



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 2025 January - March;33(1)

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 on controlled circulation basis and distributed among the faculty of all national medical colleges, main libraries throughout the province, Pakistan Medical Research Council, PMDC, HEC and Tertiary Referral Centers.

The publisher and the members of the Editorial Board can not be held responsible for errors or for any consequences arising from the use of information contained in this journal.

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:

Khyber Prints

E-mail: khyberprints@gmail.com

RETRACTION NOTICE

Title: Retraction: Mometasone Furoate Intra Nasal Spray for the Treatment of Bilateral Nasal Polyposis

AUTHORS: Khan AR, Arif MAU

PUBLISHED IN: Journal of Medical Sciences Peshawar, 2019; 27(3)

REASON FOR RETRACTION: After Publication, Similarity with another article published in the Journal of **Arch Otolaryngol Head Surg.** 2006;132 was reported.

Editor in Chief: Journal of Medical Sciences Peshawar

ABSENTEEISM IN MEDICAL COLLEGES IN PAKISTAN – ACT URGENTLY BEFORE IT IS TOO LATE

Farooq Ahmed

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This article may be cited as: Ahmed F. Absenteeism In Medical Colleges In Pakistan – Act Urgently Before It Is Too Late. J Med Sci 2025 January - March;33(1):1-2

The medical field requires a strong commitment to patient care, intense training, and unshakeable dedication. These crucial traits are shaped in large part by medical colleges, the furnaces where future physicians are formed. Discipline, diligence, and regular attendance have historically been the hallmarks of these schools. But in recent years, there has been an alarming rise in Pakistani medical students' absenteeism. This phenomenon, which appears to be a novel and developing problem, calls into question the nation's healthcare system's future and calls for a careful analysis of its root causes, possible outcomes, and potential remedies. This editorial addresses the varied nature of absenteeism in Pakistani medical colleges.

Absenteeism, defined as habitual or intentional absence from classes or clinical rotations, has become a noticeable issue in several medical colleges across Pakistan. While occasional absences due to illness or unavoidable circumstances are understandable, the increasing frequency and duration of unexplained absences suggest a more systemic problem. Several contributing factors appear to be at play.

The apparent inadequacy of conventional teaching techniques is one explanation offered by some students. The typical lecture-based method, often criticized as uninteresting and ineffective, may not appeal to today's tech-savvy generation. Students might believe that self-study, online resources, recorded lectures, and other easily accessible methods will enable them to learn the material more efficiently. The easy access to information on the internet further reinforces this perspective, prompting some individuals to question the necessity of in-person attendance. Additionally, the strong emphasis on rote memorization in some curricula may diminish students' appreciation for attending lectures, especially if they feel capable of learning the information independently.

The tremendous strain and stress of medical school may also be a contributing cause. Students' mental health can be severely impacted by the rigorous curriculum, the pressure to perform well on tests, and the dread of failing.

A coping strategy used by some students to escape the stress and anxiety related to academic achievement is absenteeism. These emotions of tension and anxiety can be made worse by the intensely competitive atmosphere of medical schools, where students are continuously compared and assessed. The problem is made worse by the fact that many institutions do not provide sufficient mental health support services.

There are socioeconomic variables as well. Many medical students come from a variety of backgrounds, and some may have to have part-time jobs to support their families or themselves due to financial issues. Consistent attendance can be difficult to maintain because of these obligations. Additionally, the growing expense of medical school may put students under more financial strain and make them choose to work over going to school. The issue may be exacerbated by certain institutions' ineffective systems for tracking attendance and holding people accountable. Students could be less likely to prioritize attendance if there are unclear penalties for missing class. The habit of skipping classes can become more common if attendance regulations are applied laxly or inconsistently.

Students' perceptions of traditional classroom instruction have changed as a result of the rise of online learning platforms and the availability of study resources. These tools can be useful additions to classroom learning, but they shouldn't be seen as a substitute. Critical components of medical education that cannot be entirely recreated online include the dynamic learning environment of a classroom, the opportunity to participate in conversations with peers and instructors, and the development of clinical skills through practical experience.

Widespread medical college absenteeism has far-reaching effects and could be harmful to Pakistan's healthcare system going forward. First of all, it lowers the standard of medical education. Students who routinely miss clinical rotations and classes lose out on important learning opportunities, including the development of professional ethics, communication skills,

and clinical reasoning abilities. Future physicians may become less competent overall as a result of this. Second, patient care may suffer as a result of absenteeism. Insufficient training and exposure to clinical situations may make doctors less capable of managing complicated medical issues, which could result in incorrect diagnosis and treatment. Serious repercussions for patient outcomes and safety may result from this.

Thirdly, the culture of professionalism and discipline that is fundamental to the medical field is undermined by widespread absenteeism. It gives the impression that participation and attendance are not important, which might erode the devotion and hard work that physicians are supposed to exhibit. Medical college absenteeism is a complicated problem that calls for a multifaceted strategy involving educators, administrators, students, and legislators.

Improving Teaching Methodologies: To meet the needs of today's students, medical schools must implement more dynamic and captivating teaching strategies. Simulations, case-based discussions, problem-based learning, and active learning techniques can all be used to enhance student engagement and make lessons more engaging. **Strengthening Mental Health Support:** Educational institutions ought to put their students' mental health and well-being first by giving them access to peer support groups, stress management courses, and counseling services. Students' stress and anxiety levels can be lowered by fostering a welcoming and inclusive learning atmosphere.

Enhancing Attendance Monitoring and Accountability: It is essential to put in place reliable procedures for tracking attendance and to enforce explicit attendance regulations. Repercussions for unwarranted absences must be explained and applied consistently. **Addressing Socioeconomic Factors:** Medical schools ought to look into measures to help students who are struggling financially, like providing financial aid, scholarships, and flexible study schedules.

Fostering Professionalism and Ethical Values: Including teaching and assessing professionalism and ethics in the medical curriculum can help students develop a feeling of accountability and responsibility. A stronger professionalism culture might result from highlighting the value of attendance and active engagement in the learning process. **Making Effective Use of Technology:** Online materials can be useful additions, but they shouldn't take the place of in-person training. Instead of encouraging

absenteeism, technology should be utilized to improve instruction and learning.

Faculty Development: Teachers can enhance their instruction and embrace more captivating educational strategies by funding faculty development initiatives. Students' learning experiences can be improved by encouraging teachers to use technology and active learning techniques. Pakistani medical college absenteeism is a complicated problem with many underlying causes. The possible effects on the standard of medical education and patient care are evident, even though some students may provide explanations for their absences. A coordinated effort from all parties involved is needed to address this expanding issue. By putting the above suggestions into practice, medical schools may foster a more stimulating and encouraging learning environment, encourage a professional culture, and eventually guarantee that aspiring physicians are suitably educated and equipped to meet the country's healthcare demands. The passion and dedication of Pakistan's medical professionals will determine the country's healthcare system in the future, and encouraging a culture of regular attendance and active involvement in medical education is an essential first step in that direction.

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BACTERIOLOGICAL PROFILE AND RESISTANCE PATTERN IN CULTURE-POSITIVE SEPTIC NEONATES PRESENTING TO TERTIARY CARE HOSPITAL, PESHAWAR

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ABSTRACT

Objective: To determine the bacteriological profile and sensitivity pattern from blood cultures of neonates diagnosed with neonatal sepsis.

Methods: It was a cross-sectional study conducted in a tertiary care hospital, i.e., Lady Reading Hospital Peshawar Neonatology Department, for 6 months from 1st July 2023 to 31st December 2023. All the neonates admitted with clinical signs and symptoms of sepsis were included in the study on confirmation of sepsis by positive blood cultures. Their resistance patterns and antibiotic sensitivity patterns were determined. The outcome of sepsis in the form of discharge or death was reported.

Results: The blood culture showed that the highest frequency of organisms isolated was gram-negative Klebsiella in 38.2% of neonates, followed by E. coli in 35.4% of neonates. There is significant sensitivity of antibiotic meropenem, imipenem, ampicillin tazobactam, amikacin, and colistin to various organisms with a p-value <0.001. However, the resistance pattern was seen with antibiotics like ampicillin and cephalosporins.

Conclusion: Antibiotics like amikacin, ampicillin-tazobactam, and ampicillin-sulbactam have shown promising results in treating neonatal sepsis other than carbapenems and colistin. The hypervirulent-resistant strains of bacteria need to be further analyzed beyond antibiotic susceptibility testing alone. This will facilitate the roadway to the development of neonatal vaccines.

Keywords: Neonatal Sepsis, Resistance, Culture Resistance.

This article may be cited as: Zahoor F, Parvaiz H, Kalsum UE, Shah G. Bacteriological Profile And Resistance Pattern In Culture-Positive Septic Neonates Presenting To Tertiary Care Hospital, Peshawar. J Med Sci 2025 January - March;33(1):3-6

INTRODUCTION

Systemic infections occurring in neonates are defined as neonatal sepsis. It may be accompanied by septic shock and multiple organ failure as well. ¹ About 3 million cases of sepsis occur in neonates globally. ² The incidence varies from 1 to 4/1000 births in developed countries but 49 to 170/1000 births in developing countries, with a case fatality rate of 24%. Neonatal sepsis occurring within 72 hours of life is called Early onset sepsis, and the one after 72 hours is late-onset sepsis. ³ Prematurity, low birth weight, premature rupture of membranes for more than 18 hours, need for mechanical ventilation, home deliveries,

and male gender are the different risk factors for neonatal sepsis. Several studies have been done using risk factor assessment for early diagnosis and treatment of neonatal sepsis. ⁴⁻⁶

Neonatal sepsis can be diagnosed with complete blood count assays, immature to mature granulocyte ratio, and markers of systemic inflammation and immune response. ⁷ Blood culture remains the gold standard for the diagnosis of neonatal sepsis. ⁸ Procalcitonin and C-C-reactive protein are other tests, and the most specific of them all is the Multiplex polymerase chain reaction, which can detect bacterial growth within hours. ^{7,9}

Over the last two decades, there has been increasing bacterial resistance being reported in neonatal sepsis cases due to improper antibiotic usage and lack of infection control services. Regular monitoring of antibiotic resistance and sensitivity patterns is important, and a strict antibiotic stewardship program is essential to curtail the rising challenges in neonatal sepsis management. ¹⁰ This study will help to know the current perspective of neonatal sepsis to detect the pattern of growths obtained and to

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Date Received: 03/12/2023

Date Revised: 16/09/2024

Date Accepted: 22/11/2024

overcome the challenge of introducing antibiotics to neonates in sepsis.

MATERIALS AND METHODS

It was a cross-sectional study conducted in a tertiary care hospital, i.e., Lady Reading Hospital Peshawar Neonatology Department, for 6 months, from 1st July 2023 to 31st December 2023. Nonprobability consecutive sampling was used for enrolling the neonates. All the neonates admitted to the nursery with clinical signs and symptoms of sepsis were included in the study after confirmation of sepsis by positive blood cultures. The signs and symptoms of sepsis were fever, lethargy, reluctance to feed, hypothermia, convulsions, grunting, jaundice, and abdominal distention. Neonates with negative culture results and inborn errors of metabolism were excluded from the study. About 1 to 3 ml of blood was collected from neonates after cleaning the prick site with povidone-iodine solution and put in BactecPLus culture bottles. Culture bottles containing Tryptone Soya Broth were also used. It was transported to the laboratory on 2-24°C. The cultures were incubated, and sensitivity to various antibiotics was tested by standard disc diffusion technique.

Data was collected prospectively using a pre-designed proforma after obtaining informed consent from the parents of the neonate. Data regarding blood culture results was obtained from HMIS and documented. The outcome of sepsis in the form of discharge or death was reported. Data was analyzed using SPSS version 27. Categorical variables and scale variables were analyzed by descriptive statistics. Scale variables were reported as mean and SD and categorical variables were reported as frequency and percentages.

RESULTS

A total of 212 neonates with symptoms of sepsis were included in the study after positive blood cultures. The demographic detail shows the mean weight of these neonates was 2.9 kg \pm 0.68SD, the mean age was 8.7 days \pm 7.9SD, and the mean gestation age at the time of delivery was 36.6 weeks \pm 2.7SD. About 69.8% were male gender, and 28.3% were female. In these septic neonates, about n=167 (78.8%) survived and recovered completely and were discharged, while n=41 (19.3%) expired even after initiation of antibiotics. The blood culture reports (Table 1) showed the highest frequency of organisms was Klebsiella at 38.2%, followed by gram-negative E. coli, present in 35.4% of cases. There is significant sensitivity of antibiotic meropenem, imipenem, ampicillin tazobactam, amikacin, and colistin to various organisms with a p-value $<$ 0.001. However, the resistance pattern was seen with antibiotics like ampicillin and cephalosporins.

DISCUSSION

Klebsiella 15.35% were the predominant pathogens.¹¹

Table No 1: Organisms Involved in Neonatal Sepsis, Obtained After Blood Culture

Organisms	Frequency	Percentage
klebsiella	81	38.2%
E coli	75	35.4%
Citrobacter	32	15.1%
Acinobacter	10	4.7%
pseudomonas aureginosa	8	3.8%
streptococcus	1	0.5%
staph aureus (MRSA)	1	0.5%

Table No 2: Sensitivity Pattern Of Antibiotics To Various Organisms

Medications	Sensitivity (%)	Resistance (%)	Intermediate (%)	p-value
Ampicillin	12.5	87	0.5	0.85
Cefotaxime	25.5	71.2	3.4	0.31
Ceftriaxone	24.5	69.3	4.2	0.175
Ceftazidime	20.8	73.6	3.8	0.36
Amikacin	74.1	15.9	8.7	$<$ 0.001
Ciprofloxacin	61.1	21.2	17.8	0.006
Ampicillin-Sulbactam	89.4	5.8	4.8	$<$ 0.001
Ampicillin-Tazobactam	87.5	9.1	3.4	$<$ 0.001
Meropenem	93.3	6.7	0	$<$ 0.001
Imipenem	95.3	2.8	0	0.005

Multidrug-resistant pathogens are an emerging problem and are responsible for morbidity and mortality in cases of neonatal sepsis.^{11, 12} Timely and adequate treatment of neonatal sepsis is essential, but injudicious and indiscriminate use of antibiotics in neonates who are not septic is causing the emergence of resistant strains.¹³ Antibiotic stewardship is important to prevent the misuse of antibiotics.¹⁴

In our study, 90% of the microorganisms isolated were gram-negative, and 10 were gram-positive. Among gram-negative, 38.2% were Klebsiella, followed by E. coli, which were 35.4%. Acinobacter was present in 4.7 % of cases, while pseudomonas in 8%. Another study done in Pakistan in 2020 by Hashmi et al. reported klebsiella in 15.2%, E. coli in 6.3%, pseudomonas in 2.5% Acinobacter in 17.7% with overall gram-negative involvement of 53.2%.¹⁵

A study done in India by Dudeja et al. in 2020 reported that gram negatives such as Acinetobacter, Klebsiella, and E. coli were most commonly isolated.¹² A study done in China by Zou H et al. showed that E. coli 34% and

Another study done by Sands et al., which was conducted across seven different low to middle-income countries of Africa and South Asia, including Pakistan, revealed that Klebsiella, E. coli, and Acinetobacter are the main causative organisms causing neonatal sepsis. Among Klebsiella, six different species were identified.¹⁶

There has been an increasing incidence of sepsis caused by Klebsiella over the last two decades. It's a hypervirulent organism acquiring resistance to antibiotics. It's one of the ESKAPE pathogens, and it belongs to the WHO global priority pathogen list due to its ability to acquire antibiotic resistance. Klebsiella has around 400 antibiotic-resistance genes, which is double that of other pathogens.¹⁷ Carbapenem-resistant Klebsiella is emerging due to increasing antibiotic resistance.^{11, 12, 17}

In a study done by Zou H et al. in China in 2021, there was high resistance to cephalosporins, and 13.5% of klebsiella were carbapenem-resistant.¹³ Acinetobacter in our study were mostly sensitive to colistin, similar to Dudeja et al. and Hashmi et al.^{12, 15}

WHO guidelines still follow first-line antibiotics Ampicillin and Gentamicin for the treatment of neonatal sepsis and cephalosporins as second-line antibiotics, but it needs to be modified.^{16, 17}

Results from our study also showed high resistance to ampicillin and cephalosporins, similar to Sands et al., which also reported the presence of resistant genes for cephalosporins and carbapenems and virulent factors.¹⁶

With escalating rates of cephalosporin use in health-care settings, the increasing dependency on carbapenems has led to the emergence of carbapenem-resistant K. pneumoniae. It is difficult to change things overnight, and the economic implications of these changes may also be a constraint on health systems in developing countries.¹⁷

CONCLUSION

Antibiotics like amikacin, ampicillin-tazobactam, and ampicillin-sulbactam have shown promising results in treating neonatal sepsis other than carbapenems and colistin. The hypervirulent-resistant strains of bacteria need to be further analyzed beyond antibiotic susceptibility testing alone. This will facilitate the roadway to the development of neonatal vaccines.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Zahoor F	✓	✗	✓	✗	✓	✗
Parvaiz H	✓	✓	✗	✓	✓	✗
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Ethical Approval:

This Manuscript was approved by the Ethical Review Board of Lady Reading Hospital, Peshawar. Vide No.793/LRH/MTI.

Dated: 20 06 2023



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COMMUNITY-ACQUIRED PSEUDOMONAL GROWTH IN PATIENTS WITH DIABETIC FOOT INFECTION AND ITS ANTIBIOTIC SENSITIVITY PATTERN

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ABSTRACT

Objective: This study aimed to determine community-acquired pseudomonas aeruginosa growth in patients with diabetic foot infections and check its antibiotic sensitivity patterns.

Materials And Methods: This descriptive cross-sectional study was performed on 180 diabetic patients with foot infections. Blood samples and wound culture samples were sent to the hospital laboratory for analysis. Data was analyzed using SPSS version 20.0. After stratification, the chi-square test was applied, keeping the p-value less than 0.05 as significant.

Results: The mean and standard deviation for age was 58.9 ± 5.9 years. One hundred and two (56.7%) patients were male, while 78(43.3%) were female. Pseudomonas aeruginosa was isolated from 16.1 % of patients with diabetic foot infections. Nearly 100% were sensitive to colistin and polymyxin B. Piperacillin, tazobactam, and imipenem showed a sensitivity of 93.1%, while cefipime and amikacin showed a sensitivity of 89% and 82%, respectively.

Conclusion: Pseudomonas aeruginosa is a commonly isolated gram-negative rod from patients with diabetic foot infections, especially in our setup. It is usually resistant to commonly prescribed oral antibiotics and requires hospital admission for intravenous antibiotics. Pseudomonas aeruginosa growth is equally common in males and females and patients with different socioeconomic and educational classes.

Keywords: Diabetes mellitus, Diabetic foot infection, Culture and Sensitivity

This article may be cited as: Khan S, Ubaid M, Wazir N, Rehman MU, Irfanullah, Ahmed I. Community-Acquired Pseudomonal Growth In Patients With Diabetic Foot Infection And Its Antibiotic Sensitivity Pattern. J Med Sci 2025 January - March;33(1):7-11

INTRODUCTION

Diabetes mellitus is defined as a chronic metabolic disease characterized by persistent hyperglycemia. Hyperglycemia is due to impaired secretion of insulin or resistance to the action of insulin at the tissue level, or the presence of both. ¹ The worldwide frequency of diabetes mellitus has amplified from 108 million in 1980 to 425 million in the year 2017, and it is expected to be 630 million by the year 2045. ² The frequency of diabetes mellitus in Pakistan was approximately 17%, and pre-diabetes was 11% in the year 2019. ³

Diabetes Mellitus encompasses pathology of vasculature leading to both micro-vascular and macro-vascular complications. ⁴ Micro-vascular complications of DM comprise neuropathy, nephropathy, and retinopathy,

whereas macro-vascular complications include cardiovascular diseases like coronary artery disease, cerebrovascular disease, and peripheral artery disease. ⁵ Diabetic foot ulcer has been defined as the occurrence of foot ulcer related to neuropathy, peripheral artery disease, and foot infection. ⁶

Approximately 25 percent of diabetic patients will develop a foot ulcer in their lifespan. There is a greater all-cause mortality percentage in diabetic patients with a Diabetic Foot Ulcer than in those without foot ulcers. ⁷ The infection encompassing the foot wound fallouts from the microbial incursion into the involved tissue in sufficient amounts to provoke a host response, resulting in compromised wound healing. The worldwide frequency of Diabetic Foot Infection has been described between 25 and 50 percent. ⁸ Diabetic foot infections (DFI) are frequently poly-microbial, involving both gram-positive, gram-negative and anaerobic bacteria. ⁹ Previously, gram-positive organisms were most commonly isolated from diabetic foot infections, but there is now a shifting tendency noted in various studies, with gram-negative bacteria replacing gram-positive bacteria as the causative organism in diabetic foot infections and pseudomonas aeruginosa having a prevalence of 13.54%. ¹⁰ Pseudomonas presents a grave

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Date Received: 04/12/2023

Date Revised: 28/12/2024

Date Accepted: 08/01/2025

therapeutic challenge for both treatment and cost burden.

Keeping in mind the higher prevalence of gram-negative organisms causing diabetic foot infections and *Pseudomonas aeruginosa* being a therapeutic challenge, this study is being conducted to find the frequency of *Pseudomonas aeruginosa* growth in diabetic foot infection and its antibiotic sensitivity. The objective of the study was to determine the frequency of pseudomonal growth in patients with diabetic foot infection and its antibiotic sensitivity pattern. This study will help in prescribing empirical treatment for *Pseudomonas* infection of the foot in diabetic patients in areas where wound culture and sensitivity tests are not available.

MATERIAL AND METHODS

This study was conducted in the endocrinology unit of Lady Reading Hospital, Peshawar, on 180 patients with diabetic foot infections after approval from the hospital's ethical committee. Written informed consent was taken from all the patients, and a non-probability consecutive sampling technique was used. Symptomatic (polyuria, polydipsia) patients with random blood glucose of more than 200 mg/dl or HBA1C of more than 6.5 were labeled as having diabetes (both newly diagnosed and those already on treatment). Diabetic patients with foot ulcers and purulent discharge with two more of the following, including white cell count of more than 10000 per cubic milliliter, signs of inflammation (swelling, redness, and pain), and raised inflammatory markers, were labeled as having diabetic foot infection. *Pseudomonas* is a bacterium and belongs to the gram-negative rod family. When an antibiotic produces an inhibitory zone of 14 mm or more for a bacterium at 37 degrees centigrade, that specific bacterium is said to be sensitive to that antibiotic, and an inhibitory zone of less than 14 mm will be considered as resistant. Infections that develop within 48 hours of hospital admission were labeled as community-acquired.

Patients with diabetic foot infections who had not received antibiotics were included in this study. Patients who received antibiotics before hospital visits were excluded from the study. Samples of blood were taken from all patients and were sent to the hospital laboratory for measurement of complete blood count, CRP, random blood sugars, and HBA1C. Swabs from wounds were taken using sterile culture sticks and were sent to the hospital laboratory for culture and sensitivity. Information regarding demographics was taken and recorded using pro forma. Data was analyzed using SPSS version 20.0. Means and standard deviations were calculated for continuous variables like age, HBA1C, and duration of diabetes. Frequencies and percentages were calculated for categorical variables like gender, *Pseudomonas* growth, education, socioeconomic status, and residence. Pseudomonal growth was stratified against gender, education, socioeconomic status, and residence to see effect modification. Post-stratification chi-square tests were applied, keeping the p-value less than 0.005 as significant. Results were presented in tables.

RESULTS

This study was conducted on 180 patients with diabetic foot infections. The following results emerged from the analysis. The mean and standard deviation for age was 58.9 ± 5.9 years, the mean and standard deviation for HBA1c was 9.6 ± 1.8 , while the mean and standard deviation for the duration of diabetes was 9.8 ± 3.0 years. One hundred and two (56.7%) patients were male, while 78 (43.3%) patients were female. Fifty-six (31.1%) patients were illiterate, 78 (43.3%) patients had primary education, and 30 (16.7%) patients had intermediate education, while 16 (8.9%) patients had secondary and higher qualifications. Ninety-one (50.6%) patients belonged to rural areas, while 89 (49.4%) patients represented urban areas. Sixty (33.35) patients had monthly income less than Rs.16000, 80 (44.4%) patients had monthly income between Rs.16000 and 35000 and 40 (22.2%) patients were having monthly income more than Rs.35000. *Pseudomonas* was found in 29 (16.1%) patients while 151 (83.9%) patients did not show pseudomonal growth (Table no. 1).

Pseudomonal growth was stratified among gender, socioeconomic status, education status, and residence for effect modifications using the chi-square test, and the results are shown in Tables no 2,3,4, and 5. Gender and pseudomonal growth cross-tabulation showed no significant difference in pseudomonal growth among male and female patients. The Chi-square test was applied and showed a value of 0.5 (table no. 2).

Pseudomonas growth and socioeconomic status cross-tabulation showed no significant difference among different socioeconomic status patients with a p-value of 0.9 (Table no. 3) Pseudomonal growth and education status cross-tabulation showed that the majority of patients with pseudomonal growth were either illiterate or had primary education qualifications. The chi-square test was applied giving a p-value of 0.6 (table no. 4). Pseudomonal growth and residence cross-tabulation showed no significant difference in growth among patients with rural and urban residences, with a p-value of 0.39 (table no. 5). The sensitivity of *Pseudomonas* was checked against commonly used antibiotics (Table no. 6). Isolates showed 100 % sensitivity to colistin and polymyxin B. Imipenem, meropenem, and piperacillin, tazobactam were sensitive against 93.1% isolates of *Pseudomonas aeruginosa*.

DISCUSSION

Diabetic foot infection is one of the common chronic complications of diabetes with significant morbidity. Many different bacterial pathogens including *Pseudomonas aeruginosa* are responsible for diabetic foot infections. *Pseudomonas aeruginosa* isolated from these infections are usually multidrug resistant. In our study, we found that *Pseudomonas aeruginosa* was isolated from 16.1% of patients with diabetic foot infections, which were resistant to the majority of commonly prescribed oral

Table No 1: Pseudomonal Growth in DFI

	Frequency	Percent
Yes	29	16.1
No	151	83.9
Total	180	100.0

Table No 2: Gender and Pseudomonal Growth Cross Tabulation

		Pseudomonal Growth		Total	P value	
		yes	no			
Gender	Male	Count	18	84	102	0.5
		% within gender	17.6%	82.4%	100.0%	
	Female	Count	11	67	78	
		% within gender	14.1%	85.9%	100.0%	
Total		Count	29	151	180	
		% within gender	16.1%	83.9%	100.0%	

Table No 3: Pseudomonal Growth Socioeconomic Status Cross Tabulation

		Socioeconomic Status			Total	P value	
		Less than 16000	16 to 35000	More than 36000			
Pseudomonal Growth	Yes	Count	10	12	7	29	0.9
		% Within pseudomonal growth	34.5%	41.4%	24.1%	100.0%	
	No	Count	50	68	33	151	
		% Within pseudomonal growth	33.1%	45.0%	21.9%	100.0%	
Total		Count	60	80	40	180	
		% Within pseudomonal growth	33.3%	44.4%	22.2%	100.0%	

Table No 4: Pseudomonal Growth Education Status Cross Tabulation

		Socioeconomic Status				Total	P value	
		Illiterate	Primary	Intermediate	Secondary and Higher			
Pseudomonal growth	Yes	Count	9	15	3	2	29	0.6
		% Within pseudomonal growth	31.0%	51.7%	10.3%	6.9%	100.0%	
	No	Count	47	63	27	14	151	
		% Within pseudomonal growth	31.1%	41.7%	17.9%	9.3%	100.0%	
Total		Count	56	78	30	16	180	
		% Within pseudomonal growth	31.1%	43.3%	16.7%	8.9%	100.0%	

Table No 5: Pseudomonal Growth Residence Cross Tabulation

		Residence		Total	P value	
		Rural	Urban			
Pseudomonal growth	Yes	Count	17	12	29	0.39
		% within pseudomonal growth	58.6%	41.4%	100.0%	
	No	Count	74	77	151	
		% within pseudomonal growth	49.0%	51.0%	100.0%	
Total		Count	91	89	180	
		% within pseudomonal growth	50.6%	49.4%	100.0%	

and intravenous antibiotics. A study published in the Journal of the American Podiatric Medical Association showed that *Pseudomonas aeruginosa* was the most commonly isolated organism (25%) followed by *Staphylococcus aureus*.¹¹ Another study published in the International Journal of Microbiology showed that 55% of *Pseudomonas aeruginosa* species isolated from diabetic foot ulcers were resistant to more than 10 antibiotics. Most of these strains were sensitive to cefotaxime and ciprofloxacin.¹² In our study, *Pseudomonas* showed 100% sensitivity to colistin and polymyxin B followed by imipenem, meropenem, piperacillin, and tazobactam.

A study published in the American Journal of Podiatric Medical Association showed that *Pseudomonas aeruginosa* was isolated from 5.4% of patients with diabetic foot ulcers. Commonly isolated organisms were streptococcal species and *Staphylococcus aureus*. Pseudomonal growth was not related to age, HbA1c, and prior antibiotic use.¹³ We did not study risk factors for *Pseudomonas* growth in detail and the prevalence of pseudomonal growth in our study was higher than the mentioned study. A study done in India showed that 56% of organisms isolated from patients with diabetic foot infections were gram-negative rods, the majority of which were *Pseudomonas aeruginosa* and 44% of these pseudomonal growth were multidrug resistant.¹⁴ Another study done in Egypt showed that *Pseudomonas aeruginosa* is the most common gram-negative bacteria isolated from diabetic foot ulcers. The majority of these were sensitive to meropenem and amikacin.¹⁵ In our study, sensitivity to meropenem was 93.1% and sensitivity to amikacin was more than 80%. Another study from Nigeria demonstrated that *Pseudomonas aeruginosa* and *Staphylococcus aureus* are the most common organisms causing diabetic foot infections. 71% of isolates of *Pseudomonas* were sensitive to levofloxacin.¹⁶ Sensitivity to levofloxacin in our study was lower than this and was approximately 62%.

A study done in Iran revealed *Pseudomonas aeruginosa* was isolated from 7% of patients with diabetic foot infections. The majority of these isolates were sensitive to meropenem.¹⁸ Sensitivity to meropenem in our study was 93.1% and sensitivity to colistin and polymyxin B were 100% which were not tested in the mentioned study. Another study done in Gujrat, India presented that *Pseudomonas* is the most common organism isolated from diabetic foot ulcers. 27% of these isolates were of *Pseudomonas aeruginosa*. Fifty percent of these were extended-spectrum beta-lactamase producers. The majority of these species were sensitive to meropenem.¹⁸ *Pseudomonas aeruginosa* producing extended-spectrum beta-lactamase and those not producing extended-spectrum beta-lactamase were not studied in detail in our study, but the majority of pseudomonal growth was multidrug resistant. A study done in Italy revealed that 11.7% of isolates from patients with diabetic foot ulcers were *Pseudomonas aeruginosa*. Fifty-seven percent of these strains were resistant to fluoroquinolones, 23% were resistant to carbapenems and 17.5% were resistant to piperacillin.¹⁹ Resistance to fluoroquinolones was 49% while carbapenem, piperacillin, and tazobactam showed 7% resistance

respectively to *Pseudomonas* in our study. This study was done on patients presented to Lady Reading Hospital, Peshawar, so there is a lack of generalizability of results. The risk factors responsible were not studied in detail. Sensitivity to some of the commonly prescribed antibiotics was not checked due to limited resources

CONCLUSION

Pseudomonas aeruginosa is a commonly isolated gram-negative rod from patients with diabetic foot infections especially in our setup. This is usually resistant to commonly prescribed oral antibiotics and requires hospital admission for intravenous antibiotics. *Pseudomonas aeruginosa* growth is equally common in males and females and in patients with different socioeconomic and education classes. *Pseudomonas aeruginosa* is among the commonly isolated organisms from diabetic foot infection in our part of the world and is usually resistant to commonly prescribed antibiotics. Care must be taken while prescribing antibiotics to patients with diabetic foot infections when *Pseudomonas aeruginosa* growth is expected to avoid resistance. Antibiotics must be used for two to four weeks in diabetic foot infections due to *Pseudomonas aeruginosa*. Further studies are needed to know the risk factors responsible for pseudomonal growth and its resistance patterns in diabetic foot infection.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Khan S	✓	✗	✓	✗	✓	✗
Ubaid M	✓	✓	✗	✓	✓	✗
Wazir N	✗	✓	✗	✗	✓	✗
Rehman MU	✓	✓	✓	✗	✓	✓
Irfanullah	✓	✓	✗	✓	✓	✗
Ahmed I	✗	✓	✗	✗	✓	✗

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.

Ethical Approval:

This Manuscript was approved by the Ethical Review Board of Lady Reading Hospital, Peshawar. Vide No. 663/LRH/MTI.

Dated: 14 02 2023



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UNLOCKING POTENTIAL; EXPLORING THE PERCEPTIONS OF STUDENTS AND FACULTY REGARDING MEDICAL MENTORSHIP PROGRAM

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ABSTRACT

Objective: Adjusting to the demanding realm of medicine can be daunting. Medical students frequently seek guidance from senior professionals who have undergone analogous experiences and can relate to their difficulties. This highlights the imperative for a structured mentorship program in medical schools. Nonetheless, there is a paucity of literature regarding medical mentoring in the medical colleges in Khyber Pakhtunkhwa. Our study aims to explore the faculty's and students' perceptions of the Medical Mentoring Program at Khyber Girls Medical College.

Material and Methods: A qualitative study (phenomenology) was conducted at Khyber Girls Medical College and Hayatabad Medical Complex, Peshawar, Pakistan. Depending on the saturation of data, five Focus Group Discussions (FGDs) were conducted with students, and six In-depth Interviews (FGIs) were conducted with faculty. The sampling technique was purposive sampling. The FGDs and interviews were audio recorded, transcribed verbatim, analyzed, and themes identified.

Results: Four themes were developed from FGDs: evolving into a better version of oneself, opportunities, progressing together, and journeying toward excellence. Three themes were developed from IDIs: strengthening each other, obstacles in the way, and refining the mentorship experience.

Conclusion: An effective mentorship program is crucial for fostering bonding between students and teachers, and hence for the self-improvement of mentees.

Keywords: Mentorship, Mentors, Students, Medical College

This article may be cited as: Jadoon S, Mahsood N, Zain K, Hashimi B, Khan SW, Iftikhar M. Unlocking Potential; Exploring The Perceptions Of Students And Faculty Regarding Medical Mentorship Program. J Med Sci 2025 January - March;33(1):12-20

INTRODUCTION

Adjusting to a demanding field like medicine is an extremely hard battle. Preparing oneself to face the challenges and help in making the right decisions at the right time, students seek help from senior professionals who have gone through the same process and hence can understand their struggle. Reaching out to a trustworthy senior who is willing to spare time for a student is yet another endeavor. A formal Mentorship Program, therefore, is imperative in any medical college. The Standing Committee on Postgraduate Medical and Dental Education (SCOPME) has defined mentorship as "a process where by an experienced, highly regarded, empathic person (the

mentor) guides another individual (the mentee) in the development and examination of their ideas, learning, and personal and professional development."¹

Mentorship Programs help students in several ways ranging from adjusting to a new environment to choosing a specialty after medical school. Students who had good terms with a mentor were seen to spend more productive time during their undergraduate years by actively taking part in research and early career choices.² On the other hand, because of the formal Mentoring Program, faculty becomes bound to make time for the students-which they find burdensome.³

Therefore, considering the faculty's perception and training them increases the effectiveness of the program.⁴ From our search, the literature was deficient on Medical Mentoring in medical colleges of Khyber Pakhtunkhwa. Therefore, we planned this study to explore the perceptions of both the teachers and students regarding the medical mentoring program to help the administration of medical colleges in developing an effective model of medical mentoring.

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Date Received: 15/12/2023

Date Revised: 04/12/2024

Date Accepted: 29/01/2025

The objective of this study was to explore the faculty's and student's perceptions of the Medical Mentoring Program at Khyber Girls Medical College.

MATERIAL AND METHODS

A qualitative study was conducted at a public sector medical college in Khyber Pakhtunkhwa, and it took three months duration. The phenomenology approach was chosen to explore the subjective experience of participants and Five FGDs with students and six IDIs with faculty were conducted depending on the saturation of data. One FGD was conducted with students from each professional year. The number of participants in each FGD was a minimum of five and a maximum of ten. Depending on the saturation of data. two faculty members were interviewed from spiral I of the curriculum (1st and 2nd-year MBBS), 2 faculty members from spiral II (3rd and 4th-year MBBS), and 2 faculty members from spiral III (final year MBBS). The sampling technique was purposive sampling. The inclusion criterion was all students enrolled in each professional year of a public sector medical school and all faculty members in basic and clinical sciences. The exclusion criteria were those students and faculty members who were not willing to participate or were absent on the day of data collection.

After ethical approval from the institutional ethical board (Ethical Review Board of Hayatabad Medical Complex, Approval No # 1414, Dated 20.6.23), consent was taken from the study participants. Participation in the interviews and group discussions was welcomed by all full-time faculty members and students. The discussion was generated about students' and faculty's perceptions of the purpose, process, and demands of the medical mentorship program.

Before the study's implementation, guiding questions were extracted from the literature, verified by three medical education department specialists, and piloted.

The guiding questions for mentees were:

1. Have you ever heard about the mentorship program? (Probe: thoughts on mentorship program)
2. What positive impact will an effective medical mentorship program have on different aspects of your life?
3. How do you think this program will shape your career or help you with setting career goals?
4. How do you think this mentorship program will help you with your personal and academic growth?
5. What kind of issues are you facing in medical school, and how do you think this program will benefit

you?

6. How do you think the medical mentorship program can lead to collaboration between students and faculty and cause them to work together in different areas (such as research projects)?

7. How do you think the medical mentorship program can influence the overall environment of our institution?

8. What would you suggest for making this program beneficial for both the mentors and mentees?

.The guiding questions for mentors were:

1. What are your thoughts on a mentorship program for undergraduate medical students?
2. Do you have any previous experience in a medical mentoring program?
3. What factors do you feel influence the development of mentoring relationships?
4. What is your motivation for participating in the medical mentorship program?
5. What do you think what challenges you will face during mentorship programs?
6. What positive impacts will an effective medical mentorship program have on different aspects of students' lives?
7. How do you think the medical mentorship program can lead to collaboration between students and faculty and cause them to work together in different areas, such as research projects?
8. How do you think the medical mentorship program can influence the overall environment of our institution?
9. What would you suggest for making this program beneficial for both the mentors and mentees?

Data was recorded verbatim by using a Dictaphone and a sound recorder. Transcription was done through transcriber software. All the responses were anonymous and kept private. The moderator for each IDI and focus group was the same. Following each session, the moderator and assistant moderator went over every transcript and classified the information into several sections. Using an open coding technique, the text was analyzed for important indigenous terms and keywords in context. Co-authors were then shown these codes and subthemes, and any disagreements were resolved by consensus. Any topic that required more explanation served as a road-

map for the following meeting. This procedure produced themes after each session, which were subsequently discussed by each author until a consensus was achieved on themes. Data analysis and collection were carried out concurrently. The participants were given copies of the final report to verify.

RESULTS

Initially, open coding was used for analysis. Axial coding was used for the second coding cycle to determine the correlations. The six stages of thematic analysis were familiarizing oneself with the data, creating preliminary codes, looking for themes within codes, evaluating themes, defining, and labeling themes, and creating the final report. The goal of the process was to create meaningful patterns through coding.

The outcomes of six IDIs and five FGDs were compiled using theme categorizations.

Regarding the theme of "Evolving into a better version of oneself," all participants spontaneously agreed that the mentorship program is essential to the personal and professional development of medical students, and it enhances their confidence, time management skills, communication skills, and strengths.

Concerning the theme "Opportunities," nearly every participant expressed the belief that the mentorship program offers them research opportunities, facilitates their connection with mentors from many disciplines, and increases their chances of networking. They can exchange knowledge and receive career coaching through mentoring programs.

Regarding the theme "Progressing together," most participants felt that mentorship programs provide them with direction in both their professional and academic lives. They gain the opportunity to learn useful information as the mentor shares their own life experiences with them. Teachers and students can form better bonds through mentorship programs, and they can engage in a variety of collaborative activities with their mentors that benefit both parties. It's essentially a mutual support system for both mentors and mentees.

When it comes to the theme "Journey towards excellence" it was recommended by many participants that the mentor should have patience and good listening skills. To build a relationship and trust between mentor and mentee, a mentor's positive behavior is crucial. Mutual pleasure and understanding should exist between the two sides. The choice of mentors ought to be made with input from the mentees.

The theme "Strengthening each other" metaphorically states that a medical mentoring program is crucial for students' career counseling, academic and personal development, and improvement of their communication skills. The mentors provide the right guidance, fostering an environment where helping each other is encouraged. This collaborative approach extends beyond academics, creating opportunities for research and instilling a culture of respect. Through these interactions, we aim to build confidence in our students while working together in collaboration towards their professional and personal development.

The theme "Obstacles in the way" metaphorically describes the challenges the mentors face during the mentoring session with their mentees. Challenges in medical mentorship programs for students can take the form of time management issues, making it difficult for them to handle their academic obligations. A lack of facilities and resources can make learning difficult and present obstacles for both mentors and mentees. Another challenge is controlling students' overly friendly conduct, which necessitates mentors setting firm limits to preserve a formal and productive mentoring environment.

In terms of the theme "Refining mentorship experience," the mentors gave suggestions for improvement of the mentoring program. To enhance medical mentoring programs for students, the mentors suggested that training programs for mentors can provide them with the knowledge and abilities they need to be successful in their positions as mentors. Many mentors suggested establishing avenues for both in-person and virtual connections that will enable more adaptable and easily accessible mentor-student relationships. In the mentoring relationship, this can improve involvement and communication. Mentors in all six IDIs recommended establishing a system of incentives and acknowledgment for mentors who exhibit extraordinary commitment and efficacy in their capacities. Mentors might be inspired to keep giving students the important support they need by acknowledging and valuing their contributions.

DISCUSSIONS

The medical mentoring program is a structured initiative designed to foster the professional and personal development of aspiring medical students. The participants in this study believed that a medical mentoring program would bring out the best in them. It may boost their confidence, such as not being afraid to express their feelings, and enhance their communication skills, whether with patients or colleagues. This was in line with the article by Parya and Saeed in which they mentioned that mentors

Table No 1: Codes and Representative Quotes Identified By Mentees in FGDs

	Representative Quotes from interviews	Codes used by the participants	Number of times the code is used by the participant in FGDs
1	"A mentor eases our life by guiding us so that we do not face the difficulties they did or the good outcomes we produce that they could not." (Participant 1 from FGD 1)	Offering guidance	+20+26+13+30 118=29
2	"A mentor can make a person believe in herself, her skills, and her capabilities and hence become a better and a confident version of herself." (Participant 3 from FGD 2)	Enhanced personal growth	14=2+2+2+2+6
3	"Mentors will provide guidance and support at every step; this will boost confidence within us and make us capable of facing any challenges." (Participant 3 from FGD 4)	Building confidence	24=9+4+4+1+6
4	"I don't know how to socially interact as I suffer from social anxiety and it's difficult for me to interact. Mentors can train us through patient engagement and teach us how to handle different personalities." (Participant 4 from FGD 2)	Improvement of communication skills	18=3+4+2+7+2
5	"Our mentors will possess expertise in specific fields, and they will not only guide us about their respective areas of specialization but also share their overall experiences. This guidance will contribute to a clearer understanding of our career paths." (Participant 1 from FGD 5)	Career counseling	32=8+5+8+4+7
6	"The experiences of mentors can serve as a lighthouse for us." (Participant 4 from FGD 3)	Sharing of experiences	25=6+3+6+3+7
7	"Their motivation is important for our personal and academic progress. When we believe in ourselves, we can perform tasks more effectively, which positively influences our overall growth." (Participant from FGD1)	motivation	16=2+4+1+6+3
8	"This will provide us with opportunities to network, gain recognition, and potentially collaborate with individuals from diverse academic backgrounds and most importantly we get research opportunities." (Participant 4 from FGD 3)	Provision of research and networking Opportunities	32=9+9+4+8+2
9	"Medical mentorship programs will produce a friendly atmosphere too and will facilitate better communication with mentors." (Participant 3 from FGD 2)	Bonding between students and teachers	22=5+5+5+1+6
10	"We want our mentors to make us part of any curricular activity that they know about, for example, research, career counseling sessions, and any knowledge-enhancing activity." (Participant 2 from FGD 3)	Collaborative activities	21=9+4+4+0+2
11	As students receive support from their mentors, they will be motivated and show greater enthusiasm towards their profession. (Participant 3 from FGD 1)	Support system	22=0+2+1+3+16
13	"Mentors will help us cope with different challenges that we face in our professional institute; they can give us advice on career decisions." (Participant 4 from FGD 4)	Valuable advice	6=0+0+5+1+0
14	"After guidance in every aspect of our medical field, the output will be doubled, as a result, the institute environment will comprise socially and academically groomed individuals." (Participant 2 from FGD 2)	Grooming as professionals	7=1+2+2+2+0
15	"They correct our mistakes and this way there is considerable improvement in every little or big thing we do." (Participant 1 from FGD 3)	Improving weaknesses and strengths	21=4+4+5+1+7
16	"Mentors can Help us in better networking and clarity of mind and reduce the energy utilized in making decisions." (Participant 4 from FGD 5)	Making better choices	7=3+0+1+1+2
17	"My mentor will help me to make effective and smart study plans and hence this will save me time and reduce the stress levels that I will face while studying if I don't have a mentor." (Participant 3 from FGD 4)	Effective time management	20=3+2+5+6+4
18	"The knowledge and skills I acquire through the program will not only benefit me but also enable me to share and teach them to my friends. They will in turn pass on this knowledge to others, thus producing a positive impact throughout the institution." (Participant 4 from FGD 1)	Exchange of knowledge	18=3+3+6+5+1
19	"This mentorship program emphasizes practical learning, which will prove beneficial when we conduct our research. It will greatly assist us in developing the necessary skills and knowledge for independent research." (Participant 1 from FGD1)	Efficient learning	20=5+0+3+9+3
20	"Mentors should have good listening skills and patience so that they can understand our learning issues and they shouldn't harshly behave with us." (Participant 5 from FGD 2)	good listening skills of mentors	22 =3+2+5+8+4
21	"Mentors should promote a friendly and approachable environment for us and should not discriminate among mentees." (Participant 3 from FGD 4)	Behavior of mentors	21 =4+2+5+7+3

22	"The administration should ensure mutual satisfaction regarding the mentorship program from both mentors and mentees." (Participant 4 from FGD 3)	Mutual satisfaction of both mentors and mentee	22 =5+2+4+8+4
23	"Mentees should be given choices for the selection of mentors or at least the administration should ensure compatible pairing." (Participant 2 from FGD 5)	Selection of mentors	23 =3+4+6+6+4

Table No 2: Codes and Representative Quotes Identified By Mentors in IDIs

	Representative quote	Codes used	No. of times the code is used by the participant
1	"The students will also get an insight about the different fields of medicine from their mentors, and this will further help the students in the selection of their career choices" (IDI 1)	Career counseling	12
2	"Students will get to learn from the life experiences of the teachers which will be very beneficial for the personal growth of students especially helping our students how to deal with different circumstances being a female" (IDI 3)	Personal growth	8
3	"Professional growth & academic improvement would happen because of mentoring" (IDI 2)	Improvement	6
4	"Teaching is not just knowledge. We will try to concentrate on not only knowledge but also other skills and attitudes" (IDI 6)	Skill development	7
5	"It will help both the students and mentors because it will be a two-way communication and exchange of knowledge" (IDI 5)	Promoting communication	14
6	"Mentor will provide guidance to the students for effective study and will also guide students in further selection of the different medical fields for their careers in future" (IDI 2)	Providing right guidance	12
7	"If you have a good relationship with students of today they give you very good social contacts for the future, good mentees can help mentors" (IDI 1)	Helping each other	15
8	"Good mentees can help mentors in medical camps in research and co-curricular activities" (IDI 4)	Research opportunities	16
9	"The students and teachers by having sessions with each other will develop respect for each other and develop good relations with each other and get to know them personally" (IDI 3)	Showing respect	16
10	"Mentoring program will lead to personal growth of the students by boosting their confidence levels" (IDI 2)	Fostering confidence	11
11	"Fostering good relationship, collaboration between faculty and students it can very effectively improve the environment of the college" (IDI 1)	Working together in collaboration	10
12	Time management is the most challenging task for faculty, especially clinical faculty face lots of issues in taking time for mentoring sessions out of their busy clinical schedules. (IDI 2)	Time management	12
13	The mentoring program needs resources, and the administration of the medical schools must provide all required resources and facilities for the smooth conduction of mentoring sessions. (IDI 5)	Lack of resources/ facilities	8
14	Sometimes students become overfriendly with mentors and demand extra favors, making mentors very uncomfortable. (IDI 6)	Over-friendly behavior of students	6
15	The mentors should be given proper training, workshops, and refresher courses so they can mentor better. (IDI 4)	Training of mentors	14
16	There should be options for physical and online mentoring sessions so that it becomes more feasible and convenient for both mentors and mentees. (IDI 3)	Opportunities for physical and online communications	9
17	The mentors should be awarded for mentoring services and should be acknowledged in promotion as sparing time for mentoring sessions is difficult for faculty, especially out of busy clinical schedules. (IDI 1)	Rewards for mentors	10

Table No 3: Subthemes and Themes derived from FGDs

S/No	Themes	Subthemes	Codes
1	Evolving into a better version of oneself	Personal and professional growth	Grooming as professionals Building confidence Enhanced personal growth. Effective time management Improvement of communication skills Improving weaknesses and enhancing strength
2	Opportunities	Learning and research opportunities	Provision of research and networking Opportunities Career counselling Exchange of knowledge Efficient learning
3	Progressing together	Mutual benefits for both mentors and mentees	Offering guidance Sharing of experience Motivation Bonding between students and teachers Collaborative activities Support system Making better choices
4	Journey towards excellence	Suggestions for mentors and administration	Good listening skills of mentors Behavior of mentors Mutual satisfaction of both mentors and mentee Selection of mentors

Table No 4: Categories or Subthemes and Themes Derived from IDIs

S/No	Themes	Subthemes	Codes
1	Strengthening each other	Benefits/ Rewards for mentees and mentors	Career counseling Personal growth Improvement Skill development Promoting communication Providing right guidance Helping each other Research opportunities Showing respect Fostering confidence Working together in collaboration
2	Obstacles in the way	Challenges	Time management Lack of resources/facilities Over-friendly behavior of students
3	Refining mentorship experience	Suggestions	Training of mentors Opportunities for physical and online communications Rewards for mentors

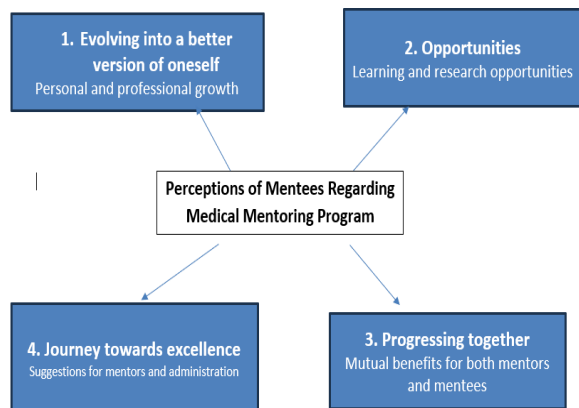


Figure 1: Thematic presentation of Perceptions of Mentees Regarding Medical Mentoring Program

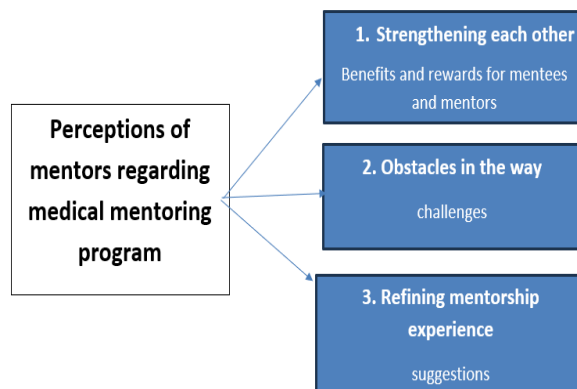


Figure 2: Thematic presentation of Perceptions of Mentors Regarding Medical Mentoring Program

help their mentees improve their social skills, in particular, communication skills and bring them a sense of empathy.⁵ These programs also groom their personalities and improve their abilities to deal with obstacles in their personal and professional lives. Aside from grooming and development, one factor that the participants emphasized was self-improvement; they believed that a mentoring program may help them analyze themselves and make positive adjustments in their lives as doctors and students.

The findings of this study that medical students (mentees) believe that medical mentoring programs can provide different opportunities for them like skills development, career opportunities, and research opportunities are similar to the findings of a study conducted by [Nimmons et al.](#)⁶ The mentoring program will also help the students learn a lot from their mentors' personal and professional experiences. The mentoring program will also provide career counseling sessions to the students in which the mentors can guide the students in selecting the right career paths based on the skills and interests of the students.⁷

Based on our study, an ideal mentoring program is beneficial for the mentors, mentees, and the institution.⁸ According to students' perspectives, as are the findings of many previous studies, mentees will gain potential assistance in several ways including motivation, valuable advice, guidance on foreign licensing exams, and emotional support.⁹ As were the findings of [Kale et al.](#) most respondents anticipated a mentor's support in coping with stress, understanding their problems, and providing a professional perspective.¹⁰ As were the findings of the study conducted by [Nimmons et al.](#), mentors in return can get help in their research pursuits and other projects and hence professional development.¹¹ Consistent with the results of the study conducted by [Bickel et al.](#), by promoting an ideal environment for learning and growth, the institute will earn a reputation as a breeding ground for leaders and good organizers.¹²

Most of the students in our study agreed to the fact that a mentor should have good listening skills; the understanding of what the mentees are trying to convey by mentors is crucial for mentees to build good relationships with mentors. Most of the students recommended that a mentor should empathize with their mentees. As discussed in the literature, practicing empathy by mentors is a proven significant factor that can foster their relationship with the young mentees.¹³ The trust-building at the start of this professional relationship is the most important factor that will let this interaction progress smoothly and yield productive outcomes, as proved in a study conduct-

ed by [Ferda et al.](#), which showed that the important factor that can influence trust-building is the efforts given by mentors for the progress of this relationship.¹⁴ Identical to the results of the study by [William et al.](#), both one-to-one and group meetings at a mutually agreed time was recommended.¹⁵ Any form of discrimination among mentees has the potential to erode and compromise the integrity of the mentor-mentee relationship. The students proposed the idea of pairing mentees with mentors based on the criterion of compatibility. Furthermore, a recommendation was put forth to the college administration or program leaders that, before the designation of mentors for specific classes, an established mechanism for assessing both academic acumens and personal attributes should be implemented. This measure aims to ensure a sense of mutual contentment and compatibility as proposed in a study conducted for the resident mentoring program at Zurich University Hospital where one of the options for choosing mentors for mentees was to assign mentors based on the interest of mentees by the criterion set up by the program leaders.¹⁶

Mentorship programs provide academic support to the students and help them choose study methods that will improve their study performance. Mentors offer emotional support to mentees and guide them through diverse situations.¹⁷ The life experiences of mentors serve as valuable lessons that help mentees with their personal growth.¹⁸ Mentors support and guide mentees through their research endeavors and enhance opportunities for networking and sharing of knowledge.¹⁹ Mentors also benefit from the mentorship programs as it has a good impact on their CVs and help them in their advancement.²⁰ They also get a great sense of achievement when they witness their mentees succeed under their guidance.²¹

Challenges often arise when both mentors and mentees have high expectations of each other, and boundaries aren't set. Therefore, adequate training of the mentors and evaluation of the process is necessary.²² Conflicting schedules of mentors and mentees can also pose a challenge as it would be difficult for them to find a suitable time to arrange meetings.²³ The absence of a proper system to guide and structure the mentorship process and the unsupportive nature of the existing system can further strain the dynamics of mentorship.²⁴

The findings of this study reported that all the mentors recommend a training session for mentors. Similar studies also report training to be a prerequisite for rendering mentorship programs successful.²⁵

This study proposed that there should be monthly in-person and virtual meetings. Mentors must put out ef-

fort to win their mentees' trust and demonstrate their dedication to the mentoring program. It was found that willpower and dedication were crucial for developing a solid mentor-mentee connection.²⁶

The key limitation of this study was that it was conducted only in one center. Further multi-centric research would be needed to capture the perceptions from different institutes to explore the in-depth perceptions of both mentors and mentees.

CONCLUSION

The study underscores the significance of the Medical Mentoring Program in facilitating students' personal and professional development. Mentors are seen by students as essential advisors who provide insightful advice, inspiration, and assistance. The program fosters a collaborative environment by offering chances for learning, research, and career advice. Resource limitations and time management were noted as difficulties. Academics underscored the need for mentor training and a methodical mentorship procedure. To contribute to the overall excellence of medical education, the findings support the maintenance and enhancement of the Medical Mentoring Program, with a special focus on mentor qualifications and program enhancements. It is advised that more studies be conducted at various locations to gain a thorough grasp of perceptions in various contexts. Further research across multiple centers is recommended for a comprehensive understanding of perceptions in diverse settings.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Jadoon S	✓	✗	✓	✗	✓	✗
Mahsood N	✓	✓	✗	✓	✓	✗
Zain K	✗	✓	✗	✗	✓	✗
Hashimi B	✓	✓	✓	✗	✓	✓
Khan SW	✓	✓	✗	✓	✓	✗
Iftikhar M	✓	✓	✓	✗	✓	✓

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.

Ethical Approval:

This Manuscript was approved by the Ethical Review Board of Hayatabad Medical Complex, Vide No. HMC-QAD-F-00/1414.

Dated: 20 06 2023



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COMPARISON OF SURGICAL SUCCESS AND VISUAL ACUITY IN EXOTROPIA CASES

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ABSTRACT

Objective: Exotropia is a condition in which there is a misalignment of the visual axes and a difference in eye symmetry. This can lead to diplopia (double vision) and a decrease in visual acuity. In some cases, the head may also change position to help the affected eye focus on distant objects. The main concerns for patients with exotropia are visual acuity, the appearance of their eyes, and cosmetic postures.

Methods: This study examines the success rates of surgery and changes in visual acuity for 44 patients who underwent exotropia surgery.

Results: Of the patients who had recession-resection surgery, 79.1% were successful, 12.5% had partial success, and 8.4% were unsuccessful. For those who had bilateral recession surgery, 70% were successful, 5% had partial success, and 25% were unsuccessful. There was a statistically significant difference in preoperative visual acuity between the two groups. After surgery, there was a significant improvement in visual acuity for both groups.

Conclusion: The majority of patients (70.4%) undergo this surgery for cosmetic reasons rather than for improved visual acuity. There was no significant difference in postoperative results between the two groups in terms of shift values.

Keywords: Exotropia, strabismus, diplopia, visual acuity.

This article may be cited as: Sever TH, İffet Yarımğa I. Comparison Of Surgical Success And Visual Acuity In Exotropia Cases. J Med Sci 2025 January - March;33(1):21-24

INTRODUCTION

Exotropia is a condition in which there is a loss of coordination between the visual axes when looking at distant objects, resulting in a lack of parallelism. In the literature, this is often described as the brain suppressing secondary vision or adapting to prevent double vision when the image in the other eye does not align with the fovea.¹⁻⁵

Intermittent exotropia is a prevalent form of strabismus in society. Studies have shown that it is prevalent in the Asian continent, as 4%.^{6,7} The success of exotropia surgeries is determined by two key factors: the patient's visual acuity and the restoration of facial symmetry for cosmetic purposes. Variables such as the age of onset of the disease, age at the time of surgery, degree of deviation, and preoperative visual acuity can all impact the success of the surgery.⁸⁻¹² The most important gain desired in the treatment of strabismus is to ensure that both eyes remain in the same symmetry permanently and to

provide binocular single vision. In cases where there is no binocular vision, strabismus surgeries are preferred for an aesthetic appearance.

In this study, we examined the preoperative and postoperative visual acuities of the patients and compared the results of unilateral and bilateral regression methods in patients diagnosed with exotropia.

MATERIALS AND METHODS

A total of 44 patients who were admitted to the Ophthalmology Polyclinic of Van Training and Research Hospital with a diagnosis of exotropia and underwent surgical treatment were included in the study. The inclusion criteria for patients were voluntary participation, age over 18, and one year of follow-up after surgery. Exclusion criteria included patients who had surgery at another hospital or clinic, those under 18 years old, those who did not wish to participate, and those with mental or physical disabilities, as well as cases of vertical strabismus and nystagmus. The cross-sectional design will be selected within the scope of the survey research design. Cross-sectional design allows the characteristics of the universe or the differences between two or more universes to be described.

Patients without mental or physical disabilities, as well as cases of vertical strabismus and nystagmus, were accepted. Informed consent was obtained from all

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Date Received: 16/12/2024

Date Revised: 07/01/2025

Date Accepted: 11/01/2025

patients, both in writing and orally. The interventions performed on the patient's eye muscles were classified according to the "Basic and Clinical Science Course" table of the American Academy of Ophthalmology (AAO).

In the study, all surgeries involved rectus resection surgery. The AAO scale was used to evaluate the success of the regression surgeries, with a focus on values of 15 PD (prism diopter) and above in both monocular and symmetric surgical methods. In this study, cases with the condition of having eyes that look in different directions from each other, caused by a weakness of the eye muscles, 10 PD or less, were considered successful, while those between 10-19 PD were classified as partially successful. Patients with 20 PD or more were classified as unsuccessful.

According to the AAO Basic and Clinical Science Course table, the sample is divided into two basic groups: monocular surgery (external rectus recession and internal rectus recession) and symmetrical surgery (bilateral external rectus recession).

Permission for the study was obtained from the Van Training and Research Hospital Clinical Research Ethics Committee with the number 2023/04-03. The data obtained were analyzed with the help of a statistics program, SPSS version 20.0.

RESULTS

The average age of the 44 patients included in the study was 41.2 years old. The youngest patient was 22 years old, and the oldest was 56 years old.

As shown in Table 1, the demographic characteristics of the patients were analyzed, and it was found that more than half (56.8%) were male. The majority of the patients had a high school or primary school education level (79.5%), and almost all of them had an income of less than 10,000 - (90.8%). Additionally, the majority of the patients were married (84%). When examining the reasons for the patients' request for strabismus surgery, it was found that 70.4% of them chose to undergo the surgery for cosmetic reasons.

Visual acuity was compared between the two groups (see Table 2). In the monocular surgery group, patients had a range of visual acuity from 0.1 to 0.9, according to LogMAR. In the symmetry surgery group, the range was from 0.2 to 0.7. The mean visual acuity using LogMAR for the first group was 0.8 ± 0.053 , while the mean for the second group was 0.5 ± 0.732 . A statistically significant difference was found between the two groups when comparing their preoperative visual acuity using LogMAR ($p=0.037$).

When the preoperative shift levels were measured, it was determined that the lowest was 30, the highest was 72 PD for the first group, the lowest was 38, and the highest

was 88 PD for the second group (table 3). In terms of the averages, it was understood that the first group was 42.21 ± 8.1 , and the second group was 46.15 ± 7.9 PD. In the comparison between both groups, it was understood that there was no statistically significant difference in terms of preoperative shift values ($p=0.697$).

After the surgery, patients were regularly monitored at standard intervals (1 week, 1 month, 3 months, 6 months, and 1 year).

Visual acuity improved in both groups after surgery (table 4). In addition to both the minimum and maximum values, there was an increase in the mean visual acuity. After the t-test analysis, a statistically significant difference ($p=0.014$) was found between the two groups in terms of visual acuity. When the Tukey HSD test was applied to determine the direction of the difference, it was determined that those who had unilateral resection surgery constituted the direction of this difference.

In the first group, 19 patients (79.1%) had successful results, three patients (12.5%) had relatively successful results, and one patient (8.4%) had an unsuccessful outcome after undergoing regression-resection surgery. As a result of the unsuccessful surgery, no cosmetic success was achieved. For patients who underwent bilateral recession surgery, 14 patients (70%) had successful results, one patient (5%) had a relatively successful outcome, and five patients (25%) had unsuccessful results.

When the post-surgical shift levels were measured, it was determined that the lowest 6 PD and the highest 32 PD for the first group, and the lowest eight and the highest 40 PD for the second group (table 5). In terms of the averages, it was understood that the first group was 12.43 ± 7.9 and the second group was 18.64 ± 6.8 PD. In the comparison between the two groups, it was understood that there was no statistically significant difference in terms of the postoperative shift values ($p=0.725$).

DISCUSSION

According to studies, several factors can significantly impact the success of surgical treatment for exotropia. These factors include gender, age, age at onset of the disease, age at the time of surgery, and the amount of preoperative shift. For instance, binocular vision is one example of a factor that can affect surgical outcomes. In this particular study, 56.8% of the participants were male. However, unlike other studies, there was no significant difference between men and women in terms of preoperative shift levels ($p=0.697$).⁸⁻¹²⁻¹⁴

The majority of the patients had an income of less than 10,000 - (90.8%). The hospital where the study was conducted is a state hospital. The health payments of everyone with social health insurance are covered by the state. Therefore, it is evaluated that the majority of the patients in the study are those who cannot have this surgery

Table No 1: Demographics and income details of the participants

Gender	n	%	Marital Status	n	%
Male	25	56.8	Married	37	84
Female	19	43.2	Single	7	16
Education			Patient's request for surgery		
Primary School	17	38.6	Cosmetic	31	70.4
High School	18	40.9	Visual acuity	13	29.6
University	9	20.5			
Income					
0-5000 ₺	21	47.7			
5.000-10.000 ₺	19	43.1			
10.000-15.000 ₺	4	9.2			
+15.000 ₺	-	-			
Total	44	100.0	Total	44	100.0

Table No 2: Visual acuity of the participants

Groups	n	Min	Max	Mean	StD.	t	p
Monocular	24	0.1	0.9	0.8	0.053	-2.412	0.037
Symmetry	20	0.2	0.7	0.5	0.732		

Table No 3: Preoperative Shift

Groups	n	Min	Max	Mean	StD.	t	p
Monocular	24	30	72	42.21	8.142	-0.861	0.697
Symmetry	20	38	88	46.15	7.923		

Table No 4: Visual Acuity

Groups	n	Min	Max	Mean	StD.	t	p
Monocular	24	0.5	1.0	0.9	0.053	-3.162	0.014
Symmetry	20	0.4	0.9	0.7	0.082		

Table No 5: Postoperative Shift

Groups	n	Min	Max	Mean	StD.	t	p
Monocular	24	6	32	12.43	7.964	-0.668	0.725
Symmetry	20	8	40	18.64	6.834		

in private hospitals.

According to studies, 10 cases of successful PD correction have been reported (15). The American Academy of Ophthalmology (AAO) uses a «Basic and Clinical Science Course» scale with 10 PD as a reference. In this study, 79.1% of patients who underwent recession resection were successful, 12.5% were partially successful, and 8.4% were unsuccessful. It can be concluded that 70% of patients who underwent bilateral recession surgery were successful, 5% were partially successful, and 25% were unsuccessful.

When comparing the preoperative visual acuity of the two groups, a statistically significant difference was found ($p=0.037$). Following the surgery, both groups showed a significant increase in visual acuity. Further analysis using a t-test revealed a statistically significant difference ($p=0.014$) between the two groups in terms of visual acuity. The Tukey HSD test was then used to determine the direction of this difference, which showed that those who underwent unilateral resection surgery had a higher visual acuity. This suggests that unilateral resection surgeries may yield more successful results in terms of visual acuity compared to symmetry surgeries. Similar results have been obtained in other studies, although the increase in visual acuity sometimes increases after a second or more operation [16,17].

One of the most significant findings of the study is that patients with a preoperative deviation level of 50 PD or higher experienced less satisfactory results after surgery. Therefore, it can be stated that the satisfaction levels of patients with high deviation levels are mixed.

One finding from the study is that the majority of patients (70.4%) opt for this surgery for cosmetic purposes rather than to improve their visual acuity. After comparing postoperative values, it was determined that there was no significant difference in shift values between the two groups ($p=0.725$). Additionally, there was an improvement in visual acuity for both groups. Upon examining the postoperative results of patients who initially sought the surgery for cosmetic reasons, it was concluded that satisfactory success was achieved in terms of both cosmetic appearance and visual acuity.

CONCLUSION

Exotropia cases are a condition that negatively affects both the cosmetic appearance and visual acuity of patients and deeply undermines their overall quality of life. The results of this study indicate that postoperative deviation levels showed a satisfactory improvement compared to preoperative levels, with monocular surgery proving to be more successful than symmetry operations.

The satisfaction levels of patients with a preoperative deviation level of 50 PD or higher vary. Contrary to our expectations, patients with a high deviation level were found to have lower satisfaction and contentment levels. This suggests that re-surgery may be necessary for patients with a high degree of deviation. It is crucial to inform patients about this possibility before the operation.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Sever TH	✓	×	✓	×	✓	×
İffet Yarınmağa I	✓	✓	×	✓	✓	×

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.

Ethical Approval:

This Manuscript was approved by the Ethical Review Board of University of Health Science, Van Research and Training Hospital. Dated: 15 02 2013



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ROLE OF MEAN APPARENT DIFFUSION COEFFICIENT (ADC) VALUE IN DIFFERENTIATION OF HIGH- AND LOW-GRADE GLIOMAS ON CONTRAST-ENHANCED MRI

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ABSTRACT

Objectives: The purpose of our study was to determine the role of mean apparent diffusion coefficient (ADC) values in differentiating low-grade from high-grade gliomas, keeping conventional MRI sequences as a gold standard

Material & Methods: This study was done in Lady Reading Hospital from September 2022 to December 2023. The prospective cross-sectional descriptive study included patients from the Out-Patient Department and Neurosurgery wards. Patients underwent MRI on a 1.5 Tesla machine, acquiring T2WI, T1WI, FLAIR, DWI, and gadolinium-enhanced T1WI sequences. PACS software identified areas with restricted diffusion and low ADC values. ROI measurements were made to determine ADC values. Image artifacts and contrast enhancement patterns were noted. Data on patient demographics, lesion location, MRI features, and ADC values were analyzed with SPSS-23.

Results: A total of 104 patients were included, with ages ranging from 3–87 years (Mean 41 years, \pm 19.5), with 62 having low-grade gliomas and 42 high-grade gliomas. The mean ADC values were 1334.37 ± 300.85 mm²/s for low-grade and 842.88 ± 232.013 mm²/s for high-grade gliomas. The sensitivity and specificity of low ADC for high-grade glioma are 83.33% and 77.42%, respectively. The optimal ADC cut of 1086.58 mm²/s significantly correlated with glioma grading ($p < 0.001$). Multiple linear regression revealed a significant relationship ($p < 0.001$) between mean ADC and tumor enhancement. No table associations between ADC cut-off and enhancement were identified ($p = 0.001$).

Conclusion: The ADC values serve as a non-invasive and reliable radiological marker in distinguishing low-grade and high-grade gliomas. They improve the diagnostic accuracy of conventional MRI and aid in preoperative decision-making, reducing the need for invasive tissue biopsy.

Keywords: ADC, gliomas, MRI, peritumoral edema, tumor enhancement.

This article may be cited as: Khan MI, Khan MZ, Afzal F, Ahmad FS, Zahoor B, Ishaq BH. Role Of Mean Apparent Diffusion Coefficient (ADC) Value In Differentiation Of High- And Low-Grade Gliomas On Contrast-Enhanced MRI. *J Med Sci* 2025 January - March;33(1):25-30

INTRODUCTION

Gliomas constitute 26% of all primary brain tumors and 81% of malignant central nervous system tumors.¹ The World Health Organization (WHO) tumor classification categorizes gliomas into four grades, where grades I–II are low-grade gliomas (LGGs) with better prognosis and longer life expectancy. Whereas grades III–IV are highly aggressive and thus categorized as high-grade glioma

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Date Received: 19/02/2024

Date Revised: 02/02/2025

Date Accepted: 11/02/2025

(HGGs), they have a poor prognosis despite therapeutic procedures.² The standard treatment for gliomas is surgical removal.

Postoperatively, LGGs are only followed and observed closely, while HGG requires adjuvant therapy with radiation and chemotherapy to prevent recurrence.³ Complete resections of HGG are critical due to their high malignant potential, and thus, assessment of tumor grade and infiltration into surrounding tissue preoperatively is of utmost significance for intraoperative decision-making.⁴ Histopathological grading has its major limitation of being an invasive procedure.

It is also prone to sampling error as it proliferates by infiltration, and thus, the region of highest malignancy and the most vascular part of the tumor may lie with-

in the peri-tumoral or peri-enhancing.⁵ These limitations raise the need for further research into refining noninvasive methods for accurate preoperative assessment of gliomas. The WHO Classification of Tumors of the Central Nervous System Fifth Edition (WHO CNS5) encourages the use of molecular characteristics for the diagnosis and grading of gliomas.⁶

Conventionally done contrast-enhanced MRI is the gold standard among non-invasive techniques for glioma grading.⁷ Avid contrast enhancement, peritumoral edema, mass effect, heterogeneous signal, central necrosis, and hemorrhage within the tumor are characteristics of HGGs. Low-grade gliomas appear as a relatively homogeneous mass with well-defined margins, minimal or no vasogenic edema, and little or no contrast enhancement.⁸ With technological development, newer MRI techniques like diffusion-weighted imaging (DWI) have been used to grade gliomas. DWI gives information about tumor cellularity, which in turn predicts the tumor grade.⁹

Additionally, the apparent diffusion coefficient (ADC) value of a tumor provides more accurate information compared to conventional MRI, correlating well with the histopathological grade. The ADC sequence utilizes the diffusion of water molecules within tissue.¹⁰ Due to heterogeneous micro-architecture, diseased and normal brains have different ADC values. High water diffusion in tissue results in a higher ADC value. Recent studies suggest that high-grade gliomas (HGG) exhibit lower ADC values compared to low-grade gliomas (LGG) due to higher tumor cellularity and diffusion restriction in the former. Performing multiple sequences for grading gliomas has a significant economic impact on already strained healthcare systems, making it beneficial to establish a few sequences that better characterize gliomas, both economically and in terms of reduced scanning time.¹¹ However, there is limited literature and evidence-based data from our region to support ADC findings.

The purpose of our study is to determine the role of mean ADC values in grading gliomas using conventional MRI sequences as the gold standard. We also aim to examine the correlation between ADC values and conventional MRI features of gliomas.

MATERIALS AND METHODS

This was a validation study from September 2022 to December 2023. Its approval for patient data collection was obtained from the institutional review board (Ref: No.886/LRH/MTI, dated 15 August 2022) from MTI, Lady Reading Hospital Peshawar. All patients who were found to have gliomas on MRI were included in the study. Pa-

tients who underwent prior treatment, had deficient clinical data, or had inconclusive imaging were excluded from the study.

All patients were referred from OPD and Neurosurgery and neurology wards of LRH to the Radiology department for a brain Scan, and they underwent an MRI scan on a 1.5 Tesla machine (Toshiba Vantage). Imaging sequences included T2-weighted (TR/TE 5160/112 ms), T1-weighted (TR/TE 500/9.4 ms), FLAIR (TR/TE 7000/92 ms, inversion time 2214.1 ms), DWI (TR/TE 4000/97 ms), and gadolinium-enhanced T1-weighted (TR/TE 500/9.4 ms). All images had a 5 mm section thickness, 1 mm intersection gap, and a field of view (FOV) of 23.0 cm × 23.0 cm.

MR imaging results were analyzed using the PACS software. The area of greatest diffusion. Restriction and lowest ADC within the solid component of the tumor were selected, making sure to avoid peritumoral edema. Areas of restricted diffusion within the tumor, appearing as bright signal intensity on DW images and correspondingly low ADC appearing as a dark area on the ADC map, were identified.

The first step in numeric ADC analysis was the examination of T1WI, T2WI, and post-gadolinium sequences to identify and avoid areas likely to be cystic, hemorrhagic, calcific, necrotic, or peri-tumoral edema. Within the remaining areas of the tumor, a section with the lowest visual ADC was identified, and within this section, a spherical Region of Interest (ROI) of 0.16 cm² was determined, and the ADC was recorded. In case the low ADC area was large, the ROI was moved slightly, and the means and maximum ADC were determined in the ROI of the lowest ADC. Any difficulties encountered during the selection of the ROI, such as artifacts and hemorrhage, were noted. Following the analysis of T1WI with and without contrast, patterns of enhancement were described as non-enhancing, mild, moderate, and intense.

The study parameters such as gender and age of the patient, lesion location in terms of lobar and superficial or deep location, conventional MRI features such as edema, mass effect, necrosis, and pattern of enhancement, and finally, the mean ADC values were recorded and entered into SPSS 20. The sensitivity and specificity of low ADC for high-grade glioma were calculated along with positive and negative predictive values. The test for normality, i.e., Kolmogorov-Smirnov, shows the normal distribution, so parametric tests, i.e., chi-square test, spearman test, and multiple linear regression, were applied as given in the result.

RESULTS

The study consists of 104 patients, ranging in age from 3 to 87. 59 cases were male, and 45 were female. On cMRI, 62 cases were low-grade glioma, and 42 were high-grade.

The mean ADC for low-grade glioma was 1334.37 ± 300.85 (95% confidence interval for mean of $1257.97 - 1410.77$), and for high-grade glioma, it was 842.88 ± 232.013 (95% confidence interval for mean of $770.58 - 915.18$). The calculated cut-off value of ADC between the two groups was 1086.58. The sensitivity and specificity of low ADC for high-grade glioma are 83.33 % and 77.42%, respectively. The positive predictive value (PPV) is 71.42 %, and the negative predictive value (NPV) is 87.27%.

There was a significant relationship between ADC cut-off categories and grade of glioma as given in table 1 and chi square test, $X^2 (1, N= 104) = 37.089, P < 0.001$.

Independent sample T test also established a significant difference of mean ADC among high and low grades glioma as given in table 2.

The lobar distribution of gliomas were as: 33 (31.7%) glioma in frontal lobe (19 LGG – 57%), 25 in pari-

etal (12 LGG – 48%), 13 in temporal (8 LGG – 61%), 6 occipital (5 LGG – 83%), 4 in cerebellum (2 LGG – 50%), 5 in basal ganglia (3 LGG – 60%). 7 in the thalami (3 LGG – 42 %) and 11 in the brainstem (10 LGG – 90%). No significant Correlation was present on Spearman between the Lobar location and grade of glioma, i.e. (rs) [104] = -.123, p = 0.214. No significant correlation was established between glioma type and its location as either cortical or white matter by spearman test, (rs) [104] = -.168, p 0.089. A total of 41 lesions involves the cortex (32 LGG - 78%), while 51 cases were entirely in white matter (27 HGG - 53%) and equal distribution of 6 cases in each grade involving the deep nuclei.

We found only a significant relationship (p <0.001) between Mean ADC and tumor Enhancement, among other characteristics of tumors in multiple linear regression as given in table 3 despite low $R^2 = 0.25$ of the models. The correlation of ADC cut-off value and enhancement are also given in table 4 with other characteristics of tumor. The relationship of cut off ADC was further explored by chi square test individually with different tumor characteristics on MRI as given in table 5.

Table No 1: Apparent diffusion coefficient vs. Glioma type

ADC value (cut off value of 1086.6 mm2/s)	Glioma type on cMRI		
	High grade	Low grade	Total
Low ADC	35 (71.4 %)	14 (28.6%)	49 (100%)
High ADC	7 (12.7 %)	48 (87.3 %)	55 (100%)
Total	42 (40.4%)	62 (59.6%)	104 (100%)

Table No 2: Independent Sample T-Test for Comparing Mean ADC among grades of glioma with Levene’s statistics

ADC Mean Value	Levene’s tests for equality of variances		t-test for Equality of Means		
	F	Sig	T	Df	Sig (2 tailed)
Equal variances assumed	3.099	.081	8.935	102	.000
Equal variances not assumed			9.387	100.210	.000

Table No 3: Coefficients of multiple linear regression of ADC and Tumor characteristics

Model 1	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta				Upper Bound
(Constant)	1284.946	55.083		23.328	.000	1175.650	1394.242
Enhancement	-153.426	29.162	-.511	-5.261	.000	-211.289	-95.563
Bleed	117.917	79.268	.138	1.488	.140	-39.369	275.202
Edema	42.423	75.004	.057	.566	.573	-106.401	191.248
Necrosis	-41.397	73.962	-.057	-.560	.577	-188.153	105.359

a. Dependent Variable: ADC Mean Value

Table No 4: ADC vs. Tumor imaging characteristics

ADC (1086.58)	Enhancement				Necrosis		Edema		Bleed	
	No	Mild	Moderate	Intense	None	Yes	No	Yes	No	Yes
Low ADC	10	14	6	19	23	26	17	32	38	11
High ADC	32	11	5	7	33	22	23	32	41	14
Total	42	25	11	26	56	48	40	64	79	25

Table No 5: Relation of ADC cut-off value and tumor characteristics on Chi-Square test:

Tumour characteristics	Chi – Square test (X2)	Degree of Freedom (df)	P-value	Significant?
Enhancement	17.224	3	0.001	Yes
Bleed	0.128	1	0.720	No
Edema	0.556	1	0.456	No
Necrosis	1.778	1	0.182	No

DISCUSSION

The ADC value is a quantitative and, thus, reproducible parameter that has been used to evaluate tumor cellularity to grade gliomas.¹² HGG shows high tumor cellularity, clustering of malignant tissue, and greater curvature of space between malignant cells, leading to slowing down of water molecules giving lower ADC values.¹³

Our study conducted a comprehensive analysis of 104 patients with glioma in which the mean ADC value significantly varied between LGG (1334.37 mm²/s) and HGG (842.88 mm²/s). The calculated cut-off value of ADC (1086.58 mm²/s) effectively distinguished between the two groups.

In the study conducted by Phuttharak et al.,¹² it was observed that the ADC values were 969.12 mm²/s for high-grade gliomas and 1,470.02 mm²/s for low-grade gliomas. The optimal ADC threshold for distinguishing between tumor grades was determined to be 1119.48 mm²/s. This threshold yielded a sensitivity of 88.90%, specificity of 90%, positive predictive value (PPV) of 90%, negative predictive value (NPV) of 88.9%, and an overall accuracy of 89.47% in classifying glioma grades.

Differences among the values may be due to differences in ROI size, Magnetic strength, and number of patients. Similarly, the study analysis of pediatric tumors by Yao et al.¹⁴ showed that the cutoff ADC mean value of 1192 mm²/s for the differentiation between low- and high-grade pediatric gliomas provided a sensitivity, specificity, accuracy, positive predictive value (PPV), and negative predictive value (NPV) of 77.6%, 80.3%, 78.5%, 89.5%, and 62.4%, respectively.

The sensitivity and specificity of ADC values

computed by Zhang et al., based on the currently available data, were 82% and 76%, respectively. This further strengthens the evidence of using ADC for designation grades of glioma.¹⁵

Guzmán-de-Victoria et al.¹⁶ did a multivariate logistic regression and found that the combination of enhancement and necrosis as independent predictors of tumor grade yielded 95.9% sensitivity and 70% specificity for the differentiation glioma grades.

Apart from tumor enhancement, our study did not find significant correlations between ADC values and other tumor characteristics such as bleeding, edema, and necrosis. While these factors are important in assessing tumor characteristics, the study highlights that ADC is primarily associated with tumor enhancement. Further research may be needed to explore the relationships between ADC and other tumor features in larger cohorts.

Momeni et al.¹⁷ found that the difference between ADC of LGG and HGG is most prominent in the center of the lesion, i.e., 200 mm²/s, but no significant difference if taken from an oedematous ring or the interface with the normal tissue, i.e., 100 mm²/s. Our study showed a difference of about ADC mean of 492 mm²/s, which is taken from the center of the lesion; however, our sample size was double that of their study.

Our study also explored the lobar distribution of gliomas and found no significant correlation between lobar location and glioma grade signifying. This correlates with a study done by Hong et al.¹⁸

which also showed no such statistical significance. However, most of the low-grade tumors involve cortical locations. In our study, 31.7% were in the frontal lobe, similar

to the study by Al-Sharydah et al. ¹⁹, which also shows the frontal lobe as the most common location (32.5%).

Our sample size is small, with the potential influence of confounding factors like the inclusion of pediatric and adult patients in the same group, the use of a single scanner, and the broad categorization of tumor grade instead of histological types. Our study did not utilize histopathological grading nor the assessment of proliferative activity by immune markers. Future research should focus on validating these findings in larger cohorts and integrating machine learning approaches for automated glioma classification. This study reinforces that integrating ADC mapping into routine clinical workflows will improve diagnostic accuracy and guide targeted biopsy if needed.

CONCLUSION

The ADC values serve as a non-invasive and reliable radiological marker in distinguishing low- and high-grade gliomas, and improve diagnostic accuracy of conventional MRI and aiding in preoperative decision-making reducing the need of invasive of tissue biopsy, ultimately enhancing patient outcomes.

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CONFLICT OF INTEREST: Authors declare no conflict of interest
GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Khan MI	✓	✓	✓	✓	✓	✓
Khan MZ	✓	✓	✗	✓	✓	✗
Afzal F	✓	✓	✓	✓	✓	✓
Ahmad FS	✓	✓	✓	✗	✓	✓
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Ishaq BH	✓	✓	✗	✓	✓	✗

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.

Ethical Approval:

**This Manuscript was approved by the Ethical Review Board of Lady Reading Hospital Peshawar, Vide No. 886/LRH/MTI.
 Dated: 15 08 2021**



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GENOTYPE-BASED ANTIFUNGAL SUSCEPTIBILITY OF CANDIDA ALBICANS IN ICU PATIENTS AT A TERTIARY CARE SETTING

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ABSTRACT

Objective: Oral Candidiasis is one of the most common opportunistic infections of *Candida albicans*. Treatment of *C. albicans* is becoming a challenge due to the acquired resistance to antifungal drugs. Resistance to antifungal drugs may vary among the *C. albicans* genotypes. The objective of the study was to find the genotype-based antifungal susceptibility of *C. albicans* isolated from oral candidiasis of ICU patients.

Material & Methods: This cross-sectional study was conducted at Ayub Medical Complex and Khyber Medical University Peshawar, Pakistan. Sampling was done from ICU patients, and identification of *Candida* species was carried out by inoculating samples on Sabouraud's and CHROM agar (Oxoid Germany), by incubation at 37°C for 48 hours. The pathogenicity of *C. albicans* was confirmed by the formation of a germ tube. The antifungal sensitivity of *C. albicans* was determined on Moller Hinton agar according to the CLSI 2022 guidelines. Sensitivity to Fluconazole, Voriconazole, Clotrimazole, Nystatin, Amphotericin, (Oxoid) was assessed by disk diffusion method. Furthermore, the genotype identification was done by PCR through amplification of 25SrDNA amplification using specific primers.

Results: Out of 260 samples, 145 (55.5%) samples were of candida species. Among the positive samples prevalence of *C. albicans* was predominant at 111(76.5 %) followed by *C. tropicalis* 15(10.34%), *C. kruzei* 11 (7.58%), and *C. glabrata* 8(5.5%) high incidence was reported in females (59.4%) compared to males (49.55%). The most susceptible age groups were 61-70 years (27%) and 1- 10 years (20.70%), while the lowest incident was reported in the age group 20-30 years (2.70%). Among *C. albicans* genotype-A was more prevalent 65(58.5%) followed by genotype-B 33(28.82%), and genotype-C 14(12.6%). Overall, high resistance was reported against Voriconazole (70.2%) followed by Miconazole (61.2%), and fluconazole (58.5%) while comparatively lowest resistance was reported against clotrimazole (31.53%). Nystatin and Amphotericin were found effective against oral candidiasis in ICU patients with a resistance of 9.9% and 11.71%, respectively. Genotype-A of *C. albicans* was found to be highly resistant to the azole group of antifungal drugs among all three genotypes.

Conclusion: *Candida* infection is common among ICU patients, especially at extremes of ages due to immune-compromised status. Overall, resistance to the Azole group of drugs is very high, however, the polyene group of drugs was found to be effective. The prevalence of Genotype-A of *C. albicans* was predominant in ICU patients with high resistance to Azole antifungal drugs.

Keywords: Azole antifungal drugs. *C. albicans*. Genotype, Oral candidiasis, Polyenes

This article may be cited as: Akhtar M, Asghar S, Jehangir F, Khurshid S, Jadoon Z, Khwaj A, Ullah I. Genotype-Based Antifungal Susceptibility Of *Candida Albicans* In Icu Patients At A Tertiary Care Setting. *J Med Sci* 2025 January - March;33(1):31-36

INTRODUCTION

Oral mucosa is susceptible to infection by bacterial, viral, parasitic, and fungal microbes. ¹ Fungi cover a small portion of the oral microbiome, of which the major contributor is *C. albicans*, which can become pathogenic in an immune-compromised state and underlying diseases.

^{2,3} The prevalence of *C. albicans* is very high, ranging from 17- 80%. Other candida species include *C. glabrata*, *C. krusei*, *C. tropicalis*, and *C. parapsilosis* have also been reported in different studies (4). *C. albicans* takes advantage of the impaired immune system, which helps the fungi to proliferate in the oral mucosa and form a characteristic white plaque in the oral cavity (5). Oral candidiasis is the most frequent form of infection, with predisposing factors including prolonged hospitalization, use of broad-spectrum antibiotics, poor oral hygiene, Diabetes Mellitus, and other immune-compromised states. ⁶

The pathogenicity of *C. albicans* is linked to the host predisposing factors, as well as microbial factors such as phenotypic switching, biofilm formation, secretion of hydrolyzing enzyme, and drug resistance(7). Phenotypic

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Date Received: 21/08/2024

Date Revised: 21/01/2025

Date Accepted: 18/02/2025

ic switching from yeast to pseudohyphae helps *Candida albicans* evade the immune response, invade the tissue, cause systemic infection, and facilitate the formation of biofilm, which further enhances the survival of the candida.⁸ The hydrolytic and proteolytic enzyme of *C. albicans* helps in tissue disintegration and facilitates its invasion into the oral mucosal layer. The pathogenic strain of *C. albicans* produces hemolysin enzymes; besides this, they also produce more than ten different types of proteinase enzymes with diverse pathological functions.⁶ The drug resistance in *C. albicans* is mainly associated with biofilm formation and efflux pumps, which makes the treatment option more difficult.⁹

Azole antifungal agents, particularly fluconazole, have been used as a prophylaxis agent or treatment of oral candidiasis in patients with underlying disease. Continued exposure to azoles in the oral cavity leads to the development of resistance in the candida species due to the selective pressure of the drugs, which is a high point of concern for clinicians.¹⁰ The resistance is achieved either in the modification of the enzyme the cytochrome P-450 lanosterol, 14- α -demethylase which is mediated by chromosomal gene ERG11, or the activated efflux pump that expels the drugs out of the cell cytoplasm makes these drugs less effective against the oral candidiasis infection.¹¹ Furthermore, Nystatin is considered highly effective against oral candidiasis. Its widespread use in oral candidiasis led to the emergence of nystatin resistance among the candida species.¹² Similarly, resistance to amphotericin B has also been on the rise. All of these conditions make the infection worse, which eventually leads to a high mortality rate due to candidiasis.¹³

Molecular typing for candida is important in epidemiological studies as different strains exhibit a diverse range of pathogenicity and drug resistance patterns.¹⁴ So for PCR-based, various typing methods have been used for typing the *Candida* species, such as multi-locus sequence typing (MLST), pulse field gel electrophoresis (PFGE), and restriction fragment length polymorphism (RFLP), while several studies used the ABC genotyping method for *C. albicans* in clinical samples.^{15, 16} The ABC genotyping is based on the presence, and absence of transposable intron in the 25Sr DNA gene, which is after PCR confirmed on the gel electrophoresis, thus classifying *C. albicans* to genotype A, B, C, D, and E.¹⁷ Studies evidence that genotype A of *C. albicans* is more prevalent in oral, vaginal, and skin infections, furthermore, genotype A is comparatively more resistant to antifungal agents.¹⁸

The present study is designed to find a genotype-based antifungal susceptibility pattern of *Candida albicans* among ICU patients having oral candidiasis.

MATERIAL AND METHODS

This cross-sectional study was conducted at Ayub

Medical Complex Abbottabad and Khyber Medical University Peshawar. A total of 261 samples were collected from ICU patients with suspected oral candidiasis at Ayub Teaching Hospital, Abbottabad. Ethical approval for the study was obtained from the ethical review board of Khyber Medical University and the concerned hospital. Sample swabs were then transported aseptically to the microbiology lab of the Institute of Pathology and Diagnostics Medicine, Khyber Medical University (IPDM-KMU) Peshawar for culture sensitivity and molecular identification.

ISOLATION AND CONFIRMATION OF THE *C. ALBICANS*

Samples were cultured on Sabouraud's Dextrose agar (Oxoid Germany) and incubated at 37°C for 48 hours. After incubation, pinpoint white colonies were picked from the SDA agar for further confirmation of *C. albicans*. The colonies were tested for germ tube formation and growth pattern on CHROM agar (Paris France company).

ANTIFUNGAL SENSITIVITY OF *C. ALBICANS*

Antifungal sensitivity of *C. albicans* was performed by the disc diffusion method according to the guideline of Clinical Laboratory Standard Institute (CLSI) documents M44-A2. Six standard antifungal drugs were included in this study that is Amphotericin B (20ug/disc), Nystatin (50ug/disc), Fluconazole (25ug/disc), Clotrimazole (10ug/disc), Voriconazole (15ug/disc), and Miconazole (10ug/disc) were obtained from Oxoid (Turkey). A suspension of *C. albicans* was prepared 10⁶ colonies/ml and was spread on the surface of Muller Hinton Agar (Oxoid Germany). The antifungal discs were placed on the agar plate with equal distance and incubated at 37°C for 48 hours. After incubation, the zone of Inhibition was measured in millimeters.

DNA EXTRACTION

The Genomic DNA of confirmed *C. albicans* was obtained by using the Thermo Fisher Scientific, Yeast Genomic DNA extraction kit (Cat no.: 78870), following the manufacturer's guidelines. The integrity of the genomic DNA was checked on 1% agarose gel, while its concentration was checked on Spectrophotometric Nanodrop (Thermo-Fisher).

PCR AMPLIFICATION OF 25S RIBOSOMAL ENCODED GENE

For the *C. albicans* genotype, a 25S ribosome-encoded gene was selected and already published, and optimized primers were used (19). The primer sequence and condition mentioned as forward primer -ATAAGG-GAAGTCGGCAAATAGATCCGTAA, and Revers primer R-CCTTGGCTGTGGTTTCGCTAGATAGTAGAT, the primer was further confirmed through the primer blast, after

fulfilling the criteria, 20ul reaction mixture volume was prepared that contain 10ul PCR master Mix (cyber green thermo scientific), 1ul forward and 1ul Reverse primer, 2ul genomic DNA, and 6ul PCR water (thermo scientific). PCR conditions were initial denaturation of 95°C for 5 minutes, second denaturation at 95 °C for 35second, with 35 cycles then annealing at 60°C for 45 seconds followed by primer extension at 72 °C for 45 sec and then last extension at 72 °C for 3 minutes and a holding temperature of 4 °C for 10minutes. The PCR product was confirmed based on its product size on 1.5% agarose gel electrophoresis with a 100bp ladder (Thermo Fisher).

RESULTS

Out of a total of 261 suspected oral samples collected from ICU patients, 145(55) were cultured positive for candida species on Sabouraud’s dextrose agar and

Chrom agar. The most prevalent species was *C. albicans* 111 (76.5%) followed by *C. tropicalis* 15 (10.34%) *C. Kruzi* 11(7.58%), and *C. glabrata* 8(5.5%). Samples were taken from patients of both genders; the incidence of candida albicans was found higher in females 59.4% (66) compared to their counterpart males 49.5% (55).

Overall, the prevalence of *C. albicans* was found higher in the aged group 60-70 years, 17.1% (19), followed by 1-10 years 13.5% (15) while the lowest incident was reported in the aged group 20 to 30 years below Table 1 explains the age and gender-wise prevalence of *C. albicans*.

Table No 1 Antifungal susceptibility profile of candida albicans

Antifungal drug	Resistance n (%)	Sensitivity n (%)	SSD n (%)
Fluconazole	65 (85.5)	40 (36.1)	6 (5.4)
Clotrimazole	35 (31.53)	67 (60.36)	9 (8.1)
Miconazole	68 (61.2)	33 (29.7)	10 (9)
Voriconazole	78 (70.2)	25 (22.5)	8 (7.2)
Amphotericin	13 (11.71)	90 (81)	8 (7.2)
Nystatin	11 (9.9)	94 (84.6)	6 (5.4)

PREVALENCE OF C. ALBICANS GENOTYPES IN ORAL CANDIDIASIS

The prevalence of *C. albicans* different genotypes in oral candidiasis was identified by using a primer that targeted the 25SrDNA gene. In our studies, a high prevalence of *C. albicans* genotype A, 65 (58.55%), was found in the oral candidiasis, followed by genotype B, 33 (28.82%), and genotype C, 14 (12.6%). The below picture shows the result confirmation of all three genotypes on 1.5% agarose gel.

ANTIFUNGAL SENSITIVITY

Candida albicans susceptibility was checked. The antifungal drugs used are Fluconazole, Clotrimazole, Miconazole, and Voriconazole of the Azole group, while

Table No 3.2: Genotype, antifungal sensitivity profile of C. albicans; R stands for Resistance, S: Sensitive, SDD: Susceptible dose-dependent

Drugs	Genotyps			
	Pattern	Genotype A	Genotype B	Genotype C
Fluconazole	R	47(34%)	16(14.41%)	2(1.8%)
	S	16(14.41%)	13(11.71%)	11(9.9%)
	SDD	2(1.8%)	3(2.7%)	1(0.9%)
Clotrimazole	R	25(22.52%)	7(6.3%)	3(2.7%)
	S	36(32.43%)	20(18.01%)	11(9.9%)
	SDD	4(3.6%)	5(4.5%)	0(0%)
Miconazole	R	43(38.73%)	20(10.01%)	5(4.5%)
	S	16(14.41%)	10(9%)	7(6.3%)
	SDD	6(5.4%)	2(1.8%)	1.8%(2)
Voriconazole	R	50(45%)	22(19.81)	6(5.4%)
	S	12(10.81%)	6(5.4%)	7(6.3%)
	SDD	3(2.7%)	4(3.6%)	1(0.9%)
Amphotericine	R	13(11.71%)	0(0%)	0(0%)
	S	51(45.94%)	28(25.22%)	13(11.71%)
	SDD	1(0.9%)	4(3.6%)	3(2.7%)
Nilstaine	R	11(9.9%)	0(0%)	0(0%)
	S	52(46.84%)	32(28.82%)	12(10.8%)
	SDD	2(1.8%)	2(1.8%)	2(1.8%)

Amphotericin and Nystatin are from the polyene group. Among azoles, high resistance was reported against Voriconazole at 70.2% (78), followed by miconazole at 61.2% (68), and fluconazole at 58.5% (65), while the lowest was against clotrimazole at 31.53% (35). In Polyene, the lowest resistance was reported against both amphotericin 11.71 % (13) and nystatin 9.9 % (11). Comparatively, polyene is safe in the sense of resistance, as resistance to both of the drugs is within the WHO recommendation range. *C. albicans* collectively antifungal sensitivity resistance, and susceptible dose dependence is shown in table 2.

Out of 111 samples, 9% (10) samples were showing an MDR pattern of drug resistance they were resistant to all the tested antifungal drugs used in this research study.

R*- Resistance, S*- Sensitive, SDD*- Susceptible dose-dependent

GENOTYPE ANTIFUNGAL SENSITIVITY PROFILE OF *C. ALBICANS*.

The antifungal sensitivity of each genotype was determined. genotype A was found highly resistance to all of the azole antifungal agents, with lower resistance to the polyene agent, followed by genotypes B, and C, both show up to some extent resistance to the azole group while highly sensitive to the polyene antifungal agents. among azole group, clotrimazole was comparatively found effective against all genotype of the *C. albicans* in oral candidiasis patients. The below table explains % wise prevalence of each tested drug to all of the *C. albicans* genotypes.

ALBICANS GENOTYPES.

DISCUSSION

Recently, the incidence of fungal infection, particularly that of *C. albicans*, increased in patients with underlying diseases, which eventually raised the mortality rate due to fungal infection. Besides *C. albicans*' high morbidity, other fungal etiology have been in an uprising trend, which is an alarming situation as most of them are highly resistant to currently available antifungal agents.²⁰ For efficient treatment, rapid diagnosis and correct identification of fungal species are crucial to the timely management of the infection. In the case of fungal infection, commonly used phenotypic methods are time-consuming and cannot differentiate among genotypes, even among species. Therefore, the Rapid molecular method offers accurate results with high discriminate power.²¹ The molecular methods used for the identification of *Candida* species are RFLP, PFGE, and MLST. The genotype of *C. albicans* is differentiated based on the presence or absence of transposable intron in the 25SrDNA gene. The PCR-based amplification of the 25SrDNA gene differentiates *C. albicans* into 5 different genotypes, A to E genotypes. The

most commonly reported are A to C genotypes, while D and E are rare genotypes (19). In the current study, both Phenotypic and genotypic methods were used for the identification of *C. albicans*. In phenotypic confirmation, the growth pattern was checked on SDA, CHROMagar, and the formation of germ tube. CHROMagar, although efficient in the differentiation of *Candida* species, cannot differentiate all of its species. Therefore, molecular methods are required. Based on the characteristic growth color of *Candida* species on CHROMagar, a high prevalence of *C. albicans* was reported at 76.5% (111) followed by *C. tropicalis* at 10.35%, *C. kruzi* at 7.58%, and *C. glabrata* 5.5%, a previous study from Pakistan also report likewise pattern of *Candida* species prevalence (22). Similar findings were reported in China, where the prevalence of *C. albicans* was in the top 75.35%, followed by *C. tropicalis* at 15%, then *Kruzi* 2.7%, while *C. glabrata* that has recently risen having a 2.4% prevalence, The data was from four years, in the last years the prevalence of *glabrata* increased in their study. Another study from India also reports a similar pattern of *Candida* species prevalence in patients with oral squamous cell carcinoma where *C. albicans* was leading, followed by *C. tropicalis*, *Kruzi*, and *glabrata*.²³

In the current study, samples were taken from both genders aged 1-80 years old. Patients were categorized based on age group and gender. The prevalence of candidiasis was found to be higher in females (59.4%) in all age groups compared to males (49.5%), which is in concurrence with a previous study conducted in Karachi, Pakistan.²² Similar findings were also reported from China and India, where oral candidiasis was found to be more common in females compared to their male counterparts (4, 22). The high prevalence of oral candidiasis in females may be due to hormonal changes, poor oral hygiene, the low immune status of females, and the excess use of oral antibiotics in developing countries like Pakistan and India.

Most of the earlier studies on oral candidiasis use only phenotypic way for the identification of *Candida* species, but here we used both phenotypic and genotypic methods even to explore different genotypes of *C. albicans* while targeting the 25SrDNA gene of the *C. albicans*. Based on 25SrDNA gene polymorphism, *C. albicans* are classified into different genotypes A to E (17). In the existing study, the prevalence of *C. albicans* genotype A (58.55%) was found, followed by genotype B (28.82%) and genotype C (12.6%). Although a study from Iran reports a high prevalence of genotype A in oral candidiasis, it was followed by genotype C rather than B. Additionally, they also report genotype D in their study.²⁴ In contrast to our finding, a study in Thailand reported a high prevalence of genotype B in oral candidiasis followed by genotypes A, C, and D.²⁵

In this study, six antifungal agents of two classes (azole and polyene) were used. Collectively, *C. albicans*

was found to have high resistance to the azole group, particularly to the Voriconazole, miconazole, and fluconazole, while sensitive to the polyene antifungal agent, the nystatin, followed by amphotericin B (Table 2). This finding coincides with a study from Iran where the resistance ratio of *C. albicans* was found to be higher in the azole group, while the polyene group showed 100% sensitivity.²⁶ The current findings in China, the rate of resistance in *C. albicans* to azole in oral candidiasis is comparatively lower although they mentioned upraised resistance to azole, while the first-line treatment in oral candidiasis the topical nystatin was found highly effective (27). To the best of our knowledge, no such data is available that mentions the genotype-based antifungal sensitivity profile of *C. albicans* in oral candidiasis. In our study, genotype A was found to be highly resistant to azole, even though some strains of it show resistance to nystatin and amphotericin, while genotypes B and C were comparatively found less resistant to azole while highly sensitive to nystatin and amphotericin (Table 3). The rise of resistance to azoles, particularly to fluconazole and Voriconazole, is an alarming stage for clinicians. Numerous studies have been conducted exploring various aspects and mechanisms of azole resistance in *C. albicans*. Our result revealed an increased rate of resistance to azoles. Our study population was of ICU patients with already weakened immune status, and already exposed to a variety of antibiotics and antifungal agents, It may be possible that the organism acquired resistance via horizontal gene transfer, or due to selective antifungal pressure on the candida species in the hospital environments that leads to the development of drugs resistance among them.

This study has certain limitations. Firstly, the small size of the samples and short duration, including one center, we used only PCR-based identification of the *C. albicans* genotype, as clearly sequencing will further explore the new strain and will possibly help in rapid diagnosis.

CONCLUSION

Oral candidiasis is an opportunistic infection. Its occurrence is an alarming sign of immune-deficient status, as it often causes systemic infection in critically ill patients. Treating such patients is difficult if caused by drug resistance strain. In this study, the overall prevalence of *C. albicans* was found to be 55.5%. Females were found more susceptible to candidiasis, particularly in the age group 60-70 years, genotype A of *C. albicans* was mostly reported one with higher resistivity to both azole and polyene antifungal agents. Further studies are needed in this contest to design rapid diagnostic tests and empirical treatment strategies, as well as to manage oral candidiasis in critically ill patients.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
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Asgar S	✓	✓	✗	✓	✓	✗
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Jadoon Z	✓	✓	✗	✓	✓	✗
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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.

Ethical Approval:

This Manuscript was approved by the Ethical Review Board of Khyber Medical University. Vide No. KMU/IPDM/IEC/2023 19.

Dated: 31 07 2023



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THE SUCCESS AND COMPLICATIONS OF ENDOSCOPIC ENDONASAL MULTI-LAYER TECHNIQUE FOR THE MANAGEMENT OF SPONTANEOUS CEREBROSPINAL FLUID (CSF) RHINORRHEA

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ABSTRACT

Objective: To determine the success and complications of endoscopic endonasal multi-layer technique for the management of spontaneous cerebrospinal fluid (CSF) rhinorrhea

Materials and Methods: This descriptive chart review was conducted at Khyber Teaching Hospital and involved thirty-four patients with spontaneous CSF rhinorrhea confirmed by MRI. Exclusions included trauma, previous surgery, and tumors. The primary outcome was the success rate of the endoscopic endonasal approach and associated complications. Patients underwent endoscopic repair under general anesthesia. Postoperative care included strict bed rest, prophylactic antibiotics, and regular follow-up evaluations.

Results: The participants had a mean age of 37 ± 14.3 years, with a female predominance (67.65%). The mean BMI was 28 ± 3.6 , with 74% of patients having a BMI over 25. Preoperative imaging identified the cribriform plate as the most frequent leak site (64.71%). The most common complication was meningocele (5.8%). One patient had idiopathic intracranial hypertension (2.9%). All patients underwent successful endoscopic endonasal multi-layer repair, achieving a 97.06% success rate. Postoperative complications included nasal crusting (14.71%), sinusitis (11.76%), and a brief postoperative CSF leak (2.94%), which resolved spontaneously. One patient required a secondary repair. Follow-ups at one and three months confirmed the durability of the repairs, with no recurrence of CSF leaks.

Conclusion: The endoscopic technique is effective for managing spontaneous CSF rhinorrhea, demonstrating a high success rate with minimal complications. These findings support minimally invasive approaches in CSF leak management, emphasizing the importance of patient demographics and comorbidities in treatment planning.

Keywords: CSF Rhinorrhea, Endoscopic repair, Endoscopic endonasal multi-layer technique

This article may be cited as: Khan I, Osama M, Din IU, Ullah S, Liaqat N, Orakzai KA, et al. The Success And Complications Of Endoscopic Endonasal Multi-Layer Technique For The Management Of Spontaneous Cerebrospinal Fluid (CSF) Rhinorrhea. *J Med Sci* 2025 January - March;33(1):37-42

INTRODUCTION

Spontaneous cerebrospinal fluid (CSF) rhinorrhea is a rare condition of CSF leakage into the nasal sinuses and passages from a tear in the meninges due to a non-traumatic cause. Most CSF rhinorrhea cases are secondary to head injuries (80% to 90%) while a few are spontaneous. ¹ Skull base bony defects and tumors are often seen in non-traumatic cases. ^{2,3} These leaks are common-

ly present as a breach between the skull base and dura of meninges through defects in the cribriform plate anteriorly and temporal bone laterally, often accompanied by brain hernia, a condition known as encephalocele. ⁴ The cribriform plate is the most frequent location due to its fragility and the proximity of the arachnoid layer with olfactory nerve passage through it. ⁵

Middle-aged women with obesity are frequently identified as high-risk populations for spontaneous CSF leaks. ^{6,7} The predominant manifestations encompass orthostatic headache, nausea, and neck pain in order of frequency. Moreover, tinnitus, anosmia, and dysgeusia might also manifest as plausible clinical evidence. ⁸ They are often accompanied by complications including meningitis and tension pneumocephalus. ⁹

Schlosser et al. have postulated the etiology of

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Date Received: 28-07-2024

Date Revised: 30/12/2024

Date Accepted: 13/01/2025

spontaneous CSF leaks as a variant of benign intracranial hypertension (BIH).¹⁰ Radiological findings often point to BIH, with observations such as an empty sella, enlarged periodic CSF spaces, tortuosity of the optic nerve, and bilateral transverse sinus stenosis in the absence of thrombosis.^{11, 12}

Endoscopic repair has emerged as a minimally invasive and increasingly preferred approach for the repair of CSF leaks of diverse origins at the anterior skull base.¹³ It is embraced as an efficacious modality compared to conventional open surgeries, with higher success rates and reduced morbidity.¹⁴

This study aims to evaluate the management of spontaneous CSF rhinorrhea using the endoscopic endonasal multi-layer technique and its success rate by presenting a comprehensive analysis of thirty-four patients. Thus, this research endeavors to elucidate the potential role of endoscopic techniques in the broader landscape of CSF leak management.

MATERIALS AND METHODS

It was a descriptive chart review of 34 patients (incident cases in the last year from Jan 2023 to Jan 2024), retrospective in nature, conducted at the otolaryngology department of Khyber Teaching Hospital Peshawar. The study protocol was approved by the Institutional Research and Ethical Review Board (IREB) of Khyber Medical College Peshawar under reference number (64/DME/KMC dated 27/11/2023). Informed consent from patients was waived because of the retrospective nature of the study. Every aspect of this study was according to the Declaration of Helsinki 1964 and the amendments that followed.

Patients' data were extracted from the hospital's electronic health record system database/paper-based health records from the hospital. The collected data included demographic variables like age, gender, and Body Mass Index (BMI), presenting complaints, diagnostic investigations carried out and documented medical and surgical history as written by the attending doctor. Comprehensive details regarding the surgical procedure done including the type of procedure and post-operative care and follow-up were also retrieved. Patients who presented with spontaneous CSF leak, as confirmed by magnetic resonance imaging (MRI) were only included. Those with a history of trauma, previous surgery, and brain or skull base tumors were excluded for accurate analysis of results.

As documented in the health records of the patients, a comprehensive radiological assessment was conducted preoperatively in all instances to precisely determine the location and dimensions of the defect, as well as to identify any associated complication, such as meningoencephalocele or meningocele. Radiological indicators of heightened intracranial pressure (ICP) were also carefully

scrutinized. It involved a contrast Computed Tomography (CT) scan and T2-weighted Magnetic Resonance Imaging (MRI) with contrast in the prone position, and a late venogram. Furthermore, consistent monitoring of serum electrolytes was implemented. As a prophylactic measure, patients were kept on oral third-generation cephalosporin (cefepodoxime) 200 mg every 12 hours, in combination with oral acetazolamide 250 mg every 6 hours, and syrup potassium chloride 5-10 mL every 24 hours (to prevent hypokalemia) until the definitive surgical intervention. Faculty from neurosurgery and radiology disciplines were also consulted regarding the management plan.

All participants underwent an endoscopic endonasal multi-layer restoration of the imperfection under general anesthesia. The location of the CSF leakage was verified intraoperatively by executing a Valsalva maneuver, involving the elevation of intraabdominal pressure by an anesthesiologist. The surgical field was exposed with dissection of adjacent turbinate and sinuses endoscopically. If present, meningoceles and meningoencephaloceles were reduced in standard fashion. The imperfection was then repaired, employing either adipose tissue or fascia lata graft (if measured <1 cm or had a low-flow leakage) or a vascularized nasoseptal flap (if measured >1 cm or had a high-flow leakage). A two-component fibrin sealant (Tisseel; Baxter Healthcare, Deerfield, IL) known as tissue glue, was administered for mending purposes in every instance. During the procedure, a CSF diversion technique was implemented, where lumbar drain (LD) insertion was performed on individuals with high-flow leaks. LDs were subsequently removed if there was no evidence of CSF leak.

Postoperatively, absolute bed rest for five days with the head positioned at a 30-degree angle was recommended for all cases. Each patient was administered prophylactic ceftriaxone injections of 2 grams every 12 hours for 5 days, followed by oral cefepodoxime 200 mg every 12 hours for 10 days. The regimen also included oral acetazolamide 250 mg every 6 hours, in conjunction with syrup potassium chloride at a dosage of 5 to 10 mL every 24 hours, aimed at preventing hypokalemia. Upon discharge, patients were instructed to gradually reduce the dosages over six to eighteen weeks. Patients were followed up on two visits, one month and three months period post-operatively. They were subjected to nasal endoscopy and MRI with contrast to look for primary outcomes. A surgical success was assigned if the defect was closed with no recurrence of CSF leak.

Data was analyzed using SPSS software version 24.0 ((IBM Corp, Armonk, NY, USA). All the quantitative variables are presented in the form of mean and standard deviation. While qualitative variables are presented as frequency and percentages.

RESULTS

The mean age of the 34 patients in the cohort was 39 ± 14.3 years. The majority (23, 67.65%) were females. The mean BMI stood at 28 ± 3.6, with data indicating that 26 patients (76%) had a BMI exceeding 25. Among the comorbidities observed, hypertension was the most prevalent (4, 11.76%), as shown in Table 1. Symptoms upon presentation mainly featured thin watery nasal discharge, especially on exertion and when bending over.

Preoperative imaging successfully identified CSF leak sites in all patients, with the cribriform plate being the most frequent site (Figure 1; 22 patients, 64.71%). The most common complication was meningocele (Supplementary Figure 1, 4; 2 patients, 5.8%). Idiopathic intracranial hypertension (BIH), as indicated by an empty sella (Figure 2), was found in only one patient (2.9%), as shown in Table 2. The most common defect size was 7-10 mm in 12 patients (35.2%) followed by 3-6 mm in 11 patients (32.3%). Table 02. Intraoperative CSF leak was experienced by 23 patients (68%). Utilizing endoscopic endonasal sinus surgery (Figure 03), the middle turbinate flap emerged as the most commonly employed technique (18, 52.94%) Supplementary Table 01.

Postoperative hospitalization lasted an average of 2 days for all participants. As outlined in Supplementary Table 02, during the follow-up period, nasal crusting was observed in five patients (14.71%) while sinusitis developed in four patients (11.76%) and was appropriately managed. Two patients (5.8%) experienced a postoperative CSF leak; one at the one-month follow-up, which spontaneously resolved, and another patient on the 14th

Table No 1: Characteristics of patients

Demographics			
Age (mean ± SD), years	39 ± 14.3		
BMI (mean ± SD), kg/m2	28 ± 3.6		
Female Patients	23 (68%)		
Co-morbidities	Number	Percentage	
Hypertension	4	11.74	
Morbid Obesity*	2	5.88	
CRSWNP	1	2.94	
BMI-wise patient distribution	Male	Female	
< 18.5	1		2.9
18.5-24.99	5	2	20.5
25-29.99	4	15	56
30 and above	1	6	20.5

*BMI > 40, CRSWNP = Chronic rhinosinusitis with nasal polyp.

Table No 2: CSF leak associated data

Anatomical location of CSF leak			
	Cribriform plate, n (%)	Ethmoid roof, n (%)	Sphenoid sinus, n (%)
	22 (64.71)	9 (26.47)	3 (8.82)
Associated complication			
Meningocele	2 (5.88)	0 (0.00)	0 (0.00)
Meningoencephalocele	1 (2.94)	0 (0.00)	0 (0.00)
BIH	1 (2.94) (fig 2)	0 (0.00)	0 (0.00)
Meningitis	1 (2.94)	0 (0.00)	0 (0.00)
Defect size-wise distribution of patients			
Defect size	Number (n)	Percentage (%)	
<3mm	7	20.5	
3-6mm	11	32.3	
7-10mm	12	35.2	
1-2cm	3	8.8	
>2cm	1	2.9	

BIH = Benign intracranial hypertension

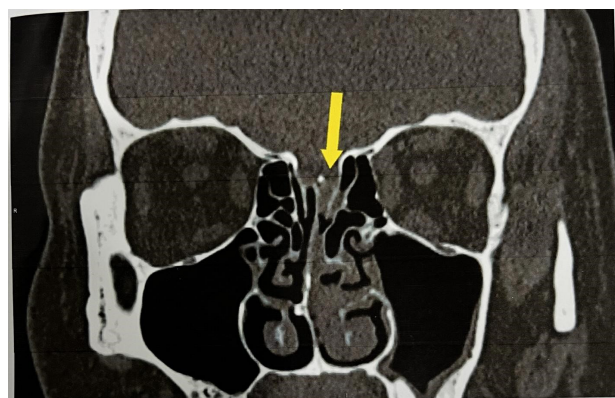


Figure 1: Coronal CT scan of the paranasal sinuses showing an anterior CSF leak through a defect in the cribriform plate of the ethmoid bone (indicated by yellow arrow)

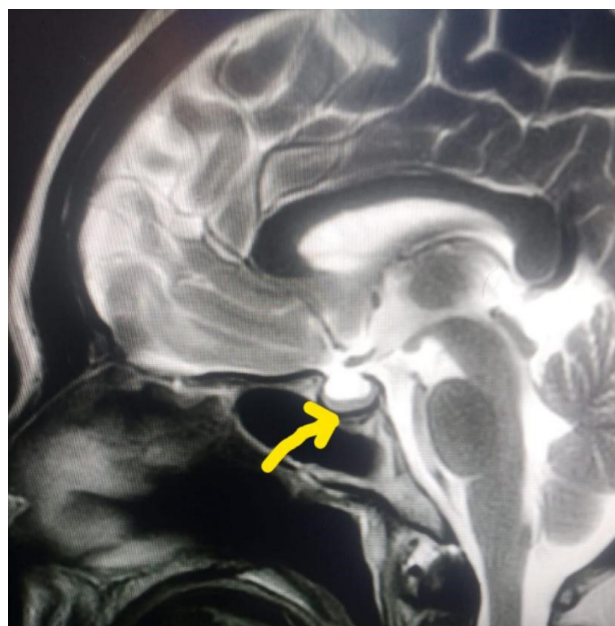


Figure 2: Axial T2-weighted MRI showing an empty sella (indicated by yellow arrow).

postoperative day, was repaired again. The primary endoscopic repair procedure demonstrated an overall success rate of 97.06% (33/34 patients) in our investigation.

DISCUSSION

Spontaneous CSF rhinorrhea is a rare condition that presents diagnostic and therapeutic challenges. In this retrospective study, we explored the management of 34 patients who underwent successful surgical management using the endoscopic endo-nasal multi-layer technique with an overall 97% success rate.

In our study, most of the presenting patients were middle-aged and females, with a 2.09:1 female-to-male ratio. Twenty-five patients had a BMI exceeding 25. These demographics align with previous studies indicating that spontaneous CSF rhinorrhea is more common in obese females.^{15, 16} Although only one patient had BIH in our study, a strong association has been demonstrated between BIH and spontaneous CSF rhinorrhea previously.¹⁷ Furthermore, some patients had underlying medical conditions such as hypertension, highlighting the potential relevance of comorbidities in CSF rhinorrhea management.

Thin watery discharge was the commonest presenting symptom which occurred most commonly during exertion and bending over, other studies do favor the findings.¹⁸ Based on research findings, it is advisable to consider the possibility of spontaneous CSF rhinorrhea in individuals exhibiting elevated Sino-Nasal Outcome Test-22 (SNOT-22) scores for rhinorrhea, particularly when they identify this manifestation as their primary concern, but have lower scores related to the other cardinal symptoms of CRS.¹⁹ In our study, we utilized various radiological modalities for preoperative assessment. These included contrast CT and T2-weighted MRI with contrast in the prone position, along with a late venogram to aid in localization and diagnosis, this aligns with other studies.^{20, 21} Currently, Beta 2 transferrin is the gold standard for diagnosing CSF rhinorrhea, still, it cannot be used for localizing the site of leakage, imaging techniques such as volumetric extended echo train T2-weighted MRI and intrathecal gadolinium-enhanced spine MR imaging have shown promise in differentiating low- and high-flow CSF leaks, correlating with postoperative complications and recurrence rates.²²

In our result the most common site of CSF leak is the cribriform plate (18/34 patients), the finding is consistent with literature²³. Intraoperative encounters with CSF leaks were consistent across all cases. These findings align with the challenging nature of CSF rhinorrhea management, where the primary objective is to locate and repair the site of the leak effectively. Surgical techniques, including the use of flaps like the naso-septal flap and middle turbinate flap, were employed successfully in achieving durable repairs. These techniques have been recognized as valuable tools in the armamentarium for en-

doscopy CSF leak repair.^{24, 25}

Surgical outcomes were favorable, with all patients achieving success, findings are similar to other studies.²⁶ Some patients experienced transient sinusitis postoperatively, which is not unexpected in endoscopic sinus surgery.²⁷ However, these cases were effectively managed, highlighting the importance of postoperative care. One patient presented with numbness in V2 distribution which was resolved after 2 weeks, this is consistent with the literature.^{28, 29}

Follow-up data at the 1st and 3rd months post-surgery revealed sustained success and the absence of adverse radiological findings. This long-term follow-up is essential in assessing the durability of the surgical repair and the prevention of CSF leak recurrence. Our findings align with previous research stating that among the various approaches, defects repaired endo nasally had the lowest recurrence rate.^{30, 31}

There are a few limitations in our study. It is a single-institution study with a small sample size. Some missing data could not be remedied due to the retrospective nature of the study. The relatively shorter follow-up period of 3 months limits the ability to assess long-term outcomes and the durability of the surgical repairs. The study does not compare the endoscopic endo-nasal multilayer technique to other surgical approaches, making it difficult to determine its relative effectiveness. Due to these factors, the findings may not be generalizable to other settings or populations with different demographics or clinical practices.

The study demonstrated a high success rate of 97.06% through comprehensive data collection and analysis, employing a minimally invasive surgical technique with detailed postoperative care and follow-up. However, its retrospective design, single-center nature, small sample size of 34 patients, and lack of a control group limit the generalizability and introduce inherent biases.

CONCLUSION

Our study highlights the effectiveness and success rate of the endoscopic endo-nasal multi-layer technique for the surgical management of spontaneous CSF rhinorrhea. All patients achieved successful outcomes, with few minor side effects. Extended follow-up further supports the durability of the surgical repairs. These findings contribute to the evidence of a minimally invasive approach and underscore the importance of considering patient demographics, comorbidities, and financial factors in CSF rhinorrhea management.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
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Osama M	✓	✓	✗	✓	✓	✗
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Ethical Approval:

This Manuscript was approved by the Ethical Review Board of (IREB) of Khyber Medical College/Khyber Teaching Hospital Peshawar. Vide No. 614/DME/KMC. Dated: 27 11 2023



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FACTORS CONTRIBUTING TO ABSENTEEISM AMONG UNDERGRADUATE MEDICAL AND DENTAL STUDENTS AT A PUBLIC SECTOR UNIVERSITY IN KARACHI, PAKISTAN

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ABSTRACT

Objectives: To determine the demographic characteristics of undergraduate medical and dental students with absenteeism and to explore the factors contributing to absenteeism among undergraduate medical and dental students at JSMU, specifically within SMC and SIOHS.

Material and Methods: A cross-sectional study was conducted at Jinnah Sindh Medical University (JSMU), Karachi, from September to October 2024. The sample size of 322 participants was calculated using a 50% prevalence rate, 5% margin of error, and 95% confidence level. The study included medical and dental students from Sindh Medical College (SMC) and Sindh Institute of Oral Health Sciences (SIOHS) who missed at least five lectures. A structured, closed-ended questionnaire assessed demographic data and factors related to absenteeism. A pilot study validated the questionnaire with a Cronbach's alpha of 0.761. Data was analyzed using SPSS (version 26).

Results: Of the 322 participants, 113 were male, and 209 were female. Absenteeism was most common in the 5-day range (76.4%), with class schedule inconvenience and lack of assignment checks being statistically significant reasons for absenteeism ($p < 0.05$). Lack of motivation and long lecture durations were also reported as key factors.

Conclusion: Absenteeism is rising among health science students, with long lecture durations being the most significant factor. Improving lecture quality, reducing duration, and teaching more student-centered could help improve attendance.

Keywords: Absenteeism, Motivation, Socialization

This article may be cited as: Shah H, Rizvi SMA, Irshad M, Muqri IA, Mubasher A, Ayoub D. Factors Contributing To Absenteeism Among Undergraduate Medical And Dental Students At A Public Sector University In Karachi, Pakistan . J Med Sci 2025 January - March;33(1):43-47

INTRODUCTION

Absenteeism refers to the frequent missing of classes without any valid reason related to education. The absenteeism of students may negatively affect their education and their achievements because the classroom environment provides better interaction of students with teachers. Also, during the lecture, teachers share their personal professional experience with students that cannot be achieved by only reading the textbook.¹

Students who attend classes properly have better academic and clinical performances as compared to students who miss classes and wards. It affects their moral values. Moreover, students who skip classes continuously

experience psychological problems such as depression or Behavioral disorders and may also be indulging in violent activities and bad habits.² Students' achievements and clinical performances are particularly important for medical and healthcare providers because they are concerned with urgent decision-making in life-and-death matters.³

According to Massingham and Herrington, students skip classes more as they progress to seniors in college. This behavior may be due to familiarity with the curriculum, past experiences, or lifestyle modifications.⁴ Undergraduate medical education aims to produce physicians who have sufficient knowledge about health and disease, better clinical skills, and a professional attitude towards patients and their health. Therefore, students who repeatedly miss classes and wards on examination perform poorly because they remain absent when the topic is being covered.⁵

The reasons for student absenteeism are different from university to university, although the most common reason originates from the institute itself. Various studies evaluate the reasons for absenteeism. One of the problems mentioned by students was to prepare for tests or tutorials, and mostly, the short attendance is found in the

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Date Received: 30/09/2024

Date Revised: 30/12/2024

Date Accepted: 01/01/2025

pre-examination period.⁶

Students claim that their interest in their field of study has decreased as compared to the time of admission.⁶ The tendency of students to be absent from classes is a major problem for universities because it affects the quality of education.⁸ Faculty members and their boring or traditional teaching methods are also an important factor in student absenteeism.^{9,10} The relationship between gender and absenteeism is also different from university to university. The study conducted in a nursing college shows no relationship between gender and absenteeism, but in most of the studies, males are more frequently absent than females.¹⁰⁻¹⁴

Sleep Deprivation, the burden of study and academic assignments, lack of interest in the subject, excessive socialization, lower course grades, and social and family issues are the other factors related to absenteeism.^{12,13,15} The feedback session from students should be managed at regular intervals to know the possible causes of absenteeism.¹⁶ The students of this era don't like traditional textbooks because they've more resources to gain education.¹⁷ For example, online self-learning resources and the availability of recorded lectures have markedly decreased classroom response during the past decade.¹⁸ New teaching styles and motivations cause students to attend the lectures. By changing the students' perspective towards attendance, academic performance can be improved.^{19,20}

The absence of students from classes is a major problem in higher education, particularly in the healthcare profession, due to its damaging effect on academic and clinical performance. Therefore, it is necessary to gain insight into the reasons and contributing factors that lead to absenteeism. Despite knowing this, there lies a notable gap between the reason and factors that contribute to absenteeism in literature, especially within the local context. This research will help bridge that knowledge gap within the literature, which will prove beneficial in the long run to help provide such interventions that aim to decrease absenteeism among medical and dental students. Ultimately, this will help medical and dental students enhance their performances by modifying their behavior regarding attendance and regulating a modified learning environment.

MATERIAL AND METHODS

A Cross-sectional study was conducted at Jinnah Sindh Medical University (JSMU), Sindh Medical College (SMC), and Sindh Institute of Oral Health Sciences (SIOHS) Karachi, Pakistan, from September 2024 till October 2024 after taking permission from the IRB of JSMU.

A sample size of 322 participants was calculated by using the reputable online calculator provided by Open Epi.²¹ Criteria for inclusion was undergraduate medical students (1-5 years) and dental students (1-4 years) of JSMU (SMC and SIOHS) who were absent for five lectures

overall were included in the questionnaire. Both males and females willing to participate belonging to any cast, religion, creed, and socioeconomic status were included. Students who were not willing to participate were excluded. Incomplete questionnaires were to be removed as part of the protocol.

A structured, designed questionnaire composed of closed-ended questions and consisting of two parts was used to collect data. The first part deals with demographic questions, for example, age, gender, institute, academic year, etc., along with personal factors and aspects of the learning environment related to absenteeism.⁴ In the second part, a 5-point Likert scale containing nine items was used to measure students' satisfaction level towards the university's medical and dental program.

Additionally, a pilot study was conducted on 10 study participants to check the validity of the questionnaire and minimize the misinterpretation of questions.¹² Data from the pilot study were included in the final analysis. Face validity was found to be excellent, and reliability was calculated to be 0.761 Cronbach Alpha, which is interpreted as good. The non-probability convenience sampling technique was utilized to collect data. The questionnaire was distributed among the students of JSMU (SMC and SIOHS) after informing them about the study purpose and criteria and obtaining consent from them. Researchers distributed a hard copy of the questionnaire among participants before a lecture. Students were asked to spare 10 minutes for this activity in advance. Those who consented to participate were given a hard copy of the questionnaire. After filling in the questionnaires, they were returned to the principal investigator.

Collected data was entered and analyzed through Statistical Package for Social Sciences (SPSS version 26.0) to get a descriptive analysis of the participant's gender, number of absences in particular sessions, reasons for absences, and satisfaction level in the university's medical and dental program.^{1,12}

RESULTS

A total of 322 students from both institutes participated in the study of whom 113 are male and 209 are female with male to female ratio of 1:1.8. The number of participants from SIOHS was 56 while from SMC were 266 and the distribution of participants from 1st year was 67, from second year was 66, third-year 69, fourth year 67, and fifth year was 53.

Table 1 shows that most students (76.4%) were absent for 5 days, occurring 1-2 times during the academic year. A smaller group (14.3%) experienced less frequent absences of 5-10 days, with absences occurring 3-4 times, while 9.3% of students had more severe absenteeism, missing 10-15 days and being absent 5 or more times. This suggests that absenteeism is more common in moderate durations and frequencies, with a small but notable group experiencing extended absences.

Table 2: The data was checked for normalcy and

found that it does not follow a normal distribution. We applied for a chi-square test to find out the most common reasons for absenteeism. The results show a non-significant association for several factors, such as the duration of lectures, the ventilation of lecture halls, lack of interest in the subject, and motivation to study. However, factors like an inconvenient class schedule and the absence of assignment checks show a statistically significant relationship with student absenteeism ($p < 0.05$). Students from both institutes report the inconvenience of class schedules as a notable reason for their absences, with SMC students particularly affected. Additionally, lack of self-discipline also emerges as a significant factor influencing absenteeism. These findings suggest that institutional factors related to academic management and personal discipline are key contributors to students missing classes, while other variables, such as peer pressure and time spent in the canteen, show less impact.

DISCUSSION

Absenteeism is a widespread issue among students globally, across various fields of study. Multiple studies have examined absenteeism among medical students, seeking to identify factors contributing to chronic absence, to address manageable causes to improve attendance. However, there is a lack of relevant literature on this topic in dentistry.^{18,22-23} Most authors have defined absenteeism as missing five or more lectures per semester. In recent years, absenteeism has gained significant attention, affecting health science students equally. Universities are increasingly concerned about the quality of graduates, as this can impact the overall standard of healthcare across the country.²

Table No 1: Shows the distribution of absentees according to duration and frequency in the current academic year

Duration of Absence	Frequency of Absence	Frequency	Percent
5 days	1-2 times	246	76.4%
5-10 days	3-4 times	46	14.3%
10-15 days	5> times	30	9.3%

Studies from Pakistan on absenteeism in medical colleges/universities found that the most common reason for absenteeism was "preparing for tests/exams," while others cited "inappropriate educational environment" and "self-studying".^{2,5,6} This contrasts with our findings, where the most frequently reported reason among our population was a "lack of motivation to study" (SIOHS = 38, SMC = 196). Studies from India and Jammu and Kashmir have reported similar findings, with the highest number of absences occurring during exam preparation periods. Other reports pointed to "poor teaching skills of the instructors" as a key factor.¹³ Additionally, one study highlighted a gender difference in absenteeism, noting that male students often missed lectures due to their lengthy lectures, while female students most frequently cited health issues as the primary reason for absence.⁴ These findings differ from our results.

In Middle Eastern countries, reasons for absenteeism vary significantly from those identified in our participants. The most common reason cited was "lack of sleep," while students from Iran reported the professor's mastery of the subject as the primary motivation for attending lectures.^{7,8,12} A study from Tunisia found that students often skipped lectures because they found them boring. Further, certain characteristics were associated with chronic absenteeism. gender ($p = 0.015$, males), year of study ($p = 0.0001$, second-year students), and whether a student was repeating a year ($p = 0.002$, repeater students).¹⁰ In Cyprus, researchers investigating early burnout in medical students found that unhappiness and low motivation were key causes of absenteeism.²³

The medical profession, particularly the academic phase, is demanding and requires significant dedication and time. Students must absorb and retain a vast amount of information to diagnose and treat diseases, which can make the system feel monotonous. Additionally, courses are often taught in a linear and highly structured manner, further contributing to this issue.²⁴ As a result, absenteeism is becoming more prevalent among health science students. Identifying the reasons for low attendance in lectures can help in finding solutions and supporting struggling students. In our study, we found that the high-

Table No 2: The common reasons according to institute for absentees

Factors	Institute	Pearson Chi Square	Asymptotic Significance (2-sided)	Fisher's Exact Test (2-sided)
The duration of lectures is quite long	SIOHS: 34 SMC: 157	0.05*	0.815	0.882
There is a lack of motivation to study	SIOHS: 38, SMC: 196	0.791	0.374	0.410
The lecture halls are ill ventilated	SIOHS: 35, SMC: 189	1.598	0.206	0.206
The schedule of classes is inconvenient	SIOHS: 29, SMC: 200	12.335	0.000	0.001
The teachers have poor presentation skill	SIOHS: 26, SMC: 146	1.330	0.249	0.302
There is no checking of assignments	SIOHS: 18, SMC: 158	13.867	0.000	0.000
You lack interest in the subject	SIOHS: 26, SMC: 93	2.610	0.106	0.128
You lack self-discipline	SIOHS: 29, SMC: 97	4.558	0.033	0.036
You like to spend more time in the canteen	SIOHS: 14, SMC: 49	1.272	0.259	0.269
You get up late in the mornings	SIOHS: 22, SMC: 85	1.120	0.290	0.349

*Value is significant up to p-value of 0.05, ** Value is significant up to p-value of 0.001

est number of absences reported was five days, with 246 participants reporting this frequency, while 46 participants took 5-10 days off multiple times throughout the semester. The most significant factor affecting lecture attendance in our sample was the “long duration of lectures” ($p = 0.05$).

To improve attendance, several measures can be adopted, including shortening lecture durations and limiting content coverage to avoid cognitive overload and loss of interest. Additionally, training lecturers to make their lectures more engaging and student-centered could help keep students in class.²⁵ Discussing clinical applications and integrating subjects to cover topics more holistically may further enhance student engagement. Our study found no significant difference in the reasons for absenteeism between medical and dental students. This comparison between the two student communities makes this study the first of its kind. Collaboration with policymakers and students to enhance the overall quality of education and the learning environment may help address this pervasive issue.

This study has several limitations. The cross-sectional design of the study can only capture one point in time. This precludes the ability to establish causal relationships between identified factors and absenteeism. Due to its nature, convenience sampling may have introduced selection bias, limiting the generalizability of the findings as the sample may not entirely represent the broader student population. The use of self-reported data predisposes to both recall and social desirability biases. Participants may report or fail to report absenteeism or the reasons for such, and the sample was targeted at students who had missed five or more lectures, thus excluding participants with less frequent absenteeism. Although a pilot study was conducted to find out the validity of the questionnaire, a small size for the pilot and its inclusion in the final analysis could compromise the reliability of the findings altogether.

The study is conducted at a single institution, Jinnah Sindh Medical University (JSMU). The findings might not be generalizable to other medical or dental schools or different geographic regions. Future studies with larger, more diverse samples and longitudinal designs would help better understand the factors influencing absenteeism.

CONCLUSION

Absenteeism is the new emerging trend in the health sector; students need to be curtailed at this early stage. The commonest reason for this was the long duration of lectures, which could be further worked on by training the faculty members to improve the quality of the lecture delivered and decreasing the duration of the lecture.

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CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE: NIL

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Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
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Rizvi SMA	✓	✓	✗	✓	✓	✗
Irshad M	✗	✓	✗	✗	✓	✗
Muqri IA	✓	✓	✓	✗	✓	✓
Mubasher A	✓	✓	✗	✓	✓	✗
Ayoub D	✗	✓	✗	✗	✓	✗

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.

Ethical Approval:

This Manuscript was approved by the Ethical Review Board of Jinnah Sindh Medical University, Vide No. JSMU/IRB/2024/894. Dated: 04 09 2024



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CLINICAL CASE REPORT: TUBEROUS SCLEROSIS COMPLEX

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ABSTRACT

Tuberous sclerosis complex is an autosomal dominant genetic disorder that affects multiple systems, resulting in the formation of hamartomas in different organs such as the skin, central nervous system, kidneys, and lungs. This leads to a variety of symptoms, ranging from seizures to skin manifestations. Here, we report a case of a 14-year-old male child who presented with myoclonic fits and fever. He was eventually diagnosed to be suffering from tuberous sclerosis, based on his clinical signs and investigations.

KEYWORDS: Fever, Seizures, Hamartomas, Tuberous Sclerosis

This article may be cited as: Raza M, Iqbal S. Clinical Case Report: Tuberous Sclerosis Complex. J Med Sci 2025 January - March;33(1):48-51

INTRODUCTION

Tuberous sclerosis/Bourneville disease is a genetic disorder that affects cellular differentiation, proliferation, and migration in early embryonic development, which subsequently leads to the formation of hamartomatous (benign tumors) lesions, which may affect virtually every organ system of the body.¹

It is inherited in an autosomal dominant manner and results from genetic mutations in the TSC1 (9q34) and TSC2 (16p13.3), which encodes Hamartin and Tuberin proteins, respectively.² The genetic mutation may be inherited, or it can occur sporadically. Males and females are equally affected.^{3,4}

Activation of the cell cycle control pathway, mTOR pathway, results in the formation of hamartias (misaligned group of dysplastic cells), hamartomas (well-circumscribed group of dysplastic cells), and hamartoblastomas (rare malignant tumors derived from hamartoma). It is a rare disease that affects approximately 1 in 6000 to 1 in 10,000 live births, with an overall occurrence of 1 in 20,000. The median age of presentation is about 7 months.⁵

The prognosis is variable as it depends upon the system involved. Due to the wide spectrum of clinical manifestations, its diagnosis is often delayed. Here, we demonstrate a case of tuberous sclerosis who presented with myoclonic fits and fever.

CASE PRESENTATION

A 14-year-old special child from Peshawar district, the capital city of province Khyber Pakhtunkhwa, Pakistan, who was known epileptic, landed in Emergency department of Khyber Teaching Hospital, Peshawar with myoclonic fits and fever. His pulse was 112/minute, BP was 110/65, and temperature was 101 °F.

His fits could not be controlled with IV midazolam and diazepam, so we injected IV levetiracetam and sodium valproate, which controlled the fits. At the time of admission, his serum electrolytes were normal, serum calcium was 11.42mg/dl, and serum CPK (Creatine Phosphokinase) was 423 U/L.

Upon inquiring his past medical history, he had normal vaginal home delivery with no history of delay cry. However, his developmental milestones were delayed. He had been epileptic from the first year of life. Initially, fits were generalized tonic-clonic, but then they were localized to upper limbs and occurred only during sleep.

His family history revealed that his father was an epileptic with no mental retardation and died at the age of 40 years due to some cardiac disease of which no record was present. His elder brother had fits when he was 7 years old, he received anti-epileptic medicines for a few years. He is off medicine and has been fine for so many years. His elder sister has hypomelanotic macules on her body. One of his paternal uncles is also taking anti-epileptic drugs for seizure control.

Clinical Examination of this child revealed that he had bilateral cataracts in eyes, hypomelanotic macules, and ash leaf spots on skin on various parts of his body, as shown in the pictures, which were taken with the permission of the patient and his parents.

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Date Received: 24/04/2023

Date Revised: 01/02/2025

Date Accepted: 18/02/2025

His laboratory investigations showed raised C-reactive protein (CRP) of about 32.65mg. Complete Blood count, serum PTH (Parathormone), and serum TSH were in normal range. Serum calcium, albumin, and magnesium were normal. However, his serum vitamin B12 level were low (62.85pg/ml with normal value of 190-950pg/ml).

His CT scan Brain was ordered, which showed multiple calcified sub-ependymal tubers along both lateral ventricles. Calcified subcortical tubers were also seen in the right occipital and frontal lobe. However, there was no midline shift. MRI brain (with contrast) revealed sub-ependymal nodules along both lateral ventricles (figure 5).

There was a calcified lesion (hamartoma) in the right occipital lobe and a (subcortical) hamartoma right frontal lobe. Abdominal ultrasonography was ordered to look for renal Angiomyolipomas, the report of which depicted bilateral renal cysts. His ECG and Echocardiogram were both normal.

His clinical features showed the classic triad (Vogt's triad) of tuberous sclerosis. His CT scan and MRI brain reports were also suggestive of tuberous sclerosis disease. He was diagnosed with Tuberous sclerosis disease based on diagnostic criteria which includes major and minor features.

DISCUSSION

Tuberous Sclerosis Complex presents with a wide spectrum of clinical findings. The signs and symptoms continue to keep on developing over a patient's lifetime. ² Neurological deficits like seizures, intellectual disability, and autism spectrum disorders are common. ¹

A case series that comprised 125 cases reported seizures being the most common presentation in early

Table No 1: Clinical Diagnostic Criteria for Tuberous Sclerosis Complex

MAJOR FEATURES	MINOR FEATURES
Hypomelanotic macules (≥3 and at least 5 mm in diameter)	Confetti skin lesions
Angiofibromas (≥3) or fibrous cephalic plaque	Dental enamel pits (more than 3)
Ungual fibromas (≥2)	Intraoral fibromas (≥2)
Shagreen patch	Retinal achromic patch
Multiple retinal hamartomas	Multiple renal cysts
Cortical dysplasias	Nonrenal hamartomas
Subependymal nodules	
Subependymal giant cell astrocytoma	
Cardiac rhabdomyoma	
Lymphangiomyomatosis	
Angiomyolipomas (≥2)	



Figure 1: Skin Lesions



Figure 2: Hypopigmentation



Figure 3: Nails examination

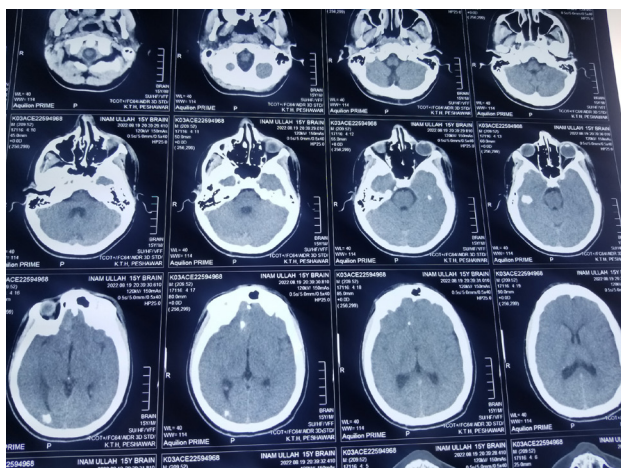


Figure 4: CT Brain Showing Subependymal Tubers

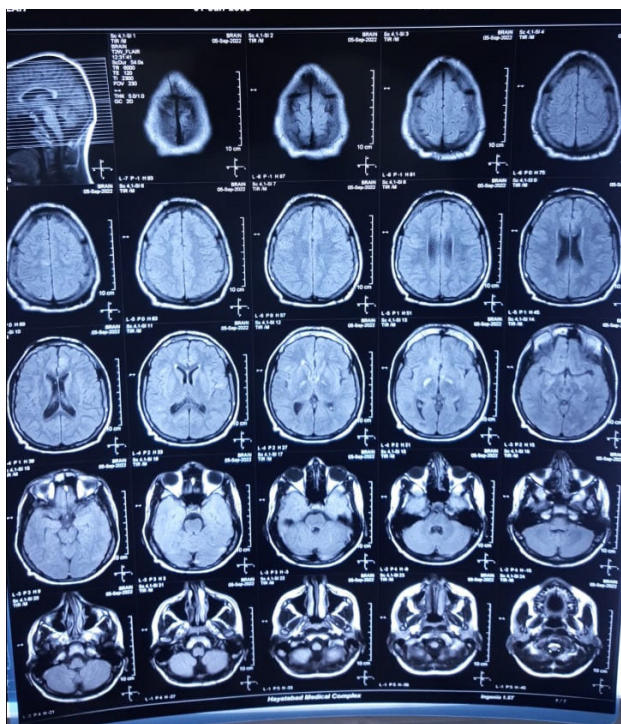
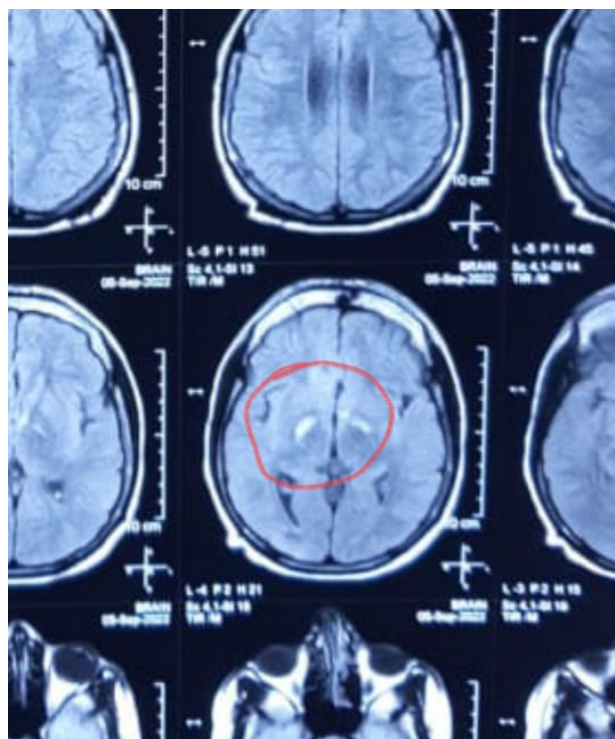


Figure 5 (a): MRI Brain Showing Hamartomas

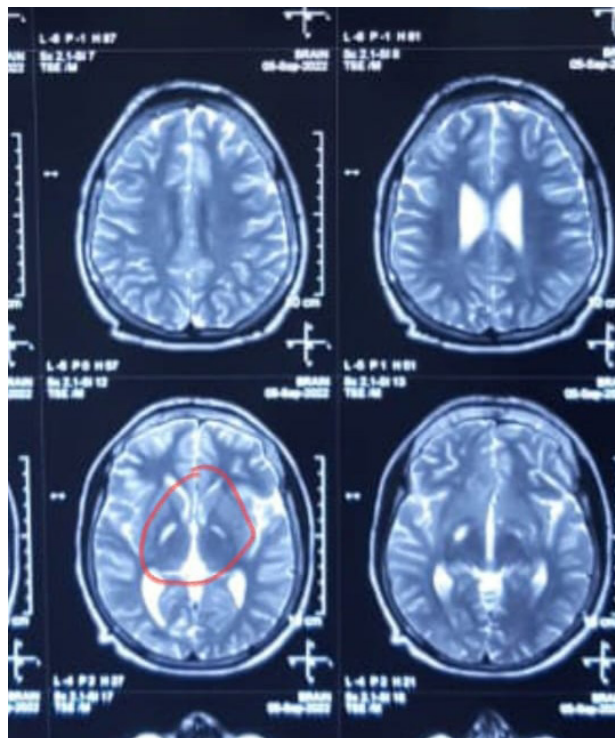


Figure 5 (b): MRI Brain Showing Hamartomas

childhood or infancy, followed by cardiac rhabdomyomas.⁵ As it involves multiple systems, its clinical features include neuronal lesions, dermatological, cardiac, ophthalmic, renal, and pulmonary manifestations. However, the disease is characterized by classic triad (Vogt's triad) which includes seizures, mental retardation and adenoma sebaceum (angiofibroma).^{6,7}

In the 2012 International Tuberous Sclerosis Complex Consensus Conference, the clinical diagnostic criteria for tuberous sclerosis were revised, which consist of the following major and minor features.⁸ A definitive diagnosis is established if a patient has two major features or one major feature with at least 2 minor features, while "possible diagnosis" is predicted in patients with one ma-

or feature or at least 2 minor features.^{2,9}

Due to its multi-system involvement, TSC patients may present with a variety of clinical features, which makes its diagnosis a little difficult. Our patient presented with fits and low grade fever; the clinical examination revealed hypomelanotic macules, ash leaf spots, and bi-

lateral cataracts. Bilateral renal cysts were found on the ultrasonogram. CT scan and MRI brain depicted subependymal nodules. All these features confirmed the diagnosis of tuberous sclerosis disease.

The management and treatment of tuberous sclerosis disease focus on providing a good quality of life to patients with lesser adverse effects. The main complaint of tuberous sclerosis patients is seizures, which require long-term therapy. Vigabatrin is the drug of choice for infantile spasm and children with TSC. Focal seizures can be treated with narrow spectrum agents such as oxcarbazepine. Sirolimus and Everolimus are mTOR kinase inhibitors and are approved for use in tuberous sclerosis disease. Furthermore, surgical care for seizures in patients with TSC can be considered, which includes focal cortical resection, corpus colostomy, or Vagus nerve stimulation.

Our patient was managed with Carbamazepine, Levitracetam, and Benzodiazepine. He was discharged when his condition improved.

Since TSC is a lifelong condition and prognosis varies from person to person. There is no curative treatment, however, symptoms can be treated so that patients can lead a better life. Complications that occur in major organ systems are a cause of mortality. Evaluation for TSC-associated neuropsychiatric disorders (TAND) should be done.

CONCLUSION

Tuberous sclerosis is a rare genetic multisystem disorder that persists throughout the life. It sometimes presents with such mild symptoms that the patient is not diagnosed until adulthood. Sometimes, patients present with severe complications such as cardiac rhabdomyomas and pulmonary manifestations, which can consequently lead to death. Hence, early diagnosis and prompt treatment are necessary to prevent life-threatening complications so that the quality of life of patients can be improved.

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ETHICAL AND EDITORIAL POLICY OF THE JOURNAL OF MEDICAL SCIENCES (JMS) - UPDATED 2024

1. PURPOSE

This document highlights JMS's mission, objectives, and editorial policy 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

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

To publish high-quality descriptive and experimental research, review articles, editorials, letters to the Editors, and case reports to enhance the understanding of the scientific community regarding clinical practice and education

To provide a platform for the scientific community to promote their career development through publishing quality research

2- SCOPE

This policy applies to the authors, reviewers, and readers of the JMS inside and outside the institution.

PROCESS / POLICY DESCRIPTION

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 au-

thors. 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 follows a "triage approach". Upon submission of a manuscript, either online or physical, the document undergoes a preliminary open (un-blinded) review by the Editorial team. The document is either accepted for further review, sent for revision back to the authors, or rejected at that time mentioning the reasons for rejection/declining. Further review of JMS follows a blinded approach, where the article is sent to 2 reviewers, local and international who are already registered on the JMS website. During this process, the confidentiality of the authors and reviewers is ensured. The editorial board has the authority to retract an article if a serious violation of credibility or quality of research is found any time before publication, including after acceptance or after the article is published if concerns arise about the integrity of the work. (See also the section on 'Correction and retraction of articles").

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 in 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. The journal editor should seek an explanation and signed statement of the agreement if a corresponding author requests the removal, addition, or changes in the sequence of a co-author after manuscript submission and processing mentioning the approval of all listed authors and the author concerned. 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, except in some cases where the rationale must be provided by the corresponding author that will need the approval of a committee comprising the Chief, Executive, and managing editors.

4. SUBMISSION OF MANUSCRIPT

The manuscript should be submitted through the journal's website, which uses the Online Journal System (OJS) along with the Institution's Research and Ethics Board (IREB) certificate and other requirements as mentioned during the submission process. The article should have the following format:

4.1: The abstract should be structured with a word count of not more than 250 words. The whole document should be between 2500 and 3500 words (excluding references and appendices) for an original article. The case report and case series should be between 500-1500 words excluding references. A letter to the editor should not be more than 500 words and a review article (including meta-analysis and systematic reviews should be between 3000-5000 words excluding references and other documents. A short communication should be between 1500 to 2500 words excluding references.

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

4.4: No article in any form should contain more than 4 figures and more than 5 tables.

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

5. INSTITUTIONAL RESEARCH AND ETHICS BOARD (IREB) CERTIFICATE

Under no circumstances, an article will be processed if approval from the relevant ethical board/committee for Ethical approval is not presented at the time of article submission. The Ethical approval certificate MUST have been availed before the start of the research and must include the participants' consent

forms as follows:

- a. Baseline data
- b. Introduction
- c. Purpose of the research
- d. Type of research intervention
- e. Voluntary participation
- f. Information about the trial drug/device/test (if an experimental study)
- g. Procedures and protocols
- h. Description of the process
- i. Side effects and risks
- j. Benefits
- k. Reimbursements
- l. Confidentiality
- m. Sharing the results
- n. Right to refuse or withdraw from the study
- o. Contact person
- p. Undertaking of the participant and the researcher

6. CONFLICT OF INTEREST

The authors, peer reviewers, and editors must declare conflicts of interest about the financial aspects, academic competitions, and relationships during the writing, reviewing, and publishing of the manuscripts. This will ensure transparency in the research conduction, writing, and publication. The authors should clearly state the details of sponsors along with their roles and access to data.

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 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 per-

sonal 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 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 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 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 publication, the article must be retracted after approval of at least 3 editorial board members in consultation with the chief editor. The process will follow the guidelines presented by the Committee on Publication Ethics (COPE).

8.6: The retracted article should be noted 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 re-

garding 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. 15,000/- (Pakistani) for local authors and \$ 250 (US) for international authors has 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:

1. Article processing fee of 5000/- PKR at the time of submission of the article. This amount will be non-refundable.
2. Article publication fee of 10000/- PKR at the time of acceptance of article after external review. This amount will be refundable if the article is rejected for any reason.
3. 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.
4. 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 ongoing development of the journal

11.1.5: To identify topics for special issues of

the journal or recommend a Conference which 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 own 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: It is important that Editorial Boards 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 a number of 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
- vii. It is not necessary to fulfill all the criteria to become a chief editor.

11.3.2: THE ROLES OF 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 ensure that any feedback to authors is constructive.

- ii. An editor 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 smooth running of the journal
- iv. To regularly evaluate the research work
- v. To communicate with funding and regulating agencies (HEC and others) for grants and accreditations.

11.3.4: EXECUTIVE EDITOR:

- i. The roles of executive editor are:
- ii. To evaluate the research articles presented for publication
- iii. To help the editorial board in policy making
- iv. To help the editorial board in smooth publishing
- v. 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

senior editorial team

- vi. Training of future reviewers, young members and other faculty members
- vii. others

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

14. CONTACT INFORMATION

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

