pISSN 1997-3438
eISSN 1997-3446
Indexed in
Index Pakistan (IP/016)
WHO Index Medicus (IMEMR)
EMBASE
EBSCO
Clavirate
IMEMR
Asian Digital Library (ADL)
Elsevier
Pakmedinet
NETMEDICS
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QUARTERLY

JOURNAL OF MEDICAL SCIENCES

PESHAWAR - PAKISTAN

Recognized by Higher Education Commission of Pakistan

J Med Sci 2023 October;31(4)

KHYBER MEDICAL COLLEGE, PESHAWAR - PAKISTAN

JOURNAL OF MEDICAL SCIENCES

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Journal of Medical Sciences (Peshawar, Print/Online) is a peer reviewed open access journal that publishes biomedical public health and educational research on quarterly basis.

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Journal of Medical Sciences is published quarterly, composed and printed at Khyber Printers, Peshawar KP, Pakistan.

Annual Subscription
Pakistan: Rs. 5000/-
Overseas: US $ 500/-

Printed at:
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E-mail: khyberprints@gmail.com

EDITORIAL

THE HEALTHCARE SYSTEM IN THE TWENTY-FIRST CENTURY - THE ROLE OF ARTIFICIAL INTELLIGENCE (AI)

Khansa Khan[1], Salman Zahir[2]

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This editorial may be cited as: Khan K, Zahir S. The healthcare system in the twenty-first century - the role of Artificial Intelligence (AI). J Med Sci 2023 October;31(4):269-270

Most people are unfamiliar with the concept of Artificial Intelligence. It is defined in several ways. Some regard it as the innovation that enables software systems to operate effectively and consider it as a tool that substitutes manual labor, in a timelier manner. Some consider it to be "a system" capable of correctly analyzing external data, mastering it, and implementing what it has learned to accomplish specific goals and tasks using flexible modification. In a nutshell, machine intelligence is human-designed intelligence. Artificial Intelligence has entered almost every aspect of our lives, and some of it, such as facial recognition or the Alexa-built gadgets retrieving information, which is so widespread in our daily lives that we have gotten accustomed to it, which may no longer be deemed Artificial Intelligence. We can identify two forms of AI based on the functions and skills it provides. The first sort of AI is intended to do a specific task, such as image and fingerprint recognition or automated cars. The second characteristic is a system's theoretical ability to grasp or master any intellectual work capable of assisting persons in solving the problem at hand. [1]

There are always two sides to a picture: the brighter and the darker. Artificial Intelligence also has some of its adverse effects on the human race. With the developing technology, there are some drawbacks to it as well, such as an exceptional societal transition that will occur, and disturbing life patterns all over the globe. Individuals must be innovative to earn a living, but AI can easily develop an algorithm to execute our work. Also, it eliminates the necessity for people to communicate, to share views, because of which interpersonal contact is decreasing. Hence, AI will create a barrier between individuals because personal connections will be hardly required for interaction. Also, the machines would take over a large number of occupations. This would result in unemployment. Furthermore, a wealth imbalance will be established since AI investors will receive the majority of the earnings. The gap between the affluent and poor will widen. AI that has been educated to perform an assignment may ultimately reach a stage where humans no longer have power over it, resulting in unanticipated consequences. This signifies the AI's capacity to work autonomously after having been programmed according to the codes, ignoring human operator instructions or the creators of AI may design something that is racially biased to hurt specific individuals or objects. [2]

On the other side, there are several beneficial impacts of AI on humans, especially in the sphere of healthcare. AI can help us make faster and more accurate decisions by uploading the findings of a physical examination to a system that evaluates all potential outcomes instantly and decides if the patient has any deficiencies or illnesses, and offers different treatment alternatives. Also, human error is unavoidable; the greater the degree of exhaustion, the greater will be the probability of mishaps and accidents. Modern technology, on the other hand, is insensitive to exhaustion and cognitive distraction. It prevents errors and enables you to complete the task more swiftly and correctly. In the modern world, patients have the option to select AI-based surgical treatments. Though this AI requires the supervision of medical professionals, it can perform the duty with minimal risk to the body. Recently, many radiologic operations have improved a lot with the help of AI. Diseases can be treated remotely via modern technology. The patients while staying in bed can be monitored by the doctors without attending using a remote monitoring robot. [3]

Artificial Intelligence is being used in the pharmaceutical industry as it can assist with decision-making, rational drug design, determining the best medical care, including personalized medicines, and handling the clinical information generated and using it for drug development programs. [4] Artificial intelligence applications are being explored for a variety of ocular ailments, among the most prevalent of which are diabetic retinopathy (DR), retinopathy of prematurity (ROP), and glaucoma. Because of technological breakthroughs such as computerized visual field assessment and optical coherence tomography (OCT), the subject of ophthalmology is perfect for artificial

intelligence investigations. [5] The effectiveness of using AI, particularly Machine Learning, in cardiology has also been shown in a variety of areas, including risk prediction of CAD along with cardiac scans, including electrocardiography and echocardiography. [6]

Considering technological advancements and the digitization of dentistry, artificial intelligence is also spreading in dentistry. Neuronal networks in dentistry can be used to improve diagnosis precision, quickness, and effectiveness. Neural networks may aid in the detection of dental caries on radiological images, making the examination more rapid and accurate. Furthermore, dental restorations may be revealed using artificial intelligence. [7]

There is a lot of expectation that AI will lead to significant improvements in all sectors of healthcare, from detection to therapy. The need for medical services is expanding, and many nations are facing a lack of medical practitioners. Technologies built on AI will be vital in assisting people in conserving their health by constant monitoring as well as providing earlier diagnoses, personalized treatments, and improved follow-ups. It also has shown promising results in the fields of precision medicine and genetics-based solutions.

It is believed that AI has a major role to play in future healthcare offers. Given the tremendous advancements in AI for imaging analysis, most medical imaging and histological data will almost certainly be reviewed by a computerized device at some time. Artificial intelligence (AI) algorithms will not replace human clinicians on a big scale; but they will supplement existing efforts to provide care for patients. Physicians could eventually evolve in the direction of activities and duties that rely on essentially human characteristics like empathy and persuasion. Hence those medical practitioners, who choose not to cooperate with artificial intelligence, could end up being the sole individuals who lose their jobs gradually.

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ORIGINAL ARTICLE

EFFECTS OF TAI CHI EXERCISES ON PHYSICAL ACTIVITY AND PULMONARY FUNCTION IN PATIENTS WITH CORONARY ARTERY BYPASS GRAFTING

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ABSTRACT

Objective: To determine the effects of Tai Chi exercises on physical activity, pulmonary function, and rate of perceived exertion in post-coronary artery bypass grafting patients.

Material and Methods: A Randomized control trial was conducted in the Armed Forces Institute of Cardiology/National Institute of Heart Diseases Rawalpindi Pakistan from January 2018 - July 2018. 50 post-coronary artery bypass grafting patients were calculated by the open epi tool and randomly allocated into two groups in equal halves through non-probability purposive sampling with the toss the coin method. 40-60 years males and females with >40% ejection fraction were included while vitally unstable patients were excluded. The experimental group was given Tai Chi exercises while the control group was given a bicycle. Levels of physical activity and pulmonary functions were assessed at baseline, 4thand 6th week of training.

Results: Out of the total sample size only 39 were analyzed 11 were dropped off due to not following proper follow-up, and there was no statistical difference in heart rate P=0.095. Oxygen saturation shows a significant difference with P<0.001, Physical activity was low at baseline but after exercise training, the Tai Chi group showed great improvement P< 0.01. Pulmonary functions showed statistically insignificant results P=0.865. The rate of perceived exertion was high in 2nd week and gradually decreased with the mean of 3.20 and 3.37 while the time of exercise was improved with P<0.01.

Conclusion: Tai Chi exercises have better improvement in pulmonary function, rate of perceived exertion, time of exercise, and physical activity in post-coronary artery bypass grafting patients.

Keywords: Coronary artery bypass grafting, pulmonary functions, physical activity, rate of perceived exertion, Tai Chi

This article may be cited as: Razzaq M, Obaid S,Tariq I, Iqbal MA, Kiani SK, Ramzan T. Effects of Tai Chi exercises on physical activity and pulmonary function in patients with coronary artery bypass grafting. J Med Sci 2023 October;31(4):271-275

INTRODUCTION

Across Europe, more than 85 million people have cardiovascular diseases CVD every year. [1] Advancement in medical technology and treatment strategies in health care improves the rate of recovery and survival day by day. [2, 3] The most complicated and full of risks but long-lasting effective treatment is coronary artery bypass grafting CABG it is also known as open heart surgery. In this surgery flaps or grafts are placed on diseased vessels and make another pathway or bypass for circulation. [4] Flaps or grafts are replaced by the individual's saphenous vein and internal left memory artery. [5]

CABG is mandatory in multi vessels blockage mainly when 90% occlusion in the left anterior descending artery, and the left and right circumflex arteries. [6] In emergency conditions like with and without ST-segment elevation MI is also treated with CABG if poor ejection fraction but not in less than 35 %. [7, 8] After CABG, patients need urgent cardiac rehabilitation CR. It is designed according to the patient's post-operative health condition. [9] However, in the literature it was observed the rate of patient participation in CR is very low and they drop exercise plans in various countries just because of difficult to follow up as most of the participants are living far away from the hospital. [10] Patients didn't follow the exercise program regularly so the benefits of cardiac rehabilitation are not as high as it seems in the literature. [11]

CR is a complete model of care including a set of various core components, for instance, aerobic/ anaerobic exercise, patient training, psychosocial training, and

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Date Received: 07-08-2022
Date Revised: 08-4-2023
Date Accepted: 31-7-2023

reduction in risk factors. To upgrade patients' satisfaction and reduce the risk of future heart problems. [12] CR is a multidisciplinary teamwork, cardiologists, nurses, physical therapists, and cardiac rehab specialists work together to design and manage physical activities by avoiding risk factors, and unstable vitals. [13] Physiotherapists or other exercise experts design a well-organized and specialized exercise plan separately for all individuals. [14] Tai Chi TC exercises are also known as aerobic exercises or conditioning exercises. [15] TC was used as a fighting form or defense, for this purpose it was used to emphasize strength, stability, elasticity, and fast movements. [16] Later on it progressed into health or physical fitness for this it convert into a smooth, steady, and gradual type of exercise which is practiced by all age groups. [17, 18] In 2016 a study was done by Cole AR et.al and they concluded that TC is used as aerobic exercise. Tai chi is slow, gentle, and rhythmical movements so it shows substantial descent in systolic and diastolic blood pressure but the heart rate is unchanged. [19]

Different studies have focused on preventing and managing coronary arteries by TC exercises in phase III and IV but the effects of Tai Chi training during phase II cardiac rehabilitation is still needed to be determined. The purpose of the study was to determine the Effect of TC on physical activity, pulmonary function, and rate of perceived exertion after exercise in patients with CABG.

MATERIAL AND METHODS

A randomized control trial NCT03857282 was conducted at the Armed Forces Institute of Cardiology/ National Institute of Heart Diseases AFIC/NHID Rawalpindi Pakistan from January 2018 - July 2018. The sample of 50 post-CABG patients was calculated by the open epi tool and randomly allocated into two groups in equal halves through non-probability purposive sampling with the toss & coin method. 40-60-year males and females with >40% ejection fraction were included while vitally unstable patients were excluded. Before and after the exercise all vitals were checked, during each session, the treatment intervention was 5 to 10 min warm-up and cool-down exercises in both groups after that experimental group practiced 30 min Tai Chi exercises while the control group performed 30 min bicycling. The level of physical activity was analyzed by using an international physical activity questionnaire and the rate of perceived exertion Borge scale. Pulmonary function was assessed through a digital spirometer, all variables were analyzed at baseline, 4th, and 6th weeks of training. For the normality test, Shapiro wilk values and the Non-parametric Man Whitney U test was applied to analyze all vitals except Heart Rate HR at the baseline to compare both groups, while the parametric independent t-test was applied to HR.

RESULTS

74 post-CABG patients were assessed out of them 24 didn't meet the inclusion-exclusion criteria, remaining 50 patients were randomly allocated into interventional and control groups in equal halves. 1122% of patients were dropped off due to loss of follow up 3978% of patients were completed a 6-week exercise program, 2040% in the experimental group, and 1938% were in the control group. In the experimental group, 1743.6% were males and 37.7% were females while 1538.46% and 410.2% were males and females in the control group respectively.

The mean ± SD of age was 55.13± 5.130 in years, 3589.7% of patients were having chest pain, 12.5% coughed and 37.6% had no presenting chief complaint regarding their surgery. 3897.2% had no previous Cardiac surgical history while only 12.6% had surgical history. HR was significantly dropped as shown in Table 1 and Improvement in saturated Oxygen SPO2 is described in Table no.2

Pulmonary function was assessed by spirometer and results show the forced expiratory volume in 1 second FEV1 in the 2nd and 6th week of training in the experimental and control group was P-value >0.05 while in the 4th week was p-value <0.05. Forced vital capacity FVC and Peak expiratory flow PEF in the 2nd, 4th, and 6th week of training of the experimental and control group was p-value > 0.05.

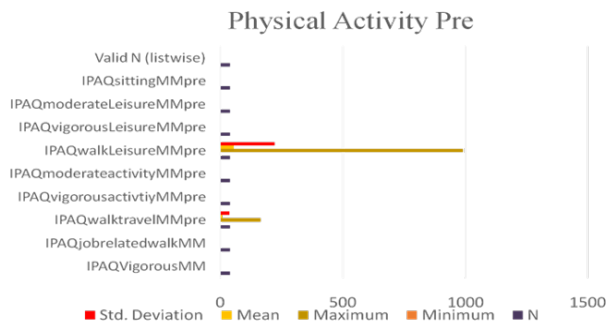

Fig 1: Physical activity pre-exercise

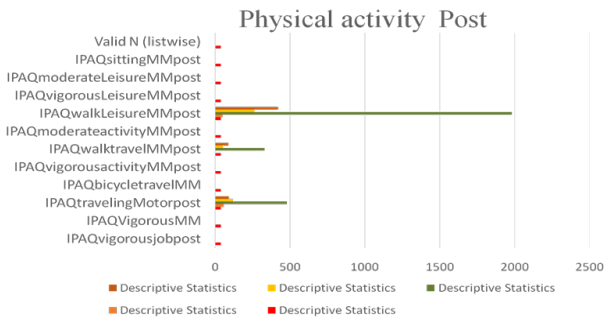

Fig 2: Physical activity post-exercise

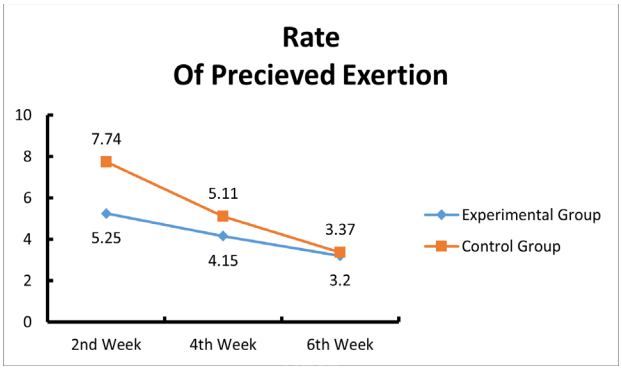

Fig 3: Rate of perceived exertion RPE in Experimental and Control Groups

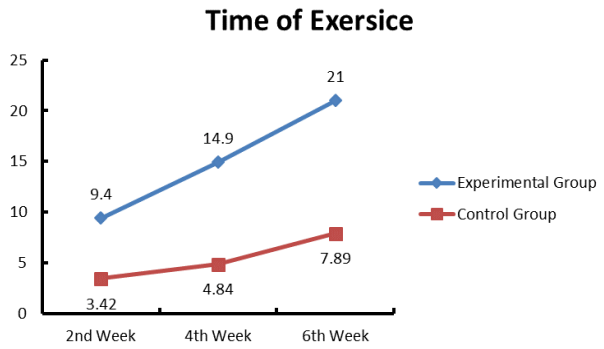

Fig 4: Time of Exercise in Experimental and Control Groups

Table 1: Heart Rate HR Comparison between Experimental and Control Groups

Variable HR		Experimental group	Control group	P-Value
Baseline		78.70 +3.988	80.88 +2.699	0.064
2nd Week	Pre	78.65 +2.277	76.16 +2.853	0.005
	Post	80.00 +1.297	80.58 +2.219	0.32
4th Week	Pre	77.35 +1.386	77.00 +1.732	0.49
	Post	78.75 +1.446	80.10 +2.865	0.068
6th Week	Pre	77.05 +2.305	77.68 +1.108	0.285
	Post	78.05 +2.064	78.00 +1.000	0.095

Table 2: Comparison of SpO2 Levels between Experimental and Control Groups

Variable HR		Experimental group Median IQ	Experimental group Mean Rank	Control group Median IQ	Control group Mean Rank	P-Value
Baseline		962	18.73	971	21.34	0.444
2nd Week	Pre	961	19.05	971	21.00	0.569
	Post	971	23.70	961	16.11	0.024
4th Week	Pre	970	22.33	971	17.55	0.139
	Post	981	22.38	981	17.50	0.116
6th Week	Pre	980.75	25.88	972	13.82	0.000
	Post	990	25.75	982	13.95	0.000

DISCUSSION

In a recent study, Heart Rate was statistically significant between both groups in 2nd week of exercise while in the 4th and 6th weeks of training shows no effective results, which was due to adaptation of activities. A systemic review was conducted by Cole AR et.al and they concluded that at the beginning of training, TC exercises increase the vagal modulation, decrease the sympathetic modulation and shift the sympathovagal balance to the increased parasympathetic dominance, and ultimately HR increases. [19] In the current study, Heart Rate Reserve showed positive effects on both groups in the 2nd week of exercise later on the 4th and 6th weeks of the exercise program had constant results. This extended the same results as a study conducted by Sato S, Makita S, et. all published in an international Heart J in 2010 and it proved that heart rate reserve was constant during all exercise protocols and showed conflicted outcomes. [20] Saturated oxygen saturation was measured in this study at baseline, 2nd, 4th, and 6th week of training. Maximum oxygen saturation showed that TC Training had positive effects as compared to bicycling in post-CABG patients. Another study was done by Lu, Wan et.al in 2014 and they concluded that TC exercises had positive effects on autonomic nervous modulation so in TC groups increased vagal modulation and HR along with a decrease in breathing frequency and mean respiratory rate interval. [21]

Pulmonary function was measured in a recent study by digital spirometer at baseline, 2nd, 4th, and 6th week of training results showed that there is no statistically significant difference in both groups because both exercise protocols were aerobic, which had the same effect

on pulmonary functions. A study was done on functional capacity in post-myocardial infarction MI patients by Nery RM et.al, they concluded that after a recent MI functional capacity decreased as it was measured low level of VO2 max however after TC training increase in Vo2 was observed. [22]

The current study showed that the TC group improved functional capacity as the minimum walk time was 30 Min walk, increase time of exercise 30 min Tai chi and minimum level of exertion RPE=3, and no complaints of Shorts of Breath. While the control group's maximum time of exercises was 10 min, RPE=8, and a maximum walk time of 20 min was recorded. A study was done on functional capacity by John Liu et.al and they concluded that TC training is more effective than traditional cardiac rehabilitation programs because it shows greater improvement in overall functional capacity in CAD patients. [23]

A recent study found that there was a statistically significant difference in physical activities between both experimental as well as in control groups. Before the exercise program, patients did not perform the physical activity but after the six weeks of training experimental group increased more in physical activity like traveling, walking, and sitting time without moderate and vigorous activity as compared to the control group. A systemic review was done on physical activity by Lan C, et.al and they concluded TC training enhances cardiovascular health and can be used as an alternative method of training in CR. Previous studies concluded there is a great improvement in physical activity functional capacity on top of other effects of Tai Chi furthermore it is a safe technique for patients with CABG, CVD, CHF, and stroke. [24]

The limitation of the study was that it was very difficult for the patients to follow up the session properly on time. As the study population was drawn from one hospital, the population is quite homogenous, and any generalization of the results has to be made cautiously.

CONCLUSION

It is concluded that Tai Chi exercises are a very effective technique to improve heart rate, Time of exercise, rate of perceived exertion, pulmonary functions, and physical activity in post-coronary artery bypass grafting patients.

It is recommended that studies should be conducted on the effect of TC in phase I cardiac rehabilitation in post-CABG patients. The research should focus on cellular changes due to TC in post-CABG patients.

DISCLAIMER

The online poster presentation of the abstract was presented at the World Conference of Physical Therapy on April 9-13 2021.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Razzaq M: Concept, Design,

Obaid S: Acquisition and critical review

Tariq I: Analysis and interpretation of data

Iqbal MA: Data collection

Kiani SK: Data collection

Ramzan T: Bibliography and proofreading

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ORIGINAL ARTICLE

FREQUENCY OF PRE-HYPERTENSION AMONG VARIOUS BLOOD GROUPS

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ABSTRACT

Objectives: To determine the frequency of pre-hypertension among various blood groups of medical students.

Material and Methods: This cross-sectional study was conducted at Aziz Fatima Medical and Dental College Faisalabad, Pakistan. A hundred medical students aged 18 to 25 were enrolled from first year to final year MBBS by convenience sampling technique. Blood pressure was measured by auscultatory method and blood groups were determined by conventional slide method. Data was analyzed by SPSS version 25. Basic characteristics of the studied population are presented as mean and standard deviation (age, height, weight, and blood pressure). Categorical variables like prehypertension are analyzed as dichotomous variables and are expressed as frequencies and percentages. Proportions were compared using the Chi-square test. $p \leq 0.05$ was taken as statistically significant.

Results: The study revealed that blood group B was the most common blood group followed by O blood group. While AB blood group is the least common blood group in our study.

Of the total population pre-hypertension was found in 56(55.4%). Prehypertension was most frequently found in subjects with blood group A (71.4%) whereas least commonly found in subjects having blood group B.

Conclusion: Blood group B was the most common blood group of our studied population. Prehypertension is commonly found in subjects with blood group A.

Keywords: Blood group antigens, Pre-Hypertension

This article may be cited as: Moiez M, Zahid H, Ashfaq R, Zareen S, Altaf B, Rasheed Z. Frequency of pre-hypertension among various blood groups. J Med Sci 2023 October;31(4):276-279

INTRODUCTION

Hypertension, which is also known as the "silent killer", is a modifiable risk factor and a challenging health problem globally. [1] Prevalence of pre-hypertension is an emerging disease that is increasing at an alarming rate among youngsters. [2] It is estimated that the number of mortalities due to prehypertension in developing countries is rising to 15% i.e. 44 million people by the year 2020. [3] Prehypertension accounts for 45 to 55% of the morbidity in youngsters of the Indo sub-continent. [4] Association of blood groups regarding paternity issues and medicolegal issues is already been well documented. These days the interest of medical researchers is increasing to explore its association with different diseases. The association of various diseases with blood group antigens is well documented including certain infections and carcinomas while certain diseases are still questionable regarding blood groups. [5]

Essential hypertension is more prevalent in adults than in children. Diagnosis of raised blood pressure in the early years of life can be a forecast of hypertension in adults.[6] Various studies in the past have been conducted to find the correlation of "ABO" and "Rhesus" blood groups with hypertension showing conflicting results.[6]

Future research is required concerning the linkage between these parameters, which might help screen the young population at risk of pre-hypertension and take primary preventive actions to reduce the burden of diabetes and its complications in the community.

Hence current study is designed and planned to find out the frequency of pre-hypertension and ABO blood groups among medical students and to find out the association between both study parameters.

Prehypertension is usually asymptomatic and remains undiagnosed in young adults. Although some

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Date Received: 19/03/2023
Date Revised: 02/06/2023
Date Accepted: 06/08/2023

of them sometimes experience excruciating headaches and visual blurriness they do not take it enough seriously to seek medical assistance, considering themselves as healthy individuals. Ultimately when they get medical advice due to the gradual deterioration of their symptoms it gets very late and the subject gets full-blown disease. Thereby warning us to be alert and follow proper precautions to curb outcomes such as CVD. [3] According to JNC 8 guidelines starting antihypertensive drugs at specific Blood Pressure values helps to obtain better health results. [8] High-risk younger populations should be screened earlier for pre-hypertension than other populations and should advised to be adopt preventive measures to reduce the incidence of hypertension and its serious sequences and outcomes. We designed this study to determine the frequency of pre-hypertension among various blood groups of medical students.

MATERIALS AND METHODS

This study was conducted at Aziz Fatima Medical and Dental College Faisalabad, Punjab, Pakistan from July to December 2020. It was a cross-sectional study. The sample size was calculated by keeping a confidence interval of 95 while the margin of error was 0.05, power was 0.8. While using the mean difference of systolic blood pressure among normotensive and hypertensive and standard deviation. It comes out to be 88 while keeping 20% dropouts (18 students). Out of a total of 106 subjects, 6 were not willing to participate. A hundred medical students aged 18 to 25 years were enrolled from 1st year to the final year of MBBS by convenience sampling technique. Ethical approval was taken from the institutional ethical committee (Ref. No: IEC/918-20). Hundred male and female students of 18 to 25 years of age were enrolled from 1st year to the final year of MBBS by convenience sampling technique. Students of first-year to second-year MBBS were approached during their physiology practical classes, whereas students of third-year to final year were approached during ward rotation at Aziz Fatimah Hospital Faisalabad. All relevant information including age, race, medical history, and family history of hypertension was recorded on structured proforma. Medical students with a history of cardiovascular diseases, and diabetes mellitus were excluded. Before enrolling, informed consent was taken from subjects, and were assured of confidentiality.

The conventional slide method was used to determine blood groups. Three glass slides were labelled as 'A', 'B', and 'D'. Blood drops were obtained by figure pricking following aseptic measures, and were placed on each slide. Drops of anti-A, anti-B, and anti-D sera were added to respective slides and mixed with blood using toothpicks. Blood groups were determined by observing agglutination reactions.

A Mercury sphygmomanometer was used to estimate blood pressure by auscultatory method making the subject sit and relax for 5 minutes.[9] Three readings were recorded and their average value was used for data analysis. According to JNC 7 criteria, blood pressure <120/80 mmHg and 121-139/81-90 mmHg was taken as normal and prehypertension respectively.[10]

STATISTICAL ANALYSIS

SPSS 25 was used to analyse the data. Descriptive of the studied population was presented as mean and standard deviation (age, height, weight, and blood pressure). Categorical variables like prehypertension are analyzed as dichotomous variables (yes/no) and are expressed as frequencies and percentages. Proportions were compared using the Chi-square test. $p \leq 0.05$ was taken as statistically significant. Means of blood pressure were compared among prehypertensive and normotensives were compared by independent T-test.

RESULTS

The study is comprised of 100 male and female medical students (50 in each group). Description of the study population is described in Table 1. The mean ± SD of study participants was 21.6±1.82. The current study reveals that the commonest blood group was B followed by blood group O in the current study population while the least frequent blood group was AB in our study (Figure 1). Eighty-three (83.2%) of the population was Rh positive and only 17(15.8%) were Rh negative. Of the total population pre-hypertension was found in 56(55.4%). On the other hand, 44(43.6%) of the population were normotensive. Prehypertension was significantly found in subjects with blood groups A (71.4%) followed by subjects having blood groups AB and O (Table 2). Subjects with prehypertension have the highest systolic (122.2 vs. 112.9) and diastolic blood pressure (88.89 vs. 74.0) compared to normotensives. However, a statistically significant difference was found in terms of diastolic pressure (p-value 0.006) (table 3).

DISCUSSION

Prehypertension is an alarming sign if detected early in life, which depicts the risk of hypertension later on in life. The seventh report of the Joint National Committee (JNC-7) proposed separate cataloging for prehypertension, separating it from established hypertension. [10] ABO blood group system is based on the inheritance of the presence and absence of antibodies and antigenic substances. ABO Blood group system is gaining attention these days for researchers as it is found to be associated with various diseases. [11] Active research has now been carried out to explore the association of various diseases with different blood groups showing that certain diseases are found to be associated with particular blood groups. [12] It is found that there is diverse distribution of blood groups globally reflecting the particular ethnicity and genetic

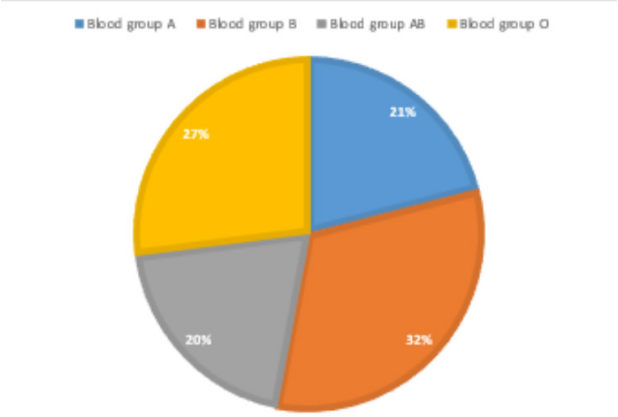

Fig 1: Blood group distribution among the study population (n= 100)

Table 1: Descriptive Statistics of study population (n= 100)

Age	Mean	Std. Deviation
	21.61	1.82
Weight	67.33	12.92
Height	2.74	0.32
BMI	24.66	4.48
BPS	118.51	10.48
BPD	82.34	11.56

Table 2: Frequencies and percentages of normotensive and prehypertensive among ABO blood groups.

ABO blood groups	Frequency of blood groups (n= 100)	Normotensive 100-120 / 60-80 mmHg (n=44) N (%)	Pre-hypertensive 121-140 / 81-90 mmHg (n=56) N (%)
A	21	6(28.6)	15(71.4)
B	32	17(53.1)	15(46.9)
AB	20	9(45.0)	11(55.0)
O	27	12(44.4)	15(55.6)
p-value		0.037	

p-value is determined by the Chi-Square test

p-value ≤ 0.05 = significant

Table 3: Comparison of Blood Pressure among Prehypertension and Normotensive subjects

	Systolic blood pressure Mean ± SD	Diastolic blood pressure Mean ± SD
Pre hypertension (n=56)	122.91±10.79	88.87±10.51
Normotensive (n=44)	112.90±6.82	74.02±6.33
p-value	0.39	0.006

p-value is determined by T-test, p-value ≤ 0.05 is taken as significant

makeup of particular populations. Knowledge and awareness regarding the blood groups and their association with different diseases might help to explore the emerging diseases which might aid help forecasting the evolving health challenges. Blood group B was the most common blood group in our study, which was in accordance with a study done by Jawed S. [13] These results are also in agreement with other studies conducted in Punjab carried out on the broader scale [14] suggesting that blood group B is more common in Punjab. However, the study conducted by Altaf B [4] suggests that blood group O was more common in their sample. [4] This result may be due to their small sample size. In contrast, Sindh and Baluchistan populations are common in blood group O.[15] The least common blood group that is found in our study is blood group AB and this is also supported by the studies showing similar results as ours. [15, 16, 17]

In the current study, prehypertension was most frequently found in individuals having blood group A. Our results are justified by the Sushil et al study conducted in Nepal, which also reported the occurrence of hypertension in individuals with blood group A. [18] Another Study conducted in Ghana reported hypertension in blood group AB followed by blood group A. [19] A study conducted in Saudia by Alanazi TS shows no significant association between different blood groups and susceptibility to develop hypertension while they didn't mention prehypertension in their study. [17]

We have found a significant difference in diastolic blood pressure in the pre-hypertensive and normotensive groups. These results are similar to a study conducted in Faisalabad by Altaf B. [4]

The strength of the study was its standardized protocol like the questionnaire and estimation of blood pressure and blood group.

This is a single-centred study is a limitation as results cannot be generalized to the whole population.

CONCLUSION

Blood group B was the most common blood group of our studied population. Prehypertension is commonly found in subjects with blood group A.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Moiez M:	Conception, write up and over all supervision
Zahid H:	Data collection, literature search
Ashfaq R:	Statistical analysis and bibliography
Zareen S:	Literature search
Altaf B:	Data collection
Rasheed Z:	Data collection

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ORIGINAL ARTICLE

COMPARATIVE EFFECTS OF MUSCLE ENERGY TECHNIQUE AND COUNTER STRAIN TECHNIQUE ON PAIN, FUNCTION STATUS AND SATISFACTION LEVEL IN PLANTAR FASCIITIS PATIENTS

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ABSTRACT

Objectives: To compare the effects of muscle energy technique and counterstrain technique on pain, functional status, and satisfaction level in patients with plantar fasciitis.

Material and Methods: This randomized clinical trial was conducted from May to November 2022. A total of 66 patients were recruited using the purposive sampling technique. Clinically diagnosed patients of plantar fasciitis of age 20-50 years, both gender and history of pain≥4 weeks were randomly allocated into two groups. The muscle energy technique was applied to Group A and the Counterstrain technique was given to Group B with routine physiotherapy. Outcomes measured were Visual Analog Scales for pain, Foot and Ankle Ability Measure for functional level, and Patient Satisfaction Questionnaire-18 for satisfaction level. The assessment was conducted at baseline, 1st, and 2nd week. Independent t-test and Repeated Measure ANOVA were used for between and within-group differences respectively with $p \leq 0.05$ was significant.

Results: The results showed no significant difference between Group A and Group B in pain ($p=0.245$), functional status (ADL: $p=0.862$, Sport: $p=0.092$), and satisfaction level ($p=0.108$). However, significant within-group difference was observed with pain ($p=0.000$), functional status ($p=0.000$), and general satisfaction level ($p=0.000$).

Conclusion: Muscle Energy and Counterstrain Technique are equally beneficial in decreasing pain, and enhancing the functional status and patient satisfaction levels in plantar fasciitis patients.

Keywords: Counterstrain Technique; Functional Status; Foot and ankle ability measure, Muscle energy technique, Pain, Plantar fasciitis, Satisfaction Level, Visual analog scale

This article may be cited as: Sandhu TB, Jamil A, Arslan SA. Comparative effects of muscle energy technique and counter strain technique on pain, function status and satisfaction level in plantar fasciitis patients. J Med Sci 2023 October;31(4):280-285

INTRODUCTION

Plantar fasciitis (PF) is a degenerative foot condition that affects people universally, irrespective of their gender, age, ethnicity, or activity level. [1] Furthermore, both active young individuals and sedentary older adults may suffer from plantar heel pain, which can disrupt their quality of life. [2, 3] Recent research indicates that approximately 1 in 10 individuals may encounter Plantar fasciitis at some point in their lives. [4] The prevalence of this condition among those over 70 years of age ranges from 3.6% to 6.9%. [5] Job type and BMI are significant risk factors for plantar fasciitis. A study conducted in Peshawar revealed that 13.2% of security workers developed PF due to their long working hours, [6] while a separate study involving Pakistani teachers reported that 34.7% had plantar fasciitis. [7] Moreover, in the non-sports population, 70% experience unilateral symptoms, with 65% of this group being overweight. [8]

Anatomical abnormalities of the foot lead to biomechanical stress on the joints and the supporting soft tissues. These structures struggle to adapt due to the repetitive and prolonged nature of such demands, causing changes in their physiology. [9] Inflammation and degenerative alterations in the plantar fascia, primarily occurring in the region where it originates at the medial calcaneal tuberosity of the heel and the surrounding tissues, give rise to Plantar fasciitis (PF) and are central to the occurrence of medial plantar heel pain. [10] The plantar fascia is crucial for supporting the foot arch, distributing loads, storing energy, and absorbing shocks during the act of walking. [11]

Past research has suggested a range of physiotherapy treatment methods, encompassing rest, orthotic night splints, silicon heel pads, stretching exercises, myofascial release, positional release therapy, and taping. Additionally, various electrotherapy techniques such as

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Date Revised: 15-6-2023
Date Accepted: 03 -10-2023

ultrasound, phonophoresis, laser therapy, iontophoresis, cryotherapy, contrast water therapy, and microwave diathermy have been experimented with for plantar fasciitis. [12]

Strain-counter strain (SCS) is a form of "passive positional release" therapy created by Lawrence Jones, D.O. in the early 1960s. This manual technique employs precise methods to alleviate muscle and connective tissue tightness. Urse recommended the Heinking counter-strain method for addressing tender points, while Wynne et al. applied counter-strain therapies to alleviate discomfort in the foot, ankle, and leg. [13] While, Muscle Energy Technique (MET) is an active positional release musculoskeletal technique that is used to extend shortened structures, increase range of motion, and resolve trigger points in a variety of musculoskeletal problems. [14] Muscle Energy Technique not only eliminates muscle trigger points, but also discomfort, relieve discomfort due to stressed ligaments and periosteum. It also aids in the reduction of hypertonia and the lengthening of tense muscles. [15]

In previous studies, the impacts of the muscle energy technique and counterstrain technique on upper trapezius and lower back pain were investigated. However, there is a noticeable gap in the literature regarding the comparative effects of these two techniques in patients with plantar fasciitis. Therefore, the primary objective of this study is to assess and compare the effects of the muscle energy technique and counterstrain technique, in conjunction with routine physiotherapy, on pain levels, functional status, and patient satisfaction among individuals diagnosed with plantar fasciitis.

MATERIAL AND METHODS

The randomized clinical trial was conducted following the guidelines of the Consolidated Standard of Reporting Trials (CONSORT). The trial was registered in ClinicalTrial.gov with ID: NCT05424341, before the recruitment of participants. The study was approved by the Research Ethical Committee of The University of Lahore (Ref Id: REC-UOL-/127-05/2022). At the beginning of the study, informed consent was requested from the participants. Anonymity and confidentiality of data were ensured. The objectives of the study were explained to the participants. And the right to withdraw from the study was reserved.

The study was conducted at the University of Lahore Teaching Hospital from May 2022 to December 2022. The sample size was 66 patients (33 in each group) calculated using OpenEpi Software using the mean value of VAS, 95% level of significance, and 80% power of the study. The sample was selected by purposive sampling technique. [14] Patients of Plantar fasciitis with an age range from 20-50 years,[13] both male and female, diagnosed by the orthopedic surgeon [15] with a history of pain in the heel and plantar surface of the foot from more than four weeks,[16] and during the first few steps after inactivity were included in the study.[14] Patients with a history of ankle and foot fracture, arthritis, congenital or acquired deformity of ankle and foot. Previous history of foot surgery or corticosteroid injection in the heel and on an assistive device for walking were excluded from the study.

Outcome measures used were pain, functional status, and satisfaction level observed using Visual Analog Scales (VAS), [17] Foot and ankle ability measure (FAAM) [18, 19] and Patient Satisfaction Questionnaire-18 respectively. [20] In group A, the Muscle Energy Technique was given with routine physiotherapy whereas, in group B, Counterstrain technique with routine physiotherapy was applied. In routine physiotherapy, therapeutic ultrasound, contrast bath, intrinsic foot muscle exercises like towel cur-up, active ankle exercise, Tendoachilles (TA) stretching, and plantar fascia stretching with a tennis ball were included. The muscle energy technique was performed with the patient in supine lying, while the therapist held the ankle in dorsiflex position for 5 to 7 seconds, meanwhile, 20% force was exerted toward plantar flexion by the patient, with 5sec relax times in-between and five repetitive sets. In the counterstrain technique, the physiotherapist placed a thumb on the plantar fascia to palpate the tender point then curled around the tender area and added supination or pronation of the foot. This position was maintained for 90 sec until the tissue relief tenderness, 3 repetitions with 30 second resting interval were applied. Around three sessions were given on an alternate basis session for two weeks. Measurements were collected at baseline, at the end of 1st week and 2nd week. The details of participant screening, allocation, and follow-up have been given in Figure no 1.

Data analysis was done using Statistical Package of Social Sciences (SPSS) version 24. Numerical data was expressed using mean ±SD and categorical variables were presented as frequency /percentage. The Kolmogorov-Smirnov test was used to determine the normality of the data. After fulfilling the assumptions of normality, the independent sample t-test was applied for the comparison of means of outcome variables between two groups, and Repeated Measure ANOVA was used for within-group comparisons of measurements at baseline, 1^{st,} and 2nd-week follow-up.

RESULTS

The mean age of participants was 39.65 ± 10.82 years. Among 66 participants, there were 19.7% males and 80.3% were females. Mean of BMI was 26.28 ± 3.80 kg/m^2. Around 30.3% had right-sided plantar fasciitis, 33.3% had left-side involvement and 36.4% had bilateral symptoms. Group-wise comparison of demographic details with the p-value has been mentioned in Table 1, representing both groups were the same at the baseline of recruitment in the study. The between-group comparison using independent t-test results showed that both groups had equal effects on reducing pain, and improving func-

Table 1: Demographic Details of the Both Groups at Baseline

Variables	Characteristics	Group A (MET)	Group B (Counter Strain Technique)	p-value
Age (Years)		42.61±12.02	36.70±8.66	0.718
Gender	Male	18.2%	21.2%	0.000
	Female	81.8%	78.8%	
BMI (kg/m2)		26.77±4.03	25.79±3.53	1.000
Effected side	Right	18.2%	42.4%	0.834
	Left	42.4%	24.2%	
	Bilateral	39.4%	33.3%	
Pain (at VAS)		70.91±7.75	67.58±8.94	0.235
Functional Status	ADL	34.58±14.51	36.26±20.11	0.513
	Sport	36.54±12.29	38.17±12.09	0.869
Satisfaction Level		64.00±5.34	65.15±6.52	0.496

Table 2: Between-group Comparison of Pain Intensity, Functional Status and Satisfaction level

Treatment group				Mean ± SD	p-value
Pain	**At Baseline**		Group A	70.91 ± 7.75	0.235
			Group B	67.58 ± 8.94	
	At 1st week		Group A	55.30 ± 8.92	0.440
			Group B	53.48 ± 10.02	
	At 2nd week		Group A	36.52 ± 10.12	0.245
			Group B	33.03 ± 11.25	
Functional status	At Baseline	ADL	Group A	34.58 ± 14.51	0.513
			Group B	36.26 ± 20.11	
		Sport	Group A	36.54 ± 12.29	0.869
			Group B	38.17 ± 12.09	
	At 1st week	ADL	Group A	58.22 ± 14.71	0.788
			Group B	54.09 ± 21.17	
		Sport	Group A	52.06 ± 8.30	0.808
			Group B	54.13 ± 5.11	
	At 2nd week	ADL	Group A	76.83 ± 13.32	0.862
			Group B	74.39 ± 20.18	
		Sport	Group A	69.33 ± 6.97	0.681
			Group B	70.91 ± 4.69	
Satisfaction level	At Baseline		Group A	64.00 ± 5.34	0.496
			Group B	65.15 ± 6.52	
	At 1st week		Group A	68.21 ± 5.13	0.136
			Group B	70.66 ± 6.95	
	At 2nd week		Group A	72.52 ± 6.43	0.108
			Group B	75.91 ± 7.26	

Table 3: Within-Group Comparison of Both Groups at Baseline, at 1st week and 2nd week using Repeated Measure ANOVA of variable

Variables			Group A		Group B	
			Mean ± SD	p-value	Mean ± SD	p-value
Pain	At Baseline		70.91±7.75		67.58±8.94	0.000
	At 1st week		55.30±8.92		53.48±10.02	
	At 2nd week		36.52±10.12		33.03±11.25	
FUNCTIONAL STATUS	ADL	At Baseline	35.58±15.14		36.26±20.11	0.000
		At 1st week	58.22±14.71		54.10±21.17	
		At 2nd week	76.83±13.32		74.39±20.18	
	SPORT	At Baseline	36.54±12.29		38.17±12.19	0.002
		At 1st week	52.06±8.30		54.13±5.11	
		At 2nd week	69.33±6.97		70.92±4.69	
Satisfaction Level		At Baseline	64.00±5.34		65.15±6.52	0.000
		At 1st week	68.21±5.13		70.66±6.95	
		At 2nd week	72.52±6.43		75.91±7.26	

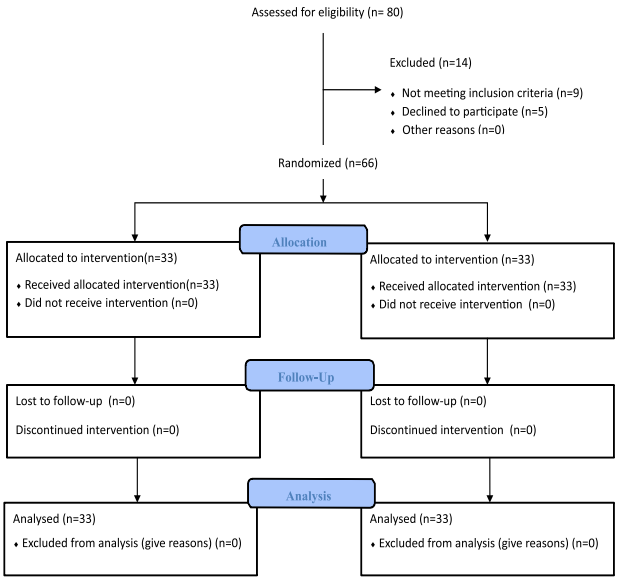

Fig 1: Consort Flow Diagram

tional status and satisfaction level with p-value > 0.005 as shown in Table 2.

The Repeated Measure ANOVA results for within-group comparison on effects of intervention within two weeks follow-up depicted that pain (p=0.000), functional status (p=0.000), and satisfaction level (p=0.000), were improved with the application of muscle energy technique and counterstrain along with routine physiotherapy respectively as given in Table 3.

DISCUSSION

This study aimed to determine the comparative effects of muscle energy technique and counterstrain technique in combination with routine physiotherapy. The results showed that both these techniques were equally effective in alleviating pain, improving ankle function, and patient satisfaction with the treatment approach. The mean age of participants in this study was 39.65 ± 10.82 years whereas the results of previous studies showed Plantar fasciitis was common in ≥50 years of age. [21] The results of the current study were based on a population with the majority of females i.e. around 80% whereas the previous studies determined the results on equal numbers of males and females affected by plantar fasciitis. [7, 22] The mean of BMI of this study was 26.28 ± 3.80 kg/m2 representing the patients with Plantar fasciitis included in this study were overweight, in contrast to the findings of this study the previous studies show that 70% people diagnosed with plantar fasciitis, were obese, which was the significant risk factor for developing this disorder. [23]

Pain is one of the prominent features of a patient with plantar fasciitis, the findings of this study showed parallel effects of MET and CS on relieving the discomforts of this condition, while a previous study showed that muscle energy technique was not effective in comparison to myofascial trigger point release in treating pain in Plantar fasciitis patients.[14] Another study showed no measurable difference between muscle energy technique and myofascial release technique to pain and lower limb functional status in patients with plantar fasciitis.[24] However, the combination of muscle energy technique with ischemic compression was found to have equal effects on plantar fasciitis. [25]

Functional status including ADLs and Sports related task were shown to improve by application of MET and CS technique along with routine physiotherapy in this study, whereas, in a previous study, no significant difference between muscle energy technique and myofascial release technique about lower limb functional status in patient with Plantar fasciitis was observed.[15] Another study showed that the muscle energy technique was not more

effective on pain and functional activity as compared to Cyriax 's Transverse Frictional Massage on plantar fasciitis.[16]

Consistent with the findings of this study, a previous study concluded that muscle energy technique and counter strain were equally effective in patients with chronic lower back pain for lowering discomfort and functional impairment. [13] Another study reported statistically significant improvement after the second session. [26] A study found that the muscle energy technique was more effective than the ischemic compression and strain counter strain technique in the treatment of upper trapezius trigger points. [27]

The majority of the population of this study were females which can affect the generalizability of results. The subjective nature of outcome variable tools may be another limitation of this study. Future researchers are recommended to reproduce this study to determine the long-term effects of the muscular energy technique and the counter strain technique on patients with plantar fasciitis.

CONCLUSION

It was concluded that Muscle Energy and Counterstrain Technique, along with routine physiotherapy are equally effective at easing pain, enhancing functional status, and patient satisfaction levels in patients with plantar fasciitis.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Sandhu TB: Data collection, Data analysis, Manuscript writing

Jamil A: Drafting manuscript, revising it critically, data analysis

Arslan SA: Execution of study, Assistance in lab work, Compilation of results

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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ORIGINAL ARTICLE

AWARENESS OF TYPE 2 DIABETES MELLITUS CONTROL AMONG URBAN AND RURAL PATIENTS

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ABSTRACT

Objective: To compare the level of awareness of type 2 Diabetes Mellitus control among urban and rural patients.

Materials & Methods: A Comparative Cross-sectional study was conducted at Ganga Ram, Sheikh Zayed, and PSRD Hospital, Lahore by using a non-probability purposive sampling technique. The data from 362 participants were gathered and analyzed from November 2021 to April 2022. Participants who had type 2 Diabetes Mellitus for 10 years, aged 34-68 years, and Body Mass Index (BMI) of 18.5 to 34.9kg/m2 were included and those with micro and macrovascular complications were excluded from this study. Ethical approval was taken from the Institutional Review Board of PSRD College of Rehabilitation (Ref#PSRD/CRS/IAJ/REC/Letter-002). Semi-structured questionnaires that comprised pharmacological, diet, and exercise components were used for data collection after getting informed consent from participants.

Results: Results of this study show Mean±SD of age in urban and rural 49.7011±7.38161, 48.3457±7.09693 years, BMI 27.6858±4.27858, 27.6551±4.27986kg/m2 respectively. The Mean±SD of pharmacological awareness in urban and rural 4.4483±0.44174, 4.3085±0.55392, and exercise awareness was 1.4415±.49789, 1.4368±.49742 showed no significant difference while diet awareness to control diabetes was 3.8391±1.10043, 2.7553±1.44922, with significant difference(p-value<0.05).

Conclusion: This study concludes that there is no significant difference between urban and rural patients for pharmacological and exercise awareness and a significant difference in diet management in diabetes control.

Keywords: Awareness, Diabetes Mellitus, Disease Management, Rural population, Type II Diabetes Mellitus, Urban population.

This article may be cited as: Jabbar I, Afzal MF, Saeed M, Arif A, Awan WA. Awareness of type 2 diabetes mellitus control among urban and rural patients. J Med Sci 2023 October;31(4):286-290

INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is considered a major public health epidemic globally due to the huge number of early deaths, disabilities, high morbidity, and mortality rates that it causes. [1] Diabetes Mellitus (DM) is the 9th major cause of death globally and it is expected to be the 7th leading cause of death by 2030. [2, 3] T2DM global epidemic is prevalent primarily in Asian countries. [2] Interestingly, countries with large populations such as China, India, Pakistan, and the United States add the most to the total number of diabetics. [4] Accordingly, Pakistan is ranked as ranked at three after China and India as per the report about the prevalence of T2DM, and if the current situation continues, Pakistan is expected to go up to the fourth-highest prevalence. Pakistan reported having diabetes in 28.3% of its urban and 25.3% of its rural areas. [5] Risk factors for T2DM include older age, obesity, a family history of diabetes, impaired glucose metabolism, and race/ethnicity associated with poor nutrition, physical inactivity, or insufficient exercise. [6 7] The knowledge of patients with T2DM about all aspects of the disease like diet, exercise, and medication of diabetes was poorly reported in a study. [8] Mikhael et al. stated that the majority of participants were aware that self-management strategies particularly balanced diet, exercise, and medications are effective in the management of T2DM. [9] It was found that the overall awareness level among diabetics was low for various management strategies used to control T2DM. [10] Prognosis of diabetes mellitus is extended due to lack of understanding, awareness, and education of diabetes patients. [7] T2DM is caused by defects in insulin production by pancreatic β -cells and insulin-sensitive tissues that do not respond to insulin.[11] American Diabetic Association (ADA) suggests that metformin and lifestyle modifications that include diet therapy and exercise are the first-line ther-

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Date Revised: 06/05/2023
Date Accepted: 20/07/2023

apies for T2DM management. [7, 12] A study showed that the majority of respondents 86.7% heard of a balanced diet. [13] Most patients with T2DM, according to a study, were aware of diet for T2DM control. [14] International guidelines prescribe aerobic, resistance exercise, or a combination of both to control blood glucose levels. [15] According to a study the majority of T2DM patients were aware of a balanced diet and engaged in brisk walking. [16] Kristina et al. found that Overall knowledge of diabetes management was lower among the diabetic rural population. [17]

According to the literature in 2007 a study compared awareness of diabetes among urban and rural diabetic patients but there is no recent data that shows a comparison of the management of T2DM between urban and rural patients and focused on the exercise component. In this study, all three components of control of T2DM, medicine, diet, and exercise combined and focused on exercise to determine whether people perform exercise or not as per the FITT principle (frequency, intensity, time, and type). Hence the objective of this study was to compare awareness of type 2 Diabetes Mellitus control among urban and rural patients.

MATERIALS & METHODS

In this descriptive cross-sectional study participants were recruited by non-probability purposive sampling and data was collected from Sir Ganga Ram Hospital, Shaikh Zayed Hospital, and Pakistan Society for the Rehabilitation of the Disabled (PSRD) Hospital Lahore, Pakistan from November 2021 to April 2022. The 362-sample size was calculated by Rao-Soft software keeping a confidence interval of 95% and a margin of error of 5%. Patients diagnosed with T2DM from 10 years, both genders, aged 34-68 years, with Body Mass Index (BMI) of 18.5 to 34.9kg/m^2 and with hypertension were included in this study. Subjects with major complications of diabetes, any history of fracture or road traffic accident, and any cognitive problem in the last six months were excluded from this study. A semi-structured questionnaire that comprised pharmacological, diet, and exercise components was used to compare awareness of management among urban and rural patients. Socio-demographic data were also taken. The pharmacological component determines whether the patient was aware that tablets or insulin are used in T2DM and that taking medication is necessary to control T2DM. In diet components, we determined that patients were aware of a balanced diet and that the balanced diet can control T2DM. Exercise components determine whether patients were aware that exercise is also a method to control blood glucose levels and exercise can reduce medicine intake. Each participant was allowed to mark a score on the basic Likert scale which comprised of 1 to 5 scores 1 score was for fully not aware and 5 for fully aware.

Ethical approval was taken from the Institutional Review Board (IRB) of PSRD College of Rehabilitation (Ref # PSRD/CRS/IAJ/REC/Letter-002) and permission letter was taken from all the study settings for this study. The data was collected after taking informed consent from the participants and it was written in both Urdu and English languages. The entire procedure was briefly explained to each participant.

Data was entered and analyzed by using SPSS software version 26.0. Descriptive analysis was used for the analysis and demographic data such as age, duration of diabetes, height, weight, and Body Mass Index (BMI) were presented in the form of Mean±SD. Categorical variables such as gender, education status, occupational status, and marital status in demographic data were presented in the form of frequency and percentages. Pharmacological, diet, and exercise variables were presented in the form of Mean±SD, frequency, percentage, and p-value that were considered <0.05 as significant.

RESULTS

The data was collected from 362 patients the mean age of urban patients was 49.7011±7.38161 and of rural patients was 48.3457±7.09693. Table 1 demonstrates the demographics of the study population. Out of 174 urban patients, there were 54.3% females and 35.5% were males. 25.3% had private jobs and 27.6% had secondary education. Out of 188 rural patients, 48.6% were female and 40.1% were male. The Mean±SD of pharmacological awareness in urban and rural participants was 4.4483±0.44174, 4.3085±0.55392. However, the Mean±SD of diet awareness was 3.8391±1.10043, 2.7553±1.44922 among Urban and rural participants which showed significant differences (p-value<0.001). Exercise protocols awareness was 1.4368±0.49742, 1.4415±0.49789 that showed no significant difference (p-value=0.111) and (p-value=0.928). As shown in Tables 2 and 3.

DISCUSSION

To compare awareness of type 2 Diabetes Mellitus control among urban and rural patients. In this study among the 174 urban participants, 100 (57.5%) were fully aware that medication is required for the management of diabetes, and 86 (49.44%) were fully aware that insulin is used to control diabetes. Mikhael, E. M., et al stated that the majority of diabetic patients are also aware that medication use is a diabetes management method. [9] Similarly reported in another study most of the participants particularly elders use medicine to manage their blood glucose levels. [14] Most of the participants 69 (39.7%) were aware that a balanced diet is important for the management of blood glucose levels and 65 (37.4%) were aware that it is necessary to consume a balanced diet every day to manage diabetes mellitus. The findings of this study, which found that most T2DM urban participants were aware

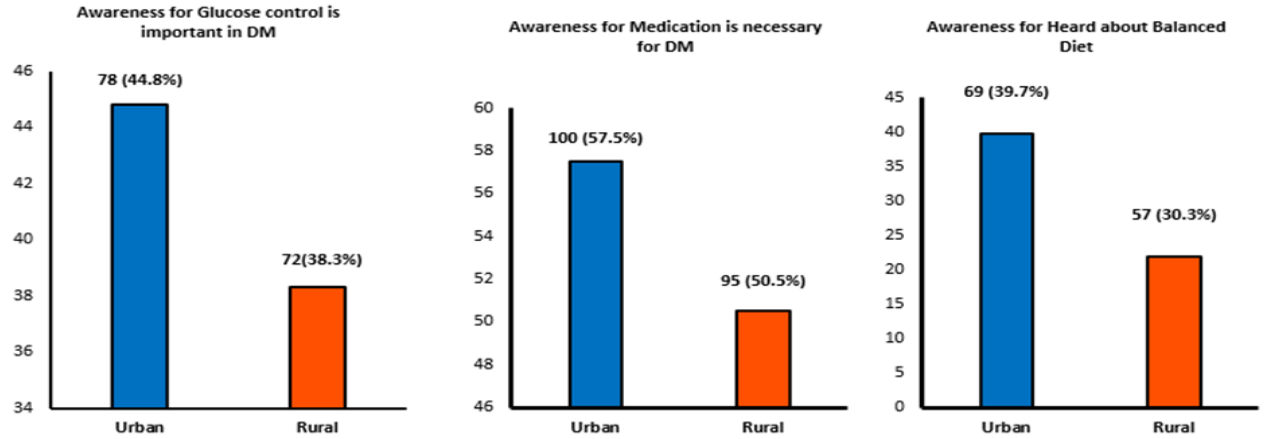

Fig 1: Descriptive analysis of urban and rural populations about T2DM management (n=362)

Table 1: Demographics data of urban and rural participants Mean ± SD (n=362)

Variables	Mean±SD (Urban)	Mean±SD (Rural)
Age (years)	**49.7011±7.38161**	48.3457±7.09693
Duration of T2DM (years)	4.8621±2.53152	4.4309±2.49502
Height (inches)	65.0287±3.53583	64.7128±3.99498
Weight (kg)	75.2586±11.10678	74.7500±11.35976
BMI (kg/m2)	27.6858±4.27858	27.6551±4.27986

Table 2: Descriptive analysis of urban and rural populations about exercise awareness (n=362)

Variable	Urban N=174		Rural N=188		P value
Do you exercise regularly to keep blood glucose under control?	Yes 98 (56.3%)	No 76 (43.7%)	Yes 105 (55.9%)	No 83 (44.1%)	0.738
How many times a week do you perform the exercise?	1-2 times 32(18.4%)		1-2time 37(19.7%)		0.408
The level of intensity of exercise	Mild 79(45.4%)		Mild 77(41.0%)		0.903
How long did you perform the exercise?	30 minutes 69(39.7%)		30 minutes 71(37.8%)		0.928
Type of exercise.	Aerobic 98(56.3%)		Aerobic 105(55.9%)		0.928

Table 3: Awareness of management of T2DM among urban and rural populations (n=362)

Variables	Overall	Urban N=174	Rural N=188	P-value
Blood glucose control is an important factor in T2DM.	3.0856 ± 1.28312	3.8448±1.07738	2.3830±1.03527	<.001
The mechanism behind managing hyperglycemia.	2.2790±1.16126	2.7069±1.25401	1.8830±0.90579	<.001
Medication is necessary for T2DM.	4.3757±0.83369	4.4483±0.77174	4.3085±0.88392	0.111
Manage T2DM with tablets.	4.1354±0.98516	4.2356+0.91025	4.0426±1.04359	0.062
Manage T2DM with insulin.	4.1298±1.05906	4.2414±1.00249	4.0266±1.10145	0.054
Medication can prevent T2DM complications.	3.6878±1.28461	4.0402±1.00495	3.3617±1.42439	<.001
Both exercise and diet are important in T2DM control.	3.1160±1.20609	3.7069±1.13802	2.5691±.99222	<.001
Heard about a balanced diet.	3.2762±1.40081	3.8391±1.10043	2.7553±1.44922	<.001
The following control and a balanced diet can control T2DM.	3.2624+1.42793	3.9138±1.08513	2.6596±1.44454	<.001
Important to eat a balanced diet for T2DM management.	3.1547±1.39184	3.7184±1.16599	2.6330±1.38301	<.001
T2DM management requires exercise regularly.	2.8011±1.37818	3.6724±1.18353	1.9947±1.00532	<.001
Exercise can reduce the chance of intake of insulin\medicine.	2.6354±1.45273	3.3736±1.38680	1.9521±1.14828	<.001
Exercise is also a method to control blood sugar.	3.2624±1.49243	3.6839±1.40933	2.8723±1.46426	<.001
Advantages of daily exercise in T2DM.	2.8398±1.46303	3.2874±1.42568	2.4255±1.37580	<.001

of a balanced diet, were consistent with the results of a study that showed urban participants were aware of diet. [13] In this study most urban residents 63 (36.2%) were fully aware that exercise is also a method to reduce blood sugar and 66 (37.9%) were aware that exercise is required regularly for managing T2DM. ninety-eight (56.3%) urban participants perform aerobic exercise 1-2 times a week of mild intensity for 30 minutes. These findings were also supported by the study, in which 59.3% of participants also performed aerobic exercise. [16]

From the results, out of 188 rural participants, 95 (50.5%) were fully aware of the medication and 77 (41.0%) were aware that insulin is used for diabetes management. Regarding diet, 57 (30.3%) were fully unaware of a balanced diet and 62 (33.0%) were fully unaware that a planned and controlled diet can help manage diabetes mellitus (DM). Sami et al. reported similar findings that Type 2 Diabetes Mellitus patients had limited awareness about the disease symptoms, causes, consequences, and management strategies used for T2DM. [8] The need for regular exercise to control blood sugar levels was not fully understood by 67 (35.6%) rural participants and only 105 (55.9%) performed an aerobic exercise of mild intensity 1-2 times a week for 30 minutes. Similar results were found in the rural population of Punjab in which overall awareness about Diabetes Mellitus is lower. [18] These results of this study are consistent with many other studies which found similar results that diabetes management and related risk factors are poorly understood in rural Bangladesh and Indonesia. [17, 19] T2DM was quite common in rural China, but treatment strategies for T2DM were not well understood and reported in a study. [20] Another study conducted in rural China found that the participants were not well aware of the features of diabetes such as symptoms, and treatment. [21]

According to the results of this study, there were greater differences in awareness between urban and rural residents, particularly when it comes to the awareness of a balanced diet and regular exercise. Al Bshabshe et al. found similar results that patients with diabetes in rural areas showed insufficient knowledge of a balanced diet. Similarly, urban residents (59.5%) in this study showed higher awareness than rural residents (37.8%). [22] Similar findings from a study indicate that rural diabetic patients are less aware of diabetes mellitus, its effects, and how to control it. [23]

The data was collected from only 362 participants due to the time limitation of 6 months. The sample size can be large for the more generalizability of results.

CONCLUSION

This study concludes level of awareness regarding diabetes management is higher in urban participants as compared to rural participants. There is a significant difference found between urban and rural participants regarding awareness of diet for the management of diabetes and no significant difference was found for pharmacological and exercise awareness in diabetes control.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Jabbar I: Conceived the idea, writing

Afzal MF: Data collection

Saeed M: Statistical analysis

Arif A: literature search and review

Awan WA: Bibliography, data collection

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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ORIGINAL ARTICLE

PREVALENCE OF LOWER LIMB EDEMA IN NATAL AND POST-NATAL PERIOD

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ABSTRACT

Objective: The objective of this study was to determine the occurrence of edema in the natal and post-natal period, risk factors, and their association with edema.

Material and Methods: An observational study was conducted at Cantonment Hospital and Benazir Bhutto Hospital, Rawalpindi, Pakistan from August 2018 to January 2019. Out of 405 females, 18-35 years of age and 3rd trimester of gestation or post-natal period and women with previous venous diseases or high-risk gestations were included. In contrast, women with edema in other body parts and those after puerperium were excluded. The data was collected by self-structured questionnaire, edema grading scale, and limb measurement. Data was analyzed by SPSS 23.

Results: The frequency of leg edema was 65.9% and higher in the third trimester, especially during the eighth and nine months of pregnancy. It could lead to several other symptoms like pain and cramps that could be intensified by prolonged standing and comforted through rest. At the same time, a few other factors that affect edema include less water intake and lack of exercise. There is a significant association between edema and its related risk factors including months of pregnancy, exercises during pregnancy, and activity level ($p < 0.001$).

Conclusion: Lower limb edema is prevalent in late pregnancy, especially during the 8th - 9th month. There is a significant association between edema and its related risk factors including months of pregnancy, exercises during pregnancy, and activity level.

Keywords: Edema, lower limb, pregnancy, prevalence.

This article may be cited as: Rafique A, Rafique N, Afzal K, Khan HA, Ashfaq N, Rubab A. Prevalence of lower limb edema in natal and post-natal period. J Med Sci 2023 October;31(4):291-295

INTRODUCTION

Gestation is linked with variations in the larger portion of the physiological outlines of the body. Leg edema is ace of cutaneous appearances of gestation. [1] Gestation-provoked leg edema is linked with gestation consequences and is almost observed as typical. [2] Edema of the lower limb area is remarkably elementary in normal gestation and it is very difficult to say at what time this has conceded as far as possible, the hydration of gestation might in some cases, become shown as edema without being physiological. [3] Through usual gestation whole body water increases through 6-8 liters, 4-6 liters of which are extracellular, and no less than 2-3 liters are interstitial. At some stage in gestation 8, out of 10 women have self-evident clinical edema. During gestation, nearby is a modest decrease in interstitial liquid colloid osmotic pressure and an upsurge in capillary hydrostatic pressure. [4] Water absorption for 20 minutes is an effective technique for waning peripheral edema throughout gestation. [5] External pneumatic pressure reduces lower limb swelling and pressure stocking moreover reduces leg signs. [6] For occurrence, if only one out of ten pregnant females developed leg edema, it would be acceptable to contemplate herself as abnormal but if eight out of every ten pregnant females developed leg edema, they are more likely to consider leg edema a normal sign of gestation. [7] Similarly, if a female who had pregnancy-related leg edema in earlier gestations might associate the condition with precise hostile gestation events, the concern about leg edema during pregnancy would be well respected. While a number of physical and pharmacological procedures have been tried to relieve leg edema throughout gestation, nobody has been constantly created to discuss benefits superior to non-treatment, and some are possibly destructive. [8-10] The presence of sedentary, prolonged standing, wearisome fitted stockings, and being obese are a few of the risk factors that contribute to

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Date Revised: 17/08/2023
Date Accepted: 17/08/2023

lower limb edema. By altering these factors, the quality of life could be enhanced. [11] The frequently happening kinds of edema are pitting and non-pitting. Pitting edema reacts to every type of compression whereas non-pitting edema does not. If the skin with a finger/object and a ditch-like spot appears, it shows pitting edema whereas non-pitting edema does not react to compression or lead to any kind of pit. Individuals suffering from edema may be observed with distended and constricted veins and shiny skin. Puffiness on the eyes, face, and ankle swelling were similarly detected. Pain in several parts of the body and joint stiffness are also common in affected females. [12]

The primary purpose of the study is to find out the occurrence of lower limb edema in natal and post-natal periods and the secondary objective is to find out major associated risk factors. This research offers useful knowledge on pregnancy-induced leg edema with related risk factors. Information on the occurrence and clinical significance are important for treatment preparation and cure plans in hospitals as well as in local societies whereas information on risk factors is important for prevention.

MATERIALS AND METHODS

The observational study was conducted on the pregnant and postpartum females in the gynecological ward and OPD at Cantonment Hospital and Benazir Bhutto Hospital, Rawalpindi, Pakistan for a duration of 6 months from August 2018 to January 2019. The sample size of 405 was calculated through the pool in this study. Females 18-35 years of age and in 3rd trimester of the pregnancy or post-natal phase and women with previous venous diseases or high-risk pregnancies were included. Whereas women with edema in other body parts sparing lower extremities and those after the puerperium were excluded.

The data was collected by self-structured questionnaire, edema grading scale, and limb measurement was done through measuring tape. Primary, examining and palpating the limbs whether edema was prevalent or non-prevalent, whether it was unilateral or bilateral, and whether it was pitting or non-pitting. While examining the leg edema, apply pressure through the thumb/index finger on the leg behind the ankle, on the midfoot, and on the shin bone for at least 5 seconds.

After pressure application, a clear pit was observed, documented as pitting edema, whereas no pit on the area where pressure was applied, was documented as non-pitting edema. Moreover, the grading of pitting edema, no noticeable change or pit, depth less than 6mm, and pit extinct quickly, it is edema grade 1.

When the pit was approximately 6 – 12mm and was extinct within 10 – 15 seconds, it was grade 2. When the pitting was deep, the limb swelled, and the depth of pitting was 1 – 2.5 cm, and the length of the pit extinct was 1 – 2 minutes, it was grade 3, and when the limb swelled, out of shape, pitting depth was greater than 2.5 cm, and length of pit extinct was 2 – 5 minutes, it was grade 4 edema. Limb circumference measurement was done through measuring tape at three different areas that are; instep (5 cm from the big toe), at the ankle (4 cm from the heel), and at the calf (11 cm from the heel). A greater than half-inch difference in circumference values of both limbs indicated edema.

The study has been approved by Riphah Ethical Committee, Riphah College of Rehabilitation Sciences, Riphah International University, Islamabad, ref no: Riphah/RCRS/REC/00482, whereas informed consent was taken from all patients through a printed form in the local language.

RESULTS

Out of 405 females with a mean age of 26.8 ± 4.3 years were included in the study. The majority of females were housewives 394 (97.3%) while 11 (2.7%) were serving and 349 (86.2%) belonged to urban areas while 56 (13.8%) were from rural areas. Most of the females were graduates 123 (30.4%), 111 (27.4%) were matric, 75 (18.5%) had the degree of intermediate, 63 (15.6%) were under matric and 33 (8.1%) females did not go any school. Among these females, 170 (42%) were in their 9th month, 113 (27.9%) were in their 8th month, 79 (19.5%) were in the 7th month and 43 (10.6%) were in the puerperium period.

Most (86.1%) didn't have any menstrual irregularities, (94.4%) had not used any contraceptive measures and had not worn tight clothes or shoes, (77.5%) had no bowel and bladder difficulties, (97.8%) had no smoking history, and (95.5%) had not used any medicines. Regarding the prevalence of edema, prevalent in 267 (65.9%) and non-prevalent in 138 (34.1%). Most of the women had bilateral edema 238 (58.8 %). Non-pitting edema was more experiential 162 (40%) and pitting edema 105 (25.9%). Grade-1 pitting edema was mostly noticed at 77 (19%) (Table 1).

Most women's limb perimeter had between 8 to 9 inches at the right instep 210 (51.9%) and likewise at the left instep 201 (49.6%), between 8 to 9 inches at the right ankle 179 (44.2%) and left ankle 174 (43%) and between 12 to 13 inches at right calf 112 (27.7%) and left calf 112 (27.7%) respectively (Table 2).

Regarding the risk factors of edema, most of the females 166 (62.3%) had a normal body type, 202 (75.7%) female's daily routine throughout pregnancy was prolonged standing 202 (75.7%), most of the females presented a lack of activity level i.e., did not do any exercise before pregnancy 239 (89.5%) or during pregnancy 245 (91.8%) whereas most women's sleep duration was about 7 to 9 hours 137 (51.3%). In terms of diet, the majority

included dairy products 215 (80.5%), meats 229 (85.8%), vegetables 263 (98.5%), fruits 264 (98.9%) whereas very limited had a high sodium 41 (15.4%), and high caffeine consumption 26 (9.7%). Women experienced different symptoms in lower limbs like pain 213 (79.8%), redness 233 (87.3%), cramps 175 (65.5%), fatigue 229 (85.5%), heaviness 208 (77.9%), numbness 174 (65.2%) and paresthesia 131 (49.1%).

Regarding the aggravating factor, most females had a history of prolonged standing 182 (68.2%) whereas the rest was the most dominant relieving factor 100 (37.5%). Most edema-prevalent women had a family history of hypertension adding diabetes mellitus (16.9%) and (89.9%) had no considerable significance past medical history and complications in current gestation; many females were seen with anemia 56 (21%), and 25 (9.4%) reported preeclampsia (Table 3).

Table 4 reveals that the chi-square test of independence showed a significant association between edema and risk factors of edema including months of pregnancy with X2 = 17.90, p = 0.000, exercises during pregnancy with X2 = 400.58, p = 0.000, and activity level with X2 = 396.2, p = 0.000. the findings showed that pregnancy at the 9th month, sedentary females, and female activity level of prolonged standing exhibited higher frequency.

Table 1: Circumference Assessment of Edema Limb

AT INSTEP		
Circumference in Inches	Right Instep N (%)	Left Instep N (%)
7" to 8"	18 (4.4%)	22 (5.4%)
8" to 9"	210 (51.9%)	201 (49.6%)
9" to 10"	162 (40%)	159 (39.3%)
10" to 11"	15 (3.7%)	22 (5.4%)
AT ANKLE		
	Right Ankle N (%)	Left Ankle N (%)
6" to 7"	25 (6.2%)	24 (5.9%)
7" to 8"	125 (30.9%)	129 (31.9%)
8" to 9"	179 (44.2%)	174 (43.0%)
9" to 10"	63 (15.6%)	66 (16.3%)
10" to 11"	9 (2.2%)	8 (2.0%)
11" to 12"	4 (1.0%)	4 (1.0%)
AT CALF		
	Right Calf N (%)	Left Calf N (%)
8" to 9"	1 (2%)	0 (0%)
9" to 10"	13 (3.2%)	12 (3%)
10" to 11"	21 (5.2%)	24 (5.9%)
11" to 12"	65 (16%)	64 (15.8%)
12" to 13"	112 (27.7%)	112 (27.7%)
13" to 14"	94 (23.2%)	96 (23.7%)
14" to 15"	58 (14.3%)	58 (14.3%)
15" to 16"	24 (5.9%)	23 (5.7%)
16" to 17"	11 (2.7%)	11 (2.7%)
17" to 18"	6 (1.4%)	5 (1.2%)

DISCUSSION

Gestation is interrelated with variations in the utmost of physiological systems of the body and edema is a very common problem during gestation. The conclusions of the current study kindle discussion as to what is a main

Table 2: Risk Factors of Edema

	Risk Factors	No. of Cases N (%)
Routine Throughout Pregnancy	Prolong Standing	202 (75.7%)
	Prolong Sitting	29 (10.9%)
Activity Level During Pregnancy	Regular exercise	12 (4.5%)
	Exercise sometimes	10 (3.7%)
	No Exercise	245 (91.8%)
Sleep Duration	≤ 6 hours	80 (30.0%)
	7 to 9 hours	137 (51.3%)
	≥ 10 hours	50 (18.7%)
Symptoms experienced in lower limbs	Pain	213 (79.8%)
	Redness	233 (87.3%)
	Cramps	175 (65.5%)
	Fatigue	229 (85.8%)
	Heaviness	208 (77.9%)
	Numbness	174 (65.2%)
	Paresthesia	131 (49.1%)
Aggravating Factors	Rest	31 (11.6%)
	Walking/Prolonged Standing	182 (68.2%)
	Changing the position of a limb	13 (4.9%)
	Nothing	40 (15%)
Present Pregnancy Complications	Preeclampsia	25 (9.4%)
	GDM	13 (4.9%)
	Anemia	56 (21%)
	Placenta Previa	4 (1.5%)
	Preeclampsia + GDM	3 (1.1%)
	Preeclampsia + Anemia	11 (4.1%)
	GDM + Anemia	1 (0.4%)
	Placenta Previa + Anemia	2 (0.7%)
	Placenta Previa + GDM	1 (0.4%)
	Preeclampsia + GDM + Anemia	1 (0.4%)
*GDM, gestational diabetes mellitus		

Table 3: Chi-Square Between Edema and Risk Factors

Risk Factors				X2	df	p-value
		Prevalent n	Non- Prevalent n			
Months of Pregnancy	7th	44	35	17.90	3	0.000***
	8th	79	34			
	9th	125	45			
	Puerperium	19	24			
Exercise during Pregnancy	Regular	13	139	400.58	4	0.000***
	Sometimes	11	0			
	No Exercise	242	0			
Activity Level	Prolong Standing	201	138	396.2	3	0.000***
	Prolong Sitting	30	0			
	Bed Rest	36	0			

***p < 0.001.

part in the improvement of the lifestyle of females affected by leg edema and how to alter the risk factors that contribute to leg edema. Very limited research has been directed to assess leg edema and related risk factors, the current study revealed that the occurrence of leg edema is higher in late pregnancy and is mostly associated with prolonged standing and sedentary females. Tanveer F. et al. directed an observational study to rule out the incidence of lower limb edema throughout 3rd trimester of gestation and observed the frequency of leg edema. It is concluded that most women suffered from lower limb edema throughout gestation, particularly in 3rd trimester. [13] Pregnancy induces many changes in the female body including hormone-induced sodium and water retention, increased levels of hormones, and changes in vascular permeability. All these changes lead to edema formation. Other factors can aggravate edema like prolonged static posture, excess salt intake, warm atmosphere, etc. [14] In the present study, the frequency of pregnancy-induced lower limb edema was higher in the third trimester, especially during the eighth and nine months of pregnancy. This edema mainly was associated with activities in prolonged standing and females with a sedentary lifestyle. Limb circumference measurement increased to 8 – 9 inches to the right and left instep, 8 – 9 inches to the right and left ankle, and 12 – 13 inches to the right and left calf regions.

Cross-sectional research on reliability and feasibility approaches to quantitatively evaluate peripheral edema. 20 individuals with diabetes type II and a variety of edema severity, comprising individuals with no edema, eight approaches of edema evaluation were estimated. The research determined that out of 8 approaches, water displacement and ankle circumference presented greater reliability; though, water displacement is time-consuming and may be challenging in clinical setups. Patient-reported level and occurrence of edema, based on an unvalidated questionnaire, were usually well associated with physical evaluation of edema severity and might be evidence to be an alternative reliable and precise technique of evaluating edema.[14] One more retrospective research by Katarzyna O et al was directed to find out the interrelated risk factors of limb edema, compression, and physical activity throughout gestation. Research revealed that out of 54 expecting women 42 were observed with bilateral lower limb swelling, majority in areas of feet and lower legs, and less often on entire legs. Edema was collected complaint by particular symptoms, such as sensation of limb heaviness, pain, and a bursting sensation in limbs (40%). The research determined that compression therapy in combination with appropriate exercises looks to be an effective method to prevent and treat venous thrombosis and lower limb edema in expecting females. [15] While the current study highlights that out of 405, 238 females observed with bilateral leg edema, most of them were non-pitting edema, and in grade 1. Out of those females experienced symptoms like feelings of pain, heaviness, and paresthesias-like sensations.

Another study was conducted on leg edema during gestation amongst Nigerian females: perceptions, prevalence, prognosis, and treatment-seeking behaviors. Results showed that the general frequency of leg edema throughout gestation was 8.5%. The initial gestational age at which edema first appeared throughout gestation was 24 weeks, and 100% of cases were extinct within one week of delivery. Anemia, malnourishment, unnecessary body water, kidney and liver diseases, and hypertension/pre-eclampsia were the assumed reasons for leg edema throughout gestation.[16] On the other hand, in the current study, the prevalence rate of leg edema was 65.9% and first appeared during the third trimester. Prolonged standing, no exercise during pregnancy, a sedentary lifestyle of females, anemia, low water intake, and hypertension with diabetes are the expected risk factors for pregnancy-induced leg edema. There is a significant association between edema and its related risk factors including months of pregnancy, exercises during pregnancy, and activity

level ($p < 0.001$). Females in the 9th month pregnant, sedentary females, and females' activity level of prolonged standing showed a higher frequency of developed edema.

CONCLUSION

The study showed that lower limb edema is prevalent in 3rd trimester of pregnancy, especially during the 9th month. Edema is one of the numerous changes that happen in a woman during pregnancy, could be caused and affected by several factors like prolonged standing, and a sedentary lifestyle. It could lead to various warning signs such as pain, cramps, and further distress that could be aggravated by continued standing and relieved by rest. Other factors that affect edema include reduced water consumption and lack of exercise.

This study included an assessment of risk factors only from subjects who had been prevalent with edema. In future studies, the assessment of risk factors can be spread to even cases without having edema and a comparison of both groups can be brought to light.

ACKNOWLEDGEMENT

Dedicated to our exceptional parents, family, and adored siblings whose tremendous support and cooperation led us to this wonderful accomplishment.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Rafique A:	Data analysis and interpretation
Rafique N:	Critical revision of the articleFinal approval of the article
Afzal K:	Writing the article
Khan HA:	Research concept and design
Ashfaq N:	Collection and/or assembly of data
Rubab A:	Collection and/or assembly of data

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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ORIGINAL ARTICLE

FREQUENCY OF RISK FACTORS ASSOCIATED WITH DIABETIC KETOACIDOSIS IN PATIENTS PRESENTING AT KHYBER TEACHING HOSPITAL PESHAWAR

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ABSTRACT

Objectives: To determine the frequency of risk factors associated with diabetic ketoacidosis in patients presenting at Khyber Teaching Hospital Peshawar.

Materials and methods: Patients of either gender, aged between 18 and 60 years, with either type I or type II diabetes mellitus presenting with diabetic ketoacidosis with the duration of diabetes > 1 year were included in the study. DKA was diagnosed based on the clinical presentation of respective patients, serum Random Blood Sugar (RBS), and urinary ketones. Careful scrutinization was done for the detection of common risk factors for DKA like infections, stroke, myocardial infarction, and pancreatitis. Based on the clinical examination for Stroke and acute pancreatitis, CT imaging of the brain and CT of the abdomen with pancreatic protocol were performed.

Results: Among 111 DKA patients, the mean age was 43 years with standard deviation ± 12.05. 63(57%) patients were male while 48(43%) were female. Infection was found in 54(49%) patients, stroke in 4(4%) myocardial infarctions in 3(3%), and pancreatitis was found in 7(6%) patients.

Conclusion: The most common risk factor for diabetic ketoacidosis is infections in half of the participants while stroke was 4%, myocardial infarction was 3% and pancreatitis was 6%.

KEYWORDS: diabetic ketoacidosis; type I diabetes; type II diabetes

This article may be cited as: Asim M, Badshah A, Atif D, Mohammad W. Frequency of risk factors associated with Diabetic Ketoacidosis in patients presenting at Khyber Teaching Hospital Peshawar. J Med Sci 2023 October;31(4):296-299

INTRODUCTION

Diabetes Mellitus [DM] is a disease of altered glucose metabolism resulting in hyperglycemia and glucose intolerance due to absolute or relative deficiency of insulin with the presence of clinical features of polyuria, polydipsia, and polyphagia in the majority of cases. It has affected the life of modern man and has taken the shape of an epidemic of this century and is still on the rise. The prevalence of diabetes globally according to a 2019 report was 9.3% (463 million people), escalating to 10.2% (578 million) by 2030 and 10.9% by 2045. [1] Diabetes Mellitus has a range of complications. These lead to increased mortality and morbidity of patients.

One of the serious complications of diabetes is Diabetic Ketoacidosis (DKA) with mortality reaching up to 15.9% (according to a 2005 local study in Mayo Hospital Lahore). [2] Internationally, the mortality rate is much lower, overall, 0.2% to 2%, with individuals under 40 years of age having mortality of 5% and elderly or those with serious illnesses of 20%. [3] DKA usually occurs due to non-compliance with insulin administration, infections, dehydration, or poorly controlled diabetes with inadequate insulin leading to ketosis and acidosis. Recent studies have demonstrated infection as the most common cause of precipitating DKA (30-50%). Among these infections, urinary tract infections and respiratory tract infections contribute a major percentage of infections. [4] Acute pancreatitis may also be associated with severe DKA. [5]

The diagnosis of DKA requires the presence of hyperglycemia as is evident by a random blood sugar of more than 200mg/dl (11.1 mmol/l), plasma beta-hydroxybutyrate concentrations of $\geq$ 3.0 mmol/l, or urine ketones of more than 2+, and the pH must be less than 7.3 or serum bicarbonate level be less than 15 mmol/l. [6] Proper management of DKA needs admission into a hospital for aggressive intravenous fluids, insulin therapy, electrolyte replacement, and management of the underlying cause of DKA. Frequent monitoring is also required of the patient's health status. [7]

There is no doubt that the management of DKA is a challenging process for the physician, but it leads to a

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Date Received: 12-01-2023
Date Revised: 29-3-2023
Date Accepted: 14-10-2023

fruitful outcome if the physician is committed and dedicated to the patient's treatment. Our present study aims to find the frequency of common risk factors associated with DKA in patients presenting to Khyber Teaching Hospital, Peshawar. This will provide us with a general idea of the common risk factors and we might be able to help the patients through the prevention of such catastrophic episodes by counseling them. The results of our study vary from other studies due to different cultural, and socioeconomic conditions and education levels.

MATERIAL AND METHODS

This descriptive study was carried out at the Department of Khyber Teaching Hospital, Peshawar from 17 July 2021 to 17 Jan 2022. The sample size was calculated using the WHO formula for sample size calculation keeping an 11.73% prevalence of pancreatitis in patients presenting with diabetic ketoacidosis, a confidence level of 95%, and a margin error of 6%. The sample size was 111 and the sampling technique was non-probability consecutive sampling. Male and female patients aged between 18 and 60 years with either type I or type II diabetes, presenting with diabetic ketoacidosis with a duration of diabetes > 1 year were included in the study.

Patients with metabolic acidosis related to any other cause e.g. Chronic renal failure, Hyperosmolar non-ketotic coma (which is serum glucose >600 mg/dl, arterial pH >7.3, serum bicarbonate >15 mEq/l, which is confirmed on Arterial blood gases and minimum to none ketone bodies on urine examination), Ethanol poisoning, Salicylate poisoning, Type 2 respiratory failure, and lactic acidosis were excluded from the study. The above-mentioned conditions were excluded based on confounding results when included.

All 111 patients fulfilling the inclusion criteria were enrolled in the study through OPD of the Department of Khyber Teaching Hospital, Peshawar. Patients were recruited to the study after ethical approval from the hospital's ethical committee and informed consent from patients or their first-degree relatives in case patients were not in a state to make informed decisions. The diagnosis of DKA was made according to serum RBS, urinary ketones, and clinical presentation. Detailed history was taken from all patients followed by clinical examination. This was followed by routine baseline investigations; patients were carefully scrutinized for detection of common risk factors like infections, stroke, myocardial infarction, and pancreatitis. Blood and urine cultures were sent. ECG and Chest X-ray were performed. Based on the clinical examination for Stroke and acute pancreatitis, CT of the Brain and CT of the abdomen with pancreatic protocol were performed if needed. All the demographic data including name, address, age, gender, duration of disease, and type of diabetes were recorded on proforma. Exclusion criteria were followed strictly to avoid bias in the study.

All the recorded data was entered into the statistical software SPSS version 23 and descriptive analysis were performed. Quantitative variables including age, and duration of disease were expressed in terms of mean and standard deviation while categorical variables including gender, type of diabetes, and common risk factors (infection, stroke, myocardial infarction, pancreatitis) were described in terms of frequencies and percentages. Common risk factors (infection, stroke, myocardial infarction, pancreatitis) were stratified for age, gender, duration of disease, and type of diabetes mellitus to see the effect modifiers. Post-stratification chi-square test was applied in which a P value of 0.05 was considered a significant value.

RESULTS

Our study shows that age distribution among 111 patients was analyzed as: 36 (32%) patients were in the age range 18-40 years, and 75 (68%) patients were in the age range 41-60 years. The mean age was 43 years with a standard deviation ± 12.05. Gender distribution among 111 patients was analyzed as: 63 (57%) patients were male while 48 (43%) patients were female. Duration of diabetes mellitus among 111 patients was analyzed as: 64 (58%) patients had a duration of diabetes ≤12 years and 47 (42%) patients had a duration of diabetes >12 years. Type of diabetes mellitus among 111 patients was analyzed as 26: (23%) patients had type I diabetes while 85 (77%) patients had type II diabetes.

The frequency of risk factors among 111 patients was analyzed as follows: infection was found in 54 (49%) patients, stroke was found in 4 (4%), myocardial infarction was found in 3 (3%) patients, and pancreatitis was found in 7 (6%) patients. (table No 1) Stratification of risk factors concerning age, gender, duration of disease, and type of diabetes mellitus is given in tables 2,3,4,5 respectively.

DISCUSSION

Diabetes Mellitus [DM] is a disease of altered glucose metabolism resulting in hyperglycemia and glucose intolerance due to absolute or relative deficiency of insulin with the presence of clinical features of polyuria, polydipsia, and polyphagia in the majority of cases. [8] One of its life-threatening complications is diabetic ketoacidosis which is precipitated by several factors, including infections, non-compliance with insulin administration[9], dehy-

Table 1: Risk factors in diabetes mellitus patients (n=111)

Risk Factors	Frequency	Percentage
Infection	54	49%
Stroke	4	4%
Myocardial infarction	3	3%
Pancreatitis	7	6%
Total	111	100%

Table 2: Stratification of risk factors with respect to age (n =111)

Risk Factors		18-40 years	41-60 years	P Value
Infection	Yes	19(53%)	35(47%)	0.5464
	No	17(47%)	40(53%)	
Stroke	Yes	1(3%)	3(4%)	0.7463
	No	35(97%)	72(96%)	
Myocardial infarction	Yes	0(0%)	3(4%)	0.2237
	No	36(100%)	72(96%)	
Pancreatitis	Yes	2(6%)	5(7%)	0.8216
	No	34(94%)	70(93%)	

Table 3: Stratification of risk factors with respect to gender

Risk Factors		Male	Female	P Value
Infection	Yes	32(51%)	22(46%)	0.6044
	No	31(49%)	26(54%)	
Stroke	Yes	2(3%)	2(4%)	0.7811
	No	61(97%)	46(96%)	
Myocardial infarction	Yes	2(3%)	1(2%)	0.7254
	No	61(97%)	47(98%)	
Pancreatitis	Yes	4(6%)	3(6%)	0.9830
	No	59(94%)	45(94%)	

Table 4: Stratification Of Risk Factors With Respect To Duration Of Diabetes Mellitus (n =111)

Risk Factors		≤ 12 years	>12 years	P Value
Infection	Yes	32(50%)	22(47%)	0.7395
	No	32(50%)	25(53%)	
Stroke	Yes	2(3%)	2(4%)	0.7522
	No	62(97%)	45(96%)	
Myocardial infarction	Yes	1(2%)	2(4%)	0.3873
	No	63(98%)	45(96%)	
Pancreatitis	Yes	3(5%)	4(9%)	0.4129
	No	61(95%)	43(91%)	

Table 4: Stratification Of Risk Factors With Respect To Duration Of Diabetes Mellitus (n =111)

Risk Factors		Type I	Type II	P Value
Infection	Yes	12(46%)	42(49%)	0.7711
	No	14(54%)	43(51%)	
Stroke	Yes	1(4%)	3(4%)	0.9395
	No	25(96%)	82(96%)	
Myocardial infarction	Yes	0(0%)	3(4%)	0.3314
	No	26(100%)	82(96%)	
Pancreatitis	Yes	2(8%)	5(6%)	0.7397
	No	24(92%)	80(94%)	

dration, or poorly controlled diabetes. [4, 10] Previously many studies have been done to identify risk factors for DKA. A UK-based evaluation from 2000 to 2009 showed that mortality with DKA was significantly associated with age, presence of co-morbidities and diabetic complications, non-compliance with medications, female gender, no follow-up with physician, and psychological problems all of which increase the risk for recurrent DKA. [11] According to a 2019 study of 93 patients, infections (36.5%) and inadequate insulin doses (22.5%) were commonly seen as the precipitating factors for DKA. The rate of mortality was recorded to be 23.6%. [12] One analysis of 45 published cases even identified the use of atypical antipsychotics as a risk factor for DKA. [13] Previous reporting about pancreatitis as a consequence of diabetic ketoacidosis has been done, with a prevalence of 15.53%. [14, 15, 16] Severe hypertriglyceridemia from insulin deficiency causes pancreatitis in type 1 diabetic patients. [17] DKA can also occur in diabetic patients with acute pancreatitis. Our study counts pancreatitis as a precipitating factor for DKA. Myocardial infarction is another documented rare, but renowned risk factor for DKA. Both these disorders can trigger each other and it is often difficult to conclude which disorder appears first. A 2019 article suggested that the elevation of troponin levels in a DKA patient should always prompt the physician to think of coronary abnormality until proven otherwise.[18] Same is the case for strokes. They are counted as one of the risk factors for the development of DKA and DKA itself is a risk factor for stroke. A substantial intersection of signs and symptoms and laboratory findings in both conditions makes it difficult to interpret which condition is the primary cause, especially in elderly and less expressive patients. However, quick and efficient investigation can lead to a certain diagnosis. [19]

The study conducted in Khyber Teaching Hospital to find out the frequency of common risk factors in DKA patients found that infections were the mainstream cause of DKA (just like previously done international studies), maintaining the majority of the proportion. Less common causes are acute pancreatitis, stroke, and myocardial infarction. We need to educate the patients regarding infection control to prevent further episodes of DKA as it is a life-threatening condition and late management can lead to high-rate mortality.

CONCLUSION

The most common risk factor for diabetic ketoacidosis is infections in half of the participants while stroke was 4%, myocardial infarction was 3% and pancreatitis was 6%.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Asim M:	Main idea, data collection
Badshah A:	Literature search, formatting of article, final review
Atif D:	Data compilation, discussion writing
Mohammad W:	Proofreading

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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ORIGINAL ARTICLE

COMPARATIVE EVALUATION OF PARENTAL PERCEPTIONS OF THE ORAL HEALTH-RELATED QUALITY OF LIFE OF AUTISTIC AND NON-AUTISTIC CHILDREN AFTER FULL MOUTH REHABILITATION UNDER GENERAL ANESTHESIA

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ABSTRACT

Objectives: To compare the parental perceptions of the oral health-related quality of life (OHRQOL) of autistic and non-autistic children after full mouth rehabilitation under general anesthesia (GA).

Methods and Materials: The study included 114 autistic children and 116 children without autism. Two years after receiving therapy under GA, participating parents completed a condensed version of the Perceptions Questionnaire (P-CPQ) and Family Impact Scale (FIS). Demographic data was collected. Oral symptoms, social health, psychology, functional limitation, and family affect ratings. Mean, standard deviation and statistical differences between groups were analyzed using SPSS.

Results: Children with autism received higher overall P-CPQ scores than children without autism, according to the frequency distribution of the P-CPQ for parental perception when children with and without autism were compared. In all four domains, when scores were compared according to the domain, there was no statistically significant difference in the scores. According to the FIS frequency distribution, children with autism had higher total FIS scores than children without the condition. The change was not statistically significant, though. Only parental emotions showed a statistically significant difference when scores were examined by domain.

Conclusion: Children with autism and children without autism score the same on the P-CPQ, indicating that the impact of comprehensive rehabilitation under GA is positive for both types of children. Parent emotions may not change immediately following the complete rehabilitation under GA which may be required to handle separately to boost the confidence of the patient.

Keywords: Autistic, children, general anesthesia, parents, perception

This article may be cited as: Aswad NA, Abushanan A, Ali S. Comparative evaluation of parental perceptions of the oral health-related quality of life of autistic and non-autistic children after full mouth rehabilitation under general anesthesia. J Med Sci 2023 October;31(4):300-304

INTRODUCTION

Autism is "a complex developmental disability that typically appears during the first three years of life and affects a person's ability to communicate and interact with others".[1,2] There is a better understanding of this disability as of now with broader inclusion of the disease process with few related disabilities that have been recognized as a separate entity as Autism Spectrum Disorders (ASDs).[3] Children with autism require special care, and pediatric dental treatment demands several modifications. The involvement of the parents in the management of systemic and dental conditions of the autistic child helps to achieve better development of the child.[4]

Knowing the prevalence aids in the establishment of appropriate policies and programs for the care of this particular group. The numerous studies that have been published to date make it abundantly evident that the frequency of ASD varied greatly by nation, gender, socioeconomic position, geographic location, continent, and the assessment methods employed. Adak and Halder in their systemic review concluded the average prevalence

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Date Received: 02-02-2023
Date Revised: 06-03-2023
Date Accepted: 12-06-2023

of 9.19 per 1,000 population in Saudi Arabia.[5] Another recent study in Saudi Arabia revealed that 2.81 out of every 1,000 children in Jeddah and 3.68 out of every 1,000 in Makkah had ASDs.[6]

Dental treatment under general anesthesia (GA) is one of the methods to treat children with dental disease. The use of GA in autistic children seems to be much more required than that of normal children since many patients require complete full mouth rehabilitation and it needs to be completed in fewer appointments, managing these individuals in a clinical setting is different from that of normal individuals as it poses significant issues in behavior and communication while providing dental care and treatment.[7] Although such treatment is commonly done and followed in autistic children, involved parents' perception is important to continue, and if required any modification in the treatment strategies.[8]

Assessing Oral Health defined Oral Health-Related Quality of Life (OHRQoL) helps in identifying the exact need of the patients and the expectation of the parents. According to a Saudi Arabian study, autistic children and their families had lower OHRQOL than typically developing children.[9] However, to date, there are no studies done on the parental perceptions of OHRQOL with autistic individuals treated with complete rehabilitation under GA. Thus, the current study is aimed to compare parental perceptions of the OHRQoL in both autistic and non-autistic groups 4-9 years after treatment under GA.

MATERIALS AND METHODS

A cross-sectional study was conducted in March-December 2022 to compare the parental perceptions of the OHRQoL of autistic and non-autistic children after full mouth rehabilitation under GA at Dammam Dental Center, Dammam, Saudi Arabia. The sample size for the present study was calculated using G power 3.0.10 version software. The effect size of 0.32 was calculated based on a similar study by Pani et al. (2013).[9] The alpha error was fixed at 5% and the power of the study was fixed at 80%. The estimated sample size was 116. Ethical approval (FPGRP/2021/653/677/660) was obtained from Riyadh Elm University, Riyadh, Saudi Arabia, and Dammam Dental Center, Dammam, Saudi Arabia.

Children aged 4-9 years who had undergone comprehensive dental treatment under GA at Dammam Dental Center, Dammam, Saudi Arabia were included in the study. Inclusion criteria: patient age group between 4 to 9 years treated under GA, n established diagnosis of ASD by a medical specialist, and received full dental rehabilitation under GA. Exclusion criteria: children diagnosed with other co-morbidities and whose ages are not within the mentioned above. After obtaining informed consent from the parents for participating in the study, data was collected. All the patients were given a questionnaire to answer following 2 years after completion of the treatment.

The questionnaire used for the study was divided into three sections: demographic information (age, gender, and nationality of the child), the child's oral health practices (brushing, flossing, and sugar consumption), and parents' attitudes toward their child's oral health. The questionnaires used for data collection were based on the OHRQoL questionnaire. The P-CPQ consists of 31 items that are divided into four subscales: Oral Symptoms, Functional Limitation, Emotional Well-being, and Social Well-being, and aimed to assess the frequency of events within the past 3 months. The FIS consists of 14 items that aim to assess the effect of a child's oral condition in four domains: Family Activities, Parental Emotions, Family Conflict, and Family Finances.

A five-point Likert-like scale was used to score the items. Data collected were generated using Microsoft Excel (Excel 2015, Microsoft Corporation, Redmond, WA.) spreadsheet. Descriptive analysis was computed. The Mann-Whitney test was employed to compare the scores between the two groups. The statistical analysis was performed using SPSS (IBM Corp. Released 2013. IBM SPSS Statistics for Macintosh, Version 22.0. Armonk, NY: IBM Corp.) and tests were conducted at a confidence interval (CI) of 95%, and a significance level of 0.05.

RESULTS

A total of 114 autistic children and 116 non-autistic children participated in the study. Table 1 shows the demographic characteristics of the children. The autistic children (61 boys and 53 girls) were aged 2–6 years (mean age, 5.0 years; SD, ±1.1). Children without autism (78 boys and 38 girls) were aged 1–6 years (mean age, 3.8 years; SD, ±1.9). The mean difference in age was statistically significant ($p<.001$). Autistic children were more likely to be girls ($p<.05$) and from Dammam ($p<.001$).

PARENTAL PERCEPTION

Figure 1 shows the frequency distribution of P-CPQ. When the parental perception scores were compared between children with and without autism (Table 2), it was found that the overall P-CPQ scores for autistic children were higher than those for children without autism. However, the difference was statistically not significant ($p>.05$).

When scores were compared according to the domain, it was observed that autistic children had lower scores in functional limitation and emotional well-being than children without autism. On the other hand, scores in oral symptoms and social well-being were higher in autistic children than in children without autism. However, in all four domains, the difference in the scores was statistically not significant ($p>.05$).

FAMILY IMPACT

Figure 2 shows the frequency distribution of FIS. When the family impact scores were compared between autistic children and children without autism (Table 3), it was found that the overall FIS scores for autistic children were higher than those for children without autism. However, the difference was statistically not significant ($p>.05$). When scores were compared according to the domain, it was observed that autistic children had higher scores in family activities, parental emotions, family conflict, and family finances than children without autism. However, a statistically significant difference in the scores was found only with parental emotions ($p<.05$).

DISCUSSION

OHRQOL assessment is much in need among children with autism. Perceptions of parents and caregivers of autistic children will add a new dimension to the treatment. Autistic children treated for complete rehabilitation under GA and their parent's perception regarding the oral health and general well-being assessed will be beneficial to build up the overall treatment strategy. Thus, the present cross-sectional study was planned to compare

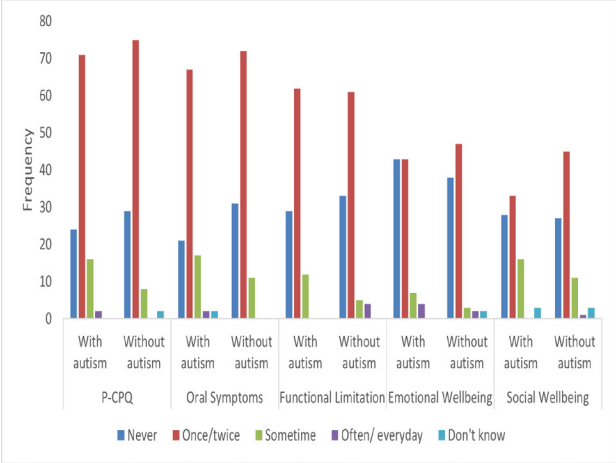

Fig 1: Frequency distribution of P-CPQ

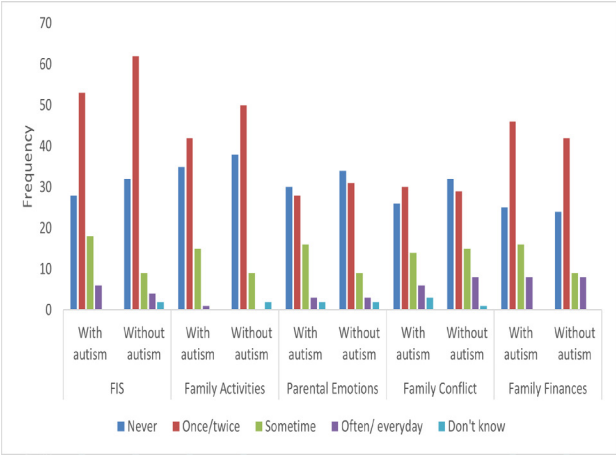

Fig 2: Frequency distribution of FIS

Table 1: Demographics details of the study population

		With autism	Without autism
Gender	Boy	61	78
	Girl	53	38
Location	Dammam	113	72
	Khobar	1	3
	Qatif	0	5
	Riyadh	0	36
Father's education	Elementary or less	2	2
	Middle or high school	1	2
	College	98	94
	Higher education	13	18
Mother's education	Elementary or less	4	45
	Middle or high school	3	3
	College	94	58
	Higher education	13	14
Father working	Yes	110	81
	No	4	34
Mother working	Yes	41	39
	No	73	72
Family income	SAR 3,000 or less	7	12
	SAR 3,000 – 5,000	14	19
	SAR 5,000 – 10,000	52	39
	SAR 10,000 – 20,000	20	28
	SAR 20,000 or more	4	3

Table 2: P-CPQ scores for children with autism compared to those without autism

	With autism	Without autism	p-value
P-CPQ		16.17 (±8.65)	.919
Oral Symptoms	5.80 (±2.30)	5.24 (±2.35)	.142
Functional Limitation	4.84 (±2.27)	4.96 (±2.11)	.630
Emotional Wellbeing	4.00 (±3.26)	4.30 (±2.95)	.227
Social Wellbeing	4.25 (±2.90)	3.90 (±2.24)	.781

Table 3: Family impact scores for children with autism compared to those without autism

	With autism	Without autism	p-value
FIS	14.14 (±8.92)	12.29 (±6.83)	.324
Family Activities	5.73 (±3.79)	5.51 (±3.12)	.974
Parental Emotions	4.29 (±3.14)	3.37 (±2.59)	.048*
Family Conflict	2.94 (±1.76)	2.86 (±1.70)	.801
Family Finances	4.01 (±2.50)	3.58 (±2.23)	.260

 https://doi.org/10.52764/jms.23.31.4.7

and evaluate the parental perceptions of the OHRQOL in autistic and non-autistic children after full mouth rehabilitation under GA.

The difference in the prevalence rate of the present study compared to previous studies could be due to the variation in the sample size.[10] However, it is also important to know that this is not a prevalence study. Parental perceptions regarding the management of autistic children are an important part of the management of ASD. P-CPQ scores for autistic children in the present study were higher than those for children without autism.

Nonetheless, it should be noted that the difference in scores in all four domains was statistically not significant. According to Pani et al., pediatric autism lowers OHRQOL for both the affected kid and the family.[9] Alaki et al. reported that autistic children scored much worse on measures of their oral health.[8]

Both study findings are not in agreement with the present study. However, these two studies are not related to the recording of the perception of patients following treatment.

According to previous studies, it is clear that complete rehabilitation or the treatment of autistic children under GA improves overall health conditions including the oral condition of the autistic children, and improvement in positive perceptions of parents.[11-14]

When children with autism and children without autism were compared using the FIS, it was discovered that the total FIS scores for autistic children were higher than those for children without autism. However, only parental emotions were found to have a statistically significant effect on the ratings.

Similar findings were reported in a study by Mokhtar et al.[14] However, other studies reported different outcomes. According to Baens-Ferrer et al., oral rehabilitation under GA improves QOL for children with exceptional healthcare needs and their families.[15] Baghdadi also reported that treatment under GA is associated with considerable improvement in FIS scores among the parents of the children.[12]

The present study compared the OHRQoL of autistic children with that of healthy children of similar age groups. Thus, the study results provide new information on the treatment and management of autistic children. Yet there were several limitations to this study.

Due to the lack of accuracy in the medical records, the severity and classification of the health condition of the autistic group were not used which could have provided further insight into their OHRQoL.

Also, the parents or caregivers that completed the questionnaire might have completed it based on what they believed the investigators want to know rather than what they believed which limits generalizability. It would be beneficial in future studies to assess the OHRQoL of autistic children before their treatment under general anesthesia and follow up after to have a better understanding, as it would enhance the current literature and provide further insight into the management of autistic children.

CONCLUSION

There is no difference in the parent perception between autistic and non-autistic children, thus suggesting that the impact of complete rehabilitation under GA is beneficial to autistic children like non-autistic children.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Aswad NA: Data collection, Analysis, Interpretation of data and Write up

Abushanan A: Concept, Design, Supervision, Proofreading

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Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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ORIGINAL ARTICLE

ASSOCIATION OF LEVEL OF EDUCATION AND OCCUPATION WITH DIABETIC FOOT ULCER IN PATIENTS WITH TYPE 2 DIABETES MELLITUS

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ABSTRACT

Objective: Diabetic foot ulcer (DFU) is a well-known microvascular complication of Type 2 Diabetes mellitus (T2DM) with several risk factors. This study intended to determine the association of the level of education and occupation with the severity and outcome of DFU in diabetic patients.

Materials and Methods: This study was conducted from 1st January 2023 to 25th January 2023 in the Endocrinology Division of the Department of Medical Specialties, Khyber Teaching Hospital, Peshawar. Adult diabetic patients with DFU were enrolled in the study. All the relevant demographic, clinical, and biochemical characteristics were measured.

Results: Out of 148 patients, only 50 (33.8%) patients were educated. The study participants had a mean age, BMI, HbA1c, and duration of DM of 56.48 years, 27.3 kg/m2, 10.3 % and 9.4 years, respectively. There was a substantial association between the level of education and occupation with the severity of DFU which was statistically significant (p-value = 0.001 and p-value = 0.01, respectively). Regarding the outcome of DFU, it was found that patients with medium and high levels of literacy and skilled occupation had lower rates of major amputations. These results were statistically non-significant however they were found to be clinically significant.

Conclusion: A significant association was observed between the education level and occupation with the severity and outcome of DFU. This underpins the significance of structured education of patients with low and medium literacy levels and those with unskilled and semiskilled jobs regarding their foot care.

Keywords: Type 2 Diabetes Mellitus, Diabetic Foot ulcer, Occupation, Education.

This article may be cited as: Malik SE, Kanwal S, Javed J, Naeem H, Jehandad Z, Haider I. Association of level of Education and Occupation with diabetic Foot Ulcer in patients with type 2 diabetes mellitus. J Med Sci 2023 October;31(4):305-310

INTRODUCTION

Diabetes mellitus (DM) is a widely spread metabolic disorder with devastating complications leading to increased morbidity and mortality. [1] According to the International Diabetes Federation's survey in 2021, around 537 million people have DM globally, and in Pakistan, 33 million people have DM. [2] Type 2 diabetic patients are at higher risk of lower limb complications like diabetic foot infection and diabetic foot ulcers (DFU) which are among the most disabling and costly problems. [3] According to the estimations, 19 to 34% of diabetic patients will suffer from DFU once in their life. Moreover, patients with DFU have a 2.5-fold higher probability of death at 5 years in contrast to those without DFU.[4]

Patients with DFU are at higher risk of lower limb amputations. [5] Due to lengthy hospital stays and the severity of ulceration, it has been estimated that the foot care of patients with DM accounts for a considerable amount of health care expenses in a developed country like England. This is more than the combined expenses of lung, prostate, and breast carcinomas. [6] In Pakistan, the prevalence of DFU is 7.02 %.[7] Common risk factors for DFU are foot deformities, peripheral arterial disease, diabetic peripheral neuropathy, and uncontrolled glycemic status. [8] Most of the risk factors are due to the poor educational status of the patient. Patients with adequate education had a lower risk of severe DFU and thus amputations. A study

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Date Revised: 31-07-2023
Date Accepted: 03-8-2023

conducted in Iran showed that gender, disease duration, occupation, and literacy level of patients had a significant association with the healthcare practice of patients with DFU. [9]

In Pakistan, various studies have been conducted to ascertain the contributing factors for DFU but none of them assess the effect of occupation and level of education on the occurrence of DFU. Thus, the objective of the current study is to find the association between the level of education and occupation with the severity and outcome of DFU in type 2 diabetic patients. The outcomes of this study will emphasize the importance of the educational status and occupation of patients in relation to DFU.

MATERIALS AND METHODS

This descriptive cross-sectional study was conducted from 1st January 2023 to 25th January 2023 in the Endocrinology Division of the Department of Medical Specialties, Khyber Teaching Hospital, Pakistan after getting approval from the hospital's ethical committee (Ref. No. 92/DME/KMC dated 26/12/2022). The calculated sample size was 101, taking the 7.02% prevalence of DFU in T2DM patients with a 95% confidence interval. [7] After taking informed written consent, type 2 diabetic patients of both genders with DFU were registered in the study through non-probability consecutive sampling. Patients with type 1 DM, pregnancy, end-stage renal disease, and those with any critical illness were excluded from the study.

The diagnosis of DM was established according to the American Diabetes Association (ADA) guidelines. [10] Ulcer on the foot and severity of DFU was classified as per Wagner-Meggitt Classification. [11] Outcome of DFU was classified as conservative when only debridement was performed, minor when the amputation level was at or below the ankle joint, and major when the amputation level was above the ankle joint. [12]

The education status of the patients was categorized as uneducated and educated. The education level was classified according to the International Standard Classification of Education-11 (ISCED-11) into the following literacy levels: Low: early childhood education/primary education/lower secondary education; Medium: upper secondary education and High: bachelor/master or equivalent. [13]

Occupation of the patients was categorized into the following categories: Unemployed, Unskilled (fast food workers, Laborer, maids, furniture movers) Semi skilled (drivers, flight attendants, security guards, shopkeepers, and waiters), Skilled (carpenters, police officers, firemen, doctors, nurses, lawyers, welders, plumbers, administrative jobs, electricians & computer operators) and Housewife. [14]

The SPSS software was applied for the analysis of data. Mean ± standard deviation was calculated for the numerical variables. Frequencies and percentages were computed for the categorical variables. The association of the level of education of patients and occupation with the severity and outcome of DFU was analyzed via the Chi-square test. Results having p-value ≤0.05 were considered to be statistically significant.

RESULTS

A total of 148 T2DM patients with DFU were included in the study. There were 75 (50.7%) males and 73 (49.3%) females having an average age of 56.48 years. The mean BMI, HbA1c, and duration of DM were 27.3 kg/m2, 10.3 % and 9.4 years, respectively. The baseline demographic profile and clinical features of the study participants are presented in Tables I and II, respectively.

The relation between the occupation and literacy level of patients with the severity and outcome of DFU was also assessed and is presented in Tables III and IV, respectively. Out of 148 patients, only 50 (33.8%) patients were educated, of whom only 12 patients had a high education level. It was evident that none of the patients with a higher education level had a higher-grade ulcer. Regarding occupation, the majority of the patients with unskilled and semiskilled occupations had a higher grade of DFU. It was found that the association of the employment status of patients and their literacy status with the severity of DFU was statistically significant (p-value = 0.001 and p-value = 0.01, respectively).

Similarly, the association of education level and occupation was assessed with the outcome of DFU and it was found that patients with medium and high levels of education and skilled occupation had lower rates of major amputations. These results were statistically non-significant however they were found to be clinically significant.

Table 1: Baseline Demographic profile of the study Participants

	Characteristic	Frequency (n=148)	Percentage (%)
Age(years)	<50	30	20.3
	>50	118	79.7
Gender	Male	75	50.7
	Female	73	49.3
Level of Education	Uneducated	98	66.2
	Low	12	8.1
	Medium	26	17.6
	High	12	8.1
Occupation	Un Employed	3	2.0
	Unskilled	19	12.8
	Semiskilled	35	23.6
	Skilled	21	14.2
	Housewife	70	47.3

Table 2: Baseline clinical characteristics of the study participants

		Frequency (n=148)	Percentage (%)
Duration of DM	< 10 years	81	54.7
	≥ 10 years	67	45.3
Treatment of DM	Oral	42	28.4
	Oral plus Basal insulin	18	12.2
	Twice daily insulin	69	46.6
	Basal Bolus Insulin	19	12.8
HbA1c	≤ 7 %	11	7.4
	7.1 to 8.5 %	14	9.5
	≥ 8.6 %	123	83.1
Grade of DFU	Grade I	17	11.5
	Grade II	46	31.1
	Grade III	39	26.4
	Grade IV	36	24.3
	Grade V	10	6.8
Type of DFU	Neuropathic	71	48.0
	Ischemic	61	41.2
	Neuroischemic	16	10.8
Cause of DFU	Blister	35	23.6
	Cellulitis	105	70.9
	Trauma	8	5.4
Risk Assessment of foot	No	130	87.8
	Yes	18	12.2
Education for Foot Care	No	91	61.5
	Yes	57	38.5
Outcome of DFU	Conservative	91	61.5
	Minor Amputation	45	30.4
	Major Amputation	12	8.1
Retinopathy	No	48	32.4
	Yes	100	67.6
Nephropathy	No	80	54.1
	Yes	68	45.9
Hypertension	No	59	39.9
	Yes	89	60.1
Stroke	No	135	91.2
	Yes	13	8.8
MI	No	107	72.3
	Yes	41	27.7
Heart Failure	N0	129	87.2
	Yes	19	12.8

Table 3: Association of Education and Occupation with the severity of Diabetic Foot ulcer

Association of Education with the severity of Diabetic Foot ulcer								
Grade of Diabetic Foot Ulcer								
Level of Education		Grade I	Grade II	Grade III	Grade IV	Grade V	Total	p value
	Uneducated	11	25	30	25	7	98	0.001
	Low	0	1	4	7	0	12	
	Medium	2	12	5	4	3	26	
	High	4	8	0	0	0	12	
	Total	17	46	39	36	10	148	
Association of Occupation with the severity of Diabetic Foot ulcer								
Grade of Diabetic Foot Ulcer								
		Grade I	Grade II	Grade III	Grade IV	Grade V	Total	p value
Occupation	Unemployed	0	1	1	1	0	3	0.01
	Unskilled	1	2	6	9	1	19	
	Semiskilled	1	9	8	13	4	35	
	Skilled	6	11	2	2	0	21	
	Housewife	9	23	22	11	5	70	
	Total	17	46	39	36	10	148	

Table 3: Association of Education and Occupation with the severity of Diabetic Foot ulcer

Association of Education with the Outcome of Diabetic Foot Ulcer						
Outcome of Diabetic Foot Ulcer						
		Conservative	Minor Amputation	Major Amputation	Total	p value
Level of Education	Uneducated	53	36	9	98	0.123
	Low	8	2	2	12	
	Medium	21	5	0	26	
	High	9	2	1	12	
	Total	91	45	12	148	
Outcome of Diabetic Foot Ulcer						
		Conservative	Minor Amputation	Major Amputation	Total	P value
Occupation	Unemployed	3	0	0	3	0.144
	Unskilled	11	4	4	19	
	Semiskilled	18	14	3	35	
	Skilled	17	4	0	21	
	Housewife	42	23	5	70	
	Total	91	45	12	148	

DISCUSSION

This study demonstrated that the association between the literacy level of patients and the severity of DFU was statistically significant (p-value = 0.001). Most of the uneducated patients had DFU Grade II to V, while patients with a high level of education had DFU Grade I to II. A study conducted in Punjab, Pakistan found a substantial relation between the education status of diabetic patients with the risk of DFU.[5] Similarly, a study by Madmoli et al. revealed a strong association between literacy status and DFU (p-value=0.002). [15] These findings are very comparable to our study. Another study conducted in Saudi Arabia also identified that patients with secondary and university level education had better knowledge of diabetic foot and thus lower risk of DFU. [16]

Our study demonstrated a substantial association between the literacy status of patients and the severity of DFU (p-value = 0.01). Pourkazemi et al. also noticed a significant association between employment status and literacy level with diabetic foot.[9] None of the patients with

skilled occupations had Grade V ulcers while the majority of patients with unskilled and semiskilled occupations had Grade II to V ulcers. A study performed in India showed that patients with higher literacy and skilled and semi-skilled occupations had a better knowledge of self-care activities and thus low risk and severity of DFU. [14] Another study also found that patients with skilled occupations had a lower risk of severe DFU. [16] These findings are quite similar to the findings of our study.

This study also revealed an association between education status and occupation with the outcome of DFU which was clinically significant but statistically non-significant (p-value = 0.123 and p-value= 0.144, respectively). In a study by Madmoli et al. there was a substantial association of education status with DFU (p-value = 0.002).[15] Likewise, in a study by Rostami et al. patients with low education levels were more likely to have an amputation. [17] The findings of a study by Madmoli et al. also revealed a significant association of occupation with lower limb amputation (p-value = 0.03) among T2DM patients with DFU. [15] The difference between the findings of our study and these studies could be due to that the fact the majority (66.2%) of patients in our study were uneducated and all of these patients had conservative or minor amputations with very few patients undergoing major amputation. Only one out of 12 patients with high education levels had a major amputation and none of the 26 patients had had a major amputation. These findings are clinically significant but not statistically significant (p-value = 0.123)

Regarding employment status, our study identified that 4 out of 19 (21.1%) and 3 out of 35 (8.6%) of unskilled and semiskilled occupations respectively, had a major amputation. While none of the patients with skilled occupation had a major amputation These findings are clinically significant however they didn't reach a statistical significance (p = 0.144). A study by Amalraj et al. demonstrated that 23 % of the patients who underwent lower limb amputation were unemployed. [18] Similarly, a study by Madmoli et al. observed a strong association between limb amputation and occupation (p-value = 0.03).[15] Study by Rastomi et al. also demonstrated similar results. [17]

Our study also found that 87.8% and 61.5% of the study participants had never had risk assessments of their feet and had never been educated about foot care, respectively. Another study demonstrated that 34.2% of the patients were examined by physicians for risk assessment and 36.7% of the patients received structured education regarding their foot care.[19] The findings of our study are quite alarming, enhancing the importance of timely risk assessment and structured education of our patients. This also highlights the literacy rates of our population, in that the majority of our patients are uneducated which acts as a barrier in imparting education of foot care.

Our study revealed that 67.6% and 45.9% had diabetic retinopathy and nephropathy, respectively. It also showed that 60.1% and 12.8% of the patients had hypertension and heart failure, respectively. The study by Abdulghani et al. found that 61.4%, 14.4%, and 23.3% had hypertension, heart disease and retinopathy, respectively.[19] Our study had more patients with retinopathy, the reason for the difference could be that most of the study participants had advanced diabetic foot disease imparting that they had more risk factors for diabetic retinopathy.

The result of this study has some limitations. Firstly, this is a cross-sectional study where associations between different factors are difficult to ascertain. Secondly, it was a single-centered study, so it is suggested that such a study should be carried out in multiple centers on a large scale for a better understanding of this association and generalization of the findings.

CONCLUSION

A considerable relationship was observed between the literacy rate and occupation with the severity and outcome of DFU. It emphasizes that patients with a low and medium level of education and patients with unskilled and semiskilled jobs should be properly educated regarding their foot care. This reiterates the importance of timely and regular risk assessment of feet and structured education of diabetic patients regarding their foot care. Optimum glycemic control, structured education, risk assessment, and control of associated risk factors will reduce the number of foot ulcers and thus hospital admissions and lower extremity amputations, which will further reduce the economic burden on our health system, especially in our resource-limited country.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Malik SE:	Concept, Design, and Proofreading
Kanwal S:	Acquisition and critical review
Javed J:	Analysis and interpretation of data
Naeem H:	Analysis and interpretation of data
JehandadZ:	Analysis and interpretation of data
Haider I:	Data collection, Final approval

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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ORIGINAL ARTICLE

DIAGNOSTIC ACCURACY OF FLUID-ATTENUATED INVERSION-RECOVERY MAGNETIC RESONANCE IMAGING IN DETECTION OF ACUTE SUBARACHNOID HEMORRHAGE KEEPING LUMBER PUNCTURE AS GOLD STANDARD

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ABSTRACT

Objective: To determine the diagnostic accuracy of FLAIR MRI in identifying acute Subarachnoid Hemorrhage (SAH) using Lumber puncture (LP) as a gold standard.

Materials and Methods: This was a validation study conducted from 3rd September 2020 to 3rd February 2021 at the Department of Radiology, Khyber Teaching Hospital, Peshawar. The sample size was 266. A non-probability consecutive sampling technique was used. All alert patients aged 20-70 years with sudden acute headache, other signs of SAH (nausea, vomiting, blurring of vision, sensitivity to light, and neck stiffness), and GCS >13 were included in this study. SAH on FLAIR-MRI was determined based on high signals in the subarachnoid space on FLAIR. Diagnostic accuracy was calculated regarding sensitivity, specificity, and positive and negative predictive values. SPSS version 22 was used to perform statistical analysis of the data.

Results: Mean age ranged from 20 to 70 years (46.3 + 14.1 years), with 58.6% male, and 41.4% female subjects. On FLAIR-MRI, SAH was observed in 65.4% of patients while SAH was recorded in 57.5% of patients on follow-up LP. Sensitivity of FLAIR-MRI was found to be 91.5% and specificity 69.9%. FLAIR-MRI had 80.5% positive predictive value and 85.8% negative predictive value.

Conclusion: FLAIR-MRI is effective in accurately identifying SAH with high sensitivity and fair specificity. As such, it is a useful radiological tool for diagnosis of SAH in adults and further studies are recommended to confirm its usefulness.

Keywords: Magnetic resonance imaging, lumber puncture, subarachnoid hemorrhage, headache

This article may be cited as: Iftikhar S, Anjum H. Diagnostic accuracy of fluid-attenuated inversion-recovery magnetic resonance imaging in detection of acute subarachnoid hemorrhage keeping lumber puncture as gold standard. J Med Sci 2023 October;31(4):311-314

INTRODUCTION

Non-traumatic subarachnoid hemorrhage (SAH) accounts for 3% of all strokes.[1, 2] Classical symptoms are sudden, explosive "Thunderclap" headaches, including neck stiffness, vomiting, confusion, and loss of consciousness. [3,4] In 75%-80% of cases, rupture of an intracranial aneurysm is the primary cause of non-traumatic SAH. [5, 6] SAH yearly incidence is about 10 per 100,000 persons with high fatality (40%–50%). Incidence of SAH is 40.6%, 46.2%, 14.0%, and 59.1% in Europe, Asia, North America, and Japan respectively. [7] Incidence is 5% in Pakistan as well as in India.[8] Early accurate diagnosis of SAH is crucial for better patient outcome as misdiagnosis can lead to poor prognosis.[9]

To detect SAH, the diagnostic algorithm involves non-contrast computed tomography (NCCT) brain followed by LP if NCCT is negative. [1] CT has a sensitivity of 98% to detect blood up to 5 days and 100% within 6 hours of symptom onset. LP has 98% sensitivity, 95% specificity, a negative predictive value of 99%, and a positive predictive value of 72% for aneurysmal SAH. [9] CT shows high sensitivity and specificity, but LP is the gold standard for ruling out SAH when NCCT is negative. [3, 9] CT sensitivity for subacute or chronic SAH is lower and produces artifacts [9], while LP is invasive and can cause postural headaches. [1]

Magnetic resonance fluid-attenuated inversion-recovery (FLAIR) has high sensitivity in detecting SAH and is superior to CT for subacute and chronic SAH. [2, 10] Recent

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Date Accepted: 25/10/2023

studies report FLAIR's sensitivity for detecting acute SAH as 78.57%, specificity as 96.53%, positive predictive value (PPV) as 57.89%, negative predictive value (NPV) as 98.67%, and accuracy rate as 95.29%. [12]

There is no international consensus on SAH diagnosis, and published data on FLAIR imaging in SAH is limited and this area of study has not been much of a focus in Pakistan. Our research aimed to determine the diagnostic accuracy of FLAIR-MRI in acute SAH using lumber puncture as the gold standard, so that FLAIR MRI, if found to be accurate, may replace the invasive procedure of lumber puncture.

MATERIALS AND METHODS

This descriptive cross-sectional study was conducted from 3rd September 2020 to 3rd February 2021 at the Department of Radiology, Khyber Teaching Hospital, Peshawar. A sample size of 266 was calculated using a sample size calculator for sensitivity and specificity by Lin-Naing taking sensitivity and specificity of FLAIR of 78.57% and 96.53% respectively, the prevalence of SAH of 46.2%, 95% confidence level, and 10% precision. [7, 12] Non-probability consecutive sampling technique was used. All alert patients aged 20-70 years with sudden acute headache, other signs of SAH (nausea, vomiting, blurring of vision, sensitivity to light, and neck stiffness), and GCS >13 were included in this study while patients who had previous surgery for the source of SAH and those with a history of head trauma, toxic causes, or unconscious presentation were excluded.

Subarachnoid hemorrhage is defined as extra-axial hemorrhage in subarachnoid spaces of the brain. [13] SAH on LP was confirmed based on all the following features[14], like visual examination of CSF for xanthochromia, CSF cytology for increased red blood cell counts, increased proteins and measurement on Spectrophotometry for oxyhemoglobin or bilirubin determination. SAH on FLAIR-MRI was determined based on high signals in the subarachnoid space on FLAIR. [15] Diagnostic accuracy was calculated in terms of sensitivity, specificity, and positive and negative predictive values.

This study was conducted after ethical committee approval and informed consent from patients presenting to the accident and emergency department with severe headaches and other signs of SAH. FLAIR-MRI was conducted within 6 hours of symptom onset, followed by LP for CSF analysis after 8-12 hours for confirmation of SAH. Imaging was performed with a 1.5T machine (Achieva, Phillips) and included routine sequences with FLAIR (2200ms inversion time (TI) with axial cuts). MRI findings and CSF results were reported and compared by an expert radiologist and pathologist. On a pre-made proforma, all data was entered.

SPSS version 22 was used to perform statistical analysis of the data. The study variable was FLAIR-MRI findings and LP CSF analysis report. Sensitivity, specificity, PPV, NPV, and diagnostic accuracy were determined by taking LP as the gold standard.

RESULTS

The study was conducted on 266 patients with headaches and suspected SAH. The sample's mean age ranged from 20 to 70 years (46.3 + 14.1 years). In our study, 58.6% of the sample were male and 41.4% were female gender. 42.1% had a history of nausea, 33.5% had vomiting and 3.5% had blurring of vision.

On FLAIR, SAH was observed in 65.4% of patients while on follow-up LP, SAH was recorded in 57.5% of patients.

Sensitivity of FLAIR-MRI was found to be 91.5% and specificity 69.9%. FLAIR-MRI has 80.5% PPV and 85.8% NPV. (Table 1)

DISCUSSION

Detecting acute SAH with MR imaging is controversial due to fresh blood's minimal effect on CSF signal intensity. However, some studies have reported reliable detection of acute SAH with MRI using appropriate parameters. [16] The role of MRI in the identification of SAH relies on different T1 and T2 times in SAH, cerebrospinal fluid (CSF), and brain tissue. [15] According to Ogawa et al. patients with acute SAH revealed significantly reduced T1

Table 1: FLAIR-MRI AND LP 2x2 TABLE (n = 266)

		SAH on LP		Total
		Yes	No	
SAH on FLAIR-MRI	Yes	140	34	174
	No	13	79	92
Total		153	113	266

Sensitivity of FLAIR-MRI: TP/TP + FN = 91.5%

Specificity of FLAIR-MRI: TN/TN + FP = 69.9%

Positive Predictive Value FLAIR-MRI: TP/TP + FP = 80.5%

Negative Predictive Value FLAIR-MRI: TN/TN + FN = 85.8%

Accuracy: TP + TN / n = 82.3%

time and moderately reduced T2 time than in normal CSF while these values were of long duration in SAH than in grey matter. [17] PD images and T2W images adequately revealed acute SAH in their research. FLAIR is an inversion recovery sequence with a long echo time (TE) and strong T2 weighting, nullifying CSF signals that appear hypo-intense. However, due to the short T1 time of blood products in subarachnoid space, the bloody CSF appears hyperintense relative to brain tissue. [18] Noguchi et al. have demonstrated that FLAIR is more sensitive compared to CT in identifying diluted acute SAH. [19]

Given conflicting results from previous research, we did this research to determine the diagnostic efficacy of FLAIR MRI in detecting acute SAH. We found that FLAIR had a diagnostic accuracy rate of 85.8% in detecting acute SAH, with a sensitivity of 91.5%, specificity of 69.9%, PPV of 80.5%, and NPV of 85.8%, using LP as the gold standard.

Prior research showed a sensitivity of FLAIR in detecting acute SAH at 97.6%, a specificity as 66.7%, and NPV of SAH at 85.7%, which is comparable to our findings for sensitivity, specificity, and NPV. [15]

Another study by Burtscher M and co-workers found that FLAIR had a sensitivity of 89%, similar to our findings, and suggested that it has higher sensitivity than CT for detecting SAH, especially in cases where SAH has a significant load. [20]

According to one research, FLAIR had 89.4% specificity, and 58.3% sensitivity for identifying SAH, which is in some contrast with our study's lower specificity and higher sensitivity. [21]

Verma RK and colleagues evaluated the effectiveness of susceptibility-weighted imaging (SWI), CT and FLAIR MRI in detecting SAH. [10] They also evaluated whether the combined data from SWI/FLAIR MRI was more accurate than CT in detecting SAH. This study found SAH in 146 areas. FLAIR MRI detected 127 (87%) regions, SWI identified 129 (88.4%), and CT detected 110 (75.3%) regions. SWI and FLAIR together detected 146 regions (100%). Research has found that combining SWI and FLAIR increases detection rate for SAH compared to CT scans.

FLAIR is good for detecting SAH in temporal-occipital, frontal-parietal and Sylvian cistern areas, whereas SWI is better for detecting it in interhemispheric and intraventricular areas. Together, these two techniques provide complementary detection capabilities across different anatomical regions, making MRI a more effective tool for SAH detection. SWI is effective in the central brain regions, while FLAIR's strength is high in periphery. Even while FLAIR and SWI worked well together to produce promising results, FLAIR alone had a high sensitivity of 87%. This shows that FLAIR alone can function as a useful diagnostic tool. [10]

Our study, conducted on a large number of subjects, provided valid outcomes and supported the implementation of FLAIR as a replacement for CT, which emits harmful radiation. These findings can improve guidelines and prevent delays in the diagnosis.

FLAIR MRI is a valid non-invasive method for SAH detection, the future of MRI in the diagnosis of SAH is likely to see a significant boost in sensitivity and specificity through the incorporation of the Susceptibility-weighted imaging (SWI) sequence, as prior research has found that combining SWI and FLAIR increases detection rate for SAH. [10]

CONCLUSION

FLAIR-MRI is effective in accurately identifying SAH with high sensitivity and fair specificity. As such, it is a useful radiological tool for diagnosis of SAH in adults and further studies are recommended to confirm its usefulness.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Iftikhar S: Concept, Critical appraisal, and Discussion Writing

Anjum H: Data collection, compilation of results, formatting of the article

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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COMPARISON OF BLOOD PRESSURE INDICES (MEAN ARTERIAL PRESSURE AND PULSE PRESSURE) AFTER INDUCTION OF STRESS BETWEEN POST-COVID-19 AND HEALTHY ADULTS

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ABSTRACT

Objectives: This study aimed to compute the effect of stress 6-minute Walk Test (6-MWT)/Exercise) on Blood Pressure Indices (BPIs) in both COVID-19 patients and Controls.

Materials and Methods: A total of 122 young adults were included in this research with 61 participants each in the cases and the controls group. Participants between the ages of 18-40 with a previously positive confirmed PCR report covid (>3 months had passed after resolution of COVID-19 infection) were included as cases while healthy adults who did not contract covid were included in the control group. All the participants from both groups were stressed by asking them to perform the 6MWT. The subject's blood pressure was checked both before and after the stress and their MAP and PP were calculated.

Results: In both pre and post-stress comparisons between cases and controls there was no significant difference between MAP (Post-Stress p=1 and Pre-Stress p=0.25) and PP (Post-Stress p=0.129 and Pre-Stress p=0.68). Matrix Scatter Plot between variables both pre and post-stress shows that all the variables (MAP, PP, and HR) did not correlate with each other.

Conclusion: BPI i.e., MAP and PP show no significant difference between post-COVID participants and healthy adults after induction of stress.

Keywords: Six Minute Walk Test; Covid-19; Mean Arterial Pressure; Pulse Pressure

This article may be cited as: Raza SS, Khan NW, Fida N, Zafar U, Ali DES, Shah A. Comparison of blood pressure indices (mean arterial pressure and pulse pressure) after induction of stress between post-COVID-19 and healthy adults. J Med Sci 2023 October;31(4):315-318

INTRODUCTION

Coronavirus disease 2019 (COVID-19) spread like hay fire resulting in both morbidity and mortality. [1] The COVID-19 pandemic has had a significant impact on the cardiovascular system (CVS) of individuals infected with the virus. MAP and PP are important indicators of cardiovascular health and have been studied in COVID-19 patients in comparison to healthy adults. BP is also an integral part of any formula that predicts cardiovascular risk. [2–8] It has not been certain as to which BPI is considered more reliable and important in evaluating the risk factor for developing cardiovascular events. The focus has more recently been on MAP and PP. [9–11]

MAP is the estimate of mean pressure in the arterial vasculature during one cardiac cycle. Whereas PP is the difference of systolic minus the diastolic BP i.e., the pressure exerted by the heart in the arterial tree per heartbeat. It is noteworthy here that COVID-19-infected individuals show decreased MAP and raised PP levels when compared to healthy adults. Thus, indicating a potential of cardiovascular risk linked to the condition (COVID-19). [12]

The six-minute walk test (6MWT) is a very simple way of giving physiological stress. It is a very safe and well-established self-paced assessment tool to gauge the physiological exercise capacity of individuals having cardiorespiratory illnesses. [13] The test is performed by asking the subject/patient to walk on a flat surface as swiftly as possible but without running.

This research was undertaken to examine the

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Date Revised: 28/08/2023
Date Accepted: 20/10/2023

differences in MAP and PP in both COVID patients and Controls both before and after stress via the 6MWT or Exercise. This comparison between the indices pre and post-stress led us to determine the effects of COVID-19 on CVS. Remedies can be developed once we have established the effects of COVID-19 infection on BPIs. This research aims to assess the effect of the 6-minute walk test on blood pressure indices (MAP and PP), between healthy and post covid young adults of Khyber Pakhtunkhwa.

MATERIALS & METHODS

The study was carried out in the Dept. of Physiology at the Khyber Medical College from July 2021 to December 2021 after seeking approval from the Institutional Review & Ethics Board of Khyber Medical University. A total of 122 young adults were included in this research with 61 participants each in the cases and the control group.

The sample size was estimated using the G* Power equation. The statistical test adopted was: the difference between two independent means, test family was t test. A priori analysis was performed by keeping power at 95% (1-β) and 5% margin of error. Effect size of 0.6. Allocation ratio of 1.

Adults between the ages of 18-40 with a previously positive confirmed PCR report covid (>3 months had passed after resolution of COVID-19 infection) were included as cases while healthy adults that did not contract covid were included in the control group.

Participants with cardiovascular comorbid were removed from the study population. Similarly, smokers and athletes were also excluded. The participants consented to take part in the study.

All the participants from both groups were stressed by asking them to perform the six-minute walk test. Participant's blood pressure was checked both before and after the stress and their MAP and PP were calculated according to their respective formulas: MAP = Diastolic Blood Pressure + 1/3(Pulse Pressure) and PP = Systolic Blood Pressure (SBP) – Diastolic Blood Pressure (DBP). The variables were fed in MS Excel followed by calculation of MAP and PP. This data was then entered in the SPSS software v. 26.0. The distribution of data was checked using Shapiro-Wilk tests.

The differences in mean and standard deviation were calculated for both pre and post-stress phases followed by the application of t-test for comparison of means. A matrix scatter plot was obtained between variables to check for any correlation between them.

RESULTS

The mean age of cases was 27±3.8 years and that of controls was 24.1±1.92 years. In both pre and post-stress comparisons between cases and controls, there was no significant difference between MAP (Post-Stress p=1 and Pre-Stress p=0.25) and PP (Post-Stress p=0.129 and Pre-Stress p=0.68). However, HR (Post-Stress p=0.021 and Pre-Stress p=0.034) showed statistical significance **(Tables 1 and 2).**

Although the variables were statistically insignificant upon a comparison of the means, controls had a higher PP than cases in both pre and post-stress phases. Post-stress PP for controls was 42.75±10.24 mm Hg while for cases it was 39.7±11.12 mm Hg with a mean difference of -3.05 mm Hg (p=0.129). While pre-stress PP for controls was 38.66±9.84 mm Hg while for cases was 37.98±7.89 mg Hg with a mean difference of -4.86 mm Hg (p=0.68).

Controls had a slightly higher MAP than cases in the pre-stress phase. Post-stress MAP for controls was 97.61±11.84mm Hg while for cases it was 95.27±9.91 mm Hg with a mean difference of -2.33 mm Hg (p=0.25). HR was higher in controls in comparison to cases in both the pre and post-stress phases.

Matrix Scatter Plot between variables both pre and post-stress show that all the variables (MAP, PP, and HR) did not correlate with each other (**Figure 1**).

Table 1: Post-testing statistics showing no statistically significant difference between Blood Pressure Indices (Mean Arterial Pressure and Pulse Pressure) of COVID cases and controls.

	Group Statistics (Post Stress 6-MWT)				
	History of Covid Infection	Mean± Std. Deviation	Mean Difference	Sig. (2-tailed)	95% CI of the Mean Difference
Mean Arterial Pressure (MAP) DP + 1/3(PP)	Cases	98.65±13.51 mm Hg	0.00031	1	-4.76, 4.76
	Controls	98.65±12.24 mm Hg			
Pulse Pressure	Cases	39.7±11.12 mm Hg	-3.05	0.129	-6.99, 0.896
	Controls	42.75±10.24 mm Hg			
HR (Beats/Min)	Cases	96.59±18.48	8.18	0.021	-15.11, -1.25
	Controls	104.77±18.92			

Table 1: Post-testing statistics showing no statistically significant difference between Blood Pressure Indices (Mean Arterial Pressure and Pulse Pressure) of COVID cases and controls.

	Group Statistics (Pre-Stress 6-MWT)				
	History of Covid Infection	Mean± Std. Deviation	Mean Difference	Sig. (-2tailed)	%95 CI of the Mean Difference
Mean Arterial Pressure (MAP) DP + 1/3(PP)	Cases	9.91±95.27 mm Hg	2.33-	0.25	1.73 ,6.39-
	Controls	11.84±97.61 mm Hg			
Pulse Pressure	Cases	7.89±37.98 mm Hg	0.67-	0.68	2.65 ,3.99-
	Controls	9.84±38.66 mm Hg			
HR (Beats/Minute)	Cases	10.9±83.91	4.81-	0.034	0.37- ,9.25-
	Controls	13.11±88.72			

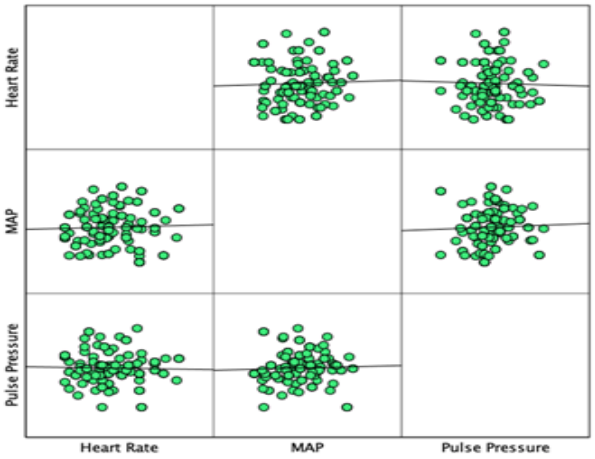

Fig 1: Matrix Scatter Plot between variables post stress shows that all the variables (MAP, PP, and HR) did not correlate with each other

DISCUSSION

Our study is the first of its kind given the design of our study. Although the variables were statistically insignificant upon a comparison of the means, controls had a higher PP than cases in both the pre and post-stress phases. There are no studies in the literature that have checked the BPIs before and after giving stress. However, a study carried out in China found a PP of 49.9 ± 6.8 mm Hg for COVID-infected individuals. [14] This is considerably higher in comparison to the results of our study.

The Covid group had a MAP of 98.65±13.51 mm Hg in the post-stress phase. This is in contrast to a study where COVID-19-affected individuals had a MAP of 93.6 ± 5.3 mm Hg. [14] However, the readings were not checked before or after stress and there was no control group like ours. Increased sympathetic tone also occurs during exercise, severe hemorrhage, and in times of psychological stress. The combination of these events increases both cardiac output and systemic vascular resistance, effectively increasing MAP [15,16]. Hence, the measurement of both MAP and PP before and after stress via 6MWT was taken into account in our study.

A United States-based study reported MAP and PP between COVID-19 symptomatic patients (S), controls (CON), and COVID-19 asymptomatic patients (AS). This study included 27 participants divided equally into each group. The pre-exercise MAP was not different between the groups when taken in the sitting position (CON = 89 ± 6 mm Hg; AS = 92 ± 3 mm Hg; S = 87 ± 5 mm Hg). The study reported no difference in MAP before or during submaximal treadmill exercise between groups. Significance was set to $p < 0.05$. [17,18]

The differences in MAP and PP between COVID-19 patients and healthy adults may have important clinical implications. Lower MAP and higher PP are associated with increased mortality in critically ill patients, and monitoring these values may be important in the management of COVID-19 patients. [19]

It is evident from the literature that COVID-19 patients have lower MAP and higher PP than healthy adults or non-COVID-19 ARDS patients. Such differences may exist due to the direct effects of the virus on CVS or the increased vascular permeability and inflammation associated with the disease. Further research is needed to fully understand the implications of these differences for the management and prognosis of COVID-19 patients.

Due to limited resources a larger study sample could not be checked for BPIs which is a limitation. No biomarkers were studied only the BPIs were checked and the differences between the two groups were audited.

CONCLUSION

In conclusion, BPI i.e., MAP and PP show no significant difference between post-COVID-19 participants and healthy adults after induction of stress.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Raza SS:	Concept, critical appraisal, formatting of the article and discussion writing
Khan NW:	Data collection, compilation of results
Fida N:	Data collection, manuscript writing
Zafar U:	Concept, Manuscript writing, bibliography, over all supervision
Ali DES:	Data collection, Overall compilation of the article, manuscript writing
Shah A:	Data collection, manuscript writing

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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ORIGINAL ARTICLE

COMPARISON OF SUSCEPTIBILITY BETWEEN CONVENTIONAL FIRST LINE ANTIBIOTIC CO-TRIMOXAZOLE AND NEWER ANTIBIOTICS IN RECURRENT UNCOMPLICATED URINARY TRACT INFECTIONS

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ABSTRACT

Objective: The current study aims to evaluate the susceptibility pattern of relatively older antibiotic Co-trimoxazole and its comparison with Levofloxacin, Nitrofurantoin, and Fosfomycin.

Material and Methods: This cross-sectional study was conducted in Mardan Medical Complex, Mardan, and the Postgraduate Medical Education Department of Khyber Girls Medical College, Peshawar from April 2022 to September 2022. Both male and female patients, above the age of 15 years with recurrent uncomplicated urinary tract infections were included in the study. The samples were inoculated onto CLED (Cystine-Lactose-Electrolyte-Deficient) Agar, a differential culture medium. The grown bacteria were identified, using Gram staining and BIOMÉRIEUX® API® 10S kits. Minimum inhibitory concentrations (MIC) were determined by the Agar dilution method; as per standard protocol. The results were compared among Co-trimoxazole, Levofloxacin, Nitrofurantoin, and Fosfomycin using statistical tests.

Results: A total of 680 samples were received, of which 158 samples were culture-positive. The gender distribution of females and males was 63.3% and 36.7%, respectively. A predominant proportion of the patient cohort manifested within the age range of 21-40 years, with the subsequent highest representation observed in the 41-60 year age group. The isolated organisms were E. coli (74.1%), Klebsiella (10.8%), Pseudomonas (5.1%), Enterococci (6.3%), Proteus species (2.5%), and Citrobacter (1.3%). Based on MIC analysis, 77.2% of isolates were found to be sensitive to Co-trimoxazole, 52.5% to Levofloxacin, 86.7% to Nitrofurantoin, and 90.5% to Fosfomycin. When comparing antibiotics, Co-trimoxazole displayed significantly higher effectiveness against the isolates compared to Levofloxacin (p-value 0.004). However, in comparison to Nitrofurantoin and Fosfomycin, Co-trimoxazole exhibited lower effectiveness, with respective p-values of 0.000 and 0.007.

Conclusion: The study revealed that the susceptibility of bacterial isolates to Co-trimoxazole is significantly higher than that to Levofloxacin but lower than that to Nitrofurantoin and Fosfomycin.

KEYWORDS: Urinary Tract Infections, Drug Resistance, Culture And Sensitivity, Minimum Inhibitory Concentration

This article may be cited as: Qadir H, Suleman S, Falah SF, Faisal MS, Sadia H, Ullah K. Comparison of Susceptibility between Conventional First Line Antibiotic Co-Trimoxazole and Newer Antibiotics in Recurrent Uncomplicated Urinary Tract Infections. J Med Sci 2023 October;31(4):319-324

INTRODUCTION

The discovery of penicillin in the 20th century marked the beginning of the antibiotic era which made a significant contribution to the decline in the rates of morbidity and mortality brought on by previously lethal illnesses. [1] The primary mortality shifted from infectious diseases to cardiovascular disease, stroke, and cancers in the United States (U.S.), while the average life expectancy at birth climbed to 78.8 years, and the senior population increased from 4% to 13%. [2] Unfortunately, the vast benefits of having access to antibiotic therapy are threatened by the rise of resistance in healthcare settings and the general population. [3] Currently, we are battling resistant strains causing infections most of which are essentially incurable. [4] Almost 17 million people die from bacterial infections each year. Infectious diseases are now the second leading killer in the world, third in developed countries, and fourth in the U.S. [5] Antibiotic resistance poses a serious risk to global

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Date Received: 08-07-2023
Date Revised: 01-09-2023
Date Accepted: 09-09-2023

mortality and economic burden. The widespread misuse of antibiotics, non-human antibiotic use, poor drug quality, inadequate surveillance, and aspects of individual and societal poverty (poor healthcare standards, malnutrition, chronic and recurrent infections, unaffordability of more expensive and effective drugs) have a more significant impact on developing nations. Furthermore, it is essential to address the scarcity of novel medications and manage resistance effectively to prevent the exhaustion of strategies countering it. [6] Antibiotic resistance in urinary tract infections has been rising in a variety of contexts and is linked to worse outcomes, such as symptom persistence, repeated doctor visits, and disease progression brought on by ascending infection. [7, 8] UTIs, without any anatomical or functional abnormality are categorized as uncomplicated urinary tract infections (uUTIs). When at least three UTI episodes occur within 12 months or at least two episodes occur within 6 months; it is labeled as Recurrent UTI (rUTI) which is challenging to manage. [9-11]

Drug discovery, resistance monitoring, and combinations of novel approaches to decrease resistance are only a few of the measures that will ultimately be needed to control resistance. One component of the comprehensive approach can be a reuse of the old "forgotten" medications. [12,13] Co-trimoxazole is the combination of Trimethoprim (TMP) and Sulfamethoxazole (SMX), which was once a very commonly prescribed combination antibiotic with a better safety and efficacy profile. TMP and SMX both work by obstructing particular mechanisms that produce metabolically active folate.[14] Traditionally used as first-line treatment in the empirical management of uUTIs, Co-trimxazole is no longer regarded as first-line therapy because of reported resistance higher than 20%. However, this medication is still among the antibiotics that can be regularly used to treat UTIs.[15] Bacteria will inevitably adapt to therapies, therefore to stay ahead of the game, our techniques for dealing with resistance must also change. This study aimed to assess the antibacterial effectiveness of Co-trimoxazole and compare it with commonly prescribed antibiotics like Levofloxacin, Nitrofurantoin, and Fosfomycin. The fundamental approaches for assessing the susceptibility of bacteria to antibiotics are the Minimum Inhibitory Concentration (MIC) and the Disk diffusion methods. We chose MIC because it accurately measures the antibiotic concentration required to inhibit bacterial growth. This precision is particularly valuable when dealing with resistant bacterial strains, as it enables us to determine the exact susceptibility of these bacteria to antibiotics.

MATERIAL AND METHODS

The study was conducted in Mardan Medical Complex, Mardan, and the Postgraduate Medical Education Department of Khyber Girls Medical College, Peshawar, Pakistan. Ethical and institutional approvals were obtained from the review board of Khyber Medical University (No. DIR/KMU-AS&RB/CS/001660). A standardized proforma was filled from clinically diagnosed cases of recurrent uncomplicated UTI who were advised a urine culture and sensitivity test. Colonies from culture-positive samples were collected and stored for bacterial identification, antibiotic susceptibility, and MIC testing following the Clinical and Laboratory Standards Institute (CLSI) guidelines (M100-S31, M07-A9). [16, 17] The samples were inoculated onto CLED (Cysteine-Lactose-Electrolyte-Deficient Agar) and incubated at 37°C for 24 hours. The bacteria were identified by Gram staining and BIOMÉRIEUX® API® 10S kits. The basal media used for Agar dilution was Mueller-Hinton (MH) and was determined based on the type of organism. The pure antibiotic powder was sourced from a pharmaceutical company and stock solutions were prepared with concentrations of 1000μg/ml for Co-trimoxazole, 10μg/ml for Levofloxacin, 1020μg/ml for Nitrofurantoin and 1020μg/ml for Fosfomycin. Glucose 6 Phosphate at a concentration of 25mg/L was also added to the agar for Fosfomycin. Five serial dilutions of different concentrations were prepared for each antibiotic. For every stored sample, fresh sub-cultures were grown on CLED media. Colonies of bacteria were inoculated in distilled water (5ml) and the turbidity was adjusted to 0.5 McFarland Standard. Starting from the lowest concentrations, 2µl of inoculum was placed on properly labeled specific areas of agar plates. The plates were allowed to set at room temperature until the inoculum spots were dry, followed by incubation at 37°C for 18-24 hours. Following the incubation period, the Minimum Inhibitory Concentration (MIC) was determined as the antibiotic concentration at which the growth of an isolate was arrested, and no discernible presence of a faint haze or the growth of a solitary colony was detected (Figure 1). The growths were also cross-checked with the control plates. For statistical analysis of comparison among susceptibilities of isolates, the chi-square test was applied.

RESULTS

In the Microbiology laboratory of Mardan Medical Complex, a total of 680 samples were received, of which 158 samples tested positive for bacterial culture. Among the individuals included in the study, 100 (63.3%) were females, and prevalent bacterial isolates from this group included E. coli, Klebsiella, and Proteus species. Moreover, 58 individuals (36.7%) were males, and the most commonly isolated bacteria from this group were Pseudomonas, Enterococci, and Citrobacter. E. coli emerged as the predominant organism, accounting for 74% of the isolates, followed by Klebsiella, Enterococci, Pseudomonas, Proteus species, and Citrobacter, as illustrated in Figure 2.

Against the isolated organisms, Co-trimoxazole displayed MIC values of 40μg/ml (77.2%), 80μg/ml (10.8%), and 100μg/ml (12%). Levofloxacin exhibited MIC values of 0.5μg/ml (50.6%), 1μg/ml (1.9%), 2μg/ml (27.2%), and 4μg/ml (20.3%). Nitrofurantoin had MIC values of 32μg/ml (84.8%), 64μg/ml (1.9%), and 128μg/ml (13.3%). Fosfo-

mycin showed MIC values of 64μg/ml (89.9%), 128μg/ml (0.6%), and 256μg/ml (9.5%), as depicted in Table 1. For the purpose of statistical comparison, intermediate sensitivity was also considered as sensitive, while all concentrations classified as resistant to isolates were included in the resistant group, as represented in Table 2.

When comparing Co-trimoxazole to Levofloxacin, a total of 72 isolates were sensitive while 25 isolates were resistant to both antibiotics. The sensitivity to Co-trimoxazole was significantly higher than that of Levofloxacin, with a p-value of 0.004. In comparison with Nitrofurantoin, 113 isolates were sensitive and 12 isolates were resistant to both antibiotics, with a p-value of 0.000. Similarly, when comparing Co-trimoxazole to Fosfomycin, 115 isolates were sensitive and 8 were resistant to both with a p-value of 0.007. It is worth noting that the sensitivity was significantly higher for Nitrofurantoin and Fosfomycin compared to Co-trimoxazole. Further details can be found in Table 3.

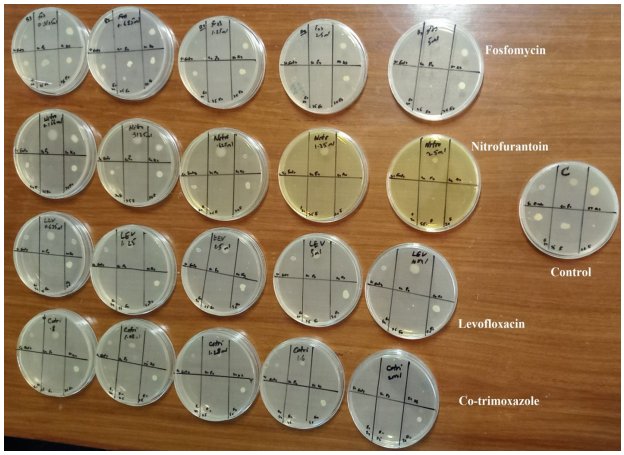

Fig 1: Showing Agar plates of Co-trimoxazole, Levofloxacin, Nitrofurantoin, and Fosfomycin. The plates are labeled with concentrations and types of bacteria. The growth of colonies can be seen at different concentrations and control plates after incubation for 18-24 hours at 37°C.

DISCUSSION

In empiric antibiotic therapy, treatment choices are educated guesses based on the relative frequency of the bacteria causing the infection and their rates of resistance. Guidelines for empiric antibiotic therapy take into account the severity of the infection as well as the selection of the most effective drug. In the current study, the MIC agar dilution method revealed that 77.2% of the isolates were sensitive to Co-trimoxazole at a concentration of 40μg/ml, while concentrations of 80μg/ml and higher were associated with a resistance rate of 22.6%. This type of susceptibility pattern has also been identified in a meta-analysis in Korea that concluded almost 40% resistance to Co-tri-

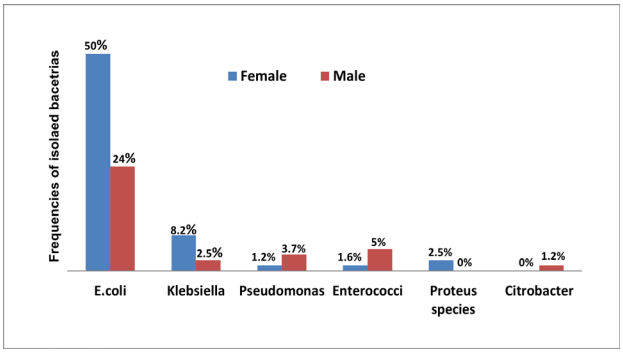

Fig 2: Organisms isolated from study samples with gender-wise distribution. Escherichia coli (E. coli), Klebsiella pneumonia (klebsiella), Pseudomonas aeruginosa (pseudomonas), Enterococcus Species (enterococci), Proteus species and Citrobacter

Table 1: Susceptibility pattern of selected antibiotics at various MIC

Class of Antibiotic	Antibiotic	MIC	Susceptibility	N (%)
Folate pathway inhibitors	Co-trimoxazole	40	S	122 (77.2)
		80	R	17 (10.8)
		100	R	19 (12)
Fluoroquinolones	Levofloxacin	0.5	S	80 (50.6)
		1	IS*	3 (1.9)
		2	R	43 (27.2)
		4	R	32 (20.3)
Nitrofurans	Nitrofurantoin	32	S	134 (84.8)
		64	IS*	3 (1.9)
		128	R	21 (13.3)
Phosphonic acid derivative	Fosfomycin	64	S	142 (89.9)
		128	IS*	1 (0.6)
		256	R	15 (9.5)

*The intermediate sensitivity was considered as sensitive

MIC-Minimum Inhibitory Concentration, S-Sensitive, IS-Intermediate Sensitive, R-Resistant

MIC is measured in μg/ml; Numerical values are expressed in frequencies and percentages

Table 2: Susceptibility pattern of bacterial isolates

Antibiotics	Susceptibility N (%)	
	Sensitive	Resistant
Levofloxacin	83 (52.5)	75 (47.5)
Co-trimoxazole	122 (77.2)	36 (22.8)
Nitrofurantoin	137 (86.7)	21 (13.3)
Fosfomycin	143 (90.5)	15 (9.5)

Numerical values are expressed in frequencies and percentages

Table 3: Comparison between effectiveness of study antibiotics and Co-trimoxazole

Study antibiotics		Co-trimoxazole		Total	X2	p-value*
		Sensitive	Resistant			
Levofloxacin	Sensitive	72	11	83	9.0	0.004
	Resistant	50	25	75		
Nitrofurantoin	Sensitive	113	24	137	16.25	0.000
	Resistant	9	12	21		
Fosfomycin	Sensitive	115	28	143	8.791	0.007
	Resistant	7	8	15		

*Calculated by Chi-square

Numerical values are expressed in frequencies

moxazole but also reported a significant decrease in rates of resistance per year. [18]

Another study reported susceptibility rates of 72.9% for E. coli and 89.8% for Klebsiella to Co-trimoxazole, which is consistent with our findings. [19] However, a meta-analysis conducted in Iran reported a Co-trimoxazole resistance rate of 64%, which contrasts with our findings. [20] The sensitivity pattern of Levofloxacin (50.6%) is similar to a study that found sensitivities of 64.5% and 47.9% for species such as E. coli and Klebsiella, respectively. [21]

The MIC at which Levofloxacin exhibited resistance was 2μg/ml and higher, affecting a total of 47.5% of the reported organisms. An Egyptian study reported similarly elevated rates of Levofloxacin resistance in E. coli (56.34%) and Klebsiella (86.2%). However, studies conducted in other parts of the world reported very high susceptibility of bacteria to Levofloxacin, such as 94.7% in Yemen and 85% in Libya. [22-24] Drugs like Nitrofurantoin and Fosfomycin are now considered the first-line treatment options for uncomplicated urinary tract infections. [9, 13] In the current study, Nitrofurantoin displayed 84.8% sensitivity at a concentration of 32μg/ml, while 13.9% of organisms were resistant at a concentration of 128μg/ml. Similar findings were reported in Bangladesh showing 16.10% resistance to E. coli and 75% susceptibility to species like pseudomonas. Contrary to this, an Indian study reported a lower susceptibility of 62% to Nitrofurantoin. [25, 26]

Our observation of 89.9% sensitivity to Fosfomycin at a concentration of 64μg/ml aligns with the findings of many studies reporting variable sensitivities ranging from 86% to 95% and cure rates of up to 90% in UTIs caused by E. coli. [27, 28] Despite higher rates of susceptibility to Nitrofurantoin and Fosfomycin, the therapeutic outcomes may differ among women with uncomplicated UTIs. A 5-day Nitrofurantoin regimen has a lesser chance of recurrent infection as compared to a single dose of Fosfomycin. [29] Keeping in view the resistance pattern of antibiotics in this study, the detection of resistant genes to Fosfomycin, Co-trimoxazole, Fluoroquinolones, and Nitrofurantoin should be taken into consideration as suggested in many studies.[30-32]

The findings from a study conducted in 2021, which reported susceptibility rates of 24%, 24.4%, 35.6%, and 45.8% for Levofloxacin, Co-trimoxazole, Nitrofurantoin, and Fosfomycin, respectively, align with our recommendation to prioritize Co-trimoxazole over Levofloxacin, but not over nitrofurantoin and fosfomycin. Co-trimoxazole has shown promising results in treating UTIs in areas where resistance is more than 20% but it is still not recommended as First-line empiric therapy for recurrent uncomplicated UTIs. [18, 32-35]

CONCLUSION

In our study cohort, the bacterial isolates showed appreciably higher susceptibility to Co-trimoxazole compared to Levofloxacin (a Fluoroquinolone). However, it remained inferior to the susceptibility rates observed for Nitrofurantoin and Fosfomycin. Given the guideline that antibiotics exhibiting resistance levels surpassing 20%

should be avoided for empirical therapy, the presence of a 22.8% resistance rate to Co-trimoxazole discourages its consideration as an empirical antibiotic option. However, it can be preferred over Levofloxacin in recurrent uncomplicated UTIs.

ACKNOWLEDGMENT

We are thankful to the laboratory staff of Mardan Medical Complex and Khyber Girls Medical College for providing technical support.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Qadir H:	Data Collection, data analysis manuscript writing
Suleman S:	Concept, supervision
Falah SF:	Technical support, data analysis
Faisal MS:	Execution, manuscript writting
Sadia H:	Data Collection, statistical anaylsis
Ullah K:	Data Collection, data anaylsis

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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ORIGINAL ARTICLE

EMPOWERING ADOLESCENTS: EXPLORING MENSTRUAL HYGIENE AWARENESS AND PRACTICES AMONG SCHOOLGIRLS IN PESHAWAR- A CROSS-SECTIONAL STUDY

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ABSTRACT

Objectives: To assess the awareness and practices relating to menstrual hygiene among school-going adolescent girls of Peshawar, Pakistan

Materials and methods: A cross-sectional institution-based research was employed in Hayatabad, Peshawar, from February 2022 to July 2022. The selection of the four schools was done through a multi-stage sampling technique. Data was collected from 200 adolescent girls through self-administered questionnaires and statistical analysis was done using SPSS. Descriptive data was expressed in the form of mean ±SD, frequencies, and percentages. A chi-square test was applied to find the association between sociodemographic factors and menstrual hygiene practices. A p-value of <0.05 was considered significant.

Results: Out of 200 girls who took part in the study, 120 (60%) exhibited inadequate awareness of menstrual hygiene, while 86 (43%) demonstrated poor hygiene practices during menstruation. 115 (57.5%) knew that hormones were the cause of menstruation. The most frequently used menstrual product was a disposable sanitary pad followed by cloth. The menstrual hygiene practices were significantly associated with the education status of the mother (p= 0.022) and the occupation of the father (p= 0.047).

Conclusion: The results of our study revealed a concerning trend: approximately two-thirds of the respondents exhibited inadequate awareness, while one-third demonstrated suboptimal hygiene practices related to menstruation. This demonstrates the need to make efforts to educate adolescent girls about more hygienic and safer methods of managing menstruation and such products are made more affordable and accessible to them.

Keywords: Awareness, practices, menstrual hygiene, adolescent girls, menstruation

This article may be cited as: Mahmood U, Hifsa, Qazi B, Akhtar I, Rehman SU, Asim M, Mustafa P, Iqbal HS, Zafar K, Junaid M. Empowering adolescents: Exploring menstrual hygiene awareness and practices among schoolgirls in Peshawar- a cross-sectional study. J Med Sci 2023 October;31(4):325-329

INTRODUCTION

The menstrual cycle is a natural physiological process occurring in the females which requires proper awareness and management. Menstrual hygiene management (MHM) has been defined by UNICEF as "Women and adolescent girls are using a clean menstrual management material to absorb or collect menstrual blood, that can be changed in privacy as often as necessary for the duration of a menstrual period, using the soap and water for washing the body as required and having access to facilities to dispose of used menstrual management materials''. [1] To cope with menstruation, different strategies are adopted by young girls and women throughout the world depending upon their socioeconomic status, available resources, education and knowledge, personal preferences, beliefs, and traditions.

Menstruation marks the beginning of a woman's reproductive years where teenage girls are usually unprepared or uneducated about it, and the primary reason for this is that there is a prevalent social norm against addressing matters connected to women's reproductive health, including menstruation.[2] A community-based investigation in West Bengal, India showed that 67.5% of the participants had information regarding MHM before the onset of their menses while a study in southern Ethiopia has shown that the percentage of such respondents was 72.3%. [3,4] The U-report poll conducted by the UNICEF on MHM among young girls and women in Pakistan in 2017 showed that 49% did not know about menstruation preceding the menarche and 44% of the adolescents lacked access to fundamental menstrual hygiene facili-

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Date Received: 18-07-2023
Date Revised: 08-8-2023
Date Accepted: 8 -10-2023

ties at home, work, or school. [2] Studies in Pakistan have shown that the commonest source of information for girls regarding menstruation was the mother, preceding their menarche. [5, 6] Several studies have explored the effects of the educational and financial status of parents on the hygiene practices of young girls. [5,7] A study in Pakistan has shown a significant association between mothers' education level and menstrual hygiene practices of young girls (p-value=0.001). [5]

The usage of absorbent varied depending on the settings, with commercial pads frequently used in urban areas while cloths were used in rural areas, according to a meta-analysis of MHM conducted on adolescents. [8] Cloth was used less commonly in school-going girls (pp= 37%) as compared to the general community (pp=68%). According to one study, 39.9% of the high school girls in Western Ethiopia had good practice on menstrual hygiene with two-thirds using commercially available sanitary pads as absorbent material with half of them changing their pads thrice or more per day. [7] In a study conducted in Pakistan, the majority reported changing the absorbent pad/ cloth twice a day. The percentage of those who didn't prefer to take a bath during the menstrual period was 58.2%, but the majority practiced cleanliness of their genitalia with 57.6% using only water for this purpose. [6] A study in Peshawar has shown that sanitary pads were used by 77% of the respondents while 20% used cloth as an absorbent. [9]

Unhealthy menstrual practices have many medical implications like different urinary and reproductive tract infections such as bacterial vaginosis and Candida infections. [10] The importance of menstrual hygiene management increases even further for school-going girls because of a lack of adequate guidance and facilities at school. [11] Hence, this study aimed to contribute to the emerging literature by surveying school-going adolescent girls of Peshawar, Pakistan to determine their level of awareness and practices about menstrual hygiene, as well as to investigate the relationship between various sociodemographic characteristics and menstrual hygiene practices.

MATERIALS AND METHODS

This cross-sectional study was conducted on the adolescents who were currently enrolled in the schools of Hayatabad, which is a suburb on the western outskirts of Peshawar, the capital of Khyber Pakhtunkhwa province of Pakistan from February 2022 to July 2022. The selection of these four schools was accomplished by the use of a multi-stage sampling procedure. 50 students from each school were recruited through systematic random sampling.

The study participants of this research were adolescent girls 14- to 18 years old who were enrolled in either public or private institutions of the above-mentioned study area. However, those adolescent girls who had not yet undergone menarche, who were absent on the day of data collection, and who declined to take part in the study were excluded. The required sample size was calculated using open epi version 3.01. The prevalence was taken to be 15.6% and taking the confidence limit was +/- 5%. [12] The required sample size came out to be about 200. After obtaining informed consent, 50 eligible students were recruited from each institute using systematic random sampling from the class registers of 9th to 12th grades.

Data was collected through a pre-tested self-administered questionnaire with close-ended questions. The questionnaire was translated from English into Urdu by a linguistics expert to be easily understood by the students. The accuracy of the translation and their meanings was made certain by translating it back into English. The questionnaire comprised four domains i.e., socio-demographic profile, questions related to the respondents' menstrual history, and questions related to the awareness and practices about MHM. The questionnaires were adapted with a few modifications from relevant literature. [3, 4, 6, 7] The socio-demographic profile was evaluated using personal information (age, class, parents' education, and occupation). Education status was classified as being literate (able to read and write) and illiterate (unable to read and write). Occupation status was classified as blue-collar workers (engaged in manual labor) and white-collar workers (working in an office setting). The respondent's menstrual history was determined by questions about age at menarche, duration of menstrual bleeding, and regularity of cycles.

The menstrual hygiene awareness and practices score was calculated from 6 awareness-related and 8 practice-specific questions. 1 point was given to correct responses and 0 points for other responses. In light of this, the cutoffs for awareness and practices were chosen based on the mean score of 3.13±1.42 and 3.7±1.2 respectively. A score of 4-6 points was good awareness while 0-3 points was poor awareness. Those who scored between 4 and 8 points were considered to have good hygiene practices, whereas those who scored between 0 and 3 points were considered to have poor hygiene practices.

The process of data collection was completed in two months i.e., April 2022 to May 2022. The questionnaires were distributed among the students on the assigned date. 15-20 minutes were given for filling out the questionnaires after which the questionnaires were collected by the researchers on the same day. Any incompletely filled questionnaires were returned for completion. Every student was given a unique ID number.

The data was analyzed with SPSS software version 22.0 and results were expressed in the form of mean, frequency, and percentage. A chi-square test was applied

to find an association between sociodemographic aspects and menstrual hygiene practices. A p-value of <0.05 was considered significant. After the completion of data entry, they were checked for any missing values. Luckily, no missing values were reported.

Several steps were taken to comply with the ethical considerations of research. The study protocol was reviewed and approval for data collection was granted by the institutional research and ethics board (IREB) of Khyber Medical College, Peshawar. Informed verbal consent was taken before data collection and confidentiality of the respondents was maintained throughout the study.

RESULTS

All 200 of the respondents laid in the range of 14-18 years of age out of which the majority (71, 35.5%) were aged 16 years. The mean age of the respondents was 16.53± 1.03 years. The menarche was reported at 12.82 ± 1.103 years. The majority of the fathers i.e., 187 (93.5%) were literate while among the mothers of the respondents, only 100 (50%) were literate. Regarding the occupation of fathers, 136 (68%) were white-collar workers, 40 (20%) were blue-collar workers and 24 (12%) were jobless. The majority i.e., 179 (89.5%) of the mothers were housewives, 16 (8%) were white-collar workers and 5 (2.5%) were blue-collar workers.

One-hundred and one (50.5%) respondents were aware of menstrual hygiene before the occurrence of their first periods, in which mothers, elder sisters, friends, relatives, and media were the sources of information in 45 (44.5%), 23 (22.8%), 22 (21.8%), 8 (7.9%) and 3 (3.0%) girls respectively as compared to 99 (49.5%) who were unaware about it. Regarding the cause of menstruation, 115 (57.5%) knew it was due to hormonal changes in the body, 71 (35.5%) did not know the cause, 13 (6.5%) believed it was a curse of God while 1 respondent (0.5%) thought it was a disease. About the organ of origin of menstrual blood, 88 (44%) did not know the answer to it, 54 (27%) thought it was from the vagina, 47 (23.5%) knew it was from the uterus, 10 (5%) thought it was from the bladder while one respondent (0.5%) gave some other option (Table 1).

Disposable sanitary pads were the most used absorbent during menstruation (141,70.5%) out of whom 35 respondents also used cloth on some occasions. 51 (25.5%) used only cloth/towel, 6 (3%) used some form of reusable sanitary pads, 1 respondent (0.5%) used tissue paper alone and 1 (0.5%) used only underwear. Of those who used cloth or reusable sanitary pads (92, 46%), the majority washed them with soap and water and dried them in sunlight (table 2). The most common reason for preferring disposable sanitary pads was “its ease of use” and the most common reason for preferring cloth/towel was its “ease of availability”. 129 (64.5%) of the respondents didn’t take a bath during menstruation. When asked about cleaning their genital area during menstruation, 116 respondents (58%) washed with water only, 46 (23%) with tissue paper, 26 (13%) with water and soap/ antiseptic solution, 9 (4.5%) did not clean while 3 (1.5%) used some other method. 74 (37%) respondents changed the absorbent thrice or more than thrice a day, 75 (37.5%) changed twice a day and 51 (25.5%) changed only once a day. Disposal of used sanitary pads was mostly in the dustbins (table 2).

A significant association was found between menstrual hygiene practices and mothers’ education (p-value= 0.022) and the occupation of the father (p-value= 0.047) (table 3). There was no substantial association with the age of the respondents (p-value= 0.320), class of the respondents (p-value= 0.568), and attending public or private institutes (p-value= 0.571).

DISCUSSION

Our results showed that 50.5% of the respondents were aware of menstruation before their menarche which aligns with another study in Peshawar where 45.7% of the subjects exhibited pre-menarche awareness. [9] This suggests that a considerable portion of girls may have lacked access to information or resources that could have helped them understand their menstrual health in a better way.

In our study, most girls were informed by their mothers, consistent with other studies. [4, 5, 8] This is because mothers are the nearest family members with whom girls can easily share their problems. Parallel to our results, other studies conducted in western Ethiopia, Quetta, and Peshawar, showed that the majority of the respondents knew that hormones were the cause of menstrual bleeding. [6, 7, 9]

Our finding about the type of menstrual hygiene material used aligns with several other studies in which commercially made sanitary pads were the most used absorbent while other alternatives were old cloths, towels, cotton wool, or tissue. [4, 6, 7, 9, 14] Nevertheless, in some studies, cloth has been reported to be more commonly used than commercially made sanitary pads. [3, 15–17] According to our study, the majority of the respondents didn’t take a bath during menstruation which might be ascribed to different cultural beliefs. Overall, 57% of the girls had good menstrual hygiene practices which is contrary to other studies in which only 40% of the respondents had good menstrual hygiene practices. [4, 7]

We found in our study that menstrual hygiene practices were significantly associated with the education of the mother and the occupation of the father. This is because literate mothers can better educate their daughters about how to manage their menstruation safely and comfortably. Our findings are similar to other studies which displayed a significant positive association between good knowledge and practices of menstruation and the educa-

Table 1: Awareness of school-going adolescent girls regarding menstrual hygiene

Awareness of school-going adolescent girls regarding menstrual hygiene	Correct response (1 point)	Number, % (N=200)
Awareness about menstruation before menarche	Yes	101, 50.5%
Education level of the person who informed	Literate	75, 37.5%
Cause of menstruation	Hormones	115, 57.5%
Organ of origin of menstrual blood	Uterus	47, 23.5%
Noticing physical changes in the body	Yes	104, 52%
Awareness about good diet	Yes	183, 91.5%
Awareness summary	Good awareness= 80 (40%) Poor awareness= 120 (60%)	

Table 2: Practices of school-going adolescent girls regarding menstrual hygiene

Practices of school-going adolescent girls regarding menstrual hygiene	Correct response (1 point)	Number, % (N=200)
Type of menstrual hygiene material used	Disposable sanitary pads	141, 70.5%
Frequency of changing the absorbent material	Thrice or more than thrice a day	74, 37%
Washing and reusing the absorbent cloth	With soap and water	77, 38.5%
Method of drying the absorbent cloth	In the sunlight	64, 32%
Taking a bath during menstruation	Yes	71, 35.5%
Cleaning genital area during menstruation	Yes, with soap and water	26, 13%
Storing unused/ reusable menstrual hygiene materials	Cupboard	140, 70%
Disposing of the used menstrual hygiene material	Dustbins	155, 77.5%
Practices summary	Good practices=114 (57%) Poor practices= 86 (43%)	

Table 3: Association between sociodemographic factors and menstrual hygiene practices

Characteristics		Menstrual hygiene practices		P value
		Good practices	Poor practices	
Education of mother	Literate	65 (65.0%)	35 (35.0%)	0.022
	Illiterate	49 (49.0%)	51 (51.0%)	
Occupation of father	White collar worker	84 (61.8%)	52 (38.2%)	0.047
	Blue-collar worker/ jobless	30 (46.9%)	34 (53.1%)	

tion of the mother. [5, 7] Similarly, the occupation of the father affects the financial position of the family which has an impact on the affordability of safer hygiene products.

CONCLUSION

In light of our findings, a considerable percentage of school-going girls lagged regarding the awareness and practices of menstrual hygiene which makes it evident that implementing comprehensive menstrual hygiene education programs in schools is crucial to equip adolescent girls with knowledge and promote the adoption of hygienic and safer methods for managing menstruation. Menstrual hygiene products should be made accessible and affordable to make menstruation a comfortable experience for young girls. Mothers can play a pivotal role by providing correct and age-appropriate information about menstruation and addressing any questions or concerns the girls may have. Replication of a larger sample size and different ethnic groups along with qualitative studies should be conducted to explore the barriers towards inadequate menstrual hygiene management and efforts should be made to overcome those barriers.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Mahmood U:	Drafting the manuscript, analysis and interpretation of data
Hifsa:	Analysis and interpretation of data
Qazi B:	Analysis and interpretation of data
Akhtar I:	Critical revision of the draft
Rehman SU:	Acquisition of data
Asim M:	Acquisition of data
Mustafa P:	Acquisition of data
Iqbal HS:	Drafting the manuscript
Zafar K:	Critical revision of the draft
Junaid M:	Critical revision of the draft

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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ORIGINAL ARTICLE

THE EFFECTIVENESS OF CEFTRIAXONE AND MEROPENEM IN THE TREATMENT OF ENTERIC FEVER IN CHILDREN- EXPERIENCE IN A TERTIARY CARE HOSPITAL IN PAKISTAN

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ABSTRACT

Objectives: To determine the effectiveness of ceftriaxone and Meropenem in the treatment of Enteric Fever in the Paediatric Department of Khyber Teaching Hospital Peshawar.

MATERIALS AND METHODS: This cross-sectional descriptive study was conducted at the Department of Child Health Khyber Teaching Hospital Peshawar Pakistan from June 2020 to June 2022. The sample size included 392 patients. Keeping in view 392 blood samples were taken and sent for blood culture. Both positive and negative cultures were incorporated in the study. The patients were started empirically on ceftriaxone and then in case of no response, the patients were shifted to Meropenem based on the sensitivity of the culture report. The response was defined as when the patient is afebrile for 72 hours after the treatment and the absence of complications like peritonitis, intestinal hemorrhage, and obtundation. Data was analyzed using SPSS version 21.0.

RESULTS: In our study, out of 392 patients, 64% were males while 36% were females. Among blood cultures sent, 16.8% were positive and 83.2% were negative. Among the culture positive, 10.5% of patients were sensitive to Meropenem, 3.6% were sensitive to ceftriaxone and 2.8% were sensitive to other drugs. 60.7% of patients responded to Meropenem. Ceftriaxone-responsive patients were 11.7%, while 27.6% showed a response to other drugs.

CONCLUSION: The efficacy of Meropenem was significantly high (in 2/3rd patients) while Ceftriaxone showed 11.73% efficacy.

KEYWORDS: Enteric fever, Ceftriaxone, Meropenem

This article may be cited as: Afridi JM, Amir S, Pervez S, Rahman SKU. The Effectiveness of Ceftriaxone and Meropenem in the treatment of enteric fever in children- experience in a tertiary care hospital in Pakistan. J Med Sci 2023 October;31(4):330-334

INTRODUCTION

Enteric fever also called typhoid fever caused by the rod-shaped gram-negative bacteria Salmonella enterica serovar Typhi is a life-threatening systemic infection. The presentation of enteric fever differs in children from that in adults.[1] Children present with fever, abdominal pain, diarrhea, vomiting, hepatosplenomegaly, anaemia, and thrombocytopenia.[2, 3] S typhi is frequently cultured during the first week of illness in blood. It is important to diagnose the infection clinically and via blood culture as soon as possible and to institute appropriate therapy to minimize the risk of adverse outcomes and mortality associated with the disease.

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Date reviewed: 28/09/2023
Date accepted: 20/10/2023

According to WHO, about 11 to 21 million cases of Typhoid Fever are reported annually and the death toll ranges from 12,8000 to 161,000 annually.[4] South Asia has been the focal point where maximum numbers of typhoid fever cases have been found and resistant bacterial strains have become a serious issue.[5] For the developing countries it poses a major problem because of poor sanitation and public health standards. [6] Antibiotics are prescribed indiscriminately for all febrile illnesses. This misuse has led to the emergence of antibiotic-resistant strains. [7]

In the last 20 years, multiple outbreaks of multidrug-resistant S. typhi of the HS8 genotype have occurred in different parts of the world. [8, 9] These organisms are resistant to ampicillin, chloramphenicol, and trimethoprim-sulfamethoxazole, which are regarded as 1st line antimicrobials for typhoid fever. Similarly, the strains resistant to fluoroquinolones have also emerged. [10, 11]

Ceftriaxone and Meropenem are two commonly used antibiotics used these days in the treatment of enteric fever. Ceftriaxone is a 3rd generation cephalosporin while Meropenem is a carbapenem antibiotic.[12, 13] One common subject of interest regarding the treatment of en-

teric fever in children that existed among medical professionals for several years is the efficacy of ceftriaxone and Meropenem. [14] Both antibiotics seem to be efficacious in the treatment of disease, but the optimal choice of antibiotics in children remains unclear.[15] Several studies have been run in children to study the effectiveness of ceftriaxone and Meropenem.[16]

The results depended upon the patient's age, severity of illness, and resistance patterns of bacteria. All these factors were taken into consideration. [12] To find out the best treatment option for children with enteric fever more research is required, furthermore, this disease needs continued monitoring regarding the efficacy of ceftriaxone and Meropenem. [13]

This study was conducted to see the effectiveness of ceftriaxone and Meropenem in enteric fever based on clinical and microbiological remission, shortened hospital stay, and lower chances of relapse. This will help us to formulate a standardised protocol to treat enteric fever thus preventing further antimicrobial resistance in the best interest of the patients.

MATERIALS AND METHODS

This cross-sectional descriptive study was conducted at the Department of Paediatric, Khyber Teaching Hospital Peshawar, Pakistan from June 2020 to June 2022. The sample size included 392 patients. Patients aged more than 6 months and less than 15 years of both genders and those cases presenting with signs and symptoms of enteric fever such as fever, vomiting, and abdominal pain were included. Both positive and negative cultures were incorporated in the study. The patients were started empirically on ceftriaxone and then in case of no response or on the basis of drug sensitivity in the culture report were shifted to Meropenem.

A nonprobability consecutive sampling technique was used for sample taking. Data was entered and analyzed using SPSS version 21.0. Percentages were calculated for categorical variables. A chi-square test was employed where needed. P value < 0.05 was taken as significant.

RESULTS

Table 1 shows the demographic characteristics, clinical presentation, and antibiotic sensitivity of salmonella to Ceftriaxone and Meropenem.

Gender and age-wise percentages with association to drug response have been shown in Table 2. In those with a positive blood culture, 14.3% were sensitive to ceftriaxone, while 80.5% were sensitive to Meropenem, and 12.2 % were sensitive to other drugs. Overall, 7.6% responded to ceftriaxone, 56.1% responded to Meropenem, and 36.4% responded to other drugs. In those with a negative blood culture, 12.6% responded to ceftriaxone,

Table 1: Baseline characteristics of the participants

Demographics		Subgroups	N	%
		Male	251	64.0%
		Female	141	36.0%
		1 - 5 Years	123	31.4%
		6 -10 Years	202	51.5%
		11 - 15 Years	67	17.1%
Symptoms	Fever		392	100.0%
	Vomiting		172	43.9%
	Abdominal Pain		114	29.1%
	Diarrhea		42	10.7%
	Constipation		25	6.4%
	Toxicity		45	11.5%
	Headache		34	8.7%
	Obtundation		4	1.0%
Drug Sensitivity and Response to Treatment	Blood Culture	Positive	66	16.8%
		Negative	326	83.2%
	Sensitive	Ceftriaxone	14	3.6%
		Meropenem	41	10.5%
		Others	11	2.8%
	Response	Ceftriaxone	46	11.7%
		Meropenem	238	60.7%
			108	27.6%

Table 2: Demographics with association to drug Response

Variables	Subgroups	Drug response						P-value
		Ceftriaxone		Meropenem		Others		
		n	%	n	%	N	%	
Gender	Male	27	10.8%	149	59.4%	75	29.9%	0.341
	Female	19	13.5%	89	63.1%	33	23.4%	
Age in Years	1 - 5 Years	15	12.2%	85	69.1%	23	18.7%	0.052
	6 -10 Years	22	10.9%	120	59.4%	60	29.7%	
	11 - 15 Years	9	13.4%	33	49.3%	25	37.3%	

Table 3 Blood Culture Sensitivity to Different Drugs

Variables	Subgroups	Ceftriaxone		Drug response				p-value
				Meropenem		Others		
		n	%	N	%	n	%	0.158
Blood Culture	Positive	5	7.6%	37	56.1%	24	36.4%	
	Negative	41	12.6%	201	61.7%	84	25.8%	
Sensitivity	Ceftriaxone	2	14.3%	4	28.6%	8	57.1%	
	Meropenem	3	7.3%	33	80.5%	5	12.2%	
	Others	0	0.0%	0	0.0%	11	100.0%	0.000

61.7% responded to Meropenem and 25.8% responded to other drugs. (table 3)

DISCUSSION

Enteric fever also called typhoid fever caused by rod-shaped gram-negative bacteria. Salmonella is a life-threatening systemic infection. Children present with fever, abdominal pain, diarrhea, vomiting, hepatosplenomegaly, anaemia, and thrombocytopenia. Typhoid fever is treated with antibiotics, antipyretics, and IV fluids. Commonly used antibiotics include Fluoroquinolones, Cephalosporins, and carbapenems. Ceftriaxone is a third-generation Cephalosporin antibiotic while Meropenem is a carbapenem antibiotic. Both antibiotics seem to be efficacious in the treatment of disease, but the optimal choice of antibiotics in children remains unclear.

Resistance to third-generation Cephalosporins emerged in 2016, during the epidemic of enteric fever in Karachi and Interior Sindh in Pakistan. [17] Currently, Meropenem and Azithromycin are the most commonly prescribed drugs for the treatment of extensive drug-resistant enteric fever.

A study was conducted in Lahore where blood culture showed positivity for Salmonella in 62 (25.2%) patients, and negativity in 184 (74.8%) patients among 246 children. [18] In our study, 392 patients were enrolled. The mean age of children was 8 ranging between 1 to 15 years. Among them, 141 (36%) were females and 251 (64%) were males. Out of 392 patients' blood cultures showed positivity in 66 (16.8%) patients and negativity in 326 (83.2%). In our study decreased culture positivity rate was due to frequent antibiotic prescriptions already taken by our patients prescribed either by quacks or taken by themselves. A study conducted in Karachi Pakistan showed a culture-positive rate of 22%. [19]

Data derived from population-based research in Vietnam, Delhi, and Egypt showed a blood culture positivity of 8.5%, 5%, and 4.2% respectively in febrile cases. [20] In our study 16.8% of patients were blood culture positive while 83.2% were blood culture negative in febrile patients. A challenge in countries with limited resources like Pakistan is the emergence of resistant strains causing enteric fever. It is endemic in South-East Asia including Pakistan, Nepal, Bangladesh, and India. [21]

In a study conducted in Lahore, ceftriaxone had a sensitivity of 38.7%, which was not comparable with research from central Asia in which ceftriaxone had a sensitivity of 100%. Meropenem was found sensitive in all patients and up till now no resistance has been seen to this drug.[18, 22]

In our study, the response to Ceftriaxone was 11.7% while the response to Meropenem was 60.7% and the response to other drugs was 27.6%. The sensitivity pattern to ceftriaxone was 3.6%, to Meropenem was 10.5%, and 2.8% to other drugs.

In a study conducted in Korea, the efficacy of Ceftriaxone and Meropenem in the treatment of enteric fever in children was 53.6% vs 63.9%.[23-25] This is comparable to our study in which the efficacy of ceftriaxone is 11.73% while the efficacy of Meropenem is 68.79%.

Some of the limitations of this study include a small

sample size and the cross-sectional nature of the study. The study was restricted to one hospital only. Multicentre studies are needed before general guidelines for antibiotic prescription can be made.

CONCLUSION

The emergence of resistant organisms causing enteric fever is on the rise and there is very high resistance to the majority of antibiotics. Ceftriaxone showed 11.73% efficacy in response to enteric fever while Meropenem showed 68.79% efficacy.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Afridi JM: Concept, Critical appraisal, and Discussion Writing

Amir S: Data collection, compilation of results, formatting of the article

Pervez S: Data Collection, Manuscript writing

Rahman SKU: Manuscript Writing, Bibliography

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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ORIGINAL ARTICLE

ENTREPRENEURIAL MINDSET: PERSPECTIVE OF MEDICAL UNDERGRADUATES

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ABSTRACT

Objectives: This study aimed to comprehend the entrepreneurial and abroad practice mindset among Pakistani medical undergraduates and the factors influencing their choices.

Materials and Methods: A cross-sectional survey involving 401 students from various medical and dental colleges in Khyber Pakhtunkhwa, Pakistan, was conducted. Participants completed a questionnaire concerning their career preferences, reasons for working abroad or in private practice, and perceptions of benefits and drawbacks to working in public and private sectors, among other questions. Data was analyzed using the SPSS software (IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp.).

Results: Two hundred and five (205) students preferred postgraduate training, while 168 preferred overseas clinical training. Outpatient services in governmental hospitals were mentioned as a benefit, while a lack of facilities was noted as a hurdle. Twenty-eight (28) students chose private practice due to its appealing work environment. There was no significant association between studying years and preference for working abroad as a clinician, with a p-value of 0.251 regarding barriers in private practice or the type of setup preferred.

Conclusion: Perceptions of general practice among medical students in Pakistan are influenced by various factors, such as income potential, quality of life, and the chance to acquire new skills. The responses reflect the students' inclination towards furthering training and gaining experience in different healthcare setups. Further research may explore how these perceptions affect healthcare delivery within the country.

Keywords: Entrepreneurial Mindset, Overseas Training, Public Sector Benefits, Private Practice Barriers, Postgraduate Training.

This article may be cited as: Haider I, Khan MS, Shafi M, Khan QA, Saeed R. Entrepreneurial mindset: Perspective of medical undergraduates. J Med Sci 2023 October;31(4):335-340

INTRODUCTION

Clinical practice is the work of a doctor treating patients with minor or chronic illnesses or referring them to other structures or specialists if needed. It is the practice of a doctor trained in a wide array of medicine, diseases, procedures, and treatments. General practice is pivotal in the health care system. [1] Healthcare systems focusing on primary care generally produce high-quality, equitable, and efficient care. [2] The current population of Pakistan in 2023 is 240,485,658, with a 1.98% increase from 2022. Of 114 medical colleges in Pakistan, 44 (38%) are public and 70 (62%) are private. Province-wise, Punjab and the Federal area have 62 (53%) medical colleges, including 19 public and 43 private sector medical colleges. Sindh has 26 (23%) medical colleges, including 11 public and 15 private sectors; KPK has 20 (17%) medical colleges, having 10 public and 10 private sectors; Balochistan has 2 (less than 2%) with one public and one private, Gilgit and Azad Jammu and Kashmir (AJK) has 4 (3 %) medical colleges including three public and one private sector medical colleges. [3] During the first two years of medical and dental studies, basic health sciences are taught to the medical undergraduates. Clinical training gradually increases as the year progresses and peaks in the final year of the respective medical undergraduate training programs. Students get more ideas and get familiar with the healthcare system, and they start making up their minds about their entrepreneurship perspectives. They have diverse preferences about future clinical practice; some opt for post-graduation in Pakistan, some for private clinics,

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Date Accepted: 25/10/2023

and some for overseas clinical training. Medical education in Pakistan is currently facing many challenges. Some challenging factors regarding general practice in Pakistan include lack of facilities, long working hours, lack of supervision, etc. Our setup has many advantages of private practice, including high income, better teamwork, less crowding, etc. Many students are interested in working abroad as a clinician mainly due to better financial perspectives, new skills and practices, better life quality, and security perspectives. [4]

Pakistan produces 32,879 doctors yearly, with 40% settling overseas. Pakistan now has 20,000 specialists, almost half of whom are foreign nationals. [5] The best graduate doctors of almost all medical institutes in Pakistan migrate abroad for better jobs and postgraduate training. Indeed, after training abroad in their respective fields, these doctors can potentially transform Pakistan's underdeveloped healthcare system. Being a developing nation with a very limited GDP, Pakistan spends significant public resources to produce doctors; it is reasonable to expect the medical graduates to "payback" to their nation by playing their roles for the greater goal of social good and service to their country instead of the more limited goal of personal benefit. [6, 7]

This study aims to identify medical undergraduates' perspectives on clinical entrepreneurship at different study phases, explicitly identifying key factors influencing their views. The rationale of this study is to acquire knowledge about clinical entrepreneurship in Pakistan and the career choices of medical undergraduates of public and private sector medical colleges in Pakistan.

MATERIALS AND METHODS

This cross-sectional study was conducted on willing students of medical and dental colleges of Khyber Pakhtunkhwa, Pakistan. A written informed consent was mandatory for each participant to participate in this research. Ethical approval was availed for this study from the institute's Institutional Review and Ethical Board (IREB) (Ref. No. 387/DME/KMC Dated 27-06-2023). The duration of this study was two months. OpenEpi.com calculated the sample size, and regarding a local study from Karachi by Mustafa S, it turned out to be 401. A convenient sampling technique was utilized for this research. Medical undergraduates of 3rd, 4th, and final year MBBS and dental undergraduates of 3rd and final year BDS, both from public and private sectors of Peshawar, Pakistan, were included in this study. The questionnaire was developed on the AMEE Guideline No. 87 framework. [8] This questionnaire underwent face and content validity by pilot study and subject medical experts by Lynn criteria, with 0.80 of CVI as the threshold. [9] Both online and hard copies of the questionnaire were utilized to collect the data. Data was collected through a comprehensive survey among medical undergraduates, covering diverse variables related to abroad practices and entrepreneurial aspirations. This data was then entered and analyzed in SPSS version 26.0 for all the relevant variables. Frequency tables were employed to present the distribution of responses across different categories. Additionally, Chi-Square tests were conducted to explore the relationships between various factors.

RESULTS

Four hundred and one public and private medical and dental college students participated in this study. Amongst them, 177(44.1%) were males, and 224 (55.9%) were females. There were 327(81.5%) medical students and 74(18.5) dentistry undergraduates. Students from public sector were 368(91.8%) and 33(8.2%) from private sector. Thirty-five (9%) participants were third-year students,161(40%) were fourth-year students, and 205(51%) were final-year students. Ten (3%) participants had done A-level while 391 (97%) had done a Higher Secondary School Certificate (HSSC). Forty-one (10%) students had a migration background from other medical colleges to their current institute. Data analysis revealed that 205 (51.1%) students preferred postgraduate training for their general practice, while 168(41.9%) chose overseas clinical training.

The study findings documented that the beneficiary factor undergraduates think regarding government hospitals is increased outpatient services. The challenge regarding general practice in government hospitals is the need for more facilities.

Those undergraduates who opted to study abroad practice were of the view that they could acquire new skills and techniques there. Twenty-eight (7%) undergraduates chose private practice, and they gave the reason for a pleasant environment for the workplace.

The various findings of this study are shown in Figures# 1-6. Broadly, the findings of this study are stratified in the following domains:

Gender and Preference of Practice Setup: The Chi-Square tests revealed a statistically significant association between gender and the preferred type of practice setup (Pearson Chi-Square = 6.155, p = .046). While the linear-by-linear association approached significance (p = .057), the likelihood ratio test also showed significance (p = .045). This suggests that gender might influence the preference for different practice setups, which could interest readers.

Gender and Beneficiary Factors Regarding Government Hospitals: The Chi-Square tests demonstrated a significant relationship between gender and factors perceived as beneficiaries of government hospitals (Pearson Chi-Square = 12.933, p = .012). However, the linear-by-linear association was not significant (p = .734).

These findings indicate that gender might play a role in shaping medical undergraduates' views on the benefits of government hospitals.

Gender and Challenging Factors Regarding General Practice in Government Hospitals: No statistically significant relationship was observed between gender and the perceived challenging factors related to general practice in government hospitals (Pearson Chi-Square = 7.748, p = .101). The linear-by-linear association was also not significant (p = .464). This suggests that gender might not strongly influence how medical students perceive the challenges in government hospital practice.

Gender and Advantages of Private Practice: The Chi-Square tests did not reveal a statistically significant association between gender and perceived advantages of private practice (Pearson Chi-Square = 5.411, p = .248). The likelihood ratio test showed similar non-significance (p = .248), and the linear-by-linear association was also insignificant (p = .170). These findings suggest that gender might not significantly impact medical students' perceptions of the advantages of private practice.

Gender and Influence of Factors on Opinion of Private Practice: No statistically significant association was found between gender and various factors' influence on private practice (Pearson Chi-Square = 4.726, p = .317). The likelihood ratio test and linear-by-linear association also supported this lack of significance (p = .318 and p = .156, respectively). These results imply that gender might not strongly affect how medical undergraduates' opinions of private practice are influenced by different factors.

Studying Year and Preference of Practice in the Future: A cross-tabulation between studying year and preference of practice in the future revealed exciting patterns. While preferences varied across study years, a Chi-Square test did not show a significant relationship (Pearson Chi-Square = 4.751, p = .314).

Studying Year and Reasons for Working Abroad as a Clinician: An analysis of studying year and reasons for working abroad indicated variations in motivations across different academic years. Nevertheless, the Chi-Square test did not yield statistically significant results (Pearson Chi-Square = 16.747, p = .033).

Studying Year and Reasons for Barrier in Private Practice: The relationship between studying year and reasons for barriers in private practice revealed some noteworthy patterns. However, the Chi-Square test did not show significant results (Pearson Chi-Square = 10.208, p = .251). Again, a few cells had expected counts less than 5, potentially impacting the validity of the test.

These results provide insights into the complex interplay of gender, studying year, and various factors related to medical students' perceptions of practice preferences, motivations for working abroad, and barriers to private practice. While some relationships showed statistical significance, the presence of cells with expected counts below 5 raises concerns about the reliability of those results. Further analysis and interpretation considering these limitations are crucial to drawing robust conclusions.

The other essential points elaborated from this study are Main Factors analysis, Staff Behavior Factors, and Advantages of Private Practice. These analyses were based on the type of medical college: Public Sector and Private Sector, highlighting significant associations through crosstab analyses and Chi-Square tests.

MAIN FACTORS ANALYSIS:

The analysis of the main factors revealed that Lack of Supervision and Lack of Facilities were significant concerns among respondents. Within the Public Sector, 56(14.1%) respondents attributed their opinions to Lack of Supervision, while 173 (43.8%) were influenced by Lack of Facilities. In the Private Sector, these percentages were 12.1% and 36.4% respectively. Chi-Square tests indicated statistical significance (Pearson Chi-Square: 6.177, p=0.186) in the association between Main Factors and Type of Medical College, underscoring the varying concerns within these sectors.

STAFF BEHAVIOR FACTORS ANALYSIS:

Regarding Staff Behavior Factors, 10.3% of respondents in the Public Sector were influenced by Irresponsible Staff, compared to 21.2% who cited Unhygienic Hospitals as a significant factor. In the Private Sector, 15.6% considered Irresponsible Staff, while 12.1% identified Unhygienic Hospitals as a concern. The Chi-Square test indicated statistical significance (Pearson Chi-Square: 9.555, p=0.049), suggesting differences in staff behavior perceptions between the two sectors.

ADVANTAGES OF PRIVATE PRACTICE ANALYSIS:

The analysis of the advantages of Private Practice demonstrated that Pleasant Environment and High Income were substantial factors affecting opinions. Within the Public Sector, 40.2% found Pleasant Environment significant, whereas 25.3% valued High Income. In the Private Sector, these percentages were 165(41.1%) and 102(25.4%) respectively. The Chi-Square test indicated statistical significance (Pearson Chi-Square: 4.907, p=0.297), suggesting a noteworthy association between the perceived advantages and type of medical college.

These findings collectively underscore the diverse factors influencing opinions on private medical practice among respondents from different types of medical colleges. The statistically significant associations provide insights into the nuanced perspectives within Public and Private Sectors, shedding light on the multifaceted consid-

erations that shape opinions on private medical practice in the biomedical field.

In summary, the statistical analysis did not reveal significant relationships between studying years, type of medical college, and various factors influencing students' preferences, opinions, and motivations related to their fu-

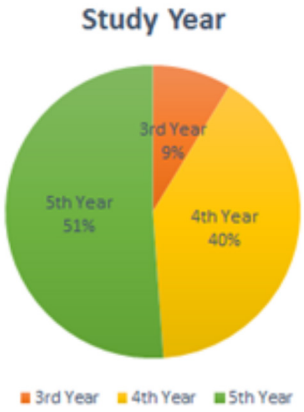

Fig 1: Study Year of Participants

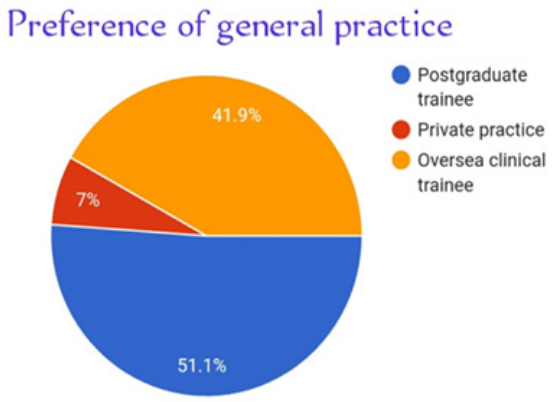

Fig 2: Preference of general practices in study participants

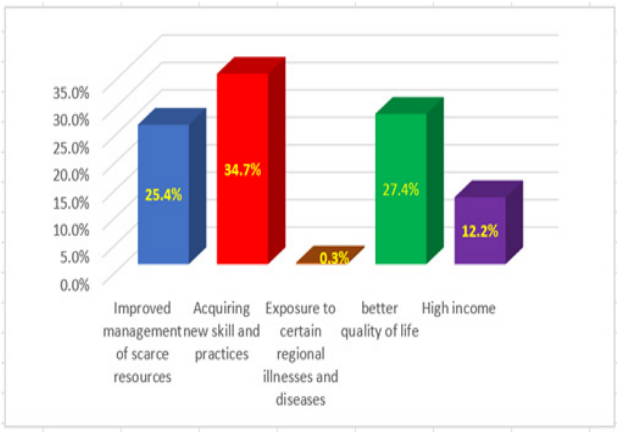

Fig 3: Reasons for working abroad as a clinician

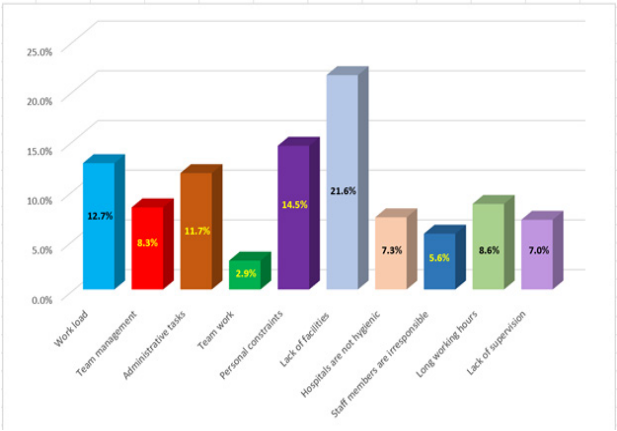

Fig 4: Barriers to private and government practices

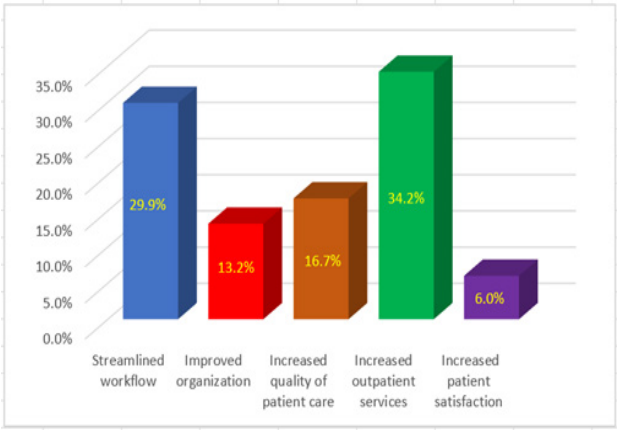

Fig 5: Beneficiary Factors Regarding Government Hospitals

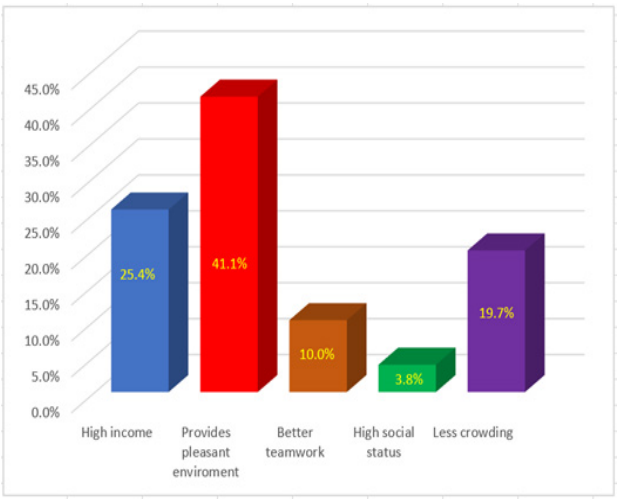

Fig 6: Advantages of Private Setup

ture medical practice setups and decisions.

DISCUSSION

This research analyzes critical factors such as studying years, premedical studies, migration from other medical colleges, gender, preference of practice in the fu-

ture, reasons for working abroad as a clinician, and barriers to private practice. This paper unveils valuable insights into the motivations and perceptions of medical students. The results provide a unique perspective for readers to understand the dynamics of abroad practices and the entrepreneurial mindset among aspiring clinicians.

The available literature on the perceptions of medical undergraduates regarding clinical entrepreneurship and practice abroad in public and private hospitals reveals the following common themes.

1. Awareness and Interest in Clinical Entrepreneurship: Many medical undergraduates need more awareness of clinical entrepreneurship as a career option. A qualitative study by Smith A documented that only a small percentage of medical students had prior knowledge about clinical entrepreneurship.[1] However, there was a positive attitude towards entrepreneurship among those who were aware. [1] Another qualitative study by Johnson J in 2018 highlighted the importance of integrating entrepreneurship education into the medical curriculum to improve awareness and interest.[2]

2. Barriers and Challenges to Clinical Entrepreneurship: Several barriers and challenges were identified by medical undergraduates regarding clinical entrepreneurship. A cross-sectional study by Patel R. reported that lack of business skills and knowledge, limited access to mentors and resources, and fear of failure were common barriers.[3] Another cross-sectional study by Lee S found that medical students perceived lack of time, limited financial support, and lack of role models as significant challenges.[4]

3. Perceptions of Practice Abroad: Medical undergraduates have varying perceptions of practicing abroad in public and private hospitals. A mixed-methods study by Garcia P. reported that medical students perceived practicing abroad as an opportunity for personal growth, exposure to different healthcare systems, and cultural diversity.[6] However, concerns about language barriers, unfamiliar healthcare practices, and social integration were also highlighted.

4. Factors Influencing Decision-Making: Several factors influence medical undergraduates' decision-making regarding clinical entrepreneurship and practice abroad. A qualitative study by Brown J identified financial considerations, career prospects, personal interests, and social support as important factors. [7] Another qualitative study by Martinez C. emphasized the role of mentorship, networking opportunities, and exposure to successful entrepreneurs in shaping students' decisions.[5] These study findings coincide with our study. Moreover, various other studies also validate the findings of the current research. [10, 11] Medical undergraduates are predisposed to international practice opportunities, including clinical rotations or internships abroad. They perceive these experiences as beneficial for their personal and professional development, providing exposure to different healthcare systems and cultures. [12, 13] However, there is also the potential threat of brain drain, and this perspective needs effective management by respective stakeholders. [14] In general, medical undergraduates perceive clinical entrepreneurship in terms of financial independence, clinical acumen, career flexibility, and the ability to contribute to healthcare system improvements. [15, 16] However, they also raised concerns regarding the need for more supportive institutional policies, the non-existence of an entrepreneurship mindset, and virtually nonexistent business acumen and training.[17] The undergraduate medical education curriculum should address and effectively teach these soft skills.[18] Integrating entrepreneurship education into the medical curriculum and providing access to mentors and resources may help undergraduates foster their entrepreneurship skills. [19-21]

Being single-centered and cross-sectional are the main limitations of this research work. Extensive multi-centered or qualitative research needs time to gain deep insight into this critical domain. Medical undergraduates need more awareness of clinical entrepreneurship and perceive various barriers and challenges to pursuing this career path. There is a need to explore further and address the perceptions and challenges medical undergraduates face regarding clinical entrepreneurship and practice abroad to prepare them for future career opportunities. Medical education curricula should consider incorporating structured programs that provide adequate training, mentorship, and support. Additionally, institutional policies and collaborations between public and private hospitals can create opportunities for students to gain international experience and foster an entrepreneurial mindset.

CONCLUSION

This study offers valuable insights into the entrepreneurial mindset of medical undergraduates. This study provides a comprehensive overview of comprehension regarding the changing dynamics in the medical education landscape. Comprehending these trends is pivotal for medical education and practice stakeholders to manage their approaches in this crucial perspective.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Haider I:	Concept, Critical appraisal, and Discussion Writing
Khan MS:	Data collection, compilation of results, formatting of the article
Shafi M:	Data Collection, Manuscript writing
Khan QA:	Manuscript Writing, Bibliography
Saeed R:	Overall compilation of the article

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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ORIGINAL ARTICLE

FREQUENCY OF SAGITTAL IMBALANCE IN PATIENTS WITH IDIOPATHIC ADOLESCENT SCOLIOSIS

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ABSTRACT

Objective: To determine the frequency of sagittal imbalance in patients with idiopathic adolescent scoliosis

Materials and Methods: This Cross-sectional study was conducted in the Department of Orthopedic Surgery, Khyber Teaching Hospital, Peshawar from 20 May 2019 to 19 Nov 2019 on 88 patients by Consecutive probability sampling technique. A standard technique was used for the study radiograph. Data was stored and analyzed using the statistical software SPSS version 21. All the quantitative variables like age were analyzed by Mean, +/- standard deviation. Post-stratification chi-square test was applied keeping P value equal or less than 0.05. All the results were presented in tables and graphs.

Results: A total of 88 patients with adolescent idiopathic scoliosis were enrolled in this study. There were 22 male (25%) and 66 (75%) female patients. The mean age of patients received was 43 years +/- 13.4 years with a standard deviation of +/- 0.23. Regarding deformity severity, there was mild deformity (Cobb angle 10-25) in 33, patients (37.5%), moderate deformity (Cobb angle 26-40) in 26 patients (29.5%) moderately severe deformity (Cobb angle41-60) in 18 (20.5%) severe deformity (>60) in 11 (12.5%). Fifty-six (63.6%) patients had structural curves i.e. flexible and corrected with the forward Adam bending test. Thirty-two (36.4%) had a nonstructural or rigid deformity.

Conclusion: Most of the patients having adolescent idiopathic scoliosis have a sagittal imbalanced spine. Spinopelvic parameters like lumbar lordosis, sacral slope, pelvic incidence, and pelvic tilt need to be included in routine workups of scoliotic patients in specific groups like one with a rigid deformity, severe deformity, and advancing age. Spinopelvic imbalance is very important in adult deformity.

Keywords: Adolescent Idiopathic scoliosis AIS, Sagittal Imbalance, Spinopelvic imbalance.

This article may be cited as: Naseer Q, Ullah R, Ahmad M, Sardar B, Shoaib M, Hakim Y. Frequency of Sagittal imbalance in patients with Idiopathic Adolescent Scoliosis. J Med Sci 2023 October;31(4):341-346

INTRODUCTION

Scoliosis is characterized by a lateral displacement of the frontal plane of greater than 10 degrees in three dimensions. This deformity can include changes in sagittal balance, a notable coastal hump in the convex region of the curve, and asymmetry of the shoulders and carriage. [1]

The general prevalence of scoliosis is 1.8%. [2] The most common type is adolescent idiopathic scoliosis having an overall frequency of 90%. [2] It affects young and growing children in the age group of 12-17 years and is 70% more common in girls than boys. The treatment for scoliosis of 10 -25 degrees is observation, 25-40 degrees is orthotics and more than 40 degrees is surgical. [3]

The prevalence of sagittal profile imbalance in adolescent idiopathic scoliosis is not known exactly as little research is available in this context both locally and internationally. However, Tambe ADet al. in a study stated that 71 % of patients with adolescent idiopathic scoliosis have abnormal sagittal and spinopelvic parameters including the C7 plumb line and it gradually progresses. [4]

In the past, the sagittal balance has not been given attention in the correction of deformity in idiopathic adolescent scoliosis. Following corrective surgery, these patients develop gait problems, pelvic tilt, back pain, and adding on due to an imbalanced sagittal profile. Scoliosis has recently captured the interest of spinal surgeons, who are now paying attention to balancing in the sagittal plane. [4] Methods for improving sagittal balance have been challenging and confusing due to our poor understanding of

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Date Revised: 12/08/2023
Date Accepted: 20/10/2023

the interplay between spinal and pelvic motion. Nevertheless, proper restoration of coronal and sagittal balance has been acknowledged as a necessary component of the successful treatment of adolescent idiopathic scoliosis (AIS). [5]

In both healthy and diseased conditions, sagittal balancing and spinopelvic symmetry are important. According to a recent study by Mac-Thiong et al, Lumbar lordosis (LL) was related to pelvic configuration. [6]

The C7 plumb line (C7PL) and the spino-sacral angle (SSA) are regarded as markers of the overall balance of the spine. The angle between the sacral plateau and the line that connects the middle of the sacrum plate and the center of the C7 vertebral body was used to compute the first one, whilst the second would be very simple to distinguish but more challenging to compare. The position of the posterior margin of both the sacral plateau is where C7PL can be deemed to be quite stable; nevertheless, whether it is in front of or behind this location, it becomes unstable. [7]

Another ratio that can help with the issue is the ratio of the distance between the C7PL and the femoral heads to the distance between the posterior border of the sacral plateau and the femoral heads. [8-10] A C7PL must be categorized as either an imbalance spine or a balance spine depending on where it lies about the patient's femoral head. If it lies in front of the patient's femoral head, it must be classified as an imbalanced spine. If the C7PL is behind the sacrum with the same relationship, but now with negative values, should be taken into consideration. [11 and 12]

In our preoperative workup and planning for scoliosis surgery in adolescent idiopathic scoliosis, sagittal balance does not form part of the plain radiographic assessment of spinal deformity. However, we do consider it an important parameter in degenerative scoliosis.

Although getting a decent sagittal profile is crucial when planning surgery for AIS, there have only been a few publications published in the literature that discuss how surgically correcting the deformity affects the spino-pelvic parameters. To better understand and surgically correct the deformity, we will conduct this study on patients who present with idiopathic adolescent scoliosis. If we discover sagittal imbalance, trying to plan for sagittal balance using the C7 Plumb line will become a standard preoperative action plan in all patients.

MATERIALS AND METHODS

It was a cross-sectional study conducted at the Department of Orthopedic Surgery, Khyber Teaching Hospital, Peshawar from 20 May 2019 to 19 November 2019 on 88 patients (sample size calculated by using a 95% confidence level, 71% prevalence of sagittal imbalance in all adolescent idiopathic scoliosis 6, with a 5% margin of error under the WHO formula for sample size determination in health studies) by Consecutive nonprobability sampling technique. Inclusion criteria include Both male and female patients with idiopathic adolescent scoliosis having a Cobb angle of 10 degrees or more on PA plain radiograph with an age range of 12-16 Years. Exclusion criteria included patients with other congenital spinal deformities, muscular dystrophies, and neurological/neuromuscular scoliosis.

Patients having a previous history of spine surgery. Ethical approval of the synopsis by the institutional ethical review committee was taken before the start of the study. Patients who met the requirements for inclusion were enrolled in the research through the outpatient department. Each patient signed a written statement of informed consent. Clinical examination, x-rays, and prior medical records all indicated surgery for these patients. A thorough clinical history was obtained before a systemic and general physical examination.

In the radiology department of the Khyber Teaching Hospital, standing posteroanterior, lateral, and supine bending radiographs as well as magnetic resonance imaging (MRI) of the entire spine were performed in selected cases. Exclusions were made based on history, physical examination, and radiography.

For all patients who are eligible for inclusion in the study, a Cobb angle was measured usinga standard technique, and the type of scoliosis was classed according to the standard Lenke Classification system as presented in the table-1. These were grouped as Mild (10-25 degree Cobb angle), Moderate (26-40 Degrees Cobb angle) Moderately severe (41-60 Degree Cobb angle), and severe (more than 61-degree Cobb angle).

The structure of the curve is also important and is a measure of the flexibility of the curve. Acurve was structural if its Cobb angle did not fall below 25 degrees on bending posteroanterior X-rays as compared to standard erect posteroanterior X-rays. If the Cobb angle falls below 25 degrees on bending radiographs the curve was regarded as nonstructural (flexible).

A standard technique was used for the study radiograph. A single true lateral film was taken with the patient standing, leveling the pelvis and both arms elevating to take the upper limb out of the field. The x-ray must show C7 vertebrae superiorly and both femoral heads overlapped inferiorly. A straight line was drawn from the body

of the C7 vertebra downwards as defined, which is called the C7 plumb line. This line must cross the S1 vertebral body's superior endplate, or more accurately, within 2 cm of its postero-superior corner either anteriorly or posteriorly normally. If it is within normal limits, it is categorized as balanced spine. If it falls more than 2cm it is termed as sagittal imbalance. [12]

Data was analyzed using the statistical software SPSS version 21. All the quantitative variables like age were analyzed by Mean, +/- standard deviation. Frequencies and percentages were calculated for qualitative variables like gender, Lenke Type, deformity severity, and sagittal balance. The outcome (Sagittal Balance or Sagittal imbalance) was stratified among age, gender and Lenke type, deformity severity groups to see effect modifications. Other effect modifiers like curve structure and type were controlled through stratification. Post-stratification chi square test was applied keeping the P value equal or less than 0.05. All the results were presented in tables and graphs.

RESULTS

A total of 88 patients with adolescent idiopathic scoliosis were enrolled in this study. There were 22 male (25%) and 66 (75%) female patients (table 2). The mean age of patients received was 43 years (SD= +/-13.4 years). Two-thirds of patients were below 14 years of age and 32% were more than 14 years of age (Table 2). In this study, it was observed that advancing age has a statistically significant effect on sagittal balance.

Regarding deformity severity, there was mild deformity (Cobb angle 10-25) in 33 patients (37.5%), moderate deformity (Cobb angle 26-40) in 26 patients (29.5%) moderately severe deformity (Cobb angle 41-60) 18 (20.5%) Severe Deformity (>60) in 11 patients (12.5%). (table 3). About half of patients 50% were Lenke type 1 (main thoracic curve). The rest of the patients having scoliosis were Lenke type 2, type 3, type 4, type 5, and type 6. Lenke type i.e. curve specificity and level have no significant effect on sagittal imbalance (table 7). Fifty-six (63.6%) patients had structural curves i.e. flexible and corrected with the forward Adam bending test. Thirty-two (36.4%) had a nonstructural or rigid deformity.

The structure of the curve has no impact on sagittal balance (table 5). The frequency of Positive Sagittal Balance was observed in 38 patients (43.2%), Neutral balance was observed in 18 patients (20.5%) and Negative balance was observed in 32 patients (36.4%). See Table 3 for details. According to our defined study variables, the sagittal imbalance (both positive and negative balance) was observed in 70 patients (79.5%), and 18 patients (20.5%) were labeled as having a balanced spine. (table 6).

Table 1: Assigning the type of curves type 1-6

Curv Type	Curve Name	Proximal Thoracic curve (Apex D1-D4)	Main Thoracic Curved Apex (D5-D10)	Thoracolumbar (D11-L4)
Type 1	Main Thoracic (MT)	-	Structural	-
Type 2	Double thoracic (DT)	Structural	Structural	-
Type 3	Double major (DM)	-	Structural	Structural
Type 4	Triple major (TM)	Structural	Structural	Structural
Type 5	TL/L	-	-	Structural
Type 6	TL/L-MT	-	Structural	Structural

Table 2: Distribution of Sagittal balance concerning Age

	Sagittal Balance			Total
Age	Positive Balance	Neutral	Negative Balance	
12	16	8	15	39
13	10	3	3	16
14	2	4	7	13
15	3	2	3	8
16	7	1	4	12
Total	38	18	32	88
P Value	0.375			

Table 3: Distribution of Sagittal Balance Concerning Gender

		Sagittal Balance			Total
		Positive Balance	Neutral	Negative Balance	
Gender	Male	8	4	10	22
	Female	30	14	22	66
Total		38	18	32	88
P Value		0.335			

Table 4: Distribution of Sagittal Balance Concerning Deformity Severity

		Sagittal Balance			Total
		Positiv Balance	Neutral	Negative Balance	
Deformity Severity	Mild Deformity (25-10)	12	5	16	33
	Moderate Deformity(40-26)	13	6	7	26
	Moderately Severe Deformity (60-41)	8	4	6	18
	Severe Deformity (>60)	5	3	3	11
Total		38	18	32	88
P Value		.273			

Table 5: Distribution of Sagittal balance concerning Curve type

		Sagittal Balance			Total
		Positiv Balance	Neutral	Negative Balance	
Curve	Structural	26	12	18	56
	Non-Structural	12	6	14	32
Total		38	18	32	88
P Value		0.300			

Table 6: Sagittal Imbalance

Sagittal Balance	Frequency	Percent
Positive Balance	38	43.2
Neutral	18	20.5
Negative Balance	32	36.4
Sagittal Imbalance (Positive+negative balance)	70	79.5
Total	88	100.0

Table 7: Lenke classification

Lenke Type	Frequency	Percent
Type 1	44	50.0
Type 2	9	10.2
Type3	4	4.5
Type 4	7	8.0
Type 5	16	18.2
Type 6	8	9.1
Total	88	100.0

DISCUSSION

The pelvic position and spinal alignment determine an upright, balanced posture. To reduce energy consumption, the spine or pelvis works together. [13] Regarding age, gender, race, and coronal curve kind morphology, some investigators have found rather large differences in sagittal alignments and pelvic orientation.[14] Few studies, however, have looked at how the pelvic morphology of adolescents with idiopathic scoliosis is affected by the sagittal balance of the spine.[15,16] The incidence of spinopelvic sagittal balance in scoliosis individuals and its correlation with various patient factors and curve types were the main subjects of our investigation. It may be deduced that distinct coronal curve patterns are preceded by changes in sagittal profile, even in the early phases of the formation of the curvature. [16] The sagittal profile of the scoliotic spine varies from the normal spine. It would be ideal to know the sagittal profile of the developing spine before the onset of the deformity, but this would necessitate a large, prospective population study with upright image analysis of the spines of a large number of developing children, of whom only a small percentage would ultimately develop scoliosis. Age has a significant correlation with sagittal balance. Significant sagittal imbalance was observed in patients having more age compared with younger. The results are comparable with the results observed by Ozkunt et al. [17] In contrast, gender has no significant correlation with sagittal balance. The results observed were comparable with other research in literature. [18] Other researchers have assessed the significance of the sagittal alignment of a scoliotic spine in relationship to the coronal curve type. In contrast to idiopathic lumbar scoliosis, they noticed less kyphosis in thoracic scoliosis. [20 and 21]

The assessment of kyphosis and lordosis, as already mentioned by Voutsinas and MacEwen, is of little use in determining the true curvature of the spine and the way it is mechanically pressured. [22]

According to the Lenke classification system, Grivas et al. observed no discernible variations among mild thoracic, thoracolumbar, and lumbar scoliosis, and the sagittal balance was regarded as a variable independent of curve type. [19] Because they employed a somewhat different methodology in a smaller patient group than we did in our study, their different results contribute to this.

Upasani et al. observed greater pelvic incidence in AIS patients (regardless of curve type), whereas in the studies of Mac-Thiong et al. and Yong et al. and our study, no differences in sagittal balance were found between scoliotics patients in terms of deformitystiffness. [20-22]. No differences in morphology (curve type) were observed between the subjects in the present study.

CONCLUSION

Most of the patients having adolescent idiopathic scoliosis have an imbalanced spine. Spino pelvic parameters like lumbar lordosis, sacral slope, pelvic incidence, and pelvic tilt need to be included in routine workups of scoliotic patients in specific groups like one with a rigid deformity, severe deformity, and advancing age.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Naseer Q:	Concept, Critical appraisal, and Discussion Writing
Ullah R:	Data collection, compilation of results, formatting of the article
Ahmad M:	Data Collection, Manuscript writing
Sardar B:	Manuscript Writing, Bibliography
Shoaib M:	Overall compilation of the article
Hakim Y:	Manuscript Writing, Bibliography

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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ORIGINAL ARTICLE

COMPARISON OF SODIUM ABNORMALITIES ASSOCIATED WITH HYPOTONIC VERSUS ISOTONIC MAINTENANCE INFUSIONS IN HOSPITALIZED CHILDREN

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ABSTRACT

OBJECTIVE: To compare Sodium abnormalities associated with Maintenance Infusions, Hypotonic versus isotonic in hospitalized children: A Randomized Controlled Trial

Material and Methods: This study was a randomized control trial conducted in the Department of Pediatrics A Hayat Abad Medical Complex Peshawar from 28 October 2020 to 28 April 2021. All the admitted patients aged 1 year to 12 years requiring maintenance infusion and were nothing by mouth (NBM) for at least 48 hours and serum sodium between 135-145 mmol/l were included in the study. Patients with renal disease diabetic ketoacidosis and on drugs affecting sodium level were excluded from the study. Two hundred and four patients who fulfilled the inclusion criteria, were randomly classified into groups A and B 102 each by lottery method. Group A was given Isotonic fluids (0.9% Sodium Chloride and 5% Dextrose water with Potassium 20 mmol/L) and Group B was given hypotonic fluids (0.45% Sodium Chloride and 5% Dextrose water with Potassium 20 mmol/L). The baseline tests and targeted tests, such as CBC, Blood sugar, urea, creatinine, electrolytes (sodium, potassium, and chloride), osmolality, and arterial blood gases, were performed. Data was analyzed using SPSS version 21.0. The post-stratification chi-square test was utilized to examine potential effect modifiers, and results were presented in tables.

Results: For a total of 204, there were 43 (42.3%) female patients and 59 (57.8%) male patients in Group A. Eighty (78.4%) male patients and twenty-two (21.6%) female patients were documented in Group B. In Group A, 61 (59.8%) patients had ages of 1-6 years while 41 patients (40.2%) were 7-12 years old. Eighteen patients in this group developed hyponatremia after receiving isotonic fluids. Fifty-two (51.0%) patients in Group B were 1-6-year-old and 50 (49.0%) patients were 7-12 years old. while 49 patients in this group developed, hyponatremia receiving hypotonic fluids. Patients given isotonic fluids didn't develop any complications (Hypernatremia and hyperchloremic metabolic acidosis).

Conclusion: On the basis of the results of this study, Isotonic intravenous maintenance fluids are a safe option in the pediatric population.

Keywords: Children, Intravenous fluids, Hypotonic, Isotonic Maintenance Infusions

This article may be cited as: Karim R, Afridi JK, Afaq S, Zaman MB, Naeem S, Zaman MA. Comparison of sodium abnormalities associated with hypotonic versus isotonic maintenance infusions in hospitalized children. J Med Sci 2023 October;31(4):347-351

INTRODUCTION

Since 1957, Holliday and Segar have advocated for the use of the hypotonic solution as a maintenance intravenous fluid (IVF) in children. Their suggestion was supported by data on the caloric intake of healthy youngsters and the electrolyte content of human and cow's milk. When compared to plasma tonicity, it is equivalent to 0.2% sodium chloride in a 5% dextrose solution, which is hypotonic. [1] Moritz and Ayus suggested that an isotonic solution would be a better choice as maintenance IVF in children after reporting over 50 deaths and major unfavorable neurological sequelae associated with hypotonic fluids in 2003. [2]

The movement of water from the extracellular fluid (ECF) compartment into the intracellular fluid (ICF) com-

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Date Revised: 30/10/2023
Date Accepted: 30/10/2023

partment is constrained by the osmolality of an isotonic solution, which is close to that of plasma (275-295 mOsm/kg). This is important for preventing cerebral edema as a result of hyponatremia, which can cause significant neurological morbidity. [3]

In 2018, the American Academy of Pediatrics (AAP) released guidelines recommending isotonic solutions as an intravenous maintenance fluid therapy for children between the ages of 28 days and 18 years. [4] In 2020, the National Institute for Health and Care Excellence (NICE) modified its recommendations and suggested that term newborns older than eight days be provided isotonic fluids[5]. Compared to prior years, pediatricians have recommended isotonic solutions. [6-9]

Isotonic fluid's safety is questioned since it can cause fluid overload and hypernatremia, cardiac dysfunction, hyperperfusion, and hypertension, as well as fluid overload and metabolic acidosis. [10, 11]

In order to compare the effectiveness and safety of isotonic versus hypotonic solutions for the maintenance of IVF in hospitalized children, the current study was carried out.

The aim of this study was to compare the complications of sodium abnormalities associated with hypotonic and isotonic maintenance infusions in hospitalized children.

MATERIAL AND METHODS

This study was a randomized control trial conducted in the Department of Pediatrics A MTI-HMC Peshawar from 28 October 2020 to 28 April 2021 after approval from an ethical committee. All the admitted patients aged 1 year to 12 years requiring maintenance infusion and were nothing by mouth (NBM) for at least 48 hours and serum sodium between 135-145 mmol/l were included in the study. Patients with renal disease diabetic ketoacidosis and on drugs affecting sodilevelsvel were excluded from the study.

Two hundred and four patients who fulfilled the inclusion criteria, were randomly classified into two groups A and B (102 each) by lottery method. Group A was given Isotonic fluids (0.9% Sodium Chloride and 5% Dextrose water with Potassium 20 mmol/L) and Group B was given hypotonic fluids (0.45% Sodium Chloride and 5% Dextrose water with Potassium 20 mmol/L).

The purpose of the study was explained to guardians and informed written consent was obtained. Predesigned proforma was used for documentation of each individual record including name, age, sex, address, history, clinical examination, investigations, response to management, and complications. The baseline tests and targeted tests, such as CBC, Blood sugar, urea, creatinine, electrolytes (sodium, potassium, and chloride), osmolality, and arterial blood gases, were performed. The hospital offered investigations to all patients. Patients whose follow-up was not maintained were removed from the study.

The sample size was 204 (102 patients in each group) keeping isotonic fluid had a substantially lower risk of hyponatremia (17% versus 34%) as compared to hypotonic fluid with 80% power of the test, 5% level of significance and 5% margin of error calculated on WHO formula for sample size determination. The sampling technique was random Sampling using lottery method.

Data was analyzed using SPSS version 21.0. Means and standard deviations were calculated for name, age, and disease duration, while frequencies and percentages were determined for categorical factors. The post-stratification chi-square test was utilized to examine potential effect modifiers, and results were presented in tables.

RESULTS

This study was conducted on 204 patients (102 in each group). Group A received isotonic maintenance fluids and group B received hypotonic maintenance fluids.

The mean age and SDs in Group A were 6.29+/- 2.013 years while 6.74+/- 2.602 years in Group B. In Group A,61(59.8%) patients had ages of 1-6 years while 41 patients (40.2%) were 7-12 years old. Fifty-two (51.0%) patients in Group B were 1-6-year-old and 50 (49.0%) patients were 7-12 years old.

There were 43 (42.3%) female patients and 59 (57.8%) male patients in Group A. Eighty (78.4%) male patients and twenty-two (21.6%) female patients were documented in Group B. According to frequencies and percentages, 18 (17.6 percent) patients in Group A, while 49 (48.0 percent) patients in Group B experienced hyponatremia. Age, gender, and disease duration were used to stratify hyponatremia. None of our patients on isotonic maintenance (IVF) developed hypernatremia and metabolic acidosis.

DISCUSSION

When oral intake is insufficient to maintain the extracellular volume, maintenance IVF is used to maintain a

Table 1: Frequencies and Percentages for Hyponatremias (n=204)

Treatment Groups	Hyponatremia	Frequency	Percent	P Value
Group A (n=102)	Yes	18	17.6%	0.00001
	No	84	82.4%	
	Total	102	100.0%	
Group B (n=102)	Yes	49	48.0%	
	No	53	52.0%	
	Total	102	100.0%	

Table 2: Stratification of Hyponatremia with Age Groups

Age Groups			Hyponatremia		Total	P Value
			Yes	No		
1-6 Years	Treatment Groups	Group A	13(11.50%)	48(42.47%)	61(53.98%)	0.005
		Group B	24(21.23%)	28(24.77%)	52(46.01%)	
	Total		37(32.7%)	76(67.3%)	113(100%)	
7-12 Years	Treatment Groups	Group A	5(5.49%)	36(39.56%)	41(45.05%)	0.000
		Group B	25(27.47%)	25(27.47%)	50(54.94%%)	
	Total		30(32.96%)	61(67.03%)	91(100%)	

Table 3: Stratification of Hyponatremia with Gender Groups

Gender			Hyponatremia		Total	P Value
			Yes	No		
Male	Treatment Groups	Group A	10(7.19%)	49(35.25%)	59(42.44%)	0.000
		Group B	39(28.05%)	41(29.49%)	80(57.55%)	
	Total		49(35.25%)	90(64.74%)	139(100%)	
Female	Treatment Groups	Group A	8(12.30%)	35(53.84%)	43(66.15%)	0.022
		Group B	10(15.38%)	12(18.46%)	22(33.84%)	
	Total		18(27.69%)	47(72.30%)	65(100%)	

Table 4: Stratification of Hyponatremia with Duration of Treatment (n=204)

Duration of Treatment			Hyponatremia		Total	P Value
			Yes	No		
>24 Hours	Treatment Groups	Group A	14(13.72 %)	88(86.27%)	102(100%)	0.000
		Group B	34 (33.33%)	68(66.66%)	102(100%)	
<24 Hours	Treatment Groups	Group A	4 (3.92%)	98(96.07%)	102(100%)	0.003
			15 (14.70%)	87 (85.3%)	102(100%)	

normal electrolyte balance[12,13]. Children getting hypotonic intravenous fluid in hospitals frequently develop hyponatremia[14]. The choice of the best treatment option for the pediatric population is still up for debate. The purpose of this study was to compare the safety and effectiveness of giving hospitalized children isotonic versus hypotonic intravenous maintenance fluid.

According to our study, 49 out of 102 individuals who used hypotonic fluid experienced hyponatremia. Comparable to other studies[14]. Non-osmotic ADH secretion triggers such pain, stress, dehydration, and post-operative consequences can produce hyponatremia in hospitalized children, in line with our research, hyponatremia does not directly contribute to morbidity or mortality[14]. While it was linked to a higher risk of death and other side effects [15].

Our study findings are analogous to those of Hasim N, who found that children who received isotonic fluid for intravenous maintenance were guarded against hyponatremia[14]. The structure and integrity of cells are preserved by isotonic fluid. Children are more susceptible to cerebral edema if hypotonic IVF is used because they have a greater brain-to-intracranial volume ratio. In order to prevent unforeseen problems, doctors must use extraordinary caution while administering IVF to youngsters.[3]

It was found that throughout the course of more than 24 hours, isotonic fluid consistently protects against hyponatremia. As a result, isotonic fluid is a better option for at least 72 hours after starting treatment[14]. More research is necessary to determine how IVF intake advised for a longer period of time affects children's sodium balance.

With extended usage of isotonic solution, Holliday et al.[16] have found evidence of hypernatremia. Isotonic IVF did not cause hypernatremia in any of our patients. This is consistent with earlier research.[17,18,19,20]

It has been claimed that isotonic solutions cause metabolic acidosis due to an excess of chloride, the reason may be rapid infusion. [21]. Similar to our results, Torres et al. found no changes in the frequency of metabolic acidosis between the two management arms. [22] In their retrospective study, Bulfon et al. discovered that the use of 0.9% sodium chloride as a bolus and maintenance fluid increases the incidence of hyperchloremic metabolic acidosis (HCMA). Although its use was restricted to maintenance purposes, it wasn't a standalone risk factor for the development of HCMA[23]. To determine the impact of isotonic solution as maintenance therapy on the emergence of metabolic acidosis, particularly in youngsters, more research is necessary.

CONCLUSION

When compared to hypotonic intravenous fluids, isotonic intravenous maintenance fluids have a lower risk of hyponatremia and were not associated with complications like hypernatremia and hyperchloremic metabolic acidosis. Therefore, isotonic fluids should be prescribed as maintenance intravenous fluids in the pediatric population.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Karim R: Concept, Critical appraisal, and Discussion Writing

Afridi JK: Data collection, compilation of results, formatting of the article

Afaq S: Data Collection,

Zaman MB: Manuscript Writing, Bibliography

Naeem S: Overall compilation of the article

Zaman MA: Manuscript writing, Bibliography

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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EOSINOPHILIC GRANULOMATOSIS WITH POLYANGIITIS PRESENTING AS NECROTIZING GLOMERULONEPHRITIS

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ABSTRACT

Eosinophilic Granulomatosis with Polyangiitis (EGPA) previously known as Churg-Strauss syndrome, belongs to a group of diseases with features of necrotizing vasculitis of small and medium-sized arteries. Its distinctive features include rhinosinusitis, asthma, and prominent blood eosinophilia.[1]

We report a case of a 70-year-old male patient with a history of newly diagnosed hypertension and asthma, who presented to us with bilateral lower limb edema. His investigations showed proteinuria of 1.7g/24 hours and p-ANCA positive. His renal biopsy was done which was reported as Necrotizing Glomerulonephritis.

Keywords: EGPA (Eosinophilic Granulomatosis with Polyangiitis), Glomerulonephritis, ANCA

This article may be cited as: Anwar U, Tahir M, Khan NW, Tahir T, Ali J. Eosinophilic Granulomatosis with Polyangiitis presenting as Necrotizing Glomerulonephritis. J Med Sci 2023 October;31(4):352-354

INTRODUCTION

Eosinophilic Granulomatosis with Polyangiitis (EGPA) is a multi-system disorder characterized by small and medium-sized arteries vasculitis. The organ most commonly involved is the lung, but any organ system can be involved comprising cardiovascular, renal, skin, and gastrointestinal systems.

The exact etiology is not known. 40-60% of the patients have ANCA detected and thus it is among the ANCA-positive vasculitides. [2]

The renal manifestations include acute renal impairment with plasma Creatinine greater than 1.4 mg/dL or it can also manifest as microscopic hematuria or proteinuria.

Biopsy findings show Necrotizing Glomerulonephritis. In all patients with Glomerulonephritis, a positive test for p-ANCA is present. Systemic hypertension is one of the manifestations of renal involvement in EGPA.[3]

CASE REPORT

A 70-year-old male patient, newly diagnosed asthmatic and hypertensive came to us with chief complaints of bilateral lower limb swelling from last 1 month. On general examination, he had pitting edema up to the knee joints. His vitals were: BP 150/90 mmHg and a pulse of 80 beats/ min.

Respiratory examination showed bilateral wheeze with the rest of the observations being normal. His blood investigations revealed TLC of 15000/microL with 10% eosinophils. Renal functions showed creatinine 2.7 mg/dL, and urea 81 mg/dL. Urine RE showed +++ proteins and 1-2 RBCs. 24 hours urinary proteins were 1.7g. normal levels of C3 C4 were reported.

ANCA profile showed p-ANCA positive 21 AU against a cut-off value of >10 AU. Chest HRCT showed small centrilobular nodules in the upper lobes and the superior segment of the right lower lobe. Spirometry revealed mild obstruction.

A renal biopsy was done, and the initial report showed Focal Segmental Glomerulosclerosis. The biopsy specimen was reviewed by the Pathology Laboratory upon request which then showed Necrotizing Glomerulonephritis.

DISCUSSION

Renal involvement is seen in one-quarter of the patients with EGPA. The most common presentation is ANCA-positive Necrotizing Crescentic Glomerulonephritis but other forms of nephropathy may also occur, including Eosinophilic interstitial nephritis, mesangial Glomerulonephritis, and focal sclerosis.[4]

According to the ACR, 4 criteria out of 6 should

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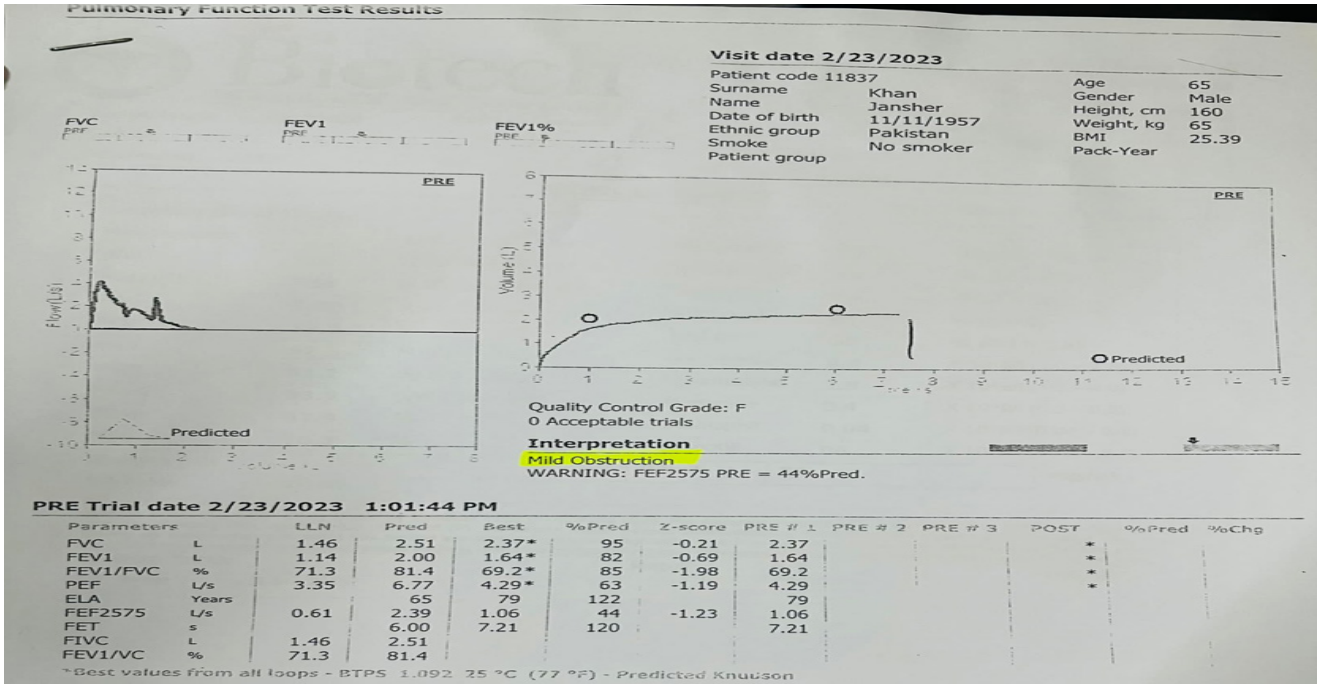
Date Received: 26-09-2023
Date Revised: 13-10-2023
Date Accepted: 13-10-2023



Pulmonary Function Test Results

Visit date 2/23/2023

Patient code 11837
Surname Khan
Name Jansher
Date of birth 11/11/1957
Ethnic group Pakistan
Smoke No smoker
Patient group

Age 65
Gender Male
Height, cm 160
Weight, kg 65
BMI 25.39
Pack-Year

FVC FEV1 FEV1%

PRE

Flow (L/s)

Predicted

Volume (L)

PRE

Predicted

Quality Control Grade: F
0 Acceptable trials

Interpretation
Mild Obstruction
WARNING: FEF2575 PRE = 44%Pred.

PRE Trial date 2/23/2023 1:01:44 PM

Parameters		LLN	Pred	Best	%Pred	Z-score	PRE # 1	PRE # 2	PRE # 3	POST	%Pred	%Chg
FVC	L	1.46	2.51	2.37*	95	-0.21	2.37			*		
FEV1	L	1.14	2.00	1.64*	82	-0.69	1.64			*		
FEV1/FVC	%	71.3	81.4	69.2*	85	-1.98	69.2			*		
PEF	L/s	3.35	6.77	4.29*	63	-1.19	4.29			*		
ELA	Years		65	79	122		79					
FEF2575	L/s	0.61	2.39	1.06	44	-1.23	1.06					
FET	s		6.00	7.21	120		7.21					
FIVC	L	1.46	2.51									
FEV1/VC	%	71.3	81.4									

*Best values from all loops - BTPS 1.092 25 °C (77 °F) - Predicted Knuuson

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OUT

Ordered On ..... : 10-MAR-23 10:47 AM
Specimen No ... : IF-2023-000297

HISTOPATHOLOGY
IMMUNOFLUORESCENCE RENAL BIOPSY

Verified On..... : 20-MAR-23 05:38 PM

Morphologic Diagnosis

RENAL BIOPSY:
- RENAL CORE SHOWING 19 GLOMERULI.
- 06 SHOW GLOBAL SCLEROSIS AND 03 SHOW SEGMENTAL SCLEROSING LESIONS (FSGS).
- MODERATE ACUTE ON CHRONIC TUBULOINTERSTITAIL NEPHRITIS
- IMMUNOFLUORESCENCE SHOWS NON SPECIFIC DEPOSITS. WITH ACUTE TUBULAR NECROSIS.
- MODERATE HYPERTENSIVE VASCULOPATHY.
- MODERATE TUBULAR ATROPHY.
- MILD INTERSTITIAL FIBROSIS.
- SEE COMMENTS.

Clinical Notes

- Persistent proteinuria. Hypertension stable. CKD.
- BP: 130/80.
- Steroids intake in form of inhaler. Bilateral echogenic kidneys.
- ANCA-c: Negative. ANCA-p: Positive raised.
- Urine R/E shows albumin ++, Sugar: Nil, WBCs: Nil, RBCs: 4910?
- 24 hour urinary protein: 1.7 grams per 1500.0 ml, Blood urea: 146.2, Serum creatinine: 3.28
- Bleeding profile: 1.58, FFPs given. Viral serology: Negative.

Immunoflouresence Findings

	Number	Glomeruli GBM	Mesangium	Tubules	Blood Vessels	Interstitum
IgG	6/6	-	-	-	-	-
IgA	6/6	-	-	-	-	-
IgM	5/5	-	+	-	-	-
C3	5/5	-	++	-	-	-
C1q						
	5/5	-	-	-	-	-

Interpretation

5-6 glomeruli seen in immunofluorescence slides. These show weak to moderate intensity IgM and C3 deposits. Rest of the antibodies are negative.

Result

NON SPECIFIC DEPOSITS.

Comments

This is a Computer GENERATED Report. It DOES NOT require any SIGNATURE or STAMP.

INITIAL BIOPSY REPORT

FINAL DIAGNOSIS:

LEFT KIDNEY, PERCUTANEOUS NEEDLE BIOPSY -

A. FOCAL SEGMENTAL PROLIFERATIVE, NECROTIZING AND SCLEROSING PAUCI-IMMUNE GLOMERULONEPHRITIS

B. NECROTIZING GRANULOMATOUS ARTERITIS INVOLVING INTRALOBULAR SIZED ARTERIES AND ARTERIOLES.

C. FOCAL ACUTE TUBULAR INJURY WITH INTERSTITIAL EDEMA AND PATCHY ACUTE AND CHRONIC INTERSTITIAL INFLAMMATION.

REVIEW REPORT

be satisfied to establish the diagnosis of EGPA, including.

1. Asthma
2. Blood eosinophilia 10%
3. Mononeuropathy
4. Migratory or transient pulmonary opacities detected radiologically.
5. Paranasal sinus abnormalities
6. Biopsy showing accumulation of eosinophils in extravascular areas [5]

In our patient criteria 1, 2, 4, and 6 were fulfilled thus the diagnosis of EGPA was made and the patient was assessed for vasculitis disease activity using the Five Factor Score (FFS), which is as follows

- Age>65 years
- Cardiac insufficiency
- Renal insufficiency
- Absence of ear, nose, throat manifestations [6]

A score of greater than 2 indicates severe disease and require aggressive treatment.

We treated our patient with 3 days pulse therapy of Methylprednisolone 500mg IV daily followed by IV Cyclophosphamide 500mg with Mesna and Deltacortril 60mg. And he was asked to follow up 2 weeks later for second dose of Cyclophosphamide. Asthma and eosinophilia are the features that distinguish our diagnosis from GPA(Wegener's) and Microscopic Polyangiitis.

CONCLUSION

EGPA is a common vasculitis and has variable presentations. It should be kept as a differential diagnosis in patients presenting with asthma and renal impairment.

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THE EDITORIAL POLICY OF THE JOURNAL OF MEDICAL SCIENCES (JMS), KHYBER MEDICAL COLLEGE, PESHAWAR

Overview

This document highlights the mission, objectives, and editorial policy of JMS regarding the publication process by adhering to the guidelines of COPE (Committee in Publication Ethics) and ICMJE (International Committee of Medical Journals Editors). Each component of the editorial policy is explained in the next sections.

A MISSION OF JMS

To publish relevant, scientific, and accessible material to help medical students and health professionals in their practice, teaching and learning, and career development

B OBJECTIVES OF JMS

a. To publish clinical, epidemiological, public health, educational, translational, and allied sciences research to enable scientists, clinicians, and researchers to learn about developments and innovations in these disciplines

b. To publish high-quality descriptive and experimental research, review articles, editorials, and case reports enhancing the understanding of the scientific community regarding clinical practice and education

c. To provide a platform for the scientific community in promoting their career development through publishing quality research

C EDITORIAL POLICY

1 Open access

JMS is an Open access scholarly literature source that is free of charge and often carries less restrictive copyright and licensing barriers than traditionally published works, for both the users and the authors. However, it complies with well-established peer review processes and tries to maintain high publishing standards.

2 Peer review process

The review process of JMS is following a "triage approach". Upon submission of a manuscript, either online or physical, the document undergoes a preliminary open (un-blinded) review in the chief editor's office. The document is either accepted for further review, sent for revision back to the authors, or rejected at that time. Further review of JMS follows a blinded approach, where the article is sent to 2 reviewers, local and international reviewers. During this process, all the relevant information about the authors and reviewers is kept confidential. However, we encourage sharing reviewers' comments with co-reviewers of the same paper in a blinded manner, so reviewers can learn from each other in the review process. We also encourage the readers to send us the post-publication reviews about research work in the form of letters to the editors, which are then published and shared with the authors of relevant articles. The editorial board has the authority to retract an article if a serious violation of credibility or quality of research is found after the article is published.

The journal is under no obligation to send submitted manuscripts for review, and under no obligation to follow reviewer recommendations, favorable or negative at all times. The editor of a journal is ultimately responsible for the selection of all its content, and editorial decisions may be taken on issues unrelated to the quality of a manuscript, such as suitability for the journal. An editor can reject any article at any time before publication, including after acceptance if concerns arise about the integrity of the work.

3 Authorship

According to the ICMJE criteria, authorship is based on 4 criteria; (1) conceptualization and designing, (2) AND, data collection, (3) AND, writing and critical review,

(4) AND, taking responsibility for the authenticity and integrity of all the research process. All those designated as authors should meet all these 4 criteria. The co-authors should declare their roles and contributions to the research process explicitly. Those who do not meet all 4 criteria should be ACKNOWLEDGED only. If agreement cannot be reached about who qualifies for authorship, the institution(s) where the work was performed, not the journal editor, should be asked to investigate. If authors request removal, addition, or change in the sequence of an author after manuscript submission or publication, journal editors should seek an explanation and signed statement of agreement for the requested change from all listed authors and the author to be removed or added. The corresponding author is the one individual who takes primary responsibility for communication with the journal during the manuscript submission, peer review, and publication process. The corresponding author typically ensures that all the journal's administrative requirements, such as providing details of authorship, ethics committee approval, clinical trial registration documentation, and disclosures of relationships and activities, are properly completed and reported. The maximum number of authors for any manuscript must not exceed 6. If the number of authors exceeds this number, an explicit rationale for their role must be provided, which will be decided by the committee comprising the chief editor, executive editor, and managing editor.

4 Submission of manuscript

The manuscript should be submitted through the journal website which is using the Online Journal System (OJS) along with the Institution research and ethics board (IREB) certificate. The article should have the following format:

4.1: The abstract should be structured with a word count of not more than 250 words.

4.2: The fonts should be Calibri, with size 12, and spacing of 1.5, with justified margins in MS office format.

4.3: The whole document should not be more than 3000 words (excluding references and appendices).

4.4: The number of figures and tables should not exceed 5 in the whole document.

4.5: The pictures and tables should be black and white in color.

4.6: Copied pictures and tables from other sources will not be entertained unless written approval from the original researcher and publisher is provided

4.7: Only that article will be considered for publication where the data is collected during the last 5 years.

4.8: Fifty percent of the references must be from the last 5 years. The introduction section must not have more than 30% of the total references.

4.9: any article having a similarity index of more than 50% will be declined altogether. For those having a similarity index of more than 19% but less than 50%, the authors will be given one chance to correct the manuscript.

5 Institutional Research and Ethics Board (IREB) certificate

Under no circumstances, an article will be accepted if approval from the relevant ethical board/committee is not taken before the start of the research. The board/committee should assess the proposal of research in both ethical and technical aspects before giving a certificate of approval.

6 Conflict of interest

To ensure transparency in the research conduction, writing, and publication, the authors, peer reviewers, and editors have to declare conflicts of interest regarding financial aspects, academic competitions, and relationships during the writing, reviewing, and publishing of the manuscripts. Details of sponsors along with their roles and access to data should be clearly stated.

7 Confidentiality

The editorial board in no way should publicize the work of a researcher in any form unless it is published. They should not publicize the comments and critiques given by reviewers. Similarly, the reviewers are bound to keep the confidentiality of the work of researchers during and after the review. The work of researchers and the critique should never be discussed or exemplified in forums. The confidentiality of the researchers should be maintained in every possible way when the documents are sent for review. However, our review process is open (non-blinded) in the first phase, as per the policy of the journal. In this case, the policy is displayed on the journal`s website for the researchers. Reviewers must not retain the manuscript for their personal use and should destroy paper copies of manuscripts and delete electronic copies after submitting their reviews. If a manuscript is rejected, it should be deleted from the editorial system. If an article is published, the manuscript along with its reviews and other relevant documents should be retained for a period of 3 years and then deleted. The only situation where confidentiality needs to be breached is when a situation of fraud or misconduct is found during the review process or after publication. Still, the authors and sometimes the reviewers, have to be notified.

8 Correction and retraction of articles

The guidelines for the correction and retraction of articles are as follows:

8.1: A specific page is allocated in the journal (both electronic and printed) that will be used for news related to corrections in articles published in previous journals.

8.2: The editor should also post a new article version in the journal with details of the changes from the original version and the date(s) on which the changes were made.

8.3: Previous electronic versions will prominently note that there are more recent versions of the article (that will be placed at the end of the abstract). Similarly, the authors or others should cite the more recent version.

8.4: If the error is judged to be unintentional, the underlying science appears valid, and the changed version of the paper survives further review and editorial scrutiny, then retraction with the republication of the changed paper, with an explanation, allows full correction of that research paper.

8.5: If a serious violation of credibility or quality of a research paper is found after the publication, the article has to be retracted after approval of at least 3 members of the editorial board in consultation with the chief editor. The whole process will follow the guidelines presented by Committee on publication ethics (COPE).

8.6: The retracted article should be notified on the website and the word “retracted” should be mentioned along with the title of the article.

9- Correspondence

Correspondence for submitting an article in JMS will be through a corresponding author. The duties of a corresponding author have already been presented in a previous section. Correspondence regarding debating an article is given high value and a separate page for letters to the editors has been allocated. Derogatory and demeaning letters are screened and letters that promote debates and critique are encouraged to be published. However, correspondence about the articles published in the last 1 year will be included only.

10- The fee submission process

A processing and publication fee of Rs. 10,000/-(Pakistani) for local authors and $ 250 (US) for international authors have been approved by the competent authority. The fee should be submitted as bank draft/ online payment through the account (IBAN) no: PK56NBPA0388004048685170 (Branch code: 0388 / National Bank of Pakistan, University campus branch,

Peshawar, Pakistan) as follows:

01. Article processing fee of 3000/- PKR at the time of submission of the article. This amount will be non-refundable.

02. Article publication fee of 7000/- PKR at the time of acceptance of article after external review. This amount will be refundable if the article is rejected for any reason.

03. For international authors, the amount of 250 US dollars will be accepted after both internal and external review. Researchers belonging to countries other than Pakistan are advised to submit the fee after the whole process of review is completed and the article is accepted for publication.

04. There will be no fee exemption in any circumstances, including members of the editorial board.

11 Roles of the editorial board, editors, and members

The editorial board of JMS is following the Higher Education Commission (HEC) policy for research journals. The roles of the editorial board for JMS are mentioned below:

11.1: The roles of the Editorial Board are:

11.1.1: To offer expertise in their specialist area

11.1.2: To review submitted manuscripts

11.1.3: To advise on journal policy and scope

11.1.4: To work with the Editor to ensure the ongoing development of the journal

11.1.5: To identify topics for special issues of the journal or recommend a Conference that would promote the journal, which they might also help to organize and/or guest edit

11.1.6: To attract new and established authors and articles

11.1.7: To submit some of their work for consideration, ensuring that they adhere to Conflict of Interest rules and stating their relationship to the journal. This is very important as the journal cannot be seen to publish only papers from members of the Editorial Board.

11.1.8: Editorial Boards must have a regular communication forum with other boards of similar nature, either face-to-face in person (depending on their country of origin, funding availability, etc.) or as more journals are doing today, communicating by teleconference, Skype, or other web platforms.

11.2: The Patron:

The Patron is usually the Dean of the institute and is overall in charge of the journal, who needs to be kept informed of the decisions taken by the editorial board. The patron is the final authority to approve the decisions and policies of the editorial board.

11.3: The Chief Editor:

11.3.1: The criteria for selection of Chief Editor are:

i. Expertise and experience in the specialist field related to the journal

ii. Publication record of several articles and /or books (usually in / related to the specialist field)

iii. Being a reviewer for an international peer-reviewed journal

iv. Senior research position with equivalent experience in research and scholarship

v. Enthusiasm to undertake the Editor role

vi. Preferably a diploma, master or doctoral degree in Education and Research

It is not necessary to fulfill all the criteria to become a chief editor.

11.3.2: The roles of the Chief Editor are:

i. The key role of a journal`s chief editor is to promote scholarship in the specialist field associated

with the journal, whilst also promoting the journal as the best journal to publish in. For any journal, the editor will need to encourage new and established authors to submit articles and set up a reliable panel of expert reviewers. Editors are also responsible for offering feedback to reviewers when required and ensuring that any feedback to authors is constructive.

ii. Editors should also familiarize themselves with the Committee on Publication Ethics (COPE) 'Code of Conduct and Best Practice Guidelines for Journal Editors'.

iii. Depending on how the journal is managed and how it is structured, an Editor may have to make all the decisions regarding which articles to accept or reject for publication.

11.3.3: Managing editor:

i. The roles of managing editor are:

ii. To help the chief editor to achieve the above-mentioned goals

iii. To communicate with the authors, reviewers, publishers, and other agencies for the smooth running of the journal

iv. To regularly evaluate the research work

v. Communicate with funding and regulating agencies (HEC and others) for grants and accreditations.

11.3.4: Executive editor:

The roles of the executive editor are:

i. To evaluate the research articles presented for publication

ii. To help the editorial board in policymaking

iii. They help the editorial board in smooth publishing

iv. To communicate with reviewers and collaborate with external agencies for relevant purposes

11.3.5: Section editors:

Section editors are allotted different responsibilities. Some of these are mentioned below:

i. Bibliography

ii. Proof-reading

iii. Academic writing reviewing, grammar, and spell checking

iv. Dissemination of articles for review

v. Contact with publishers under the supervision of the senior editorial team

vi. Training of future reviewers, young members, other faculty members

vii. others

11.3.5: Editorial advisory board:

Editorial advisory board members consist of national and international senior academicians, researchers, clinicians, and others to help the current editorial board in designing, implementing, and evaluating policies regarding upgrading the quality of research work. These people also share best practices to help the editorial team to refine their research work.

12 Policy regarding recruitment and continuation of the editorial board

The policy for recruitment and continuation of the editorial board is based on the guidelines discussed in the previous section. The chief editor, managing editor, and executive editors are recruited by the patron in-Chief. Members are then selected by them from amongst the faculty who have an aptitude for research, and their names are endorsed by the patron. The tenure of the editorial board is decided by the Patron after a period of 3 years whether to continue or recruit a new team or member. The editorial advisory board members are recruited for an indefinite period by the editorial team of JMS.

13 Plagiarism policy

The journal is following the plagiarism policy of the Higher Education Commission of Pakistan, and for this purpose, a plagiarism standing and review committee has been established under the chairmanship of the Chief Editor of JMS along with 4 members amongst se-

nior faculty. The committee has been given the authority to review research papers and plagiarism complaints related to published work in the journal.

14 Allegations of research Misconduct

The policies of the COPE, WAME, and ICMJE serve as the foundation for the policy of research misconduct in our journal.

Before submitting, authors must carefully read the journal's author guidelines and research ethical principles and adhere to them.

While authors have the right to recommend potential reviewers for the peer-review process, all potential reviewers will have their credentials and potential conflicts of interest carefully examined before they are invited to review.

A manuscript that is undergoing peer review or a published article may be the subject of a report of research misconduct. The application and management process for claims of author misconduct should go as follows:

14.1: An article submitted or to be published in the JMS if allegedly suspected of scientific misconduct, an official complaint for the same must be received by the office of the managing editor via email, contact@jmdsci.com. For instance, in case of plagiarism, the copied section should be underlined and the original and suspected sections should be explicitly pointed out. The complaint must specify the particular matter and details of the misconduct.

14.2: an investigation will be carried out by the editorial board and the corresponding author of the suspected article will be kept in contact. An explanation will be asked from the corresponding author in this respect. If the misconduct is accepted, the managing editor will take the following steps:

In the case of published articles, retraction might be considered.

In the case of unpublished articles, the review process may stop or continue depending on the changes suggested to the corresponding author.

If the corresponding author does not respond in the stipulated time or the response is unsatisfactory, the article may be declined or retracted.

14.3: Before reaching any conclusion in case of retraction of an already published article, the editorial team will be in consultation with the experts within or outside the institution.

14.4: If during the review process, suspicion of gifted authorship is identified, the editor in charge of the article may ask the corresponding/principal author about the role of the authors, and if the response is found to be unsatisfactory, the review process may stop or the article may be declined altogether.

15 Appeal and complaint process

The JMS follows the recommendations of COPE regarding the appeal and complaint process (https://publicationethics.org/appeals) as follows:

15.1: The authors may ask the managing editor for inquiring about the status of the article through the official email of the JMS (contact@jmedsci.com) citing their official article ID.

15.2: The author may contact the managing editor for inquiring about the reason for the rejection of articles during the review process by the above email link.

15.3: Sometimes, the authors may re-upload an article as a new submission if they have modified the article as suggested by the editors

15.4: For withdrawal of an article during the review process, the corresponding author will write

a request through the OJS to the relevant editor for retraction.

15.5: Reconsideration of the decision will be conducted only at the discretion of the managing and chief editors.

16 Contact information

The office of the managing editor or chief editor should be contacted anytime during working hours or can be contacted through their emails for correspondence.

17 Archiving and Data Repository

- In accordance with our open-access policy, we permit the self-archiving of published papers after their publication in JMS. Without requesting permission from the journal or publisher, authors are free to archive their academic works in PDF format at any time and retain ownership of the intellectual property. However, a yearly subscription is required to access the print edition of the entire magazine issue, which can be stored in libraries in the country and overseas for 500 US dollars or 5000 Pakistani rupees respectively.
- In the "Archives" tab of the website (https://jmedsci.com/index.php/Jmedsci/issue/archive), you can access every issue of the journal from the past.
- Writers of articles that appear in JMS have the right to deposit their accepted manuscript in institutional or centralized repositories and can immediately make it publicly accessible after doing so provided that the journal is attributed as the original place of publication and that correct citation details are given.
- The real-time data backup of the whole server for the Journal of Medical Sciences (JMS) is created on the remote VPS (Virtual Private Server) of Khyber Medical College(KMC). Parallel mirror Imaging (PMI) is also created on the JMS server. JMS Publishing has further made sure that the metadata of all its open-access journals is compliant with well-known repository services and their digital crawlers may regularly collect it for record and preservation

References

ICMJE recommendations

COPE guidelines

SCOPUS

This document is prepared in January 2020 to be used by an editorial board, reviewers, researchers, and faculty as a guide to making them aware of policies and procedures for publishing, conducting, writing, reviewing, and evaluating the research published in JMS. This document is developed by including the recommendations of ICMJE (2019) and COPE guidelines and in case of any conflict, lack of clarity, and ambiguity, the recommendations of the latest ICMJE recommendation and COPE will prevail.

JOURNAL OF MEDICAL SCIENCES (PESHAWAR, PRINT)

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Key to abbreviations

OA = Original Article
ED = Editorial

DIGITAL HEALTH: REVOLUTIONIZING HEALTH CARE

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Digital health: Introduction

Digital Health (d-Health) encompasses the fusion of Information Sciences, Computer Science, Information Technology, and Healthcare. It involves utilizing ICT for tasks like storing, retrieving, and sharing medical information, such as using the internet for paperless medical record management. d-Health signifies both the use of ICT in healthcare and a dedication to enhancing global healthcare standards through technology[1].

Digital health: Contents

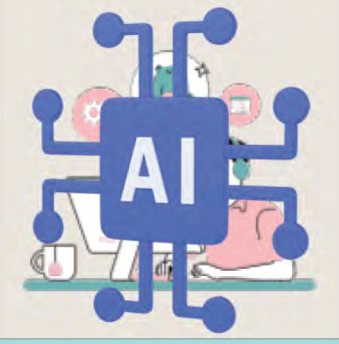
Digital health contents encompass a wide range of digital tools, information, and services related to healthcare and wellness. These may include health apps, wearable devices, electronic health records (EHRs), telemedicine services, health-related websites, and online communities, all aimed at improving healthcare access, monitoring, and management through digital technology.

Global uses of digital health

The world is rapidly adopting digital health which can be inferred from the value of digital health market which was 233 billion USD in 2022 and is projected to increase rapidly in upcoming years [2]. As of 2021, nearly 4 in 5 office -based physicians (78%) and nearly all non-federal acute care hospitals (96%) adopted a certified EHR. This marks substantial 10- year progress since 2011 when 28% of hospitals and 34% of physicians had adopted an EHR [3].

Pros and cons of digital health

Pros of Digital Health:1. Enhanced Convenience and Access 2. Efficient Data Analysis 3. Remote Monitoring 4.Improved Patient Engagement 5. Potential Cost Savings CONS. of Digital Health:1.Privacy and Security Concerns 2.Unequal Access 3. Data Accuracy Risks 4. Cybersecurity Vulnerabilities 5. Reduced Doctor-Patient Interaction



Uses of digital health In Pakistan

Pakistan faces significant health care challenges, and digital health holds promise for addressing them. However, global digital health solutions vary, making a tailored approach necessary. To succeed, Pakistan needs a comprehensive digital health strategy, driven by collaboration among stakeholders, both public and private, for the sector's transformation and widespread benefits[4].

References

1. website Digital Pakistan.pk.
2. Global market insights.
3. Office of the National Coordinator for Health Information Technology. 'National Trends in Hospital and Physician Adoption of Electronic Health Records,' Health IT Quick-Stat #61.
4. website digital Pakistan.pk