QUARTERLY

Print ISSN 1815-4018
Online ISSN 2410-5422

JIIMC

Journal of Islamic International Medical College

RIPHAH
ISLAMIC INTERNATIONAL
MEDICAL COLLEGE

June 2017, Vol.12, No.2

Indexed in:
WHO-Index Medicus (IMEMR)

Recognized by:
Pakistan Medical & Dental Council (PMDC)
Higher Education Commission, Pakistan (HEC)

JIIMC JOURNAL OF ISLAMIC INTERNATIONAL MEDICAL COLLEGE

Print ISSN 1815-4018 **PMDC No. IP/0059** **Recognized by PMDC & HEC**
Online ISSN 2410-5422

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Journal of Islamic International Medical College
Quarterly

June 2017; Vol.12, No.2
Print ISSN: 1815-4018
Online ISSN: 2410-5422

JIIMC

"Journal of Islamic International Medical College (JIIMC)" is the official journal of Islamic International Medical College Rawalpindi Pakistan. The college is affiliated with Riphah International University and located in Rawalpindi (Punjab) Pakistan.

JIIMC is a peer reviewed journal and follows the uniform requirements for manuscripts submitted to Biomedical journals, is updated on www.icmj.org. JIIMC has a large readership that includes faculty of medical colleges, other healthcare professionals and researchers. It is distributed to medical colleges, universities and libraries throughout Pakistan.

For Online Submission Visit: Scopemed.org
Published by IIMC, Riphah International University Islamabad, Pakistan
Web Site: jiimc.riphah.edu.pk
E mail: prh.jiimc@riphah.edu.pk

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Recognized by: Pakistan Medical & Dental Council ; Higher Education Commission (HEC) Islamabad (Category Y)
Indexed in: WHO - Index Medicus for Eastern Mediterranean Region (IMEMR) and Scopemed (ejmanager)
Registered with: International Serials Data System of France
Covered by: Pakmedinet, PASTIC inventory "Directory of Scientific Periodicals of Pakistan"- Pakistan Science Abstracts (PSA)

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Journal of Islamic International Medical College
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EDITORIAL

Noise Pollution a Public Health Concern, Its Consequences & Prevention

Muhammad Ayaz Bhatti, Maqsood ul Hassan

In the words of Mother Teresa "We need to find God, and he cannot be found in noise and restlessness. God is the friend of silence. We need silence to be able to touch souls". Noise is derived from the Latin word "nausea" implying 'unwanted sound' or 'sound that is loud, unpleasant or unexpected'. The noise originates from human activities, especially development of transport, industry and the urbanization. Human activities create sounds in their surroundings through their propensity for work place/industrialization and urbanization.[1] The noise pollution is thought to be slow and subtle killer, still it is not perceived as it is and yet very little efforts have been made to ameliorate the Problem. It is also adding along with other types of pollution which has become a hazard to quality of life.[2]

Majority of sounds can be classified as essential and desirable, but abuse of the sounds for various purposes such as in unregulated industries, social events, transportation, construction activities household chores and poor urban planning create noise. In general sounds that we deem unwanted or unnecessary are considered to be noise.[3] A better definition of noise is wrong sound in the wrong place at the wrong time. Our society is affected by noise, which is invasive, persistent and abundant, most important of all, it is unhealthy. Now is the right time to realize that how big this problem is and how to address it.[4]

Burden of the Problem

Excessive noise is a global occupational health hazard with considerable social and physiological impacts, including noise-induced hearing loss (NIHL). Worldwide, 16% of the disabling hearing loss in adults (over 4 million DALYs) is attributed to occupational noise, ranging from 7% to 21% in the various sub regions. The effects of the exposure to occupational noise are larger for males than females in all sub regions and higher in the developing ones.[5] About 9 million workers in the United States, are exposed to time-weighted average (TWA) sound levels of 85 dBA and above and about 10 million have NIHL >25 decibels (dB). In the European Union, 28% of workers surveyed reported that at least one-fourth of the time, they are occupationally exposed to noise. Adult-onset hearing loss has been described as the "fifteenth most serious health problem" in the world, with profound effects ranging from social isolation and stigmatization of individuals to serious national economic burdens.[6] Estimates of the number of people affected worldwide by hearing loss increased from 120 million in 1995 to 250 million worldwide in 2004 Much of this impairment is caused by exposure to noise on the job. In Eastern Mediterranean Region Pakistan, Afghanistan, Djibouti, Egypt, Iraq, Morocco, Somalia, Sudan, Yemen are the countries with High child, and high adult morbidity.[7]

Effects of Noise on Health

Effect of sound/noise on health and quality of life has been known to human race since ancient times of Roman empire and medieval Europe but striking insights into the phenomenon was hypothesized scientifically in 1960. Despite long standing knowledge on the subject medical fraternity and specifically public is unaware of the deleterious hazardous effects of the noise.[8] There are many perilous effects of noise but mainly they are divided in two main categories Auditory: auditory fatigue, whistling and buzzing in ears, deafness or hearing loss may be temporary or permanent. Exposure to sound level less than 70 dB does not produce hearing damage whereas levels more than 85 dB is potentially damaging. Exposure to noise above 160db may rupture the tympanic membrane and permanent hearing loss. Non-auditory Effects include interference with speech, difficulty in communication, Annoyance which is a psychological response, irritability, short temperedness, impatience, agitation and decreased production.[9] Physiological effects are rise of blood pressure, rise in intracranial pressure, increased heart rate increased breathing, sweating, giddiness, nausea and fatigue, interference with sleep, visual disturbances, narrowing of pupil also affect color perception and reduced night vision.[10] Disturbed sleep is a

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Received: May 11, 2017; Accepted: May 23, 2017

consequence of environmental noise pollution, in chronic occurrence this results in mood changes, performance deterioration and other long term effects on health and well-being. The primary sleep disturbances are difficulty in falling asleep, frequent awakenings, waking too early, and alterations in sleep stages and depth, especially a reduction in REM sleep. Secondary effects include fatigue, depressed mood, well-being and decreased performance.[11] Vulnerability to noise hearing loss is more in children than adults. In the young hearing loss affects communication, cognition, behavior, social-emotional development and academic outcomes. Population studies have suggested association between noise and learning, reading, problem solving, social and emotional development.[12] Our history is common with examples of issues of public health importance which we fail to recognize in spite of over whelming evidence and are reluctant and very late to respond. Now having abundant knowledge on medical, social and economic effects of noise on our society should alert our policy makers to address the issue of noise pollution and its effects as an important public health problem to disconnect the connection between noise and disease.[13]

Prevention

The principle of prevention in the words of Napoleon Bonaparte may be taken as the land mark that ten people who speak make more noise than ten thousand who are silent. Two approaches to noise pollution control can be advocated as least costly, must be logistically feasible and effective. These are governmental interventions to introduce regulations of noise emissions and the public awareness. A variety of methodologies are needed to control the noise.[14]

Careful planning of the cities with division of the city in zones with separation of areas concerned with transport and industry. Residential areas should be with wide green belts at least 15 meters from road with thick plantation. There should be wide streets to reduce the level of noise penetration in the houses. Control of big vehicles in residential areas, horn blowing restrictions, building control preferably detached building rather than continuous big buildings, and the buildings should be sound proof. Areas for railway, industry, marshaling yards should be planned well.[15]

There should be hearing protection for exposed persons, rotation of exposed persons, periodical audiograms checkup and use of ear plugs, ear muffs when and where required in the noisy industries. Legislation at the Governmental level for control of noise and compensation for the workers if they suffer from the noise pollution. Improved public health education on the issue is the main pivot to draw the benefits of policy.

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ORIGINAL ARTICLE

Noise Related Health Issues among Residents of High Traffic Flow Areas of Rawalpindi and Islamabad

Iffat Atif, Adeela Mustafa, Ishaq Ahmed, Farah Rashid, Mohsin Javaid, Shahroz Saud Ahmed, Muhammad Ausaf Saleem, Waqas Ahmed

ABSTRACT

Objective: To determine noise related health issues prevailing in the residents of high traffic flow areas of Rawalpindi and Islamabad.

Study Design: Cross sectional study.

Place and Duration of Study: High traffic flow residential areas of Rawalpindi and Islamabad from 15th May to 18th October, 2015.

Materials and Methods: A cross-sectional study was carried out from 15th May to 18th October, 2015. A total of 352 respondents in the age group 25-65 years from high traffic flow residential areas of Rawalpindi and Islamabad were selected through non-probability convenience sampling technique. A structured closed ended questionnaire was administered and the collected data was analyzed through SPSS version 22.

Results: Among the various findings of our study, difficulty in sleeping was a significant problem (87%), irrespective of the age of respondents. The annoyance (69%), stress (63.4%), easy fatigability (61.4%) and poor digestion (60.5%) were also significant predicaments owing to excessive noise exposure. The residents complained that noise was interfering with their speech (58.2%) and reducing their productivity leading to difficulty in concentrating on a task (55.1%) and reduced task performance (52.3%).

Conclusion: The current study revealed that there are certain health issues attributed to noise, posing a major threat to the health of community and gradually worsening the burden of non-communicable diseases.

Key Words: *Health Issues, High Traffic Flow, Noise Pollution, Residents.*

Introduction

In an ever changing environment, a new man-made epidemic breed, a pernicious agent of many physiologic and psychological aliments as it grows, hailed by many theorists as "slow agent of death", the environmental noise devours its prey as time courses forward.[1,2] It is a significant problem all over the world especially in urban territories.[2] Environmental noise particularly high traffic noise is increasing day by day in urban areas over the period of past few years. Noise health effects are the health consequences of elevated sound levels.[3] Increased traffic noise alone is harming the human health and interferes with people's daily activities at school, at work, at home and during leisure time.[4] Noise exposure has been known to induce auditory and non-auditory effects.[5] It can disturb sleep, can cause cardiovascular, autonomic and other psychological and physiological effects including reduce performance and provoke annoyance responses and changes in social behavior.[5,6]

An insight into noise pollution in our opinion is a daunting combination of many factors. The formidable wrath of poverty has influenced migration of individuals inspiring a shift from rural to urban areas.[6] This shift has not only lead to noise pollution but serves as a nidus for various other complexities and has proved rather grave instead of being bounteous.[7] Population explosion and overcrowding has led to congestion of residential and commercial areas in its vicinity and this in turn postulates and dictates rise in traffic; deemed by some theorists as a "forerunner and a preposterous cause of noise pollution".[8]

At least one million healthy life years are lost every year from traffic related noise in the western part of Europe.[9] Most of the areas, particularly the urban side, are subjected to unacceptable noise conditions due to construction, manufacturing, traffic and recreational activities.[10] The road traffic noise is another source of noise nuisance in urban areas of Pakistan; the situation is getting alarming with increase in traffic density on city roads.[9-11] There is no

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Funding Source: NIL; Conflict of Interest: NIL
Received: Nov 11, 2016; Revised: Jan 10, 2017
Accepted: April 25, 2017

specific and detailed legislation to deal with the emergingdilemma of noise nuisance in urban areas of Pakistan, no national survey has been conducted to assess the noise level in cities and no national standards for prescribing noise limits for residential areas, industrial areas, commercial areas or silence zones.[12-14]

There has been a lapse of effort to glean sufficient information on the health hazards caused by noise[15,16,] therefore, this study was conducted to determine associated health issues, primarily to highlight the importance of a possible linkage between noise pollution and ill health and provide a growing evidence of effects of noise on community health. The objective of this study was to determine noise related health issues prevailing in the residents of high traffic flow areas of Rawalpindi and Islamabad.

Materials and Methods

A cross sectional study was conducted in high traffic flow residential areas of Rawalpindi and Islamabad from 15th May to 18th October 2015. The present study focused on road traffic noise therefore air traffic noise, railway stations, people living near railway tracks and industrial area were all excluded from the study. Occupational and household noise exposures also ruled out. A total of 352 respondents in the age group 25-65 years from these localities were selected through non-probability convenience sampling technique. The sample size was calculated by WHO sample size calculator. For the purpose of noise exposure assessment, a structured closed ended questionnaire was administered, mainly dealt with duration of residential status and health effects of noise pollution from road traffic noise. The persons were interviewed for auditory and non-auditory effects including annoyance, sleeplessness, interference with communication and other harmful effects. Informed consent was taken from the respondents explaining them the purpose of this study and confidentiality of data was ensured. The collected data was analyzed using SPSS version 22. Standard descriptive and analytical statistics were used to analyze the data. Frequency distributions were calculated. Chi-square test was used to ascertain the association between qualitative variables and p-value less than 0.05 was considered significant.

Results

The mean age of respondents in this survey was 35.4 years with a standard deviation of ± 10.2. The majority (65.3%) spends 9 hours daily in high traffic flow areas and 58.8% lived for more than 4 years or more in their noise affected residential areas. Among various findings of our study, difficulty in sleeping was a more prevalent problem showing magnitude of the effect of noise has on the sleep alone, affecting respondents of all ages.

The annoyance, stress, easy fatigability and poor digestion were also considerable predicaments owing to noise exposure. The residents complained that ambient noise was interfering with their speech, provided a barrier for proper communication and reducing their productivity leading to difficulty in concentrating on a task and reduced task performance. The people experienced trouble in hearing, buzzing noise in ears and difficulty in understanding spoken words. They also complained of headache and palpitations but to a lesser extent, the findings being presented in figure 1.

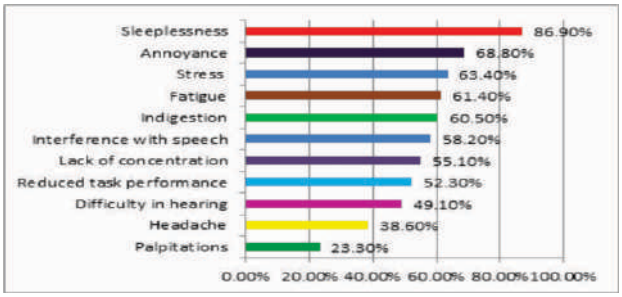

Fig 1: Frequency of health issues caused by noise

The problems faced during sleeping or primary sleep disturbances were frequent awakening, the most significant finding, followed by difficulty falling asleep, waking too early, alteration in sleep stages especially reduction in REM sleep and uncomfortable sensations in the body as shown in figure 2.

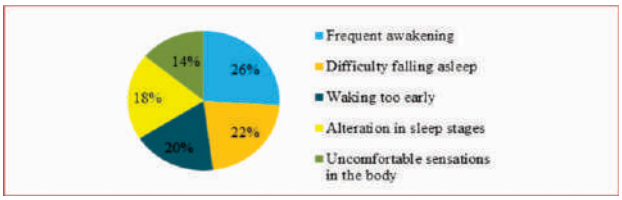

Fig 2: Problems faced during sleeping due to noise

It was appreciated that sleep disturbance prevails in all age groups and this finding was statistically highly significant (table 1).

Table I: Frequency of sleep disturbances in all age groups

Age group (Years)	Sleeplessness at night		p-value
	Yes n(%)	No n(%)	
25 - 35	75(21.3)	14(3.9)	0.000
36 - 45	69(19.6)	11(3.1)	
46 –55	77(21.8)	9(2.5)	
56 - 65	89(25.2)	8(2.2)	

It was also found that participants having exposure to noise for a longer duration with an increment in the time span spent every year, the participants experienced more health issues related to noise. The maximum frequency of health issues was observed among those who spend 9 hours or more daily at high traffic flow areas, as observed with gradually increasing years spent in the high traffic flow residential areas(table 2).

Table II: Health issues related to duration of exposureat high traffic flow areas

Time spent in noisy areas (hours)	Years of residence	Annoyance		p-value
		Yes n(%)	No n(%)	
3-4	1	0(0)	3(0.8)	0.019
5-6	2	21(5.9)	5(1.4)	
7-8	3	63(17.8)	53(15	
>9	>4	157(44.6)	50(14.2)	
		Interference with speech communication		
3-4	1	1(0.2)	2(0.5)	0.000
5-6	2	6(1.7)	20(5.6)	
7-8	3	64(18.1)	52(14.7)	
>9	>4	174(49.4)	33(9.3)	
		Sleeplessness at night		
3-4	1	3(0.8)	0(0)	0.007
5-6	2	23(6.5)	3(0.8)	
7-8	3	107(30.3)	9(2.5)	
>9	>4	193(54.8)	14(3.9)	
		Difficulty to concentrate		
3-4	1	1(0.2)	2(0.5)	0.027
5-6	2	9(2.5)	17(4.8)	
7-8	3	55(15.6)	61(17.3)	
>9	>4	129(36.6)	78(22.1)	
		Stress and easy fatigability		
3-4	1	1(0.2)	2(0.5)	0.002
5-6	2	7(1.9)	16(4.5)	
7-8	3	51(14.4)	62(17.6)	
>9	>4	137(38.9)	64(18.1)	
		Hearing impairment		
3-4	1	0(0)	3(0.8)	0.000
5-6	2	5(1.4)	21(5.9)	
7-8	3	51(14.4)	65(18.4)	
>9	>4	125(35.5)	82(23.2)	

Discussion

This study was conducted to reveal existing status of potential health effects caused by exposure to noise. The study found that there are certain adverse health effects that can be linked to exposure to traffic noise. Excessive noise seriously harms human health. Noise can be perceived as being abhorrent by some individuals, which may not pose the same impact on others in the respective vicinity.[6] The results of the study indicate that persons residing in high traffic flow areas and exposed to noise pollution showed sleep disturbance, annoyance, fatigue, difficulty in hearing, stress, lack of concentration, reduced task performance and poor digestion.[9,10]

Our study suggested that the most significant health issues related to noise exposure were sleeping problems at night and annoyance, a finding consistent with other studies.[7,9,10] Uninterrupted sleep is known to be a prerequisite for good physiological and mental functioning of healthy individuals in the present study it was proved that individuals were suffering from sleeplessness due to noise.[10] When sleep disruption becomes chronic the results are long term effects on health and wellbeing.[11,12]

Studies conducted internationally, suggests that there was a significant relationship between noise annoyance at night and sleeping problem, moreover there is no association between noise and cardiovascular problems, these results were similar to our research.[15-18] In another study it has been reported that majority of the respondents was suffering by frequent irritation, fatigue, and lack of sleep due to noise pollution, the results comparable to our research findings.[19] An important finding of the present study was indigestion or poor digestion suffered by majority (60.5%) of the participants, inconsistent with other studies.[9,10,19] This finding can be explained by the fact that environmental factors like noise can increase the levels of stress hormones in the body causing hyperacidity and alteration in gastrointestinal motility.

Noise pollution also assumed to hasten and exaggerate the development of latent mental disorders including anxiety, mood changes, nausea, headache, neurosis, psychosis and behavioral changes.[19] Our findings showed noise impairs task performance at school and work, increases errors

and decreases motivation, initially causing concentration lapse, poor understanding and progressively leading to decreased efficiency at work.[19] Hearing loss is a key feature observed in other researches in comparison.[5,9,10,19] The problem of experiencing trouble in hearing was most likely due to the direct effect of long and continuous exposure to noise, causing sensor neural hearing loss. Early detection of symptoms could yield better prognosis and a definitive treatment strategy could be formed.[19]

The assessment of road traffic noise by noise dosimeter (sound meter) was done in a study done in Iran but in our study new technological gadgets could not be used to suffice adequate sound measurement which could have effectively yielded masterful results.[20] Ignorance or lack of education had been a prime cause to hamper positive results although the symptoms perceived were mostly directing towards particular disease process. This was observed when people highlighted they were suffering from health problems but could not invariably correlate the disease process to noise pollution.[21]

Since there had been inadequate knowledge on the subject of health hazards of noise pollution as highlighted by our research; the main crux of the problem lies in the fact that general public does not appreciate this problem and do not perceive noise pollution to have negative effects on health due to lack of awareness and ignorance.[21]

Conclusion

The current study concluded that certain health issues are especially attributed to noise pollution posing a major threat to the health of community and gradually worsening the burden of non-communicable diseases. The most significant findings were sleep disturbance, annoyance, stress, fatigue, indigestion, headache, hearing problems and inefficient daily activities. Health education measures should be directed to highlight noise pollution as a public health issue and raise awareness among general public in order to reduce the consequences of noise on human health.

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ORIGINAL ARTICLE

Effect of Hyperoxia on Weight, Fasting Blood Glucose and Serum Peptide YY levels in Sprague Dawley Rats and its Potential Role in Treating Obesity

Muhammad Raza, Shazia Ali

ABSTRACT

Objective: To determine the effect of 30% hyperoxia on the weight, fasting blood glucose (FBG) and serum peptide YY (PYY) levels in Sprague Dawley rats and to see its potential role in treating obesity.

Study Design: Experimental, randomized control study.

Place and Duration of Study: It was carried out at the Department of Physiology, Islamic International Medical College, Rawalpindi in collaboration with National Institute of Health, Islamabad, Pakistan from April 2015 to March 2016.

Materials and Methods: Total 40 male Sprague Dawley rats of 2-4 months weighing 250-520 g were taken. They were divided into two groups of 20 each: control group A exposed to 21% oxygen and group B exposed to 30% oxygen for a period of 7 days. Before exposure to various oxygen concentrations the weight (g) of rats of both groups was taken and blood was collected for estimation of fasting blood glucose (FBG) (mg/dL) and serum peptide YY (PYY) (pg/mL).After exposure second sampling including weight, FBG and serum PYY was done. Statistical analysis was done applying SPSS 21, comparisons among the two groups were analyzed using independent sample t-test and correlation among variables was determined using Pearson's correlation coefficient. P value of <0.05 was considered significant in both analyses.

Results: Group B rats had significantly (P<0.05) increased weight (g), increased FBG (mg/dL) levels (P<0.001) and low serum PYY (pg/mL) levels (P<0.001) in comparison with group A.

Conclusion: Hyperoxia decreases PYY levels causing an increase in appetite leading to an increase in weight and FBG levels. Therefore, hyperoxia may not be useful as a treatment for obesity.

Key Words: *Fasting Blood Glucose, Hyperoxia, Peptide YY, Weight .*

Introduction

Obesity is a medical condition in which excess body fat has accumulated to the extent that it causes an adverse effect on health[1] and has become a global epidemic due to the readily available high calorie diets and prevailing sedentary life style.[2] The accumulated energy is stored mainly in the form of triglycerides in adipocytes leading to an increase in their size resulting in an increase in the overall body weight.[3] The increase in adipocyte size seen in obesity also leads to a decrease in insulin sensitivity hence raising blood glucose levels and increasing the risk of diabetes.[4]

A number of circulating hormones that play a vital role in controlling the appetite and ultimately reducing the weight of the body have been identified through recent research.[5] Peptide YY (PYY), the short 36 amino acid protein, is one such hormone. It is released from the gut and increases satiety resulting in a decreased in food consumption.[6] Much study has been carried out on the role of exogenous PYY in reducing weight, but more research needs to be conducted on raising endogenously produced PYY as its levels have shown to be decreased in obese individuals.[7]

Oxygen is an odorless and colorless gas having a normal atmospheric concentration of 21% and is widely used for treating a number of medical conditions.[8] Although exposure to a high level of hyperoxia for extensive periods has been shown to damage cells through the production of excessive free radicals,[9] low levels of hyperoxia produce lesser free radicals. These low levels of free radicals have shown to play an important role as signaling molecules that regulate various cellular processes and gene expression, such controlling fasting blood glucose levels through the production of glucose

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Funding Source: NIL; Conflict of Interest: NIL
Received: May 04, 2016; Revised: Oct 24, 2016
Accepted: March 25, 2017

membrane transporters[10] and in healing wounds.[11]

The effect of hypoxia on serum PYY levels in humans has already been studied. Hypoxia has shown to decrease serum PYY levels, but as the oxygen concentration is gradually raised back to a normoxic state of 21% oxygen, the serum PYY levels increase again.[12] Studies showing the effect of hyperoxia on PYY levels, especially as a potential treatment for obesity and diabetes, still needs to be explored. The objective of this study was to see whether exposure to a low level of hyperoxia of 30% could be used as a treatment for obesity by raising endogenous PYY levels, ultimately decreasing the appetite leading to a reduction in weight and fasting blood glucose.

Materials and Methods

The experimental, randomized control study was carried out in the Department of Physiology, Islamic International Medical College, Rawalpindi in collaboration with the Animal house at National Institute of Health, Islamabad, Pakistan from April 2015 to March 2016. The study was approved by the Ethics Review Committee of Islamic International Medical College, Riphah International University. A total of 40 male Sprague Dawley rats of 2-4 months weighing 250-520 g were included in the study.[13] They were randomly divided into two groups: control group A (n=20) that was exposed to 21% oxygen and group B (n=20) that was exposed to 30% oxygen.[14] For 7 days the rats were allowed to acclimatize to the NIH Animal house environment. A standard diet in pellet form was prepared at the Animal house of NIH, Islamabad according to the guidelines given by the universities federation for animal welfare.[15] The food and water was provided ad libitum. On the morning of day 8 the first sample was collected by anesthetizing each rat of group A and B by placing it in a jar containing cotton soaked in chloroform. Its weight (g) was recorded using a weighing machine (TS200 electronic compact scale, Jiangyin Ditai electronic technology Co. Ltd., China) after which blood was drawn via intra cardiac sampling. One drop of blood was added onto the test strip of the glucometer (Easy Gluco Ultra Advance blood glucose meter, Isotech Co. Ltd., South Korea) and the fasting blood glucose (mg/dL) level was recorded. The blood was collected and stored in labeled gel tubes, protected from light and contamination and kept in a laboratory ice box at 2-8oC until shifted to the laboratory where they were tested for serum PYY (pg/mL) levels using an Enzyme-linked Immunosorbent Assay (ELISA) kit (CUSABIO Biotech Co. Ltd., China).[16]

Two transparent plastic chambers of dimensions 1.22 m x 0.72 m x 0.72 m were designed. The group A control chamber rats was not made air tight by keeping the upper two sides open allowing fresh air of a 21% oxygen concentration to enter freely. The group B chamber was made air tight with only two holes: an inlet for entry of oxygen and an outlet exit of air. Two nitrogen cylinders of 6.8 m3 and three oxygen cylinders of 4.5 m3, 3.4 m3 and 3.4 m3 were used. Two flow meters (Richu Medical Regulator YR-88E, Ningbo Beilun DB Marine Co. Ltd., China) were each attached to one nitrogen cylinder and one oxygen cylinder after which they were connected by a T-tube to allow oxygen and nitrogen to mix before supplying the chamber.[17] An oxygen sensor (CY-12C portable oxygen concentration tester, CLEVER Co. Ltd., China) was also attached within the chamber to monitor the oxygen concentration.

After 2 weeks given to the rats for replenishing their blood volume to normal levels [18] the experiment was started. To achieve an oxygen to nitrogen ratio of 3:7, the flow rate for oxygen was adjusted between 1-2 L/min and that for nitrogen between 3-4 L/minso that the chamber for group B rats was supplied with an oxygen concentration of 30 + 1%.17 Upon reaching a value of 31% on the oxygen sensor the flow rates were readjusted to bring it back to a 30% oxygen concentration. The water in the flow meters provided the required air humidity and these conditions were kept for 24 hours for 7 days [19] except for two situations where the experiment was stopped for no more than 10 min: first for supplying food and water and to clean trays for waste matter, and second to refill gas cylinders. Upon completion of 7 days of the experiment, second sample, comprising of weight, fasting blood glucose and serum PYY, was collected on the morning of day 8 similar to the method applied for the first sample collection.

The labeled gel tubes containing the blood samples were centrifuged using a centrifuge machine (EBA-20 small centrifuge, Andreas Hettich GmbH & Co. KG) at a speed of 3000 rpm for 15 min. The quantitative Enzyme-linked Immunosorbent Assay (ELISA)

method was used to measure serum PYY (pg/mL) levels. Statistical analysis was done applying the Statistical Package for Social Sciences version 21 (SPSS 21). Results were documented as mean + SEM. Comparisons among the two groups was analyzed using the independent sample t-test and correlation among the variables was done using Pearson's correlation coefficient. P value of <0.05 was considered significant for both analyses.

Results

A total of 40 male Sprague Dawley rats were included in the study. During the experiment two rats died from group A and one from group B making the survival rate 92.5%. The weight of group B rats (309.08 + 10.71 g)was significantly higher (P<0.05) than the weight of group A rats (283.75 + 5.20 g) after exposure to 30% oxygen for seven days. The rats of group B had fasting blood glucose levels of 172.71 + 8.59 mg/dL which were significantly raised (P<0.001) as compared to those of the group A rats (132.06 + 4.66 mg/dL). On comparison the serum PYY levels of the group B rats was 14.62 + 6.14 pg/mL which was significantly lower (P<0.001) than those of the group A rats (256.87 + 25.48 pg/mL). Mean ± SEM of weight (g), fasting blood glucose (mg/dL) and serum PYY (pg/mL) for the two groups of male Sprague Dawley rats exposed to different concentrations of oxygen as are displayed in Table I. No significant correlation was observed between serum PYY (pg/mL) levels, weight (g) and fasting blood glucose (mg/dL) levels in both groups using Pearson's correlation coefficient as is displayed in Table II.

Table I: Comparison of mean ± SEM of parameters (weight, fasting blood glucose and PYY) for the exposed and control groups of male Sprague Dawley rats

Parameter	Group A (21% oxygen) (n=18)	Group B (30% oxygen) (n=19)
WT (g)	283.75 ± 5.20	309.08 ± 10.71*
FBG (mg/dL)	132.06 ± 4.66	172.71 ± 8.59**
PYY (pg/mL)	256.87 ± 25.48	14.62 ± 6.14**

Weight (WT), Fasting Blood Glucose (FBG)
Peptide YY (PYY)
* = P<0.05 (value vs corresponding control)
** = P<0.001 (value vs corresponding control)

Discussion

Wasseet al, (2012) conducted an experimentin 10 male volunteers to explore how rest and exercise in a hypoxic environment influenced PYY levels. They concluded that the levels of serum PYY were lower in hypoxia as compared to normoxia [12] suggesting that as the oxygen concentration is increased from that of hypoxia to normoxia then serum PYY levels also increase. The aim of our present study was to see whether this pattern of increase in serum PYY levels was consistent after increasing the oxygen concentration beyond that of a normoxic state. According to our findings, a 7 day exposure to an oxygen concentration of 30% resulted in a significant decrease in serum PYY levels demonstrating that both hypoxia, as shown by Wasseet al (2011), and hyperoxia, as shown by our present study, lowers the levels of serum PYY.

Table II: Correlation of serum PYY (pg/mL) levels with weight (g) and fasting blood glucose (mg/dL) levels for the exposed and control groups of male Sprague Dawley rats

Parameter	Group A (21% oxygen) (n=18)	Group B (30% oxygen) (n=19)
WT (g)	-0.355	-0.343
FBG (mg/dL)	-0.012	0.163

Peptide YY (PYY), Weight (WT)
Fasting blood glucose (FBG)

Our present results showed that exposure to hyperoxia led to a significant increase in weight which was in accordance with the study carried out by Lakaniet al., (2012) who observed the effects of hypoxia, normoxia and hyperoxia on a total of 81 great sturgeon Husohuso fish and concluded that the group exposed to hyperoxia led to the greatest weight gain in the fish.[20] The significantly increased weight seen in our study could have been due to an increase in appetite caused by the significant decrease in serum PYY levels observed as supported by the studies carried out by Roth et al., (2005) who showed that fasting serum PYY levels are negatively correlated with weight.[21] On the other hand, our findings did not show a significant correlation of serum PYY levels with weight.

Stress is a situation in which the organisms' homeostasis is threatened by endogenous and exogenous stimuli[22] and cortisol is the most commonly measured indicator of stress that provides a good reflection of its duration and severity.[23] Exposure to high levels of cortisol

stimulates appetite and weight gain as well.[24] In the research by Wedemeyer, (1997) exposure to both hypoxia and hyperoxia result in oxidative stress.[25] Hence in our study an exposure to hyperoxia could have led to oxidative stress thus increasing the serum cortisol levels in the Sprague Dawley rats causing an increase in their appetite resulting in the gain of weight.

Likewise, other hormones could have also been at play such as ghrelin as shown in the study carried out by Batterham et al., (2003) to investigate the resistance of PYY in 12 obese subjects in which they concluded that PYY infusions significantly decreased plasma ghrelin levels.[26] Wren et al., (2001) have also observed an increase in appetite due to a rise in plasma ghrelin.[27] Hence it can be postulated that the decreased levels of serum PYY in our study could have led to increased levels of ghrelin which ultimately increased the appetite leading to more calorie consumption resulting in the increased weight.

Bertrand et al., (1992); Greeley et al., (1988) have demonstrated that an increase in serum PYY levels inhibits insulin secretion hence causing blood glucose levels to increase.[28,29] On the contrary, the results of our present study showed that an exposure to 30% oxygen led to a significant increase in the fasting blood glucose levels in the presence of a significant decrease in serum PYY levels. As there was no significant correlation between our findings for serum PYY and fasting blood glucose levels, it can be deduced that may be some other hormone was involved in raising the levels of fasting blood glucose which is in accordance with the study carried out by Ahren and Larsson, (1996) who infused PYY intravenously in 9 healthy adult females followed by a glucose infusion and discovered that PYY did not inhibit the acute insulin response to glucose.[30]

The significant increase in fasting blood glucose levels seen in our results can be explained from the study conducted by Antunes et al., (2014) who evaluated the association between insulin-resistance, fasting levels of PYY and ghrelin in 25 male Wistar rats and proved that increased fasting ghrelin levels were associated with insulin resistance rather than increased PYY levels ultimately leading to the increased fasting blood glucose levels.[31] Our results can also be explained by the study carried out by Adam et al., (2010) on 354 latino adolescents to determine the association between cortisol and insulin, in which they concluded that increased serum cortisol levels led to decreased insulin sensitivity and hence a raised fasting blood glucose level.[32] As we have already stated that hyperoxia induces oxidative stress and leads to an increased production of cortisol so maybe the increase in fasting blood glucose observed was due to an increase in serum cortisol levels produced on exposure to hyperoxia. As we did not measure other hormones apart from PYY, such as cortisol and ghrelin, so it remains unclear as to which hormone could have brought about the change observed in fasting blood glucose levels as seen in our study.

On the other hand, the significant increase in fasting blood glucose observed can further be elaborated by the study carried out by Stolicet al., (2002) to determine the influence of BMI, anatomical depot and body fat distribution on glucose uptake and insulin action in human adipose tissue in 68 subjects. They concluded that glucose uptake was increased in the omental adipose tissue of lean subjects, whereas it was decreased in the omental adipose tissue of obese subjects as their adipose tissue cells had developed resistance towards insulin.[33] Hence it may be postulated that the increased fasting blood glucose levels observed in our study may have resulted from an increase in adipocyte size which occurs when there was an increase in weight.

Conclusion

The conclusion derived from the results of the present study are thathyperoxia decreases serum PYY levels causing an increase in appetite leading to an increase in weight and fasting blood glucose. Therefore, hyperoxia is not a useful option for the treatment of obesity and may be a precipitating factor for the development of diabetes mellitus.

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ORIGINAL ARTICLE

Effect of Storage Media on the Solubility of Commercially Available Calcium Hydroxide Cements. A Clear Guideline for Dentists

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ABSTRACT

Objective: The objective of this study was to evaluate the influence of storage media on the solubility of four different commercially available calcium hydroxide cements.

Study Design: Comparative Experimental study

Place and Duration of Study: The study was conducted 1st August 2016 to 29th November 2016 at Army Medical College NUMS.

Materials and Methods: The present study included four different commercially available calcium hydroxide cements. For each material 8 disc-shaped specimens were prepared according to manufacturer's instructions. Then each material was further divided in to two groups on the basis of storage media. “Group A” used distilled water (DW) and Group B used saliva for the storage of specimens (n=4).Solubility was noted using analytical balance after immersion. Data was analyzed with analysis of variance (ANOVA) and post hock Tukey's test using SPSS 21.

Results: A significant difference ($p \leqslant 0.05$) between the results of solubility due to change in media of group A and B was observed. The difference in solubility between the various cements was significant.

Conclusion: The study confirmed the difference between the cements on the basis of solubility hence it highlighted the importance of solubility and provides a guideline for the clinician to choose the type of calcium hydroxide that is required in a particular situation on the basis of determined solubility.

Key Words: *Calcium Hydroxide, Dental Cavity Lining, Dental Cements Solubility.*

Introduction

The role of calcium hydroxide in the materials used as bases and cavity liners was identified in the early twentieth century.[1] They are used for pulp protection after injury caused either due to carious lesion or clinical intervention. Also it prevents infiltration of dentinal fluid into the restoration or leaching of restorative components into the oral tissue.[2] Furthermore the ability of calcium hydroxide based cements to simulate dentin recovery has seen an expansion of their use as deep cavity cements.[3-5]

Although, the use of calcium hydroxide cements to induce dentin bridges formation is well documented, their seals are known to be vulnerable to bacterial infections beyond short-term applications. Infection and necrosis are quite common in breached seals (micro-leakages in caps and tunnel defects in dentin bridges), within the first few years of application.[6,7] This is mostly due to lower strength and higher solubility than alternative products.[8] Available literature suggests that base/liner materials become unstable under restorations, possibly due to dissolution after exposure to dentinal fluid or other aqueous media. This results in loss of cavity protection and physical support to restorations.[9,10] Evidence suggests that the solubility and water sorption properties have a direct impact on how well lining between teeth and their restorations endure. Consequently, in the study of the quality of calcium hydroxide cements, their resistance to disintegration is one of the most critical criterion.[11]

Recent developments have seen an advent in the use of resin based calcium containing cements and methylcellulose based cements that have proven to have more resistant, robust and easier to cure compared to their non-resin based counterparts and water based respectively.[12-14] although, the results of pulp capping based on such cements seems to be encouraging, available evidence does not yet suggest that they would act as more resistant

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Funding Source: NIL; Conflict of Interest: NIL
Received: Dec 03, 2016; Revised: Mar 08, 2017
Accepted: Jun 04, 2017

barriers.[14] Consequently, there is an opportunity to conduct qualitative research to test resin based calcium cements. This study aimed to fill this gap in existing research by presenting a study in the observed performance of various commercially available resin based calcium cements. Of special interest is the observation of their water solubility. The tests conducted focused on all possible factors that breach the cement integrity and their corresponding causes, over a period of time.

Considering the extensive use of calcium hydroxide in the field of dentistry and the varieties of formulation available by different companies with several claims, there was a need for a comprehensive comparison of the materials, particularly in the varying solubility media.

The objective of this study was to evaluate the influence of storage media that is distilled water and saliva on the solubility of four different commercially available calcium hydroxide cements.

Materials and Methods

The materials used in the experimental in vitro study conducted from 1st August to 30th November 2016 at Army Medical College NUMS were four commercially available calcium hydroxide cements: one chemically cured two paste system Septocalcine ultra +, two with physical mode of activation system (Calcipulp by Septodont and cavity liner paste by Produits Dentaires) and one resin-based light curing system Cavity Liner, (Light cure Calcium hydroxide paste by Produits Dentaires). Details are given in the table I below:

The ISO 6876 specification was implemented with minor changes to develop the methodology used in this study. For the solubility tests a total of 32 disc-shaped specimens (6.2 mm diameter x 1 mm thick) were prepared according to manufacturer's instructions using a split mould of stainless steel (8 from each material given in figure 1). Then each material was randomly divided by tossing a coin method in to two groups on the basis of different media for immersion. “Group A” used distilled water (DW) and Group B used saliva for the storage of Specimens (n=4).

The percentage difference in mass of the specimens before and after immersion in DW and saliva was determined. Solubility was noted after 24 hours. The methodology has also been illustrated in figure 2.Data was analyzed with analysis of variance (ANOVA) and post hock Tukey's test using SPSS 21.

TableI: Materials used in the study along with composition and activation modes

SR No	Cement	Composition	Activation mode	Batch	Manufacturer
1	Septocalcine ultra + (2 paste)	2 paste Paste A: butyleneglycol salicylate, zinc oxide, calcium phosphate, excipients. Paste B: Calcium Hydroxide, Zinc oxide, excipients	Chemical	106860571000	Septodont, France
2	Calcipulpe Paste (Calcipulpe)	Calcium hydroxide (20.0 %), barium sulphate, excipients	Physical	B14554AB	Septodont, France
3	Cavity Liner, Paste Calcium hydroxide paste (cavity liner)	Calcium hydroxide, Barium sulfate in a Methylcellulose base	Physical	8383 AG	Produits Dentaires SA, Switzerland
4	Cavity Liner, Light cure Calcium hydroxide paste (light cure)	Urethane dimethacrylate, Calcium hydroxide, Barium sulfate, silicates, excipients	Light cure	8672 DH	Produits Dentaires SA, Switzerland

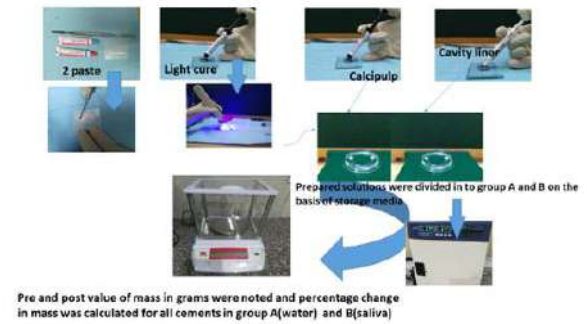

Fig 1: Methodology used for testing solubility of calcium hydroxide based cements

Results

The results of solubility of group A and B and comparison between the groups are given in figure 2 and 3 respectively. There was a significant difference between the results of solubility due to change in storage media of group A and B ($P < 0.01$) while the difference in solubility between the various cements was also significant ($P < 0.05$).

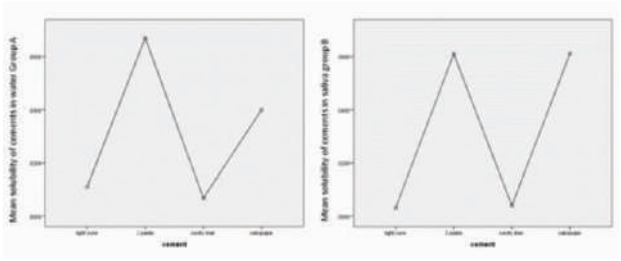

Fig 2: Means plot showing the effect of storage media on the solubility of various calcium hydroxide cements

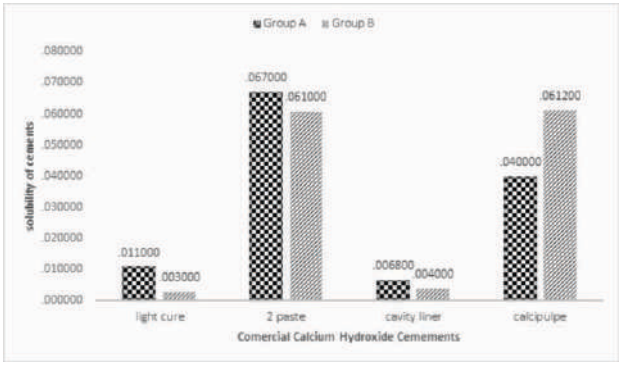

Fig 3: The effect of environment on the setting time of various calcium hydroxide cements

Discussion

The subject of liners and bases has been controversial as there is no single guideline for clinicians, regarding the use of liners and bases. Lot of research work has been done on the biological and mechanical properties of these materials.[15-17] Strength and low solubility are critical features of base and lining materials.[13] The strength and resistance to oral solvents are necessary for the reliable support of restorations, especially the vertical stresses they have to face. Further studies were needed to compensate the gap in current research with regards to loss of strength in bases and loss of hardness in liners, due to solubility of cements and the pH levels of the saliva.

To maintain their protective effects, lining and base materials have to be resistant to dissolution in organic oral solvents.[18] The focus of this study is to identify vital quality indicators for the clinical validity of each tested material. Hence, ISO 6876 specification was used to test the solubility of various cements, not only in distil water but also in saliva. The results of present study were consistent with previous study which concluded that calcium hydroxide cement bases are significantly more soluble in distilled water than in saliva,[19] with exception of calcipulpe. This may be attributed to the excipients present in the cement.

The manufacturers claim physical reliance and longevity due to low solubility. Despite the several variations in their compositions, for all intents and purposes, pulp-capping materials are a mixture of calcium hydroxide and an ester of salicylic acid.[20] A selection of these compositions were evaluated and analysed for this study:

(i) Septocalcine ultra+ (Chemically cured two-paste system)
(ii) Light Cure Calcium Hydroxide paste by Produits Dentaires (resin-based light curing)
(iii) Calcipulp by Septodont (physical mode of activation)
(iv) Cavity Liner Paste by Produits Dentaires(physical mode of activation)

Amongst the cements, light cure calcium hydroxide paste and cavity liner paste performed substantially better than the other two. The low solubility of the light cured system may be attributed to the presence of resin particles in its composition. On comparing the cements with the physical mode of activation, the single paste methyl cellulose based cement showed more resistance to solubility than water based system (figure 2). These observations about the resilience of resin-based lining materials in this study have been validated by Burke and Watts,[21,22] who demonstrated the higher resistance of resin-based lining materials compared to conventional

calcium hydroxide cements. The observation of the increase in resistance to solubility due to presence of methylcellulose has also been previously observed in other cements.[23]

It would be pertinent to emphasise that the results of this study are strictly limited to the parameters and factors described and cannot be extended to other conditions without explicit tests. The need for high strength and low solubility in base materials has been established in this study. However, the solubility should not be low to an extent to hinder the ion exchange with the odontoblastic layer at the dentin-base interface.

Conclusion

The present study characterized various calcium hydroxide cements on the basis of solubility. These results will be used as a guideline for the clinician to choose the type of calcium hydroxide that is required in a particular situation on the basis of determined solubility.

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ORIGINAL ARTICLE

Effect of Tocotrienols on Aortic Adventitia of Cholesterol-Fed Rabbits

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ABSTRACT

Objective: To identify the effect of tcotrienols on adventitial changes induced by high cholesterol diet in descending thoracic aorta of rabbits.

Study Design: Laboratory based randomized control trial.

Place and Duration of Study: The Anatomy department of Army Medical College Rawalpindi in collaboration with National Institute of Health, Islamabad. The study commenced on 10th March 2009 and completed on 10th September 2009.

Materials and Methods: Thirty adult male New Zealand White rabbits were randomly divided into three equal groups (I, II & III). Group-I consumed standard NIH diet while group-II was fed 2% high cholesterol diet. Group-III animals were given the same diet as to group II, however, tocotrienols 6 mg/kg body wt/day were also added to the diet. Following six weeks of experiment, aorta of every animal was dissected. Cross sections were taken from descending thoracic aorta and processed for light microscopic examination. In H&E and verhoeff stained slides, adventitial histomorphological changes were compared among the three groups.

Results: In rabbits on standard diet, tunica adventitia was a thin layer composed of loose network of collagen and elastic fibers which lacked lamellar pattern as that of media. Adventitial cells were relatively scanty. In contrast, aortic adventitia in group-II was thickened with increased number of inflammatory cells characterized by central round nucleus and foamy cytoplasm. Above mentioned histological changes were present in group-III but were of lesser degree than group-II. Mean±SD thickness of adventitia and inflammatory cells score was significantly greater in group-II &III when either was compared with group-I. However, group-III showed 19% ($p<0.05$) reduction in adventitial thickening and & 36% ($p<0.05$) lesser inflammatory cells score versus group-II.

Conclusion: Tocotrienols decrease adventitial thickening and inflammation induced by high cholesterol diet in aorta of cholesterol-fed rabbits.

Key Words: *Adventitia, High Cholesterol Diet, Rabbit Aorta, Tocotrienols.*

Introduction

Atherosclerosis is considered to be the most common physical burden globally.[1] Despite the use of dietary modifications and newer pharmacological approaches, very few effective measures exist for the prevention and treatment of this disease. Anti-atherogenic effects of tocotrienols (members of vitamin E family) are also unclear as yet.

Traditionally, atherosclerosis is considered as disease of intima with involvement of media in later stages of disease progression. Accordingly, intimal and medial thickening was accepted as the most appropriate predictor of atherosclerosis.[2] With the advancement of new era, however, it was noted that features of atherosclerosis definitely exist in the tunica adventitia[3] and adventitial inflammation is an early event in the process of atherogenesis.[4] Majesky et al labeled adventitia as a dynamic interface harboring progenitor cells which respond to arterial injury and then migrate into tunica intima.[5] Gutterman proposed that future managements for prevention of atherosclerosis should focus on drug therapies targeting adventitia of vessels.[6]

Vitamin E includes eight chemically distinct substances: four tocopherols and four tocotrienols (alpha, beta, gamma and delta). Heath benefits of vitamin E in the prevention and treatment of atherosclerosis have been postulated with conflicting results but more than 95 per cent studies of vitamin E were directed towards tocopherols and tocotrienols remain poorly understood.[7] Moreover, available data regarding tocotrienols is mainly limited to their potent hypocholesterolemic, antioxidant and anti-inflammatory properties[8,9] and thus addresses a major void in evaluation of their effect on histomorphological aspects of the atherosclerosis.

Therefore, this experimental study was designed to investigate the effect of this lesser known form of

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Funding Source: NIL; Conflict of Interest: NIL
Received: Nov 02, 2016; Revised: Feb 08, 2017
Accepted: May 01, 2017

vitamin E (tocotrienols) on aortic adventitia of rabbits fed high cholesterol diet.

Materials and Methods

The present study was a laboratory based randomized control trial conducted in the Anatomy department of Army Medical College Rawalpindi in collaboration with National Institute of Health (NIH), Islamabad. All experimental procedures were approved by the institutional animal ethical committee. The study commenced on 10th March 2009 and completed on 10th September 2009. Inclusion criteria were thirty adult male New Zealand White (NZW) rabbits, 10-18 months old and weighing 1.5 to 2.5 kg. Female rabbits and animals with any evident pathology were excluded from the study. Each rabbit was kept in a separate cage, at a standard temperature of 21 ± 20C with 12 hour light/dark cycle at NIH. Each animal was given 100g/day standard NIH diet. Water was available ad libitum. After one week of acclimatization to experimental conditions, thirty rabbits were divided into three equal study groups (I, II&III) by using non-probability convenient sampling technique. Group-I continued standard NIH diet (100g / head/day) while each animal in group-II was given 2% high cholesterol diet {2g cholesterol powder (Applichem, Germany) mixed with 100g standard NIH diet/ head/day.[10] Group-III animals were fed the same diet as to group II, however, tocotrienols {mixture of 90% delta & 10% gamma (American River Nutrition, Inc. Hadley, MA. USA)} 6 mg/kg body wt/day[11] were also added to the diet. Composition of diet per animal in each group is given in table-I. After six weeks of experiment, rabbits were euthanized. Cross sections were taken from descending thoracic aorta and placed in 10% formol calcium. After 48 hours, tissues were processed for light microscopic examination. H&E staining was done for histomorphological examination. For morphometry, verhoeff van-Geisson stain was used for the delineation of collagen and elastin. Under 40X objective, at three point of maximal luminal narrowing, adventitial thickness (AT) was measured from media-adventitia interface (external elastic lamina) to the adventitia-periadventitia interface (outer edge of collagen containing dense fibrous tissue).[12] Mean of the three values was calculated for each cross section. Inflammation in adventitia was semiquantitatively scored accordoing to the following criteria: 0 = No inflammatory cells, 1 = inflammatory cells present in $\geqslant$ 25 to < 50 per cent circumference, 2 = inflammatory cells present in $\geqslant$ 50 to < 75 per cent circumference, 3 = inflammatory cells present in $\geqslant$ 75 per cent circumference. Inflammation was defined as presence of $\geqslant$ 25 mononuclear round cells with foamy cytoplasm per field with 40X magnification objective.[13,14]

Parametric data was analyzed using SPSS (Statistical package for social sciences) windows version 20. Quantitative data was expressed as Mean ± S.D. For each variable, group differences were compared by one way analysis of variance (ANOVA) followed by post hoc tukey test for intergroup comparison of parameters. All the results were considered statistically significant at a p-value less than 0.05.

Results

In rabbits on standard NIH diet, tunica adventitia was a thin layer composed of loose network of collagen and elastic fibers which lack lamellar pattern as that of media. Adventitial cells were relatively scanty and mainly suggestive of fibroblasts (Figure 1-a). Vasa vasora and nervi vascularis were also scattered amongst the fibers. In contrast, aortic adventitia in group-II appeared to be thickened especially beneath the intimal lesions (Figure 1-b). This thickening was associated with increased number of mononuclear round cells with central nucleus and foamy cytoplasm. These cells were forming aggregates in adventitia and penetrating medioadventitial interface (Figure 1-d). Above mentioned changes were present in group-III (Figure 1-c) but were of lesser degree than group-II

Mean±SD thickness of adventitia and inflammatory cells score was significantly greater in group-II &III when either was compared with group-I. However, group-III showed 19 % reduction in adventitial thickening and & 36% lesser inflammatory cells score versus group-II (Table-II).

Table I: Showing composition of diet per animal per day in each group

Components of diet	Group-I	Group-II	Group-III
Chickpea powder	77 g	77 g	77 g
Wheat bran powder	23 g	23 g	23 g
Cholesterol powder	—	2 g	2 g
Tocotrienols	—	—	12.5 mg

Table II: Showing comparison of adventitial thickness and inflammatory cells score between rabbits fed standard NIH diet (Group-I), 2% high cholesterol diet (Group-II), 2% high cholesterol diet+ tocotrienols (Group-III) for 6 weeks

Parameters	Adventitial thickness (µm)			Inflammatory cells score		
Groups	I	II	III	I	II	III
Mean value	4.63	9.30	7.53	0.00	2.20	1.40
Std. Deviation	0.777	1.451	0.737	0.00	0.918	0.516
SEM	0.245	0.459	0.233	0.00	0.290	0.163
p-value	Group-I versus Group-II=0.000 Group-II versus Group-III=0.002 Group-I versus Group-III=0.000			Group-I versus Group-II=0.000 Group-II versus Group-III=0.018 Group-I versus Group-III=0.000		

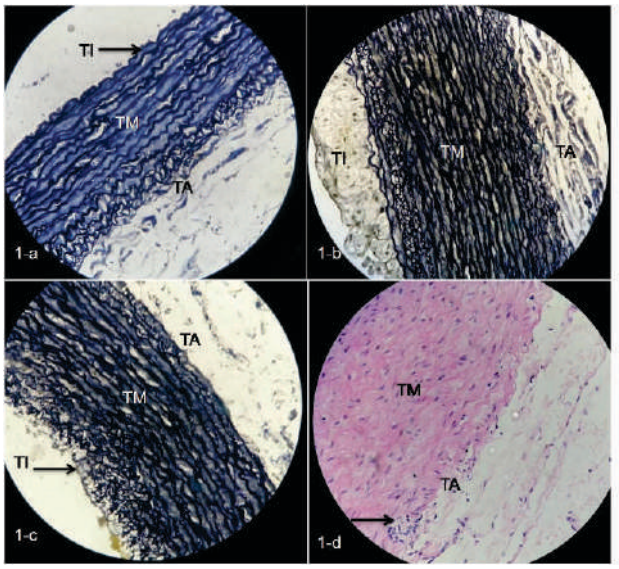

Fig 1: Aortic cross sections of rabbit fed standard NIH diet (1-a), 2% high cholesterol diet (1-b, 1-d,) & 2% high cholesterol diet+ tocotrienols (1-c) for 6 weeks (1-a, 1-b, 1-c: Magnification X400, Verhoeff Van Geisson stain; 1-d: arrow indicates inflammatory cells, H&E stain).
TI: Tunica intima, TM: Tunica media. TA: Tunica adventitia

Discussion

The present experimental study evaluated the effect of tcotrienols (mixture of 90% delta & 10% gamma) on adventitial atherosclerotic changes induced by high cholesterol diet in aorta of rabbits. Our results suggested that tocotrienols supplementation significantly decrease adventitial thickening and inflammation. Adventitial thickness displays a strong correlation with atherosclerosis risk factors especially dyslipidemias.[12,15] Atherogenic stimuli excites adventitial cells particularly fibroblasts, which in turn produce increase amount of extracellular matrix. These fibrobasts also generate an inflammatory response by releasing cytokines and chemokines.[16,17] Growth of vasa vasora further modulates arterial wall structure by acting as conduit for inflammatory and progenitor cells.[16] Adventitial thickening and inflammation, in response to high cholesterol diet, as observed in the current experiment, supports the findings of Gradus-Pizlo et al[17] who found significantly greater thickness of adventitia in patients with coronary atherosclerosis than those with normal arteries. This adventitial thickening was associated with enhanced number of mononuclear vacuolated cells especially in the outer half of vessel. According to dushkin,[18] these cells are considered as an attribute to generate inflammation. Maillaro & Taylor [19] reported that population of these inflammatory cells include lymphocytes, monocytes, macrophages and fibroblasts which work in concert to elicit an inflammatory response that progresses towards tunica intima. In reviewing the immune and inflammatory mechanisms regarding atherosclerosis, Galkina and Ley[20] stated that these cells are found in normal adventitia but their number expands in atherosclerotic lesions. Contrary to our findings, Deopujari and Dixit[21] reported that basic pathological changes occur in tunica intima and media and tunica adventitia is not affected in coronary artery disease. Tocotrienols mediated substantial reduction in adventitial thickening is quite close to the findings of Qureshi et al[22] whose striking results highlighted the atheroprotective properties of novel tocotrienols of rice bran by substantial reduction of 57 per cent, 33 per cent and 47 per cent in growth of atheromatous plaque in three genotypes of mice. Comparable results were seen in a recent local study which showed that tocotrienols significantly decrease atheromatous changes in diet induced diabetic BALB/c mice.[23] However, our findings are not consistent with Ismail et al[24] who found no beneficial effect on atherosclerosis development in six rabbits given palm tocotrienols plus 2 per cent cholesterol for 10 weeks compared with the six rabbits given cholesterol alone and six rabbits on regular diet. The difference can be accredited to relatively small sample size in their study and more severe nature of the disease.

As inflammation is the hallmark of atherosclerotic lesions.[25] Reduction in adventitial inflammatory cells, in our study, is in supportive context with Wu et al[26] who concluded that tocotrienols possess potent anti-inflammatory activity by suppressing the expression of inflammatory mediators in human monocytic cells. Many researchers have compared anti-inflammatory properties of various tocotrienols and tocopherols and found delta tocotrienol as the most potent isoform.[27,28] In a study on hypercholesterolemic subjects, delta tocotrienol was given in doses of 125, 250, 500, 750 mg/day for 4 weeks. In each concentration, delta tocotrienol was therapeutically effective in reducing biomarkers of oxidative stress and inflammation including serum nitric oxide, C-reactive protein, malondialdehyde, and δ-glutamyl-transferase.[9]

In conclusion, our experimental data suggests that tocotrienols exhibit significant potential in lowering adventitial atherosclerotic changes induced by high cholesterol diet in aorta of rabbits. The study had been carried out in an experimental model of atherosclerosis that differs from chronic lesions observed in human cases. Therefore, human trials should be considered necessary for final elucidation of tocotrienols as atherosuppressive agents. Moreover, mechanisms involved in suppression of atherosclerotic changes warrants further investigations.

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ORIGINAL ARTICLE

Efficacy of EPI-OFF and EPI-ON Collagen Cross-Linkage Procedure in Terms of Visual Acuity and Astigmatism in Keratoconus Patients

Sumaira Amir, Aamir Asrar

ABSTRACT

Objective: To compare the efficacy of epi-off and epi-on collagen cross-linkage procedure in terms of visual outcomes and astigmatism during one-year period.

Study Design: Prospective study.

Place and Duration of Study: Amanat Eye Hospital from May 2014 to April 2015.

Materials and Methods: Eighty patients (102 eyes) with keratoconus were included in this study. There were forty patients (51 eyes) presented with epi-on collagen cross-linkage procedure (Group I) and forty patients (51 eyes) with epi-off collagen cross-linkage procedure (Group II). Epi-off procedure involved epithelial removal comprised of isotonic riboflavin solution 0.1% with 20% dextran, whereas epi-on procedure involved intact epithelium utilized hypotonic 0.25% riboflavin solution.

Results: In Group I, the mean age of patients was 21.83 years± 3.83 SD. There were 27 (67.5%) male and 13 (32.5%) female patients. In Group II, the mean age of patients was 20.75years ± 4SD. There were 22 (55%) male and 18 (45%) female patients. Uncorrected visual acuity improved to 0.04 Log MAR in epi-on and 0.03 Log MAR in epi-off procedure with p-value=0.7(statistically insignificant), whereas best corrected visual acuity improved to 0.06 Log MAR in epi-on and 0.02LogMAR in epi-off technique with p-value=0.28 (statistically insignificant) respectively. However, mean pre-operative topographic astigmatism were (5.51± 2.58) with epi-on procedure and (3.98 ±2.30) with epi-off procedure, improvement of mean post-topographic astigmatism were improved in epi-on procedure (5.10 ±2.42) than epi-off procedure (3.96± 2.20).

Conclusion: There was insignificant difference between both cxl procedures. However, improvement of mean topographic astigmatism were observed in epi-on as compared to epi-off collagen cross linkage procedure.

Key Words: *Epi-On CXL, Epi-Off CXL, Keratoconus, Riboflavin.*

Introduction

Keratoconus is degenerative eye disease characterized by localized thinning and conical protrusion of the cornea, which typically develops in the inferior-temporal and central zones .[1] It results in distorted, blurred vision, glare and photophobia. Consequently, visual acuity is reduced due to irregular astigmatism and high myopia resulting from asymmetric topographical changes in the anterior corneal surface. Keratoconus is the most prevalent form of corneal ectasia and affects all ethnicities.[2,3,4,5] It is a progressive condition with a heavy burden for patients as a result of aggravation in the third decade of life.[6]

A diagnosis of keratoconus is most commonly made through slit lamp examination, corneal topography, measurement of visual acuity and refraction. Since slit lamp examination is unable to show the signs of keratoconus in the early stages and visual acuity may not be affected, corneal topography is the only reliable criterion,[7,8] Recent advances in corneal imaging and the possibility of the assessment of the corneal surface with the help of anterior or posterior elevation measurements have provided ophthalmologists with valuable information.[9,10] Pentacam employs the Scheimpflug imaging technique to present the corneal topographic indices with an acceptable accuracy and repeatability.[11] In the mildest form of keratoconus, spectacles or soft contact lenses may help. But as the disease progresses, with the thinning of the cornea and more irregularity in shape, glasses and regular soft contact lens no longer provide adequate vision correction. Corneal cross-linking has made it possible to arrest keratoconus, especially in the early stages, hence significantly reduce the need for corneal transplantation (keratoplasty).[12] Therefore, early diagnosis is of vital importance.

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Funding Source: NIL; Conflict of Interest: NIL
Received: Sep 30, 2016; Revised: Feb 10, 2017
Accepted: March 08, 2017

Corneal collagen cross-linking (CXL) with riboflavin and ultraviolet-A is a new technique of corneal tissue strengthening by using riboflavin as a photosensitizer and UVA to increase the formation of intra and inter fibrillar covalent bonds by photosensitized oxidation. There are two procedures introduced for treating keratoconus,epi-off collagen cross-linkage(standard CXL) and epi-on collagen cross-linkage(trans-epi CXL). Epi-off cxl involved epithelium removal followed by instillation of 0.1% isotonic riboflavin drops with 20% dextran solutions. However, the epi-on cxl procedure involved intact epithelium with hypotonic riboflavin drops 0.25% solution.Long-term clinical reports showed that both these methods halts the progression of keratoconus[13,14] and to some extent improves refractive and topographic parameters.[15,16,17] Recently introduced technique epi-on cxl that involves intact epithelium targets to reduce postoperative pain, reduced chances of infections and early visual recovery.[18]

The aim of this study was to find the efficacy of epi-off and epi-on collagen cross-linkage in terms of visual outcome and astigmatism in keratoconus patients in order to better define the validity of both techniques.

Materials and Methods

A prospective study conducted in the settings of Amanat Eye Hospital, Rawalpindi. Consecutive sampling technique was used to collect the sample of eighty patients (102eyes) from May 2014 to April 2015 with age group 14-31 years. An informed consent was obtained from all the patients enrolled in the study. An approval was taken from the hospital ethical committee. There were forty patients (51 eyes) with epi-on cxl procedure (Group I) and forty patients (51 eyes) with epi-off cxl procedure (Group II). The inclusion criteria included 14-31 years of age, history of vigorous eye rubbing, intolerant to contact lenses, patients with the complaint of unstable refraction, vision deterioration, Pentacam corneal thickness 450microns - 380 microns depending upon K-readings on the basis of mild<48D, moderate 48-54D and advanced keratoconus>54D.The exclusion criteria included systemic diseases affecting ocular conditions and corneal scarring.

Pre and post-operative testing included uncorrected distance visual acuity (UDVA), best-corrected distance visual acuity (CDVA), slit-lamp examination, corneal topography (Oculus Pentacam). UDVA and CDVA were recorded using Log MAR Early Treatment Diabetic Retinopathy Study vision chart at distance of 4m. Pentacam topography was used to evaluate pre- and postoperative corneal topography and pachymetry.Silt-lamp examination was done by an ophthalmologist. The selection criteria for cxl procedure includes high K-readings >47.0 D and corneal thickness <450microns .Those with K-readings >49.0 D and corneal thickness < 400 microns undergo epi-on cxl procedure,as thin corneas can be best treated with epi-on technique.

Epi-off CXL technique involved epithelial debridement performed under topical anesthetic drops followed by instillation of isotonic riboflavin drops 0.1% in 20% dextran solution topically for 30 minutes. The cornea was exposed to UVA 370 nm light for 3 minutes at an irradiance of 30mW/cm2, bandaged contact lenses were applied for 5 days after the procedure.

New intervention for the treatment of keratoconus in regards to patient comfort and safety is epi-on cxl procedure (trans-epi).Epi-on cxl involved intact epithelium followed by instillation of hypotonic riboflavin drops 0.25% solution for one hour, then cornea was subjected to UVA radiation for 3 minutes with a wavelength of 370 nm at the intensity of 30mW/cm2 within a circular diameter of 9 mm which increases collagen cross-linkages and stiffens the cornea. Pre-operatively and post-operative data of visual acuity and astigmatism were measured by using Log MAR chart and corneal topography (Pentacam) at baseline, three and twelve months respectively.

The Statistical Package for Social Sciences software (SPSS, version 22) was applied to organize and tabulate the data collected. Pre and post-operative data of visual acuity and astigmatism were calculated by using independent sample t-test. All the results were evaluated at a confidence interval of 95%. p-value <0.05 considered to be statistically significant.

Results

Eighty patients (102 eyes) presented with mean age (in years) ± SD as 21.29 ± 4.07. There were forty patients (51 eyes) with epi-on cxl procedure (Group I) and forty patients (51 eyes) with epi-off cxl procedure (Group II). In Group I, the mean age of

patients (in years) ± SD was 21.83 ± 3.83 (range 14 to 31). There were 27 (67.5%) male and 13 (32.5%) female patients. Right eye was affected in 15 (37.5%) patients, left eye was affected in 14 (35%) patients while there were 11 (27.5%) patients with both their eyes affected. In Group II, the mean age of patients (in years) ± SD was 20.75 ± 4.27(range 14-31). There were 22 (55%) male and 18 (45%) female patients. The right eye was affected in 17 (42.5%) patients, left eye was affected in 12 (30%) patients while there were 11 (27.5%) patients with both their eyes affected.

The Independent Sample t-test reported no significant statistical difference between epi-on cxl and epi-off cxl procedure in terms of improvement in un-corrected visual acuity after three months, twelve months and between three to twelve months of treatment, with p values > 0.05. There was also statistically insignificant difference among group 1(cxl epi-on) and group 2 (cxl epi-off) procedure on the basis of improvement in best corrected visual acuity with p-value > 0.05 (Table I and II).

Table I: Un-corrected visual acuity after epi-on and epi-off cxl procedure

Visual Acuity	Type of Procedure	N	Improved (n)	Stable (n)	Worsened (n)	Mean Improvement ± SD (in Log MAR units)	t (df)	p-value
UCVA after 3 months of treatment	On	51	11	40	0	0.05 ± 0.11	- 0.67 (100)	0.5
	Off	51	16	28	7	0.03 ± 0.20		
UCVA after 12 months of treatment	On	51	17	31	3	0.09 ± 0.19	- 0.84 (100)	0.4
	Off	51	16	27	8	0.06 ± 0.19		
UCVA between 3 to 12 months of treatment	On	51	10	35	6	0.04 ± 0.18	- 0.29 (100)	0.7

Table II: Best-corrected visual acuity after epi-on and epi-off cxl procedure

BCVA after 3 months of treatment	On	51	8	43	0	0.04 ± 0.11	0.73 (100)	0.47
	Off	51	7	41	3	0.03 ± 0.11		
BCVA after 12 months of treatment	On	51	15	35	1	0.09 ± 0.21	- 1.29 (100)	0.19
	Off	51	11	36	4	0.04 ± 0.20		
BCVA between 3 to 12 months of treatment	On	51	11	38	2	0.06 ± 0.16	- 1.08 (100)	0.28

After stratification of keratoconus as mild, moderate and severe, Independent Samples t-tests revealed that there were statistically insignificant difference between group 1 (epi-on cxl) and group 2 (epi-off cxl) procedure in terms of improvement in astigmatism after three months, twelve months and between three to twelve months of treatment among all three grades of keratoconus, with p values > 0.05 (Table III and IV).

Table III: Astigmatism results on the basis of grades of keratoconus after epi-on cxl procedure

Grades of keratoconus	Improved	Stable	Worsened	Total
Mild	3	3	2	8
Moderate	12	5	11	28
Severe	7	3	5	15

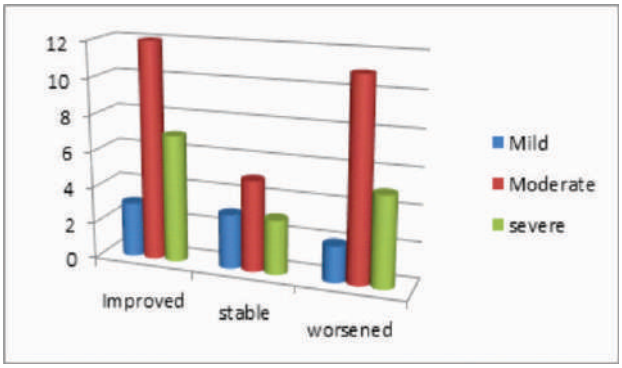

Fig 1. Graphical representation of grades of keratoconus after epi-on cxl procedure

Table IV: Astigmatism results on the basis of grades of keratoconus after epi-off cxl procedure

Grades of keratoconus	Improved	Stable	Worsened	Total
Mild	8	13	7	28
Moderate	9	1	10	20
Severe	1	1	1	3

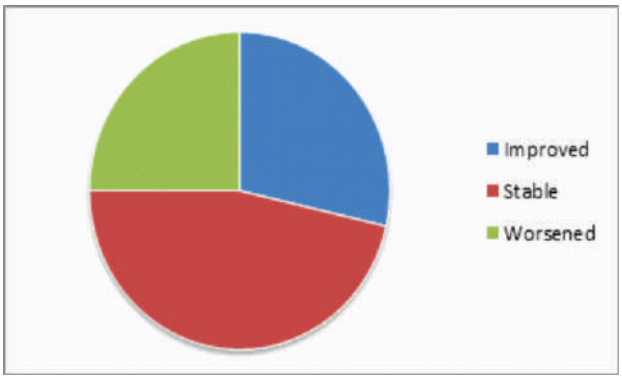

Fig 2.Graphical representation of grades of keratoconus after epi-off cxl procedure

Table V: The descriptive statistics of keratometric readings after epi-on and epi-off cxl procedure

K-readings	Procedure	Total	Mean ±SD	Min	Max	Range
Pre-operative Keratometric Reading of Steep Meridian	On	51	52.06 ± 4.56	42.00	63.00	21.00
	Off	51	48.24 ± 3.29	42.00	60.75	18.75
Keratometric Reading of Steep Meridian after 3 Months of Treatment	On	51	52.15 ± 4.63	42.50	63.50	21.00
	Off	51	48.34 ± 2.95	43.50	59.75	16.25
Keratometric Reading of Steep Meridian after 12 Months of Treatment	On	51	51.91 ± 4.63	42.50	63.25	20.75
	Off	51	48.40 ± 2.86	43.50	57.75	14.25

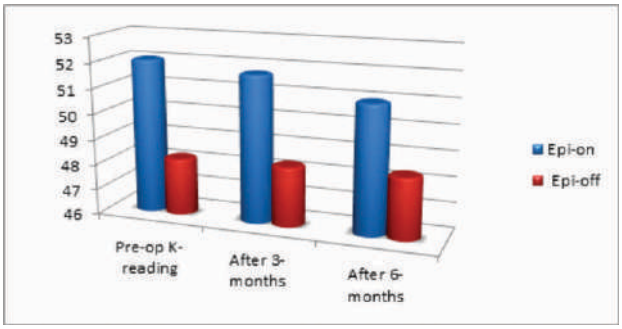

Fig 3: Mean pre-operative topographic astigmatism after epi-on and epi-off cxl procedure

Mean pre-operative topographic astigmatism were (5.51± 2.58) with epi-on procedure and (3.98 ±2.30) with epi-off procedure, improvement of mean post-topographic astigmatism were improved in epi-on procedure (4.84 ±2.42) than epi-off procedure (3.96± 2.20) after six months as shown in figure IV.

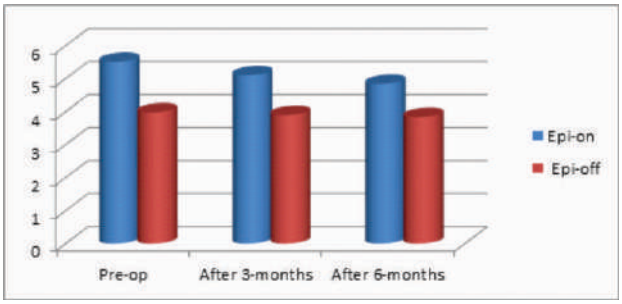

Fig 4: Mean post-topographic astigmatism after epi-on and epi-off cxl procedure

Discussion

This study analyzed comparison of cxl procedure in two homogenous groups (epi-on and epi-off cxl) for treating keratoconus. At 12 months post treatment results showed that both procedures proved to be useful and effective in halting the progression of keratoconus. Caporossi et al[19] and Magli et al[20] reported a study of 26 eyes treated by epi-on cxl, and they observed an initial, although not statistically significant, increase in UDVA and CDVA in the first 3 months. However, this study showed no statistically significant difference between both cxl procedures on the basis of uncorrected visual improvement after three months, twelve months and between three to twelve months of treatment. The person who lost 2lines of Log MAR chart of best-corrected visual acuity (BCVA) was 18 years old female who at baseline had un-corrected distance visual acuity (UDVA) of 0.6 Log MAR, BCDVA of 0.2 Log MAR and maximum K-value of 56.70D. After 12 months she was noted to had further deterioration of vision, UCDVA was 1.0Log MAR, BCDVA was 0.6 Log MAR and the maximum K value had increased slightly to 57.30D.

Wollensek et al[21] reported regression with reduction of maximum K readings by 2.01D after epithelial removal in 70% of eyes with mean follow-ups of 23.2 months. In this study we analyzed no change in mean keratometric readings in case of the steep and flat meridian with epi-off procedure. Several complications were reported in the literature, especially after epi-off cxl procedure such as corneal edema and endothelial damage.[22,23,24] In this study we observed significantly greater postoperative pain in the epi-off cxl group compared to epi-on cxl group with no complications in both treatment groups.

An overall analysis of the clinical outcomes after epi-off and epi-on cxl showed that keratoconus was relatively stable after 12 months, and no differences were observed comparing the two procedures. The main aim of the cxl procedure initially was to stabilize the keratoconic cornea. Stabilization was achieved with extra benefits like more symmetric corneas, which not only increased visual acuity but made the cornea easier to fit with contact lenses. It is reported that the cornea still tolerates contact lenses after the procedure.[25] Some investigations indicate that keratoconus leads to keratoplasty in approximately 20% of patients.[26,27] Collagen cross linkage (CXL) will significantly decrease the need for keratoplasty[28,29] or at least delay the need for it.

However, limitations of this study include limited treated eyes and shorter follow-ups (12 months).

Conclusion

One year follow- up study showed that in terms of visual outcomes and topographic parameters, there were statistically insignificant differences between both cxl procedures. However, mean topographic astigmatism tends to improved in epi-on procedure as compared to epi-off cxl procedure. Above all, the added advantage of patient comfort reduced post-operative infection and early visual recovery gave epi-on cxl, the best treatment of choice.

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ORIGINAL ARTICLE

Correlation of Maternal Albumin Levels with Neonatal Birth Weight

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ABSTRACT

Objective: To correlate maternal albumin levels with neonatal weight.

Study Design: Cross-sectional study.

Place and Duration of Study: The study was carried out in Obstetrics and Gynecology unit and Laboratory of Railway hospital, Rawalpindi from June 2015 to March 2016.

Materials and Methods: Eighty-five mother -baby pairs were selected using systematic random sampling method, they were divided into two groups. Group I included mothers with serum albumin level in the acceptable range (3.5-5.0) gm/dl and Group II included mothers with serum albumin level less than 3.5gm/dl. Maternal venous blood was collected before delivery, serum was separated by centrifuge method. Information regarding the monthly income and dietary protein was recorded from patients. Quantitative in vitro determination of serum albumin was done by calorimetric biuret on photometric system. (Micro Lab).Birth weight of neonates was assessed using the laica weighing scale. Comparison of baby weight in group I and group II was done by Mann Whitney U test. p-value of < 0.05 was considered significant. Correlation of maternal albumin with baby weight was done by Spearman correlation.

Results: In Group I the median of 3.00 kg baby weight and in Group II the median of 2.30 kg baby weight. Spearman correlatin showed a significant correlation coefficient between maternal albumin and baby weight with p value less than 0.05.

Conclusion: The weight of the babies born to Mothers with serum albumin level < 3.5gm/dl was low as compared to the weight of the babies born to mothers with serum albumin level of (3.5-5.0 gm/dl).

Key Words: *Animal Protein, Maternal Albumin, Mother Baby Pair, Neonatal Weight.*

Introduction

The rate of low birth weight neonates have increased in the recent years. Metabolic demand increase in pregnancy. Reduced dietary protein during pregnancy causes decreased maternal albumin and low weight of babies. Nutritional reserves including protein , and vitamins are low in these babies.[1] Reduced baby weight leads to neonatal mortality, morbidity, subsequent growth and developmental retardation.[1]In developing countries women living in poverty have poor albumin status and are at increased risk of having low birth weight babies.[2] Identification before delivery of such mothers is important for the better outcome of babies. Serum albumin is the most abundant protein in human blood plasma. It is soluble and is produced in the liver.[3]It has a major role in modulating the distribution of fluids between compartments and keeps the plasma inside the blood vessels, also causes transportation of molecules including fatty acid to liver.[3]Albumin attaches to and carry bilirubin, drugs, thyroid hormone, it competitively binds with calcium, prevents photo degradation of folic acid and helps maintain the blood acidity in a narrow range.[4] Increased dietary protein intake promotes the synthesis of more albumin and raises albumin levels in the blood.[4]Albumin also has free radical scavenging ability. There is one free sulfhydryl group in albumin that reacts with thiol compounds and reduces inflammation.[5]During pregnancy one kilogram of extra protein is required with half going to the fetus and placenta and another half going to uterine contractile proteins, breast glandular tissue, plasma protein, and haemoglobin.[6] There is increased plasma volume by 50% and cardiac output by 30-50% leading to low albumin level.[7] Increased water retention causes reduction in plasma osmolality.[8] It has been reported that poor nutrition of mother and low albumin level in late gestation was associated with low birth weight in babies.[9] This decreased birth weight is an important determinant

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Funding Source: NIL; Conflict of Interest: NIL
Received: Jul 23, 2016; Revised: Aug 23, 2016
Accepted: Feb 05, 2017

of infant mortality and morbidity worldwide.[10] Low albumin level in neonates is associated with various adverse clinical conditions, including necrotizing enterocolitis, and sepsis.[11]Diet rich in protein include meat, chicken , cheese, beans, lentils, milk , yogurt, eggs, nuts, and seeds.[12]If protein rich diet is given to the mothers during pregnancy it can improve the weight of neonates.[13]Present study was conducted to find out the level of maternal albumin and its relation with neonatal weight.

Materials and Methods

This cross-sectional study was carried out in the Obstetrics and Gynecology unit and Laboratory of Railway hospital Rawalpindi from June 2015 to March 2016. Eighty-five mother -baby pairs were selected using systematic random sampling method. Women of age more than 18 years and less than 45 years with single full term pregnancy based on fundal height or Naegele's rule.[14] Irrespective of any mode of delivery were included in our study. Women with pregnancy complications including intrauterine growth retardation, pregnancy induced hypertension, gestational diabetes mellitus, Rh , ABO incompatibility, sepsis or having twins or triplets at the time of delivery were excluded from the study. Information regarding socio economic status, belonging to urban or rural area, dietary proteins, antenatal care ,delivery outcome were collected The birth weight of babies in kg was recorded using the Laica weighing scale.[15] Babies weighing < 2.5 kg were considered as low birth weight babies and those weighing $\geqslant$ 2.5 kg were taken as acceptable birth weight for this study. Under aseptic technique two milliliters of maternal venous blood was collected and placed in vacutainer. Sera were separated from maternal venous blood by centrifuging these blood samples at 5000 revolutions per minute (rpm) for five minutes. The sera were used to estimate maternal albumin in (gram/dl) by using calorimetric biuret on photometric system. (Micro Lab).[15]All sera collected was kept in a refrigerator at -20°C until the time of maternal albumin assay. Statistical analysis was performed using statistical package for social science (SPSS) statistical software version 20, Statistical significance was defined as a p value <0.05. Correlation of maternal albumin with baby weight was done by spearman correlation method.

Results

Table I shows 51 mothers in group I and 34 mothers in group II. Comparison of baby weight in group I and Group II was done by Mann Whitney U test which showed in group I the median IQR of baby weight was 3.00 (2.80-3.50) kg and in group II the median IQR of baby weight was 2.30 (2.23-2.50) kg. This comparison showed a significant difference with p value less than 0.05. Mann Whitney U test indicated that increased maternal albumin causes increase in baby weight. Table II shows the correlation of maternal albumin with baby weight by Spearman Correlation showing rho value of 0.71 and indicating a significant correlation between maternal albumin and neonatal weight with p value less than 0.001.

Table III shows that 40 % of women in group I were taking animal protein and 60% were taking non animal protein. In group II 80% of women were taking animal protein and 20% were taking non animal protein.

Thus from the above results we can say that group I mothers with acceptable albumin level had improved baby weight as compared to group II mothers with low albumin level and low baby weight. Most mothers in group I were taking non animal protein while majority of mothers in group II were taking animal protein.

Table I: Comparison of baby weight in Group I and Group II by Mann Whitney U Test

Parameter	Group I (n=51)	Group II (n=34)	P-value
Baby weight (Kg)	3.00 (2.80-3.50)	2.30 (2.23-2.50)	0.00***

Group I = Albumin level (3.5-5.0) gm/dl
Group II= Albumin level < 3.5 gm/dl
***p<0.05 is considered significant

Table II: Spearman Correlation of Maternal Albumin with baby weight (n=85)

Parameter	Both Groups	
Maternal Albumin	*p*-value	rho
Baby Weight	0.00***	0.71

***p<0.001 is considered significant

Table III: Frequency distribution of animal and non animal protein in both groups

Albumin	Animal protein	Non animal protein
Group I	40%	60%
Group II	80%	20%

Discussion

In the developing countries the relationship between maternal albumin and birth weight outcome of neonates is of major public health importance. In this study, majority of neonates and mothers had acceptable birth weight and maternal albumin respectively. Similar observation was made by Baba usman et al., 2010 who observed high percentage of mother-baby pair with acceptable maternal albumin levels and birth weight of babies. He further attributed that this high percentage is a good indicator not only of mother's health and nutritional status, but also of the good outcome for survival, growth, long-term health and psycho social development of babies.[15] In our study it was seen that neonates (34) in number had low weight and their mothers were having albumin level < 3.5 gm/dl. Saleem,2014 in one of his study said that reduction in nutritional diet of mother causes intrauterine stress and disturbance of metabolic system leading to reduction in baby weight.[16] Rucker et al.,2011.in one of his research said that health insults in utero may lead to greater physiological deterioration of metabolic and immune systems.[17] These less weight neonates develop many diseases in adult life, Carlos et al., 2013 concluded that low baby weight and under-nutrition in utero causes adult diseases with fetal origin.[18] Eriksson, 2005 said that neonates with low weight are at increased risk of obstructive lung disease, high blood cholesterol and renal damage.[19] Betty et al., 2010 suggested that intrauterine stress also contribute to the risk of increased blood pressure in later life.[20] In our study neonates (51) in number had acceptable weight and their mother were having albumin level in the acceptable range 3.5-5.0 gm/dl. About 60% of these mothers were taking diet containing cereals , beans, milk, yogurt and vegetables frequently and fish, beef, mutton and chicken once a month. Most of these mothers belonged to rural areas and had a monthly income of less than 50,000 PKR. The mothers with low albumin level mostly belonged to urban area and had monthly income of more than 50,000 PKR, 80% were frequently taking beef, mutton, chicken, potatoes in their diet and were seldom taking cereals, beans and vegetables. The percentage of usable protein in Beef, meat and poultry is 20-40 %. Vegetables 75-80%, rice 85-90%, dairy products 80-90%, cereals and beans 60-70 %.[21] Animal products contain less protein as compared to dairy and vegetable products. Animal products contain all the essential amino acid but not in the concentrated form as compared to vegetables and beans.[21] Chris et al., 2007 in one of his study suggested that amino acids increased whole-body protein synthesis including albumin. Albumin function as building blocks for bones, muscles, cartilage, skin, blood, enzymes and hormones.[22] According to Neil osterweil., 2016 albumin is also used for building and repairing tissues.[23] It is seen in our study that neonates of the mothers of group II had low weight, Improving the maternal albumin level will increase the weight of neonates as albumin act as a building block for many structures of body and causes tissue growth and repair . In our study a positive correlation is seen between maternal albumin and neonatal weight indicating that increased maternal albumin is associated with increase in neonatal weight. The mothers belonging to low income class can easily buy the diet containing non animal proteins and had high albumin level indicating that vegetables and cereals proteins improves maternal albumin and neonatal weight more as compared to animal protein.

Conclusion

It is seen that Maternal albumin is directly proportional to neonatal weight and a positive correlation exists between maternal albumin and neonatal weight. For the better outcome of growth of neonates it is essential that mothers should be advised to take proper protein diet during pregnancy including cereals and vegetables in increased amount as compared to animal protein. This will improve the albumin of mother and weight of neonates preventing them from intrauterine neonatal stress and disease of fetal origin.

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ORIGINAL ARTICLE

The Prevalence of Shoulder Pain in Spinal Cord Injury Patients Using Manual Wheelchair in KPK (Khyber Pakhtunkhwa)

Rafiullah[1], Sayed Zulfiqar Ali Shah[2], Sajida Mazhar[3]

ABSTRACT

Objective: To determine the prevalence of shoulder pain in spinal cord injury patient using manual wheelchairs in Khyber Pakhtunkhwa.

Study Design: Cross sectional.

Place and Duration of Study: The study was carried out at Paraplegic Center Peshawar from 1st January 2014 to 30th June 2014.

Materials and Methods: A cross sectional survey using convenience sampling method was used to determine the prevalence of shoulder pain in spinal cord injury patients using manual wheelchair at Paraplegic Center Hayatabad Peshawar. A total of one hundred and fifty traumatic paraplegic and tetraplegic patients using manual wheelchair post two weeks were included in this study. Wheelchair user shoulder pain index (WUSPI) was used as data collection tool. Descriptive statistic was applied. Frequencies and percentages were calculated for identifying the responses of patients to different questions, for level of injury, and identifying the prevalence.

Results: A total of one hundred and fifty (150) manual wheelchair user tetraplegic and paraplegic spinal cord injury patients were included in this study. Among them 84% were male while 16% were female. The prevalence of shoulder pain was 34.7% while performing different activities in manual wheelchair users. From patient's responses, it was declared that shoulder pain was most common while pushing on inclined surfaces and ramps, pushing the wheelchair for 10 minutes or more, sleeping on the shoulder and transferring from bed into wheelchair. While at rest 89.3% of the subjects were free of pain.

Conclusion: Most of the traumatic spinal cord injury (SCI) manual wheelchair users (MWUs) complain of shoulder pain during the course of their rehabilitation program. Shoulder pain restricts most important activities of daily living like pushing wheelchair on inclined surfaces, ramps and transferring from bed to wheelchair and wheelchair to bed.

Key Words: *Manual Wheelchair User, Spinal Cord Injury, Shoulder Pain, Wheelchair User Shoulder Pain Index.*

Introduction

Any kind of neural disturbance in the spinal cord whether from trauma or disease is called spinal cord injury.[1] According to the Standards for Neurological Classification published by the American Spinal Injury, the term complete injury means no preservation of motor and/or sensory function more than 3 segments below the neurological level of injury while the Incomplete injury means some preservation of sensory and/or motor function more than 3 segments below the neurological level of injury.[2]

Spinal Cord Injury (SCI) is a devastating event that brings significant changes in life of the victims as well as their family. Presently there is no SCI registry at national level in Pakistan. Therefore, there is no accurate estimate of the number of individuals who suffer from SCI in Pakistan every year.

The research on epidemiology of traumatic SCI in Pakistan is very limited. About 650-750 spinal cord injuries occurred in October 2005 in Pakistan.[3] Globally around 90 million individuals are suffering from spinal cord injury (SCI). In developed countries SCI incidence ranges from 1 to 5 persons per 100,000.[4] The most common causes of spinal cord injury are automobile accidents (31.5%), fall from height (25.3%), gunshot injury (10.4%),motor cycle accidents (6.8%) and diving (4.7%).[5] The Manual

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Funding Source: NIL; Conflict of Interest: NIL
Received: Oct 27, 2016; Revised: Dec 13, 2016
Accepted: Feb 12, 2017

wheelchair ((MWC) is a potential enabling technology for mobility impaired people.[6] The MWC is a source of mobility and support to the body. It facilitate activities of daily living (ADL), self-care and recreation activities.[7] In United States, around 1.7 million people were using wheelchair in 2000 in which 1.5million were MWUs (manual wheelchair users).[8] The lifelong dependency of SCI patient on MWC for their ADLs causes repetitive loading of shoulder joint and consequently results in shoulder pain.[9] The upper extremity repetitive use, high forces and awkward posture leads to shoulder impingement in MWCUs.[10] Also the increase weight, high seat position and prolong disability may lead to shoulder pain in these patients.[4] Shoulder pain in MWCUs may result from shoulder impingement (75%), rotator cup tears (65%), aseptic humeral head necrosis (22%), tendinitis and bursitis.[11] Epidemiological studies have revealed that shoulder pain is common in MWC users and its prevalence ranges from more than 32–78%.[12] Two third of MWUs complain of shoulder pain after five years of injury.[13] After 20 years of injury almost all of MWCUs complain of shoulder pain.[9] A study has reported that shoulder pain prevalence in tetraplegic is 59%and 42% in paraplegic MWCUs SCI patient.[14] Shoulder pain in manual wheelchair users result into decrease quality of life.[15] Initially MWC users ADLs may not be affected so much but later on it may result early fatigue, low level of endurance, lower work potential and reduced cardiopulmonary endurance.[16] The Wheelchair Users Shoulder Pain Index (WUSPI) is a 15 item tool for assessing shoulder pain while at rest and during activity. The pain intensity is measured through a 10cm line with zero (0) representing no pain and ten (10) representing the worse pain experienced on the basis of the past week activities.[17]

Spinal cord injury patients exclusively rely on upper limb for weight bearing activities like transfer and wheelchair propulsion, so it is necessary to keep them aware of proper wheelchair use, shoulder loading and shoulder complication in order to keep them functional in society.[18]

Shoulder pain in spinal cord injury patients in Pakistan is under reported and up to author's knowledge no research has been found on this topic in Pakistan. This study was designed to determine the prevalence and study different aspects of shoulder pain experienced by spinal cord injury patients in Khyber Pakhtunkhwa (KPK), using manual wheelchairs.

Materials and Methods

A cross sectional survey was designed to identify the prevalence of shoulder pain in manual wheelchair users. The study was carried out at Paraplegic Center Peshawar from 1st January 2014 to 30th June 2014. A total of 150 subjects both male and female with traumatic SCI using MWC were included in this study. It was mandatory that subject have completed two weeks rehabilitation training in paraplegic center Peshawar and Rafsan neuro rehab center Peshawar and currently.

Data was collected using WUSPI with the help of follow up program team of paraplegic center Peshawar and some subject were directly interviewed in Rafsan neuro rehab center Peshawar and paraplegic center Peshawar. WUSPI is a 15-items questioner specifically designed for independent MWCUs scored from zero to ten with zero representing no interference of pain with daily activity and ten represents complete interference.

Inclusion criteria was independent Manual wheelchair users, patients of both gender with traumatic spinal cord injury, C5 and below level Quadriplegics subjects, age 18 -59 years, completed at least 2 weeks rehabilitation in an inpatient center.

Subjects with any of the following were excluded from the study: paraplegic and Quadriplegics not using MWC, progressive diseases Paraplegics, above C5 level Tetraplegic, patients with age range below18 years and above 60 years, , PWC (power wheel chair) user subjects, subject having shoulder pain from a history of fall on affected shoulder after SCI, subject experiencing referral pain from any other part of the body, subjects that are dependent for wheel chair propulsion and transferring.

The WUSPI was used for data collection which is a standard valid questioner. The covering letter was send along with the questioner to explain purpose of the study to the subjects. Willing participants filled consent form and questionnaire.

SPSS version 20 was used for data analysis. Descriptive statistic was applied. Frequencies and percentages were calculated for identifying the

responses of patients to different questions, for level of injury, and identifying the prevalence.

Results

The wheelchair user shoulder pain index (WUSPI) was used for data collection. A total of one hundred and fifty (150) manual wheelchair user tetraplegic and paraplegic spinal cord injury patients were included in this study. Among them 84% were male while 16% were female. The age limit was from 19 to 58 years. Among all 86.7% of the subjects were manual wheelchair users from one to five (1-5) years while the 13.3% were using wheelchair from the past five to twenty years. Among the total recruited patients there were 64% with thoracic, 28% with lumber and 7% with cervical level of spinal cord injury patients. The shoulder pain noticed was as following.

About 10.7 % of the subject reported shoulder pain even at rest while 89.3% of the subjects were free of shoulder pain while at rest. The prevalence of shoulder pain with wheelchair related activity was 34.7%. The shoulder pain was most common (41.3 %.) while pushing on inclined surfaces and ramps. Among all 20% of the participants reported mild shoulder pain when pushing their wheelchair for ten minutes or more. Some of the patients (24%) reported that they feel pain while washing their back while 17.3% reported that they feel pain during transferring from bed into wheelchair. The prevalence of shoulder pain while sleeping was 18.7%.The subjects were asked to mark their pain level on a 10cm line of visual analog scale (VAS) according to their pain intensity while performing activities. The severity of the pain on VAS was graded as"no pain, worse pain ever experienced and activity not performed".

Table I: Rehabilitation duration of the study population (n= 150)

Years of Rehabilitation	Frequency	Percent
0-5	130	86.7
5-20	20	13.3
Total	150	100.0

Table II: Level of injury of the study population (n= 150)

Level	Frequency	Percent
Thoracic	97	64.7
Lumbar	42	28.0
Cervical	11	7.3
Total	150	100.0

Table III: Pain at rest and on activity

Shoulder pain at rest		
	Frequency	**Percent**
No	134	89.3
Yes	16	10.7
Total	150	100.0
Activity related shoulder pain		
	Frequency	**Percent**
No	98	65.3
Yes	52	34.7
Total	150	100.0
Shoulder pain while pushing on inclined surfaces and ramps		
	Frequency	**Percent**
No pain	69	46.0
Mild	62	41.3
Not performed	10	6.7
Moderate	8	5.3
Worst pain ever	1	.7
Total	150	100.0
Shoulder pain while transferring from bed into wheelchair		
	Frequency	**Percent**
No pain	118	78.7
Mild	26	17.3
Moderate	2	1.3
Worst pain ever	2	1.3
Not performed	2	1.3
Total	150	100

Discussion

Postspinal Cord Injury (SCI) life expectancy of the patient has improved as a result of advancement in medical care and followed up in specialized unit. The SCI patient are compelled to go through repetitive weight bearing activity through their upper limb(UL) joints as a compensation for paralyzed lower limb (LL) and trunk muscle while performing different activity of daily life (ADL), as a consequence, they develop shoulder joint pain at some stage of their life.

Very less number of patients (10.7 %) reported shoulder pain at rest while 34.7% reported shoulder pain with wheelchair related activities. Most of the participants (41.3%) reported shoulder pain while pushing wheelchair on inclined surfaces and ramps.

This study results revealed that 89.3% of the SCI patients have no pain while it rests. A similar results were obtained from a study conducted it the United Kingdom by Dorsett (2001) showed that among SCI

manual wheelchair users 80% have no shoulder pain while at rest.[19] This study's result showed that 41.3% of the clients experienced Shoulder pain while pushing on inclined surfaces and ramps. These finding were supported by a study conducted by subbarao et al (1955) who conducted a study to find the prevalence of wrist and shoulder pain in SCI patients and find that wheelchair transfer and propulsion activity exacerbated most of the shoulder pain in MWUs.[19] This study result showed that pushing the wheelchair for 10 minutes or more produced shoulder pain in 20% of patients. These finding were supported by a study conducted by Salisbury et al (2006) and reported that wheelchair propulsion is the main cause of shoulder pain.[15] Also Curtis et al, (1999) conducted a study about shoulder pain in wheelchair user tetraplegic and paraplegic patients and reported that most of the wheelchair users complain of shoulder pain while propelling on ramps, inclined surfaces.[17] This study result showed that 17.3% of patients were having pain during transferring from bed into wheelchair,8% of patients have pain in transferring from wheelchair to a tub or shower and 6.7% of patients have shoulder pain while transferring from wheelchair to a car. These finding were supported by a study conducted by Gellman et al where they revealed that25% of the patient complain shoulder pain in post-traumatic weight bearing UL while transferring activities.[18] A survey has reported that 31 to 73% shoulder pain in wheelchair users rehabilitated patients increases continuously up to 20 years and then it begins to declines.[11] A study from the United Kingdom by Dorsett (2001) showed that among manual wheelchair users 80% did not reported shoulder pain while at rest.[19] Shoulder pain should be treated at priority it may later restrict patient's ADLs.

Table IV: Prevalence of spinal cord injuries

Authors	Sample	Number of subjects	Prevalence	Outcome measure used
Ballinger et al (2000)	P and T	89	30%	FIM
Salisbury et al (2003)	T	40	85%	101 point, numerical, Rating Scale
Bayley et al (1987)	P and T	94	30%	Self-report
Curtis et al (1999a)	P and T	195	T=59%, P=42%	WUSPI

Conclusion

This study concludes that the prevalence of activity related shoulder pain was high than pain at rest as many participants were having pain during activity. This study also concludes that most of the manual wheelchair users with spinal cord injury experience shoulder pain in activities which put more load on their shoulder joint and rotator cuff muscles, like profiling on inclined surfaces and transferring from bed to wheelchair. Most of the patient experience shoulder pain in their later years of rehabilitation.

Recommendations

This study recommends that the proper wheelchair training and upon experience of shoulder pain; proper treatment should be taken to facilitate further wheelchair use and combat immobility. Patients should be taught not put abnormal weights on the shoulder and always ask for assistance for activities that demands high forces.

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ORIGINAL ARTICLE

Prevalence of Urinary Incontinence in Post-Partum Females in Hayatabad, Peshawar

Zoha Gilani[1], Haider Darain[2], Sadia Aziz[3], Mashal Javed Orakzai[4], Laila Raheem[5], Musarrat Jabeen[6]

ABSTRACT

Objective: The aim of the study was to determine prevalence of urinary incontinence in post-partum females in tertiary care setups in Hayatabad, Peshawar.

Study Design: Cross-sectional.

Place and Duration of Study: Tertiary care hospitals of Hayatabad, Peshawar from September 2016 to February 2017.

Materials and Methods: A cross-sectional survey was conducted and a total of 296 females between 17 years and 40 years were recruited from September, 2016 to December 2016. The mean age of the population was 27.20 ± 4.46 years. Participants were recruited by means of convenience sampling from tertiary care setups in Hayatabad and were included in the study according to specified selection criteria. All of the participants completed Bristol Female Lower Urinary Tract Symptoms Short Form (BFLUTS-SF) after consent was taken and were evaluated accordingly.

Results: The prevalence of post-partum urinary incontinence in females coming to in- and out-patients departments of tertiary care hospital Hayatabad Peshawar was 28.64%. Out of total, 96% had moderate urinary incontinence i.e. between one third to two third of the time (1/3-2/3) and the remaining 4% had severe incontinence. Majority of the women (84.4%) reported nocturia as their major symptom, while nocturnal incontinence/leakage was the lowest (9.8%). Bladder pain (48.3%) and intermittency (36.5%) were the next highest reported symptoms. Stress incontinence proved to be slightly more prevalent at 45.3%, whereas urge incontinence was at 43.9%. Less than half of the population 36.2% women reported an adverse effect on their overall quality of life ranging from a little to a lot on the "bother" scale.

Conclusion: It can be concluded that urinary incontinence is a common condition in post-partum women in Hayatabad with most patients reporting a mild to moderate effect on quality of life.

Key Words: *BFLUTS-SF, Perpeurium, Post-Partum Female, Tertiary Care, Urinary Incontinence.*

Introduction

Urinary incontinence is considered a significant health problem worldwide. According to the International Continence Society urinary incontinence is "The complaint of any involuntary leakage of urine".[1] It can be associated with significant physical, psychological, social and economic burden.[2] As a result of urinary incontinence, a big portion of population get frustrated, socially isolated and are rendered incompetent. Urinary incontinence is a common problem in woman population compared to their counterpart's male population.[3] Although urinary incontinence is not a mortal condition, still the consequences are severely affecting quality of life of all patients who are suffering from this condition.[4] This issue is well documented and national and international networks have focused on this condition. However still organized, consistent and reliable data is deficient in developing country like Pakistan where female population has limited access to health care services. Urinary incontinence has various types which are mainly affected by specific conditions and therefore it may be described by specifying its relevant factors associated with those conditions.[5] The various forms of urinary incontinence are stress, urge, and mixed urinary incontinence.[6] Stress UI is the involuntary loss of urine during certain physical activities such as coughing, sneezing, laughing, jumping, or exercising etc., urge UI is the involuntary leakage of urine that is coupled with the lower urinary tract symptom urgency, and Mixed UI is accompanied by urgency and exercise, sneezing, or coughing.[1] Urinary

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Funding Source: NIL; Conflict of Interest: NIL
Received: Jan 12, 2017; Revised: Mar 12, 2017
Accepted: May 14, 2017

incontinence is often associated with a variety of factors included pelvic floor muscles disorders, postmenopausal hypo-estrogenism, pregnancies and vaginal births, trauma of pelvic floor muscles, pelvic surgeries and the use of various medications like diuretics, chronic constipation, smoking, obesity and diabetes mellitus.[7]

Urinary incontinence is often considered a problem that occurs mostly after pregnancy and childbirth.[8-10] Stanton et al. and Allen and Warell reported an increase in prevalence of stress urinary incontinence during pregnancy followed by a decrease after childbirth. The prevalence of urinary incontinence is around 20%-30% during pregnancy but it resolves shortly after delivery.[11] In contrast, in other trials, high prevalence of urinary incontinence was reported after delivery before gestation.[12,13] Urinary incontinence is four times more common in women under 60 years age than in men of the same range of age.[14] It is noteworthy that prenatal incontinence increases the risk of postpartum incontinence suggesting an increased risk of long-term persistent incontinence.[15-18] The increased incidence rate of stress urinary incontinence during pregnancy and postpartum period is associated with low pelvic floor muscle strength. Variation in the number of female population suffering from the condition may be found in the literature ranging from 0.7% to 34%.[19,20] Similarly, in a systematic review prevalence of urinary incontinence during pregnancy was reported 16–60 % and after spontaneous and instrumental vaginal delivery 16–34 %.[21-23]

The exact mechanism of urinary incontinence remained a dilemma, still, it is assumed that the condition develops at least in part as a result of delivery trauma to the pelvic floor.[24] Pregnancy is a normal physiological phenomenon and many systemic changes occurring inside the body of a mother to meet the demands of a foetus. One of these changes included alteration in hormonal levels. It is well-known fact that the level of relaxing increases during pregnancy, which is thought to stimulate connective tissue remodelling consequently playing a vital role in the modifications female pelvis for delivery.[25]

As urinary incontinence remained a major problem during pregnancy, therefore, a huge number of trials may be found in the literature. It is noteworthy that majority of these studies have been carried out in developed countries. Data regarding the prevalence of post-partum urinary incontinence in female population in countries like Pakistani is scarce and need attention. Therefore, this study was carried out in order to report intensity of the problem in female population living in the country.

Materials and Methods

A descriptive cross-sectional study was conducted in the in- and out-patient gynaecology departments of tertiary care setups in Hayatabad, Peshawar. Major tertiary care hospitals in Hayatabad were included for this purpose. A total of 296 patients took part in the study after detailed information was provided to them and consent was taken. The participants all responded on standard questionnaire [Bristol Female Lower Urinary Tract Symptoms- Short Form (BFLUTS-SF)]. The questionnaire comprised of 5 parts and measured incontinence, severity of symptoms and its effect on the patient's quality of life. The five categories assessed by the questionnaire were a) filling symptoms which scored nocturia, urgency, bladder pain and frequency between voiding, b) voiding symptoms i.e. starring strain, hesitancy and intermittency c) incontinence symptoms i.e. pre-void dribbling, frequency daily, stress incontinence, unpredictable incontinence and nocturnal incontinence, d) sex symptoms i.e spoilt sex life and urine leakage during sex, e) quality of life symptoms which were scored on a “bother” scale. Each question was scored from 0 to 4 with 0 pointing to no symptoms and 4 being worst possible symptoms. The last section i.e. the section consisting of questions pertaining to the quality of life assessed the degree of bother caused the symptoms caused.

The sample was selected according to the inclusion criteria which consisted of female patients who were in the perpeurium period i.e. day 1-day 40, and had complaints of urinary incontinence. Patients who had systemic diseases such as diabetes mellitus, previous urinary tract infection or any other neurological disorder leading to urinary incontinence were not included in the study. Non-probability sampling was carried out and patients were recruited according to convenience sampling. The total time duration for this study was 6 months. Data was analysed using SPSS version 20. Mean, range and standard deviation were measured for the

demographic data.

Results

A total of 296 post-partum female patients with mean age 27.2 ± 4.4 years (range: 17-4 years) were included in this study. The mean marrying age of the participants was 21.32 ± 3.35 (range: 13-30). Majority (53%) of this female population had undergone caesarean section while a small number (9%) had instrumental deliveries. The remaining (38%) had normal vaginal deliveries. Majority of the female population (41%) was uneducated and the rest had completed their primary level (23%), secondary education (20%), graduation (15%) and post-graduation (1%). Nutritional levels were determined by calculating BMIs of the patients with most of them (38%) being in the overweight category. A total of 81% patients in this study were having moderately incontinence, while a small number of the patients (4%) were having severely incontinence and 15% of the patients had no symptom of incontinence i.e. they were continent. The mean total score for BFLUTS-SF was 12.0±10.0 with the following mean subscale scores FS=4.2 ± 3.2, VS= 1.5 ± 2.2, IS= 3.6 ± 3.2, SS= 0.3 ± 0.8, QOL= 2.3 ± 4.0. Higher total sum scores were associated with higher chances of urinary incontinence.

Individually, nocturia remained the most reported symptom at 84% (64% moderate and 20% severe) while 16% reported no symptoms of nocturia. The lowest reported symptoms were 7% for the question pertaining to urine leakage during sex (see table 1 for frequency of severity of different symptoms). Effects on quality of life subsection showed that 36% of the patients had reported an adverse effect on their quality of life (22% moderate- 14% severe). Regarding changing their outer garments, 17% of the patients reported changing their outer garments once while 10% had to change them more frequently. Water intake percentages showed that 11% of the population had decreased water intake to prevent frequent urination most of the time whereas 14% reported that they had reduced their water intake occasionally. In response to effects on daily activities, 10% of the patients responded 'quite a bit' and 14% reported a minor effect on their activities of daily living. Avoidance of public places with no access to toilets was reported by 27% of the population with 18% avoiding them occasionally and 9% avoiding them most of the time.

Cross tabulation between incontinence and other variables including age, parity, mode of delivery, duration of labor and BMI showed no significant differences suggesting that these factors have no major contributing role on incontinence in this population. The prevalence of urinary incontinence in this population was 85% with 82% moderately incontinent and 3% severely incontinent.

Discussion

The aim of this study was to find out the prevalence of post-partum urinary incontinence amongst female population of Hayatabad, Peshawar in tertiary care settings. Previous studies have shown post-partum urinary incontinence to be a significant problem with far reaching effects that considerably affects physical and psychological status of female population. A variation in the prevalence of post-partum urinary incontinence might be seen and it has been reported between 0.7% to 34%[19,20] in some trials. On the other hand its prevalence has been reported between 16%-34%.[21,22] In this study, we found the prevalence of post-partum urinary incontinence to be 28.% which in accordance to the previous trials carried out on the prevalence of the condition. Finding of our trial suggested that stress incontinence remained higher than urge incontinence. A disagreement about the type of incontinence may be found in the literature and higher ratio of developing post-partum stress incontinence in these patients have been reported,[12,26] while in the other trials, post-partum incontinence was reported a rarely occurring situation in these patients.[13] Our study revealed that nocturia was one of the most cited symptoms in this population and 85% of the participants had nocturia; almost one fifth reported severe symptoms and more than half reported mild to moderate symptoms. This was followed by bladder pain which was experienced by almost half of the participants. Other symptoms that also had high frequencies were intermittency, pre-void dribbling closely followed by starting strain, hesitancy and unpredictable miscellaneous incontinence. Similar findings were reported in the trials carried out on urinary incontinence in female population.[27]

Quality of life assessment proved that the condition had severely affected quality of life in these patients.

It was found that the included population had reduced their water intake to help combat the problem while a quarter of the population confessed to avoiding public at places with no toilet facilities including markets or long journeys. The latter had severely affected their living style and majority of the population confined themselves to their homes or their movements were severely restricted. Moreover, it was found that female population were using toileting facilities hourly up to multiple times an hour with a big number rushing to toilet in urgency.

Regarding the questions on sex, they appeared to not be applicable to one third of the population as it was their first pregnancy and they had not yet resumed the activity. Regarding those who had it, a small number reported that their sexual life was adversely affects by incontinence. These findings are in accordance to the previous trials were sexual hypo or sexual dysfunction sexual was observed in female population with urinary incontinence.[28]

The factors affecting postpartum urinary incontinence parity remained in accordance with other studies with multiparous women having more of a risk. Other factors such as mode of delivery, duration of labour, number of pregnancy and BMI have been found to be significantly related to postpartum urinary incontinence in some studies.[20] However, in our trial no significant results were found for then mentioned factors. Culturally, female population in Pakistan especially in Pathans culture is shy and we assumed that deviation of result from what is available in the literature might be caused by this issue. Such issues may be covered by conducting large scale trials in the culture with questionnaires modified to the culture. This might be one of the limitations of this study. Moreover, the questionnaire used in this study was in English language and data collectors have to explain it to the participants. The responses of the participants were then recorded by the data collectors.

Conclusion

In conclusion, the overall prevalence rate of postpartum urinary incontinence in perpeurial women in tertiary care setups in Hayatabad, Peshawar was within the range reported in other cultures. Urinary incontinence may be regarded as one the major contributing factors that affects significantly affects overall quality of life in female population.

Table I: showing the frequency values for severity of different symptoms

SYMPTOMS	Total %	Moderate	Severe
Nocturia	84	63	21
Urgency	43.9	31.1	12.8
Bladder Pain	48.3	39.9	8.4
Frequency between voiding	54.7	49.3	5.4
Starting strain	29.1	24	5.1
Hesitancy	22.6	17.9	4.7
Intermittency	36.5	31.1	5.4
Pre-void dribbling	35.5	32.1	3.4
Frequency daily	79	58.1	20.9
Stress incontinence	45.3	35.2	10.1
Unpredictable Incontinence	20.3	18.6	1.7
Nocturnal Incontinence	9.8	8.1	1.7
Spoiled Sex Life	16.2	15.5	0.7
Leakage of urine during sex	7.4	7.1	0.3

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ORIGINAL ARTICLE

Pilonidal Sinus: A Comparative Study of Open Versus Closed Methods of Surgical Approach

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ABSTRACT

Objective: To compare the outcomes of open and closed technique in surgical management of Pilonidal Sinus.
Study Design: Randomized control trial.
Place and Duration of Study: All three Surgical units, at Ayub Teaching Hospital, Abbottabad, Pakistan from 1st April 2006 to 31st December 2015.
Materials and Methods: A total of 65 patients with Pilonidal Sinus presented at Out Patient Department were included. Detailed history, general physical and systemic examination especially sinus area were done along with laboratory investigations. The patients were divided into two groups; patients in group I were managed by open technique and those in Group II were managed by closed technique. All patients were called for review at 01, 06, 12, 18 & 24 months interval to check for the recurrence and complications.
The data was entered on SPSS 22.0 for analysis.
Results: A total of 65 patients with Pilonidal Sinus disease were included in the study. Wound infection and dehiscence was found in 0.76% patients managed with close technique and in 5.17% patients managed with open technique. Similarly Recurrence rate in close technique were also found more i-e 12.06%while in Open technique only in 03.44%.
Conclusion: The management of Pilonidal sinus is a surgical challenge. Both techniques are effective but the open technique is better option as compared to close technique because of low recurrence and wound dehiscence rate.

Key Words: *Close Technique, Open Technique, Pilonidal Sinus, Wound Dehiscence, Wound Infection.*

Introduction

The word Pilonidal sinus, piliferous cyst, pilonidal cyst or fistulas are synonymous and derived from latin word meaning nest of hairs. The sinus forms when hair puncture the skin and embedded in it and mostly found at cleft of the buttocks. Infected pilonidal disease affects approximately 0.7% of the population[1] Surgery is the definitive treatment of the disease. There are two methods of surgery i-e; open and closed method. The open method includes excision of the tract without primary closure but healing occurs by secondary intention however, in closed method the tract is excised with primary closure or closure by some other means designed to avoid a midline wound like Z- plasty, Karydakis procedure, Bascom's procedure.[2]

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Funding Source: NIL; Conflict of Interest: NIL
Received: Oct 12, 2016; Revised: Jan 21, 2017
Accepted: May 15, 2017

In meta analysis of Iain J et all on 12 trials found that Wounds heal more quickly after primary closure than after open healing but at the expense of increased risk of recurrence.[3] R. Dudink on his comparative analysis of 63 patients found that close technique is better that open technique. The primary management should be close technique .While open technique with wide local excision should be avoided.[4] Loran et al did another randomized controlled trial on 80 patients and found that sinus excision and primary closure results in faster healing than laying open does, but there is no difference in healing rate after 1 year.[5]

Bariş Saylam et al used 4 different surgical interventions for management of pilonidal sinus.i-etotal excision + primary closure, D-flap, Karydakis technique and Limberg flap. They concluded that there is no statistically significance in terms of wound recurrence.[6] BarışSevinçet al did a trial on 150 patients and found that off line midline closure is superior than midline closure in terms of wound healing and recurrence.[7] Calikoglu et al did a comparative analysis of using phenol injection and excision with secondary wound healing. They observed that phenol injection is better option in

terms of wound healing as compared to open technique but they didn't analyzed the recurrence rate.[8]Different techniques were used for the management of this disease like the use,of fibrin glue[9], minimally invasive video-assisted ablation of pilonidal sinus[10], use of platelet-rich plasma[11], Excision and primary closure of sacrococcygeal pilonidal sinus using suction drain[12], spinal versus general anesthesia[13] and Semi-closed surgical technique[14]Alot of interventions done for the management of pilonidal sinus but still there is no universal acceptance of a single procedure to be carried out. Each procedure having its own advantages and disadvantages.

Pilonidal sinus are very common in our society and till time to best of our knowledge no single specific study regarding the proper recommendation of surgical option of choice for this pathology found in our setup. The findings of this study will be recommended for future management of Pilonidal sinus and will help the surgeons. The main aim of this study was to compare the outcome of both techniques in terms of wound healing, recurrence, wound infection and Dehiscence.

Material and Methods

This prospective randomized controlled trial using non probability consecutive sampling technique was carried out on 65 patients at 03 Surgical Units of Ayub Teaching Hospital Abbottabad from 1st April 2006 to 31ST December 2015. The study was started after approval from the hospital ethical committee and permission from the concerned departments. All patients of either gender presented with symptoms suggestive of chronic Pilonidal Sinus disease (intermittent pain, swelling and discharge at the base of the spine), confirmed by clinical examination were included in the study. Patients selected for the study were randomly placed into two groups i-e Group-I comprised of patients planned to undergo open while Group-II included patients planned to undergo closed technique of surgery. The patients with acute sinuses or recurrent sinuses or who refused to be a part of this study or lost in follow up or having some other pathology were excluded from the study. After admission, all the patients were operated on elective list. The patients were placed in prone / Jack-Knife positions under Local Anesthesia in most and Spinal Anesthesia in some cases. Presence of more than one sinus tracts per-operatively was assessed with a blunt probe. In Group-I patients sinus along with its tracks (judged by probe) was excised through a midline elliptical incision up to sacral fascia. Totality of pathological tissue removal was confirmed and if any much left-over residual tissue found, it was removed. Similarly in Group-II patients probe guided adequate elliptical excision (taking margins of normal tissue) around the sinus was ensured. In Group I patients the wound were left open and pyodine soaked dressing was done while in Group II, the wound was allowed to close by primary healing. All the surgeries were performed by same group of surgeons and patients were discharged on analgesics and antibiotics on 2nd post-op day with the advice for daily dressing for Group-I patients and every alternative day Group-II patients. All patients were called for review at 01, 06, 12, 18 & 24 months interval, mainly to check for the recurrence and complications. Initially all the data were entered on a preformed proforma and then were put in SPSS 22.0.T-test was applied in comparison of complications of both groups. Frequencies and percentages were calculated. Data represented in table where necessary.

Results

A total of 65 patients with Pilonidal Sinus disease were included in the study. 49 (75.38%) were male and 16 (24.62%) were female patients. Male to female ratio was 3.06:1. Mean age was 24.5 years while the range being 19 – 33 years. Mean age for Group-I patients were 25.3 with range from 19 – 33 years while the mean age of Group – II patients was 24.1 with range from 21 to 32 years. Group-I (open technique) comprised of 33 and Group-II (closed technique) of 32 patients.

Most of patients presented with the symptoms of (intermittent pain, swelling and discharge at the base of the spine) followed by temporary remission, total being 57 (87.69%) including 30 (90.9%) from Group-I and 27 (84.37%) from Group-II. Other presenting symptom was painless, foul smelling discharge of the remaining patients. 63 (96.92%) patients in both groups presented with single sinus opening while 02 (3.07%) were having multiple openings. All of 65 (100%) patients were having their sinus openings in the midline. 15 (23.07%) patients were found (with

the help of probe) to have lateral extensions of the main track, including 09 (27.27%) patients form Group-I and 06 (18.75%) from Group-II.

Mean healing time for Group-I was 20.46 days (range 17 – 28 days) and 13.50 days (range 10 -15 days)for Group-II. Unhealed wounds were managed with daily dressing. Patients were called for follow-up at 01, 06, 12, 18 & 24 post-op month (total 05 visits) to check for recurrence, healing and wound infection

OPD consultation visits and telephonic contacts in some cases were used to call patients for follow-up visits in our study. The mean follow up were 29.50± 5.30 months. 6(10.76%) patients from Group 11 presented with Wound infection and wound dehiscence and 7 (12.06%) patients with recurrence as compared to 03(5.17%) and 02 (03.44%) patients from Group 1 which was statistically significant p<0.005. (Table I)

Table I: Surgical outcome of Group I (open) and Group II (close)

Outcome Variables	Group I	Group II	P value
Blood loss in ml	95±15.50ml	105±25.0ml	0.045
Mean hospital stay	4.74±1.84 days	3.64± 1.52 days	< 0.005
Surgery time in mins	63.5±20.5 mins	74.8±32.5mins	0.025
Mean Healing Time in days	20.46 (range 17-28)	13.50(range 10-15)	<0.005
Wound infection and dehiscence	3(5.17%)	6(10.76%)	<0.005
Recurrence rate	2(03.44%)	7(12.06%)	<0.005

Discussion

Type of pilonidal sinus surgery is still an enigma in the modern world of robotic surgeries. Controversies exists either to use the open or close technique. The open technique having its own advantages and disadvantages and vice versa for close technique. Aim of the treatment in Pilonidal Sinus disease is to heal the Sinus, as early as possible either by open healing method or primary closure and to avoid the risk of recurrence and other complications. In our study we therefore divided the patients into two groups, to exactly know the outcome of both the procedures. The main advantages with the open technique is the less recurrence rate, low surgical time, low wound dehiscence and wound infection rate as observed in our study. However the disadvantages are its daily dressing, long healing time and more hospital stay, as observed in our study. Many treatments and approaches had been discussed for its management from time to time but still no consensus could be developed regarding its satisfactory management. Pilonidal disease is an infection under the skin in the gluteal cleft, which is a common source of morbidity and loss of work productivity in healthy young adults.[15] Ideal treatment of Pilonidal sinus still remains to be the topic of debate and controversy. A large number of surgical techniques (with varying complexity) have been described in the literature for the treatment of this disease, each method has its own advocates.[16] Primary closure of pilonidal sinus tract following complete excision has been described by many authors with some kind of variation to closure method. The ideal surgery should be simple, with short hospital stay, a low recurrence rate, associated with minimum pain and wound problems. It should also be cost effective. None of the surgical procedures of Pilonidal Sinus proved to be ideal with respect to results of wound infection, wound dehiscence or recurrence.

Shahida et al did a comparative study on 40 patients. They found a statistically significant difference in terms of hospital stay, wound healing and recurrence rate between the two groups, similar to our findings. However the mean healing time in our study for open technique was 17 – 28 days and 10 -15 days for close group while in their study technique wound healing time with open technique was 22-42 days and with close technique was (9-11 days). These healing times are much longer than our findings. Similarly the wound infection and recurrence rate were 10% and 11.11%.[17] which were nearly similar to our study .Mohamed et al did a comparative study using three different surgical interventions i-e wide excision and left wound open, limited wide excision and left wound open and excision with primary closure. They observed significant difference in terms of hospitalization and operative time but they didn't observe any significant difference in terms of complications among all three groups.[18]

Mehmet Füzün et al did a comparative study on 110 patients. They found that the hospital stay is longer in patients who were managed with closed technique. Similarly the wound infection and recurrence rate were not significant among both

groups. These findings are against to our observations. The main reason for longer hospital stay for the close group were to observe for a longer time for any complication.[19] Anees K Nile et al did a comparative study on 60 patients and found that the hospital stay with open group was lesser as compared to closed group. Similar findings of Mehmet et al study. However there is significant difference in terms of complications like wound healing and recurrence in both groups which is similar to our findings.[20] M. Testini in their study found no statistically difference in both surgical intervention.[21] Mahmoud Sakr et al found that complications is not due to the type of surgical intervention but it is the obesity which causes morbidity. The complications of surgical interventions in management.[22] Ahmed AL-Khamis et al did a meta analysis on 17 trials and observed no significant difference in both groups in terms of complications. However for close group, the best option is off midline closure rather than midline closure.[23] Similarly Iain McCallum did a meta analysis of 18 trials and found no significant difference between two groups.[24]

There are certain limitations in our study. First, we used probe for the identification of tract and no other advanced investigations .This may result in missing of sinus in whom there are more than one tract. Moreover we did not use different flap procedures in closed technique for more significant results and advanced techniques like use of phenol, vacuum assisted technique etc. So, further studies like the use of dye for the identification of different tracts and different flap coverages needed for better results in our setups.

Conclusion

The open technique for the management of pilonidal sinus is better option in terms of wound infection, wound dehiscence and recurrence rate as compared to close technique. The only significant drawback for open technique is the long healing time, which can be compensated easily considering its advantages.

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ORIGINAL ARTICLE

Awareness among Medical and Non-Medical Students About the Practice of Periodic Medical Examination

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ABSTRACT

Objective: To compare the Awareness among Medical and non-medical students about the practice of Periodic Medical examination.

Study Design: Cross sectional descriptive study.

Place and Duration of Study: The study was conducted between 1st February 2016 to 30th April 2016 among the students enrolled in universities and colleges of Rawalpindi and Islamabad.

Materials and Methods: It was a cross-sectional comparative study. Data was collected through structured, pre-validated questionnaire. Eight colleges of Rawalpindi and Islamabad were selected, four were related to medical profession and four were non-medical. On the basis of simple random sampling, 271 students enrolled in bachelor program were selected among these institutes. The data was analyzed through SPSS version 20.

Results: Overall 63 % of the students, both from medical and non-medical institutions, had awareness about the knowledge and practice of periodic medical examination. Among medical students 68% and 61% among non- medical students had knowledge about periodic medical examination. No major difference was found in knowledge and practice among medical versus non-medical students.

Conclusion: This study concludes that Medical and non-medical students are aware about the importance of periodic medical examination with trivial difference and lack of practice and reasons of not following the medical advice are busy schedules and heavy costs of investigations. From public health perspective there is a great need to raise health awareness amongst those who do not have awareness about periodic medical examination to prevent our future generation from chronic illnesses.

Key Words: *Awareness, Medical examination, Medical Students, Non-Medical Students.*

Introduction

Healthy environment, good knowledge, practicing attitude and approachable availability of health services for all individuals are essential for prevention of diseases. It is progressively more recognized now a days that health is preserved and enriched not only through the development and application of health advancements but also through the efforts adopted for intelligent lifestyle choices by the individuals and community. Staying physically active and conscious about health can help prevent or delay certain diseases, including some cancers, heart diseases and diabetes.[1] In 2005 World Health Organization emphasized on chronic diseases and highlighted their role in global health issues, including High Blood Pressure, Stroke, Diabetes and Cancer.[2] Notably 60% of deaths were observed due to these diseases worldwide. However 80% of these deaths emerged in developing countries including Pakistan.

In 2020 approximately 13.9 million people with diabetes will drag up Pakistan to 4th most populous country in the world.[3] In the present world, Pakistan is ranked 6th among countries, who have high burden of diseases. Communicable diseases have share of 40% in Pakistan which means every 3rd individual has some sort of communicable disease.[4] Childhood infectious diseases were responsible for two thirds of the burden of disease in Pakistan.[5] These statistics emphasize to save future through raising awareness about health seeking behavior and practicing periodical medical examination. That will lead a developed society because of the availability and productivity of workable human resources. It will reduce medical expenditure in household bucket and will increase economic productivity of workable adults accordingly.

Periodic medical examination (PME) is essential for

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Funding Source: NIL; Conflict of Interest: NIL
Received: Feb 07, 2017; Revised: Mar 31, 2017
Accepted: May 20, 2017

early detection of an illness.[6] It plays vital role to keep human resource healthy and productive. As individual are considered basic entity in any society, they should give priority to health and allocate time for health facilities and for this purpose two utmost aspects are good healthy food and regular checks on health conditions.[7] Periodic medical examination is defined as a thorough study or examination of the health of an individual.[8] Some studies have also shown in their results that people who undergo regular medical examinations have decreased the rates of invasive cancers and mortality respectively.[9] It shows that developing societies should be more concerned and sensitive towards the health needs of its members. In modern day life, health care has made significant improvement in management of various diseases but it is still hard to understand the rise of mortalities and morbidities.

According to 1998 census Pakistan has placed sixth populous country with 180 million individuals. If percentage who suffered with different diseases translated into figures then estimation will be alike 40 million individuals suffer from high blood pressure, 32 million cardiovascular diseases, 24 million from obesity, 18 million from high cholesterol, 8 million from diabetes and about 50 million from mental health disorders respectively.[10] This is the reason that life expediency in Pakistan is still low if we compare it with developed countries.[11]

Main goal of Periodic medical examinations is to diagnose treatable asymptomatic diseases. In Pakistan researches on periodic medical examination are done mainly on workers in different industries, hospital workers and food handlers.[12,13] Limited work is available on students especially who have strong educational background and studying in renowned medical and non-medical fields.

Purpose of this study was to raise awareness about health through addressing the gap between knowledge and practice of periodic medical examination. Youth considered as cream of the nation is expected to be more conscious about health seeking behavior and practices as compared to other age groups, especially medical students who are the future health care providers. It is therefore important to raise awareness on periodic medical examination so that diseases can be detected and managed at early stages to reduce morbidity and mortality. This study will highlight the level of awareness among Medical and non-medical students about the practice of Periodical Medical examination and the factors which are considered as causes for not practicing would be the future recommendations.

Materials and Methods

This cross-sectional descriptive study was conducted in three months duration from 1st February 2016 to 30th April 2016 among the students enrolled in 8 colleges and universities of Rawalpindi and Islamabad. Four institutes selected from public sector and four from private sector were included in the study. Wherein four were related to medical profession and remaining four were related to non-medical profession. Sample size was based on WHO calculator by using following figures. CI 95%, anticipated population proportion (P value) was 0.20, absolute precision required was 0.05 so the sample size turned out 246 and the actual sample size for the current study was 271. Sampling technique used was simple random sampling. A structured, pre validated questionnaire was used for data collection. After the validation of questionnaire, pilot testing was done at Riphah International University Islamabad, before the actual study was carried out. Questionnaire had different variables about periodic medical examination like knowledge, practice, source of information, and gap between PME, trends in family regarding PME and finally identifying the reason in those students who don't practice it. Data was collected by Authors themselves. Statistical analysis was done through Chi Square test (non-parametric). P value less than 0.05 was considered as significant.

Results

A total of 271 Students from Medical and non-medical profession were included in the study. 131 were male and 140 were female students. A total 132 (48.7%) respondent were between age interval of 18-21, 116 (42.8%) were of 21-23 and 23 (8.5%) were of 24-26. Total 127 respondents were from the medical colleges and 144 from non-medical institutes. 246 (90.7 %) were single, only 21 (7.8%) were married and Four (1.5%) were separated. Among all 81% of respondents marked PME important for health, whereas others think that it is wastage of resources as well as time. Respondents

who practice regular periodic medical examination, 89% of their family members also practice it.

Table I highlights the fact that the 170 respondents including medical and non-medical were aware of the periodic medical examination. 101 respondents including 53 males and 48 females had no knowledge about it.

Table I: Knowledge about Periodic Medical Examination according

Knowledge of respondents	Male	Female	Total
Yes	78	92	170 (63 %)
No	53	48	101 (37 %)
Total	131	140	271 (100%)

Table II highlights the differences between knowledge of Periodic medical examination and its practice. Most of the respondents who know the importance of Periodic medical examination, actually practice it.

Table II: Difference between knowledge and practice of Periodic Medical Examination

Level of knowledge and practice	Knowledge about significance of PME	Practice of self PME among those who know the significance of PME	Practice of self PME among those who don't know the significance of PME
Yes	63 %	54 %	18 %
No	37 %	46 %	82%

Table III highlights the comparison of knowledge of periodic medical examination among medical and non-medical students. There is no major difference but still medical students are more knowledgeable then non-medical students. This difference could be because of their study fields.

Table III: Comparison of knowledge about Periodic Medical Examination in Medical vs Non-Medical students

Comparison of Knowledge	Knowledgeable	Not knowledgeable
Medical Students	68 %	32 %
Non-Medical Students	61 %	39 %

P value = < 0.01

In figure 1, 76 (28 %) respondents reported internet as their source of information about medical examination, while 60 (22 %) respondents reported peers and friends as their source of information.

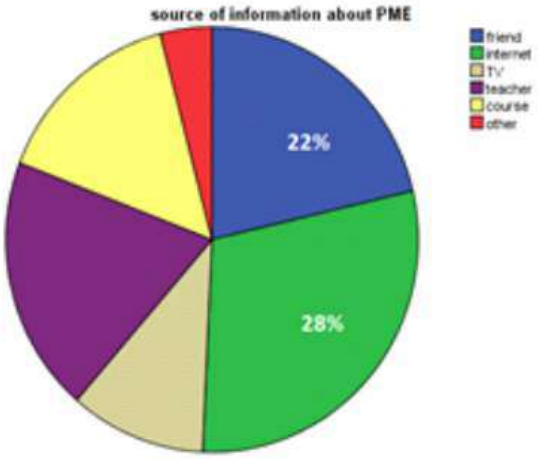

Fig 1: Sources of information about periodic medical examination

In figure 2, important reason among those who don't practice PME is ignorance (33%). Some others are not practicing because of their busy schedules (25%) and cost of investigations (20%)

Fig 2: Reasons for not practicing periodic medical examination

Discussion

Developing world is facing double burden of diseases. It is need of the time as well as cost effective measure to prevent chronic illness by raising awareness of periodic medical examination. Current study shows that 62 % respondents had the knowledge of periodic medical examination. Among those, 54% practice and 46 % don't practice, although they know the importance of periodic medical examination. There is no significant difference in their knowledge due to their educational profession. As per figure 3 health education alone is not sufficient if health behavior is not changed.[14] The female respondents knew about periodical medical examination, but were not

practicing it. However these findings were not similar to other researches done with different prospective in world wide.[15] There are multiple reasons mentioned by respondents not to have periodic medical examination. 33 % respondents marked in appropriate knowledge about PME and few mentioned reasons like lack of facilities and cost of investigations. World health organization's annual reports support this data.[16] Most of the respondents gave credit of knowledge for PME to the internet and friends. Medical students seem more knowledgeable (68%) then non-medical students (61 %). Although the medical students should be more aware of health behavior and risk awareness, as concluded in other studies.[17] It is clear sign that curriculum of all profession is lacking in providing knowledge on periodic medical examination. Current study suggests that the periodic medical examination serves a purpose of screening for diseases and the awareness and practice of proven beneficial components of such examinations be increased among students.

Conclusion

The present study concludes that awareness is present among medical and non-medical students, however the practices are low. There is no major difference between medical and non-medical students in terms of their knowledge and practice. Periodic medical examination being a cost effective measure as compared to actual treatment expenses, should be practiced in routine by youth. Efforts should be made by the government and other health agencies, especially students/youth representative societies to educate them on the periodic medical examination on regular basis especially for newly enrolled students.

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