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Editorial

Learning Theories: From Divine to Mortals

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Learning is a fascinating journey, a puzzle waiting to be solved. It's like piecing together a complex jigsaw, with each theory offering a unique piece of the puzzle. As an educator, I have come to appreciate three fundamental learning theories that have shaped the way we understand the process of acquiring knowledge: behaviourism, Cognitivism, and Constructivism.[1] Let's embark on this enlightening voyage through the world of learning.

First, there is behaviourism.[2] Imagine knowledge as something external, waiting to be absorbed like a sponge soaking up water. In behaviourism, learners are like blank canvases, waiting for the right stimuli to shape their behaviour. It is like training soldiers; actions are repeated, words of encouragement are spoken, and rewards are offered. While this method may work well in military training, it is not the ideal approach for children or adults in optimal learning environments. After all, we are more than just passive recipients of information; we are thinkers and creators.

Cognitivism, on the other hand, treats learners as active processors of information.[3] Think of your mind as a supercomputer, with intricate processes happening internally. Unlike the blank slate of behaviourism, cognitivism recognizes the complexity of human thought. It is not just about stimuli; it is about thinking and reorganizing information. Learning occurs as we find new explanations or adapt old ones. This theory is the birthplace of concepts like cognitive load theory and schema theory. However, it has its limitations, as it tends to overlook the impact of the social environment and individual differences.

Now, let's delve into Constructivism, a theory that views learners as architects of their own knowledge.[4] We are not blank slates; we bring our unique experiences and prior knowledge to the table. Learning, in this context, is about building upon what we already know. We assimilate new information and accommodate it into our existing mental structures. It is like adding new bricks to a constantly evolving mental structure. Teachers in this approach play interactive roles, guiding learners as they construct their understanding. I have always been intrigued by how these theories have been part of human inquiry for centuries. Plato himself pondered, "How does an individual learn something new?" It is not a new question; it is an age-old quest for under standing. Learning theories have been attributed to various scholars throughout history, from Kohler and Vygotsky to Piaget and Bloom. But it is essential to remember that these theories are not rigid boxes; they often overlap and complement each other.

In my academic journey, I have found inspiration in the wisdom of the Quran. It invites us to think critically, to learn through thinking (cognitivism) and doing (experiential), and to draw lessons from the experiences and fates of previous generations (behaviourism). It is a call to engage our minds and hearts in the pursuit of knowledge. The first verse revealed to the Prophet Muhammad (PBUH) is: "Read (O Prophet), in the name of your Lord, Who, created: created man from a clot of congealed (clotted) blood".[5] Here we see an invitation to think critically based upon "creation of a new human" the unique power of the creator (Allah/Lord).

Beyond religious texts, there are pearls of wisdom from Confucius and Aristotle.[6] "I hear and I forget; I see and I remember; I do and I understand," says Confucius, emphasizing the importance of experience in learning. Aristotle adds, "For the things we have to learn before we can do, we learn by doing." These ancient insights resonate with constructivism, where hands-on experience is key.

But let's face the reality of education. In an ideal world, every teacher would prefer a student cantered approach in small groups, fostering interaction and providing hands on experiences. Unfortunately, the real world comes with stakeholders like departments, curriculum committees, and educational authorities. Teachers often find themselves with one hand tied. It is a balancing act between theory and practice. As you embark on your academic journey, remember that learning is not a one size fits all endeavor. It is a dynamic process influenced by various factors. Embrace the principles of behaviourism, cognitivism, and constructivism as tools in your toolkit. Think critically, learn by doing, and construct your unique

understanding of the world.

In your pursuit of knowledge, do not forget the rich tapestry of learning theories that have shaped education throughout history. They are not just abstract concepts but practical guides on your path to academic excellence. So, as you explore new horizons, keep these theories in mind, and let them be your compass in the ever-evolving landscape of learning.

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Original Article

Detection of Inguinal Hernia in Patients with Groin Pain on Ultrasound

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Abstract

Objective: To establish ultrasound's contribution to precise diagnosis and to differentiate between inguinal hernia from other diseases in patients with groin pain.
Methodology: This descriptive cross-sectional study was conducted in Hayatabad Medical Complex, Peshawar from January to June 2023, with permission of Research Board Ethics Committee. The inclusion criteria comprised patients of all ages and genders with right or left lower quadrant pain suspected of having a hernia. Exclusion criteria included patients who had undergone other ultrasound examinations for lower quadrant pain, diagnosed male prostatic pain, and pregnant women with groin pain. Data collection involved the use of a self structured questionnaire after obtaining ethical approval and informed consent.
The collected data was analysed using SPSS version 25. Descriptive statistics, including frequencies, percentages, mean, and standard deviations, were used to present the data.
Results: A total of 323 patients were presented with groin pain and swelling. Out of 323 patients 280 (86.7%) were male patients and 43 (13.3%) were females patients included in our study. All of 323 patients 267 patients were evaluated for inguinal hernia by ultrasound examination during the study period. Out of 323 patients 56 patients of ultrasonographic examinations shows other diseases of groin region which includes 40 patients (12.4%) of enlarged lymph nodes, 10 patients (3.1%) were mass and 6 patients (1.9%) were abscess noted. Thus, ultrasound diagnosed accurately inguinal hernia detection and differentiated us inguinal hernia from other diseases in patients with groin region pain or swelling.
Conclusion: Routine Ultrasonography is a helpful and accurate imaging modality performed before general surgery to identify inguinal hernias in groin discomfort patients or swelling.

Keywords: Ultrasound, Risk Factors, Inguinal Hernia, Groin Pain, Pakistan

Introduction

A hernia is when an organ protrudes through the muscle wall of the cavity that surrounds it, through an abdominal hole.[1] It occurs in selected regions, specifically those where the aponeurosis and the fascia lack the protective support of striated muscle and are susceptible to abdominal wall hernias. The "normal" person already has several of these areas, but others might be added through surgery, trauma, or muscle atrophy.[2]

The groin, the umbilicus, and the linea alba are the three most typical locations for hernias because of their anatomical connections. Reducible hernias, on the other hand, can be forced back into the abdominal cavity on occasion (such as when straining or standing), while irreducible hernias, on the other hand, do not return to the abdominal cavity at all. The most typical signs of a hernia are abdominal discomfort, groin enlargement, and a sense of weight in the abdomen, particularly while coughing, lifting, or stooping.[3] The factors that contribute to a hernia's development, such as muscular weakness and strain, determine how long it takes to manifest. An uncomfortable or painful hernia may extend into the scrotum. After therapy, the problem may return in one or both groin (bilateral hernia or unilateral hernia), depending on where it occurs (recurrent hernia).[4] Up to 20% of affected adults have a bilateral inguinal hernia. Due to the right testicles' later descent and the related process of vaginitis, with a 2:1 ratio, it is more abundant on the right than the left. It has been claimed that another factor contributing to its more frequent incidence on the right side is an appendectomy scar. Hernias are substantially more common in males with varicose veins, in those who have hemorrhoids, in those who have prostatic hypertrophy symptoms, and in skinny men. These relationships can be a result of elevated abdominal pressure. Obesity may operate as a preventative measure because hernias are less common when a person is overweight or adipose.[5]

Groin hernias are the most frequent indirect hernias in both men and women. 75% of abdominal wall hernias are inguinal hernias, with a life-long risk of 27% in males and 3% in females.[6] Inguinal hernias are the most prevalent type of abdominal wall hernias. Men are much more common than women to have inguinal hernia. They might also be more prevalent among older people and white people; congenital or acquired inguinal hernias are also possible.[7]

Hernia's primary risk factors are pregnancy, weightlifting, constipating and overweight. The individual should contact a doctor in case of pain or obvious swelling on the belly, pelvic bone, or groin or if there are any other hernia symptoms. When the patient touches the affected area or stands up straight, they can feel the protrusion.[8] They may also occur in the upper thigh, navel and inguinal areas.[9] The purpose of this study was to establish a connection between groin pain and inguinal hernia and the significance and feasibility of its detection on ultrasound among the locals of Peshawar visiting Hayatabad Medical Complex. This study was conducted to establish a correlation between physical examination findings (palpable mass or bulge) and ultrasound diagnosis.

Methodology

The cross-sectional study was conducted at Hayatabad Medical Complex Hospital in Peshawar from January to June 2023. The study had ethical approval with the approval letter number NS/539/2022, dated December 1, 2022. A sample size of 323 patients was determined based on a prevalence of morbidity of 50% with a precision of 5%. Convenience sampling was used to select the participants. All patients included in the study were diagnosed by the same radiologist, who has seven years of hands-on practice experience.

The inclusion criteria comprised patients of all ages and genders with right or left lower quadrant pain suspected of having a hernia. Exclusion criteria included patients who had undergone other ultrasound examinations for lower quadrant pain, diagnosed male prostatic pain, and pregnant women with groin pain. Data collection involved the use of a self-structured questionnaire after obtaining ethical approval and informed consent.

The collected data was analysed using SPSS version 25. Descriptive statistics, including frequencies, percentages, mean, and standard deviations, were used to present the data. The analysis included examining inguinal hernia measures, patient age, and gender. For the association inguinal hernia between palpable or bulge appearance and detection on ultrasound machine was assessed using the Chi-square test.

Results

A total of 323 patients who presented with complaints of groin region pain and suspicious inguinal region mass or bulge appearance on physical examination were included. Among these patients, 280 (86.7%) were male and 43 (13.3%) were female, as determined by ultrasound evaluation. The demographic results revealed a higher proportion of males (86.7%) compared to females (13.3%) among the patients included in the study.

In this study, all study participants (100%) reported a history of inguinal pain. However, the presentation of pain varied depending on the type of pain in the inguinal region. Among the study participants, burning pain was reported by 167 (51.7%), sharp pain by 265 (82%), shooting pain by 217 (67.2%), dull pain by 101 (31.3%), and pinching pain by 108 (33.4%) out of 100% observed. Sharp and shooting pain were the most commonly reported types of pain among all study participants (Table 1).

Table 1: Distribution of pain types among the study participants

Pain	Frequency	Percentage
Burning	167	51.7
Sharp	265	82
Shooting	217	67.2
Dull	101	31.3
Pinching	108	33.4

In this study, participants reported experiencing discomfort in various positions such as walking, sitting, standing, exercising, weight lifting, and changing positions. Specifically, 172 (53.3%) reported discomfort while walking; 247 (76.5%) while sitting; 250 (77.4%) while standing; 22 (6.8%) while exercising; 173 (53.5%) while weight lifting, and 228 (70.6%) while changing positions, as shown in Table 2. The most common positions associated with discomfort were sitting and standing.

The selection of the transducer (probe) is mostly the same for all participants. The probe of choice for a diagnosis of inguinal hernia is a linear probe and was used for all 323 participants. The position of the participant depends on the participant's physical condition, like obesity, weight, etc. The position most people prefers over others is supine. In this study, we diagnosed 297 (92.0%) participants in a supine position. Study included 26 (8.0%) participants diagnosed in standing positions because of some factors like obesity or difficulty in diagnosis in prone and supine positions, and no participant is diagnosed in a prone position (Table 2).

Table 2: Distribution of discomfort reported in different positions

Symptoms	Frequency	Percentage
Walking	172	53.3
Sitting	247	76.5
Standing	250	77.4
Exercise	22	6.8

The sites of pain in this study include the right, left, and bilateral inguinal regions. In all 323 participants, right-side pain was observed in 147 (45%) participants, 141 (44%) participants had left-side pain and the remaining 35 (11%) participants had both sides of bilateral pain in their inguinal region, as shown in Figure 1.

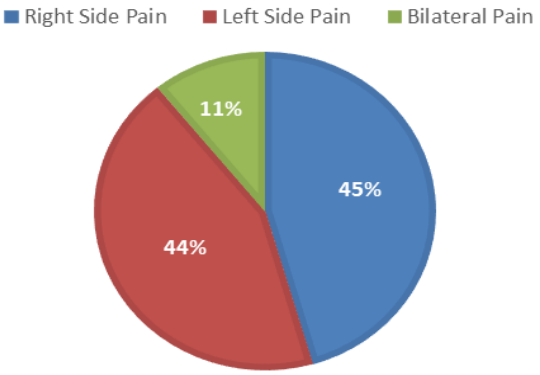

Figure 1: Sites of Growing pain

In this study, before the ultrasound examination, a physical examination was performed, who observed certain changes. 288 participants had palpable or visible mass out of all participants, and 180 participants had bulges in the groin region. So according to this condition, the physicians prefer to have participants undergo an ultrasound for a further diagnosis to find out the result. Out of 323 patients, 318 participants in the physical examination have a mass or bulge that is more prominent when coughing or standing. The Association between ultrasound findings can be seen in Table 3.

The portion of the ultrasound impression includes the diseases that are present in the participants who have been diagnosed with ultrasound. The frequencies of disease in the groin region are: enlarged lymph nodes present in 40 (12%) participants; swelling or mass in 10 (3%); inguinal hernia in 267 (83%), abscess in 6 (2%); and the femoral artery aneurysm is never recorded in this study Figure 2. The results given in Table 3, show that there is a relationship between physical mass palpable and bulge appearance with inguinal hernia, where the detection of false positive or

false negative cases of inguinal hernias on ultrasound was done on the intraoperative surgical procedures and the values of chi square test for physical mass palpable and ultrasonography were (X2 =7.41, p=0.00) and bulge appearance and ultrasonography were (X2=16.98, p=0.00) in groin region pain, both p values are highly statistically significant. The percentage has been shown in Figure 2.

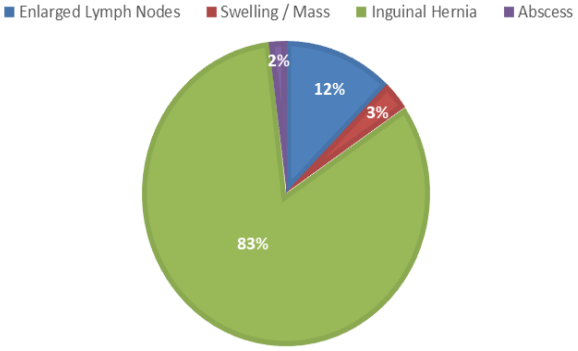

Figure 2: Showing the percentage of symptoms of organs

Table 3: Association between ultrasound findings, physical palpability, and bulge appearance in groin region (Hernia) with p-values

Yes		Ultrasound Findinds		Total	p-value
		No	Yes		
Physically mass palpable / feel /visible	Yes	237	51	288	0.00
	No	22	13	35	
Total		259	64	323	
Bulge appearance in groin region					
Yes		**Ultrasound Findinds**		**Total**	**p-value**
		Yes	No		
Bulge appearance in groin region	Yes	159	21	180	0.00
	No	100	43	143	
Total		259	64	323	

Discussion

An inguinal hernia is an outpouching of the peritoneum, with or without its contents, that occurs through the muscles of the anterior abdominal wall at the level of the inguinal canal in the groin. It is a common condition that can affect anyone at any age. It is more frequent in men than in women, according to several studies conducted in various parts of the world. Hernias are typically asymptomatic at first, appearing as a swelling that increases with strain and subsides at rest. Over time, though, they enlarge and start to cause pain and discomfort. Producing an ultrasound that is of high quality is a big duty for sonographers. A linear probe is the preferred transducer (probe) for diagnosing an inguinal hernia. The goal our study was to diagnose inguinal 7.7:1.0. Another retrospective study was conducted in Sudan with 180 participants presented with groin pain and swelling for ultrasound examination. Ultrasound diagnosis of 163 participant shows inguinal hernia of 112 were males and 51 were females included.[11] According to one study, the majority of the patients who were affected by inguinal hernia were under the age of 60, giving the idea that the elderly people are more susceptible to this disease.

Conclusion

In our study, groin hernias were the most common type, and in total study participants, 100% had a history of inguinal region pain. However, the presentation of pain is different according to pain types in the inguinal region, such as burning pain sharp pain, shooting pain dull pain and pinching pain is observed out of 100% each. Sites of pain in this study include right, Left, and bilateral inguinal regions.[9]

In Saudi Arabia, a study involving 256 participants was conducted with only children.[14] Physical examinations were not included in their study. While in our study physical examination was included, we also included the factor of vascularity and the portion of the ultrasound impression, which includes the diseases that are present in participants who have been diagnosed with ultrasound. Frequencies of disease in the groin region are enlarged lymph nodes, swelling or mass, inguinal hernia, abscess. All the frequency is carried out to find a ratio of individual diseases in participants with a history of groin pain. In this study, 297 participants were diagnosed while supine, and 26 were diagnosed while standing due to factors including obesity or the difficulties of diagnosing patients when prone or supine, and no participant was diagnosed while prone.

Ultrasound examination, a common diagnostic tool for inguinal hernias, revealed a high incidence of hernia detection (83%) in the study population. The correlation between physical examination findings (palpable mass or bulge) and ultrasound diagnosis was statistically significant, reinforcing the importance of clinical assessment in conjunction with imaging for accurate diagnosis.[15] Notably, the study identified other groin pathologies, including enlarged lymph nodes and abscesses, emphasizing the need for a comprehensive evaluation to differentiate between different etiologies.[16]

However, it was observed in this study the exclusive use of ultrasound as an imaging modality might limit the detection of certain hernias, especially those in obese individuals where ultrasound sensitivity might be reduced.[17] Additionally, the study does explore the potential impact of different hernia orifices area and patient comorbidities on symptomatology or diagnostic accuracy, which could provide valuable clinical context. In clinical practice, integrating a thorough physical examination with appropriate imaging techniques remains paramount for accurate inguinal hernia diagnosis. Moreover, considering the diverse symptomatology reported by patients, healthcare providers should maintain a high index of suspicion for hernias, particularly in the presence of characteristic symp-

toms or physical findings.

Future research could explore the role of advanced imaging modalities such as magnetic resonance imaging (MRI) in cases where ultrasound results are inconclusive, especially in challenging diagnostic scenarios. Additionally, investigating the impact of hernia orifices area, location, and patient-related factors on symptom severity and diagnostic outcomes could enhance our understanding of hernia pathophysiology and aid in personalized surgical treatment strategies.[18]

Various imaging techniques have been proposed to explore occult hernias. Magnetic Resonance Imaging (MRI) is recommended for investigating groin pain and is particularly useful in further examining musculoskeletal causes, such as osteitis pubis.[19] A study conducted by van der Berg *et al.* (1999) comparing ultrasound, MRI, and laparoscopic surgical findings for clinically detectable hernias demonstrated the superior accuracy of MRI over ultrasound.[20] Nevertheless, MRI has not undergone comprehensive evaluation for occult hernias. Additionally, the higher cost, time consuming and non-availability of MRI in comparison to ultrasound examinations might limit its use as an initial investigative method.

Limitations

Since not all of the study's participants had positive ultrasound scans, it was impossible to determine the exact sensitivity and specificity of ultrasound. Another limitation of this study is this study excludes occult inguinal hernia and does not include a physical examination.

Authors' Contributions: MAA conceived and designed the study, participated in data collection, and contributed to drafting and revising the article. IK involved in study design and execution, contributed to data analysis, and participated in drafting and revising the article. AA contributed to study design, data collection, analysis, interpretation, and drafting/revising the article**.**

Conflict of interest: The authors have no conflict of interest.

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Original Articles

Attitude, Practice and Preparedness of Dental Practitioners for Providing Oral Care to Patients with Speech and Hearing Impairment

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Abstract

Objective: To explore the attitudes, practices and preparedness of dental practitioners for providing oral care to patients with speech and hearing impairment.
Methodology: This cross-sectional study was conducted on a sample of 467 dental practitioners between November 2021 and April 2022. A survey questionnaire was administered to practicing dental practitioners in Pakistan through online Google forms and in person. The survey included questions regarding dentists' demographic information, their attitudes and concerns, practices and views regarding training needs concerning the provision of oral care to patients with speech and hearing impairment. Data was analyzed with STATA version 16. Descriptive statistics with frequencies were computed and x^2 was used to find out the associations between different variables.
Results: The findings suggest that a significant proportion of participants, specifically 88.22%, were unfamiliar with sign language and relied on the assistance of an attendant (54.82%) for communication purposes. According to their accounts, surgical extraction (54.4%) was perceived as the most challenging treatment to execute, whereas scaling and polishing (73.9%) was considered the easiest treatment to administer in this particular population. When it came to providing care for individuals with speech and hearing impairment, several barriers were identified. These included communication obstacles (65.3%), patient cooperation (63.2%), concerns about medical emergencies (29.1%), inadequately trained staff (26.3%), and limited experience (25.5%).The participants unanimously agreed that there is a pressing need for enhanced undergraduate training (43.68%). Additionally, they suggested that it should be obligatory for students to treat a specific number of patients with speech and hearing impairment as part of their undergraduate training (49.25%).
Conclusion: There is a need to address the identified barriers and create a better understanding between dentists and individuals with speech and hearing impairments. Basic dental signs should be learned and mastered to engage patients more effectively via non-verbal communication.

Keywords: Dentists' Opinion, Oral Care, Speech and Hearing Impairment, Sign Language Education, Language barrier

Introduction

Oral health has emerged as a significant concern for individuals with physical, sensory, mental, intellectual, medical, emotional or social disabilities owing to its predominant influence on overall well-being. The World Health Organization (WHO) estimates that globally there is a 15% disability ratio out of which 2-4% face functional limitations.[1] In Pakistan, the disability ratio stands at 3.4%, and the functional limitation rate is reported at 10.7%.[2] Among developmental disabilities worldwide, deafness ranks third in terms of years lived with disability and affects over 1.5 billion people while low and middle-income countries account for around 80%. It is most prevalent in the Western Pacific Region followed by Southeast Asia.[3] Such a substantial population demands specialized healthcare needs; however, those who have intellectual developmental disabilities report having more unmet requirements for general health care services like oral care and prescription medication than the general population.[4]

Individuals with developmental impairments are highly vulnerable to oral diseases due to their complex medical condition along with an inability to maintain adequate oral hygiene practices coupled with medication side effects and poor dietary habits.[5] This situation becomes further complicated by inadequate knowledge about when dental care should be sought combined with limited access to oral healthcare facilities. Other challenges include high costs associated with treatment along with poor quality healthcare delivery given time constraints plus insufficient knowledge or skills among practitioners providing oral health care services.[6]

Poor oral health outcomes occur when multiple barriers are encountered during treatment. A comparative study carried out in Karachi revealed that disabled children had a higher proportion of poor oral hygiene compared to normal children indicating that speech/hearing impaired children were particularly susceptible to such issues.[5] Another study found that dental caries was highly prevalent among speech/hearing-impaired children where half of them never visited a dentist.[7] These patients also faced communication difficulties leading towards less cooperation between dentists and patients alike.[8]

Reports suggest physicians' attitudes towards differently-abled individuals plus physical accessibility problems accompanied by communication barriers pose major challenges hindering healthcare access.[9] Addressing these issues through proper approaches is mandatory for maintaining healthy societies since they lead towards extra social/economic burdens

within any country.

To our knowledge so far this research represents the first attempt made towards addressing challenges faced by non-cognitively impaired speech/hearing-impaired individuals seeking dental treatments alongside assessing dental practitioners' practices/preparedness regarding managing such cases in Pakistan. Our research aims at assisting decision-makers in devising policies aimed at overcoming various obstacles encountered while providing oral care services specifically designed for speech/hearing-impaired individuals without significant cognitive or behavioral disorders.

Methodology

This cross-sectional study was approved by the Institutional Review Board of Dow University of Health Sciences (Ref: IRB-2450/DUHS/Approval/2022/797). The sample size of 467 subjects was calculated using PASS version 15 software, based on a test for one sample proportion with a 95% confidence interval, 80% power of the test, 5% margin of error, dentistry treated individually among developmental disabilities was (80.3%). A survey questionnaire was administered to practicing licensed dental practitioners across Pakistan through online Google forms and in person regardless of age or gender. The questionnaire was adapted and modified using previously published articles.[6-10] The reliability of the questionnaire was calculated using Cronbach alpha and the value attained was 0.74. The survey includes questions regarding dentist's demographic information, opinion about willingness, practices and concerns and preparednessregarding the provision of oral care to patients with speech and hearing impairment. The answers use a 5-point Likert scale ranging from 0 (strongly disagree) to 4 (strongly agree). This study includes all licensed dental practitioners who gave consent. Undergraduate students were not included in the study. Data was analyzed using STATA version 16. Descriptive statistics with frequencies were computed and x^2 was used to find out the associations between different variables. p-value of <0.05 was taken as significant.

Results

A total of 467 licensed dental practitioners participated in the survey. The gender distribution in the surveyed population is skewed towards females (60.81%), with majority of participants falling within the 22-28 age bracket (63.60%). Geographically, most of the participants come from Sindh (60.39%), and their professional roles encompass various categories, with Interns/House Officers comprising the largest group (32.55%). In terms of education, 70.66% of the participants hold graduate qualifications, while most of them have less than 5 years of work experience in the field (65.74%). This thorough and in-depth analysis presents an intricate and nuanced comprehension of the make-up and characteristics of the individuals involved in the study. It goes beyond a mere surface-level examination by delving into various aspects such as their gender, age, place of origin, occupational roles, levels of education, and past professional experiences within the specific group that was surveyed. Through this comprehensive exploration, valuable insights and understanding can be gained, shedding light on the diverse and multifaceted nature of the participants' backgrounds and qualifications. The practice and its frequency has been shown in Table 1.

Table.1: Practices and attitudes of dental practitioners

Practices and concerns	Frequency (%)
Do you know sign language for dumb and deaf individuals?	
• Yes	55 (11.78)
• No	412 (88.22)
Have you ever provided dental treatment to a patient with speech/ hearing impairment?	
• Yes	191 (40.90)
• No	276 (59.10)
How do you communicate with patients with speech and hearing impairment?	
• Through sign language	51 (10.92)
• With the help of his/her attendant	256 (54.82)
• I have not encountered such patients yet	156 (33.40)
• Other	4 (0.84)
Do you refer patients with speech/ hearing impairment to other dental professionals?	
• Yes	164 (35.12)
• No	303 (64.88)
If YES, then to whom do you refer such patients (n=164)	
• General Dental Practitioner	x30 (18.29)
• Specialist/ consultant (depending on patients complain)	134 (81.71)
Where do you usually refer these patients (n=164)	
• Private dental hospital	54 (32.93)
• Public dental hospital	67 (40.85)
• Private clinic	43 (26.22)
In your opinion, where should patients with speech/ hearing impairment be treated.	
• In the same clinic as for the general population	146 (31.26)
• In special clinics	244 (52.25)
• In hospitals	77 (16.49)

The data illustrates the inclination and ease levels of dental experts in offering diagnoses and treatments for patients with speech/hearing impairment, as well as their receptiveness to receiving supplementary education in this domain. A noteworthy proportion of respondents demonstrate a favorable stance towards providing dental diagnoses (78.3% combined agree and strongly agree), and a comparable tendency is observed for the willingness to administer dental treatment (80.95% combined agree and strongly agree). Intriguingly, while the comfort levels fluctuate (51.67% combined agree and strongly agree), the confidence levels remain relatively elevated, with 75.1% expressing agreement or strong agreement in feeling self-assured while treating patients with speech/hearing impairment Overall, the findings indicate a positive disposition among dental professionals towards addressing the requirements of patients with speech/hearing impairment, in conjunction with an eagerness to augment their competencies through further

training.

Table 2: Preparedness of dental practitioner

Preparedness	Frequency (%)
Undergraduate dental education provided me with the knowledge to treat patients with speech/ hearing impairment	
Strongly disagree	121 (25.91)
Disagree	222 (47.54)
Neutral	66 (14.13)
Agree	46 (9.85)
Strongly agree	12 (2.57)
Undergraduate dental training made me confident in treating patients with speech/ hearing impairmentStrongly disagree	125 (26.77)
Disagree	195 (41.76)
Neutral	82 (17.56)
Agree	57 (12.21)
Strongly agree	8 (1.71)
More training is needed at the undergraduate level for the management of patients with speech/ hearing impairment	
Strongly disagree	13 (2.78)
Disagree	11 (2.36)
Neutral	36 (7.71)
Agree	204 (43.68)
Strongly agree	203 (43.47)
Postgraduate dental education provided me with the knowledge to treat patients with speech/ hearing impairment (n=265)	
Strongly disagree	24 (9.06)
Disagree	101 (38.11)
Neutral	57 (21.51)
Agree	57 (21.51)
Strongly agree	26 (9.81)
Postgraduate dental training made me confident in treating patients with speech/ hearing impairment (n=265)	
Strongly disagree	19 (7.17)
Disagree	100 (37.74)
Neutral	74 (27.92)
Agree	57 (21.51)
Strongly agree	15 (5.66)
More training is needed at the postgraduate level for the management of patients with speech/ hearing impairment (n=265)	
Strongly disagree	12 (4.53)
Disagree	12 (4.53)
Neutral	18 (6.79)
Agree	122 (46.04)
Strongly agree	101 (38.11)
I think my staff is prepared to assist me in providing any emergency treatment to patients with speech/ hearing impairment	
Strongly disagree	55 (11.78)
Disagree	149 (31.91)
Neutral	105 (22.48)
Agree	131 (28.05)
Strongly agree	27 (5.78)
It should be mandatory for undergraduate students to treat a certain number of patients with speech/ hearing impairment	
Strongly disagree	9 (1.93)
Disagree	16 (3.43)
Neutral	60 (12.85)
Agree	230 (49.25)
Strongly agree	152 (32.55)
It should be mandatory for postgraduate students to treat a certain number of patients with speech/ hearing impairment (n=265)	
Strongly disagree	9 (3.4)
Disagree	21 (7.92)
Neutral	34 (12.83)
Agree	98 (36.98)
Strongly agree	103 (38.87)

A statistically significant (p=0.01) proportion of female participants (262) and male participants (150) did not know sign language. Further analysis revealed that postgraduate dental training had a statistically significant association with gender, with regards to making them confident in treating patients with speech and hearing impairment (p=0.03). A statistically significant relationship was found between work experience and knowledge of sign language also (p=0.00) (Table 3).

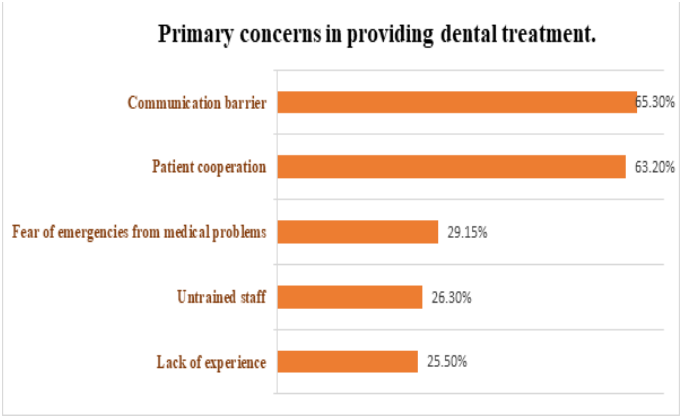

Figure 1: Primary concerns in providing oral care to patients with speech and hearing impairment.

With regard to training, a significant majority (85.01% combined agree and strongly agree) manifests a preparedness to acquire additional proficiencies for treating patients with speech/ hearing impairment. Various barriers have been reported in literature regarding the provision of oral care for individuals with developmental disabilities. For instance, behavior management of patients, inadequate training and experience among dental practitioners, severity of patient's condition, inadequately trained staff as well as inadequate reimbursement were identified as common barriers by Michigan based dentists[6], whereas Indian-based dentists cited prolonged time consumption, lack of adequate infrastructure or trained assistants along with fear related to medical emergencies from communication problemsor disturbance. More than 50% of the dentists who participated in the survey (52.25%) held the belief that individuals with speech and hearing difficulties should receive treatment in specialized clinics. Nonetheless, there is currently a scarcity of such clinics, resulting in the necessity for meticulous attention in order to ensure satisfactory quality care. Similarly, it was observed in a study that a majority, accounting for more than half (57%), of individuals with speech and hearing impairments were unable to completely grasp the preventive guidelines and counseling provided by their dentist concerning measures to prevent future oral health issues due to the caregiver's restricted proficiency.

Table 3: Practices, attitudes and preparedness of dental practitioners stratified by work experience

Practices, attitude and preparedness	<5 years	5-10 years	11-15 years	16-20 years	More than 20 years	p-value
Do you know sign language for deaf and dumb individuals?						
• Yes	29	11	10	3	2	
• No	278	95	24	12	3	0.00
I feel comfortable while treating patients with speech/ hearing impairment						
• Strongly agree	31	21	3	3	1	
• Agree	85	25	14	7	4	0.01
• Neutral	135	37	6	3	0	
• Disagree	31	3	1	0	0	
• Strongly disagree	48	20	10	2	0	
I feel confident while treating patients with speech/ hearing impairment						
• Strongly agree	27	18	2	1	2	
• Agree	67	25	14	6	3	0.00
• Neutral	145	32	7	5	0	
• Disagree	55	25	10	3	0	
• Strongly disagree	13	6	1	0	0	
Postgraduate dental training made me confident in treating patients with speech/ hearing impairment (n=265)						
• Strongly agree	5	7	3	0	0	
• Agree	31	18	3	3	2	0.00
• Neutral	50	20	1	3	0	
• Disagree	43	24	24	7	2	
• Strongly disagree	8	5	3	2	1	
I think that my staff is prepared to assist me in providing any emergency treatment to patients with speech/ hearing impairment						
• Strongly agree	15	6	5	1	0	
• Agree	86	32	5	4	4	0.00
• Neutral	78	21	3	3	0	
• Disagree	15	6	5	1	0	
• Strongly disagree	25	19	8	3	0	

Discussion

Individuals with developmental disabilities encounter obstacles when attempting to access oral healthcare. Research has identified the challenges associated with obtaining dental services, particularly for those with speech and hearing impairments, which present significant communication barriers. Dentists must be fully equipped to provide oral care for these patients. Our study offers insight into how dental practitioners approach managing and treating patients with speech and hearing impairments. It has been revealed that the dental experience of patients with hearing impairment is often unpleasant.[10] Our findings indicate that 33.40% of participants know individuals who have speech or hearing impairments; however, only 11.78% of them are proficient in sign language a finding consistent with Al-Shehri AA *et al.,* study in Southern Saudi Arabia where only 11.0% of dentists were familiar with sign language and lip reading.[10]

Communication between dentist and patient is critical during all stages of treatment; therefore, learning sign language can establish better understanding between both parties while also strengthening their bond. Dentists must become well-versed in non-verbal communication methods such as signs and gestures related specifically to dentistry for optimal patient care outcomes regarding individuals suffering from speech or hearing impediments alike.

A comparative analysis conducted by Jain S *et al.,* in India demonstrated that dentists proficient in sign language delivered an impressive 83% information retention rate among individuals affected by deafness compared to less experienced peers delivering only 36%[8]. Similarly, a study showed that more than half (57%) of participants with speech and hearing impairment could not fully comprehend preventive guidelines nor counseling provided by their dentist regarding preventative measures against future oral health problems due to limited proficiency on behalf of the caregiver.[11]

While unfamiliarity concerning sign language presents one barrier towards effective communication within this demographic group; literature highlights another crucial factor: healthcare professionals discussing treatment plans solely through caregivers[9] as they act as primary means between dentist-patient interactions during appointments confirmed by over half (54%) of our surveyed respondents relying heavily on attendants for successful communication efforts.

Our study revealed that 35.12% of dental practitioners referred their patients to other dentists, a result consistent with earlier studies.[12,13] A study found that only 29% of Jordanian dentists referred their patients for speech and language assessment by speech and language pathologists to recognize disorders. Moreover, it highlighted the fact that many dentists (58%) believed it was necessary to refer patients who want to learn sign language to a speech and language pathologist rather than a speech interpreter.[13] More than half of the dentists surveyed (52.25%) thought that patients with speech and hearing impairment should be treated in special clinics however, few such clinics are operating at present which require high-level attention for adequate quality care.

Various barriers have been reported in literature regarding the provision of oral care for individuals with developmental disabilities. For instance, behavior management of patients, inadequate training and experience among dental practitioners, severity of patient's condition, inadequately trained staff as

well as inadequate reimbursement were identified as common barriers by Michigan-based dentists[6], whereas Indian-based dentists cited prolonged time consumption, lack of adequate infrastructure or trained assistants along with fear related to medical emergencies from communication problems or disturbance.[12] Similarly Australian-based dentist reported difficultymanaging behavioral issues along with insufficient surgical facilities.[14]In Saudi Arabia majority of surveyed dentist considered treatingsuch individuals challenging or very challenging.[15] In contrast our survey showed much positive attitude towards treatment among dental practitioners towards those suffering from hearing/speech impairments- around 80.94% participants expressed willingness to provide them dental treatment.

The undergraduate education system has failed miserably in educating graduates on how best they can manage/treat people affected by developmental disorders according to previous studies.[16,17] 73.45% of graduates disagreed or strongly disagreed with the statement that undergraduate dental education provided them with the knowledge to treat patients with speech and hearing impairment. Postgraduate trainees also disagreed with the statement that postgraduate dental education (38.11%) and training (37.74%) made them confident in treating patients with speech and hearing impairment. Our findings are similar to a study by Simi Abraham et al in the USA that highlighted the fact that pediatric residency programs still lack adequate training in special care dentistry.[18] Another study by Shah *et al.,* in Saudi Arabia proposed that there needs to be a specific course designed for special care dentistry where emphasis on practical experience should be placed.[15]

Regarding the preparation of staff to aid dentists during any medical emergency treatment, dentists in Michigan had positive responses but our findings were unsatisfactory. It was reported that patients with hearing impairment had difficulty in communication with staff too as the contact of such patients is not just limited to dentists.[10,19] So, dental assistants need to learn basic sign language and emergency procedures as they play roles side by side with dentists in providing primary care. Lastly we recommend including specified number of cases dealing specifically with this group into both undergraduate/postgraduate curriculae thereby boosting exposure levels alongside competence/confidence building measures .

Conclusion

There is lack of confidence and incompetent attitude due to a gap in interaction of undergraduate students with patients having compromised speech and hearing during the undergraduate level which leads to problems treating them later in practical life.

Limitations

Our research is the first of its kind signifying the communication barrier, however, there are a few limitations. The sample size of our survey was small and both Google form and self-administered questionnaire were used as means to collect the data which can be the source of bias. Nationwide studies with large sample sizes should be conducted in the future for better representative outcomes.

Recommendations

1) Dental practitioners and dental assistants should learn sign language to cope with communication barriers while addressing patients with speech and hearing impairments.

2) The dental curriculum should be updated with guidelines to treat patients with special needs like speech and hearing impairment.

3) It should be made compulsory for undergraduates and postgraduate students to treat patients with speech and hearing impairment as a part of their training.

More training for the management and treatment of such patients needs to be incorporated into undergraduate as well as postgraduate curricula.

Basic sign language workshops and seminars should be arranged in the form of continuing dental education for dental practitioners throughout the country as the majority of dentists showed to be willing to get additional training in this regard.

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Conflict of interest: The authors have no conflict of interst.

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Original Article

Association of Dysmenorrhea with Mental Health and Academic Performance among University Students

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Abstract

Objective: Dysmenorrhea refers to the recurring cramp-like pain experienced during menstruation. Many females experience menstrual health issues during their reproductive years, such as irregular cycles, menstrual pain, abnor- mal flow, and premenstrual syndrome. Therefore, this study aimed to determine the association of dysmenorrhea with mental health and academic performance among university students.
Methodology: This cross sectional study was carried out on a sample of 384 female university students aged 19 to 29 years. The data was collected using selfstructured questionnaires. Numeric Pain Rating Scale (NPRS) and Depression Anxiety Stress Scale (DASS) were the outcome measure tools for determining pain and mental health. The Cumulative Grade Point Average (CGPA) grading system was used for observing academic performance. A chi-square test was applied to find out the association of dysmenorrhea with mental health and academic performance.
Results: There were 356 (92.7%) participants who were experiencing painful menstruation with a mean age of 22.97±8.79 years. The majority of females i.e., 186 (48.4%) had moderate pain. There was a statistically significant relationship between dysmenorrhea and the academic performance of students ($p<0.05$). However, no association was observed between dysmenorrhea and mental health ($p<0.05$).
Conclusion: Dysmenorrhea is highly prevalent among female university students and it has a significant impact on the academic performance of students. How ever, no association was found with mental health.

Keywords: Academic Performance, Depression Anxiety Stress Scale, Dysmenorrhea, Mental Health.

Introduction

Dysmenorrhea, which is also known as menstrual cramps or painful periods, refers to the recurring cramp like pain experienced during menstruation.[1] Many females experience menstrual health issues during their reproductive years, such as irregular cycles, menstrual pain, abnormal flow, and premenstrual syndrome.[2] It is a prevalent gynecological disorder among adult females that negatively impacts their quality of life and health.[3] According to various studies, the prevalence of dysmenorrhea has been reported to be between 50 and 70 (8%).[4] In Pakistan, 78% of females experience dysmenorrhea and female adolescents comprise 51% of the global population.[5] Dysmenorrhea is divided into two types: primary and secondary. Primary dysmenorrhea involves painful cramps in the lower abdomen, often accompanied by sweating, headaches, nausea, omiting, diarrhea, and trembling. These symptoms occur just before or during menstruation (in the menstrual phase)[6] unlike the Pre-Menstrual Syndrome (PMS), or Pre-Menstrual Dysmorphic Syndrome (PMDS) which are characterized by moderate to severe emotional and physical changes respectively, that occur days or weeks before menstruation in the luteal phase of the menstrual cycle and ends during menses.[2,3] Secondary dysmenorrhea refers to menstrual pain that arises due to underlying pelvic pathologies like pelvic tumors, endometriosis, and other related disorders.[7,8] Dysmenorrhea is classified as mild, moderate, or severe, based on the intensity of pain. The duration of pain usually lasts between 72 hours to entire periods and can radiate to the lower back or back of the legs.[5,9] The primary pathogenesis for dysmenorrhea is the overproduction of uterine prostaglandins. In a normal ovulatory cycle, progesterone withdrawal triggers the release of fatty acids, leading to cramps and systemic symptoms due to leukotriene and prostaglandin cascade in the uterus.[10,11] Many young females self-manage menstrual pain, considering dysmenorrhea normal. They use selfcare methods like rest, exercise, herbal remedies, and analgesics. Non steroidal anti inflammatory drugs effectively treat menstrual pain by blocking a prostaglandin-producing enzyme.[12-15] Various factors can affect the duration and severity of dysmenorrhea.[5] These include early menarche, heavy menstrual flow, smoking, positive family history, obesity, and alcohol consumption. Work, lifestyle, pain perception, and menstrual history also play a role. Anatomical issues and emotional problems (anxiety, depression) matter too.[6,16] It notably impacts social relationships, mental well-being, academics, and sleep, potentially leading to anxiety and depression. Mental health is crucial for females during this cycle due to natural mood swings, tension, and stress. Primary symptoms like pain negatively affect the daily life and school performance of female adolescents, leading to frequent short-term school absenteeism.[17,18] The student experiences a lack of focus in class, inactive participation, difficulty completinghomework, poor exam performance, and limited physical activity.[18-20] Severe dysmen-

orrhea can limit certain activities and impair the ability to perform daily routines.[3,21] Dysmenorrhea is often overlooked and given lower priority compared to other health issues worldwide, despite its persistence and invisibility.[22] Until now, only a limited number of studies have investigated the link between dysmenorrhea and the academic performance of adolescents in developing countries. This condition adversely impacts their quality of life, diminishes productivity, hinders their ability to attend classes, and impairs concentration on studies, subsequently affecting their academic achievements. Therefore, the objective of this research is to determine the association of dysmenorrhea with mental health, and academic performance.

Methodology

It was a cross-sectional study, conducted in six months from February 2023 to July 2023. The ethical approval of the study was taken from the Research Ethics Committee of the Sehat Medical Complex; ref # REC/SMC-106-05-2023 and was carried out according to Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines and Helsinki Principles. Informed consent was taken from participants. The objective of the study was explained to each participant and ensured to maintain confidentiality and anonymity. A sample of 384 females was selected through a convenient non-random sampling technique from different public and private sector universities in Lahore, Pakistan. The inclusion criteria of this study were the females of undergraduate and post graduate programs from different departments, aged between 19 to 29 years, 23. Those females who suffered from secondary dysmenorrhea, PMDS, secondary menopause, with a past or current medical condition, gynecological history i.e., PCOS, any systemic illness, or undergone any major surgical history, or being pregnant or breastfeeding were excluded.[2,24] Data were collected through a structured questionnaire[25,26] consisting of 30 questions categorized into demographic details, reproductive health, dysmenorrhea characteristics, pain intensity assessed via NPRS, mental health assessed using the Depression Anxiety Stress Scale (DASS) questionnaire, and academic performance measured by Cumulative Grade Point Assessment (CGPA). For DASS-21, a cutoff value of 37 was used depicting that those participants having a score higher than 37 had more mental health issues. The dataset was coded, entered, and analyzed using SPSS version 22. Pearson's Chi-square test was utilized to determine the association of dysmenorrhea, with mental health, and academic performance. A p-value of 0.05 was set as significant.

Results

The summary of the socio demographic details and educational information of the participants is given in Table 1. It shows that the mean age of participants was 22.97±8.79 years, and the body mass index was 21.8±3.4 kg/m^2. The majority i.e., 172 (44.8%) were in the 5th year of the study program, 341 (88.8%) were single and 357 (93%) belonged to middle-class families. Menstrual patterns and characteristics of dysmenorrhea are summarized in Table 2. This table provides valuable insights into The menstrual experiences and dysmenorrhea patterns among the surveyed individuals.

Table 1: Demographic Data of Participants

Variables	Categories	Mean ± SD	
Age	In years	22.97 ± 8.79	
Height	In cm	161.54 ± 7.87	
Weight	In kg	56.732 ± 10.01	
BMI	In kg/cm^2	21.8 ± 3.402	
		Frequency (n)	**Percentage (%)**
Academic Year of Study	1st year	98	25.5
	2nd year	58	15.1
	3rd year	26	6.8
	4th year	30	7.8
	5th year	172	44.8
	Masters	14	3.7
Marital Status	Single	341	88.8
	Married	43	11.2
Social Class	Lower Class	5	1.3
	Middle Class	357	93.0
	Upper Class	22	5.7
Lifestyle Habits	Smoking	2	0.5
	Alcohol	2	0.5
	Others	3	0.8
	None	376	97.9

Table 2: Association of dysmenorrhea with mental health and academic performance

Variables	Dysmenorrhea			Chi-Square, p-value
	Categories	Yes	No	
		N (%)	N (%)	
CGPA	2.5 - 3.0	140 (36.4)	6 (1.5)	124.23, P= 0.03
	3.1 - 3.5	174 (45.3)	10 (2.6)	
	3.6 - 4.0	42 (11.0)	12 (3.12)	
DASS-21 Score	> 37	67 (17.4)	5 (1.3)	0.01, p=0.90
	≤ 37	289 (75.3)	23 (6.0)	

The results reveal that a larger portion of participants experienced menarche between 13 to 14 years, with most having a regular 21 to 28-day cycle, lasting three to five days. Painful menstruation was prevalent (92.7%), typically starting on or just before the first day, with lower abdomen pain being most common, and varying in intensity from mild to moderate.Table 3 represents the relationship of dysmenorrhea with the mental health and academic performance of participants. The results of the chi-square analysis showed that there is an association of dysmenorrhea with academic performance ($p<0.05$) and around 140 (36.4%)

participants with dysmenorrhea had a low CGPA in the range of 2.5-3.0.

Table 3: Menstrual pattern and characteristics of dysmenorrhea of participants

Variables	Categories	Frequency (n)	Percentage
Age at Menarche	12 years	104	27.1
	13–14 years	180	46.9
	≥15 years	100	26.0
Menstrual Regularity	Yes	299	77.9
	No	85	22.1
Avg. length of menstrual cycle	<21 days	61	15.9
	21–28 days	181	47.1
	28–35 days	101	26.3
	>35 days	41	10.7
Duration of menstrual flow (days)	1–3 days	73	19.0
	3–5 days	155	40.4
	5–7 days	135	35.2
	More than 7 days	21	5.5
No. of pads used (in a day)	<3 pads	205	53.4
	3–5 pads	136	35.4
	5–7 pads	28	7.3
	>7 pads	15	3.9
Painful Menstruation	Yes	356	92.7
	No	28	7.3
Location of Pain	Lower abdomen	187	48.7
	Pelvic pain	42	10.9
	Back pain	85	22.1
	Groin pain	9	2.3
	Leg and thigh pain	61	15.9
Pain Onset	1 day before menstrual flow	112	29.2
	Same day to menstrual flow	195	50.8
	One day after the menstrual flow	77	20.1
Free from pain after onset of periods	After 8 hours	133	34.6
	After 8-72 hours	173	45.1
	After 3 days or more	38	30.3
Average Intensity of Pain	No Pain	19	4.9
	1-3 (Mild)	112	29.2
	4-6 (Moderate)	186	48.4

The analysis of DASS-21 revealed that there is no statistically significant association of mental health with dysmenorrhea (p=0.90) and about 289 (75.3%) participants with dysmenorrhea had a DASS-21 score of less than 37.

Discussion

Dysmenorrhea holds its place as the predominant menstrual concern among adolescent females.[19] Nonetheless, research on this subject, especially within Pakistan's context, remains limited. In this study, dysmenorrhea prevalence was found to be 92.7% among the participants. The pain, predominantly situated in the lower abdomen, exhibited moderate intensity and frequent occurrence. Its influence on students' academic performance was evident, although it did not appear to significantly affect mental health. A study on the prevalence of dysmenorrhea among students in the Turkish population also found a high i.e., 72.7%,[20] while a study on Serbian university students has a relatively less prevalence of around 29.9%. This occurrence is linked to factors such as coffee consumption, extended menstrual bleeding, and a positive family history.[21] Likewise, a cross-sectional study on medical students at Mohiuddin Islamic University in Mirpur Azad Kashmir revealed a 56% prevalence of dysmenorrhea. It also reported the common symptoms among those experiencing dysmenorrhea included reduced concentration (65%), limited participation in social activities, disrupted sleep (64%), mood swings (58%), and headaches (56%) and concluded that this menstrual discomfort significantly impacts the academic performance and daily activities of female medical students at the university.[22]

Similarly, a study conducted at Debre Berhan University in Ethiopia highlighted that dysmenorrhea significantly impacted female university students' class attendance, academic performance, and concentration during exams. Consistent outcomes arose due to the selection of the population having a positive family history, which was not physically active and struggled to maintain focus on their studies.[23,24]

Vesga *et al.,* conducted a study in 2008 examining the distinctions in social support, quality of life, and mental health problems among females with menstruation issues. Their findings indicated a result contrary to our study, that females facing menstruation problems had a notably elevated prevalence of mental health issues (p<0.05). Conversely, these findings highlight the substantial influence of dysmenorrhea on academic performance (p=0.03), aligning with our study's outcome. Furthermore, Iqra *et al.,* conducted a study encompassing 150 young females aged 12 to 25 in Lahore City. It stated that there was no significant association between academic stress and dysmenorrhea. Thus, the study's conclusion contradicted the present results that indicate dysmenorrhea might affect academic performance.[26]

Furthermore, Sarwar *et al.* (2021) conducted a study encompassing 150 young females aged 12 to 25 in Lahore City.[28] It stated that there was no significant association between academic stress and dysmenorrhea. Thus, the study's conclusion contradicted the present results that indicate dysmenorrhea might affect academic performance. This incongruence might be attributed to the fact that their selected population exhibited a higher quality

of life, greater physical activity, and employed home remedies to manage dysmenorrhea.[27]

Painful menstrual cramps and absenteeism from university might be a reason for low CGPA. However, this pain-related distress was not found to harm the mental health of the participants in this study. One significant reason for not observing an association between dysmenorrhea and mental health may be that dysmenorrhea is typically of lesser severity and shorter duration compared to other menstrual issues like premenstrual syndrome (PMS) or Premenstrual Dysphoric Disorder (PMDD). Moreover, the observed relationship between mental health and dysmenorrhea might be due to random variation.

Nonetheless, about 17% of participants who reported higher DASS-21 scores experienced dysmenorrhea, suggesting a potential clinical relevance. From a clinical perspective, this observation might raise concerns about the impact of mental health on the experience of dysmenorrhea and the potential need for interventions or support for these students. Further research with a larger sample size and consideration of additional variables with objective outcome measure tools may provide a more comprehensive understanding of this relationship.

Conclusion

Dysmenorrhea is highly prevalent among female university students, and it has a significant impact on academic performance. The physical and emotional discomfort associated with it can disrupt a student's ability to focus, attend classes regularly, and excel academically. However, no association was seen with mental health in this study.

Limitations

Screening of participants for mental health assessment was only done at the time of data collection, which raises concerns about the potential presence of recall bias. This study focuses on only one health condition related to the menstrual cycle.

Recommendation

It is recommended to conduct studies considering cultural, dietary, and genetic factors. Further research may be needed to explore the underlying factors contributing to this association and its implications for academic success. Other health issues related to the menstrual cycle including PMS and PMDS should also be explored. Open communication between healthcare providers and young women should be encouraged to facilitate early diagnosis, proper management, and individualized support plans. Student support systems should be developed within educational institutions, to provide academic accommodations for those experiencing dysmenorrhea-related challenges.

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Original Article

Breast Cancer: Epidemiology, Risk Factors and Survival Analysis in the Pakistani Population

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Abstract

Objective: To find out the association of genetic, reproductive and socio demographic factors with breast cancer in Pakistani women along with the survival percentage of patients having breast cancer.
Methodology: A case control study was carried out for a period of 3 years. Data were collected from different hospitals in Pakistan and the survival rate was determined by having direct contact with patients through telephone calls. For the estimation of survival probability Kaplan-Meier curve was used.
Association of various demographic and epidemiological factors with breast cancer occurrence was estimated by using the odds ratio (OR) and 95% confidence interval (CI). Various tests used to find out the significance of results included student t-test, chi square test, Fisher exact test and ANOVA. A statistical tool SPSS version 22 was used to analyze the date and results orientation.
Results: The mean age for breast cancer diagnosis 47.3±11.8 years of age was found as mean age for breast cancer diagnosis. Higher Body Mass Index (BMI) was the major contributing factors in developing breast cancer (OR=3.5, 95% CI=2.6-4.5). Significant risk factors found to be associated with the breast cancer include dlong reproductive period (menarche to meno- pause), family history of disease and habit of passive smoking (P<0.05). Out of 448 married patients, 23% were nulliparous and 26% of patients did not have a lactation history. Chemotherapy along with radiotherapy and surgery have been found to be effective methods for breast cancer treatment (80% survival).
Conclusion: Present study concluded that age, body mass index, oral contraceptives usage, lactation duration, reproductive duration and marital status of the female are significant factors in developing breast cancer in Pakistani women.

Keywords: Breast Cancer, Nulliparous, Chemotherapy, Radiotherapy, Surge

Introduction

Breast cancer is the carcinoma of the breast which originates in breast tissue. This carcinoma is mostly found in the inner lining of milk producing ducts. In this carcinoma a single cell is transformed into multiple abnormal cells with high potential of malignancy.[1] Breast cancer has high incidence (23% of the total cancer) as well as mortality rate due to which it is considered as a major health problem throughout the world.[2] After lungs cancer, breast cancer has the highest mortality rate in Asia.[3] Among the list of Asian countries, Pakistan is at the top in breast cancer morbidity and mortality rate with 2.1 million new cases and 627,000 deaths in 2018.[4] Lack of awareness is associated with delayed diagnosis that may be attributed to personal, sociocultural and economic factors.[5]

Epidemiological studies showed correlation between various risk factors and breast cancer development.[4,5] These genetic and enviromental factors that interact with each other contributing in increasing risk of developing breast cancer. These factors also contribute to the variability in incidence of the disease onset.[6] Early and late events in life also contribute to breast cancer on set, but the mechanism of differential susceptibility has not been fully explored.[7] Those women who have family history of this carcinoma, women who used exogenous hormones, those who have first child at older age and obese women are more prone to developing breast cancer.[8,9] In order to understand the etiology of breast cancer, risk factors contributing in breast cancer need to be evaluated properly.

Age at the time of diagnosis is one of the most important factor contributing in increasing breast cancer mortality. In Asian countries breast cancer is found to be diagnosed in younger age of 40-50 years, whereas in western countries breast cancer is usually diagnosed in late ages of 60-70 years.[10] Geographic location was observed to be contributing in varying breast cancer incidence, therefore breast cancer risk factors in different populations are also varying. Population based cancer registries have not been formulated in Pakistan; available data is gathered from small groups of population.[11] So, it is important to explore the potential risk factors contributing in the onset of breast cancer in Pakistan.

Knowing the breast cancer susceptible groups of Pakistani women and factors contributing in causing breast cancer will increase awareness among women at high risk, promote early diagnosis and decrease cancer probability. It will also help in formulating programs for public health improvement.

Purpose of this study was to find out the asso- ciation of breast cancer with various epidemi- ological, reproductive and demographical risk factors in Pakistani women. Factors which are particularly focused in

this case-control study include age, reproductive age (menarche/meno-pause age) or duration, age of women when she gave first birth, number of pregnancy, lactation history, use of oral contraceptives and passive smoking. This study also analyzed the survival probability of breast cancer patients.

Methodology

Study design: The Inclusion/exclusion criteria and data collection. In the present study standardized, structured questionnaire was used for information collection from histologically confirmed breast cancer patients. Questionnaire was comprised of questions about different factors including personal and family detail as well as disease history of each candidate. Study approval was taken from the ethical committees of Fatima Jinnah Women University (FJWU) and Rawalpindi Medical College (RMC) and Allied Hospitals (Holy family, Benazir Bhutto and District Headquarter Hospitals). These hospitals were visited to collect data from breast cancer patients and age match controls. An informed consent was signed by all the participants who were being interviewed. A total of 1000 individuals (500 histologically positive patients and 500 age matched controls) were interviewed. Only those individuals were included in the study who had been confirmed by oncologists as breast cancer patients. However, control data was collected to monitor any age related factor. Study participants were contacted personally through telephone calls for determination of their vital status (alive or dead). Death dates of the participants were recorded for survival analysis of breast cancer patients. Samples were collected for the duration of 3.5 years (January 2017 to July 2020).

Statistical analysis

SPSS 25 was used to perform statistical analysis of the data collected from patients and controls. Variables were compared by using Fisher exact, chi-square and t-test. Frequencies and percentages were used to describe the categorical variables whereas mean and standard deviations were used for analyzing continuous variables. Odds ratios and 95% CI were used to estimate the association between breast cancer and different risk factors. Kaplan-Meier curve was used to find out the survival probability of breast cancer patients. Results with P values less than 0.05 were considered as statistically significant (Table 1).

Results

A total of 1000 individuals (500 cases and 500 age match con- trols) were selected for the study and they were interviewed for the specific questions. The mean age of patients and healthy women was found as 47.6+12.2 years and 46.6+12.01 years re- spectively. Significant association was found by multivariate analysis between increased age (≥40 years) and breast cancer risk (P=0.03). Highest number of patients was found in the age group of 36-45 years with the mean age 42.1±1.51 years (Figure 1). Body mass index (BMI) of the patients as well as controls was calculated by recording their weight in kg and height in cm. Al- most twice increase in breast cancer risk was found as associated with obesity (OR=2.3, 95% CI=1.6-3.3). Significant association of marital status was found with risk of breast carcinoma (p<0.05). Large number of the patients were married (82%), only few were unmarried. However, number of pregnancies didn't play role in the cause of breast cancer as only 5% cases were nulliparous in the current study (Figure 1).

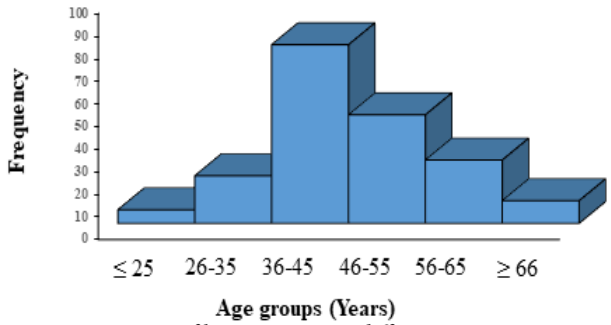

Figure 1: Frequency of breast cancer in different age groups

Among parous 26.2% females had no lactating history, which could be considered as the cause of breast cancer in them. Mean age of the patients at first birth was 21.3± 0.3 years. Majority women had 3 to 4 live births with mean 3.8± 2.2. Family history, consuming oral contraceptives and passive smoking were the factors that had significant association (P<0.05) with increased risk of disease (Table 1). In the current study, none of the patients were active smokers. Few passive smokers had double risk of breast cancer compared to patients who did not smoke (OR=2.0, 95% CI=1.5-2.6). Pictorial data for the various factors associated with breast cancer are shown in Figure 2.

Although both peri and post-menopausal breast cancer cases were found, with large number of patients having an early men- arche or late menopause. Females with late menopause (after 55 years of age) had more than double risk of developing breast cancer compared to women having early menopause (OR=2.5, 95%, CI=1.7-3.7). In the same way an early menarche (<12 years of age) doubled the risk of developing breast cancer as compared to late menarche of ≥12 years of age (OR=2.0, 95%=1.5-2.6).

In the conducted survival analysis of breast cancer patients utilizing the Kaplan-Meier curve, the mean survival time was determined by calculating the interval between sample collection (T0) and the maximum time (Tmax). The median survival time, the point at which the probability of patient survival is reduced by half, was found to be 23 months. This crucial metric was derived from assessing the survival rates under three different treatments: surgery, chemotherapy, and radiotherapy. Statistical tests, including the log-rank, Breslow, and Tarone-Ware tests, were employed to evaluate the impact of these treatments on breast cancer survival. Significantly, all three treatments demonstrated notable effects on survival rates (p<0.05).

It is truly remarkable and noteworthy that the most elevated de-

gree of survival was observed and documented when the three in- terventions were implemented and utilized simultaneously, which strongly suggests and implies that there may exist significant synergistic effects that greatly enhance and augment the overall outcomes and results for patients who are undergoing treatment. It is of utmost importance and necessity to accurately and precisely capture and record instances and cases of patient mortality in order to provide and present a clear and visual representation of the patients' outcomes. These instances and cases are meticulously documented and effectively portrayed on the widely recognized and accepted Kaplan-Meier curve, which serves as a powerful tool and method to display the progression and status of patients where data was censored and not fully available.

Table 1: Cross-sectional analysis of epidemiological and socio demographic factors in breast cancer patients and healthy controls

Cases			Controls		
Risk factors	**Mean/ Frequency**	**Standard deviation%**	**Mean/ Frequency**	**Standard deviation/%**	**P-Value**
Diagnosis age	47.6 years	+12.23	46.6 years	+12.01	0.21#
Menarche age	11.8 years	+0.79	12.7 years	+0.8	0.33#
Body Mass Index	29	+3.9	24.3	+2.7	<0.01#*
Married Children	410	82.0%	351	70.0%	<0.01+*
None	87	21.2%	11	3.1%	<0.01@*
≤ 4	228	55.6%	116	33.0%	
5-9	95	23.1%	224	63.8%	
Menopausal status					
Pre	206	41.2%	299	59.8%	<0.01+*
Post	294	58.9%	201	40.2%	
Menopausal Age					
≥ 50 years	181	61.5%	106	52.7%	0.05+*
Breast Carcinoma					
History in family	192	38.4%	46	9.2%	<0.01+*
Usage of oral contraceptives	238	47.6%	117	23.4%	<0.01+*
1st pregnancy age					
Less than 30 years	260	80.4%	290	85.2%	0.21+
Passive smokers	312	62.4%	115	23%	<0.01+*

*#T-test*Significant difference the specific risk factor in two groups (cases and controls).\ +Fisher's exact test @Annova*

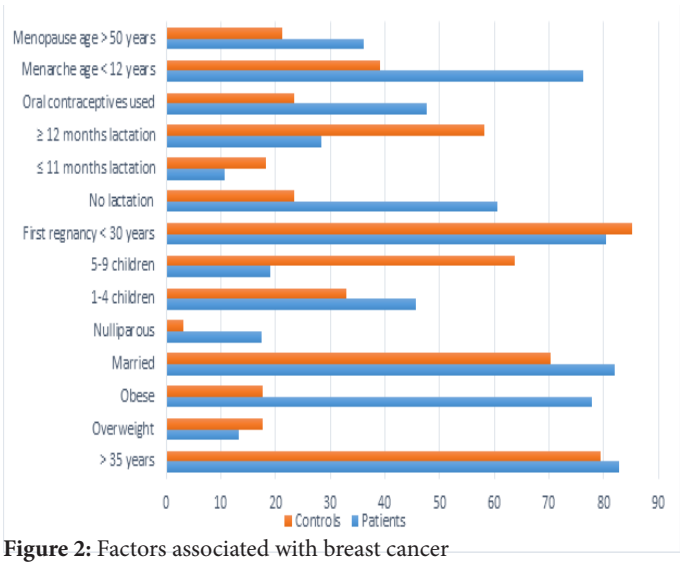

Figure 2: Factors associated with breast cancer

Fisher extract test showed significant association between reproductive period (menarche to menopause) and increased breast cancer risk (P<0.01). For the follow-up 447 participants were contacted, some of them lost during study. In order to check survival rate, patients were followed up for 3 years (after interview date), through telephone calls and found that 77% of the patients survived (Table 2).

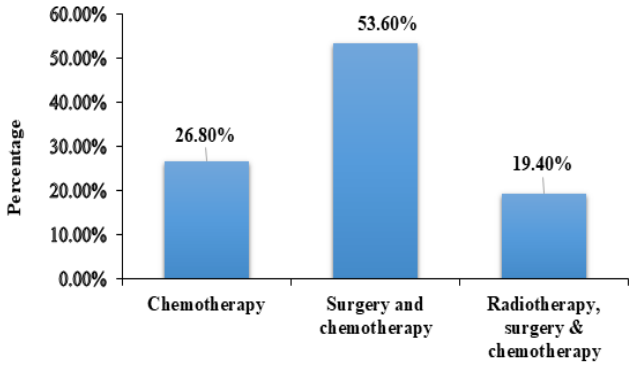

Figure 3: Percentages of the patients receiving different treatments is illustrated

This comprehensive and all-encompassing analysis and examination of the data and results obtained from different treatments and interventions offers invaluable and highly valuable insights and knowledge into the effectiveness and efficacy of these various approaches. Furthermore, this analysis also strongly emphasizes and highlights the potential advantages and benefits of adopting and implementing a combined and integrated approach in order to significantly improve and enhance the rates of survival for individuals who are adversely and severely impacted by the devastating effects of breast cancer (Figure 3 and 4).

Table 2: Statistical analysis of different treatments given to breast cancer patients and association of these treatments with breast cancer survival

Treatment	Mean	95% CI	Median	95% CI	P-Value
Chemotherapy	17.4 ± 0.2	16.8-17.9	18.0 ± 0.2	17.4-18.5	<0.01
Chemotherapy and Surgery	23.0 ± 0.3	22.3-23.7	25.0 ± 0.6	23.7-26.2	
Chemotherapy, Surgery and Radiotherapy	27.2 ± 0.6	25.8-28.5	25.0 ± 0.6	23.7-26.2	
Overall	22.8 ± 0.3	22.2-23.5	22.0 ± 0.3	21.2-22.5	

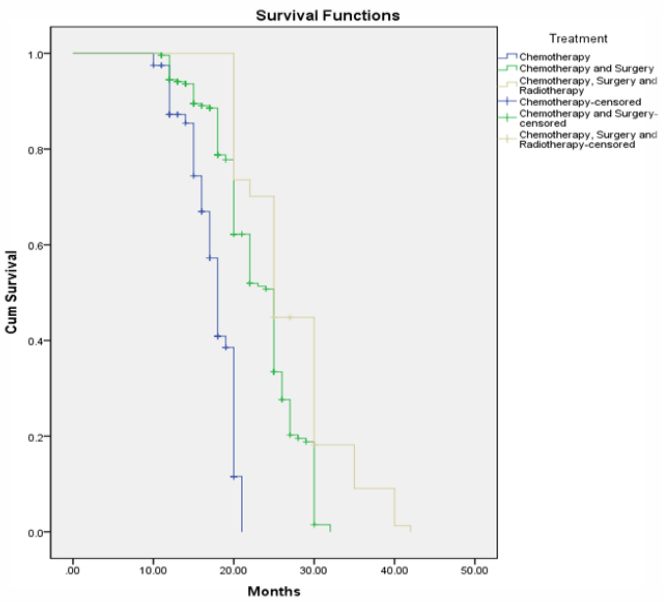

Figure 4: Survival analysis curve, after 3-year follow-up.

Discussion

In Pakistani females, breast carcinoma is the most frequently diagnosed cancer. The rate of breast carcinoma is promptly increasing almost everywhere, especially in less developed countries.[12] Ratio of breast cancer in Asian countries is lower than European countries, however death rate due to breast cancer in Asian countries is comparable to European countries.[13] Five Asian countries having highest breast cancer death rates are Pakistan, Armenia, Lebanon, Jordan and the Syrian Arabic Republic.[14] Pakistan is at the top list, due to this alarming situation its need of hour to adopt preventive strategies.[15] World wide breast cancer has been studied widely but disagreement is found about breast cancer risk factors and its development. Most important risk factor listed for different cancers is age.[16] Although no age is specified for the development of breast cancer, but ¾ number of cases diagnosed after 50 years of age.[17] However average age of breast cancer diagnosis for different countries is different, for US it is 61 years 18 for Iran it is above 44 years[19] and for Brazil it is 55.8 years old.[17] Mean age at the time of diagnosis of breast cancer in the current study was re- corded as 47.3±11.8 (Table 1) which is in accordance with the previous studies.[20] Diagnosis age in the present study (as well as previous studies in Pakistan) is almost ten years earlier than the diagnosis age in Western countries. Further studies are needed to find out the reason of breast cancer diagnosis in younger ages in Pakistan. Another major health issue globally is obesity, elevated BMI gives rise to different diseases including cancer.[21]

It was estimated that if obesity is prevented, breast cancer occurrence rate could be 50% reduced in European Union alone.[22] Studies conducted on relation between obesity and breast can- cer reported that obesity increased the risk of breast cancer in women above 50 years of age.[23-25] Current report also showed an association of obesity with breast cancer risk (OR 3.5, 95% CUI=2.6-4.5) (Table 1). Previously, Bhaskaran et al.,[26] and Xia *et al.*,[27] also found association of high body mass index with in- creased risk of breast cancer, it might be due to the activity of excess aromatase in the peripheral adipose tissue, that produced higher levels of free estrogen.[28]

In Asian countries important risk factors associated with breast cancer include menarche at younger age, menopause at late age, first birth at older age and few live births.[29] Contrast has been found in the marital status and breast cancer in different studies. Marriage somehow affects the health of women, however association of breast cancer risk with marital status has not been investigated comprehensively. Similar to the results of Aizer et al., we also found that married women have less chances of developing breast cancer (OR=0.35, 95% CI=0.2-0.6) (Table 1). But in contrast to the previous studies, we found equal probability of breast cancer in both nulliparous females and females with vary- ing number of children (OR=1, 95% CI=0.7-1.3). It is reported in literature that many women effected with breast cancer have lactation history.

In the present study we also found that major- ity cases were having lactation history (OR=0.8) (Table 1). But further studies are required to investigate the mechanism that how breastfeeding effects breast cancer. There is no direct link between menopause and breast cancer but menopause at older ages increased the risk of developing breast cancer. We found that early menarche and late menopause increases the chances of developing breast cancer, (Table 1) these results are in accor- dance with the findings of Khalis et al., It can be said that repro- ductive duration (menarche to menopause) plays fundamental role in breast cancer which may be due to the production of steroids during reproductive ages. Steroid's hormones are produced by ovaries and they effect the function and development of the breast. In previous studies, family history is also reported as one of the important risk factors of breast cancer. Familial history of breast cancer in first degree relative is considered an independent risk factor for the development of the breast carcinoma. In this study only few patients had family history of breast cancer (Table 1).

It has been reported that most of the familial breast cancer cases are caused by mutations in the BRCA-1 and BRCA-2 genes.[30] In the present study, chemotherapy was found as most common method of treatment. Chemotherapy was given to patients at three different times, i.e.; at initial stages to destroy cell, before surgery to shrink tumor size and after surgery to destroy remaining cancer cells. In order to avoid spreading of cancer across the body some patients had removed their effected breasts by

surgery. Few patients were given radiotherapy, after chemotherapy and surgery (Table 2). All the treatments were effective, and their combination resulted in good overall survival rate (80%).

Conclusion

Present study concluded that age, body mass index, oral contraceptives usage, lactation duration, reproductive duration and marital status of the female are significant factors in developing breast cancer in Pakistani women. Survival analysis revealed that combination of different treatments. Overall survival analysis showed that different treatments conferred good impact on patient's survival. Breast cancer susceptible groups have been identified in the current study, these groups should be focused on priority basis to avoid breast cancer development.

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Original Article

Role of Career Counselling in Medical Profession: Perceptions of Medical Students

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Abstract

Objective: To determine the perception of medical students regarding the role of career counselling in medical profession.
Methodology: It was a cross sectional study done between April and October 2023, where 140 medical students from Central Park Medical College, Lahore were enrolled via convenience sampling. After receiving formal IRB approval, data was collected via self-designed google forms and WhatsApp groups from MBBS students in their first to final academic year who volunteered to participate after piloting with Cronbach Alpha score of 0.81. After collecting data, SPSS software version 26 was utilized for analysis. The outcomes were presented as frequency tables and bar graphs.
Results: A total of 140 responses were collected with the average age of the respondents being 21±1.7 SD years. About 59 (42.1%) of the students who responded were from 2nd year MBBS, 38 (27.1%) were from 4th year MBBS, 26 (19%) were from 1st year MBBS, 09 (6%) were from 5th year MBBS and remaining 08 (6%) were from 3rd year MBBS. About 60 (42.9%), 52 (37.1%), 133 (95%) and 131 (93.6%) of the students said that career counselling helped identify their capabilities. About 130 (93 %), 115 (82 %), and 113 (81%) gave positive responses when asked about the impact on gaining perspective, developing strategies, and managing conflicts. There was a significant relationship between the role of career counselling in identifying opportunities and building the CV 109 (95%) (p=0.01), understanding interest 59 (99%) capabilities 49 (94%) (p=0.00), broadening one's perspective 126 (95%), adopting the right strategies 126 (97%) (0.00), and resolving conflicts 108 (95%).
Conclusion: Career counselling should be conducted in the early years of medical professional's career, so that students can identify their areas of interest in order to choose the appropriate specialization in the future.

Keywords: Career Counselling, Career guidance, Career Opportunities, Career Options

Introduction

Career counselling or career assistance is designed to support choosing, changing, or leaving a career and is available at any stage in life.[1] One's career is often one of the most important aspects of adulthood, and embarking on a new job, whether at any stage of life, can be stress ful[1]. A career counselor can help by outlining and discussing one's potential career options.[2] It is a process that focuses on helping one understand oneself and work trends so one can make an informed decision about career and education.[2]

Like in many other professions, the career counselling concept is gaining acceptable recognition, especially among medical students.[2] Students are overwhelmed with excessive academic competition and have no time to explore career options.[3] Additionally, current medical school education focuses primarily on essential medical knowledge and skills, with little interest in career choice and student counselling.[4]

Students in the undergraduate medical program study a wide range of medical specialties. Their late exposure to the clinical atmosphere makes their career preferences very late until after graduating from medical school.[5] Most medical students admitted to various medical colleges in the country don't know what they want to pursue in the future as their specialization.

Careers differ in their demands, requiring different amounts of intellectual ability, manual skill, long-term commitment, or willingness to work environments.[6] In addition, they can be better suited to personalities, aptitudes, and physical dispositions.[7] Individuals also differ, having different talents, interests, and abilities.Therefore, career choice involves people considering the entire range of careers and then circumscribing those they regard as broadly acceptable, making their eventual choices within the subset.[8] Career counselling helps identify the students' inclinations early and guides them to the careers most suitable. Proper counselling will enable medical students to find an appropriate job, providing stability in their thoughts.[8] Many doctors devote too much time in their initial postgraduate years toward trying to enter a specialty for which they are either not suited or insufficiently endowed with the attributes required.[8] So, the best thing to do is to provide medical students with career counseling as soon as possible. Appropriate career selection is also crucial as students may drop out from their selected specialties or change their choice after spending a few years of training in a thing not set appropriately. The medical specialty chosen by medical practitioners as a career is an essential factor for the future supply of physicians.[8] Moreover, it plays a vital role in planning the specialty professionals for the country's healthcare services.[9] The selection and training for a resident in a specific medical field demand a long time, thorough training, dedicated effort, and a considerable amount of money.[10] It can go to waste as medical

students end up in a field unsuitable for them and unable to work efficiently.

Many students end medical school, unlike other students in other professions, without a clear vision for the future. At graduation, they have acquired the knowledge and clinical skills for becoming competent doctors, but on the other hand, they have progressed very little in knowing about their career choices.[10] Therefore, the rationale of this study was to determine medical students' perception regarding career counselling in the medical profession, which will help establish a foundation for counseling interventions that assist medical students in choosing a suitable major or aligning the direction of their careers. Moreover, the study results will help to advocate for the policymakers of the medical college to establish career counselling cells in each medical institution for student guidance.

Methodology

It was a cross-sectional study in which MBBS students were enrolled from first to final year at Central Park Medical College Lahore. The study was completed in 6 months duration. The sample size was 140 participants using the WHO sample size calculator by keeping the prevalence at 10% from literature review, level of significance 5% and d as the margin of error after piloting with Cronbach Alpha score of 0.81.

After the IRB approval (CPMC/IRB-NO/1365), the data was collected from CPMC medical students from first to final year, through a convenient sampling technique. All medical students in their respective years fulfilling the inclusion criteria of minimum 75% attendance were enrolled in the study after takin written consent. The students were asked about their year of MBBS in which they were enrolled and perception about career counselling in medical profession through a self-designed structured questionnaire which was disseminated to the medical students through WhatsApp group using online google proforma. The response time was one week. Once the data was collected, the compiled excel sheet from online google proforma was transferred to SPSS software version 26 for further analysis. Means and standard deviations were calculated for quantitative variables like age while frequencies of each variable were calculated. Chi square test was applied to determine the relationship between the categorical variables. Data was presented in the form of frequencies tables and bar charts. The level of significance was set at 95% ($p<0.05$) and the power of the study at 80%.

Results

The data was obtained from a group of 140 individuals pursuing a medical education. The average age of these individuals was calculated to be 21.3 years, with a standard deviation of 1.7 years. Among these students, 59 of them, constituting 42.1% of the total, were enrolled in their second year of the MBBS program. Additionally, 38 students, accounting for 27.1% of the total, were in their fourth year. Furthermore, 26 students, representing 19% of the total, were in their first year. A smaller proportion of students, 9 in total, making up 6% of the total, were in their fifth year. The remaining 8 students, also making up 6% of the total, were in their third year (Figure 1). In relation to their interests, 60 students, or 42.9% of the total, expressed an interest in career counseling. Similarly, 52 students, accounting for 37.1% of the total, stated that career counseling could aid in the identification of their capabilities. A significantly higher percentage of students, 133 in total or 95% of the total, expressed interest in career counseling. Similarly, 131 students, representing 93.6% of the total, believed that career counseling can be instrumental in identifying their capabilities (Figure 1).

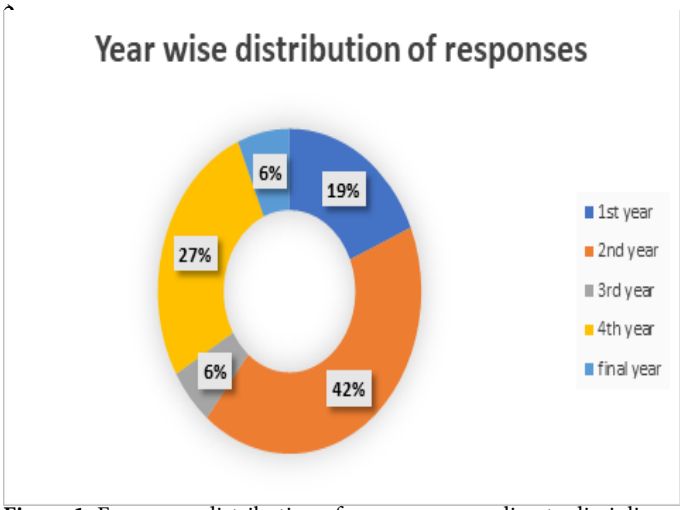

Figure 1: Frequency distribution of responses according to discipline

Out of all respondents, 92%, 93% and 81.4% were of the view that career counselling helped them with career options, finding opportunities and building their CV (Figure 3). Chi-square test of association and fisher's exact test (where required) was used to observe the significant association between opinion of students about help of career counselling in identifying opportunities and different outcome variable. Statistically significant association was observed between opinions about help of career counselling in identifying career opportunities with help in building a resume 109 (81%), helps in understanding interest 59 (99%) and capabilities 49 (94%), broadens the perspective 126 (95%), develop the right strategies 126 (97%), help in resolving conflicts 108(95%) and whether it's a challenge for you or not 50 (85%) ($p<0.05$) (Table 1).

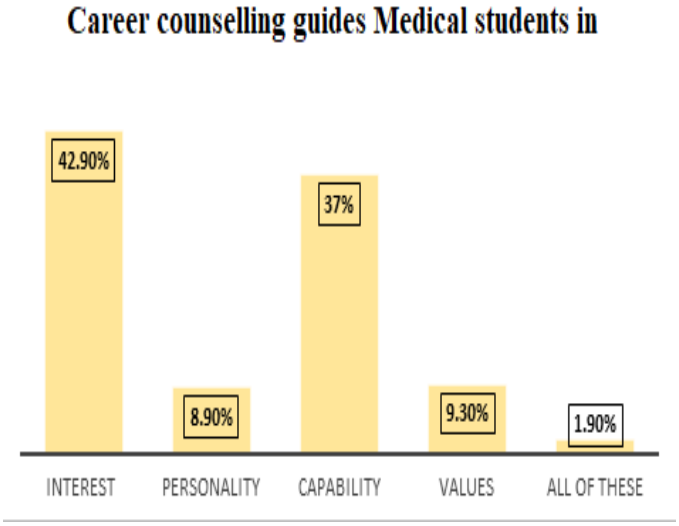

Figure 2: Bar chart of responses about role of career counselling in guiding students

Table 1: Association of opinion about career counselling with outcome factor

Factor	Category	Career counselling helps in identifying opportunities		Total 140 n(%)	p-value
		No n(%)	Yes n(%)		
Building a CV profile	No	06(26)	20(76)	26(18)	0.01*
	Yes	05(4)	109(96)	114(81)	
Helps to understand aspects	Different options	01(100)	00	01(0.7)	0.01*
	Interest	01(1)	59(99)	60(42)	
	Personality	02(16)	10(84)	12(8)	
	Capabilities	03(6)	49(94)	52(37)	
	Values	03(23)	10(77)	13(9)	
	All of these	01(50)	01(50)	02(1.4)	
Broadens your perspective	No	04(57)	03(43)	07(5)	0.01*
	Yes	07(5)	126(95)	133(95)	
Develops the right strategies	No	06(66)	03(44)	09(6)	0.01*
	Yes	05(3)	126(97)	131(93)	
Helps resolve conflicts	No	05(19)	21(81)	26(19)	0.03*
	Yes	06(5)	108(95)	114(81)	
Counselling can be a challenge	No	02(2)	79(98)	81(58)	0.01*
	Yes	09(15)	50(85)	59(42)	
Creates confusion	No	09(9)	91(91)	100(71)	0.73
	Yes	02(5)	38(95)	40(29)	
Creates uncertainty	No	07(6)	96(94)	103(73)	0.32
	Yes	04(10)	33(90)	37(26)	
Uncomfortable in getting counselling for career choice	No	04(5)	75(95)	79(56)	0.21
	Yes	07(11)	54(89)	61(44)	
Helps in reaching potential employer	No	04(16)	21(84)	25(18)	0.11
	Yes	07(6)	108(94)	115(82)	

*p-<0.00 Statistically Significant

Discussion

According to the findings of the current study, the majority of respondents believed that career counselling assisted them in identifying their interests and capabilities, which was significantly associated with identifying opportunities. A similiar study claims and support our results as it fosters self-awareness in individuals based on their values, abilities, and personality types.[11] It enables students to make career-related decisions. Furthermore, it assists them in identifying their own strengths and weaknesses.[11] Many studies support medical students' desire to pursue clinical fields such as internal medicine, orthopedics, gynecology and obstetrics, pediatrics, and surgery. These fields already have a large number of trainees and are experiencing a backlog. Only a few students choose to study in other areas and subfields. Financial gains, job opportunities, and early establishment are the most important motivators for choosing a career path as a specialization.[12] The role of career counselling can assist students in choosing a field with room for growth based on their interests and capabilities.[13]

According to the findings of our study, career counselling that assists in identifying opportunities is significantly associated with broadening their perspective. The findings are consistent with the literature, which suggests that career counselling can assist students in exploring various aspects of their future career options that align with their interests and clarifying their path. Effective counselling has been shown to clear confusion.[14] Every aspect of life is changing in this rapidly changing world. Many novel paths are emerging. Students have a plethora of options to choose from. Career counselling can assist in determining a course of action.[15] An undergraduate medical student studies various medical specialties. With more job opportunities and training slots, timely career counselling can increase their interest in a particular field.[16]

Our findings also show that deciding on a career path is strongly related to implementing the right strategies. The literature also supports the notion that career counselling, through various educational and professional guidelines, assists students in embracing the proper path to achieve their goals. The timely guidance assists them in identifying potential roadblocks in decision making.[17] It enables students to complete all requirements on time, which reduces anxiety.[18] Further research reveals that every profession is fraught with complexities as it has its own dynamics and standard operating procedures. Clear understanding is the need of today as it clear many job related problems and internal conflicts. They can be corrected with the help of an experienced career counsellor.[19]

Furthermore, it aids in planning and future employment. Additional research indicates that proper and timely career counselling assists stakeholders in identifying their objectives based on their interests and personalities.[20] In modern times, the aspects of education and employment are dynamically shifting to advancing technologies.[21] As a result, career paths are changing. When career counselling enlightens the developing mind to choose which is new and has room for growth, a motivating role can be played.[22]

Our findings also show that identification of career counselling opportunities are significantly associated with resolution of conflict. According to the literature, effective career counselling assists in dealing with challenges that cause internal conflicts due to confusion.[23] It aids in determining the milestones that must be met.[24] It is useful for planning. The most difficult challenge is feasibility.[25] Career counselling aids in situational analysis and thus aids in monitoring every future step.[22] Peer pressure, family background, social and cultural pressure, finances, and job opportunities are the most significant challenges that students face when deciding on a career.[26] Female students face a more challenging situation in Pakistan. They are compelled to

marry during or shortly after finishing medical school. Because they were not exposed to any career counselling during their first years of medical school, they leave the medical profession and do not pursue a specialization.[8] It is important to emphasize that if such students are guided toward pursuing basic sciences or clinical as a future specializations, they will be productive members of society. When done correctly, career counselling can help reduce obstacles and resolve internal and external conflicts.[6] Counseling broadens the vision because they have done research in the field of interest.[17]

Many fields in the medical profession have stagnated, according to the literature. Most candidates choose a career path that requires a lengthy and tedious induction process.[4] Furthermore, residents become dissatisfied when they cannot find training positions in accredited institutions around the world.[5]

Finally, it causes young students to be unsure about their career options.[14] Career counselling can assist a student in exploring fields where experts are needed.[3] Many new professional medical specializations require human resources. Proper and timely guidance of students in their early years of study in medical colleges can broaden their thinking and help them choose a future career.[4]

According to our findings, the majority of respondents do not feel awkward receiving career counselling. According to the literature, young adults in their early college years are afraid of discussing their future plans and prefer to remain in their own comfort zone.[10] They are hesitant to investigate them in the context of undergraduate education. That's one of the reasons they're hesitant to talk about their jobs.[11] It is critical to emphasize that timely intervention, such as career counselling, can help students set future goals. Understanding career options, broadening one's perspective, adopting the appropriate strategies, and resolving conflicts are all significantly related to career counselling in the medical field. Students in the medical field are aware of the benefits and significance of career counselling. They believe that future doctors do need career counselling services because it will not only assist them in choosing a career, but also inform them of opportunities in innovative and underutilized medical fields.

Limitations

The study participant enrolled were from CPMC only due to feasibility issues. It is highly recommened to plan a future study with a larger sample size and other institutions for better comparison.

Conclusion

Career counselling should be conducted in the early years of medical professional's career, so that students-can identify their areas of interest in order to-choose the appropriate specializ tion in the future.

Future Implications: The study's findings will help raise consciousness among medical students about the value of career guidance. In order to successfully convey messages aimed at altering behaviour. The current study's findings highlight the importance of providing career counselling to medical students during their academic years so that they can make informed decisions about their future. Students can be encouraged to seek out career counselling and the myths that stand in the way dispelled through the channels of social media, where trustworthy and evidence-based information can be disseminated to the masses. The findings will help inform stakeholders and policymakers at undergraduate medical schools about the importance of providing students with access to career counsellors as soon as possible.

Authors' Contribution: Data collection was performed by HA, while analysis and interpretation of results were carried out by AY. The preparation of the initial manuscript was conducted by MA and MTA. The final version of the manuscript was reviewed and approved by all authors.

Conflict of interest: The authors have no conflict of interst.

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Original Article

Challenges and Barriers of Online Teaching: Perspective of Faculty in a Private Medical College of Lahore

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Abstract

Objective: To identify the challenges and barriers faced during initiation of online teaching by the faculty of a private medical college of Lahore. **Methodology:** This cross-sectional study was conducted from Septmber-December, 2021 in Fatima Memorial Hospital (FMH) College of Medicine and Dentistry, Lahore. List of faculty members was obtained from the Human Resource Department amounting to 140, a sample size of 70 was selected which was the half of total sample. A predesigned, structured questionnaire was used. Approval from IRB committee and consent was obtained. Data was collected online using Google Performa via email, analyzed using SPSS version 20 and Microsoft Excel. Percentages, proportions and means were calculated. **Results:** The respondents included 23 (32%) demonstrators, 11 (15.7%) senior demonstrators, 22 (31.4%) Assistant Professors, 7 (10%) Associate Professors and 7 (10%) Professors. Year wise distribution of faculty was as follows; 13 (18.5%) were teaching 1st year, 9 (12.8%) 2nd year, 19 (27%) 3rd year, 25 (35 .7%) 4th year, and 4 (5.7%) final year MBBS respectively. Mean age in years was 39±9.8 of the enrolled faculty. Predominance of females 47 (67.1%) to males 23 (32.9%) was observed. Maintaining class decorum and controlling students' plagiarism was a major challenge for 65 participants (92.9%). Inadequate online teaching resources were recognized by 61 (87.1%) to be a challenge making it difficult to inculcate clinical skills while, 58 (82.9%) accepted effectiveness of lecture was interfered by lack of face to face interaction. Most common barrier 60 (85.7%) was connectivity issues, software failure, power issues and 57 (81.40) complained of lack of finances. **Conclusion:** Lack of face to face interaction, connectivity, software and power failure issues, in addition to finances and time management were major challenges and barriers faced during initiation of online teaching by the faculty.

Keywords: Online Teaching, Challenges and Barriers, Teaching Perceptions, Private Medical College.

Introduction

Information technology has transformed the style of living, learning, and teaching.[1] Online learning is a type of web-based learning that allows learners and facilitators to manage their learning time and subjects at their own pace by utilizing online communication, participation, education, and training.[3,4] Technology and pedagogy are the two required components of this non-traditional method of learning.[3] The benefits of online learning have led to its adoption in medical education and healthcare, where it improves knowledge, capability, and learner satisfaction. It keeps healthcare professionals up to date regarding the advancements in diagnose and treatments and they can consult it whenever they have any queries. A report by the WHO remarked that online-learning for healthcare professionals is equally or even more productive than traditional learning environments. Mainly because of the multitude of features included.[1,2] The concept of distance learning first came into being in the middle 19th century, with first correspondence education program in Boston, Massachusetts in 1873, University of Queensland in Australia in 1911, University of South Africa in 1946. In 1989, University of Phoenix was the first institution to launch an online education, 1996; Jones International University was the first fully web-based university.[5] In India, it started in 1982 [6], UAE 2013 [7] and it is also being used in Philippines, Malaysia, and China.[8] In Pakistan there are two distance education universities Allama Iqbal Open University (AIOU) established in 1974 and the Virtual University of Pakistan (VU) established in 2002.[3] Majority of medical schools in Pakistan are still not familiarized with online-learning. Medical schools in Pakistan are offering blended learning , and some of the pioneers being, Centre of Biomedical Ethics and Culture (CBEC) Karachi, Riphah International University Islamabad, Dow Institute of Medical Education Karachi, and The Aga Khan University, Karachi.[9]

Online learning has many benefits such as flexibility, convenience, content choice, no geographical barriers, it also has many constraints for staff and students, including: a lack of proper interaction between teachers and students, demotivation, difficulty in understanding without direction and guidance, computer anxiety and learning about the technology. In health care, especially, it is not suitable for topics that require more personalized approach and detailed discussion.[2,3] Faculty are confronted with three types of barriers: first-order barriers, which are external factors such as time, facilities, and administrative culture; second order barriers, which are related to the facilitator's pedagogical norms; and third-order barriers, which are related to the facilitator's ability to provide knowledge while assessing the needs of students.[10] Inadequacy of online teaching experience, no compensation for time and class sizes; increased responsibilities and workload;

inability to sense visual clues from students; increased time commitment; lack of autonomy in designing online courses; lack of student participation and self-discipline, concerns about the quality of the topic, and difficulty in monitoring individual student's behaviour and responses are among the faculty's perceived challenges. [11-14]

In addition, there is constant pressure from administration and high expectations of institution and students; which are found to be very overwhelming on behalf of the faculty.[15] Unavailability of required software and hardware, scarcity of standards in online learning, deficiency in technical expertise, assistance, and infrastructure are found to be major barriers on behalf of the faculty.

Online teaching although was a neglected or non essential commodity previously became important rather essential in the prevailing circumstances of the COVID pandemic. Pakistan being a low-income country mainly using traditional teaching methodologies is exploring the diverse avenues of medical education. Medical colleges are familiarizing themselves with newer teaching and learning methodologies, integrated approach as well as inclusion of online teaching within their systems so as to be able to prepare their graduates at global level.

It is important to understand the challenges and barriers being faced by the faculty in delivering academics online. It would help smoothen the process and identify the gaps and problems in launching online teaching as a permanent feature in future. This study will help stimulate an on-going discussion of effective strategies that can enhance universities and faculty success in transitioning to teach online. The aim was to identify the challenges and barriers faced during initiation of online teaching by the faculty of a private medical college of Lahore.

Methodology

This cross-sectional study was conducted in the setting of FMH College of Medicine and Dentistry, Lahore within a period of three months, September to December 2021. List of faculty members was obtained from the Human Resource Department. The Institutional Review Board letter was obtained by department with IRB#FMH-09-2020-IRB-788-M. Total number of faculty members was 140, as no specific data was available for sample size determination 50% of the total sample was included in the study. The final sample size amounted to be 70 faculty members. Systematic random sampling was employed, using the formula (Total population/sample size 140/70) sampling interval of 2 was employed.

After extensive literature search, including both national and international studies, challenges and barriers were identified. A structured questionnaire comprising of socio demographic section and questions pertaining to challenges and barriers faced by the faculty in initiating online teaching was developed and employed. Challenges were defined as situations which required efforts to be overcome, while barriers were defined as obstacles hampering progress of the task. Consents from the participants were obtained and data was collected online using Google Performa via email to the identified faculty members. Data was analyzed using SPSS version 20 and Microsoft Excel. Percentages, proportions and means were calculated for qualitative and quantitative variables respectively.

Results

In the current study 70 faculty members of FMH College of Medicine and Dentistry were enrolled having mean age in years 39±9.8. Predominance of female participants 47 (67.1%) was observed with males being 23 (32.9%). The respondents included 23 (32%) Demonstrators, 11 (15.7%) Senior Demonstrators, 22 (31.4%) Assistant Professors, 7 (10%) Associate Professors and 7 (10%) Professors. Year wise distribution of faculty was as follows; 13 (18.5%) were teaching 1st year, 9 (12.8%) 2nd year, 19 (27%) 3rd year, 25 (35 .7%) 4th year, and 4 (5.7%) final year MBBS respectively.

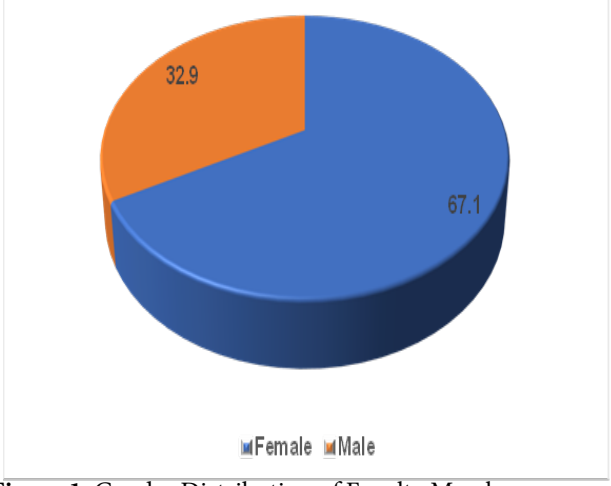

Figure 1: Gender Distribution of Faculty Members

Table 1: Challenges faced by the faculty during online teaching

Sr. No.	Challanges	Yes (%)	No (%)
1	Lack of face-to-face interaction interferes with the effectiveness of lecture	58 (82.9)	12 (17.1)
2	Grading systems in online learning are unreliable indicators of student's progress	54 (77.1)	16 (22.9)
3	It is difficult to design quizzes/ assessments online	23 (32.9)	47 (67.1)
4	Maintaining of class decorum and controlling student plagiarism is a major challenge	65 (92.9)	5 (7.1)
5	Lack of teamwork between faculty members for sharing of ideas for online teaching	27 (38.6)	43 (61.4)
6	Inadequate online teaching resources makes it difficult to inculcate clinical skills in medical students	61 (87.1)	9 (12.9)
7	Faculty shows resistance in adopting online teaching as a permanent teaching method	45 (64.3)	25 (35.7)
8	Online learning systems are vulnerable to security issues like hacking	54 (77.1)	16 (22.9)
9	Class strength in online teaching affects the quality of lectures delivered	30 (42.9)	40 (57.1)
10	Faculty feels more accountable in online teaching	40 (57.1)	30 (42.9)

Table 2: Barriers encountered by faculty during online teaching

Sr.No.	Barriers	Yes(%)	No(%)
1	Faculty lacks the technical skills for online learning and require special training	47 (67.1)	23 (32.9)
2	Time management is a significant barrier in online teaching and learning	37 (52.9)	33 (47.1)
3	Connectivity issues, software failure, power issues delay classes and make it difficult to follow schedules	60 (85.7)	10 (14.3)
4	Students show a lack of willingness to study online	48 (68.6)	22 (31.4)
5	Lack of finances for purchasing a learning management system a major barrier to online learning	57 (81.4)	13 (18.6)
6	Teaching online is labor intensive and adding to the workload	47 (67.1)	23 (32.9)
7	Students evade online quizzes and assessments with irrelevant excuses	45 (64.3)	25 (35.7)
8	Faculty have autonomy in designing their online courses	46 (65.7)	24 (34.3)
9	Faculty has to be available at odd hours of the day to respond to student queries in a timely manner	49 (70)	21 (30)
10	Lack of e-learning policies by the college administration is a major barrier to teaching online	47 (67.1)	23 (32.9)

Majority of the participants amounting to 65 (92.9%) agreed that maintaining a class decorum and controlling students' plagiarism in online classes was a major challenge. In the view of 61 (87.1%) participants inadequate online teaching resources makes it difficult to inculcate clinical skills in medical students and 58 (82.9%) accepted that effectiveness of lecture is interfered by lack of face to face interaction. The barrier most of them 60 (85.7%) faced was connectivity issues, software failure, power issues which led to delay of classes making it difficult to follow the schedules. In the view of 57 (81.40) participants lack of finances and institutional support for purchasing a learning management system was also a major barrier to online learning.

Discussion

This study was conducted to identify the challenges and barriers faced during initiation of online teaching by the faculty FMH Medical and Dental College of Lahore. In the current study online teaching was introduced in the unprecedented circumstances of the pandemic. This relatively unexplored teaching methodology posed several challenges and barriers to learning and teaching both for the faculty and the students. Majority of the faculty were not in the favour of exclusive online teaching as a pedagogical tool. Most of the faculty had the perception that effectiveness of online teaching reduced the worth and purpose of lectures due to lack of face to face interaction as mentioned in literature majority of the participants preferred face to face interaction which may be attributed to the fact that e-learning did not provide a collaborative working environment.[17]

Literature reports that faculty finds it difficult to engage learners online and maintain class decorum,[17] a challenge faced by 92.9% of the respondents of our study highlighting the importance of interactive and face to face interaction. Online assessment was considered to be a major challenge by most of the faculty; in their opinion grading systems in e-learning did not reliably indicate student progress and academic performance. Faculty was concerned that typing speed and delays in submission of assignments had a negative impact on the grades as majority students were not familiar or trained to use the technology. Supporting evidence has been observed in a study advocating the use of automated grading and feedback system.[18] A study conducted in the University of Edinburgh pointed out those students had different typing speeds which inevitably impacted their attempting of assessments.[19]

Contrarily designing of assignments and quizzes online was the least commonly faced challenge faced by the faculty.[20] Plagiarism was a major issue and challenge faced as supported by literature. These findings are pertinent as they emphasize the introduction of a plagiarism check or control system.[21] In the current study it is imperative to understand that students maybe unaware of plagiarism, its implications and detection soft wares owing to the fact that online teaching was a new experience for them altogether.

Literature contradicted the fact that class strength was a factor affecting quality of teaching.[22] Majority of the faculty in our study felt more accountable when using digital education, probably due to the fact that study material is available online and accessible to a larger audience thus increasing the vulnerability to criticism. In the current study even after being introduced to the online teaching the faculty was not in favour of adopting online teaching as a permanent teaching tool the main barrier being technological reasons like security issues of hacking and viruses in university computers, as revealed and supported by literature that classroom and face to face interaction was the preferred method.[18]

Inadequacy of online teaching resources to inculcate clinical skills in medical students proved to be a valid challenge in our study. A similar challenge in another study yielded mostly results of disagreement stressing that technology was not appropriate for courses involving entities.[11] Time management was considered a significant barrier among the faculty 52.9% in our study as opposed to previous studies where only 35% of those surveyed found it difficult to manage time with e-learning.[26] This could be the result of a lack of previous experience with e-learning among our respondents as it remains a relatively unexplored pedagogical tool as well as lack of technical training. Inadequate technical skills for operating a learning management system remains an important barrier to e-learning, both in previous studies as well as our research where more than half of the faculty struggled using a learning management system.[17] Training is an essential tool especially for the usage of technological gadgets a barrier faced by most of the faculty. In addition, internet connectivity and low bandwidth at the institution as well as the residences of both faculty and students was a significant barrier. These results are supported by a study conducted by

Farooq highlighting the fact that connectivity issues created hurdles especially during streaming, downloading and attending of online lectures.[18] Majority of faculty believed that students did not actively participate online a discouraging and non reassuring response for faculty.[23] A large number 81.4% of respondents in the current study emphasized upon the financial constraints as a challenge to e-learning compared to 40% of the respondents of a previous study who remained neutral regarding the adequacy of the university's spending in e-learning.[17] Online learning proved to be labour intensive as corroborated in similar studies which stated that technology did not reduce an instructor's workload.[24,25]

Absence in online assessments and quizzes by students has not been reported by researches conducted in the past[18] but in our study, responses confirmed this to be a major challenge with digital learning which maybe to attributed to the fact that it was a new exposure and experience for the students and faculty as well as lack of personal interaction between students and teachers. As regards the availability of instructors at odd hours of the day to respond to students queries online, a study conducted in Pakistan about the barriers in adopting blended learning are in accordance with our results as more than half of the study respondents believed that they are expected to be available 24/7 in technology-enhanced courses.[26] Majority of the senior faculty members were of the opinion that online teaching is labour intensive adding to their workload. This was major challenge for the senior clinical faculty as they are expected to take out time from their clinical practice for teaching adding to their daily workload.[10] A large number of respondents agreed that lack of e-learning policies by college administration was one of the barriers to online teaching reducing its efficacy supported by a research stating that policies need to be conducive for adoption of technology.[10] Blended learning requires faculty to deal with logistics and administration issues which may hamper their intellectual engagement with the content of the course thus the administration should introduce comprehensive policies to make e-learning fruitful. Online and blended learning are the need of the hour especially in the current circumstances for which institutions need to take appropriate measures.

Conclusion

Major challenges identified were lack of face to face interaction leading to reduced effectiveness of the lecture, maintenance of class decorum and plagiarism. Online teaching was not appropriate for clinical skills as well as the grading system were considered an unreliable indicator of student progress. Barriers faced were connectivity, software and power failure issues resulting in delay of classes in addition to lack of technical skills on part of both students and faculty. Finances and time management were a major concern too. It is recommended that blended learning be promoted with use of both face to face and online teaching methodologies. Trainings regarding online management systems of both students and faculty be organized. Institutions should support E-learning by adopting the latest learning management and other supporting soft wares available. Majority of the faculty was using traditional teaching methods for many years, for them online was a new and difficult tool hence they may have been participant bias. As the data collection was initiated during the COVID outbreak probability sampling could not be employed. Study was conducted in one medical college thus the results cannot be generalized.

Limitations of Study: As the data collection was initiated during the COVID outbreak probability sampling could not be employed. Study was conducted in one medical college thus the results cannot be generalized.

Authors' Contributions: NO Concept, Questionnaire development, methodology, data analysis and interpretation, overall supervision. IA questionnaire development, data analysis and discussion. SM introduction and methodolog. RB Data analysis and results. UN discussion and references. MS data analysis and results.

Conflict of Interest: The authors show no conflict on interest.

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Original Article

Assessing Professionalism among First year Medical Students through Professionalism Assessment Tool (PAT)

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Abstract

Objective: To assess the professional level among 1st year MBBS students of Bolan Medical College, Quetta.
Methodology: A descriptive cross-sectional study was carried at Bolan Medical College Quetta from September to November, 2022. All 200 medical students of 1st year MBBS were invited to participate in the study. A validated Professional Assessment Tool (PAT) was distributed by 3 senior demonstrators during lectures. The PAT contained 33 items within five domains: (1) Reliability and Responsibility, (2) Life-long Learning and Adaptability, (3) Relationships with Others (4) Upholding Principles of Integrity and Respect, and (5) Citizenship and Professional Engagement. Results were prepared by using SPSS version 29. Frequencies and percentages were calculated. A p-value<0.05 was considered as significant.
Results: Twenty four out of 200 students were consistently absent at the time of data collection (99% response rate). Fifty one percent were females (n=102/200). Seventy out of 200 students (35%) were 20 years of age. Thirty four percent (68/200) demonstrated only the basic level of critical thinking and only 10 students (5%) demonstrated the higher cognitive level. Overall, statistically significant results were observed at items number 3 and 1 (p-<.01)of domain 3 and 4 respectively (empathizing to the situations of others and actively and productively participating in the profession respectively)
Conclusion: Students of 1st year MBBS demonstrate positive attitude towards professionalism.

Keywords: Medical Students, Assessment, 1st Year, Professionalism level

Introduction

In medicine, professionalism forms a bridge between doctor and the patient. World Federation for Medical Education (WFME) declared "Professionalism" as an emerging element that is a mixture of implicit moral commitment and explicit behaviors.[1] It squeezes qualities of perfection, humanism, liability, and generosity that depend on clinical aptitude, communication abilities, ethical and legal knowledge.[2,3] Professionalism stretches a continuum between person's attributes, capacities and behaviors to the macro-societal level, which encompasses political objectives, moral principles and economic imperatives.[4] Keeping in perspective the apparent change in healthcare system, conflict of interest regarding commercialism and its effect on doctor's practice, worries arise from an ever-increasing medico-legal disputes. These disputes are the main factor that makes physicians and clinicians anxious in their clinical practices.[5] Professional doctors demonstrate competency in performance, ethics, professional codes and identity, commitment to excellence etc.[3,4,6,7,8] Literature search demonstrate a lot of importance to professionalism in western world countries, and countries like Saudi Arabia also essentially assess level of medical students' professionalism.[1,6,9,10, 11] On the other hand, in Pakistan, though work has been carried out in this context, yet none of these researchers assess level of professionalism among undergraduate medical students.[7,8,12,13] Therefore, the aim of current study is to assess the level of professionalism from the very start of their career. First year MBBS students were assessed through Professionalism Assessment Tool (PAT). It provided us information about missing data of professionalism among 1st year medical students of Bolan Medical College, Quetta and assisted in making strategies to take steps to enhance professionalism among undergraduate medical students.

Methodology

It was a descriptive, quantitative cross-sectional study carried out in 1st year MBBS students of Bolan Medical College, Quetta, Baluchistan, Pakistan. After taking permission of the faculty member of the concerned subject, and by using simple convenient sampling strategy data was collected between the months of September November, 2022. All (n=200) MBBS students of 1st year were included in the study. Ethical approval was taken from Bolan University of Medical & Health Sciences (IRB No. 0028/BUMHS/IRB/23; Dated 29.10.23.)

To check the validity of questionnaire among Pakistani population, a pilot study was carried out on 28 MBBS students of 1st year, the Reliability coefficient (Cronbach's alpha) was 847. A pre-formulated and validated students self-rating instrument Professionalism Assessment Tool (PAT) developed by Kelly in 2011 was utilized.[10] Confidentiality was confirmed through obtaining informed consent from participants, utilizing appropriate data collection methods, securely storing data, ethically using data, and disposing of data safely. All medical students from 1st year were included whereas students from 2nd, 3rd and 4th and final year were excluded from this research

project. Demographic data including age, gender, professional year, medical experience, other degrees (O level, A level, BSc, MSc etc.) of medical students was collected. The PAT contained 33 items within five domains; (1) Reliability and Responsibility, (2) Life-long Learning and Adaptability, (3) Relationships with Others (4) Upholding Principles of Integrity and Respect, and (5) Citizenship and Professional Engagement. Each domain assesses a specific number of related variables using the Miller's Performance Level Label (knows, knows how, shows, shows how, and teaches how). This Likert scale was weighted from 1 to 5 (1=knows, 2=know how, 3=shows, 4= shows how, 5=teaches how) each performance level label of the rating system was aligned with a modification of Miller's Framework for Clinical Assessment. SPSS version 29 was utilized to analyze the data. A p-value 0.05 considered significant.

Results

There were 200 students in 1st year medicine, out of which 51% were females (n=102/200). Demographic details are presented in Table 1.

Table 1: presenting demographic view

Sr. No.	Gender wise distribution of present students	Total students present	%
1	Girls	102	51
2	Boys	98	49
Gender wise distribution of absent students			
1	Girls	16	8
2	Boys	8	4
Age wise distribution of students			
1	20 years	70	35
2	>20 years	54	27
3	19 years	26	13
Level of thinking			
1	Critical thinkers	68	34
2	Higher cognitive level	10	5

Table 2: Age and gender wise correlation between items

Sr. No.	Gender wise comparison with Domain i.e., Reliability, Responsibility and Accountability	
	Items	**p-value**
Correlation between age and Domain 3 i.e., Relationships with Others		
1	Establish rapport	<.001
2	Empathizing to the situations of others	>.001
Age and Domain 4 i.e., Validate Principles of Integrity and Respect		
3	Use of professional language and being mindful of the environment	<.001
4	Dress up in a professional manner	<.001
Crosstab results of age and Domain 5. Citizenship and Professional Engagement		
5	Actively and productively participating in the profession	.001
6	Serve society by using society using expertise to solve problems	.002

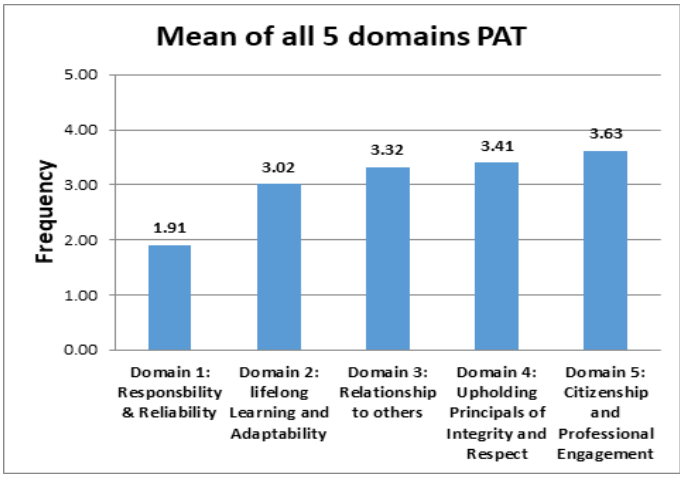

Figure 1: Mean of all 5 domains PAT

Discussion

In the current study, comparing gender and age with items demonstrated statistically significant results (p<.001), obtained from Domain 3; item no. 3.1, Domain 4; item no. 4.5 and 4.7 respectively (establish rapport, use professional language and being mindful of the environment and dress up in a professional manner respectively). There were significant results (p-.05) observed at Items No. 3.4 and 5.1 from Domain 3 and 5 "empathizing to the situations of others," Actively and productively participating in the profession respectively"

Doctors are supposed to demonstrate harmonious relationship with patients.[14] A professional doctor satisfies patients not only by providing effective treatment but also through his/her attitude. Patient's first visit in hospital/clinic is very critical, and relation between doctor-patient depends upon attitude and behavior of doctor/clinician. Doctor's good attitude with patient helps in providing high quality health care experiences, moreover, doctor's satisfactory behavior reduces the anxiety of patient.[15] Study participants of current study were cognizance of effective rapport.[3] We observed very highly significant results at items discussed below including good rapport, using professional language and wearing professional dress. Competent professional doctor by developing good rapport (p<0.001) provides effective treatment and satisfies patients with his/her attitude. Students of Bolan Medical College, Quetta were cognizant about the impact of effective rapport. High statistically significant results of current study of this item demonstrated that medical students are familiar about the importance of friendly relationship with patients. Study conducted by Dang BN recognizes patient's anxiety reduces if doctors build trust in 1st visit[15]. Doctor's behavior, communication skills and providing reassurance not only mitigate anxiety but also ameliorate quality of life by improving their overall health care experience.[15] There may be severe unpleasant issues (i.e., physical harm, obstetric trauma, medication errors, communication barriers, minimal health education, and limited medical comprehension) recognized if patient and doctor presents language-discordant care.

On the other hand, if language-clash care has been associated between doctor and patient it will ameliorate patient satisfaction, approach to health care facilities. Additionally, language-clash career in forces the curative bond between the doctor and patient. In US 66% medical colleges provides different language courses for smooth flow of patient-doctor communication.[16] The results of current study participants of 1st year MBBS express cognizance about communication power (p<.001) Undergraduate students of Bolan Medical College, Quetta college interact and experiences with cultural diversity during training.

Doctor wearing professional dress are supposed to demonstrate positive attitude, should be proficient in language to satisfy patients and relatives. Clothing gives one's personal identity and wearing white coat symbolize status and group identity. Patients psychologically trust doctors due to their white coat. Current study explained professional behavior of 1st Year MBBS towards patients. Students of Bolan Medical College Quetta were aware of this norm (p<.001) and appreciate professional dress code that gives them respect,[17] makes them distinguishable from non-professionals (patients, relatives, staff). Study conducted by Jabbal and Porter confirms patient preference white coat, induce highest trust and confidence on doctor.[18] Being professional they incorporate norms and values of medical community. In a study conducted by Byram in (2017), it was observed patients trust junior students,[19] because of the white coat they weared. The reason is white coat they wear that's why patients ask them to treat them.[16]

Researchers describe empathy as an adaptive orienting system that facilitates social interactions. Internally motivated doctors demonstrate empathy and care for patient's healthcare.[20] The recognize patient's emotions. Furthermore, they consciously understand patients thinking and feelings resulting in improvement in clinical results.[21] Students of current study were internally motivated and demonstrated high degree of empathy with patients (p<.001). It may be due the fact that they didn't have overloaded work pressure, and were fresh students from 1st year.[22]

Students of 1st year are keen to join extra-curricular activities as they respond positively with the item actively participate in the profession and empathizing others situations (p-0.001) The researchers realized that this domain was rated by those students who met through co-curricular involvement and were members of student organizations significantly increased their total scorecompared to those who were not members of student organizations.[23]

It was the first study to check professionalism in 1st year MBBS students in Pakistani population through Professional Assessment Tool (PAT). Assessing professionalism of students having no training or teaching of professionalism previously might restrain the validity of the study. If this study would be conducted on senior students of MBBS who already have got some type of training during MBBS teaching and learning might make this study more valid & contextually appropriate. Longitudinal studies needed to be carried out to assess changes in professional level with increasing cognitive level. There may be bias in data collection and/or answering the questions.

Conclusion

First year medical students are demonstrating professional behavior. As they are juniors and don't have direct contact with patients so are unaware about the importance of many of items of the questionnaire. However, they gave positive response to those items that were linked with their 1st year professional life. They were aware of wearing professional dress and using professional language that heightened impact on patient satisfaction. They were motivated and felt empathy to work with their full energy for the betterment of the sick community.

Authors' Contributation: NF conceived idea, manuscript writing. MS performed methodology and data analyis. RM did critical review of literature.

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Supplementary Material: https://docs.google.com/document/d/1SpigTaZpmW9V47bbVw4P4EatfZ7sRHDl/edit

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Original Article

Role of Physical Activity in Abating Non-Communicable Diseases: A Survey of Residents of Central Park Housing Society, Lahore

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Abstract

Objective: Regular physical activity is beneficial to both physical and emotional well-being. The present study goal is to observe how lack of physical exercise leads to various noncommunicable diseases.
Methodology: A study was conducted at Central Park Housing Society, Lahore using cross sectional study design. Data was collected from 250 residents of Lahore, Pakistan's Central Park Housing Society using the structured tool IPAQ-LF. Structured tool used in this study was applicable on age group between 15-69 years, therefore we included participants aged between 15-69 years in this study. While children, adolescences having age between 10-14 years, adults > 69 years old, pregnant women and those with existing non-communicable diseases were excluded from the study. The Kruskal-Wallis ANOVA test was used to determine whether there was a significant relationship between physical activity and non-communicable diseases.
Results: About 20.8% participants had family history of hypertension. Greater physical activity is linked to reduce hypertension risk. Lower physical activity is associated with a higher diabetes risk (18%) compared to the higher activity levels (14%). BMI and random blood sugar level is associated with physical activity.
Conclusion: Most of the participants were not involved in moderate physical activity. People who participated in physical activities are at a lower risk of developing diabetes and hypertension. In general, physical activity aids in mitigating harmful chronic diseases.

Keywords: Diabetes, Hypertension, Basal Metabolic Index , International Physical Activity Questionnaire Long Form (IPAQ-LF)

Introduction

Physical activity is the process whereby skeletal muscles consume energy to produce voluntary movement.[1] It is the primary factor driving community health improvement. Physical activity should be done on a regular basis to improve both mental and physical health and to prevent a variety of health problems.[2] According to the recommendations given by World Health Organization (WHO), "children and adolescents aged 5 to 17 should engage in 60 minutes of moderate to intense physical activity every day."[3]

According to different studies, lack of physical activity is commonly recognized as a significant factor for premature mortality and a wide array of non-communicable illnesses. Physical inactivity was estimated to be responsible for 6%-10% of premature death in 2008, as well as type II diabetes, obesity, hypertension, coronary heart disease and cancers worldwide. In 2012, cardiovascular illness was the leading cause of noncommunicable disease (NCD) mortality, accounting for 17.5 million deaths, or 46% of all NCD-related deaths.[1,3]

The global growth in chronic non-communicable diseases is directly connected to lifestyle changes such as decreased physical activity during relaxation time. Inadequate physical activity is a major community health concern. It is critical to determine the personal and environmental elements that influence physical activity behavior in order to treat this issue. Certain life events can contribute by producing emotional anguish and disturbing people's everyday routines.[4]

The combination of balanced nutrition and frequent physical activity produces a healthy life style that enhances overall health throughout one's life.[5] The World Health Organization (WHO) recommends 150 minutes of moderate to strenuous physical exercise once a week as a global standard for achieving and maintaining good health.[6]

Physical inactivity prevalence and patterns vary significantly across the globe. Rate of occurrence of physical inactivity doubled in high salaries nations (36.8%) compared to low-salaries countries (16.2%) in 2016. The rise in physical inactivity rates in high-income nations became apparent between 2001 and 2016. The burden of noncommunicable diseases has shifted noticably, with low and middle-income nations currently accounting for 80% of global noncommunicable disease fatalities.[7]

Physical activity has a number of possible benefits, including a 30% reduction in overall mortality. Even a 10-minute brisk walk can potentially cut mortality by up to 15%. It is associated with a 30-40% reduction in metabolic syndrome and type 2 diabetes, a 20% reduction in breast cancer risk, 20-50% reduction in cardiovascular disease risk, a 22-83% reduction in osteoarthritis incidence, a 20-30% reduction in depression, and a 30% reduction in falls among older adults. Walking has also been shown to provide better relief from low back discomfort.[8]

As per directions of World Health Organization, community-level physical activity

is a basic sign of health.[9] Chronic illnesses such as type II diabetes, obesity, hypertension, cardiovascular disorders and cancer can be prevented by regular exercise.[10] This study aims to investigate the relationship of physical activity with numerous non-communicable diseases.

Methodology

A cross-sectional research was conducted at the Community Medicine Department of Central Park Medical College in L hore, Pakistan from December 2022 to March 2023. The study obtained ethical permission from the institutional review board of Central Park Medical College and obtained informed written consent from all participants with reference number CPMC IRB-NO/1391.

Sample

A convenient sampling technique was used. Sample size was 250, calculated by using Raosoft calculator taking 90% confidence interval, 5% margin of error and as 29.3% as sedentary activity.[11]

Inclusion and Exclusion criteria

Structured tool i.e. International Physical Activity Questionnaire long form (IPAQ-LF) we employed in this study was applicable on age group between 15-69 years, subsequently, we included participants that were within the specific age bracket. While children, adolescences having age between 10-14 years, adults>69 years old, pregnant women and those with existing non-communicable diseases were excluded from the study.

Protocol

A self-designed questionnaire was used to record the demographic profiles of all the participants, which encompassed information such as age, marital status, and number of children, number of family members, anthropometric measurements, blood pressure and blood sugar levels. The assessment of physical activity involved the utilization of the structured tool International physical activity questionnaire long form (IPAQ-LF) among a sample of adults between age 15-69 years who reside within the community. Questionnaire can be download fromhttps://www.sralab.org/rehabilitation-measures/international-physical-activity-questionnaire-long-form. Data on the interval of mild, moderate and vigorous physical activity was collected in different categories, such as work, transportation, domestic activities, and recreational time.

Scoring Criteria

Score of each category (work, transportation, house work and leisure time) was calculated individually. All questions were based on the previous seven days physical activity. The findings were given in the form of an estimate of energy consumption in metabolic equivalent-minutes per week (MET hours/week).

Based on the IPAQ-LF scoring protocol,[12] the MET hours/week for various activities (such as work, active transportation, domestic/garden and leisure time) are determined by multiplying the corresponding MET value assigned to each activity (3.3 for walking minutes, 4.0 for moderate intensity activity, and 8.0 for vigorous intensity activity) by the number of hours devoted to that specific activity (e.g.; walking MET minutes/ week at work =3.3 × walking minutes × walking days at work). Afterwards, the overall physical activity score was computed along with individual scores for each of the four physical activity domains.[12]

Data Analysis

Various demographic variables are examined in relation to varying levels of physical activities. The normality was assessed using the Kolmogorov-Smirnov test. The Kruskal Wallis ANOVA was used to examine the relationship between NCD's and physical activity levels. The data analysis was carried out using SPSS 26.0.

Results

Data collected from 250 participants residing in Central Park Housing Society, Lahore, aged between 15 to 69 years, revealed that approximately two-thirds of the participants were females. Most of the participants were married and over half of them had a graduate degree. Nearly half of the individuals had a family history of hypertension and diabetes, while a smaller percentage had heart diseases. The data indicates that 20.8% of the participants have a family history of hypertension and are involved in low physical activity. However, engaging in high physical activity is related to less likelihood of hypertension. Additionally, participants who engage in moderate physical activity have a higher risk of diabetes (20%) compared to those with higher physical activity levels (14.4%). Moreover, raised levels of physical activity are linked to a minimized the risk of heart disease ($p<0.05$). The Table 1 showing physical activity.

In our study, we employed rigorous statistical analyses to examine the distribution of our data. The Kolmogorov-Smirnov test, yielding a p-value of 0.00, strongly suggests a departure from normality. Consequently, recognizing the limitations of parametric assumptions, we opted for the robust non-parametric Kruskal-Wallis ANOVA to explore the relationship between physical activity levels and various non-communicable diseases.Our findings, as presented in Table 2, unveil compelling insights into the association between physical activity and specific health indicators. Notably, we observed a statistically significant association between random blood sugar levels and BMI across different levels of physical activity.The nuances of these associations become clearer when examining Figure 1, which vividly illustrates that individuals with high levels of physical activity tend to exhibit a normal BMI. This visual representation enhances our understanding of the interplay between physical activity, BMI, and health outcomes. It not only reinforces the statistical significance found in our analyses but also provides a tangible and accessible representation of the observed trends. Our comprehensive approach, combining robust statistical tests and clear visualizations, strengthens the validity of our findings. This study contributes valuable

insights into the complex relationship between physical activity, BMI, and non-communicable diseases, the importance of promoting physically active lifestyle for improved health outcomes.

Table 1: Cross tabulation of demographic variables with Physical activity

Factor	Categories	Physical Activity			p-value
		Low n (%)	Moderate n(%)	High n(%)	
Gender	Male	34 (13.6)	28 (11.2)	15 (6.0)	0.36
	Females	66 (26.4)	59 (23.6)	48 (19.2)	
Marital Status	Married	88 (35.2)	73 (29.2)	51 (20.4)	0.45
	Single/Unmarried	12 (4.8)	14 (5.6)	12 (4.8)	
Educational Level	Illiterate	18 (7.2)	9 (3.6)	18 (7.2)	0.16
	Primary or less	14 (5.6)	14 (5.6)	8 (3.2)	
	Secondary or High School	33 (13.2)	25 (10.0)	21 (8.4)	
	Graduation	21 (8.4)	26 (10.4)	10 (4.0)	
	Post Graduation or above	14 (5.6)	13 (5.2)	6 (2.4)	
Family History of hypertension	Yes	52 (20.8)	53 (21.2)	32 (12.8)	0.36
	No	48 (19.2)	34 (13.6)	31 (12.4)	
Are you Hypertensive?	Yes	26 (10.4)	19 (7.6)	13 (5.2)	0.68
	No	74 (29.6)	68 (27.2)	50 (20.0)	
Family History of Diabetes	Yes	45 (18.0)	50 (20.0)	36 (14.4)	0.16
	No	55 (22.0)	37 (14.8)	27 (10.8)	
Are you diabetic Type-II?	Yes	22 (8.8)	20 (8.0)	7 (2.8)	0.14
	No	78 (31.2)	67 (26.8)	56 (22.4)	
Family history of ischemic heart disease	Yes	32 (12.8)	27 (10.8)	26 (10.4)	0.03
	No	68 (27.2)	60 (24.0)	37 (14.8)	
Have you ever had a heart attack or chest pain?	Yes	4 (1.6)	1 (0.4)	4 (1.6)	0.23
	No	96 (38.4)	86 (34.4)	59 (23.6)	

p-< 0.05 statistically significant, chi-square test

The Table 2 summarizes mean values for health-related variables across low, moderate, and high levels of Total Physical Activity (MET min/per week). Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) show no significant differences

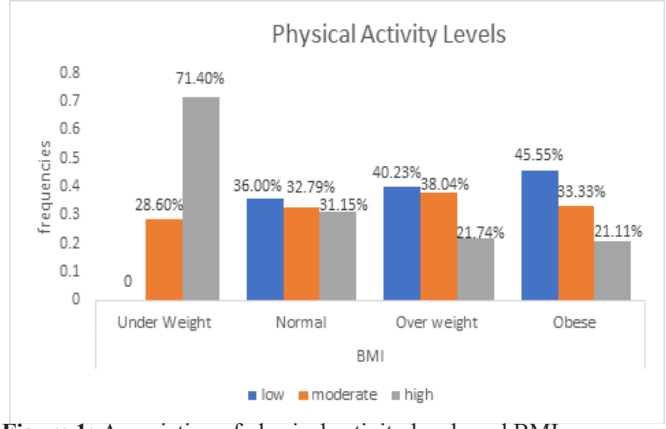

Figure 1: Association of physical activity levels and BMI

Table 2: Association of physical activity with NCD's

Variables	Total Physical Activity (MET min/per week)			
	Low	Moderate	High	P-Value
SBP	134.10 (58.38)	125.75 (16.93)	130.65 (63.159)	0.46
DBP	82.50 (11.83)	79.92 (11.89)	78.97 (10.70)	0.21
BMI	36.610 (37.70)	29.75(12.78)	27.7505 (7.45)	0.00*
Waist Circumference	100.64 (25.64)	100.21 (18.46)	95.48 (23.91)	0.12
RBS	131.10 (56.54)	125.10 (57.69)	113.59 (52.55)	0.03*
Heart Rate	82.67 (8.54)	80.89 (7.72)	81.05 (7.57)	0.19

* P-value <0.05 statistically significant,* Krushkal-Wallis ANOVA

Discussion

Scientific literature widely confirms the beneficial impacts of physical activity on health. Recent studies indicate that doing regular physical activity remarkably decreases the risk of premature mortality and over 25 chronic medical conditions. However, despite this evidence, a substantial portion of the global population continues to lead a sedentary lifestyle. According to our research, it was found that approximately 40% of the participants performed low physical activity, while around 25.2% were involved in intense exercise. These results are close to another research done by Ullah *et al.* (2021) which shows 48.2% of the participants were physically inactive, 42.8% had a moderate activity level and only 9.1% exhibited a high level of physical activity.[13] In contrast, a different study done in Karachi reported the prevalence of physical inactivity to be 72.6%.[14]

According to our findings, female participants demonstrated higher levels of physical activity (48%) compared to males (15%). These findings are contrary to a research done among undergraduate pupils in Peshawar, Pakistan, where physical activity was observed more in male participants compared to females.[15] Based on our research findings, 31.15% of individuals who engaged in vigorous physical activity were

found to have a normal BMI. These results are comparable to other study done by Satti *et al.* (2019) which reported that 54.6% of respondents had a normal BMI in participants in the age group 18-65 years.[16] A study conducted in Colombia to find the relationship between physical activity and weight status showed that there was no improvement in health of obese and underweight adults following the physical activity guidelines status. Our results do not match with this study.[17]

Our research findings show that physical activity helped in improving blood sugar levels and BMI. In comparison to another survey conducted in India, where it was seen that physical activity did not have significant effect on weight and obesity but was positively associated with reduction in diabetes and hypertension.[18] Interestingly, a cross sectional study conducted in Puducherry, India, showed no betterment in diabetes, hypertension or BMI with increased levels of physical activity.[19] A study conducted in Saudi Arabia in middle-aged showed similar results to our study regarding association of physical activity with non-communicable diseases.[20]

Conclusion

Based on the findings, individuals who engaged in physical activities were not affected by diabetes or hypertension. Morover, those who maintained a high level of physical activity exhibited a low BMI, indicative of a favorable state of health. These rsults shows that physical activity is beneficial in reducing these chronic diseases which are harmful for health.

Limitations

First of all, the sample size for our study should have been much larger. Secondly, although our investigation was cross-sectional and had a short duration, it could be done using a longitudinal study design with longer duration, such as a cohort study in order to obtain more exact and accurate results.

Recommendations

It is highly recommended that multiple studies are require for different population groups. Awareness programs and campaigns in community should be conducted about physical activity and its relation with non-communicable diseases. These issues should be highlighted and the legislations should made on government levels.

Acknowledgement: We would like to thank Mian Tahir Mehmood (CEO of Central Park Society) for his kind act of benevolence as he allowed us to conduct this study smoothly. My heartfelt gratitude also goes to Principal Mian Amir for his significant support in our work, urban developers who made this study feasible for us by providing street maps and security for our survey.

Authors' Contribution: SK is responsible for the initiation and design of the study, MH and MS conducted the data collection, SF and SI performed the analysis and interpretation of the obtained results, and SA prepared the initial draft of the manuscript.

Conflict of Interest: All authors declare no conlfict of interst.

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Review Article

A study on Bacterial Infections Associated with Central Nervous System in Pakistani Population

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Abstract

Objective: This paper reviews the evolving trends and epidemiology of CNS infections in Pakistan over four decades, exploring pathophysiology, diagnostic criteria, and treatment approaches through systematic review and meta-analysis.
Methodology: A comprehensive research study was conducted from August 2021 to May 2022 at the Department of Microbiology and Molecular Genetics, University of the Punjab, Lahore. It involved a literature review and meta-analysis of CNS infections in Pakistan from 1980 to 2022. This study estimates the burden of CNS infectious diseases, analyzing 183 articles. Approximately 100 studies used cerebrospinal fluid as a diagnostic specimen, while 83 studies used extra ventricular drainage, meeting inclusion criteria.
Results: The highest numbers of studies were conducted in 2009, 2011, 2014, 2015, 2017, 2019, 2020, and 2021, indicating an increasing focus on this area. Karachi had the highest publication rate. Bacterial agents accounted for 69% of cases, affecting both children (60%) and adults (72.2%). Males comprised 65% of the affected population. Low to middle in come patients with limited education were prevalent. Common symptoms included headache, nausea, neck stiffness, fever, seizures, and photosensitivity. *Meningitis* was the most prevalent type (55%), followed by subdural empyema (51.4%) and brain abscesses (41%). Major pathogens included *Streptococcus pneumoniae, Acinetobacter bauma nii, Enterobacter cloacae, Enterococcus faecium, and Haemophilus influenzae,* Viruses, fungi, and parasites were also involved. Many patients exhibited stages 3 and 4 on the MRC Breathlessness scale. These trends emphasize the importance of understanding CNS infections in Pakistan, focusing on causes, clinical presentations, and pathogens involved.
Conclusion: This review highlights the need for improved training, resources, and high quality care. Bacterial CNS infections continues to remain a significant challenge in the country.

Keywords: *Meningitis*, Subdural Empyema, Brain abscesses, Cerebrospinal fluid, Extraventricular drain

Introduction

When bacteria invade the central nervous system (CNS), comprising the brain, spinal cord, and nerves, it causes infections of CNS. The severity stems from the vital functions performed by this essential organ.[1] Bacteria invade the brain and meninges through various routes, causing meningitis and inflammation of the surrounding membrane.[2] Two primary meningitis types exist: leptomeningitis involving the pia and arachnoid, and patchy meningitis affecting the outer arachnoid and dura mater layers.[3] Thes pecific region of infection and severity depend on the anatomical location within the brain and meninges. Empyema, the accumulation of infected cerebral fluid, may occur in the epidural and subdural region.[4] The blood-brain barrier acts as a critical defense against bacterial invasion. Additionally, CNS infections can result from intracellular bacteria and be triggered by brain injuries, compound skull fractures, or neurosurgical procedures.[5] CNS infection symptoms include severe headache, convulsions, back pain, stiff neck, confusion, weakness, fever, seizures, high pitched crying, paralysis, loss of appetite, nausea, vomiting, light sensitivity, and more.[6] Diagnosis involves collecting specimens like cerebrospinal fluid (CSF) through a spinal tap or drain, blood samples, and imaging techniques such as CT or MRI. This research focuses on specimen collection, specifically CSF and extra ventricular drainage, and the necessary steps for diagnosing CNS infections.[7] CNS infection s result from various microorganisms, including bacteria, fungi, parasites, or viruses. Meningitis can be acute if caused by bacteria or viruses, or subacute when caused by parasites or fungi. Treatment typically involves medication.[8] CNS infections can lead to conditions like encephalitis and brain abscesses. Different bacterial species target specific age groups: *Listeria monocytogenes, Escherichia coli,* and Group B *streptococcus affect neonates, while E. coli, Neisseria meningitidis, and Haemophilus influenzae* affect children, and *Streptococcus pneumoniae* and *Neisseria meningitidis* affect adults. In the CNS, macrophages, and microglia have inflammasomes that detect infectious agents.[9] Bacterial proteins, such as IbeA, IbeB, AsIA, YijiP, OmpA, PilC, and InIB, aid in bacterial invasion of the brain.[10,11] Neisseria meningit dis, a human opportunistic pathogen, spreads through close contact and can cause meningitis and sepsis. Vaccines targeting Group B Neisseria meningitidis are available to combat its infection.[12]

Haemophilus influenza is associated with *Haemophilus meningitis,* characterized by fever, nausea, neck stiffness, and neurological disorders. Vaccines like "Hib" have been developed to reduce its incidence.[13] *Escherichia coli* are a common cause of neonatal *meningitis*

and has a high mortality rate. It crosses the blood-brain barrier using various virulence factors, leading to inflammation of the meninges. Vaccines are available to protect against severe *E. coli meningitis*.[14] *Klebsiella pneumonia* is an uncommon source of bacterial meningitis, often observed in post neurosurgical and nosocomial infections. Its polysaccharide capsule and other factors contribute to its resistance and high morbidity and mortality rates.[15] Serratia marcescens is an opportunistic pathogen that can cause meningitis, pneumonia, and wound infections. It can cross the blood brain barrier and affect the brain parenchyma, leading to fatal CNS meningitis, particularly in neonates and immunocompromised individuals.[16] *Salmonella typhimurium* rarely causes meningitis but is associated with systemic infections. It affects neonates and infants more severely, potentially resulting in severe neurological complication.[17] *Acinetobacter baumanniiis* an opportunistic pathogen commonly linked to nosocomial infections. It is challenging to treat due to its virulence patterns and antibiotic resistance mechanisms. *Acinetobacter meningitisis* often fatal, particularly in neurological settings.[18] *Pseudomonas aeruginosa*, known for causing severe pulmonary diseases, can also lead to *Pseudomonas meningitis,* especially in patients who have undergone neurosurgery. Its virulence factors weaken host cell defense mechanisms, contributing to high morbidity and mortality rates.[19] *Streptococcus pneumoniae* is a gram positive bacterium responsible for pneumococcal meningitis, particularly in young children. It can spread easily through respiratory droplets and has a high mortality rate. Vaccines are available to reduce pneumococcal infection.[20] *Listeria monocytogenes*, transmitted through contaminated food, commonly affect the central nervous system and cause meningitis. It has unique spreading mechanisms and can cross the blood-brain barrier, leading to cranial nerve involvement. Pregnant women are particularly at risk.[21] Other bacterial pathogens, such as *Clostridium tetani,* Streptococcus *agalactiae, Mycobacterium tuberculosis, Staphylococcus aureus,* and *Enterococcus faecalis*, also contribute to *meningitis* cases with their specific virulence factors and characteristics.[22] Prompt diagnosis of bacterial *meningitis* is crucial, often involving analysis of (CSF). Treatment includes specific antibiotics based on bacterial susceptibility, and in somecases, vaccines are available to prevent certain types of meningitis. Overall, understanding the diverse bacterial pathogens and their mechanisms in causing meningitis is essential for effective prevention, diagnosis, and treatment strategies to combat this life-threatening infection.[23] According to the World Health Organization (WHO), both the United States of America and Africa experience a high fatality rate from central nervous system infections, particularly meningococcal meningitis. The untreated fatality rate for this disease is 50%, with a 10% risk frequency. In Africa, the Meningitis Belt, spanning from Sub Saharan Africa to Senegal in the west and Ethiopia in the east, is known for its high incidence of meningtis among people living nearby. Annually, approximately 30,000 cases of meningitis are reported in Africa.[24] *Neisseria meningitidis* is the most commonly observed bacterial species causing meningitis in both regions, with 12 serotypes, six of which can cause epidemics. The disease shows seasonal variation, with higher case numbers during winter. Neonates and children un der five years of age are most affected, but cases among adults with a mean age of 39 years have also been reported.[25] The complexity of treatment arises from the various serotypes of the bacterium, which contribute to its pathogenicity.[26] According to the Global Burden of Disease, 400,000 deaths Report and ranked among the top 10 leading causes of death from communicable diseases in in 2020.[27] Serogroup-specific vaccines are now used for prevention and outbreak control, particularly in epidemic-prone regions of Africa. These vaccines are affordable, with prices ranging from US $0.60 to US $2.5-117.0 per dose. The use of vaccines has led to a significant reduction in meningitis cases, with a 58% decrease in the incidence rate and a 60% decline in the risk of epidemics.[28] In Pakistan, an underdeveloped country with a high population density, rapid disease spread is a challenge. Limited awareness and low literacy rates contribute to a lack of treatment, prioritizing illness over prevention and cure. The most common (CNS) infections in Pakistan are often caused by Streptococci bacteria.[29] Men being more susceptible than women. All four provinces of Pakistan face equal risk, although the northern areas, particularly Khyber Pakhtunkhwa, have a higher incidence.[30] The Aga Khan Institute in Karachi conducts extensive research on CNS infections, with a focus on cerebrospinal fluid and ventricular drain specimens. The availability of vaccines, antibiotics, and specialized medicines has significantly reduced the severity and occurrence of CNS infections in the Pakistani population.[31] This research project aims to conduct a comprehensive analysis of (CNS) infections in Pakistan. This includes enumerating the annual reported cases, assessing the effectiveness of treatments, evaluating the morbidity and mortality rates associated with CNS infections, planning appropriate diagnosis and treatment procedures, estimating the burden of these infections, and determining the current capacity of the neurosurgical workforce in managing them. Additionally, the research aims to identify geographic areas in Pakistan that require targeted improvement in neurosurgical capacity to better address the incidence of CNS infectious diseases.

Methodology

The research was conducted at the Department of Microbiology and Molecular Genetics, University of the Punjab, Lahore from August 2021 to May 2022. A retrospective literature review of published articles on Central Nervous System Infections in Pakistan was performed. Data were collected about the prevalence of CNS infection in different regions of Pakistan, types, signs and symptoms, bacterial species and socio-demographic character of patients. Google Scholar (https://scholar.google.com/) and PRISMA (http://www.prisma-statement.org/) were used with a combination of keywords and controlled vocabulary representing the concepts "CNS infections in Pakistan", "meningitis", "brain abscesses", "subdural empyema" and "Prevalence of CNS infections in Pakistan". A total of "183" articles were collected. Out of these, 100 studies met the inclusion criteria already set for CSF as a specimen for diagnosis. While 83 studies met the inclusion criteria with EVD as a specimen for diagnosis, all studies were reviewed by title and abstract and then by full text.

All articles were published in Pakistan, in a good impact factor journal from 1980 to 2022. In this study, we did not include

articles based on age and gender of patients. Thus, this literature review encompasses patients of all ages, including neonates. The review includes both immune-competent and immunosuppressed patient populations. Exclusion criteria involved CNS infections in animals (goats, mice, etc.) and infection that has an indirect route to CNS infection like tetanus, polio, etc. All the data were organized in a Microsoft Excel sheet. Data were categorized. These involve the author's name, the city in which the article was published, the year in which the article was published, the title of the article, the name of the journal in which the article has been published, the socio-demographic character of patients (education, occupation, and financial status), age of patients (neonates, 1year-10years, 10- 20years and 30 years above), the gender of patients (male and female), clinical signs, types, MRC stage, strain mentioned in the article, a specimen for diagnosis, number of citations of the article and impact factor of the journal. Two separate Excel sheets were made for each specimen, one for CSF and another for EVD as a specimen. The frequencies of each parameter were calculated using the software Prism (https://www.graphpad.com/features) and SPSS (https://www.ibm.com/spss). As the above methods involved extrapolating data from studies reported in the literature, the studies contained no personal data with no means to contact. It is a systematic observational review, so informed consent, patient consent for publication, Institutional Review Board approval, and Ethics Committee approval were not required.

Results

A comprehensive collection of articles from Google Scholar, PubMed, and PubMed Central yielded a total of 183 publications. The analysis employed conventional CSF tests and cutoffs to evaluate CNS inflammation and predict the etiology of community-acquired meningoencephalitis. Notably, CSF proved diagnostically useful in patients with recent CNS injury, surgery, or prior catheter usage (Table. 1).

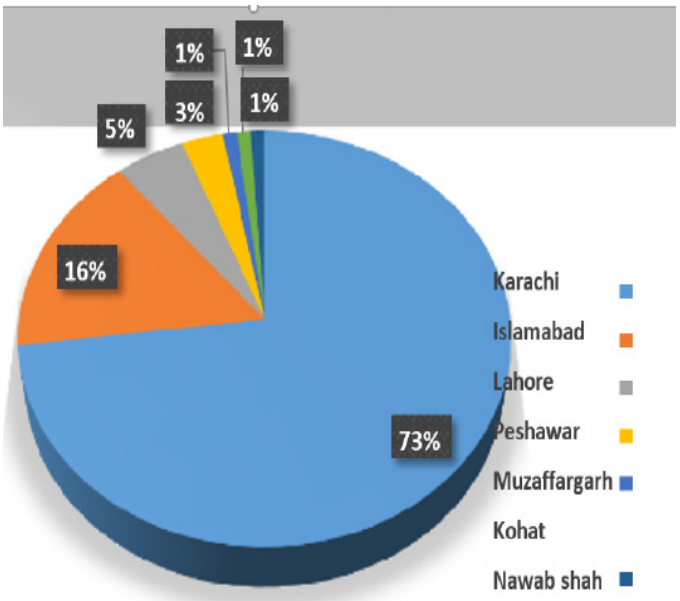

Figure 1: Percentage of studies conducted in different regions of Pakistan.

Table 1: Selection of articles with Cerebrospinal Fluid as Specimen

Sr. No	Year	Cities in which infection isstudied	Number of studies conducted (n=100)
1	2022	Karachi, Islamabad	4 (4)
2	2021	Karachi	6 (6)
3	2020	Islamabad	7 (7)
4	2019	Karachi	5 (5)
5	2018	Karachi	2 (2)
6	2017	Karachi, Islamabad	6 (6)
7	2016	Karachi, Lahore	4 (4)
8	2015	Karachi, Islamabad	7 (7)
9	2014	Karachi, Islamabad	6 (6)
10	2013	Karachi, Islamabad	7 (7)
11	2012	Karachi, Muzaffargarh	2 (2)
12	2011	Karachi, Islamabad, Peshawar, Kohat	5 (5)
13	2010	Karachi	3 (3)
14	2009	Karachi, Lahore, Islamabad	8 (8)
15	2008	Karachi, Islamabad	2 (2)
16	2007	Karachi	1 (1)
17	2006	Karachi Islamabad	3 (3)
18	2005	Karachi	2 (2)
19	2004	Karachi, Islamabad	2 (2)
20	2003	Karachi, Nawabshah	2 (2)
21	2002	Karachi, Peshawar	2 (2)
22	2001	Islamabad	1 (1)
23	2000	Karachi	1 (1)
24	1999	Karachi	1 (1)
25	1996	Karachi, Islamabad	2 (2)
26	1994	Karachi	1 (1)
27	1993	Karachi	1 (1)
28	1990	Karachi	1 (1)
29	1991	Karachi	1 (1)
30	1992	Karachi, Islamabad	2 (2)
31	1988	Karachi	2 (2)
32	1987	Lahore	1 (1)
33	1984	Karachi	1 (1)
34	1980	Karachi	1 (1)

In addition to the aforementioned findings, a distinct cohort of 83 research studies delved into the application of Sequential sampling from Exponential Viral Distributions (EVDs). The collective analysis of these studies revealed that such sampling practices emerged as a noteworthy indicator for central nervous system infection, as explicitly demonstrated in Table 2. This underscores the importance of Sequential sampling as a valuable diagnostic tool in identifying and assessing central nervous sys-

tem infections across various clinical contexts.

Table 2: Selection of articles with extra ventricular Drainage as Specimen

Sr.No	Year	Cities	Number of studies conducted (n=83)
1	2022	Karachi	5 (6.02)
2	2021	Karachi	9 (10.8)
3	2020	Islamabad	9 (10.8)
4	2019	Karachi	8 (9.6)
5	2018	Karachi, Peshawar, Lahore	7 (8.4)
6	2017	Karachi	6 (7.2)
7	2016	Karachi	4 (4.81)
8	2015	Karachi	4 (4.81)
9	2014	Karachi, Peshawar	5 (6.02)
10	2013	Karachi	4 (4.81)
11	2012	Karachi	3 (3.61)
12	2011	Karachi	4 (4.81)
13	2010	Karachi	2 (2.4)
14	2009	Karachi	3 (3.61)
15	2008	Karachi	1 (1.2)
16	2007	Karachi	1 (1.2)
17	2006	Karachi	2 (2.4)
18	2005	Karachi	1 (1.2)
19	2004	Karachi	1 (1.2)
20	2003	Karachi	1 (1.2)
21	1997	Karachi	1 (1.2)
22	1993	Karachi	1 (1.2)
23	1980	Karachi	1 (1.2)

The distribution of these studies across various regions provides valuable insights into the prevalence and scope of CNS infections in different parts of Pakistan (Figure 1). A considerable proportion of studies examined patients between 1 month to 30 years or above (Table 3). In terms of gender distribution, the majority of studies included more males than females. Neonates and children had a substantial presence among the studied cases. Financially, the patients varied from low to middle class, and many of them had limited education, often up to the primary level. However, the occupation of the patients was not specified in any of the articles.

Table 3: Age of CNS infected patients.

Sr. No	Age of patients	Number of studies conducted (n =183)
1	1 month- 10 years	82 (44.8)
2	10-20 years	50 (27.3)
3	30years or above	96 (52.4)

Clinical signs play a significant role in diagnosing CNS infections (Figure 2).

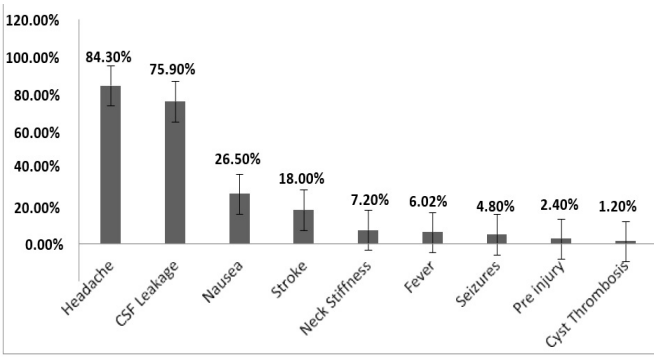

Figure 2: Clinical signs associated with CNS infections (%age)

The prevalence of CNS infections reveals meningitis as the most studied type, accounting for 45.3% of cases, while subdural empyema and brain abscesses represent 42.7% and 31.6% respectively.

Among the studies conducted, bacterial infections were the most commonly reported, followed by viral, parasite-origin, and fungal infections, in that order (Table 3). These findings underscore the diverse nature of CNS infections and the importance of conducting comprehensive research to better understand and address each specific type of infection. The MRC Breathlessness scale, specifically stages 3 and 4, was commonly observed in CNS infections, indicating the severity of the pathology (Table 4).

Table 4: Strains Causing CNS Infection

Sr. No	Strain	Number of studies conducted (%age)n =183
Gram-negative bacterial strain		
1	*Acinetobacter baumannii*	59 (32.3)
2	*Enterobacter cloacae*	52 (28.4)
3	*Enterococcus faecium*	34 (18.5)
4	*Pseudomonas aeruginosa*	31 (16.9)
5	*Haemophilus influenza*	16 (8.7)
6	*Klebsiella pneumonia*	14(17.6)
7	*Stenotrophonas maltophilia*	11 (6.1)
8	*Neisseria meningitis*	9 (4.9)
9	*Escherichia coli*	6 (3.2)
10	*Haemophilus influenza type B*	4 (2.1)
11	*Helicobacter pylori*	3 (1.6)
12	*Salmonella typhi, Salmonellaparatyphi*	2 (1.09)
13	*Campylobacter jejuni*	1 (0.54)
14	*Rhinocladiella mackenziei*	1 (0.54)
Gram Positive Bacterial Strains		
15	*Streptococcus pneumonia*	36 (19.6)
16	*Mycobacterium tuberculosis*	17 (9.2)

Sr. No	Strain	Number of studies conducted (%age)n =183
17	*Micrococcus spp*	10 (5.4)
18	*Staphylococcus aureus*	9 (5.2)
19	*Staphylococcus epidermidis*	2 (1.09)
20	*Streptococcus pyogenes*	2 (1.09)
21	*Listeria monocytogenes*	2 (1.09)
22	*Propionibacterium acnes*	2 (1.09)
23	*Actinomyces*	2 (1.09)
24	*Clostridium tetani*	1 (0.54)
25	*Nocardia*	1 (0.54)
Fungi, Parasites, and viruses		
26	*Naegleria floweri*	9 (5.2)
27	*Aspergillus*	7 (3.8)
28	*Herpes simplex virus*	3 (1.6)
29	*Japanese Encephalitis Virus*	2 (1.09)
30	*Rubella virus*	2 (1.09)
31	*Toxoplasma gondii*	2 (1.09)
32	*Enterovirus*	2 (1.09)
33	*Candida albicans*	1 (0.54)
34	*Arbovirus*	1 (0.54)
35	*Epstein Barr Virus*	1 (0.54)
36	*Varicella zooster virus*	1 (0.54)
37	*Dengue virus*	1 (0.54)
38	*Measles virus*	1 (0.54)
39	*Mumps virus*	1 (0.54)
40	*Plasmodium falciparum, P. vivax*	1 (0.54)
41	*Ramichloridium mackenziei*	1 (0.54)
42	*Wangiella dermatitidis*	1 (0.54)
43	*Rhinocladiella mackenzeiei*	1 (0.54)
44	*Bipolaris*	1 (0.54)

Discussion:

A systematic literature review and meta-analysis were conducted to analyze studies published from 1980 to 2022 in Pakistan, providing comprehensive estimates of the burden of CNS infectious diseases. The findings highlight regional disparities, pathogens involved, clinical signs, and socio-demographic factors. The limited healthcare workforce and resources in Pakistan, combined with the high burden of CNS infections, underscore the urgent public health concerns in the country. Unlike developed regions with better diagnosis and treatment, Pakistan faces a high prevalence of CNS infections, resulting in significant morbidity and mortality. The lack of access to timely diagnosis and treatment contributes to untreated cases and preventable deaths. Raising awareness about early diagnosis and treatment is crucial to reduce the impact of CNS infections in Pakistan.[32] There was a consensus on sampling for diagnostic procedures. Two such sampling methods were studied one being the CSF while the other being the EVD. For diagnostic and therapeutic purposes, surgical drainage is required to obtain cultures of bacterial, mycobacterial, fungal, parasitic, and viral origin for guidance in medical treatment. The sampling for diagnosis of CNS infection was done based on differential diagnostic recommendations.[33]

The highest number of studies were conducted in Pakistan in the years 2009, 2011, 2014, 2015, 2016, 2017, 2018, 2019, 2020, and 2021, with increasing incidence rates over time due to improved awareness and understanding of CNS infectious diseases.[34] Karachi had the highest number of published articles (73%), likely because it is the largest city in Pakistan and has several medical universities actively involved in research. Bacteria were found to be the most common causative agent of CNS infections, with a 69% incidence rate. Similarly, research conducted in the United States in 2021 also identified bacteria as the primary causative organism in most CNS cases.[35]

In terms of age distribution, CNS infections were predominantly observed in children aged 1 month to 10 years, accounting for 82% of cases. Research conducted in the United Kingdom in 2022 also highlighted the higher incidence and morbidity of neonatal meningitis compared to other age groups.[36] Adults aged 30 years and above accounted for 96% of CNS infection cases. Similar studies conducted in Thailand and the United States in 2022 reported mean ages of 40 years and 35.8 years, respectively. The reason behind this might be firstly, as individuals age, their immune systems may weaken, making them more susceptible to infections, including those affecting the CNS. Secondly, older adults may have underlying health conditions or chronic illnesses that compromise their immune function, increasing the risk of CNS infections. Lastly, lifestyle factors such as travel, exposure to new environments, and medical procedures become more common with age, potentially leading to increased opportunities for pathogen exposure and infection. Male patients were more commonly affected, with a prevalence of 65%. Males being more affected by central nervous system (CNS) infections can result from a combintion of biological and behavioral factors. One key contributor may be differences in immune responses, as females often exhibit stronger immune defenses against certain infections. Addtionally, specific risk behaviors or occupational exposures may increase the likelihood of CNS infections in males, leading to a gender-based discrepancy in infection rates. This aligns with research conducted in the United States (Pennsylvania) in 2020, which reported that 60-78% of CNS infection patients were male.[37]

The financial status of CNS-infected patients in Pakistan ranged from low to middle income. While most of the patients were illiterate or had an education status till primary, in 2022 research was conducted in the US and India, revealing that the highest cases of CNS infections are reported in low-income countries, because of poor vaccination facilities provided by the government in low-income countries.[38] The most common clinical sign of CNS infection was headache (83%), Nausea (65%),

Neck stiffness (60%), Fever (59%), Seizures (41%), and CSF Leakage (63%). Comparatively, in 2015 research conducted in the US (Pittsburgh) the major clinical signs observed were headache (58.9%), Nausea (47.1%), and photophobia (29.4%). Photophobia is not observed in either case in Pakistan.[39]

The most prevalent CNS infection was meningitis (45.3%), subdural empyema (42.7%), and brain abscesses (31.6%). Comparatively, in 2018 research conducted in India shows that bacterial meningitis occurs as 3 cases per 100,000 persons in developed countries, but it is more common ten times in underdeveloped countries, and brain abscesses have an incidence of 0.3-1.3 cases per 100,000 people per year.[40] Remarkably the most common bacterial species that causes CNS infection was gram-positive Streptococcus pneumonia with a 36% incidence. Similarly, research conducted in 2021 in the US shows that Streptococcus pneumonia and Neisseria meningitides are the cause of 80% of bacterial meningitis in cases reported per year.[41]

On the other hand, gram-negative bacteria are also involved in causing CNS infections that include Acinetobacter ba ma nii with 68.6% virulence, Enterobacter cloacae with 62.6% virulence, Enterococcus faecium with 40.9% virulence an Haemophilus influenza with 29% virulence. Similarly, research conducted in 2018 in the US shows that gram-negative bacilli are the common cause reported of CNS infections per year.[42] There are numerous viruses (*Epstein Barr Virus, Varicella zoster virus, Rubella virus, Dengue virus, Enterovirus, Herpes simplex virus, Measles virus, Mumps virus, Japanese Encephalitis Virus, etc.), fungi (Aspergillus flavus, Aspergillus fumigatus, etc.) and parasites (Plasmodium falciparum, P. vivax,* etc) involved in causing CNS infections. Comparatively, in 2022 two types of research conducted in the US revealed that *Enterovirus, Adenovirus, Herpes Simplex Varicella zooster virus* is the common cause of viral meningitis while fungal infections are caused by Aspergillus sp in most cases. MRC stage 3rd and 4th is mostly observed in patients with CNS infection.[43, 44]

Conclusion

In conclusion, bacterial meningitis with brain abscesses and subdural empyema is a common CNS infection all over Pakistan. These bacterial infections require early recognition and management. Moreover, a significant contrast between the incidences in different regions of Pakistan reinforces that CNS infections are primarily a disease in developing countries. Our results corroborate that CNS infections are a known public health problem. CNS infections are directly related to poor socioeconomic conditions, including hematogenous and direct spread from pneumonia. Meningitis, brain abscesses, and Subdural empyema are the common types of brain infections with prominent symptoms such as headache, fever, seizures, nausea, neck stiffness, and CSF leakage. CNS infections can occur in either gender and at any age of life. Mortality may increase when one is facing a dual health problem such as a head injury recently or is in an immuno-compromised state. All the diagnostic procedures should be used to identify the bacterial agent and then start the therapy accordingly. However, the vaccine is considered the best mechanism to reduce the burden.

Limitations

We recognized several limitations in this literature review. The disease estimations presented in this study are based on the widest-ranging and most comprehensive studies available till now. The major highlights of this study include the comprehensive literature research, a large number of included studies, and a great emphasis on the inclusion of data from different regions of Pakistan. To our knowledge, this is the largest review of available literature on CNS infections in Pakistan. However, the findings are not without limitations. While the three disease categories (meningitis, subdural empyema, and brain abscesses) are not comprehensive, they omit multiple diseases that lead to CNS infections such as HIV–related infections, Polio, AIDS, etc. However, less common diseases were omitted including cerebral schistosomiasis, prion disease, and neuroborreliosis, which are unlikely to greatly affect the estimated volume of CNS infections. Additionally, including data from the most significant possible number of regions in Pakistan was not practically possible. It was due to the missing data issue. In this study, we only identified the CNS infection cases that were present in the literature. However, we believe that CNS infection patients are still underreported, especially in rural areas of Pakistan. The exclusion of this vast body of data could have a significant impact on our approximations. This may result in overestimations or underestimations of incidence. While these limitations are substantial, they highlight the difficulty in obtaining high-quality epidemiological data on infectious diseases affecting the CNS, particularly in low-resource settings. Further research should specifically address these limitations, with a focus on population-based epidemiological studies in Pakistan.

Recommendations

To address the limitations of our study and advance research in this area, we propose several critical recommendations and future directions. These include expanding disease categories to encompass HIV-related infections and Polio, incorporating alternative data sources to enhance data completeness, improving rural data collection through collaborations and community engagement, employing statistical adjustments, prioritizing population-based studies in rural areas, collaborating with health organizations, conducting sensitivity analyses to assess data limitations, and advocating for future research aimed at enhancing data collection and reporting mechanisms. These measures collectively aim to reduce the burden of CNS infections in Pakistan and improve public health outcomes.

Authors' contribution: MA executed experimental design, collected data, and authored the paper. HA did collection of data and wrote the paper while TF did Contributed data and analysis tools, Contributed to article write-up. SM did whole paper analysis and proof reading, contributed to the revision of whole paper. .

Conflict of interest: The authors have no conflict of interest regarding this study.

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Case Report

Unusual Variant of Ameloblastoma with Calcifying Epithelial Odontogenic Tumor-like Areas in a Three-Year-Old Child

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Abstract

The Calcifying Epithelial Odontogenic Tumor (CEOT) is a benign odontogenic tumor, comprising approximately 1% of all odontogenic tumors. It presents as a slow-growing tumor in posterior mandibular region. A three-year-old female child from Multan, reported a swelling in right lower jaw progressively increasing in size eventually causing facial asymmetry. On intraoral examination, a protuberance was seen arising from posterior mandibular region and causing displacement of overlying teeth. The swelling was cystic on palpation and mildly tender. The patient underwent complete excision of lesion at a tertiary care center in her locality. The excision biopsy specimen was received at our lab which was intact and well preserved. A diagnosis of ameloblastoma with Calcifying epithelial odontogenic tumor-like areas was made. The patient was followed up after six months however no complaint of any recurrent swelling in the area of was recorded.

Keywords: Ameloblastoma, Calcifying Epithelial Odontogenic Tumor (CEOT), Pindborg Tumor

Introduction

The term "ameloblastoma" originates from English word "amel" meaning enamel and Greek word "blastos" meaning germ.[1] The neoplasm is thought to arise from odontogenic epithelium, particularly from dental lamina or enamel organ.[2] Ameloblastoma is one of the most common odontogenic tumors (approximately 10-50% of all odontogenic tumors). It predominantly occurs in the third to fourth decades of life, with a 1:1 male-to-female ratio, and often presents in the mandibular molar-ramus region. Radiologically, ameloblastoma appears as unilocular or multilocular radiolucency. Although it is a benign tumor, it demonstrates local aggressiveness and a high propensity to recur. Histologically, it consists of islands of proliferating odontogenic epithelium within fibrous stroma. Ameloblastma is separated into three clinical categories because of its presentation, treatment, and prognosis i.e Conventional, Unicystic, and Peripheral. Plexiform and follicular are most common histologic variants. When specific changes like granular transformation and squamous metaplasia occur, they are classified as granularcell and a anthomatousvariants, respectively. Granlarcell variantismost aggressive, characterized by a higher incidence of malignant transformation and a tendency to metastasize followed by desmoplastic variant having high recurrence rates owing to infiltrative margins.[3]

The Calcifying Epithelial Odontogenic Tumor (CEOT) is a benign odontogenic tumor, comprising approximately 1% of all odontogenic tumors. It was initially described by Pindborg, hence known as "Pindborg tumor". It presents as a slow-growing tumor in posterior mandibular region. Peak occurrence is in fourth and fifth decades of life CEOT is characterized by aunilocular or multilocular lesion, displaying mixed radiolucent-radiopaque pattern. Microscopically, it consists of three principal histological components: amyloid-like deposits, sheets of polyhedral epithelial cells, and calcifications.[4]

Both entities differ significantly based on their clinical course, etiology, histogenesis, treatment, and prognosis. Although Ameloblastomas often show a wide spectrum of histomorphological features however incidence of CEOT like areas in conventional solid multicystic ameloblastoma is exceedingly rare. This article presents a unique case of Ameloblastoma with areas resembling CEOT accompanied by a review of literature.

Case Presentation

A three-year-old female child, resident of Multan, a city in the province of Punjab reported a swelling in right lower jaw progressively increasing in size eventually causing facial asymmetry in the subject. On intraoral examination, a protuberance was seen arising from posterior mandibular region and causing displacement of overlying teeth. The swelling was tense (cystic) on palpation and mildly tender. The patient underwent complete excision of lesion at a tertiary care center in her locality. The excision biopsy specimen was received at our lab which was intact and well preserved.

On gross examination, it was a round mass 4.5cm, with solid to cystic cut surface. The cystic areas were filled with chocolate brown material. Histologically the neoplasm was composed of islands of stellate reticulum having loosely arranged oval to spindled cells with peripheral palisading. Overlying odontogenic epithelium showed classic reverse polarity.

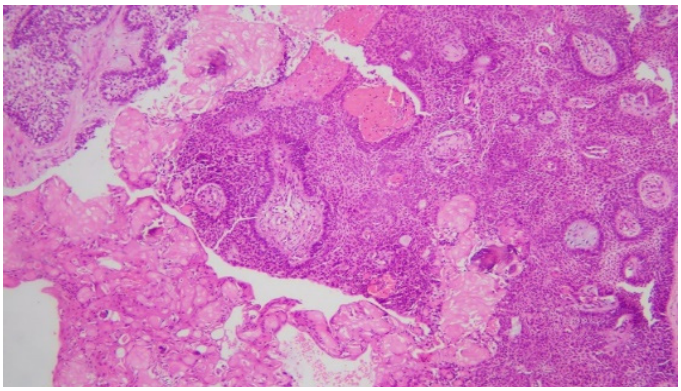

Figure 1: Low power view showing ameloblastoma with CEOT-like areas.

The follicular pattern was predominant, however, areas of plexiform pattern with anastomosing cords and sheets were also appreciated Figure 4)

Some of the foci showed polygonal epithelial cells with clear cytoplasm (ghost cells) and calcifications against a background of amyloid-like material (Figure 1,2,3). A diagnosis of Ameloblastoma with Calcifying epithelial odontogenic tumor-like areas was rendered to the patient. The patient was followed up after six months however no complaint of any recurrent swelling in the area of interest was recorded.

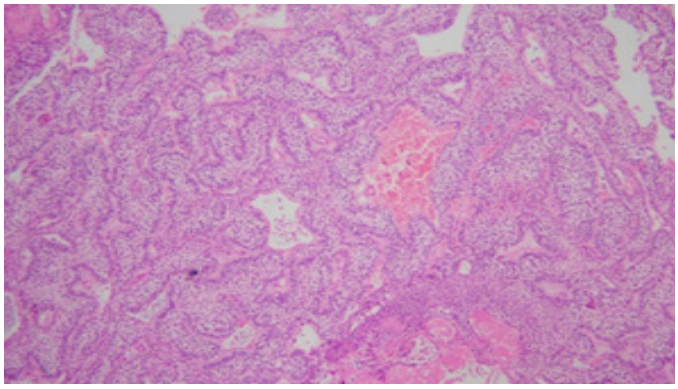

Figure 2: Low power view showing polygonal epithelial cells with ghost cells

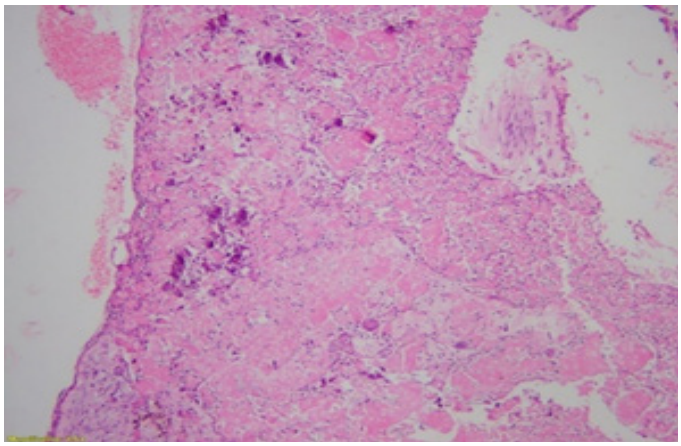

Figure 3: Low power view showing calcifications, ghost cells and amyloid like areas

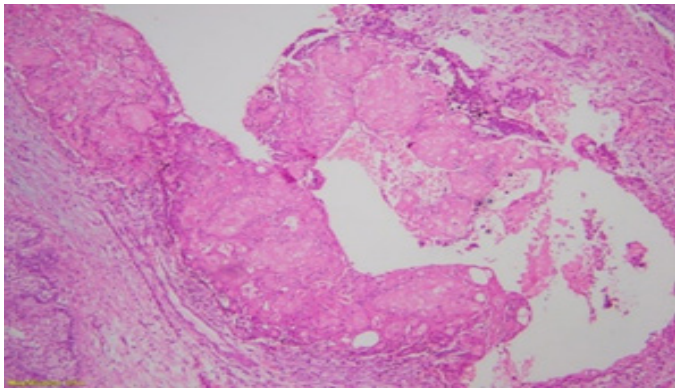

Figure 4: Low power view showing conventional ameloblastoma with follicular and plexiform pattern

Discussion

CEOT and ameloblastoma, might have overlapping clinical features. However, there are clear distinctions in radiographs and no similarities in terms of histology.

While reviewing the literature, we found quite a few reported cases of hybrid odontogenic tumors with dual morphology. Examples include Kerato-Ameloblastoma, Ameloblastoma and Ameloblastic fibroma, Ameloblastoma, and Calcifying Odontogenic Cyst, and Ameloblastoma and Glandular Odontogenic Cyst. These lesions should not be recognized as true hybrids; rather can be considered anoalous morphodifferentiation/ histodifferentiation process. Melrose writes that the term hybrid tumor is a misnomer.The odontogenic epithelium has eminent histomorphodifferentiation potential and undergoes complex inductive interactions with mesenchyme, giving rise to such lesions.[5]

Ameloblastoma are frequently aggressive with ability to destroy bone and grow upto varied sizes, leading to pathological fractures, facial asymmetry, tooth displacement, and malformities. The key prognostic factors for ameloblastoma are primary surgical approach and morphologic variant.[6,7] Recurrence is common with conservative therapy, ranging from 60% to 90% . The preferred method of treatment for biologically aggressive subtypes of primary and recurrent ameloblastoma is radical surgery i.e en bloc tumor excisiom with a safe bone margin of 1 to 2 cm.[8]

Contrary to ameloblastoma, CEOT is considered an expansile lesion that does not invade intertrabecular spaces. Various treatment modalities for CEOT have been proposed and recent data reinforces the idea that conservative surgery is preferred approach for mandibular CEOT.[9,10]

The available data suggests that when it comes to hybrid odontogenic tumors, they usually behave in a manner that is similar to other solid/multi-cystic ameloblastoma & none of these variants shows significant behavioral variability. Optimal treatment of hybrid lesions with an ameloblastoma component should follow the management guidelines for conventional

ameloblastoma.[10] This constitutes an important evidence to the proposition that such lesions are mere variants of Ameloblastoma and not composite tumors. However the long-term behavior of this hybrid tumor is uncertain, the best treatment strategy is yet to be defined. Even though enucleation and resection seemed to resolve the hybrid lesion in our case, additional data and long-term surveillance are required to establish the clinical importance of these lesions.

Conclusion

Ameloblastoma is well known to have multiple variants in a single lesion. The biological behavior of hybrid odon to genic tumors is typically the same as that of other solid or multicystic ameloblastomas. Therefore, we propose that ameloblastoma with CEOT-like areas may be a rare variant of ameloblastoma rather than a true hybrid neoplasm. To better understand the relevance of these lesions, more cases and follow-up information are required because the long-term behavior of this lesion is still unknown.

Authors' Contribution: The authors hereby validate their participation in the preparation of the manuscript in the subsequent manner: the inception and formulation of the study were done by MF, the collection of data was undertaken by AA and ZR, the analysis and interpretation of the obtained results were carried out by FWK and ZB, and the initial draft of the manuscript was prepared by MC.

Conflict of Interest: The authors have no conflicts of interest.

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