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GUEST EDITORIAL

CHATGPT IN MEDICINE: A REVIEW OF APPLICATIONS, BENEFITS, LIMITATIONS, AND ETHICAL CONSIDERATIONS

Fan Kee Hoo[1], Siew Mooi Ching[2], Anna Misyail Abdul Rashid[1], Abdul Hanif Khan Yusof Khan[1], Janudin Baharin[1]

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ABSTRACT

ChatGPT represents a major advance in AI capabilities, demonstrating potential across diverse medical applications. However, ethical concerns and limitations necessitate responsible oversight. This review provides a balanced overview of ChatGPT in healthcare, examining promising benefits as well as risks requiring consideration. It covers key themes:

1 Healthcare applications of ChatGPT

2 Limitations and concerns

3 Ethical considerations and recommendations for responsible AI use.

While highlighting ChatGPT's promise, this discussion emphasizes the importance of governance policies and interdisciplinary collaboration to uphold ethics as AI advances.

Keywords: Artificial Intelligence, Machine Learning, Clinical Decision Support Systems, Professional-Patient Relations, Ethics

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INTRODUCTION

The release of ChatGPT by OpenAI in late 2022 has generated great interest regarding implications in medicine.[1-3] Built using transformer-based deep learning, ChatGPT displays advanced natural language processing capabilities enabling remarkably human-like conversational responses.[4,5]

Early applications span areas like medical education, clinical decision support, patient communication, and documentation.[6-9] However, experts have also highlighted major risks like misinformation, lack of transparency, privacy threats, liability issues, and dehumanizing effects requiring careful oversight.[10-13] Therefore, nuanced analysis of ChatGPT examining both beneficial potential and risks in medical contexts is urgently needed.

This discussion provides such balanced perspective focused specifically on emerging healthcare applications and ethical issues. It synthesizes early evidence and expert insights highlighting promising uses while also emphasizing hazards warranting thoughtful response.

The objectives are: 1) Assess ChatGPT's promise and limitations in medical contexts based on current findings; 2) Surface ethical issues needing policies for responsible development and use; and 3) Recommend priorities for maximizing benefits while minimizing risks. By critically examining ChatGPT, this document seeks to spur informed discourse on responsibly harnessing its capabilities in vital healthcare domains.

CHATGPT'S POTENTIAL APPLICATIONS IN HEALTHCARE

In healthcare, early evidence indicates ChatGPT could aid medical education, clinical decision-making, patient communication, and productivity. Its conversational nature and medical knowledge make ChatGPT well-suited for applications needing natural language processing and text generation.[14-17]

For education, ChatGPT has exhibited aptitude answering exam-style medical questions and rapidly producing custom clinical cases.[16,18,19] By automating personalized tutoring and feedback at scale, ChatGPT may enhance knowledge acquisition and retention.[19-22] For instance, it can provide tailored explanations of concepts, quiz students' understanding, and suggest areas needing further study.

This could increase engagement and address gaps in competencies. ChatGPT also shows promise for

efficiently generating realistic patient scenarios to train clinical skills and judgment. By expanding customizable educational resources, it could make learning more adaptive, accessible, and experiential.

For clinical support, ChatGPT has shown promising ability to summarize patient data and suggest appropriate lab tests or imaging studies.[23-26] It can rapidly synthesize complex records into coherent narratives to inform diagnoses.

ChatGPT also exhibits potential to explain conditions, care recommendations, and rationale to patients in understandable language. By generating such layperson-friendly interpretations of medical information, it may boost patient literacy, engagement, and shared decision-making.[27-30]

Additionally, automating notetaking and documentation with ChatGPT could alleviate clinician burnout.[31-34] It can capture patient encounter details for charting, freeing up time and mental focus.

ChatGPT also shows aptitude generating post-visit summaries, referral letters, and other documentation requiring synthesis of findings, interpretation, and communication. By automating routine documentation tasks, it may enhance clinical workflow efficiency.

However, given risks of misinformation and liability, experts advise ChatGPT only be selectively implemented in healthcare with extensive validation and oversight.[24-26,35] It should not independently perform sensitive tasks like diagnosing, prescribing, or charting without clinician supervision. But as an assistive tool for education, communication, and documentation, ChatGPT shows substantive potential to aid medicine if responsibly directed.

LIMITATIONS AND RISKS OF CHATGPT USE IN HEALTHCARE

Despite promising capabilities, experts emphasize ChatGPT has substantial limitations and risks requiring extensive safeguards in healthcare.[18,35,36] Most critically, as a data-driven AI, ChatGPT lacks human clinicians' nuanced judgment and expertise for sound decisions [18,35]. Its responses often omit key considerations or make unjustified extrapolations that could endanger patients without oversight.[37-39]

Critically, unlike human clinicians, ChatGPT lacks understanding when its responses are incorrect or unsafe, blithely generating plausible sounding yet inconsistent, unethical, or harmful recommendations.[35,40] Such AI "hallucinations" increase risks as users may overestimate its competence.[41-43] For instance, while ChatGPT can intelligently discuss medical concepts and cases, it does not truly comprehend the implications of its advice. This could lead users to mistakenly trust dangerous or unjustified suggestions without independent clinical verification.

Furthermore, ChatGPT's knowledge stems from pre-2022 training data, rapidly growing outdated as medicine advances. Its responses may reflect outdated practices rather than current evidence-based standards.[36,44] ChatGPT also cannot judiciously interpret new research findings' validity and relevance like clinician-scientists. So, reliance on its outdated or questionable recommendations could compromise care quality and patient safety.

Additionally, overreliance on ChatGPT risks eroding essential clinical knowledge and skills gained through formal education and experience.[45-47] If students use ChatGPT as a crutch rather than an aid, they may fail to adequately develop expertise.

And clinicians depending heavily on ChatGPT could experience skill atrophy and deskilling over time. Maintaining human competencies alongside judicious AI augmentation will remain crucial.

While powerful, these risks make clear ChatGPT requires extensive safeguards in healthcare, safely augmenting but not replacing clinicians.[35,47] As an assistive rather than independent tool, ChatGPT shows promise if thoughtfully implemented. But upholding standards of care, accuracy, and safety necessitates extensive oversight and verification of its outputs.

ETHICAL CONSIDERATIONS FOR RESPONSIBLE USE OF CHATGPT IN MEDICINE

ChatGPT also introduces major new ethical challenges requiring thoughtful policies in medicine.[1,13,48] Key issues include lack of transparency, embedded biases, misuse potential, privacy concerns, accountability gaps, dehumanization risks, and fairness issues.[36,49-51]

As it lacks insight into its limitations, ChatGPT's outputs cannot be critically evaluated.[49,52] It provides no transparency into its reasoning, confidence levels, or knowledge gaps. This black-box nature hinders assessing when outputs are unsafe or improper. Biases and misinformation in its training data may also propagate undetected.[48,52] For example, outdated paternalistic attitudes or demographic skews in data could introduce biases needing ongoing monitoring.

ChatGPT's generative capacity also enables misinformation spread and fraud.[10,53] Its ability to fluently discuss medical topics could be misused to generate convincing but false health advice or predatory marketing

claims. ChatGPT's text can also be misappropriated for dishonest purposes like producing plagiarized content or forging clinician notes. Responsible policies for use are necessary to prevent such harms.

Ensuring privacy is also difficult as conversations may reveal confidential patient details.[48,54] If ChatGPT's training data included identifiable records, it further risks exposing private health information. Ongoing audits of its capabilities to detect breaches will be critical.

Additionally, without legal personhood, responsibility for medical errors ChatGPT propagates is unclear.[52,55] Users, programmers, and employing institutions all diffuse its accountability. Updated legal frameworks apportioning appropriate liability are needed to address this vacuum.

Over-reliance on ChatGPT may also erode human skills like empathy that enrich care experiences.[47,56] Excessive faith in its capabilities could reduce clinicians' direct engagement with patients and humanity. Thoughtful integration balancing AI augmentation with human connection will remain vital.

Finally, representational gaps in ChatGPT's training data could introduce marginalizing biases.[54,57] Lack of diverse perspectives risks outputs reflecting dominant groups' preferences disproportionately. Ongoing efforts to enhance inclusivity in AI will be integral to mitigating unfair biases.

Addressing these issues to uphold ethics amid rapid AI progress requires collaboration among technologists, clinicians, ethicists, lawmakers, and the public.[13,58] Their cooperation can steer development toward democratization rather than monopolization of benefits. Comprehensive ethical governance and participatory oversight of ChatGPT will be essential as healthcare applications expand.

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, while highlighting promise, this review emphasized the importance of governance and policies to uphold ethics as AI advances in medicine. Realizing benefits while addressing risks requires:

1 Comprehensive oversight for transparent, accountable, and ethical AI use. Mechanisms like external audits, monitoring boards, and public participation can enhance direction of ChatGPT toward societal good.

2 Extensive validation of any clinical recommendations. Safety standards should require ChatGPT outputs be verified by clinician teams before use in care settings to prevent patient harm.

3 Delineating best-practice human roles for responsible AI augmentation. Policies should establish domains where ChatGPT can assist versus replace human expertise to preserve competencies.

4 Promoting public participation in steering AI's development. Democratizing discourse on technological impacts through participatory forums can help align AI with societal needs.

5 Proactive research into safety, biases, and impacts. Ongoing studies on AI risks are imperative to guide wise governance.

6 Updating legal frameworks addressing emerging issues. New liability models and protections for privacy and responsible use are needed for emerging technologies like ChatGPT.

Overall, ChatGPT represents a watershed advancement poised to transform medicine if responsibly directed. But prudent policies and collaboration are essential to encourage innovation while preserving ethics and human values. With comprehensive governance and mindful integration respecting human roles, ChatGPT's remarkable capacities could be harnessed to enhance health and healthcare.

This review aimed to outline a balanced perspective assessing its promise and risks to spur thoughtful discourse toward that goal. The years ahead will be defining in charting AI's course through principled development centred on human welfare.

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ORIGINAL ARTICLE

FREQUENCY OF THE KNEE POSTEROLATERAL CORNER INJURY IN COMBINATION WITH ANTERIOR CRUCIATE LIGAMENT INJURY

Riaz Muhammad, Syed Dilbagh Ali Shah

Department of Orthopedics and Traumatology, Khyber Teaching Hospital, Peshawar - Pakistan

ABSTRACT

Objective: To determine the frequency of posterolateral corner injury in combination with an anterior cruciate ligament injury.

Materials and Methods: This Descriptive Cross-Sectional study was performed at Ortho Unit, MTI-Khyber Teaching Hospital Peshawar from 18 July 2020 to 18 January 2021. A detailed clinical history was taken followed by a general physical and systemic examination from all patients presenting with diagnosed anterior cruciate ligament tear on MRI. A plain radiograph of the involved knee was taken in sagittal and coronal planes to identify any fracture or dislocations and make necessary exclusions. The finally selected patients were enrolled and a specific data sheet purposely designed, was filled for each of them. A quick height, weight, and BMI (on Stadiometer and standard weighing scale) calculation were done and Beighton score was calculated for all patients.

Results: Incidence of posterolateral corner (PLC) injuries was found in 36 (21.3%) patients combined with anterior cruciate ligament (ACL).

Conclusion: It is of utmost importance to detect and treat the injury properly. As PLC injuries are not usually diagnosed in the first place, therefore, a thorough understanding of functional interactions of the PLC, specific history taking, and precise physical examination are required for the diagnosis and treatment.

Keywords: Anterior Cruciate Ligament (ACL); Posterolateral Corner (PLC); Knee; Multiligamentous Injury

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INTRODUCTION

The knee joint is one of the most commonly injured joints, as an isolated injury or a frequent component in multiple trauma patients. The knee is a complex joint, consisting of two condylar joints between the corresponding condyles of the femur and tibia and a patellar joint between the patella and femur[1]. Injuries to the posterolateral corner of the knee occurring in isolation or combination with injuries to the anterior cruciate ligament are uncommon and yet a common cause of ACL reconstruction failure. Posterolateral corner lesions have been estimated to occur in 9.1% of acute knee injuries with haemarthrosis and 16% of all knee ligament injuries [2]. The diagnosis is usually missed at the time of the accident.

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The main structures that make up the posterolateral corner of the knee are the lateral collateral ligament, popliteus tendon, popliteal-fibular ligament, and lateral knee capsule. Biomechanical studies have established that injuries to the posterolateral corner of the knee worsen the deleterious effects of tears in one or both cruciate ligaments[3]. A posterolateral corner injury that is not taken into account in the initial treatment strategy increases the risk of failure of procedures to reconstruct the central knee structures[4].

The posterolateral corner (PLC) structures interact functionally with the anterior cruciate ligament (ACL). They act as the primary restraint to varus and external rotation. The ACL acts as a secondary restraint to varus angulation. Because of joint conformity of the lateral compartment of the knee and the inherent bony instability of the lateral tibial plateau, injuries of the PLC structures create a set of marked instability[5]. When this is combined with an ACL tear, the instability is frank.

In an ACL-PLC injured knee, an untreated PLC injury causes a significant increase in force on the ACL graft and may be a leading cause of graft failure. So the recon-

struction should be combined[6]. In the setting of combined ACL-PLC reconstruction procedures, femoral tunnel intersection has been reported to be high.5 The proximity of ACL and lateral collateral ligament tunnels in the lateral femoral condyle carries the risk of bone weakening and tunnel collision and hence compromises graft function[7-10] . We receive plenty of patients will knee traumatic injuries in our department undergoing anterior cruciate ligament reconstruction for ACL tear as well as in some patients posterolateral corner reconstruction. In this study, I will determine the prevalence of posterolateral corner injury in combination with anterior cruciate ligament injuries. This study will help us in finding the frequency of those patients who have posterolateral corner injury using a very simple, cost-effective clinical test. The impact of this study will be to make use of these simple clinical test by medical professionals which normally is not used by them and will overall improve the outcome of ACL reconstruction in terms of identifying a population having neglected posterolateral corner injuries. The study will also act as a reference by scholars and a base for further research.

MATERIALS AND METHODS

This Descriptive Cross-Sectional study was performed at Ortho Unit, MTI-Khyber Teaching Hospital Peshawar from 18 July 2020 to 18 January 2021. A detailed clinical history was taken followed by a general physical and systemic examination from all patients presenting with diagnosed anterior cruciate ligament tear on MRI. A plain radiograph of the involved knee was taken in sagittal and coronal planes to identify any fracture or dislocations and make necessary exclusions. The finally selected patients were enrolled and a specific data sheet purposely designed, was filled for each of them. A quick height, weight, and BMI (on stadiometer and standard weighing scale) calculation were done and Beighton score was calculated for all patients. The sample size of this study was 169. Calculations are based using a 95% confidence level, 19.6% prevalence of posterolateral corner injury with concomitant anterior cruciate ligament injury[9]. The margin of error was kept 6% under the WHO formula for sample size determination in health Consecutive non-probability sampling .Both male and female patients having a confirmed ACL tear for the last six months in the Age range 16-40 Years were included in the study. However, Patients with Severe synovitis, those with the past history of ipsilateral knee joint surgery, or those with associated fracture of femoral/ tibial condyles and knee joint dislocation or those having evidence of .osteoarthritis either clinically or radiographically were excluded from this study. After securing permission from the Ethical & Research Approval Committee of our institution. The study was conducted at Department of Orthopedics & Trauma, Khyber Teaching Hospital Peshawar. Patients were selected from outpatient and Emergency departments. The purpose and benefits of the study were explained to all patients included in study. Written informed consent was taken from all patients. A detailed clinical history was taken followed by general physical and systemic examination from all patients presenting with diagnosed anterior cruciate ligament tear on MRI. A plain radiograph of involved knee was taken in sagittal and coronal planes in order to identify any fracture or dislocations and make necessary exclusions. The finally selected patient was enrolled and a specific data sheet purposely designed was filled for each of them. A quick height, weight, and BMI calculation was done and beighton score was calculated for all patients.

The patient was then undergo stress radiography of injured and uninjured knee. A bolster was kept below each knee and a 30 degree angle was maintained at knee in flexion. A varus stress was applied while the patient on radiography table and plain anteroposterior radiograph was taken. The same procedure was repeated for the normal knee. A difference of 4mm or more of opening on lateral side of knee between distal femoral condyle and proximal tibia plateau measured on the ruler was considered as having posterolateral corner injury. All procedures was performed by the same final year resident under supervision of consultant orthopedic surgeon.After confirmation of posterolateral corner injury, the frequency of posterolateral corner injury was calculated among the total subjects included in the study. All data was recorded in form of charts and tables. Confounder was controlled by strictly following exclusion criteria. Data was stored and analyzed using statistical software SPSS version 21. All the quantitative variables like age, BMI, time since ACL tear (months) was analyzed by Mean along with standard deviation. Frequencies and percentages were calculated for qualitative variables like gender, type of sports injury (Cricket, Foot Ball, Hockey, Skiing and others), Knee involvement (right or left), and obesity. Posterolateral corner tear was stratified among age, gender, time since ACL tear, right or left side, BMI, type of sport to see effect modifications. Other effect modifier like obesity, ligamentous laxity (Beighton score >4) was controlled through stratification. Post stratification chi square test was applied keeping P value equal or less than 0.05. All the results was presented on tables and graphs.

RESULTS

The study was conducted at the Department of Orthopedics Surgery, Khyber Teaching Hospital Peshawar. Comprehensive results of my study are as under:-

Mean and SDs for age was 25.70±5.128. Mean and SDs for time since ACL tear was 3.86±1.210. Mean

Table No 1: Descriptive Statistics of Study (n=169)

Numerical Variables	Minimum	Maximum	Mean	Std. Deviation
Age	16	38	25.70	5.128
Time Since ACL Tear (Months)	2	6	3.86	1.210
Body Mass Index (kg/m2)	1.00	32.20	26.9172	2.99621
Ligamentous Laxity	2	8	4.54	1.150

Table No 2: Age Wise Distribution (n=169)

Age Groups	Frequency	Percent
16-30 Years	141	83.4%
31-40 Years	28	16.6%
Total	169	100.0%

Table No 3: Gender Wise Distribution (n=169)

Gender Groups	Frequency	Percent
Male	108	63.9%
Female	61	36.1%%
Total	169	100.0

Table No 4: Frequencies and Percentages for Type of Sports Injury (n=169)

Type of Sports Injury	Frequency	Percent
Hockey	56	33.1%
FootBall	113	66.9%
Total	169	100.0%

Table No 5: Frequencies and Percentages for Knee Involved (n=169)

Knee Involved	Frequency	Percent
Right	78	46.2%
Left	46	27.2%
Bilateral	45	26.6%
Total	169	100.0%

Table No 6: Frequencies and Percentages for Obesity (n=169)

Obesity	Frequency	Percent
Yes	41	24.3%
No	128	75.7%
Total	169	100.0%

Table No 7: Frequencies and Percentages for Posterolateral Corner Injury (n=169)

Posterolateral Corner Injury	Frequency	Percent
Yes	36	21.3%
No	133	78.7%
Total	169	100.0%

Table No 8: Stratification of Posterolateral Corner Injury with Age Groups (n=169)

		Age Groups		P Value
		16-30 Years	31-40 Years	0.134
Posterolateral Corner Injury	Yes	33	3	
		91.7%	8.3%	
	No	108	25	
		81.2%	18.8%	
Total		141	28	
		83.4%	16.6%	

Table No 9: Stratification of Posterolateral Corner Injury with Gender Groups (n=169)

		Age Groups		Total	P Value
		Male	Female		0.435
Posterolateral Corner Injury	Yes	25	11	36	
		69.4%	30.6%	100.0%	
	No	83	50	133	
		62.4%	37.6%	100.0%	
Total		108	61	169	
		63.9%	36.1%	100.0%	

Table No 10: Stratification of Posterolateral Corner Injury with Type of Sports Injury (n=169)

		Type of Sports Injury		Total	P Value
		Hockey	Foot Ball		0.669
Posterolateral Corner Injury	Yes	13	23	36	
		36.1%	63.9%	100.0%	
	No	43	90	133	
		32.3%	67.7%	100.0%	
Total		56	113	169	
		33.1%	66.9%	100.0%	

Table No 11: Stratification of Posterolateral Corner Injury with Knee Involved (n=169)

		Knee Involved			P Value
		Right	Left	Bilateral	0.815
Posterolateral Corner Injury	Yes	15	11	10	
		41.7%	30.6%	27.8%	
	No	63	35	35	
		47.4%	26.3%	26.3%	
Total		78	46	45	
		46.2%	27.2%	26.6%	

Table No 12: Stratification of Posterolateral Corner Injury with Obesity (n=169)

		Obesity		Total	P Value
		Yes	No		0.579
Posterolateral Corner Injury	Yes	10	26	36	
		27.8%	72.2%	100.0%	
	No	31	102	133	
		23.3%	76.7%	100.0%	
Total		41	128	169	
		24.3%	75.7%	100.0%	

Table No 13: Stratification of Posterolateral Corner Injury with Time Since ACL Tear (n=169)

		Time Since ACL Tear		Total	P Value
		< 3 Months	> 3 Months		0.274
Posterolateral Corner Injury	Yes	18	18	36	
		25.4%	18.4%	21.3%	
	No	53	80	133	
		74.6%	81.6%	78.7%	
Total		71	98	169	
		100.0%	100.0%	100.0%	

Table No 14: Stratification of Posterolateral Corner Injury with Ligamentous Laxity (n=169)

		Ligamentous Laxity		Total	P Value
		< 4	> 4		0.483
Posterolateral Corner Injury	Yes	32	4	36	
		22.2%	16.0%	21.3%	
	No	112	21	133	
		77.8%	84.0%	78.7%	
Total		144	25	169	
		100.0%	100.0%	100.0%	

Table No 14: Stratification of Posterolateral Corner Injury with Ligamentous Laxity (n=169)

		Ligamentous Laxity		Total	P Value
		< 4	> 4		0.483
Posterolateral Corner Injury	Yes	32	4	36	
		22.2%	16.0%	21.3%	
	No	112	21	133	
		77.8%	84.0%	78.7%	
Total		144	25	169	
		100.0%	100.0%	100.0%	

and SDs for BMI was 26.917±2.99. Mean and SDs for ligamentous laxity was 4.54±1.150. (Table No. 1). 141 (83.4%) patients were recorded in the 16-30 years age group while 28 (16.6%) patients were recorded in 31-40 years age group. (Table No. 2). 108 (63.9%) male and 61 (36.1%) female patients were recorded. (Table No. 3). 56 (33.1%) patients got injuries from hockey while 113 (66.9%) patients got injuries from playing football. (Table No. 4). 78 (46.2%) patients had injury in the right knee, 46 (27.2%) patients had an injury in their left knees while 45 (26.6%) patients had injuries in their bilateral knees. (Table No. 5). 41 (24.3%) patients were recorded obese. (Table No. 6). As per frequencies and percentages for posterolateral corner injury, 36 (21.3%) patients were recorded with posterolateral corner injury. (Table No. 7). Posterolateral corner injury was stratified with age, gender, type of sports injury, knee involved, obesity, time since ACL injury and ligamentous injury at Table No. 8 to 14 respectively.

DISCUSSION

The knee joint is one of the most commonly injured joints, as an isolated injury or a frequent component in a multiple trauma patient. The knee is a complex joint, consisting of two condylar joints between the corresponding condyles of femur and tibia and a patellar joint between the patella and femur[1,11,12]. Injuries to the posterolateral corner of the knee occurring in isolation or in combination with injuries to the anterior cruciate ligament are uncommon and yet a common cause of ACL reconstruction failure. Posterolateral corner lesions have been estimated to occur in 9.1% of acute knee injuries with haemarthrosis and 16% of all knee ligament injuries [2.13]. The diagnosis is usually missed at the time of the accident.

The main structures that make up the posterolateral corner of the knee are the lateral collateral ligament, popliteus tendon, popliteo-fibular ligament, and lateral knee capsule. Biomechanical studies have established that injuries to the posterolateral corner of the knee worsen the deleterious effects of tears in one or both cruciate ligaments[3]. A posterolateral corner injury that is not taken into account in the initial treatment strategy increases the risk of failure of procedures to reconstruct the central knee structures[4,14].

The posterolateral corner (PLC) structures interact functionally with the anterior cruciate ligament (ACL). They act as primary restraint to varus and external rotation. The ACL acts as a secondary restraint to varus angulation. Because of joint conformity of the lateral compartment of the knee and the inherent bony instability of the lateral tibial plateau, injuries of the PLC structures create a set of marked instability[5]. When this is combined with an ACL

tear, the instability is frank.

In the present study, mean and SDs for age was 25.70±5.128. Mean and SDs for time since ACL tear was 3.86±1.210. Mean and SDs for BMI was 26.917±2.99. Mean and SDs for ligamentous laxity was 4.54±1.150. (Table No. 1). 141 (83.4%) patients were recorded in 16-30 years age group while 28 (16.6%) patients were recorded in 31-40 years age group. (Table No. 2). 108 (63.9%) male and 61 (36.1%) female patients were recorded. (Table No. 3). 56 (33.1%) patients got injuries from hockey while 113 (66.9%) patients got injuries from playing football. (Table No. 4). 78 (46.2%) patients had injury in the right knee, 46 (27.2%) patients had injury in their left knees while 45 (26.6%) patients had injuries in their bilateral knees. (Table No. 5). 41 (24.3%) patients were recorded obese. (Table No. 6). As per frequencies and percentages for posterolateral corner injury, 36 (21.3%) patients were recorded with posterolateral corner injury. (Table No. 7).

In an ACL-PLC injured knee, an untreated PLC injury causes a significant increase in force on the ACL graft and may be a leading cause of graft failure. So the reconstruction should be combined[6]. In the setting of combined ACL-PLC reconstruction procedures, femoral tunnel intersection has been reported to be high.[5] The close proximity of ACL and lateral collateral ligament tunnels in the lateral femoral condyle carries the risk of bone weakening and tunnel collision and hence compromises graft function [7,14].

Published data are difficult to assess, as most studies pooled patients with injuries to multiple medial and lateral ligaments, chronic and acute injuries, and/or one and both cruciate ligaments[4]. M Agha et al in a retrospective review multiligamentous knee injuries especially posterolateral corner injury in combination of anterior cruciate ligament injuries in 33.9% of patients[8] which as compared to this study, 36 (21.3%) patients were recorded with posterolateral corner injury. (Table No. 7).

In another study by Temponi EF et al, one hundred sixty-two patients with MRI following ACL rupture were evaluated and thirty-two patients (19.7%) had concomitant injury to at least one structure of the PLC [9,15,16] which as compared to this study, 36 (21.3%) patients were recorded with posterolateral corner injury. (Table No. 7).

CONCLUSION

It is of utmost importance to detect and treat the PLC injury properly. As PLC injuries are not usually diagnosed in the first place which can lead to failure of ACL reconstruction. Therefore, a thorough understanding of functional interactions of the PLC, specific history taking, and precise physical examination are required for the diagnosis and treatment

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Muhammad R	✓	×	✓	×	✓	×
Shah SDA	✓	✓	×	✓	✓	×

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

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ORIGINAL ARTICLE

MORTALITY AND LENGTH OF HOSPITAL STAY IN PATIENTS WITH LIVER CIRRHOSIS BASED ON THEIR MELD SCORE

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ABSTRACT

Objective: This study aimed to find the frequency of mortality and length of hospital stay in patients with liver cirrhosis based on their MELD score at admission. We also aim to study prognostication in cirrhotic patients using MELD scores at admission.

Materials and Methods: A descriptive cross-sectional study was conducted in the Medical Department of Khyber Teaching Hospital Peshawar from 17/10/2019 to 17/4/2020. A total of 100 patients were observed. Investigations required for the calculation of the MELD score were done from the hospital laboratory. Admitted patients were followed for study outcome in-hospital mortality and length of hospital stay for at least 30 days. All information was noted in the predesigned proforma.

RESULTS: One hundred patients were analyzed among which the mean age was 53 years with SD ± 7.11. Forty-two percent were male and 58% were female. In-hospital mortality was observed in 8(8%) while mean hospital stay was 7 days with a standard deviation ± 4.12 in patients presenting with liver cirrhosis mortality was observed in patients with a MELD score of less than 20. However, mortality was 6.89% in patients with a MELD score of 20-29 and 42.85 % in those with a MELD score of more than 30.

Conclusion: The frequency of in-hospital mortality was 8% and the mean length of hospital stay was 7± 4.12 days in patients with liver cirrhosis. For patients with higher MELD scores, the hospital stay and mortality increased.

Keywords: in-hospital mortality, mean length of hospital stay, MELD score

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INTRODUCTION

Cirrhosis is a major global health problem, especially in Pakistan due to the relatively high prevalence of chronic viral hepatitis.[1] Liver cirrhosis causes 1.2 million deaths yearly worldwide, ranking as the 14th leading cause of death in the world.Cirrhosis ranks as one of the most common causes of death in our country as well. Hospital mortality secondary to decompensated cirrhosis is high and is one of the leading causes of death in hospitalized patients.

The child-Pughre was first proposed by Child and Turcotte to predict the operative risk in patients undergoing Portosystemic shunt surgery for variceal bleeding and was subsequently found to predict the long-term survival of cirrhotic patients[2,3]. The child-Pugh score includes ascites, hepatic encephalopathy (HE), total bilirubin, albumin, and prothrombin time or international normalized ratio (INR). Child-Pugh score has been used to assess the severity of liver dysfunction. A more recently developed prognostic scoring system for patients with cirrhosis, the Model for End-stage Liver Disease (MELD), was developed for selecting cirrhotic patients to predict the survival of patients undergoing trans jugular intrahepatic-porto-systemic shunts (TIPS)[4]. The present version of the MELD score incorporates three objective variables, including total bilirubin, creatinine, and INR. Currently, it has been used to rank the priority of liver transplant candidates. The MELD scoring system has been extended to prognosticate for patients with complications of cirrhosis.

Prognostic models are useful for estimating disease severity and survival and can serve as helpful medical decision-making tools for guiding patient care.[5-7] Studies have demonstrated that the MELD sore has been useful in predicting mortality in several groups of patients, including patients on the waiting list for liver transplantation, hospitalized patients with hepatic decompensation, ambulatory patients with non-cholestatic liver disease, and patients with primary biliary cholangitis.[8] In a study by Roth et al., the in-hospital mortality was 0.8%, 2.8%,3.0% and 11. 6% while the mean duration of hospitalization in days was 7.2, 8.7, 10.3, and 12.3 in patients with MELD scores of <15, 15-19, 20-29, and >30, respectively.

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This study aims to find the frequency of in-hospital mortality and length of hospital stay in patients with liver cirrhosis based on their MELD score at admission. While the MELD score has been used to allocate organs for liver transplantation, to predict outcomes in patients with cirrhosis undergoing non-transplantation surgical procedures, and to predict mortality in acute alcoholic hepatitis and acute varietal hemorrhage, it has not been used widely for predicting in-hospital mortality and length of hospital stay in cirrhotic patients. We therefore aim to study it for prognostication in cirrhotic patients which will help us regarding advanced directives and patient and attendant counseling in addition to mortality and hospital stay.

The objectives of this study are to determine the frequency of in-hospital mortality and mean length of hospital stay in patients with liver cirrhosis and to compare the mean hospital, stay with MELD score categories in patients presenting with liver cirrhosis.

The different operational definition of MELD score: The MELD score was calculated according to the MELD 2016 formula using the first available routine laboratory data set during the patient's hospital admission:

MELD score = 11.2 log, (INR) + 3.78 log, (serum bilirubin [mg/dL] + 9.57 log, (serum creatinine [mg/dL]) + 6.43.

It was divided into four categories such as <15, 15-19, 20-29, and >30. The higher the MELD score, the more advanced the liver cirrhosis.

Liver Cirrhosis: It was defined as increased liver parenchymal echogenicity on abdominal ultrasound with a duration of at least two years, irrespective of the cause.

Length of Hospital Stay: It was defined as death or discharge home of the patient during the current hospitalization.

MATERIAL AND METHODS

This descriptive cross-sectional study was conducted in the Medical Department of Khyber Teaching Hospital Peshawar. The study was conducted after approval from the ethics and research committees of the hospital. All patients meeting the inclusion criteria were included in the study. A written informed consent was obtained from all patients included in the study. The study was completed in 6 months from 17/10/2019 to 17/4/2020. Based on the available statistics for variables of our interest (i.e. in-hospital mortality), the sample size was 100 taking the mean length of hospital mortality in MELD <15, 7.2 (9 SD) patients with cirrhosis and MELD score of >30, with 95% confidence level using WHO sample size calculator. Consecutive non-probability sampling was used for the collection of data. All adult patients aged 20 to 60 years and of any gender were included in the study. Also, patients admitted with liver cirrhosis of at least two-year duration irrespective of the cause. Patients on drugs significantly influencing MELD parameters e.g. anticoagulants, vitamin K, etc were excluded from the study. Also, the patients have conditions that affect MELD parameters such as chronic kidney disease, obstructive jaundice, and septicemia. Strict exclusion criteria were followed to limit confounders in the study results.

A detailed history was taken for patients regarding the duration of illness and the number of comorbidities and a relevant clinical examination was performed for vital signs, clinical features, and complications of liver cirrhosis. Investigations required for calculation of MELD scores such as serum creatinine, bilirubin, and INR are done from the hospital laboratory at the patient's admission in addition to baseline investigations such as ultrasound abdomen. The MELD score was calculated according to the formula. MELD score = 11.2 log, (INR) + 3.78 log, (serum bilirubin [mg/dL] + 9.57 log, (serum creatinine [mg/dL]) + 6.43. Admitted patients were followed for study outcomes in-hospital mortality and length of hospital stay for at least 30 days. All information was noted through a designated proforma.SPSS version 23.0 was used for the analysis of the data. Continuous variables such as age, duration of illness, and length of hospital stay were presented as mean + standard deviation (SD). Qualitative variables such as gender, MELD score, and co-morbidity were presented as frequencies and percentages. The results were stratified against age, gender, duration of illness, co-morbidities, and MELD category. The Chi-square test was used for in-hospital mortality and the independence test was applied for length of hospital stay. P-values were calculated and p-value <0.05 was considered as statistically significant. The results were presented in the form of tables and graphs.

RESULTS

In this study age distribution among 100 patients was analyzed as 15(15%) patients were in the age range 20-40 years and 85(85%) patients were in the age range 41-60 years. The mean age was 53 years with SD ± 7.11. (Table No 1)

Gender distribution among 100 patients was analyzed as 42(42%) patients were male and 58(58%) patients were female. (Table No 1)

Duration of illness among 100 patients was analyzed as 41(41%) patients had a duration of illness ≤5 years and 59(59%) patients had a duration of illness >5 years. The mean duration of illness was 6 years with SD ± 5.78. (Table No 1)

The status of hypertension among 100 patients was analyzed as 83(83%) patients had a history of hypertension and 17(17%) patients were non-hypertensive. (Table No 1)

The status of ischemic heart disease among 100 patients was analyzed as 33(33%) patients had ischemic heart disease while 67(67%) patients didn't have ischemic heart disease. (Table No 1)

The status of diabetes mellitus among 100 patients was analyzed as 26(26%) patients were diabetic and 74(74%) patients were non-diabetic. (Table No 1) MELD Score among 100 patients was analyzed as 22(22%) patients had MELD score <15, 27(27%) patients had MELD score 15-19, 31(31%) patients had MELD score 20-29 and 20(20%) patients had MELD score ≥30. (Table No 1)

The outcome among 100 patients was analyzed as hospital mortality was observed in 8(8%) patients while the mean hospital stay was 7 days with a standard deviation ± 4.12in patients presenting with liver cirrhosis. (Table No 1,2)

Stratification of outcome (in-hospital mortality and mean hospital stay) for age, gender, duration of illness, serious of co-morbidities, and MELD category is given in table 1 and 2

Table 1A: baseline characteristics of the participants

AGE DISTRIBUTION	**AGE**	**FREQUENCY**	**PERCENTAGE**
	20-40 years	15	15%
	41-60 years	85	85%
	Total	100	100%
	Mean age = 53 years	Standard Deviation ± 7.11	
GENDER DISTRIBUTION	GENDER	FREQUENCY	PERCENTAGE
	Male	42	42%
	Female	58	58%
	Total	100	100%
DURATION OF ILLNESS	DURATION	FREQUENCY	PERCENTAGE
	≤ 5 years	41	41%
	> 5 years	59	59%
	Total	100	100%
History of HYPERTENSION	History of HYPERTENSION	FREQUENCY	PERCENTAGE
	Yes	83	83%
	No	17	17%
	Total	100	100%
ISCHEMIC HEART DISEASE	ISCHEMIC HEART DISEASE	FREQUENCY	PERCENTAGE
	Yes	33	33%
	No	67	67%
	Total	100	100%
DIABETES MELLITUS	DIABETES	FREQUENCY	PERCENTAGE
	Yes	26	26%
	No	74	74%
	Total	100	100%
MELD SCORE	MELD SCORE	FREQUENCY	PERCENTAGE
	< 15	22	22%
	15-19	27	27%
	20-29	31	31%
	≥30	20	20%
	Total	100	100%
IN-HOSPITAL MORTALITY	MORTALITY	FREQUENCY	PERCENTAGE
	Yes	8	8%
	No	92	92%
	Total	100	100%
	The mean hospital stay was 7 days with a standard deviation ± 4.12		

Table 1B: baseline characteristics of the participants

STRATIFICATION OF IN-HOSPITAL MORTALITY W.R.T AGE	MORTALITY	40-20 years	60-41 years	Total	P value
	Yes	1	7	8	0.8364
	No	14	78	92	
	Total	15	85	100	
STRATIFICATION OF IN-HOSPITAL MORTALITY W.R.T GENDER	MORTALITY	Male	Female	Total	P value
	Yes	3	5	8	0.7880
	No	39	53	92	
	Total	42	58	100	
STRATIFICATION OF IN-HOSPITAL MORTALITY W.R.T DURATION OF ILLNESS	MORTALITY	≤ 5 years	> 5 years	Total	P value
	Yes	1	7	8	0.0874
	No	40	52	92	
	Total	41	59	100	
STRATIFICATION OF IN-HOSPITAL MORTALITY W.R.T HYPERTENSION	MORTALITY	Yes	No	Total	P value
	Yes	6	2	8	0.5299
	No	77	15	92	
	Total	83	17	100	
STRATIFICATION OF IN-HOSPITAL MORTALITY W.R.T ISCHEMIC HEART DISEASE	MORTALITY	Yes	No	Total	P value
	Yes	4	4	8	0.2863
	No	29	63	92	
	Total	33	67	100	
STRATIFICATION OF IN-HOSPITAL MORTALITY W.R.T DIABETES MELLITUS	MORTALITY	Yes	No	Total	P value
	Yes	4	4	8	0.1066
	No	22	70	92	
	Total	26	74	100	

Table 1C: baseline characteristics of the participants

STRATIFICATION OF IN-HOSPITAL MORTALITY W.R.T MELD SCORE	MORTALITY	< 15	19-15	29-20	≥30	Total	P value
	Yes	0	0	2	6	8	0.0005
	No	22	27	29	14	92	
	Total	22	27	31	20	100	

DISCUSSION

Clinical decision support systems been have shown to improve the quality of patient care and the health care costs.[9,10,11] However, little is known about their overall impact on patient outcomes.[12,13]The laboratory-based model for end-stage liver disease (MELD) score reflects the function of the kidney, liver, and extrinsic coagulation pathway and might be used as a general prognostic tool for the assessment of patients[14,15]. The well-established MELD score depends on three readily available laboratory variables, that is, serum creatinine, serum bilirubin, and the international normalized ratio (INR). It has been developed and validated to predict mortality in patients with portal hypertension undergoing placement of transjugular intrahepatic portosystemic shunts.[15-17]

In the current study, 100 patients were analyzed among which the mean age was 53 years with SD ± 7.11. 42% percent of patients were male and 58% of patients were female. In-hospital, mortality was observed in 8(8%) patients while the mean hospital stay was 7 days with a standard deviation ± 4.12 in patients presenting with liver cirrhosis.

Similar results were observed in another study conducted by Roth JA et al who reported that on admission, MELD scores of 15 to 19, 20 to 29, and ≥30 points (reference <15 points) showed increased hazard ratios (HRs) for in-hospital mortality in uni- and multivariable analysis with an adjusted HR of 2.52 (95% confidence interval [CI], 1.81-3.49; P<.001), 2.70 (95% CI, 1.89-3.84; P<.001), and 8.00 (95% CI, 3.91-16.39; P<.001), respectively.[18] The in-hospital mortality was 7.2%. Increased MELD scores of 15 to 19, 20 to 29, and ≥30 points were positively associated with LOS and the number of comorbidities in uni- and multivariable analysis.

Another study conducted by Yingying Li et al reported that in his study a total of 826 patients with liver cir-

rhosis and AUGIB were included. Median age was 55.27 years (range: 6.28 to 95.13).[19] Among them, 564 (68.3%) patients were male. Major etiology of liver diseases included hepatitis B virus infection (n=208, 25.2%) and alcohol abuse (n=219, 26.5%). A majority of patients had Child-Pugh class B (339/776, 51.4%). The median MELD score at admission was 6.37 (-7.52 to 38.22). Five hundred and twenty-two patients underwent endoscopy. No, mild, moderate, and severe esophageal varices were observed in 32 (6.1%), 24 (4.6%), 54 (10.3%), and 412 (78.9%) patients, respectively. As for the treatment of AUGIB, 508 (61.5%) patients underwent endoscopic therapy, 20 (2.4%) patients underwent Sengstaken Blackmore tube placement, 750 (90.8%) patients received somatostatin and/or octreotide, 544 (65.9%) patients received blood transfusion, 813 (98.4%) patients received PPIs, and 8 (1.0%) patients underwent surgery. Information regarding 5-day rebleeding was unavailable in 4 patients because some of their medical records were missing. Five-day rebleeding rate was 14.0% (115/822). In-hospital mortality was 5.7% (47/826). Median length of hospital stay was 11.23 days (range: 0.06 to 100.55).

Another study conducted by Peng Y et al reported that a total of 145 patients with a diagnosis of liver cirrhosis and acute UGIB between July 2013 and June 2014 were retrospectively analyzed (male/female: 94/51; mean age: 56.77±11.33 years; Child-Pugh class A/B/C: 46/64/35; mean Child-Pugh score: 7.88±2.17; mean MELD score: 7.86±7.22).[20] The in-hospital mortality was 8% (11/145). Areas under the receiving-operator characteristics curve (AUROC) for predicting in-hospital mortality were compared between MELD and Child-Pugh scores. AUROCs for predicting the in-hospital mortality for Child-Pugh and MELD scores were 0.796 (95% confidence interval [CI]: 0.721-0.858) and 0.810 (95% CI: 0.736-0.870), respectively. The discriminative ability was not significantly different between the two scoring systems (P=0.7241).

CONCLUSION

Our study concludes that the higher the MELD Scores on presentation, the higher the mortality and increased length of stay for the patients with liver cirrhosis. Hence, the MELD score can be used as a tool for the prognosis of these patients.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Khan HA	✓	×	✓	×	✓	×
Din NU	✓	✓	×	✓	✓	×
Iqbal S	✓	×	×	✓	×	×
Abbas G	×	×	✓	✓	×	✓
Yousaf M	✓	✓	×	×	✓	×
Shah BM	×	✓	✓	×	✓	×
Umam S	×	×	×	✓	×	✓

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

Ethical Approval:

This Manuscript was approved by the Ethical Review Board of Khyber Medical College, Peshawar Vide No. 721/DME/KMC.

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ORIGINAL ARTICLE

LAPAROSCOPIC EXPLORATION FOR INFANTILE HYPERTROPHIC PYLORIC STENOSIS: AN EXPERIENCE AT TERTIARY CARE HOSPITAL

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ABSTRACT

Objectives: This study aims to share our experience of laparoscopic exploration for infantile hypertrophic pyloric stenosis.

Material and methods: This retrospective study was conducted in the Department of Pediatric Surgery, Khyber Teaching Hospital, Peshawar from June 2017 to July 2020. This study includes all patients whose diagnosis of infantile hypertrophic pyloric stenosis (IHPS) was confirmed through ultrasound parameters and laparoscopic pyloromyotomy was performed. Data was retrieved from the laparoscopic surgery record. Retrieved data was tabulated and fed in SPSS 25 for analysis.

Results: This study included 42 patients with a mean age of 50.28 ±18.5days and a mean weight of 3.35±0.76 kg. Male patients were 57 % while females were 43 %. The mean time to resuscitate the patient pre-operatively was 34.6±15.4 hours while the mean postoperative hospital stay was 45±12.47 hours. The mean operative time was 31.6±10.4 min. Operative time decreased with time depicting improvement in our learning curve (p=0.004). The method of working instrument placement had no impact on operative time (p=0.337). Meantime to full oral feed was 9.7±5.1 hours. We did not encounter mucosal perforation or incomplete myotomy. No surgery was converted to open.

Conclusion: Laparoscopic pyloromyotomy is a safe and effective method of treatment for infantile hypertrophic pyloric stenosis.

Keywords: laparoscopic pyloromyotomy, pyloric stenosis, IHPS

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INTRODUCTION

Infantile hypertrophic pyloric stenosis (IHPS) is one of the common surgical conditions in neonates and infants. The initial presentation is with non-bilious vomiting usually starting at the age of two weeks, leading to metabolic derangement of hypokalemia, hypochloremia, and metabolic alkalosis.[1] Ultrasonography parameters are used as the method of choice to confirm the diagnosis. A pyloric canal length of greater than 16mm and pyloric muscle thickness of greater than 4mm is considered diagnostic[2].

Pyloromyotomy is the treatment of choice after initial resuscitation. Ramstedt introduced the standard procedure of pyloromyotomy, in which the pylorus seromuscular layer is split longitudinally to expose the mucosa. Open pyloromyotomy was practiced widely around the globe with excellent results. Currently, minimally invasive surgery is on the rise and reported with many advantages over conventional open procedures. Likewise, laparoscopic pyloromyotomy (LPM) was practiced by different centers in the world, with published results comparable with open techniques.[3] No clear benefit of LPM has been reported in the literature, although it has been labeled as a safe procedure in experienced hands.[4] A laparoscopic-assisted pyloromyotomy is also a modification published with excellent results and as the transition of open to the laparoscopic technique.[5] As with other procedures, LPM has a learning curve and the complication rate decreases with experience as reported.

LPM is gaining popularity and has been adopted by many pediatric surgeons throughout the world. The purpose of this study is to further clarify the issue of the procedure of choice of IHPS by sharing our early experience of laparoscopic pyloromyotomy.

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MATERIAL AND METHODS

This retrospective observational study was conducted in the pediatric surgery unit of Khyber Teaching Hospital from June 2017 to July 2020. This study includes a total of 42 patients who were admitted to the unit for management of IHPS. IHPS diagnosis was confirmed using ultrasound parameters of a pyloric canal length of greater than 16mm and pyloric thickness of 4mm. Patients diagnosed with IHPS and operated by laparoscopic technique were included in the study.

Data was collected from the laparoscopic record after permission for the study was granted by the Institutional Research and Ethical Board (IREB) of Khyber Medical College. Collected data included age, gender, weight, preoperative resuscitation time, operative time, time to full oral feed, postoperative hospital stays, and complications of the procedure. The collected data was revised, tabulated, coded, and fed in PC using the statistical analysis program SPSS-25. Data was presented and statistical analysis was carried out according to the type of data. Mean and standard deviation were calculated for numerical data like age, weight, gender, operative time, hospital stay, pre-operative resuscitation time, and time to full oral feed. While frequency and percentages were calculated for categorical data like operative time distribution, and method of working instrument placement. The Chi-square test was used for categorical data.

RESULTS

During the study period of 3 years, a total of 42 patients underwent laparoscopic exploration for infantile hypertrophic pyloric stenosis. The mean age of the patients was 50.28 ±18.5days (minimum 25 days and maximum 120 days). Further distribution showed, patients, having an age less than 4 weeks were 14.3%, 4 to 8 weeks were 64.3%, and above 8 weeks 21.4%. The weight of the patients was 3.35±0.76 kg. Further distribution showed that patients having weight less than 3 kg were 21.4%, 3 to 5 kg were 69%, and above 5 kg were 9.5%.

The mean pre-operative resuscitation time was 34.6±15.4 hours while the mean post-operative hospital stay was 45±12.47 hours. Time to full oral feed was calculated with a mean of 19.7±5.1 hours. Time to full oral feed was further cross-tabulated with the learning curve and decreased time in patients operated on in the second half.

A stab incision was given in 33.3% of patients as a method of working instrument placement while formal ports were inserted in 66.7% of patients.

The mean operative time was 31.6±10.4 min (minimum of 15 min and maximum of 60 min). Further distribution was done, with patients having operative time less than 25 min were 23.8 %, operative time of 25 to 40 min were 57.1%, and operative time greater than 40 min were 19%. Operative time was cross-tabulated with the learning curve and method of working instrument placement (stab incision/port placement). A decline in Operative time was observed with increasing cases depicting improvement in the learning curve (p=0.04) while the method of working port placement had no impact on operative time(p=0.337) (Tables 1 and 2)

Complications of laparoscopic pyloromyotomy were analyzed. Conversion to open surgery was zero percent. Mucosal perforation and incomplete myotomy rate were also recorded as 0%.

DISCUSSION

Table 1: Cross-tabulation of operative time with the learning curve

		Learning curve		Total	P Value
		Initial half	Second half		
Operative time	Less than 25 min	1	9	10	0.004
	25 to 40 min	13	11	24	
	> 40 min	7	1	8	
Total		21	21	42	

Table 2: Cross-tabulation of operative time with the method of working instrument placement

		Mechanism of working instrument placement		Total	P Value
		Ports placement	Stab incision		
Operative time	Less than 25 min	6	4	10	0.377
	25 to 40 min	15	9	24	
	> 40 min	7	1	8	
Total		28	14	42	

Pyloromyotomy was introduced as a treatment of choice for IHPS by Conrad Ramstedt. Since then, through a period of transformation, this procedure became the standard in treating IHPS. [6] Pyloromyotomy was initially performed through the upper midline incision and then later on modified to the right upper transverse incision.[7] Currently, some centers use semicircular supraumbilical incisions to perform pyloromyotomy. More recently double-Y pyloromyotomy has been introduced.[8] Laparoscopy has been extended to various pediatric procedures. In 1991 1st laparoscopic pyloromyotomy was introduced by Alian. Since then, this procedure has gained popularity amongst pediatric surgeons worldwide and is reported as an effective technique in expert hands. [9]

IHPS is an acquired condition and still, Children are usually diagnosed and present late for treatment having a deranged metabolic profile of hyperkalemic metabolic alkalosis. Such a deranged metabolic profile needs resuscitation pre-operatively for improved outcomes.[10] Age of presentation varies among reports and gestational age also affects presentation age.[11]The age of presentation was 50.28 days in the current study. Late diagnosis and referral were the main reasons for such a late presentation. Pre-operative resuscitation was required for all patients with a mean time of 34.6 hours.

Operative time has been an important variable to support the technique of pyloromyotomy. The literature review showed that the mean operative time for LPM ranges from 20 min to 60 min. [12,13] Initial in the learning curve of LPM, the operative time has been reported as high. [14] Cambel et all report a slightly higher operative time for LPM as compared to open. [15] The operational definition of operative time has been lacking in most of the reports on pyloromyotomy. We calculated the operative time from 1st incision to the last stitch. Operative time in the current study is 31.6±0.4 min. Operative time was high initially in the learning curve and then decreased significantly in cases operated in the second half of the series ($p=0.04$). the same result regarding the learning curve has been published by Oomen et all. [16]

Postoperative hospital stays have been reported in different studies in the range of 48 to 72 hours. [8] Postoperative hospital stay is mostly related to full oral feed in LPM. Postoperative emesis prolongs hospital stay. In the current study mean postoperative hospital stay is 45±12.47 and the learning curve has an impact on it, as this time decreases with improvement in the learning curve. Less operative time, excellent recovery, and aggressive feeding postoperatively have it role in decreasing stay after surgery. [12]

Stab incision as a method for instrument placement has been used in certain pediatric surgery procedures to minimize cost and improve cosmesis. Working instruments that are not repeatedly exteriorized were mainly used through stab incisions.[17] We used Stab incision for access of two working instruments in 14 cases and proper ports were inserted in the rest of the cases. Analysis clarified that the mechanism of access of the working instruments has no effect on operative time in the current study.

Conversion of LPM to open is one of the complications reported in the literature. One meta-analysis reports a conversion rate of 3 to 5 %. Technical issues and the low experience of the surgeon were the reasons for this conversion.[18,19] In the current series, none of the procedures was converted to open. The experience of the surgeon is the main factor [20]. We haven't experienced such complications in our study.

CONCLUSION

Laparoscopic pyloromyotomy is a safe and effective procedure for infantile hypertrophic pyloric stenosis. There is a learning curve for laparoscopic pyloromyotomy. Operative time significantly decreases with the experience of the surgeon in LPM. A randomized controlled trial is required to evaluate the comparative benefits of LPM and conventional open surgery.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Imran M	✓	×	✓	×	✓	×
Ali S	✓	✓	×	✓	✓	×
Rahman FU	✓	×	×	✓	×	×
Saeed K	×	×	✓	✓	×	✓
Ghyur MS	×	×	✓	✓	×	✓

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

Ethical Approval:

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ORIGINAL ARTICLE

MEGALOBLASTIC ANEMIA IN ADULTS WITH NEW-ONSET PANCYTOPENIA ON PERIPHERAL SMEAR

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ABSTRACT

Objectives: To determine the frequency of megaloblastic anemia in patients with a new onset of pancytopenia on peripheral smear.

Materials and Methods: This cross-sectional study was conducted in the Department of Medicine, Khyber Teaching Hospital, Peshawar from 1st February 2021 to 31st July 2021. A total of 109 patients participated in the study after fulfilling the inclusion criteria. Patients with pancytopenia on peripheral smear underwent bone marrow biopsy. Megaloblastic anemia as the cause of pancytopenia was confirmed after bone marrow biopsy reports were available. The results were stratified into tables based on study participants' demographics. Data was analyzed by SPSS 23 and presented in tables.

Results: Megaloblastic anemia was observed in 42.2% of patients presenting with pancytopenia on peripheral smear. 66.1% of these were male and 33.9% were female.

Conclusion: A large number of patients with pancytopenia on initial investigations were diagnosed to be suffering from megaloblastic anemia in our study.

Keywords: Pancytopenia; Megaloblastic anemia; Peripheral smear; Bone marrow biopsy

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INTRODUCTION

Megaloblastic anemia (MA) refers to a variety of anemias that share the features of having macrocytes on the peripheral blood smear and megaloblasts in the bone marrow.[1] Megaloblastic anemia's pathophysiology is mostly centered on poor DNA synthesis, which prevents nuclear division. Contrarily, cytoplasmic maturation has less of a problem. The huge size of megaloblasts is explained by the asynchronous maturation that results between the nucleus and cytoplasm of erythroblasts. The most common cause of megaloblastic anemia in our part of the world is undernutrition, particularly a deficiency in vitamin B12 and folate, which are essential for DNA synthesis. Adults require 50 to 100 ug of folic acid per day.[2]

The jejunum is where folic acid is largely absorbed. Folic acid can be stored by humans for 3–4 months on average.[3] Its lack is primarily caused by insufficient intake, such as in cases of malnutrition, either from starvation or chronic alcohol abuse, or increased demand, such as in cases of pregnancy, hemolysis, hemodialysis, and malabsorption.

Pancytopenia which encompasses anemia, leucopenia, and thrombocytopenia is the hallmark of megaloblastic anemia. Pancytopenia occurs when the hemoglobin level is below 9 g/dl, the leucocyte count is below 4 x 10^3/l, and the platelet count is below 100 x 10^3/l.[4] Pancytopenia can be caused by several hematopoietic and non-hematopoietic conditions, including those that reduce the production of hematopoietic cells, cause the marrow to be replaced by abnormal cells, inhibit marrow growth and differentiation, cause hematopoiesis to fail and result in cell death, cause defective cell formation, cause antibody-mediated cell sequestration or destruction, or trap cells in an enlarged and overactive reticuloendothelial system.[1]

Due to genetic diversity and various ethnic communities, the prevalence of megaloblastic anemia as a cause of pancytopenia varies widely among studies, ranging from 16.67% to 74.04%.[1] Incidence of pancytopenia has a bimodal presentation that is typically found in children and adults in their third and fourth decades. Anemia, bicytopenia, or pancytopenia may be present. The mean corpuscular volume (MCV), which is often greater than 100fL, on the peripheral smear indicates anemia with macrocytosis in most cases.[1,2]

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This study is intended to ascertain the prevalence of megaloblastic anemia in persons with newly diagnosed pancytopenia on peripheral smears. It is also imperative to gather local evidence to determine the true burden of this disease because no previous research has been done on the subject. This study will open the door for additional investigation and assist in designing the diagnostic and treatment approach for patients with pancytopenia from megaloblastic anemia.

MATERIALS AND METHODS

This cross-sectional study was conducted in the Department of Medicine, Khyber Teaching Hospital, Peshawar from 1st February 2021 to 31st July 2021. The Department of Medicine is a four-unit department with 24-hour emergency services and a daily outpatient department run from 9 am to 3 pm, Monday to Friday. A total of 109 patients were enrolled in the study. The sample size was calculated by using the expected frequency of megaloblastic anemia=16.67% [1] with a Margin of error of 7% and confidence level 95%. Non-probability consecutive sampling technique was used. Patients of both genders between 18-60 years of age with new onset pancytopenia on peripheral smear were included in the study. Patients with a history of malignancy, any bleeding disorder, decompensated chronic liver parenchymal disease, hypothyroidism, alcohol ingestion, and pregnant females (proven on ultrasound) were excluded from the study.

109 patients fulfilling the inclusion criteria from outdoor and in-door departments of Medicine, KTH, Peshawar were included in the study after permission from the ethical committee. Baseline demographic information of patients (age, gender, weight on the weighing scale) was taken. Informed consent was taken ensuring confidentiality and the fact that there was no risk involved to the patients while taking part in this study. Bone marrow biopsy was performed under aseptic conditions by a qualified pathologist. Data regarding megaloblastic anemia was noted as per the operational definition by the researcher and recorded on specially designed proforma. Data was entered and analyzed using the statistical analysis program SPSS version 23. Frequencies and percentages were computed for categorical variables like gender and megaloblastic anemia. Mean + SD was used to calculate quantitative variables like age and weight. Megaloblastic anemia was stratified for age, gender, and weight.

RESULTS

The age range in this study was from 18 to 60 years with a mean age of 35.85 + 6.92 years and a mean weight of 79.49 + 9.84 kg. Male patients were 66.1% and females were 33.9%. Megaloblastic anemia was observed in 42.2% of patients as shown in Table 1. Stratification of megaloblastic anemia for age, gender, and weight are shown in Tables 2, 3, and 4 respectively.

Table 1: Frequency of patients according to megaloblastic anemia n = 109

Megaloblastic anemia	Frequency	%age
Yes	46	42.2%
No	63	57.8%
Total	109	100%

Table 2: Stratification of megaloblastic anemia for age

Age (years)	Megaloblastic anemia	
	Yes	No
18-40	22(28.9%)	54(71.1%)
41-60	24(72.7%)	9(27.3%)
Total	46(42.2%)	63(57.8%)

Table 3: Stratification of megaloblastic anemia for gender

Gender	Megaloblastic anemia	
	Yes	No
Male	28(38.9%)	44(61.1%)
Female	18(48.6%)	19(51.4%)
Total	46(42.2%)	63(57.8%)

Table 4: Stratification of megaloblastic anemia for weight

Gender	Megaloblastic anemia	
	Yes	No
<80	14(20.9%)	53(79.1%)
>80	32(76.2%)	10(23.8%)
Total	46(42.2%)	63(57.8%)

DISCUSSION

A typical hematologic issue seen in clinical practice is pancytopenia. It is identified by the peripheral smear test results showing hemoglobin levels below 9 g/dL, total leukocyte counts below 4,000/uL, and platelet counts below 100,000/uL without a prior history of pancytopenia.[2,5] Its causes are varied. The evaluation of pancytopenia's etiology begins with a history, physical exam, and laboratory tests, including the fundamental hematological, biochemical, radiological, and histological tests. Pancytopenia's genesis can be broadly divided into two types: those that are central and involve production-related diseases, and those that are peripheral and entail greater destruction-related disorders. These factors may have an individual or combined effect on pancytopenia. While peripheral cell death can be linked to numerous autoimmune diseases (such as systemic lupus erythematosus, rheumatoid arthritis, and splenic sequestration), pancytopenia caused by decreased production is typically secondary to dietary inadequacies. The severe acute respiratory syndrome coronavirus 2 has been linked to pancytopenia in the current COVID-19 pandemic (SARS-CoV 2).[1]

The evaluation of bone marrow is a quick and safe

invasive operation that is only somewhat uncomfortable to execute. It is a crucial diagnostic tool for assessing pancytopenia cases. In 75% of instances, a bone marrow aspiration confirms the pancytopenia diagnosis.[6] Megaloblastic anemia, hematological cancers, and hypoplastic marrow are the most frequent etiologies identified. According to a 2013 Indian study, the most frequent causes of myelosuppression are megaloblastic anemia, infections, hypersplenism, and myelosuppression brought on by cancer, chemotherapy, medication toxicity, or radiotherapy. Megaloblastic anemia, followed by aplastic anemia, was found to be the most common cause in an earlier study conducted in India.[7] These findings are seconded by a local study conducted in Karachi in 2013, which concluded that the most common cause of pancytopenia is megaloblastic anemia followed by acute myeloid leukemia and aplastic anemia.[8]

Megaloblastic anemia is identified by the simultaneous presence of MCV >100fL and MCH >32fL on a complete blood count and segmented neutrophils on a peripheral smear. According to a study by Hossain MZ, et al., persons with newly diagnosed pancytopenia had a 16.67% frequency of megaloblastic anemia.[5] Another study by Gayathri BN, et al. revealed that adults with newly diagnosed pancytopenia had a prevalence of megaloblastic anemia equal to 74.04%.[4] The two micronutrients, folate, and cobalamin, which work together to produce the thymidylic acid required for DNA synthesis, are involved in the pathogenesis of megaloblastic anemia. Therefore, a shortage in the use of folate is what leads to the megaloblastic arrest in cobalamin insufficiency. Vegetarianism-related dietary vitamin B12 insufficiency results in hyper-homocysteinemia, which ultimately becomes the cause of megaloblastic anemia.[8]

Since strict vegetarianism is not practiced in Pakistan, poverty, poor cooking practices, or food taboos are likely the root causes of vitamin B12 insufficiency, which still needs additional investigation. Physicians should treat patients who present with anemia symptoms including pallor and weakness and/or who are later confirmed with anemia with a high index of suspicion for vitamin B12 insufficiency.

The clinical-hematological and histological profiles of 109 patients with pancytopenia associated with megaloblastic anemia were examined in the current investigation. In our investigation, megaloblastic anemia was determined to be the cause of pancytopenia in 42.2% of the cases. Other local research has supported similar findings.[8,10]

Characteristic bone marrow results in our investigation allowed for the diagnosis of megaloblastic anemia. Megaloblastic anemia is becoming more common, which has been attributed to the increasing prevalence of nutritional anemia in India. Due to sociological and geographic parallels, nutritional anemia may also be to blame for the rise of megaloblastic anemia in Pakistan. In Pakistan, vitamin B12 deficiency is more common than folate deficiency among nutritional anemias.[11] It was beyond the scope of this study to look into the causes of megaloblastic anemia. The Pancytopenia series from Tariq Aziz et al.[12] and Iqbal et al.[13] is roughly equivalent. Megaloblastic anemia was discovered to be the primary contributor to pancytopenia in each of these trials. Megaloblastic anemia was more common in these studies, which was likely a result of the high incidence of nutritional anemia in developing nations. According to our study, which was validated by other studies, the highest incidence of megaloblastic anemia occurs in the middle age group (41–60 years) with an equal sex ratio. In contrast, Khanduri et al. discovered in their study that the majority of patients with pancytopenia were in the age range 10-30 years (48%) and mostly females (71%).[14]

CONCLUSION

In our study, a high majority of pancytopenia patients were initially found to have megaloblastic anemia. Global awareness of the effects of folic acid and vitamin B12 deficiency on health, including megaloblastic anemia, has grown. Despite having a vague or extremely diverse presentation, vitamin B12 insufficiency can cause serious health problems in humans that, if not treated or detected in time, can be fatal. Since strict vegetarianism is not practiced in Pakistan, likely, food taboos, poor cooking practices, and/or poverty are the root reasons for vitamin B12 deficiency, all of which require additional investigation. Intermittent vitamin B12 supplement dosing, more accurate assessments of B12 bioavailability in fermented vegetarian meals, and public knowledge of food preparation and handling practices to reduce the loss of vitamin B12 and folate are all areas that need further study.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Razaq S	✓	×	✓	×	✓	×
Badshah A	✓	✓	×	✓	✓	×
Rehman O	✓	×	×	✓	×	×
Munib N	×	×	✓	✓	×	✓
Shafi M	✓	×	✓	✓	×	×

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

Ethical Approval:

This Manuscript was approved by the Ethical Review Board of Khyber Medical College, Peshawar Vide No. 908/DME/KMC.

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ORIGINAL ARTICLE

OUTCOME OF EARLY TRANSABDOMINAL SUPRAPUBIC REPAIR OF VESICOVAGINAL FISTULA SECONDARY TO BENIGN GYNECOLOGICAL AND OBSTETRIC SURGERIES

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ABSTRACT

Objectives: To determine the effectiveness of early operative management of patients with Vesicovaginal fistula (VVF) secondary to benign gynecological surgeries.

Material and methods: It is a descriptive case series of 70 patients selected from August 2018 to Oct 2022. All patients meeting inclusion criteria had routine lab investigations, imaging, cystoscopy, and vaginoscopy. The suprapubic approach described by O'Conor et al; was used. All surgeries were performed between the 4th and 6th weeks after the onset of the fistula to allow some time for tissue healing. All patients were followed after 2 weeks; a cystogram was performed to document fistula closure followed by removal of Foleys catheter. A second follow-up was at 3 months, patients were assessed with patient global impression of improvement score (PGI-I) for improvement in symptoms.

Results: The mean age of the patients was 40.6 ± 10.2 years. 14(19.7%) patients were primipara while 56 (78.9%) patients were multipara. The mean fistula size was 11.5 ± 4.5mm. Supra-trigonal fistulas were more common than trigonal fistulas 43(60.6%) vs 27(38%). Hysterectomy (including cesarean hysterectomy and simple hysterectomy) was the commonest cause of VVF followed by cesarean section and difficult labor 33(46.5% vs 21(29.6) vs 12(16.9%). The overall mean operative time was 125.3 ± 10.7 minutes. The mean hospital stay was 3.8 ± 0.8 days. The fistula was successfully closed in 64 (90.1%) patients while 6 (9.9%) patients had failed surgery. The small-size fistulas (5-10mm) had a higher success rate of closure than larger fistulas (11-20mm) with statistical significance (p=0.02). Over 63 (90 %) patients responded PGI score below 3 with much improvement in symptoms.

Conclusion: Our results show that early operative management of VVF secondary to benign gynecological and obstetric surgeries is feasible and effective. It also improves the symptoms of patients with PGI-I score.

KEYWORDS: Vesicovaginal fistula (VVF), early repair, hysterectomy.

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INTRODUCTION

Vesicovaginal fistula (VVF) is an abnormal epithelised tract between the bladder and the vagina. This leads to continuous involuntary leakage of urine into the vagina. The continuous wet feeling, odor, and discomfort not only affect physical and mental well-being but also impact the social and sexual aspects of patients[1]. In the West, the most common causes of VVF are gynecological or pelvic surgeries, radiotherapy, and malignancy. In regions with underdeveloped health infrastructure, the most common cause is obstructed labor. The impacted fetal head causes ischemic injury of tissues in obstructed and prolonged labor leading to VVF[2]. The incidence varies between 0.3% and 2.0% in developed countries[3].

Hysterectomy, in its various forms, is the leading cause of VVF with an incidence between 63% and 91%[4]. Frequent use of electrocoagulation causes inadvertent injuries to the urinary tract, the tissue necrosis and fistula formation take time. Thus 70% of fistulas are diagnosed post-operatively[5]. The incidence is much higher in developing countries. In South Asia and Africa, incidence estimates up to 4.09 cases per 1000 deliveries[6]. The important factors are early age marriage, poverty, lack of education, malnourishment, and poor infrastructure for emergency obstetric care[7]. Multiple surgical approaches like open transabdominal, transvaginal, laparoscopic, robotic, and transurethral endoscopic with or without tissue interposition have been described. There is no standardized timing for successful surgical repair[8]. There is a paucity of literature on successful early surgical repair of VVF in our setup. Most of the literature supports 3 months for

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repair after fistula development. This time is too long which leads to social and psychological problems for the patients. There is a possibility that early repair of VVF will not only improve the morbidity of the patients but also address their psychological and social well-being. We aimed to determine the effectiveness of early operative management of patients with VVF secondary to benign gynecological surgeries. The Patient Global Impression of Improvement (PGI-I) is a validated instrument for both urinary incontinence and prolapse surgeries. It is used to quantify improvement in symptoms after intervention[9]. We used PGI-I to assess a patient's perception of changes after VVF repair at 3 months.

MATERIAL AND METHODS

It is a descriptive case series carried out from August 2018 to October 2022 in the urology department of Khyber Teaching Hospital. The study included 70 patients meeting the inclusion criteria. All patients developing VVF after benign gynecological surgery with ages between 20 years to 60 years were included. The exclusion criteria included patients having malignancy, patients having a history of fistula secondary to radiation, patients with a history of diabetes (Fasting blood glucose of >126mg/dl), patients with other immunosuppressive states like HIV, genitourinary tuberculosis, and other abnormalities like ureterovaginal fistula and rectovesical fistula, patients with recurrent benign VVF.

The study was approved by the ethical and research committee of the hospital. Patients were selected through OPD using inclusion criteria. The patients were briefed about the purpose of the study. An informed consent was taken in writing. All patients went through history, and clinical examination followed by necessary preoperative investigations. Cystoscopy and vaginoscopy were performed. The characteristics of the fistula (number, location, size, and proximity to ureteral orifices) were recorded. Concomitant ureterovaginal fistula was excluded by computed tomography urography (CTU). The surgery was done by a consultant urologist having more than 5 years of experience. The suprapubic approach described by O'Conor et al;[10] was used. All surgeries were performed between the 4th and 6th weeks after the onset of the fistula to allow some time for tissue healing. After VVF surgery all patients were kept under observation in the ward for 3 days and were sent home on 4th postoperative day. The successful repair was confirmed by a cystogram on the 14th postoperative day as a routine. The catheter was then removed to see any leak and assess the leak. Double j stents were removed after one month of surgery with the flexible cystoscope.

The patients who had successful closure of the fistula were followed after three months and were assessed with a PGI-I score. At three months postoperative wound healing occurs and irritative lower urinary tract symptoms settle in most of the patients. Secondly, it is reasonable for patients to note the change in symptoms and compare the severity of symptoms before and after the repair. Success was defined as "anatomically closed/healed fistula or functional absence of continuous urinary leakage and resolution of symptoms". A proforma was used to collect all data. The SPSS version 20 was used for analysis. Mean and Standard deviation were used for quantitative variables i.e., age, fistula size, operative time, and hospital stay. Percentage and frequencies were computed for categorical variables like parity, location of fistula, etiology of fistula, and success rate. The chi-square test and Student t-test were used to compare categorical and quantitative variables respectively. A p-value ≤ 0.05 was taken as significant.

RESULTS

The basic demographics, features of the fistula, and intraoperative details are shown in Table 1. The mean age of the patients was 40.6 ± 10.2 years. The majority of patients 56 (78.9%) were multipara. The mean fistula size was 11.5 ± 4.5mm. Supratrigonal fistulas 43(60.6%) were more common. Hysterectomy (including cesarean hysterectomy and simple hysterectomy) was the commonest cause of VVF followed by cesarean section and difficult labor 33(46.5% vs 21(29.6) vs 12(16.9%). Nearly half of the patients 31(43.7%) had double j stents placed due to the proximity of the fistula to ureteric orifices. The rest of the patients had ureteric catheterization to identify ureters during surgery. The overall mean operative time was 125.3 ± 10.7 minutes and the mean hospital stay was 3.8 ± 0.8 days. The fistula was successfully closed in 64 (90.1%) patients while 6 (9.9%) patients had failed surgery. The reasons for failure were large fistula size, urinary tract infection, and Foley catheter blockage after patients were discharged home.

10(14.2%) patients had minor complications which included wound infection in 2 patients, 5 patients with urinary tract infections required a change of antibiotics and 3 patients had hematuria requiring bladder irrigation with normal saline for 6-8 hrs. Table 2 shows the PGI-I score in patients with successful repair after 3 months. The average PGI-I score was 2 (much better). Over 63 (90 %) patients responded PGI score below 3. 2 (2.8%) patients had a PGI score of 3 while the remaining 5 (7%) reported no change in symptoms. All these 5 patients had urinary urgency and urge incontinence and were continued on oral anticholinergic medications.

DISCUSSION

Vesicovaginal fistula has a variety of negative implications on physical, social, and sexual life[1]. Obstetric causes include injury to the bladder during obstructed labor, forceps delivery, and cesarean section. This is the most common cause in developing countries due to ignorance and inadequate access to health care. Surgical repair is the primary method of treating VVFs with successful outcomes≥ 90%. Various surgical approaches have been adopted for VVF repair (vaginal, transabdominal, laparoscopic, and robotic) but the debate about the best approach is still open[11]. A suprapubic approach is indicated when a transvaginal repair is not feasible (higher fistula, vaginal stenosis, concomitant bladder augmentation, or

Table 1: Basic demographic features and intraoperative and post-operative details

Parameter		Value	%95 CI
Mean Age (years ±SD)		40.6 ± 10.2	38.1 – 43.0
Parity	Primigravida	14 (19.7)	
	Multigravida	56 (78.9)	
Mean Fistula Size (mm ±SD)		11.5 ± 4.5	9.4 – 11.6
Fistula Location	Supratrigonal	43 (60.6)	
	Trigonal	27 (38)	
Etiology of fistula	Cesarean Section	20 (28.6)	
	Difficult labor	13 (18.6)	
	Hysterectomy	33 (47)	
	Trauma	4 (5.7)	
Success rate		64 (90.1)	
Double j stents		31 (43.7)	
Mean operative time		125.31 ± 10.7	122.7 – 127.9
Mean Hospital Stay (days)		3.8 ± 0.8	3.6 – 4.0
Postoperative complications	Wound infection	2	
	Urinary tract infections	5	
	Hematuria	3	

Table 2: Patient Global Impression of improvement score at 3 months

PGI score	Interpretation	N (%)
1	Very much better	35 (50)
2	Much better	28 (40)
3	A little better	2 (2.8)
4	No change	5 (7)
5	A little worse	-
6	Much worse	-
7	Very much worse	-

proximity to the ureter). The typical recommended repair is carried out after at least 3 months to allow the inflammation to settle. Early VVF repair can be performed when some contraindications like radiotherapy-induced VVF, active infection, and concomitant enteric injury are excluded. Early VVF repair has the advantage of avoiding prolonged urine leakage thus improving the patient's quality of life[12]. Some reports indicate that the timing of repair does not affect the outcome when principles, such as adequate exposure, identification of structures, wide mobilization, tension-free closure, good hemostasis, and uninterrupted bladder drainage are followed[13]. A change has been observed in the etiology of female urogenital fistula in Pakistan. A study carried out at Bahawal Victoria Hospital Bahawalpur quoted that post-hysterectomy fistula is more common than obstetric fistula (61% vs. 38.46%)[14]. Another study at the same center showed a 55% rate of post-hysterectomy fistulas in contrast to 40 % post-obstructed labor fistulas[15]. However, our study showed that 53% of fistulas were due to obstetric causes and 47% were due to non-obstetric (post hysterectomy) causes. Literature shows that successful VVF repair rate ranges between 75 to 95%[11].

In our study, successful closure of the fistula was observed in 64 (90.1%) patients while 6 (9.9%) patients had failed surgery. The reason for failure was large fistula size; urinary tract infection and Foley's catheter blockage after patients were discharged home. All of our patients had primary VVF (fresh fistula less than 3 cm in size located either supra-trigonally or at trigone ridge as determined by cystoscopy). However, it is challenging to directly compare our outcomes with other studies due to potentially differing demographics, definitions of successful closure, and follow-up duration. The complications in our study were minor including wound infection, urinary tract infection, and hematuria that were successfully treated. Wound infection occurred in two patients who were obese. Five patients had urinary tract infections after they were discharged home and were readmitted for intravenous antibiotics. Hematuria in three of the patients was self-limiting and required bladder irrigation only in the postoperative period. We used the PGI score to assess a patient's perception of changes in symptoms after VVF repair at 3 months. 90% of patients with successful VVF repair responded with a PGI score below 3 (much better). Only 3 patients had no improvement in symptoms due to urinary urgency and urge incontinence and were continued on oral anticholinergic medications. Some patients may experience new onset overactive bladder symptoms even after successful repair of VVF which impacts their quality of life. To our knowledge, this is the first study to use the PGI score for patient improvement of symptoms after VVF surgery as it has been validated for urine incontinence and pelvic organ prolapse. A low PGI score shows the satisfaction of patients and improvement in symptoms after surgery.

There are certain limitations in our study. It is difficult to determine the role of evolving surgical techniques in successful repair in a period of 4 years. Secondly, the follow-up duration is limited to 3 months, and longer follow-ups after resuming sexual activity are missing. Thirdly it is a single-center study and data on the educational level of patients, awareness about emergency obstetric care, and accessibility to healthcare are lacking. Despite limitations, the study shows that early repair in simple VVF secondary to benign gynecological and obstetric causes has a higher success rate with improvement in symptoms and quality of life. More prospective, multicenter randomized studies are needed to determine gold standards for the surgical approach, timing of surgery, standardized reporting about follow-up, and quality of life in patients with VVF repair.

CONCLUSION

Our study results show that early operative management of VVF secondary to benign gynecological and obstetric surgeries is feasible and effective. It potentiates the social and physical well-being of patients on patient global impression of improvement score.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Ullah H	✓	×	✓	×	✓	×
Khan N	✓	✓	×	✓	✓	×
Ghyur MS	✓	✓	×	✓	✓	×
Rafi A	✓	×	×	✓	×	×
Rehman IU	×	×	✓	✓	×	✓

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ORIGINAL ARTICLE

ERGONOMICS ASSESSMENT OF EXPOSURE TO RISK OF MUSCULOSKELETAL SYMPTOMS IN BANK EMPLOYEES

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ABSTRACT

Objective: Work-related musculoskeletal problems are common in many occupations and these musculoskeletal problems can decrease an individual's quality of life by affecting their daily living activities. The objective of this research was to evaluate the level of exposure to musculoskeletal symptoms risk among employees working in banks.

Materials and Methods: This cross-sectional study was conducted in Rawalpindi and Islamabad, Pakistan from January 2018 to June 2018. 620 bank employees of both genders, with the age of 25-45 years were included in this study, and employees with musculoskeletal and neurological disorders, amputee or prosthetic limb, and any trauma were excluded from this study. Rapid office strain assessment (ROSA) and quick exposure check (QEC) scales were used to assess the risk and prevalence of musculoskeletal symptoms. Data were analyzed by using SPSS 21.

Results: According to the scoring of QEC scales 92.2% of participants fall in the acceptable ergonomics category, 6% fall into investigate further and 1.1% fall into investigate and change soon, with the highest symptoms among low back (17.7%). And the mean ROSA final score (5.51) indicates that most of the participants have a high risk of musculoskeletal symptoms.

Conclusion: Regarding the scoring of ROSA and QEC scale musculoskeletal symptoms has a high prevalence among bank employees.

Keywords: Ergonomics, Employee, Environment, Pain, Risk.

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INTRODUCTION

Physical well-being and good physical state are particularly essential. Job-related musculoskeletal pain is the main problem nowadays and it refers to tissue damage to the musculoskeletal system and to the nerves. [1] The prevalence of the job-related musculoskeletal problem is important in many occupations and this has a noticeable effect on occupation. [2] These musculoskeletal problems can decrease quality of life by affecting daily living activities. [3] Originating from Greek roots, the term "ergonomics" encompasses a series of systematic principles that delve into the interactions between humans and their environment.[4] Adhering to proper ergonomic practices not only improves work efficiency and job satisfaction but also preserves individual well-being. The most significant sign of development is the health and well-being of the population. Adverse deviations in the physical state and appearance of the body can disturb its structure and function and disturb other characteristics of human life. [1] Work-related musculoskeletal problems due to information technology usage have increased extremely in recent decades. In many countries, computer use is nowadays become a new risk factor for musculoskeletal problems. [5] Sustained posture and repetitive movements of extremities apply statistically high pressure on some areas of the body which results in pain, muscle spasms, tingling sensation, and stiffness of joints. Some occupational activities in which repetitive movements of the wrist and hand can cause physical stress on joints, which in turn can cause musculoskeletal pain. [6] Studies showed that musculoskeletal pain does not only occur in a single joint it may affect other joints of the body so we can say this musculoskeletal pain is often occur in the frequent joint. [7]

A study by a French company reported that office workers have the largest population for sickness leave due to shoulder, elbow, and wrist disorders. [8] Another study having workers assess the musculoskeletal disorders of the low back in Kuwait showed that 80% suffered from a single attack of musculoskeletal disorder and 42% through disability. [9] In Sri Lankan prevalence of complaints of arm, neck, and shoulder (CANS) in one year is approximately 63.6% so can have a significant impact on individual and industrial and health areas. [10] In office workers, 33%

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of the young population experienced pain in the upper trapezius muscle from being in a static posture while using screens. [11] Musculoskeletal pain in the neck/shoulder and back are 55%-69%, 15%-52%, and 31%-51% respectively. [12] Approximately 40% of the participants reported experiencing neck pain, while discomfort in other areas was noted as follows: right shoulder (39%), left shoulder (37%), and low back (36%). Nearly 90% of the respondents had a ROSA score exceeding 5, indicating that a majority of individuals were exposed to a high level of ergonomic hazards in Pakistan. [13] The significance of the study is to highlight the ergonomics risk of musculoskeletal symptoms in bank employees of twin cities, in Pakistan. And the highlighted poor ergonomic settings of workstations could be modified and the quality of life of bank employees can be improved.

MATERIALS AND METHODS

This cross-sectional study was conducted in Rawalpindi and Islamabad, Pakistan from January 2018 to June 2018. The study was approved by Riphah Ethical Committee, Riphah College of Rehabilitation Sciences, Riphah International University, Islamabad.

620 bank employees were recruited by purposive sampling technique and sample size was calculated through epitool. Informed consent was taken from all participants. Employees of both genders, with the age of 25-45 years were included in this study, and employees with major musculoskeletal and neurological disorders, amputee or prosthetic limbs, and any other trauma were excluded from this study. Rapid office strain assessment (ROSA) and quick exposure check (QEC) scales were used to assess the risk and prevalence of musculoskeletal symptoms.

Assessment by using QEC was completed within 10 minutes for each bank employee and each task was assessed and scored separately. QEC has 8 parameters to assess including back, shoulder/arm, wrist/hand, neck, driving, vibration, work pace, and stress, which was done with observation and discussion with the bank employees. QEC has two indexes, the observer's assessment, and the worker's assessment. The observer's assessment was done by directly observing the participant of the study and the most appropriate box was marked. For the worker's assessment, asked the participants to mark the appropriate box. Each index was then scored and analyzed and interpreted for more exposure to risk factors for MSK problems. The graduation of the shading areas indicates the increased risk for MSK problems.

ROSA is a picture assessment tool that was established to assess musculoskeletal disorders risk factors for computer users in banks. The ROSA was considered to rapidly measure the risks associated with computer work. It contains 5 parameters: 1) Chair which is further subdivided into chair height, pan depth, arm-rests and back support 2) Monitor 3) Telephone 4) Keyboard 5) Mouse. The factors were diagrammed and coded as increasing scores from 1 to 3. The Scoring ROSA scale has 3 sections. In section A, arm-rests and back support are added with seat height. In section B monitor and telephone values can be measured. In section C keyboard and mouse values can be measured. In the end, ROSA's final score can be calculated. ROSA final scores ranged in magnitude from 1 to 10 with each successive score representing an increased presence of risk factors. A person with a score greater than 5 is at high risk for developing musculoskeletal disorders.

RESULTS

A total of 620 employees with a mean age of 33.3 ± 7.26 years, mean height was 5.52 ± 0.36 feet, mean weight was 67.98 ± 12.03 kgs, mean BMI was 23.48 ± 3.69 kg/m2, and mean length of bank service was 2.48 ± 1.09 years. Out of 620, 143 (23.1%) employees <1 year of service, 185 (29.8%) have 1-3 years, 139 (22.4%) has 3-5 years and 153 (24.7%) have more than 5 years of service. Regarding the socioeconomic status of employees, 168 (27.1%) of the upper class, 434 (70%) of the middle class, and 18 (2.9%) of the lower-class population. According to the musculoskeletal problems, 277 (44.75%) of bank employees had previous MSK pain whereas 343 (55.3%) had no previous pain, and the region of pain was cervical, upper thoracic, low back, knee 76 (12.3%), 49 (7.9%), 110 (17.7%) and 42 (6.8%) respectively. Whereas 343 (55.3%) had no pain in any region. On the other hand, 176 (28.4%) employees took treatment for their pain whereas 444 (71.6%) did not take any treatment, 83 (13.4%) employees took medicines, 94 (15.2%) treated their pain through physical therapy and 443 (71.5%) did not take any physical therapy treatment.

According to the relationship between the QEC list and MSK problems, employees with static back posture 26 (22.3%) on low, 55 (8.9%) on moderate, 86 (13.9%) on high, 22 (3.5%) on very high risk and 331 (53.4%) had no risk respectively. While employees with dynamic back posture 160 (25.8%) at low risk, 142 (22.9%) at moderate risk, 26 (4.2%) at high risk, 3 (0.5%) at very high risk, and 289 (46.6%) did not have dynamic back posture. Problems of shoulder/arm were low, moderate, high, and very high 325 (52.4%), 256 (41.3%), 30 (4.8%), and 9 (1.9%) respectively. While in wrist/hand problems, 324 (52.3%) were at low, 249 (40.2%) at moderate, 41 (6.6%) at high, and 6 (1.0%) at very high risk. Neck problems were at low, moderate, high and very high risk 244 (39.4%), 204 (32.9%), 113 (18.2%), and 59 (9%) respectively. MSK problems risk were low, moderate, and high in driving 407 (65.6%), 179 (28.9%), and 34 (5.5%), while for vibration 501 (80.8%), 102 (16%) and 17 (2.7%) respectively, and 234 (37.7%), 309 (49.8%) and 779 (12.4%) respectively for work pace.

Risk for MSK problems with stress was at 204 (32.9%), 231 (37.3%), 104 (16.8%), and 81(13.1%) for low, moderate, high, and very high respectively. (Table 1)

According to the correlation between REC and MSK problems, gender, BMI, length of service, and pain history have a strong correlation, while, age, duration of work, and socioeconomic status have no correlation with MSK pain. Correlation between ROSA and MSK problems, gender, BMI, length of service, and pain history have a strong correlation, while, age, duration of work, and socioeconomic status have no correlation with MSK pain. (Table 2)

The independent t test was applied to measure the correlation of QEC/ROSA. The median interquartile ranges of static back posture were 5 (3), dynamic back posture 3 (4), shoulder/arm 1 (1),

wrist/hand 1 (1), and neck 2 (2), while median interquartile ranges of driving were 1 (3), vibration 1 (0), workplace 4 (3) and stress 4 (6). The p-values of QEC categories were 0.272, 0.003, 0.588, 0.724, 0.597, 0.021, 0.090, 0.947, and 0.466 accordingly. The median and standard deviation of the chair score on the ROSA scale was 5.06 ± 1.56, the monitor and telephone score were 2.58 ± 1.14, the mouse and keyboard score were 4.47 ± 1.39 and the final score was 5.51 ± 1.40, and the p-value of ROSA categories were 0.893, 0.910, 0.733 and 0.757 respectively. (Table 3)

DISCUSSION

The evaluation of musculoskeletal risk factors in individuals within the banking sector was conducted using assessment tools like ROSA and QEC, revealing that the primary musculoskeletal concern among bankers revolves around the lower back, followed by the cervical region, then the knees, with the upper thoracic region being the least affected. These findings stem from inadequate ergonomic practices. Furthermore, the study identified correlations between musculoskeletal issues and factors such as age, gender, BMI, length of service, and history of pain.

A study conducted by Mika et.al (2017) also found the most affected region in workers is lower back (6.1%). (14) Another study observed that lower back is the most affected region for musculoskeletal problems (38%). [15] In the current study ergonomics assessment of bankers showed that the most affected region is lower back (17.7%) due to static posture in sitting. And QEC score showed that the prevalence of low back pain is (13.9%). When observing shoulder, wrist/hand, and neck problems, a study in 2017 revealed that (1.2%) of office workers experienced shoulder problems. [16] While another study showed that (20%) of office workers faced wrist/hand and (42%) head/neck problems in their service duration. [17] In the current study prevalence of shoulder pain is (41.3%), (and 40.2%) wrist/hand problems according to the QEC score.

According to the QEC score, neck pain is more common in bankers (32.9%), the low back (17.7%), upper thoracic (7.9%), and knee pain (6.8%). Moderate pain was reported due to dynamic back posture in bankers and employees who adopted static back posture are at high risk of low back pain. The previous study also supports current results that are, the most common symptom of musculoskeletal in office workers is neck (69.2%). The authors also showed that three areas may affect due to improper ergonomics and cause pain low back (58.2%), knee (41.8%), and upper back (34.1%). [18]

Rehman et.al. (2018) showed that the highest prevalence rate of musculoskeletal problems among office workers was low back (53.9%). [19] ROSA assessment tool is also used for the assessment of ergonomics in bankers. In the previous study conducted in 2015 to evaluate the ergonomics of office workers, researchers documented chair score was (3.45± 0.55), the score of monitor and telephone was (3.11±0.61), the score for mouse and keyboard was (2.11±0.31) and the final score of ROSA scale was (3.61±0.64). (20) On the other hand, in the current study, the mean score for the chair section is (5.06±1.56), the score for monitor and telephone is (2.58±1.14), the score for the mouse and keyboard ac-

Table 1: Relationship Between Region of Pain and QEC

Variables	Low n (%)	Moderate n (%)	High n (%)	Very High n (%)	None n (%)
Static Back Posture	26 (22.3%)	55 (8.9%)	86 (13.9%)	22 (3.5%)	331 (53.4%)
Dynamic Back Posture	160 (25.8%)	142 (22.9%)	26 (4.2%)	3 (.5%)	289 (46.6%)
Shoulder/Arm	325 (52.4%)	256 (41.3%)	30 (4.8%)	9 (1.9%)	-
Wrist/Hand	324 (52.3%)	249 (40.2%)	41 (6.6%)	6 (1.0%)	-
Neck	244 (39.4%)	204 (32.9%)	113 (18.2%)	59 (9%)	-
Driving	407 (65.6%)	179 (28.9%)	34 (5.5%)	-	-
Vibration	501 (80.8%)	102 (16.5%)	17 (2.7%)	-	-
Work pace	234 (37.7%)	309 (49.8%)	779 (12.4%)	-	-
Stress	204 (32.9%)	231 (37.3%)	104 (16.8%)	81 (13.1%)	-

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

Variables	QEC	ROSA
	Co-relations	
Age	0.001	0.064
Gender	0.845	0.899
BMI	0.772	0.642
Socioeconomic Status	0.000	0.000
Duration of Work	0.000	0.011
Length of Service	0.241	0.629
Pain History	0.628	0.046

Table 3: P-Values of QEC/ROSA Categories

QEC Score	Median (IQR) Mean ± SD	P – value
Static Back Posture	5 (3)	0.272
Dynamic Back Posture	3 (4)	0.003*
Shoulder/Arm	1 (1)	0.588
Wrist/Hand	1 (1)	0.724
Neck	2 (2)	0.597
Driving	1 (3)	0.021*
Vibration	1 (0)	0.090
Work Place	4 (3)	0.947
Stress	4 (8)	0.466
ROSA Score		
Chair Score	**5.06 ± 1.56**	**0.893**
Monitor and Telephone	**2.58 ± 1.14**	**0.910**
Mouse and Keyboard	**4.47 ± 1.39**	**0.733**
Final Score	**5.51 ± 1.40**	**0.757**
***p>0.05**		

cording to the ROSA scale is (4.47±1.39), and the final score of ROSA is (5.51±1.40). Shahla, et.al. documented the prevalence of complaints of musculoskeletal problems in different regions of the body and the highest prevalence rates were found for the neck (33%), shoulder (31%), and hand (11%). [21]

Another study also showed that office workers which are younger than 30 years were more likely to have symptoms of musculoskeletal in the upper back than those older than 49 years ($p<0.05$). [22] Current study also showed that age is also a factor for musculoskeletal problems. This study used long and extensive tool that was time-consuming and not comparing private and public banks. Due to lengthy questionnaires bank employees sometimes refuse to fill out the form. This study represents bankers only from twin cities.

CONCLUSION

The assessment of musculoskeletal risk factors in bankers by using ROSA and QEC assessment tools showed that the major musculoskeletal problem in bankers is low back followed by cervical then knee and least is upper thoracic. All these problems are due to improper ergonomics.

Physical and psychological problems should address for ergonomics assessment. Ergonomics awareness and training were given that can reduce MSK problems. Suggestions for improvement of the workplace, the use of stretching exercises in the training program, and active breaks with postural change may be effective in reducing pain and discomfort. Use objective evaluation tool.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Kausar A	✓	×	✓	×	✓	×
Rafique A	✓	✓	×	✓	✓	×
Rafique N	✓	×	×	✓	×	×
Afzak K	×	×	✓	✓	×	✓
Ali M	✓	✓	×	✓	✓	×

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

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DIAGNOSTIC ACCURACY OF DIFFUSION-WEIGHTED MAGNETIC RESONANCE IMAGING IN THE DIAGNOSIS OF MYOMETRIAL INVASION AMONG PATIENTS WITH ENDOMETRIAL CARCINOMA

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ABSTRACT

OBJECTIVE: To determine the accuracy of magnetic resonance diffusion-weighted imaging in the diagnosis of myometrial invasion in patients with carcinoma endometrium keeping histopathology as the gold standard.

MATERIALS AND METHODS: It was a descriptive cross-sectional study carried out from 11 July 2019 to 10 July 2021 at the Radiology Department, Khyber Teaching Hospital, Peshawar. The sample was collected via a Non-probability sampling technique. The sample size was 141 taking the prevalence of myometrial invasion 46% [12] with sensitivity and specificity of DW-MRI 90% and 73%,95% confidence level, and 10% margin of error. All women presenting with biopsy-proven endometrial carcinoma scheduled for hysterectomy, aged between 30 to 70 years were included. The myometrial invasion via MRI pelvis including DWI, with a 1.5 T machine (Philips), was evaluated for all patients. After a hysterectomy, myometrial invasion was confirmed on histopathology.

RESULTS: Among 141 women, 58 (41%) patients were between 30-50 years of age, and 83(59%) patients were in the 51-70 years age group. DW-MRI had 91.11% sensitivity, 66.66% specificity, 98.4% Positive predictive value, 25% Negative predictive value, and 90.07% diagnostic accuracy

CONCLUSION: In carcinoma endometrium, MR-DWI has good diagnostic accuracy in the detection of myometrial invasion.

Keywords: Endometrial cancer, Diffusion-weighted magnetic resonance imaging, Histopathology.

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INTRODUCTION

Among female reproductive organ malignancies, in developed countries, Endometrial carcinoma is a common one[1]. In Pakistan, it is the third most common genital tract malignancy[2] . A study conducted at Lahore found the frequency of carcinoma endometrium to be 28% in women with postmenopausal bleeding[3]. Hyperestrogenism may cause endometrial cancer by abnormal, unopposed mitogenic estrogenic stimulation of the endometrium[4]. Endometrial carcinoma most frequently occurs in postmenopausal women over 50 years of age [5]. More than 90% post-menopausal women having carcinoma endometrium present with bleeding per vagina .[6]

Presentation of endometrial carcinoma is at an early stage when there is a possibility of curative treatment thus accurate and timely diagnosis is important[7]. Preoperatively, in endometrial carcinoma, MRI can accurately assess the degree of myometrial invasion that correlates well with histological grade and hence patient outcome [5]. T2 weighted MR sequence combined with contrast-enhanced dynamic MRI study are accepted to be accurate for endometrial carcinoma staging till now[6]. The urogenital radiological society of Europe also recommends this protocol. In cervical and rectal cancers, additional benefits of Diffusion-weighted images have been defined [7]. For deep myometrial invasion prediction, in cases of carcinoma endometrium, the results of DWI are promising, but results regarding tumor grade prediction are discordant [8]. Studies have described techniques focusing on regions of interest (ROIs) placed on images of neoplasm for analysis.

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These techniques do not allow assessment of the problems of ROI size and positioning variations [9]. Being functional imaging, Diffusion-weighted MRI makes use of the water's Brownian motion in tissues. Due to interaction with cell membranes as well as macromolecules, this motion is restricted at the microscopic level in biological tissues[10]. Quantification of Brownian motion restriction, due to increased tissue cellularity, is done by apparent diffusion coefficient (ADC) calculation[10].

In one study, in 78% of cases, myometrial invasion was accurately staged by MRI. For assessing myometrial infiltration, sensitivity, diagnostic accuracy, specificity, positive and negative predictive values of DW-MR imaging were 88%, 97%, 83%, 50%, and 88% [11]. In another study, sensitivity, positive predictive value, specificity, negative predictive value, and accuracy of DWI in cases of carcinoma endometrium for the evaluation of myometrial invasion were 90%, 67%, 73%, 92%, and 80%, respectively[12]. In the same study, superficial myometrial invasion was confirmed by histopathology in 62.3% and deep invasion in 37.7% [12].

The current study was carried out to evaluate the accuracy of DW-MRI in diagnosing invasion of myometrium among patients with carcinoma(Ca)endometrium taking histopathology as the gold standard. In our population endometrial carcinoma is not so uncommon and prompt diagnosis and treatment of myometrial invasion by the cancer is of utmost importance as it carries significant challenges for the surgeons doing hysterectomy and for future chemotherapy.

MATERIAL AND METHODS

The study was done at the Department of Radiology, Khyber Teaching Hospital, Peshawar. It was a descriptive Cross-sectional study, done in two years starting from 11 July 2019 to 10 July 2021. A sample size of 141 patients was calculated by taking the prevalence of myometrial invasion 46%[12], sensitivity and specificity of DW-MRI at 90% and 73% [12] ,95% confidence level with a 10% margin of error. Sample collection was done via the Consecutive (Probability) sampling technique. All the women with biopsy-proven endometrial carcinoma scheduled for hysterectomy, aged between 30 to 70 years, were included. All women with a history of intervention on the uterus in the last year and the women subjected to chemotherapy or radiotherapy in the last year for endometrial carcinoma were excluded.

After approval from the hospital research committee, the study was conducted. Patients with biopsy-proven endometrial carcinoma and scheduled for hysterectomy, after gynecological oncologist consultation, according to their MRI report and staging, were included in the study. MRI pelvis was performed by the same expert technologist with a 1.5 T machine (Philips) after 3 hours of fasting to reduce bowel peristalsis and administrating I/M anti peristaltic agent before MRI, unless contraindicated. The imaging protocol included, routine sequences of axial T1W, T2W in 3 orthogonal planes (axial, oblique, and sagittal relative to the major axis of the uterine body), and (sagittal and axial oblique) T1W post-contrast sequences, with addition of DWI. DWI with the echo-planar technique was acquired in the axial plane with b-values of 800, 400, and 50 s/mm2. MRI was reported by a single qualified radiologist having 5 years of experience. According to the radiological stage, patients underwent hysterectomy as per the oncologist's decision. The hysterectomy specimens obtained were studied for myometrial invasion, by a single expert histopathologist, having five years minimum experience. On a pre-designed proforma, the information was recorded.

Myometrial Invasion on DW-MRI was determined based on a brighter signal of endometrium invading into more than 50% of the dark myometrium and exceeding more than or equal to stage IB of endometrial carcinoma revised FIGO staging.

Diagnostic accuracy was measured in terms of specificity, sensitivity, and positive and negative predictive values.

After collecting data, it was entered in SPSS version 22 and analyzed. The study variables were DW-MRI findings and the Histopathology report. Mean and SD were computed for the numerical variable of age. Sensitivity, positive predictive value (PPV), Specificity, and negative predictive value (NPV) were determined by keeping Histopathology as the gold standard from the 2x2 table.

RESULTS

The total number of patients was 141, Mean age was 64 years. 58 (41%) patients were between 30-50 years and 83(59%) patients were in 51-70 years. DW-MRI findings were positive in 125(89%) women, while

Table 1: Diagnostic Accuracy of DW-MRI Taking Histopathology as Gold Standard (N=141)

		Histopathology findings		Total
		Positive	Negative	
DW-MRI findings	Positive	a (123)	c (02)	125
	Negative	b (12)	d (04)	16
Total		135	06	141

a= True positive, b = False positive, c = False negative, d = True negative

Sensitivity of DW-MRI = (a / a+c) x100 : 91.11%

Specificity of DW-MRI = (d / b + d) x 100 : 66.66%

Positive predictive value (PPV) for DW-MRI = (a / a +b) x100 : 98.4%

Negative predictive value (NPV) for DW-MRI = (d / c +d) x100 : 25%

Accuracy of DW-MRI = (d + a) /overall patients: 90.07%

Histopathology tests were positive in 135(96%) women. Sensitivity, Positive predictive value, Specificity, Negative predictive value, and Diagnostic accuracy were 91.11%, 98.4%,66.66%, 25%, and 90.07% respectively as shown in Table 01.

DISCUSSION

Among female reproductive organ malignancies, in developed countries, Endometrial carcinoma is the commonest[1]. It most frequently occurs in postmenopausal women over 50 years of age[13]. An accurate and timely diagnosis is important to obtain a better outcome.

The current study showed that DW-MRI had 91.11% sensitivity,66.66% specificity, 98.4% Positive predictive value,25% Negative predictive value, and 90.07% diagnostic accuracy. It is contrary to a study performed by Tamai et al. where endometrial carcinoma was found in 18 surgically proven patients, while endometrium was confirmed to be normal upon histopathology in 12 patients.[14]

They concluded that, Diffusion-weighted imaging (DWI) high signals were observed in all cases of carcinoma endometrium. Although DWI helps in endometrial carcinoma detection, differentiating normal and malignant endometrial tissue is difficult taking into account, only the DWI hyperintense signals.

DWI, based on molecular diffusion differences, demonstrates abnormal signals in malignant foci. It allows apparent diffusion coefficient (ADC) evaluation quantitatively, which enables the differentiation of benign and malignant tissues and monitors therapeutic response.[14] In gynecological malignancies [15] DWI provides indispensable information with a sensitivity and specificity of 87% and 90% respectively[16]

Similarly, there is some contrast with a study performed by Wang et al. which showed that DWI high signals are exhibited by both normal endometrium as well as carcinoma endometrium, however, relatively lower or intermediate signals were demonstrated by all endometrial polyps and hyperplasia, as compared to the outer myometrium that is spared.[17]

The cause of normal endometrial high signals is incompletely known. [14] T2 shine-through effect cannot be considered as its cause, since T2 hyperintense fluid in bowel and bladder do not exhibit high signals on DWI at b value of 1000sec/mm^2.

The other studies obtained the diffusion images at 1000sec/mm2 b value and we at 800sec/mm2 and this may be responsible for, the discrepancy between other studies and ours. [14,17,18]

The 91.11% sensitivity of DWI for endometrial carcinoma detection in our study, is close to 96% in a study conducted by Inada et al[16] and 97% in the study by Song et al.[22]

In the study by Gil RT et al, DWI+T2WI demonstrated high sensitivity and specificity for detecting deep myometrial invasion, with an NPV of 96%, suggesting that a negative DWI result can reliably rule out deep myometrial invasion.[19] Our studies show an NPV of 25% for which further studies need to be performed at the multicentre level.

Cancerous endometrium had a much lower ADC value than the normal endometrium. This was a statistically significant difference, having a p-value of < 0.0001. Inada et al showed similar results. [16]

Similar findings were described by Shen et al.[20], where 0.864 x 10-3 mm^2/sec was the mean ADC in 24 cases of endometrial carcinoma and 1.277 x 10- 3 mm^2/sec in benign endometrial lesions (including 4 cases of hyperplasia of the endometrium and 3 cases of polyps of the endometrium).

The difference between these groups of benign lesions and endometrial carcinoma was significant. In literature, reduced ADC values and high DW signals have been reported for malignant tumors in various organs.[12] It is likely that in highly cellular malignant tissues, the movement of water molecules restricted by relatively reduced extracellular space leads to reduced ADC values.[21]

In a study by Jiang et al results of their study showed that ADC value was a helpful parameter for detecting the tumor grade, stage, and proliferation of endometrial carcinoma, and may further improve patient prognosis and contribute to the development of more effective treatment programs.[21]

In tissue under analysis, ADC value provides a quantitative evaluation of water diffusibility at the microscopic level. In our study, without overlap, the endometrial carcinoma had a statistically lower ADC value than the normal endometrium.

Thus, the ADC value is capable of differentiating normal endometrium from carcinoma endometrium and assessing the degree of invasion of myometrium by endometrial carcinoma.[23] In a study by Stanzione et al for the detection of deep myometrial invasion, the performanc-

es of DWI and Dynamic contrast enhancement alone and that of a complete protocol did not significantly differ.[24]

In a meta-analysis no significant difference in diagnostic performance between DWI and dynamic contrast enhancement was observed for diagnosis of deep myometrial invasion in endometrial carcinoma. DWI may be preferred for its ease of use in clinical practice.[25]

The consideration of T2 and DWI techniques simultaneously may signify a non-invasive, rapid, safe, and accurate approach for precisely assessing myometrial invasion and Endometrial carcinoma staging.[2]

CONCLUSION

Our study concludes that MR DWI has high accuracy in diagnosing myometrial invasion among patients with carcinoma endometrium and should be used in adjunct with routine MRI sequences in such patients.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Anjum H	✓	×	✓	×	✓	×
Khattak M	✓	✓	×	✓	✓	×
Ghyur MS	✓	✓	×	✓	✓	×
Khan MR	✓	×	×	✓	×	×
Iftikhar S	×	×	✓	✓	×	✓

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

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This Manuscript was approved by the Ethical Review Board of Khyber Medical College, Peshawar Vide No. 222/DME/KMC.

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ORIGINAL ARTICLE

A STUDY OF SELF-ESTEEM, ACADEMIC SELF-CONCEPT, AND LOCUS OF CONTROL AMONG BEHAVIORAL PROBLEM AND NON-BEHAVIORAL PROBLEM CHILDREN

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ABSTRACT

OBJECTIVE: The aim of current study was to identify and compare the children with behavioral problems and without behavioral problems on self-esteem, academic self-concept, and locus of control.

METHOD: For this study, a cross sectional research design was used, for data collection purposive sampling technique was applied. Out of 300 children a sample of 34 children with behavioral problems (that lies above 67th percentile) and a matched comparative group of 34 children (fall below 33 percentile children) were selected. The age range of sample was 11-13 years and from Wah Cantt data was collected. A booklet consisted of consent form, demographic sheet, children behavioral problem checklist; self-esteem scale, academic self-concept, and locus of control scales were administered.

RESULTS: Correlational analysis indicated that there was significant relationship between all the study variables. Children with behavioral problems exhibited lower level of self-esteem (M=39.92; SD=16.4) than non-behavioral problem children (M=47.57; SD=9.52). On academic self-concept, children with behavioral problems exhibited lower mean scores (M=32.9; SD=26.3) as compared to children having non-behavioral problems (M=44.6; SD=15.8). Furthermore, results also highlighted that non-problematic children exhibit less external locus of control (M=8.35; SD=2.51) as compared to problematic children (M=10.70; SD=3.36).

CONCLUSION: This study highlighted that SE, ASC and LOC are related process children behavioral problems. Therefore, in order to handle such children, teachers and school counselor should develop such intervention strategies that promote their self-esteem, academic self-concept and internal locus of control.

Keywords: Self-esteem, Locus of control, Behavioral problems, Academic self-esteem.

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INTRODUCTION

The problems of childhood and adolescence block or distort positive development in spheres of personality of life and cause hardships for parents and teachers, and the whole society at large. Therefore, a society must give top priority to having a scientific understanding of these so that effective measures could be taken for their effective prevention and intervention. [1-3] One of the prominent problems of childhood is behavioral disorders, which are characterized as persistent patterns of socially labelled atypical behaviors that adversely effects child educational development over a long period of time. [4]

Studies on behavioral disorders suggested that children exhibit such abnormal behaviors in two ways. i.e., first by acting negatively to the outer world (like aggressive, impulsive, rebelliousness and temper tantrums) called "externalizing behavioral problems" and second is by doing activities that specifically disturb the internal psychological environment (like depressed, anxious and withdrawn) called "internalizing behavioral problems". [5-8] These researches also highlighted that if the behavioral problems are identified early in life, various social and emotional issues related with cognitive ability[9], intellectual ability[10-12], social competence[13,14] and interpersonal relationships[15] can be sorted out effectively. Moreover, experts also claimed that development or promotion of positive self-perceptions (self-esteem and self-concept) are very crucial because of their direct effect on children abnormal, awry and disordered behavior. [16] Therefore, efforts are being made these days particularly in the more advanced countries to build character, impart moral values, increas-

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er positive self-perception (self-esteem and self-concept), inculcate civic sense, and make children aware of the hazards of vices like drugs.

Self-esteem, defined as an individual's overall sense of self-worth and value, serves as a foundational element in the study of child psychology. [17] According to Harter's (2012) Competence Motivation Theory, self-esteem is intricately linked to perceived competence in various domains, including academic achievement. In the context of behavioral problems, children may encounter additional challenges in establishing and maintaining a positive self-concept due to the social and academic implications associated with their behavior. [18]

Academic self-concept, on the other hand, encompasses a child's perception of their academic abilities and performance. Social Cognitive Theory, proposed by Bandura, posits that children's self-concept is shaped by their interpretations of their own achievements and failures [19]. For children facing behavioral problems, the impact of their behavior on academic self-concept may be particularly pronounced, as their actions could contribute to a negative perception of their overall academic competence. [19]

Locus of control, as conceptualized by Rotter, refers to an individual's belief in the extent to which they can control events affecting them. In the academic context, children with an internal locus of control may attribute their academic success or failure to their own efforts and abilities, while those with an external locus of control may attribute it to external factors, such as luck or fate. Understanding the locus of control in behavioral problem children is crucial, as it can provide insights into the factors influencing their academic outcomes. [20]

Empirical evidences confirmed the notion that behavioral problems (internal and external) have significant effect on the children self-esteem, academic self-concept and locus of control. [21,22] Moreover, [a] model for evaluating the connection of adolescents' self-concept and their behavioral problems (both internalizing and externalizing) among the Swedish adolescents (N=277) by using the Youth Self Report (YSR) and Structural Analysis of Social Behavior (SASB) questionnaires. The path analysis findings confirmed the model in desire direction. i.e. Adolescents with positive self- concept exhibit less or no behavioral problems as compared to the adolescents with negative self-concept behavioral problems. Moreover, findings also highlighted that girls exhibited more internalized behavioral problems whereas, boys (15 to 16) exhibited more externalized behavioral problems then younger and older adolescents. [23]

In Pakistan, however, there no such effort has been made and even lack of basic research in this area especially with reference to academic self-concept and self-esteem together among behavioral problem children. [24-26] Therefore, the current study aimed to investigate the connection of self-esteem, academic self-concept and locus of control among behavioral problems and non-behavioral problem children in Pakistan. This research issue has been addressed because of an interesting finding by earlier studies that learning disable children had lower self-concept in scholastic competence as compared with children without any learning difficulties. [27]

However, in most other domains (including social competence and global self-worth) no significant differences were found out. As regards the studies on locus of control, there have not been many studies except one in which the association between LOC and SE of adolescents. [28] Recently, Bukhari (2006) found out a positive relationship between depression and external LOC and feelings of loneliness of 40 adult patients comparing them with a normal sample of equal numbers. [29] This would expand the interest of researchers to examining the relation between LOC and various aspects of personality and behavior like aggression, delinquency, depression, narcissism etc. The present study is an important effort towards setting priorities of in the field of scientific research as it tries to focus the issue from important psychological angles having far reaching educational implications.

MATERIAL AND METHODS

The present study aimed to identify the children with behavior problems and to explore their self-esteem, Academic self-concept and locus of control. Furthermore, children with behavior problems were compared with those having no such problems on the constructs of self-esteem, academic self-concept and locus of control. For present study, with the permission of school principals the researcher selected a sample of 300 students (every 2nd student from the register of each section) 6th and 7th grade both boys and girls with the age range of 11-13 years was selected from different government and private schools of Wah Cantt.

Out of 300 children, 34 children were identified as having behavior problems according to child report measures of Child Problem Checklist (CPCL), who fell above the 67th percentile. A comparative matched group of 34 non-problematic children (17 boys and 17 girls) was identified from the children who fell below 33rd percentile on the same scale. After identification of behavioral problem and non-behavioral problem a set of Academic Self -concept Scale[26], Rotter`s Internal-External Locus of Control Scale (1966)[27] and Self- esteem[28] were administered to the students one by one in small group forms and these scales were completed by each student. The students were told that the research was an academic activity and they were expected to complete the scales accurately. The real nature of the scales was not revealed to avoid the possible effect of social desirability. The participants were asked

to read each statement and to indicate the response by selecting the appropriate response category, which they considered in their opinion appropriate and applicable about their own self. At the end, all the participants were thanked for their participation. After data collection, SPSS-21 was used for data analysis (descriptive, reliability, correlation matrix and t-test) to compare the children having behavior problems with the children having no such problems on the constructs of self-esteem, academic self-concepts and locus of control.

RESULTS

Alpha reliability coefficient was computed for self-esteem, academic self-concept scale, and child problem checklist (CPCL). KR-20 reliability coefficient was computed for Rotter's Internal-External Locus of Control Scale, as the items of the scale were dichotomous. The reliability analysis confirmed that all scales are appropriate for assessment of children of the study.

Table 2 shows that there is a negative correlation between self-esteem and academic self-concepts and locus of control with child behavioral problem scale, which is statistically significant ($p<.05$). It indicates that children with non-behavioral problem have higher self-esteem have more internal locus of control, and high academic self-concept whereas, children with behavioral problems have lower self-esteem, lower academic self-concept and have more external locus of control.

Table 1: Alpha Reliability Coefficient of Self-Esteem Scale, academic self-concept & Rotter`s I-E Locus of Control Scale (N = 68)

Scale	No. of Items	Alpha Coefficient
Self-Esteem Scale	29	.77
Academic self-concept scale	40	.90
Rotter`s I-E (LOC)	23	.62
Child report of CPCL	37	.91

*p<.05

Table 3 indicates the mean, S.D, and t-value of problematic and non-problematic group of children on self-esteem scale, academic self-concept and locus of control. Results show the statistically significant mean differences among the behavioral problem and non-behavioral problem children on the construct of self-esteem, which means that problematic children have lower self-esteem as compared to non-problematic group of children.

As far as the domains of self-esteem are concerned, comparison of mean scores shows that children with behavioral problems score lower on self-acceptance, self-competence, social and physical self-acceptance, and academic self-competence as compared to children with non-behavioral problematic Whereas, these differences on the domains of self-esteem are statistically significant only for academic self-competence ($p<.001$).

Results also indicate that there is statistically significant ($p<.000$) mean differences between two groups on academic self -concept, which means that problematic children have lower academic self-concept as compared to non-problematic group of children. It means that children with Behavioral problems shows more negative attitude and feelings with regards to their abilities &and academic potential as compared to non-problematic children. In addition, The mean difference is statistically significant mean scores ($t= 3.54$, $df = 66$, $p<. 01$) of problematic children is higher as compared to mean score of non-problematic group of children, indicating that problematic children have external locus of control as compared to non-problematic children.

Table 2: Correlation Coefficient analysis of self-esteem, academic self- concept and locus of control of child behavioral problem scale (N = 68)

Variables	CBCL
Self-Esteem	-.23*
Academic self-concept	-.50*
Locus of control	-.86*

Table 3: Mean, S.D, and t-value of problematic (n=34) and non-problematic group of children on self-esteem scale (its dimensions), academic self-concept and locus of control (n=34)

Groups	Problematic Children		Non-Problematic Children		T	P	Cohens d
	M	S.D	M	S.D			
Self-Esteem	39.92	16.4	47.57	9.52	2.5	.01	.58
Self-Acceptance	13.95	6.97	16.20	4.75	-1.68	.09	.38
Self-Competence	9.72	4.98	11.20	3.56	-1.52	.13	.34
Social and Physical Self-Acceptance	8.67	4.43	10.02	3.68	-1.48	.14	.33
Academic Self-Competence	7.57	3.09	10.15	3.18	-3.66	.000	.82
Academic Self-concept Scale	32.9	26.3	44.6	15.8	5.3	.000	.53
External Locus of Control	10.70	3.36	8.35	2.51	3.54	.00	.79

df = 66, p<.01, p<.001

DISCUSSION

The current study sought to delineate distinctions in self-esteem, academic self-concept, and locus of control between children with and without behavioral problems. Utilizing four scales, the research demonstrated high reliability within the sample, affirming previous findings that underscore the interconnectedness of these psychological constructs with child behavioral problems.

Our findings align with existing research, emphasizing notable distinctions between children with behavioral problems and their non-problematic counterparts across overall self-esteem, academic self-concept, and external locus of control. [30-35] The significant difference in self-esteem suggested that children with behavioral problems exhibited low self-esteem as compared to non-behavioral problem children. In the context of children with behavioral problems, low self-esteem could be a result of the challenges they face in forming positive social connections, achieving academic success, or navigating social interactions. Behavioral difficulties may lead to social exclusion, criticism, or stigmatization, further contributing to a negative self-perception. [35] These results are consistent with previous findings. [36-40.] Similarly, significant differences on academic self-concept are also noteworthy, suggesting that non-problematic children tend to exhibit greater interest in studies and demonstrate superior academic performance. This inclination may be attributed to a perceived higher level of competence and positive reinforcement from significant others. This observation is consistent with previous studies indicating that children with learning difficulties or behavioral problems tend to have lower self-concepts in academics [41-43], but not necessarily in domains such as physical appearance, athletic ability, and social acceptance. [44-45]

The study's results also underscore that children with behavior problems tend to have a more external locus of control while the non-problematic group of children leans towards an internal locus of control. An external locus of control is associated with behavior problems, suggesting that children facing behavioral challenges are more likely to attribute outcomes to external circumstances, holding others responsible for the results of their actions. On the other hand, the non-problematic group of children tends to attribute outcomes to their own control, viewing themselves as responsible for the results of their activities. This inclination towards internal locus of control may explain their more responsible behavior in striving to achieve set targets, whether self-imposed or desired by significant others. [46-49] Consistency with prior research reinforces the idea that these children are more likely to attribute the consequences of their actions to circumstances beyond their personal control. This externalization of responsibility may reflect a coping mechanism or a consequence of the challenges they face, such as academic difficulties or social conflicts. [50-51]

These findings can be illuminated through the lens of relevant theoretical literature, such as Bandura's Social Learning Theory. According to Bandura, children learn from their environment through observation and modeling. [49.] In the context of behavioral problems, negative behaviors are often acquired through exposure to unfavorable social environments. The reciprocal interactions with parents, teachers, and peers play a crucial role in influencing the behavior of these children. [46] When children with behavioral problems encounter academic challenges, it triggers a cascade of negative feedback from their social environment, aligning with the principles of operant conditioning. [46-50] Parents, teachers, and peers, acting as significant social agents, contribute significantly to shaping the behavior and self-perception of these children. Negative feedback, typically in the form of criticism or reprimand, contributes to the development of a negative self-image. Bandura's concept of self-efficacy becomes relevant in this context, as repeated experiences of failure or disapproval can erode a child's belief in their ability to succeed in academic and social domains. [47-52] Furthermore, Erikson's psychosocial theory emphasizes the importance of social interactions in the development of a child's sense of identity. Children with behavioral problems may encounter difficulties in forming positive social bonds, which, according to Erikson, are crucial for the development of a healthy self-identity. Negative feedback from peers and the lack of positive reinforcement in social interactions may contribute to the formation of a negative self-image, exacerbating their behavioral challenges. [49-55] In the broader context of self-esteem, Harter's Competence Motivation Theory underscores the significance of perceived competence in various domains, including academic and social realms. Children facing behavioral problems may perceive themselves as less competent due to the negative feedback they receive, leading to a decline in self-esteem. This aligns with Cooley's concept of the "looking glass self," suggesting that individuals form their self-concept based on how they believe others perceive them. [16, 55] In the end results indicate the statistical non-significant mean differences among both groups on several sub domains of self-esteem specifically, children facing behavioral challenges exhibited lower self-acceptance, self-competence, social and physical self-acceptance, and notably, lower academic self-competence. This finding is also consistent with the previous findings. [57]

Every psychological study is new setup toward understanding and solution of the problems. As nothing is perfect in this world and for a scientific research at least it is impossible. In the same manner there are some limitations of the study which might influence the generalizability and authencity of the results. Due to time constrains and lack of resources, data was small and collected from schools of only two cities, i.e., Wah Cantt. This might affect the generalizability of the findings. So that, in future large sample

should be taken from more cities. Future research may be carried out on a large sample of students from the schools of different cities of Pakistan. The instruments of study i.e., self-esteem, academic self-concept locus of control and child behavioral problem, were self-report measures and may have vulnerability to high social desirability. Measures other than self-reports may be used to assess self-esteem and other constructs studied in the present research. Furthermore, the present research felt that children problem checklist could be somewhat lengthy, difficult to fill out, at time as boring for children and not check out the teachers and parents view about the children behavioral problems. Researchers working in future must take the teachers and parents' views about the children behavioral problems.

CONCLUSION

This study affirms that children with behavioral issues often experience lower self-esteem, academic self-concept, and an external locus of control compared to their non-problematic peers. Externalizing problems may precede academic and criminal challenges, increasing the risk of delinquency. However, the predictive nature of internalizing behavioral problems for negative outcomes in children lacks consistent support. Children with behavioral problems lean towards an external locus of control, while the non-problematic group exhibits an internal locus.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Arzeen S	✓	×	✓	×	✓	×
Arzeen N	✓	✓	×	✓	✓	×
Shah M	✓	×	×	✓	×	×

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

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ORIGINAL ARTICLE

THE EFFECTIVENESS OF JIGSAW COOPERATIVE LEARNING STRATEGY AMONG BACHELOR NURSING STUDENTS AT ZIAUDDIN UNIVERSITY, KARACHI

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ABSTRACT

Objective: This study aimed to determine the effectiveness of the jigsaw cooperative learning strategy among Bachelor nursing students.

Material and Methods: The quasi-experimental study was conducted from July to December 2021 at Ziauddin University Faculty of Nursing and Midwifery, Karachi, among 60 students of 4th year BSN, approached by non-probability consecutive sampling method. The willing students of BSN year VI were included. The participants were divided into A and B groups. Group A was interventional, and group B was non-interventional. Independent t-test, Mann-Whitney U test, and Fisher exact test were applied for inferential statistics.

Results: The majority, 80% of the participants were female, and almost half, 31 (51.67%) study participants were between 23-26 years. The average score of the participants through jigsaw cooperative learning and lecture method was18.73±3.5 and 14.13±2.42, respectively. Moreover, it was also found to be statistically significant (p-value<0.001).

Conclusion: It is concluded that the jigsaw cooperative learning strategy was found effective as compared to the traditional teaching style. To increase the quality of education in the health sectors, the educational system must accept and apply modern interactive technologies.

Keywords: Jigsaw method, lecture method, nursing students

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INTRODUCTION

The learning technique has a great influence on the learner's understanding of knowledge, efficient exchange of ideas or information, and exhibits a positive attitude toward their education.

Teaching contains traditional and cooperative learning techniques, where the cooperative is called the student-based learning approach because of their full involvement.[1]

Cooperative learning is a method that aroused widespread research interest in recent years and is hailed as one of the greatest innovations in the education system. In it, learners are not only responsible for their learning but also the learning of others.

Learners help each other in groups to learn educational content, carry out group projects, and master different subjects by cooperating and consulting with peers and imparting knowledge to them.[2-6] The JCL or jigsaw puzzle constitutes a well-structured cooperative learning technique that has been successfully used to improve student academic performance.

Jigsaw puzzle technology is based on the philosophy that when the subject of learning can be taught to others, once it is acquired, learning can be best developed.[7]

In the 21st century, the current education system demands stimulating students' critical thinking with active class participation to promote effective and quality education. Cooperative teaching-learning (CTL) is a student-centered approach that enables them to remain engaged in learning activities with personal interest.[1]

Moreover, CTL is a method to allocate students in small groups so that students work together to maximize

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their own and each other's learning.[8] Whereas, the lecture method (LM) is a traditional teaching method (TTM), where teachers play an active role in delivering the lecture by using the board, while, students are just listeners.[9]

On the other hand, in Jigsaw, students are divided into small groups and provided content material in a different piece of information, shared notes and references to read in the group is called Home-Group; after reading, the new groups are developed by involving one student from each group with the different objective to share.[10]

In addition, this learning activity decreases conflict among students and offers better opportunities, improving students' understanding of the learning content.[11]

Taiwan Study suggested that group-based learning can improve student learning, satisfaction, and self-confidence.[12] That activity provides a platform to keep students engaged and allow them to become active in an educational setting.[13]

Therefore, the need to implement this technique to help nursing students in education, will promote in-depth learning.[14] Similarly, the jigsaw technique keeps students more friendly, learning by themselves with interest, focusing on academic activities, and giving the best performance.[15]

Eventually, in Pakistan, most of the teachers still prefer to use the TTM and ignore the students' level of understanding of a particular topic.[16] Therefore, this study was conducted to evaluate the effectiveness of the jigsaw cooperative learning (JCL) strategy among Bachelor of Science Nursing (BSN) students at a private nursing institute in Karachi.

MATERIAL AND METHODS

An institutional-based quasi-experimental study was conducted at Ziauddin University Faculty of Nursing and Midwifery (ZUFONAM) Karachi, after formal permission from the Dean of the department and Ethical Review Committee (Ref; 4270921ARNUR) from July to December 2021, among 4th year BS Nursing students.

The sample size was calculated based on the previous study mean (19.16 ± 4.45). The calculated sample size was 60. The consecutive sampling technique was used for participant selection and unwilling participants were excluded.

The questionnaire was developed after an extensive literature review and content validity was determined by an expert group in the field of education and the nursing department.

Their opinions were elicited about the format, layout, consistency, accuracy, and relevance of the tools. Reliability was checked by Cronbach's Alpha test (r = 0.766). The questionnaire consists of two sections, demographic and 30 multiple-choice questions. The intervention was divided into three days.

Day One: Participants were allocated randomly into two groups, A & B. Group A was interventional JCL, and B was non-interventional TTM. The primary investigator (PI) described the study purpose and written consent was obtained.

Day Two: 30 students of group A were facilitated for the jigsaw method, while, the rest of the (30) participants of group B were taught by the lecture method as a routine activity.

Jigsaw strategy

Students were divided into 6 home groups.

Each group has 5 students.

Every group provided puzzle material.

Each student was assigned to learn one segment and make sure every student should have direct access to only their segment.

Time was provided in class to read their segment at least twice.

"Expert Group" was formed by having one student from each jigsaw group.

After sharing their assigned material, students go back into their "Home-group".

Assess the group, and if any group has queries facilitate an expert team leader to handle this task.

By the end, the post-test was taken from group A for 30 minutes.

Day Three: A similar topic was taught to non-interventional (group B) through the lecture method and by the end of the third day, a post-test was taken through quiz material from both groups.

RESULTS

The majority of 48 (80%) of the participants were female, most of the 31(51.67%) of the study participants were aged between 23-26 years, and the lowest 4 (6.66%) were > 26 years; the mean age was 23.12±1.72 years.

The mean score of the cooperative jigsaw method was found to be higher compared to the lecture method and it is also found statistically significant (Table 1). An Independent t-test was applied for significance, P-value< 0.05.

The satisfaction was measured into three categories: > 75% (high), 50-74% (average), and < 50% (low). None of the participants were highly satisfied with the lecture method. In the JCL technique, almost one-fourth study subjects were highly satisfied and this variable is

also found statistically significant (Table 2).

It was observed that the age of participants was not statistically significant with the satisfaction level of learning by the jigsaw cooperative learning technique. However, most of the study participants fall under the category of high satisfaction (Table 3).

It was observed that the age of the study participants was not significantly associated with a high satisfaction level of learning by lecture technique. However low level of learning by lecture method was found to be common in all age groups as compared to the jigsaw method (Table 4).

It was seen that gender was not significantly associated with high satisfaction of learning by jigsaw methods. Both males and females showed a satisfactory level of learning by this method (Table 5).

Gender was not significantly associated with satisfaction of learning by lecture method. A low level of learning with lecture technique has been observed with the highest frequency in male and female participants of the study (Table 6).

DISCUSSION

The present study indicated that CLT has more impact than traditional and but with average satisfaction. This study found that the JCL method is an effective approach to improving student learning outcomes, as reflected by the average score of the students as compared to the TTM.

It showed that fewer students are at a low level of learning satisfaction, while in TTM, the average and low level of learning was higher. Therefore, the present study identifies the significant difference between the effectiveness of the JCLvs. TTM technique among BSN students and TTM's failure to satisfy students in their learning process ($p<0.001$).

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

Learning Techniques (n=60)	Average Score (Mean ±std.)	p-value
Jigsaw Cooperative Method (n=30)	18.73±3.5	<0.001
Lecture Method (n=30)	14.13±2.42	

An Independent t-test was applied for significance, P-value< 0.05.

Table 2: Association of satisfaction level with learning technique

Learning Technique					
Jigsaw method (n=30)	High Satisfaction Frequency (%)	Average Satisfaction Frequency (%)	Low Satisfaction Frequency (%)	Satisfaction Level	p-value
	8(26.7%)	19(63.3%)	3(10%)	30(100)	<0.001
Lecture method (n=30)	0(0%)	6(20%)	24(80%)	30(100)	

The chi-square test was applied to the association.

Table 3: Association between satisfaction level with jigsaw cooperative learning technique and age groups

Jigsaw method (n=30)	Age Groups				
	<23 years Frequency (%)	23- 26years Frequency (%)	>26 years Frequency (%)	total	p-value
high Satisfactory	6(20)	6(20)	1(3.3)	13(43.3)	0.666
Average satisfactory	8(26.7)	3(10)	0(0)	11(36.7)	
Low satisfactory	3(10)	3(10)	0(0)	6(20)	

Fisher's exact test was applied for the association.

Table 4: Association between satisfaction level with lecture technique and age groups

Lecture method (n=30)	Age Groups				
	<23 years Frequency (%)	23 - 26years Frequency (%)	>26 years Frequency (%)	Total	p-value
High Satisfactory	0(0)	0(0)	0(0)	0(0)	0.386
Average satisfactory	4(13.3)	7(23.3)	0(0)	11(36.70)	
Low satisfactory	4(13.3)	12(40)	3(10)	19(63.3)	

Fisher's exact test was applied for the association.

Table 5: Association between satisfaction level with jigsaw cooperative learning technique and gender

Jigsaw method (n=30)	Gender			
	Male Frequency (%)	Female Frequency (%)	Total Frequency (%)	p-value
High Satisfactory	4(13.3%)	9(30.0%)	13(43.3%)	0.691
Average satisfactory	3(10%)	8(26.7%)	11(36.7%)	
Low satisfactory	3(10%)	3(10%)	6(20%)	

Fisher's exact test was applied for the association..

Table 6: Association between satisfaction level with lecture technique and gender

Lecture method (n=30)	Gender			
	Male Frequency (%)	Female Frequency (%)	Total Frequency (%)	p-value
High Satisfactory	0(0)	0(0)	0(0)	0.126
Average satisfactory	2(6.7)	9(30)	11(36.7)	
Low satisfactory	0(0)	19(63.3)	19(63.3)	

Fisher's exact test was applied for the association

According to Hazmira et al & Shahri et al. found that the jigsaw technique is better as students were actively involved in jigsaw class (26) and tutorial (41) whereas; (15) were active in teaching cooperative learning (TCL), the moderate involvement 56 and 56 in jigsaw class and tutorial but TCL higher (60) and passive involvement was also higher (25) than jigsaw class and jigsaw tutorial were lower (18 & 3)[17] respectively.

Similar findings were given during the mathematical statistics course; three different classes were taken classes A, and B as a jigsaw teaching strategy, and only C for the traditional method. The result was measured in with distribution of grades where approximately 50% of students from class A scored 95 to 100; only 30% were less than 75. In the meantime, only 20% of participants scored 95 to 100 and 50% below 75%. This shows the great impact and interest of participants in the Jigsaw teaching method.[18, 19] Moreover, students enjoyed this learning atmosphere that increased their participation, and understanding, improved teamwork, and motivated them to study themselves before class activities began.[20]

The lecture method is considered teacher-centered and knowledge is transferred among students via this passive method. The organization demands graduates not only to have good hard skills but also to think rationally, have analytical skills, critical and creative thinking, work in a team, have excellent communication skills, and other soft skills. As a result, there is an imbalance between the abilities possessed by college graduates and the expected abilities in the practical world. For this reason, the learning process requires a paradigm shift, from teacher-centered to student-centered. Student-centered learning requires behavioral change in teachers to make students responsible for their learning and play the role of facilitator in their learning process.[14]

The current study reveals that participants who were involved in the jigsaw group had a higher mean score of 18.73±3.5 than the lectured method 14.13±2.42 with significant p-value=<0.001. The same results were found in Iran quasi-experimental study[7], that the lecture group of nursing student's mean score was little improved in the post-test 39.77 ± 5.52 to 40.95±5.39, but the jigsaw group increased from 39.9 ± 6.87 to 57.46 ± 5.64 (p = 0.000) with a significant difference then lecture method due to self-involvement in the learning process.

It showed that Jigsaw teaching could be used for nursing students' theoretical education to improve self-regulated learning and academic motivation.[21] Similarly, another study indicated that learning through the jigsaw technique influenced the self-regulated learning of the students. Even at the secondary level, the jigsaw is a suitable technique to increase satisfaction through academic motivation 22 Research study found that the jigsaw learning technique is effective in enhancing students' motivation and satisfaction levels. The current study reveals that participants who were involved in the jigsaw group had a higher mean score of 18.73±3.5 than the lectured method 14.13±2.42 with a significant p-value =<0.001. The same outcome was shown in Iran quasi-experimental study[7], that the lecture group of nursing student's mean score was little improved in the post-test 39.77 ± 5.52 to 40.95±5.39, but the jigsaw group increased from 39.9 ± 6.87 to 57.46 ± 5.64 (p = 0.000) with a significant difference then lecture method due to self-involvement in the learning process[24].

Furthermore, another study reveals no difference between a lecture and the jigsaw group 20 ± 1.9 and 20 ±

1.6, respectively with insignificant p=0.801. It seems that, in traditional instructional methods, like lectures, learners make little attempt to fulfill their educational needs. [25]

The use of the cooperative learning approach as a modern teaching method can lead to active participation in the learning process and active engagement of both male and female students. [26, 27]The present study also found that there is an insignificant association among age groups (p = 0.666) of participants and as well as gender (p = 0.691) among jigsaw group and respectively (p=0.386) and (p=0.126) n lecture technique, Insignificant difference among gender was presented p = 0.729 by quasi-experimental study. Moreover; gender gender-based experience of Spain's study contradicts this result of gender with significant findings with p = 0.017.

The active engagement of learners can promote their collaboration and satisfaction.[28, 29] The results of our study are in line with this research. The current study highlighted that student involvement in the jigsaw was observed better than the traditional However, in the previous research, the main gender differences found indicate that women rate the need to link cooperative learning with future teaching roles (p=0.017) and understand cooperative tasks (p=0.035) more than males. Female students prefer to organize groups according to academic standards and should remain stable throughout their studies. Both sexes believe that jigsaw technology is a good way to develop social skills, although they are more neutral when considering it to improve academic performance effectively.[30]

CONCLUSION

It concluded that JCL is an effective technique over TTM). Students participated interestingly and learned with major objectives with active learning. Therefore, there is an immense need for the education system to adopt and use new interactive technology to improve quality education in health sectors.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Rehman A	✓	×	✓	×	✓	×
Raja	✓	✓	×	✓	✓	×
Husain A	✓	×	×	✓	×	×
Ghouri A	✓	×	✓	×	✓	×

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

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This Manuscript was approved by the Ethical Commttee of Ziauddin University Hospital, Karachi Vide No. 4270921ARNUR.

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ORIGINAL ARTICLE

PASHTO TRANSLATION, VALIDITY AND RELIABILITY OF LEEDS ASSESSMENT OF NEUROPATHIC SYMPTOMS AND SIGNS (LANSS) IN SPINAL CORD INJURY PATIENTS

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ABSTRACT

Objective: The aim pf this study was to translate to translate English version of Leeds assessment of Neuropathic symptoms and signs (LANSS) pain scale into Pashto language and to determine the validity and reliability of Pashto version of LANSS pain scale in spinal cord injury patients.

Material & Methods: LANSS was translated from original language into Pashto and then back translated to English. It was reviewed by ten physical therapy experts for face and content validity. The scores of the Pashto version of the LANSS were studied in a sample of 113 spinal cord injury patients having pain from Pashto speaking region, Khyber Pakhtunkhwa, Pakistan. Comparison between Pashto LANSS and DN4 Questionnaire score was done to check for concurrent validity. Intra-class correlation coefficient, Cohen's kappa agreement and internal consistency were estimated to check the reliability of Pashto version of LANSS.

Results: For a p-value of <0.01, the overall mean score of Pashto-LANSS was higher in patients suffering from neuropathic pain. The ICC score for Pashto-LANSS was 0.76, kappa value 0.76 and Cronbach's alpha 0.83 indicating significant scores. The results of Pearson's correlation showed significant correlation between Pashto-LANSS and DN4.

Conclusion: Pashto LANSS is a reliable and valid tool to identify neuropathic pain in SCI patients. Pashto version of LANSS can be used in differentiating neuropathic pain from nociceptive pain in people with spinal cord injury (SCI).

Keywords: LANSS, Neuropathic pain, DN4 Questionnaire, Spinal cord injury, Pashto version of LANSS (Pashto-LANSS).

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INTRODUCTION

The Leeds Assessment of Neuropathic Sign and Symptoms (LANSS) is an assessment tool for screening of neuropathic pain. It has a high support based on current evidence to separate neuropathic pain from a non-neuropathic pain. [1] Various researchers have translated LANSS into multiple languages and validated it. It is used in multiple conditions like complex regional pain syndrome, diabetes, cancer, radiculopathies and SCI. [2-5] LANSS was a very sensitive instrument and specific to measure the neuropathic components of a pain patient across all languages. Average Positive Predictive value (93.7%) showed that the instrument was an effective instrument in the determination of components of LANSS questionnaire that marked out neuropathic pain components. [6]

The most important and frequently occurring secondary complication after spinal cord injury (SCI) is pain. [7] Pain is experienced by about half to two thirds of SCI patients.[8] It negatively affects rehabilitation outcomes and quality of life. [9,10] International Association for Study of Pain classified pain after SCI into nociceptive pain and neuropathic pain. [11] Neuropathic pain occurs as a result of injury to the nerve itself. It includes abnormal sensations like tingling, burning, electric-shock like, cold, piercing, pins and needles, squeezing, sharp, itchy and/or shooting pain. [12, 13] The wide range of signs and symptoms and lack of validated diagnostic criteria make it difficult to diagnose a neuropathic pain. [14]

Researchers in the UK developed the Leeds Assessment of Neuropathic Signs and Symptoms (LANSS) assessment tool to overcome this challenge. It consists of 7 yes/no items with a score linked to it. 5 of the 7 items

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are self-reported and 2 require clinical evaluation. A score of ≥ 12 out of 24 indicates neuropathic pain. It has a sensitivity of 83% and specificity of 87% allowing it to detect neuropathic pain in 85% of patients. LANSS is translated to various languages including Turkish, Spanish, Swedish, Portuguese and Chinese Mandarin. [5, 15, 16]

According to Center for Languages of the Central Asian Region, 40 million people speak the language Pashto. 27 million reside in Pakistan particularly in the province Khyber Pakhtunkhwa. But no Pashto version of neuropathic screening tool is available, to the best of our knowledge. Neuropathic pain occurs in 48.6% of spinal cord injury patients in KPK, Pakistan. [17] This necessitate the translation of a tool to assess neuropathic pain. We translated the LANSS scale into Pashto and assessed it for validity and reliability in spinal cord injury patients. We investigated the validity and reliability of P-LANSS in the assessment of neuropathic pain in people with SCI.

MATERIALS AND METHODS

The data was collected from Paraplegic Center Peshawar after approval of IRB letter number 21678 and research ethical committee of Riphah International University, letter number RIPHAH/RCRS/REC/Letter-01035. The study was registered with www.clinicaltrials.gov number NCT05059405. Subjects of age 18-60 years, male and female, who had complete or incomplete spinal cord injury for ≥ 3 months at or below the level of thoracic spine and having a history of pain after SCI were included in this study. Subjects with diabetes and other neurological and congenital diseases like multiple sclerosis, Guillian barre syndrome, spina bifida and tumors etc. were excluded. Sample size was calculated to be 113 subjects calculated through online ICC formula (18, 19). Before participating, informed consent was obtained from subjects.

The translation process followed the WHO's Guidelines on Translation and Adaptation of Instruments to ensure linguistic and cultural equivalence between the English version and the translated versions, involved two bilingual individuals- an experienced neurological physical therapist and a Pashto language professor- whose native language was Pashto, translated the English LANSS into Pashto LANSS (P-LANSS). [20] Back translation of P-LANSS into English was carried out by another pair of bilingual, a physical therapist and an English language professor, with no knowledge of original version of LANSS. Finally, a committee of experts compared the backward translated version with the original LANSS and refined the P-LANSS to avoid any major differences.

The content and face validity of P-LANSS was assessed as a result of which a final version of P-LANSS was developed. Two different physical therapists collected data in the first and second week using P-LANSS and DN4 at the spinal cord injury (SCI) survivors. Convergent validity was demonstrated by converging P-LANSS with DN4.

The SPSS version 22 software was used to perform statistical analysis. To elaborate the demographics and Spinal cord injury characteristics of the participants, as well as the findings of the study, descriptive statistics were applied. To establish convergent validity, the relationship between the DN4 and P-LANSS total scores was assessed using the Pearson correlation coefficient. Concurrent validity was assessed by comparing P-LANSS and DN4 questionnaire scores from study visit 1. Content validity was assessed using Item-content validity Index (I-CVI). Internal consistency was assessed using Cronbach's α coefficient. Interrater reliability was tested using k-coefficient and was analyzed using two-way mixed model of the intra-class correlation coefficient (ICC). An ICC of more than 0.6 was regarded as good reliability, between 0.5 and 0.6 was regarded as moderate reliability, and less than 0.5 referred to poor reliability. For P-LANSS visit 1 and 2, the ICC coefficient was calculated for overall score of the P-LANSS Questionnaire. To examine the agreement among different items, Cohen Kappa agreement analysis was used, as the answers to the questions in P-LANSS were binomial.

RESULTS

One hundred and thirteen subjects participated in the study with mean age in years (32.04 ± 11.33) having pain after SCI. All the participants had paraplegia (motor complete =102, motor incomplete =11, ASIA A= 102, ASIA B =5, ASIA C =4, ASIA D =2). Pertaining to the level of SCI, 82% of the patients had thoracic level SCI and 18% had lumbar level SCI. In our study the most common causes of SCI were road traffic accident and fall from height which were 39 (34.5%).101(89%) of the SCI patients had no previous history of diseases. 105(92.9%) of the patients had 3 months to 15 years of duration after the injury. As shown in the study results, n=87 (78.8%) of the SCI patients had neuropathic pain diagnosed through DN4 Questionnaire and Pashto-LANSS. n=26 (23.1%) of the study population had non neuropathic (NNeP) or nociceptive pain. Table 1 shows demographics and frequency of pain. Inter-assessor reliability of the P-LANSS was good

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

		N	%
Gender	Female	28	24.8
	Male	85	75.2
Marital status	Single	52	46.0
	Married	61	54.0
Literacy level	No formal education	23	20.4
	Primary level Education	27	23.9
	Middle level of education (upto class 8th)	35	31.0
	Matric level	10	8.8
	FA or FSc level	9	8.0
	Bachelor or Master level of education	9	8.0
Cause of spinal cord injury	Road Traffic accident	39	34.5
	Fall from Height	39	34.5
	Hit by falling object	9	8.0
	Fire arm injury	23	20.4
	Earth Quake victim	3	2.7
Duration after spinal cord injury	3 months	8	7.1
	> 3 months to 15 years	105	92.9
Previous history of diseases	No history of diseases	101	89.4
	Hypertensive	5	4.4
	Hepatitis	4	3.5
	Cardiovascular diseases	3	2.7
Level of spinal cord injury	Thoracic	93	82.3
	Lumbar	20	17.7
Frequency of NeP	Assessed by rater 1	89	78.8
Frequency of NeP	Assessed by rater 2	85	75.2
Frequency of NNeP	Assessed by rater 1	24	21.2
Frequency of NNeP	Assessed by rater 2	28	24.8
Mean diagnosed NeP	Assessed by rater 1 and rater 2	87	76.9
Mean diagnosed NNeP	Assessed by rater 1 and rater 2	26	23.1

SD=Standard deviation, N=number, %=percentage, NeP = Neuropathic pain, NNeP = Non-neuropathic pain

Table 2: Inter-rater Reliability of the P-LANSS

N	ICC	95%CI
All Questions	0.76	0.605-0.791
Q1	0.624	0.497-0.724
Q2	0.615	0.487-0.718
Q3	0.473	0.317-0.604
Q4	0.577	0.440-0.688
Q5	0.421	0.257-0.561
Q6	-0.58	-0.239-0.127
Q7	0.133-	0.52-0.309-

N=number of question, ICC=Intra class correlation coefficient, CI=Confidence interval

Table 3: Kappa agreement between P- LANSS Scores

	Visit 1; Rater 1 versus Visit 1; Rater 2		Visit 1; Rater 1 versus Visit 2; Rater 1	
Question	Kappa agreement	p value	Kappa agreement	p value
Q 1	0.62	<0.001	0.98	<0.001
Q 2	0.61	<0.001	0.97	<0.001
Q 3	0.47	<0.001	0.97	<0.001
Q 4	0.55	<0.001	0.96	<0.001
Q 5	0.43	<0.001	0.94	<0.001
Q 6	0.43	<0.001	1	<0.001
Q 7	0.03	<0.001	1	<0.001

for participants with having motor complete and incomplete SCI, when examined for all items and independently for each question (Table 2).

At study visit 1, the inter-class correlation values between rater 1 and rater 2's overall P-LANSS scores revealed acceptable inter rater reliability. When analyzed for subscales, the Cohen's Kappa agreement ranged from 0.03 to 1.0, with the lowest values for item 7 of rater 2 and highest values of item 1 to 7 of rater 1 (Table 3).

Inter-class correlation between P-LANSS total scores at study visit 1 and 2 was 1.0, ($p < 0.001$) suggesting highly significant test-retest reliability. Regarding stability, 113 patients were retested within 7 days and the scores showed high stability (ICC = 0.76) (Table 4).

The Cronbach's alpha coefficients for all questions was (> 0.83) for both raters which shows a significant internal consistency (Table 5).

Suitability of the P-LANSS (KMO value = 0.577) and the significance of the adopted procedure (Bartlett's test with a value of 194.496, $P < 0.001$) hence the factor analysis could not be performed because Bartlett's test of sphericity was highly significant and KMO measure of sampling adequacy was 0.577.

DISCUSSION

The author investigated the validity and reliability for the assessment of neuropathic pain in patients with SCI of the P-LANSS. Hence the original LANSS was translated for the validity and reliability purpose into the Pashto language first. P-LANSS showed good concurrent validity and revealed adequate reliability. When used for assessment of general items and individually for each item on patients with both complete and incomplete SCI, P-LANSS showed good inter-rater reliability. The kappa agreement between study visits was high for all seven items and significant for both raters. The kappa agreement value ranged from 0.03 to 1.0 with the lowest value for item no.7 of rater 2 and highest value for item no.1 of rater 1.

The Spanish LANSS has good reliability with Cronbach and Guttman split-half coefficients between 0.68 and 0.71 and a kappa coefficient for inter-rater agreement of 0.70 and intra-class correlation coefficients between 0.77 and 0.92. Specificity is 89.4% and positive predictive value is 91.1%. Validity is good with a kappa coefficient of 0.70 (CI 95% 0.59–0.81; $p < 0.0001$) and area under the curve 0.929 ($p < 0.0001$). [21] Cultural validation in China was highly reliable with Cronbach's alpha coefficients and Guttman half coefficients for internal consistency being 0.824 and 0.842, respectively. It has good face validity and high content validity with sensitivity being 80.0% and specificity 97.1%, and a positive predictive value of 96.9% and negative predictive value of 82.9%. [22] Cronbach's alpha was revealed to be acceptable for the Greek version (0.65), while a significant correlation was observed compared to the "gold standard" diagnosis (0.79, $P = 0.01$). [23]

Total scores of DN4 questionnaire and the total scores of LANSS questionnaire were compared for Neuropathic and Non-neuropathic pain where total scores of DN4 questionnaire were highly correlated with LANSS. [5] Similar to that current study also, compared P-LANSS with DN4 and found a strong positive correlation. The patients with NeP had a considerably higher mean of overall score of the tool, indicating that P-LANSS had discriminative potential.

The author used the same cut off score for NeP diagnosis as used in the original version of LANSS i.e ≥12. [1] We found P-LANSS to be slightly less sensitive and less specific than the original LANSS. P-LANSS is linguistically appropriate for use in Pashto speaking SCI patients revealing high test-retest reliability. It is simple to administer and can be a helpful tool in clinical settings with culturally varied population.

The current study used internal consistency analysis to check the reliability of P-LANSS which approached the accepted value of 0.83 and succeeded to pass it. The Greek version of the LANSS questionnaire found similar results (23). The Cronbach's value of the P-LANSS for all items is 0.83, indicating acceptable and significant internal consistency. Compared to the other studies, Cronbach's value for Spanish LANSS is 0.68, 0.67 for Brazilian Portuguese, 0.78 for Portuguese versions, 0.84 for Turkish and 0.82 for Chinese Mandarin versions. [3, 7 15, 16, 18]

The major and only limitation of this study is that there was no gold standard method to test the sensitivity and specificity of the P-LANSS such as detailed case history, clinical examination and further investigations if needed; this was not feasible as the time-frame for the study and resources were limited.

CONCLUSIONS

We concluded that even in northern Pashtun living areas where culture and norms play a big role in expressing pain, the Pashto version of LANSS can identify individuals with neuropathic pain from those with nociceptive pain. In current study data was provided signifying that the Pashto-LANSS could also be used by the SCI patients

Table 4: Stability of the P- LANSS

Test Mean (SD)	Re-test Mean (SD)	ICC (95% CI)
1.716(0.452)	1.68 (0.504)	0.76(0.605-0.791)

SD=standard deviation

Table 5: Internal Consistency of the P-LANSS Version

P-LANSS	Rater 1	Rater 2
All Questions	1.0	0.830
Q 1	1.0	0.766
Q 2	1.0	0.76
Q 3	1.0	0.642
Q 4	1.0	0.738
Q 5	1.0	0.626
Q 6	1.0	0.064
Q 7	1.0	0.03

P-LANSS =Pashto LANSS, α=alpha coefficient

themselves who can read and understand Pashto. They can diagnose their pain to be neuropathic or nociceptive through Pashto LANSS.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Khan H	✓	×	✓	×	✓	×
Baig MO	✓	✓	×	✓	✓	×
Obaid S	✓	×	×	✓	×	×
Haleem MH	✓	×	✓	×	✓	×

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EFFECT OF ORAL VITAMIN D3 ON THYMIC INDEX IN MALNOURISHED CHILDREN

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ABSTRACT

Objectives: To compare the thymic Index, vitamin D3 level, and T cell receptor excision circle (TREC) of healthy and malnourished infants. To evaluate the effect of oral vitamin D3 supplementation on the Thymic Index and TREC in malnourished children.

Material and Methods: This quasi-experimental study (non-equivalent control group design) included 44 infants within the age range of 2 to 6 months. The cases were 22 malnourished infants, and 22 were healthy infants (controls) based on WHO Z scores classification (weight for length). Weight, age, thymic Index (TI), Vitamin D levels, and TRECs were recorded for cases and controls(pre-test). The cases were given Vitamin D supplementation for 8 weeks. The weight for length (z-score), thymic Index (TI), vitamin D levels, and TRECs were checked in these malnourished children on follow-up (post-test). Thymic Index (TI) was checked by ultrasonography (length multiplied by breadth). ELISA was performed to check Vitamin D levels and RT-PCR was done to compare TRECs.

Results: The malnourished infants had a mean thymic index of 8.015 ±3.2192 as compared to controls of 11.667 ±3.2730. Post Vit D supplementation TI increased (8.459 ±3.2191) in cases. Weight, length, and Z scores were found to be directly related to TI values. Pre and Post supplementation TI were strongly correlated to each other ($r = 0.985$, $p = <0.001$). The thymic index increased significantly ($p = 0.001$) after intervention. There was a statistically non-significant rise in TRECS (809 vs 4242) ($p = 0.075$) after vitamin D supplementation. The Pearson Correlation showed no significant correlation of TRECS to any of the variables including the Thymic index.

Conclusion: TI (thymic size) and vitamin D levels increase with vitamin D supplementation in malnourished children. However, Vitamin D supplementation has no significant effect on TRECS.

Keywords: Malnourished, Vitamin D3, T cell receptor excision circles, Thymic Index, TRECs.

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INTRODUCTION

Children under 5 with Malnutrition can be underweight (too thin for their age), stunted (too short for their age), wasted (too thin for their weight), or even obese. Worldwide, 149 million children <5 y of age were reported as stunted and 45 million as wasted[1]. More than half of the malnourished children live in South Asia; 25.1 million are wasted and 7.7 million are severely wasted.[2] The mortality rate in malnourished children is estimated at 3.1 million and morbidity of 45%.[1,2] A survey in Pakistan reported that an estimated 38% of children under 5 years were underweight.[3]

Common infections have higher morbidity and mortality in malnourished children. This is due to decreased immune competence in malnutrition.[4] The 'vicious cycle of infections leading to malnutrition and vice versa.[5]

Undernutrition during the first 1000 days of life compromises immune development. Thus the primary and secondary lymphoid organs are influenced and so is the response to pathogens.[5] The thymus is a primary lymphoid organ producing T lymphocytes. Malnutrition reduces the size of the thymus and thus all the physiolog-

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ical processes crucial for T cell development. Ultrasound is used to measure the size of the thymus; expressed as thymic index. Its size increases from birth till 8 months of age and then decreases. The variations in the thymic index can be explained by breast-feeding status, body size, and to a lesser extent by frequency of illness.[6]

Tlymphocytes develop and mature in the thymus. Splicing and rearrangement occur due to recombination of the T lymphocyte receptor gene. Circulating T cell receptor excision circles (TREC) are formed by the excision of DNA segments from the T cell receptor (TCR) gene. Thus measuring TREC reflects the maturation process of lymphocytes in the thymus and thus thymic activity.[7] TREC concentrations are measured by RT-PCR and PCR-ELISA.

Focusing on nutritional rehabilitation by providing macro and micronutrients should improve nutritional status and in turn thymus structure and function to respond effectively to infections.[8]results in stunting, wasting and/or underweight, three deleterious forms of malnutrition that affect roughly 200 million children under the age of five years. Undernutrition compromises the immune system with the generation of various degrees of immunodeficiency, which in turn, renders undernourished individuals more sensitive to acute infections.

Vitamin D is vital for the growth and development of children. Six out of ten South Asian children are vitamin D deficient. Besides rickets Vitamin D deficiency is reported in various kinds of chronic diseases like diabetes, cardiovascular disease, cancer, tuberculosis, etc. [9,10]

MATERIAL AND METHODS

This prospective quasi-experiment study with a control group (non-equivalent control group design) was carried out to assess the effectiveness of Vitamin D supplementation in the improvement of TI (Thymic size) and TRECs (Thymic function) in malnourished infants under 6 months.

A purposive sampling technique was used to select malnourished children based on WHO Z scores classification weight for length in infants under the age of six months. This study was conducted from January 2017 to November 2017. A sample size of 44 has been calculated through STAT UBA (http://www.stat.ubc.ca/~rollin/stats/ssize/n2.html) by keeping the power of 0.80 and α value of 0.05. (Sample size <10).

A total of 22 malnourished infants admitted to the Nutritional Rehabilitation Unit (NRU) of the Department of Child Health KTH were included. 22 healthy infants were selected from the immunization center in KTH Peshawar.

The inclusion criteria for cases were a malnourished infant ≤ 6 months of age (z score -2 to -3) admitted in NRU. Infants with HIV, any acute or chronic medical condition (hepatitis B surface antigen or HCV positive, renal and cardiac diseases), and critically ill were excluded. Informed written consent (Urdu/English) was obtained from guardians/parents of eligible subjects. A proforma with two parts was used for all the participants. Part, one had a detailed history and examination including anthropometric measurements (weight, length, z-score,) and contact number/address for follow-up The other part included laboratory investigations such as complete blood count (CBC), Vitamin D levels, TRECs, and TI using ultrasonography. Samples of blood were obtained by a trained phlebotomist from both healthy and malnourished infants included in our study following a strict aseptic technique. Oral vitamin D3 was given to malnourished children for eight weeks (2000IU loading dose and 400IU per day 0r 2000/ week for 8 weeks) along with other micronutrients like zinc, magnesium and folic acid (Nutritional rehabilitation protocol).

There is no drug-to-drug interaction of these micronutrients. Dosage schedule was explained to parents/guardian of patients and a proforma (annexure B) was given to parents/guardian to fill or mark it after giving the dose. It was shown to us after two months on follow-up. TI, TRECs & Vitamin D levels of the malnourished children who received Vitamin D3 supplementation were repeated. Laboratory procedures were done in "The Institute of Basic Medical Sciences (IBMS), Khyber Medical University (KMU) Peshawar," Physiology Laboratory and Pharmacology Laboratory. Informed consent of all the eligible children was taken from the Guardian/Parents, and approved by the ethical committee of KMC and KMU.

RESULTS

This study included 44 children within the age range of 2 to 6 months. 22 children were malnourished (cases) and 22 were healthy (controls). The cases were given Vitamin D supplementation for 8 weeks.

The data was normally distributed (checked by the Shapiro-Wilk test) and presented as mean ± SD. TRECs before and after intervention were not normally distributed, and were Log transformed for analysis, and presented as geometric means (confidence interval)

An Independent sample T-Test was used to check

the difference between cases and controls as shown in table 1 below.

Paired sample T-Test was used for comparison between pre- and post-intervention vitamin D supplementation. The thymic index was increased significantly (p= 0.001) after intervention (fig.2).

Vitamin D levels also increased significantly with intervention as shown in fig. 3. TRECS also increased with vitamin D supplementation the p-value is not statistically significant (paired sample t-test comparison = 0.075) as shown in Fig. 4

Table 2 shows Pearson Correlation of TRECs, and TI with anthropometric and other variables in cases only. The pre-thymic index was significantly co-related to post post-thymic index, weight, length, and Z score. Post Thymic index was significantly co-related to weight, length, and Z score. TRECs before and after intervention were not related to any of the variables.

Table 1: Comparison of anthropometric measures and TI between cases and controls

	Cases	Control	
Group	Mean ± SD	Mean ± SD	P
Age (m)	5.16 ±1.340	3.69 ±1.677	0.003
Weight (kg)	4.191 ±1.1840	5.910 ±.9412	<0.001
Length (cm)	56.909 ±6.4469	58.429 ±5.5549	0.413
Pre Thymic Index (cm^3)	8.015 ±3.2192	11.667 ±3.2730	0.001
Z Score (SD)	1.50 ± 0.512	3.00 ±0.000	<0.001
Hemoglobin (gm/dl)	9.723 ±1.1322	11.557 ±1.3185	<0.001

Table 2: Correlation table showing the association of TRECs, and TI with other variables in cases

		TRECs Before ***	TRECs After ***	Pre TI	Post TI	Vit D Before	Vit D After	Wt	L	Z Score	Hb
TRECS Before ***	r	1	.333	-.015	-.044	.129	.147	-.014	-.252	-.184	-.490*
TRECS After ***	r		1	.070	.102	.051	-.150	-.007	-.081	-.017	-.318
Pre Thymic Index	r			1	.986**	-.235	-.205	.938**	.793**	-.544**	.065
Post Thymic Index	r				1	-.216	-.267	.947**	.803**	-.536*	.026
Vit D Before	r					1	.342	-.119	-.189	-.110	.098
Vit D After	r						1	-.238	-.190	.236	-.011
Weight	r							1	.811**	-.621**	.089
Length	r								1	-.346	.116
Z Score	r									1	-.078
Hemoglobin	r										1

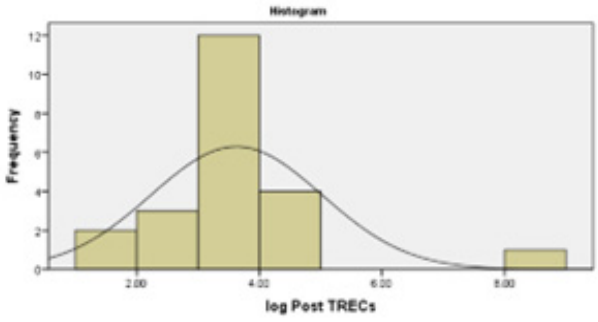

Fig 1: Normality figure Post TRECs after log transformation

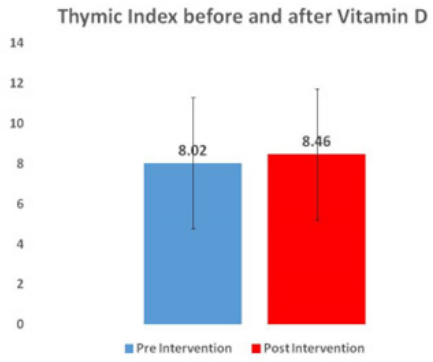

Fig 2: TI before and after Vitamin D in malnourished children

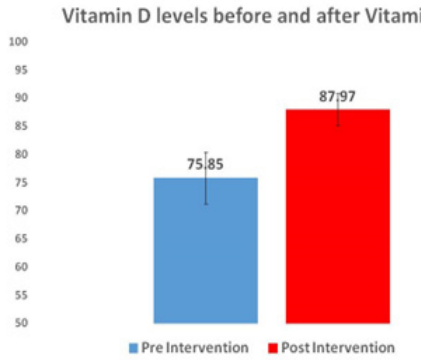

Fig 3: Initial and after intervention Vitamin D levels in malnourished children

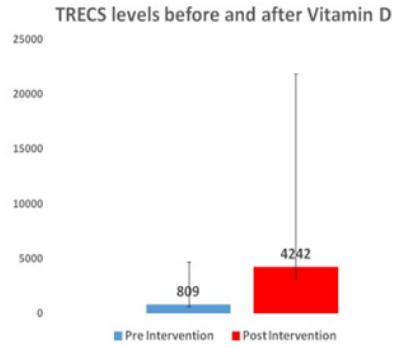

Fig 4: Initial and after intervention TRECs level in malnourished children

DISCUSSION

In this study, the size of the thymus was measured on ultrasound and was found to be directly proportionate to the age, weight, and nutritional status of the infant. The same was reported by many studies.[11–13] Thymus size, assessed as thymus index (TI Prentice AM described the thymus as the "barometer of malnutrition".[13] Moore SE measured the thymic index by ultrasound and found it to be affected by both maternal and infant nutrition. [12] Catch-up growths postnatally are associated with an increase in the thymic index. [12] Small thymic size in early infancy as a risk factor for high mortality due to infections was reported in data from Guinea-Bissau, West Africa, Gambia, and Bangladesh. In all these studies interventions to improve nutrition, improved infants' weight, and thymic size, and reduced infections and mortality.[12,14–16]prenatal and early postnatal

In our study after vitamin D3 supplementation vitamin D levels, weight and thymic index of malnourished infants improved. Siddiqee et al. reported a systematic review and meta-analysis of Vitamin D deficiency among South Asian children. He found that Vitamin D is vital for the growth and development of children.[9] DeLuca et al. reported that Vitamin D has a significant effect on the immune system and therefore can be used for the treatment of a variety of diseases.[17] Saleem et al. conducted a study in Pakistan on uncomplicated severely malnourished children. He reported that a High dose of vitamin D3 improved the "mean weight for height (z-score)" for severely malnourished children in Pakistan comparable to our study.[10]

In our study pre-intervention TRECs were low. Wilson Savino et al also reported low T- T-lymphocyte count in malnutrition. He explained thymic atrophy in undernutrition and severe infection leads to Small thymic size and in turn thymocyte reduction.[8]results in stunting, wasting and/or underweight, three deleterious forms of malnutrition that affect roughly 200 million children under the age of five years. Undernutrition compromises the immune system with the generation of various degrees of immunodeficiency, which in turn, renders undernourished individuals more sensitive to acute infections. The severity of various infectious diseases including visceral leishmaniasis (VL The impaired T cell development, has a detrimental effect on the adaptive immune system. Similarly, David Grenadier et al. reported that thymic function is extremely sensitive to deleterious acute insults, such as infection or malnutrition. These stresses lead to thymic involution but thymus also has the capability of remarkable repair and rejuvenation. He used a TREC assay to assess the exact number of lymphocytes produced by the thymus. TRECs strongly correlate with thymic function in backgrounds of age and conditioning.[18] Similarly Raqib et al reported that low birth weight affects immunocompetence and increases vulnerability to infectious diseases. They further explained that low T cell receptor excision circles (TRECs) turnover from the thymus adversely affects the immune functional reserve in preschool-age children born with LBW.[18]

In our study, there was a statistically insignificant increase in TRECs when Vitamin D was supplemented in malnourished infants. Similarly mixed results from intervention trials in <6 months of age have been reported.[19,20] Adrian F. Gombar et al reported that a combination of Vitamin D, C, and Zinc supplementation enhances immune function and decreases the risk of infection. These supplements in higher doses have the potential to reduce the global burden of infection.[21]integrated immune system needs multiple specific micronutrients, including vitamins A, D, C, E, B6, and B12, folate, zinc, iron, copper, and selenium, which play vital, often synergistic roles at every stage of the immune response. Adequate amounts are

essential to ensure the proper function of physical barriers and immune cells; however, daily micronutrient intakes necessary to support immune function may be higher than current recommended dietary allowances. Certain populations have inadequate dietary micronutrient intakes, and situations with increased requirements (e.g., infection, stress, and pollution Dietary interventions; a combination of macronutrients, micronutrients, and probiotics can recover the structural and functional damage in the thymus and rescue proper immune responses to infection. [8]

This study had a small sample size, a proper standard was not available for TRECs assay to compare our result so we used an internal marker in our study which may also affect our TRECs results.

CONCLUSION

In malnourished children vitamin D supplementation increases vitamin D levels and Thymus size (thymic index) and has an insignificant effect on TRECs.

There is a need for future comparative studies including healthy as well as malnourished children with an increased number of participants to contribute to the findings of the present study.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Bashir H	✓	×	✓	×	✓	×
Malik MO	✓	✓	×	✓	✓	×
Amir S	✓	×	×	✓	×	×
Ahmad H	✓	×	✓	×	✓	×
Rehman SKU	×	✓	✓	×	×	✓

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

Ethical Approval:

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ORIGINAL ARTICLE

ANALYSIS OF PHYSICOCHEMICAL AND NUTRITIONAL PARAMETERS OF RAW MILK FROM COMMERCIAL DAIRY FARMS-IMPLICATIONS OF ADULTERATION FOR PUBLIC HEALTH

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ABSTRACT

Objective: Globally, milk adulteration is an important public health issue but more so in developing countries, for small financial gains. This study was designed to assess the physicochemical and nutritional parameters of raw milk from commercial dairy farms from a public health perspective.

Material and Methods: In this study 29 bulk samples of raw cattle milk were selected, one from each dairy farm in Peshawar, using simple random sampling and analyzed using by ultrasonic milk analyser. The main parameters tested for adulteration of milk were urea, starch, hydrogen peroxide, detergent, sorbitol, quaternary ammonium compounds, boric acid, cane sugar, sodium chloride, carbonate, formalin, hypochlorite, freezing point, added water, salt percentages and electrical conductivity (EC). Additionally, nutritional quality was assessed by fats, solids-non-fats (SNF), lactose, and protein. The results were statistically analyzed by t-test using SPSS software.

Results: Results showed that more than 90% of the samples had water adulteration of more than 5% due to which 55% had significantly reduced nutritional parameters but still overall nutritional quality was acceptable in 24% of the samples. 21% of samples had high electrical conductivity reflecting mastitis in animals and consequently considered unsuitable for consumption due to the resultant transmission of either antibiotics or microorganisms into the human body. Furthermore, chemical adulterants were not detected in any sample. t-test showed that most of the parameters were significantly different ($p=0.05$) than the population standard means.

Conclusion: Milk samples had compromised quality due to water addition in half of them and raised EC values in about a quarter of the samples. Despite water adulteration, nutrients like fat and SNF remained within ranges, indicating a cow-buffalo milk blend. Most tested parameters were lower than national averages but above minimum values. No chemical adulterants were detected. There's a need for continuous milk testing to maintain public health standards.

key words: mild adulteration, commercial dairy farms

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INTRODUCTION

Milk is not only an ideal natural collection of carbohydrates, proteins, and fats but also has rich concentrations of vitamins, minerals, and hormones. It plays a vital role in strengthening bones, teeth, and muscles, especially in children. [1] But, the issue at hand is that we are not consuming nutritious and pure milk in the first place to get its above-mentioned benefits, thus rapid screening of milk to detect adulteration is the need of today. Pakistan being the 4th largest milk producing country in the world, has its economy instrumentally dependent on the milk industry. Annual milk production was estimated to be 65.7 million tons in 2022-23.[2] In developing countries where food safety authorities are rather lenient, free from financial gain, problems of shortage of supply and several other factors take charge and milk falls victim to economically motivated adulteration. [3] The most common adulterant is water, which reduces the nutritional value of milk by many folds and the milk tastes watered down. [3] Dilution with water increases the volume but decreases the number of calories and nutrients like proteins, fats, etc the consumer gets per ml of milk. Furthermore, the water used in the process isn't distilled and is often contaminated. [3]

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Khyber Pakhtunkhwa (KPK), the second most populous province of Pakistan, produces 4.88 Million liters of milk per year.[2] According to research done in Peshawar, the average consumption of milk is 430gm per capita daily, or just under one million liters of milk consumed per day cumulatively.[4] Hence, a public health survey is needed to find out whether milk in the capital city of KPK, Peshawar, is safe for consumption at large or not. A large proportion of the population consumes milk supplied by dairy farms and not packaged milk as the latter is more expensive for the general population. There has been some research on adulteration of milk purchased from the milk shops and packaged milk but there's little data that tests the raw milk directly from the dairy farms. [1] This study gave an insight into whether physicochemical and nutritional adulteration of milk in Peshawar was present at the sources i.e. dairy farms or done at a later stage in the food chain e.g. at the milk outlets by the vendors. It should be noted that the study does not cover microbiological contamination of milk as it is dependent on milking hygiene practices and handling of milk.

The primary objective of this research was to analyze the different physicochemical and nutritional parameters of dairy farm milk and to assess its nutritional value in Peshawar to make sure that people are drinking healthy and nutritious milk.

MATERIALS AND METHODS

A descriptive cross-sectional study was conducted in the district of Peshawar among the commercial dairy farms registered with the Livestock and Dairy Development Department KPK. The time frame for the study was from May 2022 to August 2022. The sample size for this study was calculated to be 33 but 29 samples were eventually collected because the remaining four farms had been permanently closed due to unknown reasons. Cochran's formula was used to calculate sample size, based on another study done on milk in Peshawar. [1, 5] The Institutional Research and Ethical Approval Board (IREB) of Khyber Medical College Peshawar gave ethical clearance for this study vide letter no. 436/DME/KMC dated 27-06-2022. Permission for Milk testing was granted by the Office of the District Director Livestock Peshawar vide letter no. 1419 dated 13-06-2022 upon request from the Associate Dean (Research) Khyber Medical College vide letter no.724 dated 31-05-2022. The confidentiality of the respondents was maintained. Farm owners were informed about the purpose of the research study.

A master list of 417 registered dairy farms in Peshawar was procured from the Livestock and Dairy Development Department KPK. 33 Farms were selected using a simple random sampling technique (computer-generated sequence) from the master list using an online randomizer tool from the website: https://www.randomizer.org.

All the collected samples were bulk samples, as they are dispensed to the public in the same way, and not from an individual animal. Obtained samples were of fresh milk that hadn't gone through any intervention i.e. pasteurization, boiling, ultra-heat treatment (UHT), freezing, or packaging. In case any farm wasn't able to provide the milk samples, a substitute nearest farm was selected from the same location, or a raw milk sample was taken from the nearest sourced milk shop that had been supplied by the designated farm. This sampling strategy was chosen to improve the external validity of the study. The collection of samples was done in the morning hours over a couple of consecutive days.

The variables of the study were the following parameters: The chemical adulterants; urea, starch, hydrogen peroxide, detergent, sorbitol, quaternary ammonium compounds, boric acid, cane sugar, sodium chloride, carbonate, formalin, and hypochlorite. The nutritional parameters tested were fats, solids-non-fats (SNF), lactose, protein, and salts. Apart from these, electrical conductivity, freezing point, added water, pH, and density of milk were also tested.

Inclusion criteria were raw milk from the commercial dairy farms of Peshawar. Exclusion criteria were any dairy farm that had been permanently closed.

Approximately 500 ml of raw milk was collected in line with the standard protocol of milk collection and transported aseptically to the laboratory for analysis. Samples were given identification numbers and addresses of the farms to ensure systematic collection. The samples were stored in a chilled container but not frozen and delivered to the testing facility within 48 hours.

Milk analysis for all the above-mentioned variables was done using Milkotronic Ltd. Lactoscan SA50 Ultrasound milk analyzer. The ultrasonic working principle is based on measuring the speed of the ultrasound in milk and dairy products. All results from the Lactoscan analysis are based on a direct measurement of the parameters, which means confidence in the results. Analysis was done at the Milk Testing Laboratory, Civil Veterinary Hospital, Peshawar. The data was presented in the form of tables with standard deviation values and t-test results.

RESULTS

A total of 29 samples were analyzed. The raw data for all the parameters of adulteration are listed in Appendix A. The results showed that all the samples were negative for chemical adulterants. More than 90% of the samples showed water adulteration to some extent (Figure 1). After combining all factors of adulteration, the following results were calculated: 55% of samples had reduced nutritional status due to the addition of more than 5% water. 21% of samples had high electrical conductivity (6.5-12 mS/cm) reflecting mastitis in animals. However, 24% of samples

were largely unaltered as all parameters were within acceptable range including water addition of less than 5%.

A two-tailed t-test was performed on the major parameters of all the samples. The results of this study showed that the means of most of the physicochemical and nutritional parameters were significantly different from the standard means (p=0.05). The standard milk parameters used for comparison and analysis are given in Table 1. The mean values of the tested parameters, along with statistical analysis are listed in Table 2.

All values quoted in the table have been numbered with a reference number of the sources. Both mean values and minimum values have been mentioned. The sources include mean values taken from studies done on Pakistani cow and buffalo milk. The minimum values have been taken from international food regulation bodies. The letter 'a' denotes the values used for the t-test 'standard mean.'

The bar chart shows the percentage of water that has been added to the milk samples. A total of 2 samples had no water added to them, while 13 samples had water addition between 1-10%, similarly 6 samples had 10-20%, 3 samples had 20-30%, 3 samples had 30-40% and only 2 samples had greater than 40% water added in them.

DISCUSSION

Multiple factors can change the composition of milk naturally e.g. nutrition of the animal, breed of animal, seasons, emotional status of the animal, milking intervals, etc. The fat content of milk is the most variable component as compared to other variables. [7] In this study, fat values were significantly higher than the mean fat value of Pakistani cattle milk samples from another study (p=0.05).[8] The distribution showed that none of the samples had a fat percentage less than 3.2% (minimum standard for cow milk), while 5(17%) samples had 3.2-4.5% fat, 16(55%) samples had 4.5-6% fat (minimum standard for mixed milk) and 8(28%) samples had a fat percentage greater than 6% (minimum standard for buffalo milk). [9]

Solid-non-fat (SNF) is another major component of milk that includes all other solids like casein, albumin, globulin, and lactose. Like fat, SNF can vary too, and does not provide accurate evidence for the presence of extraneous water in milk. SNF mean value was higher than the mean of Pakistani samples but not significant at p=0.05. [10] It had the following distribution: 14 (48.3%) samples had less than 8.3% SNF present in them (minimum cow

Table 1: standard means and ranges of milk parameters

Source of Milk	Fat	SNF	Densit @ 18°C	Lactose	Salts	Protein	Freezing Point	pH	Conductivity (mS/cm)18
Cow	4.95%±1.9010 a Min 3.2%9	8.24%±0.7310 a Min 8.39	1030.711 lbs./ft3 a	4.5-4.8%13 a	0.8-0.9%18 a	3.56%± 0.05 10 a Min 3%12	-0.522°C ±0.00215 a Min ≤ -0.525°C6	6.62± 0.1010 a	Normal 3-5.5 a
Buffalo	7.45%±0.4210 Min 6.0%9	10.36%±1.7 10 Min 9.0%9	1034.111 lbs./ft3	4.7-5.0%13		4.17%± 0.5110	-0.545°C ±0.01016	6.71± 0.1110	Sub-Clinical Mastitis 5.5-6.
Mixed[9]	Min 4.5%9	Min 8.5%9							Clinical Mastitis 6.5+

i. All values quoted in the table have been numbered with a reference number of the sources. Both mean values and minimum values have been mentioned. The sources include mean values taken from studies done on Pakistani cow and buffalo milk. The minimum values have been taken from international food regulation bodies.

ii. The letter 'a' denotes the values used for the t-test 'standard mean.'

Table 2: T-Test Analysis Of Tested Parameters Of Milk

	Fat	SNF	Density	Lactose	Salts	Protein	Added water	Freezing point oC	pH	Electrical Conductivity
Sample Means	5.45%	8.12%	1030.09	3.69%	0.56%	3.81%	15.37%	-0.450	6.05	5.21
Std. Deviation	±1.15	±1.23	±4.44	±0.53	±0.08	±0.57	±14.27	±0.08	±0.67	±2.22
t- test* t(29), p=0.05 tc =2.048	2.341	0.525w	0.740	9.790	19.33	2.362	-	4.80	4.581	2.329

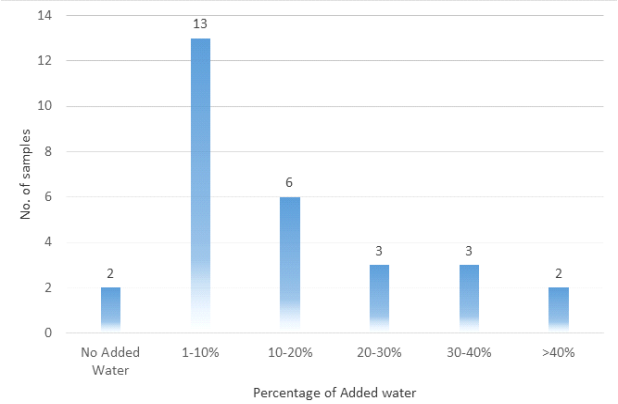

Fig 1: Percentage of added water in milk samples

standards), while another 7 (24.1%) samples had 8.3-8.9% (minimum standard for mixed milk) whereas 8(28%) samples had values greater than 9% (minimum for buffalo milk) of SNF. [9] The above-mentioned minimum cut-off percentages of fat and SNF in cow, buffalo, and mixed milk were taken from 'Food Safety and Standards Regulations, India', to interpret the results, as the cattle breeds were found to be similar in the two countries. [9]

The mean density of the tested samples was 1030.09 ±4.44 while the density of standard whole milk at 18°C is around 1032 kg/m^3 ±2. [11] Milk densities were not significantly different (p=0.05) from the standard means.

The fat, SNF, and density values were high despite adulteration with water; this could be the consequence of the admixture of cow milk with buffalo milk where the latter is naturally higher in these values. Many dairy farm owners themselves stated that they mixed the different types of milk. Mixing milk from different types of animals, especially cows and buffaloes is a familiar practice and comes under the definition of adulteration. [10] This may be done to reach regulation standards. Cow and buffalo milk differ in regards to their fat, SNF, and lactose content which are all higher in buffalo milk. Although there are methods to detect this admixture of milk, they are complex and not usually performed generally, as countries like Pakistan and India don't prohibit the mixing of milk from more than one species of animal.

The protein content was within permissible limits in a dominant chunk of the samples and only 4 (13.8%) samples had protein content <3%, which is the minimum standard according to the 'Australia New Zealand Food Standards Code'. [12] However, the mean protein content of the samples in this study was 3.81% which is more than the mean protein content of Pakistani cow milk (3.56 %) but less than Pakistani buffalo milk (4.17%). [10] This further endorses the phenomenon of mixing the milk of different cattle.

The percentage of salts and lactose was considerably low as compared to the sample means of other studies. 5(17%) samples had lactose percentages between 2-3%, while 16(55%) samples had lactose concentrations between 3-4%, and 8(28%) samples showed lactose percentages greater than 4%. The average lactose level in cow and buffalo milk in regional research was 4.85% and 5.48% respectively whereas in this study the mean lactose was 3.69% which was significantly low (p=0.05). [2,13] This can also probably be attributed to the addition of water.

It is important to note that water was added to most of the samples; up to 40% in some milk samples (Figure 1). This was deduced by the milk analyzer from the freezing point which decreases as water is added to milk, using dissolved solids. The freezing point of milk is the most constant and precise value for determining the presence of added water, due to biophysical reasons. [14] Evidence shows the average freezing point of cow and buffalo milk is -0.522°C ±0.002 and -0.545°C ±0.010 respectively [15,16], whereas in this study, the sample mean freezing point was -0.450°C ±0.08. This adulteration causes milk's nutritional value to be largely reduced, including the consumed calories/ml. This is a significant risk to public health nutrition.

The electrical conductivity (EC) of milk is measured to test for mastitis in animals. It is affected by the electrolytes present in milk, can be increased by adding salts and decreased by adding water in milk, but is always higher than the normal average in animals with mastitis. [17] It is one of the major parameters to judge milk quality and the presence of mastitis quickly and reliably in animals. In this study 6 (21 %) samples showed raised EC (6.5-12 mS/cm) and indicated clinical mastitis, 2 samples had 5.5-6.5% (subclinical mastitis) and 14 samples had 3.5-5.5% (healthy). These cut-off values and categories were provided by another research. [18] Animals receiving antibiotics for these infections can pass them onto humans through their milk, which is detrimental to health. Alternatively, untreated animals can pass on microorganisms such as S. aureus, Str. Agalactiae, Str. Dysgalactiae and E. coli etc in milk, causing diseases in humans.[19]

Another parameter of milk analysis was pH. The normal pH of fresh cow milk is 6.6 -6.9. The addition of preservatives and other adulterants can raise the pH of milk above the standard.[20] It was observed that the pH of milk was not a reliable indicator for detecting subclinical mastitis in lactating cattle [21] The pH value of milk at best

shows spoilage caused by bacterial fermentation which is based on the appropriate storage and timely usage of the milk by the end users. Hence this parameter was insignificant to our findings.

This study showed that none of the samples had any chemical toxins present, though previous studies reported the presence of chemical adulterants in milk consumed in Peshawar [4,22]. They included both packaged and fresh milk whereas our study was conducted on raw milk from dairy farms only. Furthermore, the lack of chemical adulterants might be due to the strict implementation of a ban by the provincial government. According to the Punjab Food Authority in Pakistan, only half of the milk samples were found to be adequate for drinking. Another report revealed that three-quarters of the samples of milk collected from Peshawar were found unhealthy and unhygienic. [22]

Despite best efforts to conduct the study, it had certain limitations. Only those farms that were registered with 'The Livestock and Dairy Development KPK Authority' had the farm details mentioned, allowing for a scientific sampling strategy; and were easily accessible. This may have omitted a few private small-scale farms from the study but not significant enough to affect the outcome of the study as they are not the major suppliers. Moreover, on-site testing at the farm could've reduced any systematic errors.

CONCLUSION

Water was the main adulterant resulting in significantly decreased nutritional quality in half of the milk samples. About a quarter of milk samples had high electrical conductivity indicating mastitis. Most nutritional parameters were more than the minimum values but lower than the national average milk values. An admixture of buffalo and cow milk was done. There were no chemical adulterants/preservatives detected in the milk. Continuous monitoring of milk should be made mandatory, with regular testing of dairy farms to uphold public health safety standards.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Azhar S	✓	×	✓	×	✓	×
Jamil W	✓	✓	×	✓	✓	×
Ali AH	✓	×	×	✓	×	×
Iftikhar B	✓	×	✓	×	✓	×
Orakzai M	×	✓	✓	×	×	✓
Afaq Y	✓	×	×	✓	×	×
Arshad A	×	×	✓	×	✓	×
Azhar A	✓	×	✓	×	✓	×
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Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Ethical Approval:

This Manuscript was approved by the Ethical Review Board of Khyber Teaching Hospital, Peshawar Vide No. 436/DME/KTH. Dated: 27 06 2022

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ORIGINAL ARTICLE

DETERMINING THE DEMOGRAPHIC PATTERNS OF DRUG-RESISTANT AND DRUG-SUSCEPTIBLE TUBERCULOSIS IN KPK, PAKISTAN THROUGH A RETROSPECTIVE SURVEY

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ABSTRACT

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

Objectives: The objective of this research was to find out the demographic characteristics of drug-susceptible and drug-resistant Tuberculosis in Khyber Pakhtunkhwa, Pakistan.

Material and Methods: A retrospective survey was conducted on data from the TB Control Program Khyber Pakhtunkhwa recorded between 1st January 2021 to 3rd June 2022. 7 sentinel sites and 5 Programmatic Management of Drug-resistant Tuberculosis sites report the data to the TB control program. The data was entered into Excel and analyzed through frequency tables, histograms, and bar charts.

Results: A total of 39,210 Tuberculosis cases were reported to TB control program KPK from 1st January 2021 to 3rd June 2022; 38,723 were drug-susceptible while 487 were drug-resistant TB cases. The highest percentage of TB was found in the age group 15-24 years. Males were more affected than females with drug-susceptible TB. In contrast, drug-resistant TB was affecting females more than males. 58% of cases were reported in the public sector while 42% cases in the private sector. The households of only 2,412 (6.22%) patients of drug-susceptible Tuberculosis were screened out of 38,723 patients. In 2815 Tuberculosis patients screened for HIV, 4 drug-susceptible and 5 drug-resistant cases were positive for HIV. 8.41% of drug-resistant TB patients were diabetic.

Conclusion: The frequency of TB cases is high in Khyber Pakhtunkhwa, especially among 15-24-year-olds. Household contact screening is inadequate in Khyber Pakhtunkhwa. There is a high percentage of coexisting drug-resistant TB and diabetes.

Keywords: Drug susceptible TB, Drug-resistant TB, HIV co-infection, Household contact.

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INTRODUCTION

Tuberculosis TB is an infectious disease caused by different species of mycobacterium, the most common being Mycobacterium Tuberculosis. [1] It infects all organs of the body but primarily the lungs known as pulmonary TB. [2] TB is classified into latent TB and active TB. Latent TB is non-contagious while people with active TB spread the infection through air-borne droplets.[3] Pulmonary TB is a serious health concern as it is more common than extra-pulmonary TB.[4]

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When the standard first-line anti-TB drugs; isoniazid INH, rifampin RIF, ethambutol EMB, and pyrazinamide PZA, are effective and completely cure the infection it is known as drug susceptible to TB DS TB. When the bacteria do not respond to the standard anti-TB treatment it is referred to as drug-resistant TB DR TB. [5] The global prevalence of DR TB is reported to be 11.6% which is quite high.[6] Further classification of DR TB includes multidrug-resistant TB being resistant to both isoniazid and rifampicin, the two most effective first-line TB drugs, and extensively drug-resistant TB is resistant to any fluoroquinolone, and at least one of three second-line injectable drugs capreomycin, kanamycin, and amikacin, in addition to multidrug resistance.[5]

Despite all the work done to curb TB, its prevalence remains high. Although TB cases are reported in almost every part of the world, 87 % of the new cases are reported in the 30 high-burden countries including Paki-

stan, Bangladesh, India, China, and Nigeria. The number of people getting infected with multi-drug resistant TB is also on the rise. [7]

Pakistan ranks fifth among high-burden countries for TB. An estimated 510000 new TB cases emerge annually, out of which 15000 are Drug-resistant cases. The country contributes to 61% of all the cases of TB in the WHO eastern Mediterranean region. Pakistan has the 4th highest prevalence of drug-resistant TB. [7] TB is not limited to specific age groups or gender. However, people with immune-compromised states, including HIV and Diabetes, are predisposed to active TB. The coexistence of TB and HIV is variable in different geographical locations. In Asian countries, it is around 17%. TB is the leading cause of death in HIV-positive patients.[8] According to WHO guidelines, screening of HIV in TB patients and TB in HIV patients is recommended to tackle the co-existence of this deadly combo.[9]

Diabetes is not an established co-morbidity of TB but the geographical distribution of TB burden and burden of diabetes coincide. Diabetes increases the risk of active TB. [10, 11, 12]. Changing lifestyles due to increased urbanization have resulted in a rising incidence of diabetes in developing countries. [13] Studies have shown that diabetes lowers the immunity of the body which could increase the chance of active TB. [10] The literature on emerging drug resistance, its co-infection with HIV, diabetes, and close contact transmission is lacking, which makes it difficult to eradicate TB in developing countries. Our study will help the policymakers to identify the most affected population and hence modify the measures taken to eradicate TB.

The objective of this research was to find out the demographic characteristics of drug-susceptible and -resistant TB in KPK, Pakistan. We further aimed to find out the frequency of diabetes among drug-resistant TB cases and to determine the frequency of HIV in TB patients.

MATERIAL AND METHODS

This retrospective descriptive study was conducted on data from the TB Control Program Khyber Pakhtunkhwa recorded between 1st January 2021 to 3rd June 2022. The ethical approval was granted by The Ethical and Research Board of Hayatabad Medical Complex approval number 1413 on 20 June 2023.

Data was collected using a universal purposive sampling technique from the TB control Program, KPK. The sample size was 39,210 including both drug-susceptible and drug-resistant TB cases. The TB cases reported to the seven TB/HIV sentinel sites and five Programmatic Management of drug-resistant TB PMDT sites were included. A total of 99 TB patients were excluded, out of which 69 patients were those whose treatment failed, 26 patients were those who were not able to follow up their treatment and 4 other patients were excluded due to their death during the study.

The data of the following variables was collected: age, gender, number of patients presenting to private practices and government-funded public hospitals, type of TB drug-susceptible and drug-resistant, immunodeficiency virus HIV, diabetes, and contact screening of households. Diabetes in drug-susceptible cases could not be evaluated as there was insufficient data in the records of the TB control program KPK. The data was transferred into Excel and it was presented in the form of frequency tables, histograms, and bar charts. The categorical variables were reported as numbers and percentages.

RESULTS

A total of 39210 TB cases were reported to the TB control program through 7 sentinel sites and 5 PMDT sites. Out of 39210 TB cases, 38723 98.75% were drug-susceptible while 487 1.24% were drug-resistant.

In drug-susceptible TB cases, males were more affected than females with a male-to-female ratio of 1.13 Fig 1. In drug-resistant TB cases, females had a higher frequency having a male-to-female ratio of 0.831. The age group 15-24 years had the highest prevalence of both drug-susceptible and drug-resistant TB. Although cases of drug-susceptible TB were high in the 0-4 age group, no cases of drug-resistant TB were reported in this age group Fig 2.

The household contacts of only 2412 (6.22%) patients of drug-susceptible TB were screened out of 38723 patients, while 36311 (93.7%) drug-susceptible TB patients' household contacts did not undergo screening. The total household contacts of the 2412 TB patients came out to be 8558. Out of these, only 6550 (76.53%) were screened for TB. 90 household contacts were diagnosed with TB and only 14 were put on preventive treatment.

A total of 2815 patients were screened for HIV. Only 4 cases in the drug-susceptible group and 5 in the drug-resistant group 1.02% were positive. All the drug-resistant cases were screened for diabetes. 446 cases showed a negative result while 41 (8.41%) patients were diabetic.

DISCUSSION

This survey was conducted to determine gender-wise and age-wise distribution and male-to-female ratio of drug-resistant and drug-susceptible TB. The frequency of the coexistence of Diabetes and HIV in the diagnosed TB population of Khyber Pakhtunkhwa, Pakistan was also determined.

Data collected for the survey showed that TB was most prevalent in the age group of 15-24 years- 18.76 % of drug-susceptible and 29.77% of drug-resistant TB. This is in accordance with the research conducted in Pakistan.

Table 1: Sentinel and PMDT sites

SENTINEL SITES	PMDT SITES
Lady Reading Hospital, Peshawar	Lady Reading Hospital, Peshawar
Hayatabad Medical Complex, Peshawar	Ayub Teaching Hospital, Abbottabad
District Head Quarter Batkhela, Malakand	Mufti Mehmood Memorial Teaching Hospital, D.I Khan
District Head Quarter, Abbottabad	Mardan Medical Complex, Mardan
District Head Quarter, Bannu	Programmatic Management of drug-resistant TB PMDT Swat Saidu Group of Teaching Hospital, SGTH
District Head Quarter, Kohat	
District Head Quarter, D.I Khan	

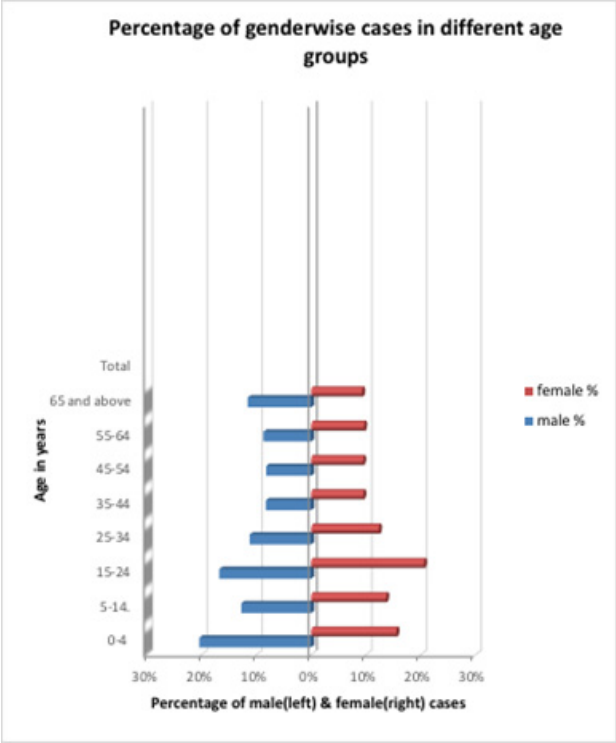

Fig 1: Age-sex distribution of Drug-Susceptible TB cases

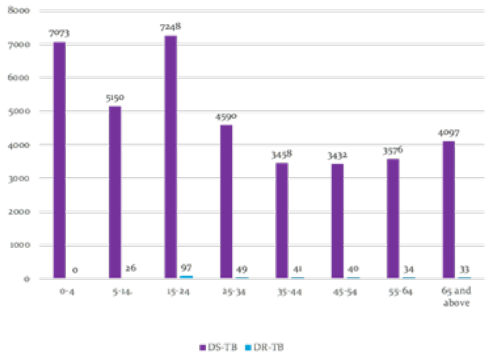

Fig 2: Frequency of DS and DR cases by age group

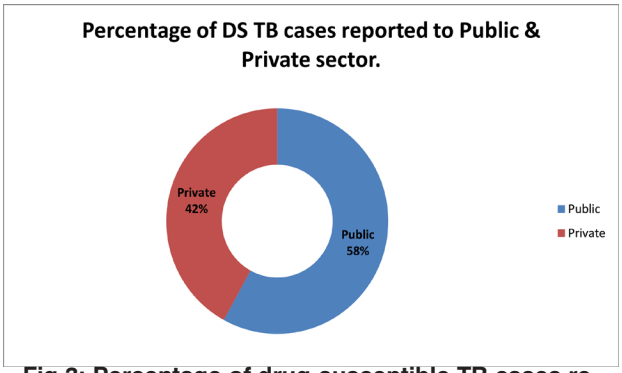

Fig 3: Percentage of drug-susceptible TB cases reported to the public and private sector hospitals

In Sana Sharif et al. 25% of TB cases were reported in the age group of 10-20 years in Multan [14]. In a research based on TB in Lower Dir, a high incidence of 28.1 % was observed in the age group of 1-20 years [7]. This age group is usually affected because of its greater exposure to potential suspects in the outside environment and ignorance of symptoms on appearance.

The data also showed that the rate of drug-susceptible TB was very high among young children aged from 0-4 years 18.312%; mainly due to malnutrition and frequent social contact of this age group with its family members.[15]

It is widely reported that TB is more prevalent in males than females. In our findings, the trends of drug-susceptible TB in KPK coincide with global trends. [16] However, the results of drug-resistant TB are contrary. Drug-susceptible TB is more frequent in males with a male-to-female ratio of 1.13, but in drug-resistant TB male-to-female ratio is 0.831. This figure is comparable to many studies conducted in KPK which have shown that the number of females suffering from TB is more than males. [17,18,19] Many factors including poor nutritional status, low immunity, and poor drug compliance could be contributing to this high frequency of drug-resistant TB in the female population.

TB is a contagious disease so people living together, especially exposed to patients with high-grade sputum smears, are at greater risk of getting the disease. [20] It is estimated that on average 10 to 15 people can contract TB from a single TB patient over one year. [21] Contact screen-

ing is an important measure in preventing the transmission of TB. Research conducted in Cambodia showed that intensive screening of contacts for 2 years made a noticeable reduction in TB cases.[22]

Although contact screening has been added to the management program of TB in Pakistan its adequacy is not reflected by our data i.e., only 2412 out of 38723 0.06% drug-susceptible TB patients' households were screened. According to the TB control program KPK, difficulty in accessing contact screening, lack of awareness about the spread of TB, and financial problems are a few reasons that result in inadequate contact screening.

Out of 38624 drug-sensitive TB patients, 58% were reported to the public sector and 42% to the private sector. This points out that the private sector plays as crucial a role as the public sector in the diagnosis and treatment of TB patients.

Public-private mix model ppm was piloted in specific areas in Pakistan in 2004. After a decade, WHO reported that Pakistan was still contributing to 7% of the gap between the reported cases and the estimated incidence of TB globally, and a revised ppm was implemented. [23]

TB and HIV are observed to display destructive synergy, TB being one of the main causes of death in HIV patients. According to WHO, 8.2% of TB patients were also suffering from HIV in 2019 [24]. Despite this high percentage, our data showed that the co-infection of TB and HIV was meager in KPK with only 4 out of 2328 drug-susceptible and 5 out of 487 drug-resistant TB patients having a co-infection with HIV.

Diabetes is known to increase the risk of active TB, especially in countries like Pakistan where the burden of both TB and Diabetes is very high.[10,11, 12] Only drug-resistant TB cases were screened for diabetes and 41 out of 487 patients 8.41% were found positive. These results agree with previous studies conducted in Pakistan. [25,26] Diabetes could be a risk factor for drug-resistant TB as TB patients with coexistent diabetes do not show a good response to anti-TB drugs. [27,28]

The limitations of this study were that data obtained from the TB control program, KPK was not available for diabetes in drug-susceptible TB. Not all TB cases were screened for household contact and it could not be confirmed if people acquired TB specifically from household contact or through any other source.

CONCLUSION

The findings of this study show that the frequency of TB cases is high in KPK, especially among the age group of 15-24. Household contact screening is inadequate in KPK, although it could be an effective way to diagnose TB in the early stages. There is only a slight difference between the total number of cases reported to private and public sector hospitals implying that both play a crucial role in the diagnosis of TB. There is a high percentage of coexisting drug-resistant TB and diabetes. Hence in patients suffering from both ailments simultaneously, procurement of successful TB treatment could warrant diabetes treatment as well. Unlike most other high-burden TB countries, HIV-positive TB cases were only meager, hence HIV could not be a risk factor for TB in KPK.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Ahmad U	✓	×	✓	×	✓	×
Arshad A	✓	✓	×	✓	✓	×
Jadoon S	✓	×	×	✓	×	×
Salih SS	✓	×	✓	×	✓	×
Ahmed H	×	✓	✓	×	×	✓
Saifullah S	✓	×	×	✓	×	×
Nayab H	×	×	✓	×	✓	×
Safi S	✓	×	✓	×	✓	×

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

Ethical Approval:

This Manuscript was approved by the Ethical Commttee of Hayatabad Medical Complex Peshawar. Vide No. HMC/QA-D/F-00 Dated: 06 09 2022

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ORIGINAL ARTICLE

MANAGEMENT OF DISC HERNIATION AT THE LUMBAR REGION THAT IS COMPLICATED WITH SPINAL STENOSIS USING SMALL INCISION FENESTRATION

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ABSTRACT

Objectives: The objective of the current study was to compare the alternative approach of smaller incision fenestration in managing lumbar disc herniation with spinal stenosis to previous conventional laminectomy procedures.

Patients and methods: The current case-control study included a total of 290 patients who were represented by two groups. Those patients were complaining of herniation of the lumbar disc with a complication of stenosis of the lumbar segments. Patients in the study group were treated by a small incision fenestration approach, whereas patients in the control group were treated by posterior laminectomy and decompression. Those patients were selected retrospectively from the pool of patients visiting the orthopedic units of Adiwaniyah Teaching Hospital, Adiwaniyah province, Iraq.

Results: Mean hospital stay of patients in the study group was lower in a significant way in comparison with that of patients in the control group, 6.03 ±2.08 days versus 8.07 ±3.13 days, separately ($p< 0.001$). Added to that, mean operative loss was significantly lower in a group of intervention in comparison with the control group, 52.12 ±5.17 ml versus 65.48 ±5.08 ml, respectively ($p< 0.001$). Added to that, mean operative time was lower in a significant way in the group of intervention in comparison with patients in the group of control, 62.62 ±3.09 minutes versus 87.09 ±3.47 minutes, respectively ($p< 0.001$). The mean"visual analogue score (VAS)" was significantly lower in the study group in comparison with the control group, 3.09 ±1.15 versus 6.08 ±2.17, respectively ($p<0.001$). A comparison of the mean "Japanese orthopedic association (JOA) score" for nerve function between the study group and the control group is shown in Figure 2. The mean "Japanese orthopedic association (JOA) score" was higher in a significant manner in the group of an intervention study in comparison with the control group, 27.15 ±3.07 versus 20.18 ±4.81, respectively ($p< 0.001$).

Conclusion: Small incision fenestration techniques are associated with significantly less hospital stay, less duration of operation, less blood loss, less visual pain score and better nerve function in comparison with conventional laminectomy procedure.

Keywords: smaller incision fenestration, lumbar disc herniation, spinal stenosis

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INTRODUCTION

Herniation of the lumbar intervertebral disc is regarded as the leading cause of sciatica worldwide, though, acute attacks of sciatica are mostly managed by conservative measures. [1] Nevertheless, the surgical managements provide a fast relief of pain in cases where surgery is the choice. [2] The previous research indicated that the relief of pain, better functional restoration, and patient satisfaction were greater in patients who underwent surgical operations than the patients who were treated conservatively. [3-5]

As the spinal cord courses in the vertebral canal posterior to the intervertebral disc and bodies of the vertebrae, the herniated disc may make compression of the spinal nerves or even cauda equina that leads to pain in the legs at its posterior aspect or even incontinence, and in severe cases, paralysis may occur. [6] Compression of the sac of the dura and spinal cord may lead to nerve-dysfunctional disease which is referred to as spinal stenosis syndrome. The patient complains of pain in the legs, weakness, and numbness after walking, these are relieved relatively by sitting or squatting, while at rest there are no symptoms. [7, 8]

Herniation of the lumbar disc associated with spinal stenosis is a commonly seen problem in clinics. The patients complain mainly of intermittent claudication during the activity of the patients. When the condition be-

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comes chronic, there is a pain-free period during rest. [9, 10]

The developments in minimally invasive techniques in spine surgery via endoscopic instrumentations and other assisted tools, furthermore trained surgeons, and patient's requests lead to the increase in the prevalence of these techniques in spine surgery. [11] Percutaneous-transforaminal endoscopic discectomy (PTED) and micro-endoscopic discectomy (MED) are regarded as the most commonly used two procedures which have been used in the last years.

The precise information about the location and morphology of the herniated lumbar disc which is enhanced by the development of imaging procedures pre-operatively, allows the ideal approach for each case. The procedure involved fenestration or extrusion of the herniated disc throw the foraminal interlaminar way with or without facet joint or laminal removal. [12]

By this approach, the stability of the vertebra is proportional to the amount of the removed bone, and to overcome these disadvantages, extrusion of the disc by direct approaches has been developed. Previous studies have described this procedure Di Lorenzo et al. and Soldner et al. used a similar technique which they described as a "translaminar approach" [13, 14] There is a generalized agreement between these authors about the efficacy of the inter-articular or translaminar approach as being the less effect on the stability of the vertebra.

The technique is increasingly performed for the release of the compression and removing the nucleus pulposus. The posterolateral approach is the route performed by the surgeons. [15, 16] Furthermore, it is shown that this procedure has therapeutic advantages that mimic the traditional procedures, and it is superior by other privileges like decreased loss of blood, smaller incision, less tissue trauma and fewer complications, adding to that, the short post-operative recovery periods and less financial cost. [17, 18]

However, the widespread use of Percutaneous Endoscopic Lumbar Discectomy (PELD), with the recurrence of disc herniation as the most frequent complication, has raised some fresh concerns over postoperative complications. With a 12-year follow-up, Choi et al. evaluated 10,228 patients who had PELD and discovered that 4.3% of the procedures failed, primarily due to the recurrence of disc herniation. However, some studies showed that the most common complication seen is the recurrence of herniation, as documented by Choi et al. [15]

Failure of conservative management in patients makes them a candidate for surgery. Removal of the herniated disc is the aim of the operation, in order to relieve the compression on the nerve root and at the same time preserve the stability of the vertebrae. The technique is commonly done, and it is regarded as the standard operation due to its feasibility and providing a good visual field to treat herniation of lumbar disc. [19, 20]

Despite its many benefits, percutaneous endoscopic transforaminal discectomy (PETD) frequently results in a disc herniation that returns. The recurrence rate of (PELD) in various investigations carried out at various spinal levels ranges from 0 to 7.4%. Nevertheless, fenestration discectomy is a widely used operation for the treatment of herniated lumbar disc. This technique is relatively easy and provides a good visual field, where the surgeon can visualize the ligamentum flavum and dissect it a way, at the same time the hyperplastic bone, too, as the purpose to decompress and expand the nerve canals. [21, 22]

MATERIALS & METHODS

The current case control study included a total of 290 patients who were represented by two groups. Those patients were complaining of herniation of lumbar disc with a complication of stenosis of lumbar segments. Patients in the study group were treated by a small incision fenestration approach, whereas patients in the control group were treated by posterior laminectomy and decompression.

Those patients were selected retrospectively from the pool of patients visiting the orthopedic units of Adiwaniyah Teaching Hospital, Adiwaniyah province, Iraq. The reports of those patients were retrieved and included those records of patients visiting the unit during the period extending from January 2018 to December 2022. The study group included 200 patients, 115 females and 85 males with an age range of 48 to 62 years.

The control group included 90 patients, 40 males and 50 females with an age range of 47 to 63 years. The diagnosis of lumbar disc herniation and spinal stenosis was based on clinical presentation combined with imaging documentation if the form of magnetic resonance imaging or computed tomogram or both.

All enrolled patients, in their reports, signed an informed consent to perform either of the two surgical approaches mentioned previously. Variables included gender, age, body mass index, duration of disease, visual analogue score (VAS), Japanese orthopedic association (JOA) score, duration of operation, blood loss during operation and hospital stay duration.

ETHICAL CONSIDERATION

The approval of the research was issued by the committee of ethical consideration of University of Al-Qadisiyah / College of Medicine. Because the collection of data was retrospective, written consent in the records of those patients was accepted by the ethical committee.

Patients were positioned prone on a spinal surgery frame with continuous epidural anesthesia. CT scans guided the fenestration point determination for precise in-

cisions. Care was taken to minimize damage to the spinal laminae. A 'narrow edged periosteal detacher' was used to delicately release the ligamentum flavum from the vertebral plates, ensuring minimal bone removal and creating a narrow operative window.

Tissue forceps and a thin nerve stripper were used to carefully manipulate the ligamentum flavum, allowing for the removal of herniated disc material and treatment of stenosis. Key steps included separating nerve roots and dura mater, cutting the fiber ring and longitudinal ligament, and removing nucleus pulposus. Techniques were adapted for specific conditions like cauda equina syndrome. Post-surgery, the focus was on thorough cleaning of the surgical site and effective wound closure. The study also compared operation duration, blood loss, and hospital stays between two patient groups.

In the control group, patients underwent posterior laminectomy and spinal decompression. The procedure included making a median incision, positioning vertebrae with a C-arm fluoroscopic device and pedicle screws, removing the ligamentum flavum, intervertebral disc, and part of the vertebral plate, and concluding with a bone transplant secured with screws and nuts.

The visual analogue score (VAS) was used to assess pain of patients after treatment (23). Nerve function was evaluated using Japanese orthopedic association (JOA) score (24).

"Data were analyzed using statistical package for social sciences (SPSS, Chicago, USA, IBM, version 16.0)". Qualitative variables were outlined as number and percentage and quantitative ones were shown as range, standard deviation and mean. "Independent samples t-test was used to compare means between groups". "Chi-square test was used to compare proportions between groups". The level of significance was suggested at $p \leq 0.05$.

RESULTS

General features of subjects included in this work are demonstrated in table 1. Significant difference was not obtained in proportion of females and males between study groups and control groups. There was, in addition, no significant difference in mean age between both groups. Moreover, significant difference was not obtained in mean BMI between both groups. Furthermore, significant difference was not obtained in mean disease duration, 8.31 ±3.72 years versus 7.92 ±4.05 years, respectively ($p = 0.108$).

Comparison of mean hospital stay, operative blood loss and operative time between control group and study group is shown in table 2. Mean hospital stay was significantly lower in study group in comparison with control group. In addition, mean operative loss was significantly lower in study group in comparison with control group. Added to that, mean operative time was significantly lower in study group in comparison with control group.

Comparison of mean "visual analogue score (VAS)" for pain between study group and control group is shown in figure 1. Mean visual analogue score (VAS) was significantly lower in study group in comparison with control group. Comparison of mean "Japanese orthopedic association (JOA) score" for nerve function between study group and control group is shown in figure 2. Mean "Japanese orthopedic association (JOA) score" was significantly higher in study group in comparison with control group

BMI: body mass index; SD: standard deviation; n: number of cases; I: independent samples t-test; NS: not significant

DISCUSSION

In the current study, we found that smaller incision

Table 1: General characteristics of patients included in this study.

Characteristic	Study group n = 200	Control group n = 90	p
Gender			
Male, n (%)	85 (42.5 %)	40 (44.4 %)	0.757 C NS
Female, n (%)	115 (57.5 %)	50 (55.6 %)	
Age (years)			
Mean ±SD	53.08 ±10.73	52.92 ±9.73	0.473 I NS
Range	48-62	47-63	
BMI (kg/m2)			
Mean ±SD	28.06 ±8.71	27.92 ±6.92	0.392 I NS
Range	23.03-36.18	22.92-37.16	
Mean ±SD	8.31 ±3.72	7.92 ±4.05	0.108 I NS
Range	2-9	3-8	

BMI: body mass index; SD: standard deviation; n: number of cases; I: independent samples t-test; NS: not significant

Table 2: Comparison of mean hospital stay, operative blood loss and operative time between study group and control group.

Characteristic	Study group n = 200	Control group n = 90	p
Hospital stay (days)			
Mean ±SD	6.03 ±2.08	8.07 ±3.13	<0.001 I ***
Operative blood loss (ml)			
Mean ±SD	52.12 ±5.17	65.48 ±5.08	<0.001 I ***
Operative time (min)			
Mean ±SD	62.62 ±3.09	87.09 ±3.47	<0.001 I ***

SD: standard deviation; n: number of cases; I: independent samples t-test; ***: significant at p ≤ 0.001

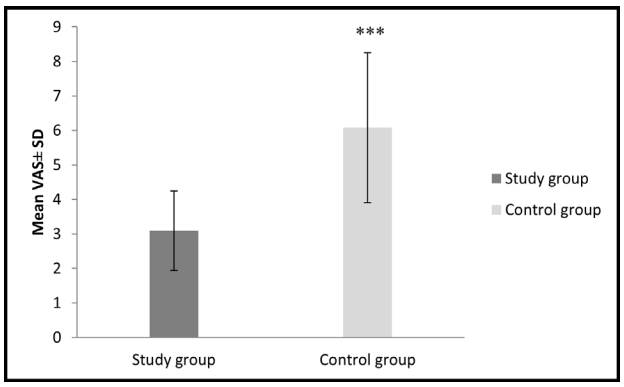

Fig 1: Bar chart showing comparison of mean visual analogue score (VAS) for pain between study group and control group. Data were shown as mean ±standard deviation; *: significant at p ≤ 0.001.**

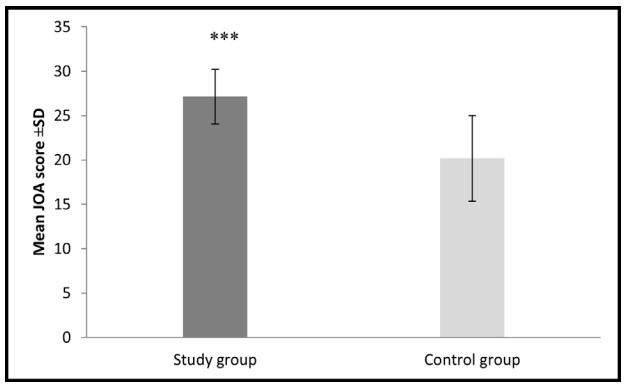

Fig 2: Bar chart showing comparison of mean Japanese orthopedic association (JOA) score for nerve function between study group and control group. Data were shown as mean ±standard deviation; *: significant at p ≤ 0.001**

fenestration approach in managing lumbar disc herniation with spinal stenosis was better in terms of hospital stay, duration of operation, blood loss, visual pain score and nerve function in comparison with conventional laminectomy procedure.

A quick and easy way to relieve severe sciatic pain is through surgical excision of the troublesome disc, and this technique has proven to be a rather safe procedure with positive yield for the most of patients. Although the technique of fenestration has several advantages over the often-utilized laminectomy technique, it has been used extensively for years to remove the problematic disc. Due to the significant corruption of the posterior stabilizing structures of the spine and its subsequent sequelae, the classic comprehensive laminectomy and discectomy have lost their reputation. [25]

The technique of fenestration discectomy is said to be less time-consuming, with less blood loss, with less postoperative complications, and it does not impact the integrity of the spine as compared to laminectomy due to the inherent minimally invasive nature of operation. [26]

In this study, we were aiming at comparing the method described previously by Zhu et al. involving small incision fenestration in managing lumbar disc herniation with spinal stenosis, to previous conventional laminectomy procedure. [24]

Indeed, Zhu et al. described less hospital stay, shorter duration of operation and better outcomes in association with this new operative technique. In line with this study, we found significantly less hospital stay, significantly less duration of operation, significantly less blood loss, significantly less visual pain score and significantly better JOA score in association with this alternative technique in comparison with conventional laminectomy procedure. According to some earlier researchers, when comparing fenestration with laminectomy, fenestration offered the added benefits of shorter operating times, less intraoperative blood loss, quick recovery, low risk of instability, and less post-operative problems such adhesions and arachnoiditis. [27, 28]

Sangwan et al. claim that the only difference between fenestration technique and microdiscectomy exposure is the extent. Both just remove a small number of discs overall. The annulus fibrosus must be cut when a protruded disc herniation is found. Due to more exposure, the fenestration approach provides the benefit of treating lateral recess stenosis as well. The surgeon should be ready to do foraminotomy or undercutting of upper or lower lamina in addition to lumbar discectomy if they be-

lieve that the root of nerve is still constricted following disc excision. [29]

CONCLUSION

Small incision fenestration technique is associated with significantly less hospital stay, less duration of operation, less blood loss, less visual pain score and better nerve function in comparison with conventional laminectomy procedure.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Kadhim AA	✓	×	✓	×	✓	×

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

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ORIGINAL ARTICLE

CHARACTERIZATION OF HYPONATREMIA IN PATIENTS WITH ISCHEMIC STROKE

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ABSTRACT

Objective: To characterize the hyponatremia based on severity in patients with ischemic stroke in the first twenty-four hours.

Materials & Methods: This cross-sectional descriptive study was done in the Medicine Department of Khyber Teaching Hospital, Peshawar, after obtaining approval from IREB. For a proportion of 25% population with mild hyponatremia, a sample of 289 was calculated using Open EPI Software keeping 95% as the confidence interval and 5% as the margin of error. We included all adult patients from age 16 years of either gender, having newly diagnosed ischemic stroke and yet had not started any treatment. Patients having other chronic diseases and endocrine disorders which can cause electrolyte disturbances, and act as confounders, were excluded. A Non-probability consecutive sampling technique was used. All data including name, age, gender, address, and the presence or absence of and the severity of hyponatremia was recorded. Data was analyzed using SPSS-22.

Results: The mean age of the patients was 53 years with SD ± 8.53 (range 40-69 years). Male patients were 56.1% while 43.9% were females. Out of 289 patients, 101 (35%) patients had hyponatremia. Amongst these patients having hyponatremia, mild hyponatremia was present in 63 (62%), moderate hyponatremia in 27 (27%) and profound or severe hyponatremia was present in 11 (11%).

Conclusion: Hyponatremia was present in about 1/3rd of patients who presented with ischemic stroke in our hospital. Among these, severe hyponatremia was seen in 11% of the patients.

Keywords: Hyponatremia, ischemic stroke.

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INTRODUCTION

A stroke is defined as a focal or global neurological deficit due to a vascular event, which lasts for 24 hours or more or leads to death. [1, 2] Electrolyte disturbances e.g. hypernatremia, hyponatremia, and hypokalemia are quite common in patients suffering from stroke. These disturbances may result from the elevation of brain natriuretic peptides (BNP), the syndrome of inappropriate antidiuretic hormone (SIADH), and/or inappropriate fluid intake or loss. These disturbances may negatively influence the outcome of such patients. The patients may develop impaired consciousness levels, seizures, complications due to seizures, or even death. [3] When the serum level of sodium is less than 135 mmol/L, it is called hyponatremia. [4] The hyponatremia is categorized as mild hyponatremia if the serum sodium level is 130-134mmol/L, moderate hyponatremia if the level is 125-129 mmol/L and profound or severe hyponatremia if the level is below 125mmol/L. [5, 6, 7] In patients with serum hyponatremia, however, the total body sodium may be low, high, or normal.[7] Hyponatremia not only is associated with high mortality in hospitalized patients but even after discharge from health care centers. The high mortality amongst the patients with hyponatremia appears to be due to the severity of the underlying disease, so the hyponatremia acts as a marker of the severity of the disease and worse prognosis.[8] In patients with stroke, hyponatremia may be clinically asymptomatic and may be associated with instability, falls, and impaired cognition. [9, 10] As early detection and correction of electrolyte disturbances in patients with ischemic may reduce mortality, we embarked on this study to determine the frequency and stage of hyponatremia in patients suffering from ischemic stroke.

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MATERIAL AND METHODS

This cross-sectional study was done in the Medicine Department of Khyber Teaching Hospital, Peshawar, after obtaining approval from IREB. For a proportion of 25% population with mild hyponatremia, a sample of 289

was calculated using Open EPI Software keeping 95% as the confidence interval and 5% as the margin of error. [11] We included all adult patients from age 16 years of either gender, having newly diagnosed ischemic stroke and yet had not started any treatment. Patients having other chronic diseases and endocrine disorders which can cause electrolyte disturbances, and act as confounders, were excluded. A non-probability consecutive sampling technique was used. We informed all patients and their caregivers about the research, and consent was taken from them in writing. After taking a detailed history and performing a clinical examination, all the participants were admitted to the medical ward. After confirmation of the diagnosis as ischemic stroke, 3 ml of venous blood was taken from the patients and was sent to the local hospital laboratory for measurement of serum electrolytes including sodium, potassium, and chloride by using the pertinent reference methods of the National Institute of Standards and Technology (NIST). [12] All data including name, age, gender, address, and the presence or absence of and the severity of hyponatremia was recorded. We used Statistical Package for Social Sciences (SPSS) version 20 for data analysis. Hyponatremia was stratified amongst age and gender, for effect modifications. All results were presented in the form of tables and graphs.

Table 1: Demographic Biodata of our patients

Variables	Group	Frequency n=289	Percentage
Age in years	18-40	78	27.0%
	41-75	211	73.0%
Gender	Male	162	56.1%
	Female	127	43.9%
Occupation	Own Business	194	67.1%
	Unemployed	95	32.9%
Marital Status	Married	237	82.0%
	Unmarried	52	18.0%
Hyponatremia	No hyponatremia	188	65.1%
	Mild	63	21.8%
	Moderate	27	9.3%
	Profound	11	3.8%

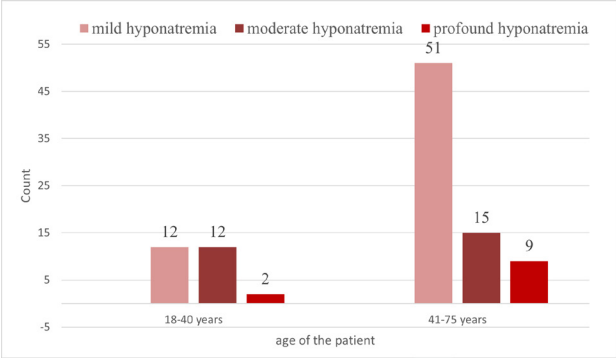

Fig 1: Distribution of severity of hyponatremia among different age groups

RESULTS

The age of the 289 patients, ranged from 18 to 75 years, 53 years was the mean age with SD ± 8.53. Male patients were 56.1% while 43.9% were females. The results related to the baseline characteristics are presented in the form of Tables and Bar graphs as follows.

DISCUSSION

The mean age of our patients was 53 years with SD ± 8.53. However, the mean age was 61.45 ± 11.8 years of the patients studied in another study. There is quite a significant difference in the age of the patients in these two studies, the obvious reason may be a population difference. In our study, 56% (162) of the patients were males while 44% (127) of the patients were females. Kidwai et al. have reported that 60% of the patients as males while 40% of the patients as females.[13] In both of the above studies, males were predominant i.e. 56-60%. This shows that somehow hyponatremia is more common in male patients presenting with ischemic stroke. Whether it was just a coincidental finding or there is some correlation between the male gender and hyponatremia in ischemic stroke needs to be sorted out. Mahesar et al. have reported hyponatremia in 38.6% of patients presenting with ischemic stroke. Out of these 38.6% of the patients, mild hyponatremia was present in 64.7%, moderate hyponatremia in 25.5%, and severe hyponatremia in 9.8% of patients. [11] Another study conducted on 132 patients at Karachi reported that mild hyponatremia was present in 25% of the patients (130-134mMol/L), but moderate hyponatremia was present in 9.8%.[11] Saleem S et al. have also reported hyponatremia in 353 patients out of 1000 patients, i.e. 35.5%. [14] So most of the studies have reported that 35-38.6% of the patients suffering from ischemic stroke have hyponatremia.

CONCLUSION

Our study concludes that 35% of our patients who presented with ischemic stroke had hyponatremia. Among these, severe hyponatremia was seen in 11% of the patients. Further large-scale studies are needed at multiple sites to determine the true prevalence, etiology and outcomes of hyponatremia.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Khan Z	✓	×	✓	×	✓	×
Iqbal S	✓	✓	×	✓	✓	×
Ahmed F	✓	×	×	✓	×	×
Ahmad A	✓	×	✓	×	✓	×

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

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This Manuscript was approved by the Ethical Review Board of Khyber Teaching Hospital, Peshawar Vide No. 424/DME/KTH.

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COMPARISON OF NEONATAL OUTCOMES IN TERM PREGNANCIES IN NORMAL VS ABNORMAL CARDIOTOCOGRAPHY- AN EXPERIENCE AT A TERTIARY CARE TEACHING HOSPITAL

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ABSTRACT

OBJECTIVE: To compare the neonatal outcomes in normal vs abnormal cardiotocograhy in term pregnancy.

MATERIALS AND METHODS: This was a prospective analytical study carried out in A unit of obstetrics and Gynaecology department of Khyber Teaching Hospital Peshawar from 15th April 2022 to 15th October 2022. A total 224 patients meeting inclusion criteria were included in study. In Group A (normal CTG) there were 111 patients and 113 were in Group B (abnormal CTG). Patients with known fetal congenital abnormalities, intrauterine growth restriction, and fetal mal presentations were excluded from the study.

RESULTS: The mean age of sample population was 26.02+4.497. Multigravidae were more than primigravidae in both groups (86.4% vs 13.6% in Group A and 72.5% vs 27.5% in Group B). In Group B, caesarean section rate was higher (82.3%) than Group A (9%). From Group B, 26 (23%) newborns went to NICU for admission, whereas only 8 (7.2%) newborns from Group A needed NICU admission. Hypoxic ischemic encephalopathy was also observed more in newborns in Group B compared to Group A (10 vs 1). In Group A 12 babies had APGAR score <7 at 1 minute while in Group B 18 babies had APGAR score < 7 at 1 minute. In Group A 2 babies had APGAR score <7 at 5 minutes whereas in Group B 7 babies had APGAR score < 7.

CONCLUSION: The caesarean section rate, NICU admission and hypoxic ischemic encephalopathy were more in Group B than in Group A and this difference was statistically significant (p-value 0.000, 0.000 and 0.006 respectively). Whereas there was no statistically significant difference in APGAR Score at 1 and 5 minutes in both groups (p-value 0.26 and 0.094 respectively)

KEY WORDS: Cardiotocography, APGAR score, Caesarean section, hypoxic ischemic encephalopathy.

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INTRODUCTION

Labour is not only painful for mother, it puts significant stress on the fetus as well. Nutrients and oxygen supply to the fetus are reduced due to reduced uterine perfusion during uterine contraction. This stress is further added if there is pre labour uterine insufficiency in pregnancies complicated by medical disorders. Fetal distress during labour, if not diagnosed and treated promptly may lead to increased neonatal morbidity including birth asphyxia, low APGAR score, operative delivery, NICU admission and even death in severe cases. [1] This emphasizes the need for fetal monitoring during labour. [2]

There are various methods for fetal assessment during labour. It includes structured intermittent auscultation, cardiotocography, assessment of amount and colour of liquor and fetal scalp blood sampling. [3] According to RCOG guidelines fetal heart rate should be monitored after every 15 minutes in the active phase of first stage of labour and every 5 minutes in second stage of labour preferably after a uterine contraction. [4]

Cardiotocography (CTG) is a simple, non-invasive tool for assessing fetal status during labour. [5] There are 4 basic components of CTG i.e baseline heart rate, variability, presence of acceleration and absence of deceleration. Normal baseline fetal heart rate is 110-160 beats per minute. Normal baseline variability is 5-25 beats per minute. Accelerations is increase in the base line fetal heart rate of 15 beats per minute lasting for 15 seconds. Decelerations is decrease in the base line of fetal heart rate of 15 beats

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per minute lasting for more than 15 seconds. Patient history, medical condition and stage of labour should be taken into account while interpreting CTG. [6] A single abnormal parameter of the CTG should not be interpreted in isolation. In our unit, we follow the three tier system of interpretation of the CTG recommended by RCOG and ACOG. In this system CTG is classified as Normal (all features are reassuring) suspicious (only 1 feature non-reassuring) and abnormal (2 or more features non reassuring or 1 or more abnormal). With all benefits of being non-invasive, readily available with pretty good sensitivity, it is only a screening test and secondary diagnostic tests are needed to avoid unnecessary obstetric intervention. Fetal blood sampling is needed to confirm acid based status of the fetus. [8] It is invasive and may not be available everywhere especially in resource limited areas. Rational of our study is to compare neonatal outcome in terms of APGAR score at 1 and 5 minutes, mode of delivery, NICU admission and hypoxic ischemic encephalopathy in normal vs abnormal cardiotocography.

MATERIALS AND METHODS

This prospective analytical study was carried out in the Department of Obstetrics and Gynaecology Unit "A" of MTI Khyber Teaching Hospital Peshawar from 15th April 2022 to 15th October 2022. Before starting the study, the ethical committee approved the proposal for the study. WHO sample size calculator was used to calculate the sample size. Relating to the correspondence prevalence of the disease of 18%, confidence interval of 95% and margin of error of 5%, sample size came to be 224. Labouring women of age between 20-55 years, having period of Gestation 37-42 weeks admitted to labour room were included in the study while patients with known fetal congenital abnormalities, intra uterine growth restriction and fetal mal-presentations were excluded.

Data collection procedure: Patients fulfilling inclusion criteria were enrolled in study. Informed consent was taken from all patients included in study. The fetal status was assessed by intra partum cardiotocography. Two groups were formed on the basis of cardiotocography findings. Group-A with normal cardiotocography findings and Group-B with abnormal cardiotocography findings. The results of cardiotocography were interpreted according to RCOG guidelines. All Patients were thoroughly assessed throughout their labour and mode of delivery was decided according to maternal and fetal status. The APGAR score was calculated for newborn babies at 1 and 5 minutes. The number of babies sent to NICU were thoroughly assessed by pediatricians for signs and symptoms of hypoxic ischemic encephalopathy.

All data was collected using a preformed proforma. The results of the study were analyzed using SPSS v.25. Descriptive statistics of percentages and frequencies were used for analysis of basic variables. Chi-square test was used to detemine the differences between neonatal outcomes and cardiotocography findings in both groups. In addition, Pearson correlation test was used to check the relationship between neonatal outcomes and abnormal cardiotocography. The results of all the test of significance will be considered significant at $p < 0.05$ level.

RESULTS

Total number of patients was 224. Group A consists of 111 cases with normal CTG and Group B consists of 113 cases with abnormal CTG. Mean age of population was 26.0214+497 with the age range of 17 to 38 years. In both groups, multigravidae were more than primigravidae. Group A had 96 (86.4%) multigravida and 15(13.6%) primigravidae. In Group B, multigravidae were 82 (72.5%) and primigravidae were 31 (27.5%). In Group A, 12 babies had APGAR score of <7 at 1 minute while in Group B, 18 babies had APGAR score of <7 at 1 minute. Two babies had an APGAR score of <7 at 5 minutes in Group A while, 7 babies had an APGAR score of <7 at 5 minutes in Group B. There was no statistically significant difference in APGAR score of newborns at 1 minute (P = 0.261) and 5 minutes (P=0.094). Caesarean section was performed in 10 patients in Group A compared to 93 in Group B. Result is statistically significant (P< 0.001). In group A, 8 babies were sent to NICU whereas 26 babies in Group B were referred to NICU. This finding was statistically significant

Table 1: Neonatal outcomes in Normal vs Abnormal Cardiotocography

S. No.	Variables		Group A (Normal CTG)	Group B (Abnormal CTG)	X2 (P. value)
1	Mode of Delivery	Normal Vaginal Delivery	101 (91%)	20 (17.6%)	124.7 (.000)
		Cesarean section	10 (9%)	93 (82.4%)	
2	APGAR Score at 1 minute	< 7	12 (10.8%)	18 (16%)	1.265 (.26)
		> 7	99 (89.2%)	95 (84%)	
3	APGAR Score at 5 minute	< 7	2 (1.8%)	7 62%)	2.802 (.094)
		> 7	109 (98.2%)	106 (93.8%)	
4	NICU Admission	Yes	8 (7.2%)	26 (23%)	10.86 (.000)
		No	103 (92.8%)	87 (77%)	
5	Hypoxic Ischemic encephalopathy	Yes	1 (0.9%)	10 (8.8%)	7.576 (.006)
		No	110 999.1%)	103 (91.2%)	

(P<0.001). Difference between 2 groups in terms of Hypoxic ischemic encephalopathy was also statistically significant (P = 0.006).

DISCUSSION

Results of our study showed that abnormal CTG is associated with an increased rate of cesarean section, NICU admission and hypoxic ischemic encephalopathy of the newborns, however it is not associated with low APGAR Scores. The mean age of the population in our study was 26.02+4.497, with age range of 17 to 38 years. The study conducted by Amena et al. showed the similar result (26.7 + 4.9). [9] L. Ali found the mean age of his study population to be 30.51 + 6.11 years. [10] We have 13.5% primigravidae and 86.5% multigravidae in Group A and 27.4% primigravidae and 72.6% multigravidae in Group B. It is comparable to the incidence reported by Bhartiya et al. [11] More than 90% of patients with normal CTG delivered normally whereas only 17.6% patients with abnormal CTG delivered normally and 82.4% had cesarean section. This difference is statistically significant (P.value 0.000). Salahuddin N et al. showed similar results where 76.7% of patients with abnormal CTG had undergone cesarean section. [12]

Gordane et al. reported the cesarean section rate of 64%. [13] Whereas, a study done by Oladrain et al. and Istran et al. showed cesarean section rate of 72% and 66.7%, respectively. [14, 15] The increase in cesarean section rate is due to the need of intervention to expedite the delivery of the distressed fetus.

APGAR score < 7 at 1 minute was seen in 10.8% of babies in Group A and 16% of babies in Group B. An APGAR score more than 7 at 1 minute was seen in 89% of babies in Group A and 84% babies in Group B. whereas APGAR Score more than 7 at 1 minute was seen in 89.2% of babies in Group A and 84% babies in Group B. It remained less than 7 at 5 minutes in 1.8% of newborn in Group A and 6.2% newborns in Group B. It was more than 7 at 5 minutes in 98.2% and 93.8% in Group A and Group B respectively. It showed no statistically significant difference in APGAR Score at 1 and 5 minutes. A local study conducted by Sheikh et al reported no association between abnormal CTG and APGAR Scores at 1 and 5 minutes. [16] A study conducted by Mahjabeen N in Dhaka Showed statistically significant difference in APGAR Scores in both groups. [17]

In Group A 7.2% of newborn babies needed NICU admission in comparison to 23% of the newborn babies in Group A. It was statistically significant difference (P. value 0.000). It compares favorably with other studies done previously. [18, 19] Timely detection of fetal distress with use of CTG results in increase in the NICU admission but decrease in the neonatal death. These babies needed only oxygen by bag and mask for a very short duration and none of them needed advanced resuscitation.

Our study showed statistically significant difference in hypoxic ischemic encephalopathy in both groups (1% versus 10%). Similar results are reported by Dilip Kumar Bhagwair. [20] All babies had mild hypoxic ischemic encephalopathy. They were kept under observation for 48 hours and then were discharged. No neonatal deaths were recorded in both groups in our study. Study done by Singh SK showed neonatal death rate of 0.6% (3 of 500). [21] Reduced morbidity and mortality are due to early detection of fetal compromise and timely intervention to expedite delivery process.

CONCLUSION

The caesarean section rate, NICU admission and hypoxic ischemic encephalopathy was more in Group B as compared to Group A and these differences were statistically significant. There was no statistically significant difference in APGAR scores in both group. CTG is a useful, noninvasive tool to detect fetal distress. But at the same time, it results in increased cesarean section. Fetal blood sampling should be done to confirm fetal acidosis before performing cesarean section. In this way, fetal distress will be diagnosed without increased cesarean section rate.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Akhtar Z	✓	×	✓	×	✓	×
Ghayur MS	✓	✓	×	✓	✓	×
Bangash AG	✓	×	×	✓	×	×
Bibi H	✓	×	✓	×	✓	×
Naib JM	×	✓	✓	×	×	✓
Akhtar N	✓	×	✓	✓	×	×

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

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ORIGINAL ARTICLE

THE CORRELATION BETWEEN BETHESDA SYSTEM AND ULTRASOUND-BASED TIRADS FOR REPORTING THYROID CYTOPATHOLOGY

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ABSTRACT

Objectives: To correlate the screening ability of ultrasound-based TIRADS with the FNAC-based Bethesda system when the latter is kept as a gold standard.

Material and Methods: A cross-sectional study was conducted in the Histopathology department, Rehman Medical Institute, Peshawar 15th June 2022- 14th June 2023. A total of 363 patients from any age group of either gender diagnosed with thyroid nodules were included in the trial. All the participants underwent ultrasound followed by ultrasound-guided fine needle aspiration of thyroid nodules. TIRADS and Bethesda grading was done for each participant. Demographics and grading scores were recorded. Keeping Bethesda scoring as gold standard diagnostic performance of TIRADS grading was calculated.

Results: Mean age of the patients was 46.68 ± 12.28 years with a female-to-male ratio of 2.3:1. TIRADS grading revealed 210 (69.8%) from TIRADS 2 while 70(82.4%), 12(50%), and 09(23.7%) patients were from TIRADS 3, 4 and 5 categories respectively. Bethesda grades were 301(82.9%), 21(5.8%), 09(2.5%), 28(7.7%), and 04(1.1%) from Bethesda 2, 3, 4, 5, and 6 categories respectively. The sensitivity of the TIRADS was 93.8%, specificity 89.1%, positive predictive value 45%, negative predictive value 99.3%, and a diagnostic accuracy of 89.5%.

Conclusion: TIRADS grading has a high diagnostic ability when Bethesda scoring is kept as the gold standard. It can be used effectively in segregating benign from malignant nodules and is recommended for screening patients presenting with thyroid nodules.

Keywords: Biopsy, Fine-Needle, Sensitivity and Specificity, Thyroid Nodule

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INTRODUCTION

The presence of thyroid nodules is a condition that can be detected coincidently in several patients with a prevalence of 68%.[1] The primary role of a clinician in such patients is to differentiate between benign and malignant nodules. The increasing incidence of cancer throughout the globe with widespread local and systemic complications warrants early detection of malignant nodules which can be found in 5% of the patients presenting with thyroid nodules.[2]

Regional statistics from a trial conducted in Pakistan revealed 4.9% of patients with solitary nodules in the district of Dera Ismail Khan, Khyber Pakhtunkhwa. Out of 4.9% nodules, 94.4% were found benign while 5.6% were found to be malignant.[3] A previous trial performed to assess the epidemiology of thyroid nodules revealed that the prevalence increases with increasing age. Similarly, gender was an important factor as female patients of all age groups are more prone to develop thyroid nodules as compared to males. The most common histological type of thyroid cancer was papillary thyroid carcinoma, which was diagnosed in 59 (84%) patients out of 70 individuals.[4] Novel diagnostic therapies have been in use for the diagnosis of thyroid nodules which include non-invasive and invasive approaches. Patients presenting with thyroid nodules are subject to undergo ultrasonography for evaluation and it helps in differentiating a benign from a malignant nodule. Benign nodules visualized under ultrasonography are usually hyperechogenic, wider than taller, flat or oval with smooth margins, and peripheral vascularity, and resemble normal parenchymal tissue. Malignant nodules are usually hypoechogenic, solid, and taller than wider

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with nodular vascularity and irregular margins.[5,6]

Thyroid imaging reporting and data system (TI-RADS) is a scoring technique based on ultrasound findings of thyroid nodules which evaluates the composition, echogenicity, shape, margins, and echogenic foci. Based on the scoring, the nodules are classified into TIRADS 1 - TIRADS 5 categories if the nodules are benign, not suspicious, mildly suspicious, moderately suspicious, highly suspicious, and malignant respectively.[7] Such noninvasive techniques utilized for stratification of benign and malignant thyroid nodules are gaining popularity as evidenced by a high sensitivity of 94% and specificity of 67.39%.[8]

Invasive diagnostic modalities include fine needle aspiration cytology of the thyroid nodules performed by histopathologists, radiologists, surgeons, or endocrinologists. Specimens obtained after the procedure are evaluated by histopathologists using the Bethesda system for reporting thyroid cytopathology. Based on the histological characteristics of the specimen Bethesda system classifies thyroid nodules into Bethesda 1 if the nodules are not diagnostic, 2 for benign, 3 for atypia, 4 for suspicious of follicular neoplasm, 5 for suspicion of malignancy and 6 for malignant nodules.[9]

The communication between a surgeon, endocrinologist, radiologist, and histopathologist is of prime importance for patients presenting with thyroid nodules. Before the availability of advanced ultrasound machines and expertise invasive procedures were commonly performed and resection was frequently employed followed by histopathological analysis in patients presenting with thyroid nodules. The application of TIRADS has led to improved diagnostics and valuable stratification of benign and malignant nodules. The objective of this paper is to evaluate the effectiveness and accuracy of TIRADS as a screening modality in correlation with FNAC FNAC-based Bethesda grading system when the results of the latter are considered the gold standard. The study can help enhance diagnostic practices in patients with thyroid nodules thus enhancing patient care and outcomes.

MATERIAL AND METHODS

This was a cross-sectional study conducted at Rehman Medical Institute, Peshawar after approval of the hospital's ethical review committee. The study period was from 15th June 2022 to 14th June 2023. Inclusion criteria were patients from any age group of either gender diagnosed with thyroid nodules were included in the trial. Patients from the TIRADS 1 category (unsatisfactory) or Bethesda 1 (non-diagnostic) after two attempts of Fine needle aspiration were excluded.

When the results of FNAC were kept as gold standard diagnostic performance of TIRADS revealed a sensitivity of 92%, specificity of 90% with expected prevalence of thyroid malignancy as 8% in patients with thyroid nodules.[10] A sample size of 363 patients was calculated using a desired precision of 10% with a confidence level of 95%.

All patients diagnosed with thyroid nodules were subject to ultrasonography of the thyroid gland by a classified radiologist. Demographic characteristics of all the participants were recorded. Based on the ultrasound findings, size, shape, texture, echogenicity, margins, and vascularity of the tissue TIRADS was employed, and a score was given to each patient. TIRADS 1 - TIRADS 5 categories were used and nodules with a score of 1 were taken as benign, 2-not suspicious, 3-mildly suspicious, 4-moderately suspicious, and 5-highly suspicious for malignancy. TIRADS scoring was recorded followed by fine needle aspiration and collection of the specimen in sterile containers. Specimens of all the patients were taken/received by the histopathology department of our hospital and reported by a specialist cytopathologist. Bethesda scoring system was employed to grade each sample. Based on the cytological characteristics, Bethesda classification was used to classify thyroid nodules into Bethesda 1 if the nodules are non-diagnostic, 2 for benign, 3 for atypia, 4 for suspicious of follicular neoplasm, 5 for suspicion of malignancy and 6 grade for malignant nodules.

The data recorded was analyzed by SPSS version 23. Frequencies and percentages were calculated for categorical variables while mean and standard deviation were calculated for continuous variables. Cross-tabulation was performed, and analysis was done to calculate sensitivity, specificity, positive predictive value, and negative predictive value. The diagnostic accuracy of TIRADS was computed with a 2 x 2 table while keeping the results of Bethesda grading as the gold standard for the segregation of benign and malignant nodules. The following formulas were used for calculation:

RESULTS

The total participants included in the study were 363 with a mean age of 46.68 ± 12.28 years out of which female participants were 256(70.5%) while male participants 107(29.5%) having a female-to-male ratio of 2.3:1. TIRADS grading was recorded for each patient which revealed 210 (69.8%) from TIRADS 2 (fig. 3&4), while 70(82.4%), 12(50%) and 09(23.7%) patients were from TIRADS 3, 4 and 5 categories respectively. After FNAC, Bethesda scoring was performed which revealed 301(82.9%), 21(5.8%), 09(2.5%), 28(7.7%), 04(1.1%) from Bethesda 2 (fig. 1&2), 3, 4, 5 and 6 (fig. 5&6) categories respectively. The results of Bethesda and TIRADS scoring are shown in Table I. For segregation of malignant from benign nodules results of Bethesda scoring were taken as the gold standard and Bethesda category 5 and 6 were taken as malignant lesions while the rest were taken as benign. TIRADS category 4 and 5 were considered malignant while 2 and 3 were taken as benign. The ability of TIRADS to predict the benign and malignant lesions was analyzed by a 2 x 2

cross table keeping the results of FNAC (Bethesda) as the gold standard and results of sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy were calculated. FNAC followed by Bethesda scoring of 363 specimens revealed 32(8.8%) malignant nodules categorized as Bethesda 5 and 6 of which 30(93.8%) were accurately predicted by TIRADS. The sensitivity of the TIRADS was 93.8%, specificity 89.1%, positive predictive value 45%, negative predictive value 99.3%, and diagnostic accuracy of 89.5% as shown in Table II.

Figures 1&2, FNAC of a benign nodular goiter showing bland follicular epithelial cells arranged in monolayered sheet with abundant colloid (Diff quick stain 10x & 40x) Figure 3 & 4, Solid isoechoic nodule with smooth margins and specks of calcifications (blue arrow) Figure 5&6, Neoplastic cells arranged in papillae with fibrovascular core and crowded cells with intranuclear pseudo inclusion (Diff quick 10x & 40x)

DISCUSSION

The cross-sectional study was conducted to evaluate the diagnostic ability of ultrasound-based TIRADS in reporting thyroid cytopathology when FNAC based Bethesda grading system was kept as the gold standard. Gender distribution of our results revealed 256 (70.5%) females as compared to 107(29.5%) males similar to the study done by Li Y et al who concluded that females are more prone to thyroid nodules as compared to males.[12] In our study out of 363 patients presenting with thyroid nodules 32(8%) were found malignant. In a similar study conducted by Hadjisavva IS et al, the overall prevalence of thyroid malignancy in patients presenting with thyroid nodules was 14%.[13]

For all calculations in our study TIRADS category 4 and 5 while Bethesda 5 and 6 nodules were recorded as malignant. A total of 301 (83%) patients revealed benign thyroid nodules or mild suspicion of USG (TIRADS 2 and TIRADS 3) while 62(17%) were suspicious of malignancy or malignant nodules (TIRADS 4 and 5). Similarly, Bethesda grading of the tumors revealed 32 (08%) suspicious of malignancy or malignant nodules (Bethesda 5 and Bethesda 6) and 331 (92%) benign nodules (Bethesda 1,2, 3, 4). None of the benign thyroid nodules as predicted by TIRADS 2 grading in 216(59.5%) patients were (Bethesda 4, 5, or 6) malignant or suspicious of malignancy hence the risk of malignancy was 0%. Similarly, the risk of malig-

Table 1: Bethesda and TIRADS grading among patients (n=363)

	BETHESDA GRADING					
	Bethesda 2 n=%	Bethesda 3 n=%	Bethesda 4 n=%	Bethesda 5 n=%	Bethesda 6 n=%	TOTAL n=%
TIRADS 2	210 (57.85%)	06 (1.6%)	00	00	00	216 (59.5%)
TIRADS 3	70 (19.28%)	08 (2.2%)	03 (0.82%)	04 (1.1%)	00	85 (23.41%)
TIRADS 4	12 (3.31%)	05 (1.37%)	03 (0.83%)	03 (0.83%)	01 (0.27%)	24 (6.62%)
TIRADS 5	09 (2.47%)	02 (0.55%)	03 (0.83%)	21 (5.78%)	03 (0.83%)	38 (10.4%)
TOTAL	301(82.9%)	21(5.78%)	09(2.47%)	28(7.71%)	04(1.1%)	363 (100%)

Table 2: Diagnostic performance of TIRADS keeping FNAC as the gold standard (n=363)

TIRADS	FNAC (Bethesda 5, Bethesda 6)	
	Malignant	Non-Malignant
Malignant	30	36
Non-Malignant	02	295

Table 3: Comparison of our results with national and international studies

Comparison	Sensitivity	Specificity	PPV	NPV	DA
Safdar A et al	93.8%	89.1%	45%	99.3%	89.5%
Ahmed SI et al19	90.6%	87.5%	39%	99%	88.5%
Raza SH et al20	89.5%	86.8%	37%	98.9%	88.1%
Zeng L et al21	91.2%	88.7%	40%	99.1%	88.9%
Xu Y et al22	92.3%	90.5%	42%	99.2%	89.8%

Sensitivity: 93.8%

Specificity: 89.1%

Positive predictive value: 45%

Negative predictive value: 99.3%

Diagnostic accuracy: 89.5%

Figure 1

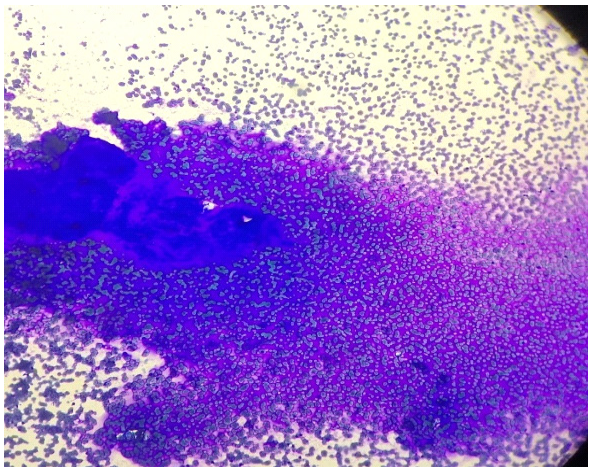


Figure 2

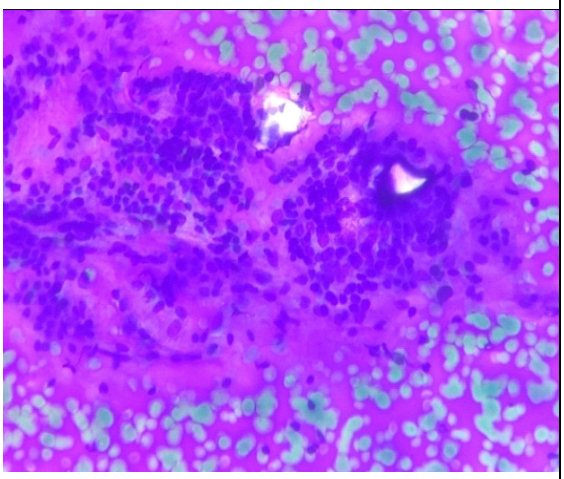


Figure 3

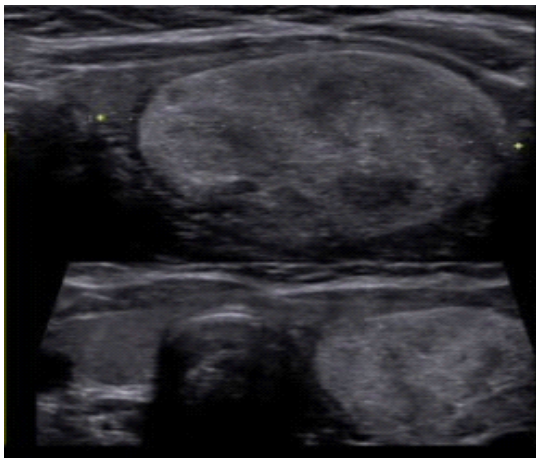


Figure 4

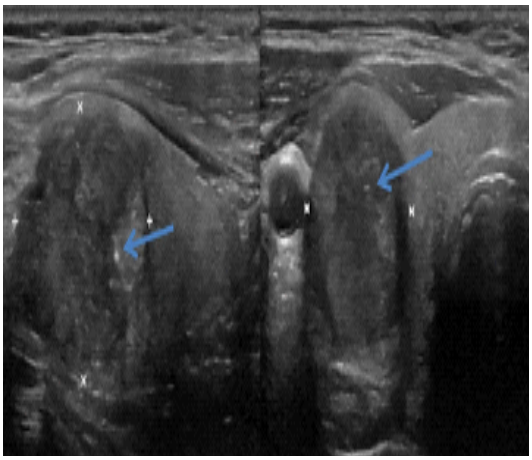


Figure 5

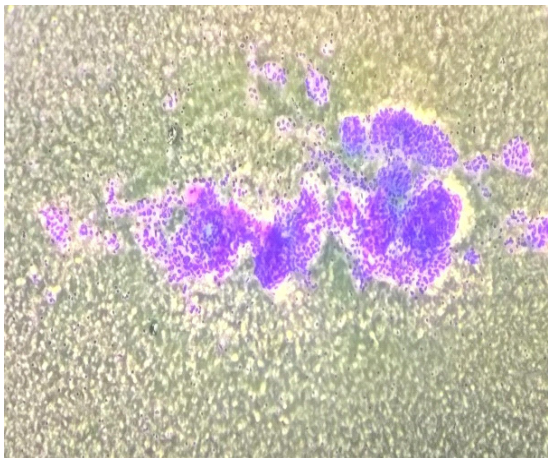
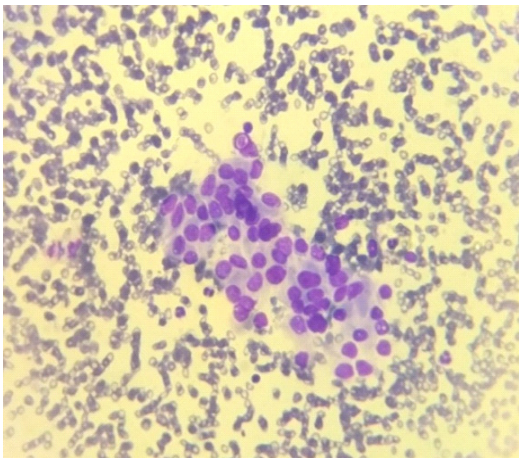


Figure 6



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nancy in TIRADS 3, TIRADS 4 and TIRADS 5 was 4.7%, 12.5% and 55.3%.

In consistency with the results of our study, a locoregional study concluded that the ultrasound and FNAC are both effective with equal sensitivity for diagnosis of malignant nodules however FNAC was more specific (90%) and had a diagnostic accuracy of 86%.[13] Similarly, another trial conducted in the region of Islamabad TIRADS was found effective in the segregation of benign and malignant thyroid nodules and TIRADS categories II, III, and IV revealed benign cytological findings.[14]

TIRADS was found a very effective technique of scoring in studies done by George NA et al[13] and Aksoy SH et al[14]. The prediction of malignancy by TIRADS 5 nodules was reported as high as 90% and a high concordance of 69% was found between the two classification systems. We concluded that the sensitivity and specificity of TIRADS were 93.8%, specificity 89.1% while Mohandas M et al found that the sensitivity and specificity of TIRADS were 85.7% and 68%.[15]

The negative predictive value of TIRADS 99.3% in our study was very high which signifies that all the nodules that are benign on ultrasound-based TIRADS do not need any further assessment by employing the invasive procedure of FNAC. Similarly, in another study a high negative predictive value of 98.6% of TIRADS was reported by Kovatcheva RD et al.[16] By employing TIRADS in patients with thyroid nodules an early segregation of the patients can be done, and the number of invasive fine needle aspirations of thyroid nodules can be minimized. In another trial, the number of biopsies procedures in patients with thyroid nodules decreased to more than 50% after TIRADS categorization and stratification of benign and malignant nodules.[17]

With the recent advances in the field of medicine, the rapidly emerging noninvasive techniques have proven to be effective in risk stratification, early identification, and prompt therapies which can lead to decreased morbidity and mortality. Ultrasound-based TIRADS is a promising diagnostic tool with various modifications and a high degree of reliability.[18] A comparison between our results with locoregional and international research conducted on the subject is promising which is depicted in Table III. Hence this study proves that the diagnostic ability of TIRADS is highly reliable, noninvasive, and cost-effective which can be safely employed in our patients with thyroid nodules for stratification of benign from malignant nodules.

CONCLUSION

TIRADS grading has a high diagnostic ability when Bethesda scoring is kept as the gold standard. It can be used effectively in segregating benign from malignant nodules and is recommended for screening patients presenting with thyroid nodules.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

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Safdar A	✓	×	✓	×	✓	×
Mahmood R	✓	✓	×	✓	✓	×
Khan M	✓	×	×	✓	×	×
Javaid F	✓	×	✓	×	✓	×
Sajjad A	×	✓	✓	×	×	✓
Khattak MT	✓	×	×	✓	×	×
Khan IM	×	×	✓	×	✓	×

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

Ethical Approval:

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ORIGINAL ARTICLE

DELINEATION OF HEMATOLOGICAL CHANGES OCCURRING IN STORED CITRATE PHOSPHATE DEXTROSE ADENINE CPDA-1 BLOOD

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ABSTRACT

Objectives: To study the changes in red cell indices and counts over a period of 42 days in blood stored in blood bags.

Materials and Methods: This research was done in Blood Bank, Khyber Teaching Hospital, Peshawar in collaboration with the main laboratory, Khyber Teaching Hospital, Peshawar. About 450 ml of whole blood was taken from 200 donors into Citrate Phosphate Dextrose Adenine blood bags. The storage temperature for the blood bags was maintained between 2–8°C. Blood samples were collected from blood bags. At days 1 and 42, using a haematology analyser, parameters including haemoglobin, RBC count, WBC count, haematocrit, mean corpuscular volume, mean corpuscular haemoglobin, mean corpuscular haemoglobin concentration and platelet counts were measured. Mean and standard deviation were used for quantitative variables. Frequency and percentages were used for qualitative variables.

Results: Through days 1 to 42, Haemoglobin (Hb) level decreased from 13.4gm/dl to 12.78 gm/dl, white cell count (WBC) decreased from 6.03x109/l to 2.95 x109/l, platelets count fell from 207 x109/l to 121 x109/l, neutrophils decreased from 59.6% to 23.8% while lymphocyte count increased from 28.36% to 66.3%.

Conclusion: There is a decrease in haemoglobin level and white cell count over a period of 42 days of storage of blood bags. Lymphocyte counts increased during the storage duration of blood bags.

Keywords: White cell Count, CPDA, Blood Bank

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INTRODUCTION

Blood products collected from donors need to be stored at appropriate temperatures in Blood Banks. As per the recommendations of the FDA, the blood and products are stored for a duration of 35 days. [1] If blood products are stored for a duration beyond the recommended duration, then the risk of transfusion reaction increases. This is because of the increased incidence of haemolysis in blood bags. [1] With increased duration of storage, the capacity of red blood cells to carry oxygen also decreases. [2]

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If blood is stored at inappropriate temperatures or for a duration longer than recommended, there happen certain abnormal changes in the blood cells. These changes are called storage lesions. [3] The commonest storage lesion is haemolysis. As a result of the haemolysis of red cells, the contents of red cells are released into circulation. [3] The contents released into plasma include haemoglobin molecules and potassium ions. This leads to effects on several organs, the most important of which is the kidney. [4, 5]

There are various ways to store blood. Most commonly, blood is stored in a refrigerator. However, red blood cells (RBCs) can be frozen by cryoprotection with glycerol, also known as cryopreservation. Blood can be stored in a refrigerator as whole blood, or it can be divided into red blood cell concentrate (RBC) and plasma (plasma) with or without leukocytes removed. One option that is easy to use and doesn't require professional blood transfusion

equipment is to store whole blood in CPDA (Citrate Phosphate Dextrose Adenine) blood bags (4°C). However, the blood stored in these bags contains platelets as well as leukocytes which, over time, can cause oxidative damage to erythrocytes.

The blood is collected in bags that contain citrate, phosphate, dextrose and adenine as preservatives. The blood bags are therefore called CPDA blood bags. Each of the constituents mentioned has a specific function. The citrate functions to bind and inactivate the calcium and thus prevent blood clotting. Dextrose provides energy for blood cells. Phosphate maintains the normal pH of the blood. Adenine helps to increase the longevity of red cells. [6]

The blood counts and haemoglobin levels are not constant during storage duration of the blood bag in blood bank refrigerators. The blood counts change during the 42-day storage period of blood bags. There is no data available regarding how the cell counts change in blood bags over storage duration. This is why the purpose of this study is to look at the haematological alterations in whole blood collected in the CPDA-1 blood bags.

MATERIALS AND METHODS

The current study was done in Blood Bank, Khyber Teaching Hospital, Peshawar in collaboration with Main laboratory, Khyber Teaching Hospital, Peshawar. This study span was from July 2022–December 2022. Ethical approval for the study was obtained from the institutional ethical review board. The donor was laid in a transfusion chair. The needle of the CPDA bag was inserted in the antecubital vein and blood was collected in the bags. The blood bags were subjected to screening for hepatitis B, C, and HIV. The screened products were stored in refrigerators at 4C for a period of 42 days. Blood samples were drawn from blood bags on days 1, 7, 14, 21, 28, 35 and 42. The samples were run on Sysmex XP 100, Japan, a haematology analyser to determine haemoglobin levels, Red cell count, White Cell Count, platelet counts, Mean cell volume, Mean cell Haemoglobin, Mean corpuscular Haemoglobin concentration along with counts of Neutrophil, lymphocytes, Eosinophil and monocytes.

RESULTS

The white cell counts and platelet counts show a decrease with time. Haemoglobin, MCV, and Haematocrit showed rising values. Red cell count and mean cell haemoglobin were constant while MCHC decreased. Lymphocyte count increased while the counts of Neutrophils, Eosinophils and Monocytes decreased.

(Hb: Haemoglobin, WBC: White blood cells, RBC: Red blood cells, MCH: Mean corpuscular haemoglobin, MCV: Mean corpuscle volume, MCHC: Mean cell haemoglobin concentration)

DISCUSSION

A red blood cell in the human body has a half-life of about 180 days. [7] The present study showed no significant changes in Red cell count haemoglobin levels and MCH. This finding is the same as reported by Chaudhary S in 2017. [8] However, there was a sudden dip in the haemoglobin curve at day 14. A similar fall on day 14 was observed by Adias TC in his study. [9] This fall in haemoglobin is due to haemolysis during storage of the blood bags. Other contributing factors are high-temperature exposure and improper mixing of blood bags before drawing samples for haemoglobin estimation. However, this is in contrast to a study conducted in Iran which showed that MCH reduced over the storage period. [10]

No changes were seen in haematocrit value in our study. A similar finding is reported by Adias TC. [9] Abella B also reported the same findings. [11] A slow increase

Table 1: Haematological values from days 1, 7, 14, 21, 28 and 42

Parameter	Day 1	7	14	21	28	35	42	Mean value	St Deviation	sig or non sig
WBC ×10^9/L	6.03	5.3	4.73	4.01	3.66	3.49	2.95	4.10375	1.0915349	sig
RBC ×10^12/L	4.47	4.16	4.13	3.99	3.79	3.91	4.26	4.13125	0.212452201	non sig
Hb g/dl	13.4	12.9	12.3	12.5	12.6	12.8	12.8	12.7875	0.313996417	non sig
Platelets ×10^9/L	207	179	165	144	132	123	121	147.375	31.53148228	sig
Neutrophils %	59.6	51	44.3	41.56	26.23	25.53	23.83	36.883	13.21541991	sig
Lymphocytes%	28.36	40.53	42.96	48.16	52.8	56.03	66.33	50.187	12.18695589	sig
Monocytes %	6	5	5	4	3	3	3	3.87	1.26861254	non sig
Eosinophils %	4	4	3	3	2	2	1	2.62	0.992158142	non sig
MCH (FL)	32	31.6	30.9	30.4	29.6	29.2	28.7	29.975	1.448059046	sig
MCV (pg.)	92.6	95	97.7	101.2	102.8	103.9	104.1	100.4	4.470458589	non sig
MCHC (g/L)	34.6	33.7	33.2	32.6	31.5	30.2	29.4	31.675	2.100446381	sig
HCT %	36.17	36.42	37.02	38.09	39.45	41	42.4	39.196	2.525583783	non sig

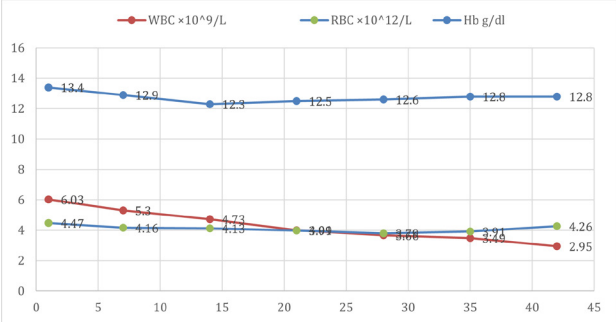

Fig 1: Changes in WBC, RBC and Hb levels from day 1 to day 42

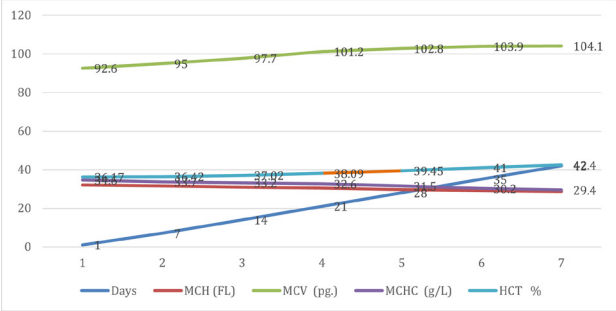

Fig 3: Changes in MCV, MCH, MCHC and HCT values from day 1 to 42

was seen in MCV value in our study. A similar trend was observed and reported by Chaudhary S. [8] An increase in MCV shows that red blood cells swell up during storage.

The study showed that there was a decrease in the value of MCHC and White cell count during the storage duration of 42 days. Similar findings are furnished by Chaudhary S. [8] Bhargava P also reported a decrease in levels of MCHC and white cell count. [11] The reason for the fall in white cell count is the depletion of ATPs in white cells.

The present study showed that polymorph nuclear cell count was decreased while Lymphocytes increased the number. Bhargava reported the same findings in his study.[12] The clinical implications of this finding are that the blood stored for transfusion may not be so effective as a clinical treatment in aplastic anaemia and other patients with leucopenia, as the most critical condition in these patients is almost always neutropenia. [13] The platelets count was decreased during the study period. A similar decrease in platelet count was found by Chaudhary S. [8] Karama also reported similar findings of low platelet count. [14] The reason for low platelet count is that the white cells release hydrolytic enzymes which cause destruction of platelets membrane and destruction of platelets. Our results are also comparable to those abstained in the L.N. Medical College study and J.K. Hospital Bhopal India, which showed a significant decrease in platelets over the

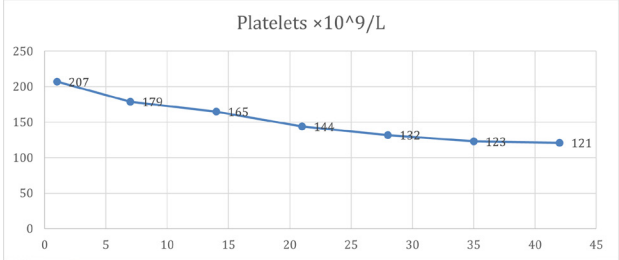

Fig 2: Changes in Platelet count

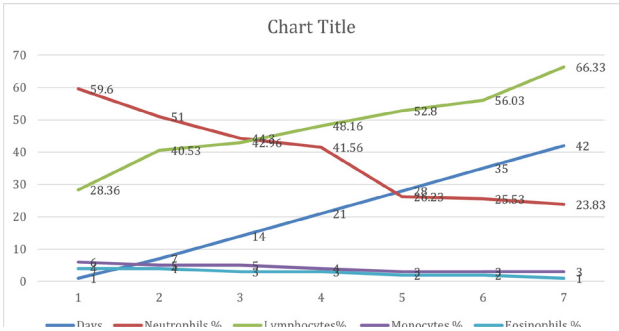

Fig 4: Changes in DLC

storage period. [15] Similar findings were observed in a study conducted by Nihal AB Almokhtar and Nour MA Ali. [16]

CONCLUSION

Most of the cellular components studied in this study show significant changes in platelets, WBCs, RBCs and indices in stored blood, particularly when stored for more than 2 weeks. The platelet counts in stored blood components displayed a significant decrease. Platelet-pheresis must be considered in patients where platelet transfusion is required. Fresh whole blood that has not been stored for longer than two weeks is advised as the best option for whole blood transfusion, yet blood components may differ on how much each blood parameter or index has changed.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Idrees M	✓	×	✓	×	✓	×
Waqas M	✓	✓	×	✓	✓	×
Rehman MU	✓	×	×	✓	×	×
Riaz H	×	×	✓	✓	×	✓
Khan MI	✓	✓	×	×	✓	×
Rahman IU	×	✓	✓	×	✓	×

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

Ethical Approval:

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ORIGINAL ARTICLE

CORRELATIONAL STUDY OF EMOTIONAL INTELLIGENCE AND ACADEMIC PERFORMANCE OF UNDERGRADUATE MEDICAL STUDENTS

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ABSTRACT

Objective: To determine the correlation between emotional intelligence and academic performance in the practical exam of fourth and final-year medical students at Pak International Medical College, Peshawar.

Materials and Methods: This is a cross-sectional correlational study and was conducted on fourth and final-year Bachelor of Medicine, Bachelor of Surgery (MBBS) students of Pak International Medical College, Peshawar, from 14th March 2020 to 10 August 2020. Data was collected with a non-probability convenience sampling technique by using a leadership toolkit emotional intelligence questionnaire. The academic performance in practical exams of students was measured from percentage marks scored in previous annual examinations. The relationship between emotional intelligence and practical academic performance was measured by multivariate analysis.

Results: A total of 176students (88 from each year) participated with male to female ratio of 2.4:1. Students with poor academic performance maximally showed emotional competencies in the range of 10-17, which means that this area needs to be developed on a priority basis in medical students. The maximum number of students with fair and good academic performance showed all their emotional competencies in the range of 18-34, which means that there is a need to pay attention to these emotional competencies. The statistically significant p-value (< 0.05) indicates that students with higher emotional intelligence are least likely to fail in their examinations.

Conclusion: Emotional intelligence can be a predictor of academic success. Students with higher emotional intelligence perform better in practical assessments. The academic performance of medical students can be improved by developing emotional intelligence-related competencies in them.

Keywords: Emotional intelligence, self-awareness, empathy, motivating one-self, social skills.

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INTRODUCTION

Emotional intelligence is defined as the ability to understand emotions and regulate them. It has a reflective role in emotional and intellectual self-growth. In the 1990s, emotional intelligence was defined as a form of intelligence that assists individuals in managing their own emotions as well as those of others, enabling them to utilize emotional cues in their decision-making and behavior. [1] Emotional intelligence gives meaningful expressions to the emotions thereby using them in intellectual thought processes. [2] Goleman explained that knowing one's own emotions, ability to control emotions, motivating oneself, having interpersonal skills, and ability to understand other's emotions are the five basic principles of emotional intelligence. [3]

The interpersonal relationship skills of people with higher emotional intelligence are better and it is found to have a positive role in social dealings such as beneficial in conflict resolution. [4] Their enhanced ability to build purposeful relationships and their competency in social environment helps them to develop intellectual and cognitive capabilities which lead them to better performance in their academic field. Academic performance has been seen to be promoted by the quality of prioritizing thoughts, regulation of behavior, and adaptation of lifestyle choices. These qualities are refined by emotional intelligence. [5] Students

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with enhanced emotional intelligence have better academic performance. Higher emotional intelligence has a positive effect on empathy in medical consultation during practice, clinical performance, and patient satisfaction. [6] Today's doctors must be compassionate communicators who act morally and skillfully to increase patient safety. [7]

According to the researchers, the emotional reactions of doctors and medical students get blunt during socialization in their profession. To stay objective and intellectual, they do not trust the emotions. [8] Emotional intelligence is considered a counterpart of communication skills, and it helps to assess the capabilities of the learners which cannot be measured by any other reliable tool. [9] Dealing with educated patients, and providing standard healthcare facilities demands a physician who is smart, dedicated and prioritizes the personal values of patients in their health decisions. [10] That is the reason, why many medical schools look into the personal qualities of the students before their selection and admission. [11] Emotional intelligence can be enhanced by the workshops or training programs designed to enhance the emotional competencies of the students. [12]

During admission to the medical colleges, emotional intelligence can also be included in the psychological assessment tests of the applicants and emotional intelligence instruments can be used to quantify the quantitative characteristics of the applicant. [13] Emotional intelligence can be used to predict the academic performance of medical students predominantly in psychomotor and affective domains. There is limited data available on the effect of emotional intelligence on academic performance in medical education, and the findings are inconsistent. [14, 15] This study aimed to investigate how emotional intelligence influences the academic performance of fourth and final-year medical students in practical exams conducted during annual examinations at a private medical college. These academic years are known to be more demanding, with increased clinical exposure to patients. The practical exams will evaluate both psychomotor and affective domain skills, which are significantly influenced by emotional intelligence.

MATERIALS AND METHODS

A cross-sectional correlation study was conducted on fourth-year and final-year medical students of Pak International Medical College, Peshawar, from 14th March 2020 to 10th of August 2020. With the approval of the institutional ethical review board and permission from the administration with Ref no 06/20/DMR/PIMC (Appendix-I), data was collected by non-probability convenience sampling technique from 176 students (88 from each fourth year and final year). The correlation sample size formula $N=[(Z_{\alpha}+Z_{\beta})/C]^2 + 3$ was applied for sample size calculation. [16] Correlation coefficient r value of 0.21. was used. [3] A brief presentation was first delivered to the students which included the clarification of difficult questions, and an open discussion session was conducted for student's queries. The leadership toolkit emotional intelligence questionnaires were then distributed and filled out by the students after taking written informed consent (Appendix II). [17] Students who refused to participate, and who were ever diagnosed with psychiatric disorders were excluded from the study. Students' participation was voluntary, fulfilling the objective, irrespective of age and gender. Emotional intelligence-related five competencies of self-awareness, managing emotions, motivating oneself, empathy, and social skills were measured by a paper-based questionnaire (Appendix III). Academic performance of the students was measured by calculating percentage marks students obtained in the previous practical annual examination i.e., percentage marks scored in third year MBBS annual practical examination of fourth-year medical students and percentage marks obtained in fourth year MBBS annual practical examination of final year medical students. Good academic performance was defined as examination marks of > 70 %, fair academic performance was taken as examination marks from 61-70%, and poor academic performance was defined as examination marks of ≤60%.

Data was saved into an Excel sheet and later, converted into SPSS-23 for statistical analysis. Participants' demographic characteristics were presented in frequencies, percentages and mean ± SD where applied. Emotional intelligence was calculated and compared with the practical academic performances of students in previous annual examinations students attended. The chi-square test was utilized for the categorical variables. The test of significance was two-tailed and the P-value of <0.05 was considered significant showing a positive relationship between emotional intelligence and academic performance. Moreover, for standardization, findings were compared with published data.

RESULTS

A total of 176 students participated in the study, 88 students each from fourth and final year MBBS. This included 124 (70.5%) male and 52 (29.5%) female students with male to female ratio of 2.4:1 (Table I). The age range of students involved in the study was 20 to 28 years, with a

maximum (118) number of students belonging to the age group of 23-25 years (Table I). The mean age of students involved in the study was 23.24 years (±1.597 SD).

A total of 11 (6.25) students showed poor academic performance during the annual practical examination, securing a percentage of ≤ 60%. 104 (59.09%) students showed fair academic performance i.e., scoring 61-70% in the annual examination, and 61 (34.65%) students showed good academic performance with a percentage of more than 70% in the annual practical examination (Table II). A maximum number of students showed the qualities of self-awareness, managing emotions, motivating oneself, empathy, and social skills in the range of 18-34. The students with poor academic performance on practical exams maximally showed emotional competencies of managing emotions, motivating oneself and empathy in the range of 10-17, which means that this area needs to be developed on a priority basis in medical students. The maximum number of students with fair and good academic performance showed all their emotional competencies in the range of 18-34. This means that there is a need to pay attention to these emotional competencies of the medical students. (Table II)

A correlational analysis between emotional intelligence and academic performance showed that there was

Table 1: Demographic characteristics of fourth-year and final-year MBBS students

Demographic characteristics		Fourth Year		Final Year		Total (n=176)	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Gender	Male	58	32.95%	66	37.5%	124	70.45%
	Female	30	17.04%	22	12.5%	52	29.54%
Age	20-22 years	43	24.43%	6	3.40%	49	27.84%
	23-25 years	41	23.29%	77	43.75%	118	67.045%
	26-28 years	4	2.27%	5	2.84%	9	5.11%

Table 2: Emotional competencies and academic performance of MBBS students (n=176)

Emotional competencies	Grading	Poor performance (≤ 60%)	Fair performance (61-70%)	Good performance (> 70%)	Total (%age)
Self-awareness	10-17 Development priority	4	7	3	14 (7.95%)
	18-34 Need attention	7	69	24	100 (56.81%)
	35-50 Strength	0	28	34	62 (35.22%)
Managing emotions	10-17 Development priority	6	5	1	12 (6.81%)
	18-34 Need attention	5	84	32	121 (68.75%)
	35-50 Strength	0	15	28	43 (24.43%)
Motivating one self	10-17 Development priority	7	12	1	20 (11.36%)
	18-34 Need attention	1	70	28	99 (56.25%)
	35-50 Strength	3	22	32	57 (32.38%)
Empathy	10-17 Development priority	5	9	2	16 (9.09%)
	18-34 Need attention	5	68	28	101 (57.38%)
	35-50 Strength	1	27	31	59 (33.5%)
Social skills	10-17 Development priority	3	8	1	12 (6.818%)
	18-34 Need attention	7	71	30	108 (61.36%)
	35-50 Strength	1	25	30	56 (31.8%)
Total (%age)		11 (6.25%)	104 (59.09%)	61 (34.659%)	176 (100%)

Table 3: Correlation between emotional intelligence and academic performance, success rate, year of graduation and demographic characteristics of MBBS students (n=176)

Demographics characteristic	Emotional intelligence competencies									
	Self-awareness		Managing emotions		Motivating oneself		Empathy		Social skills	
	r	p	R	p	r	p	R	P	r	p
Academic performance	0.320	0.001	0.434	0.001	0.375	0.001	0.342	0.001	0.299	0.001
Pass/Fail	0.221	0.003	0.332	0.001	0.419	0.001	0.283	0.001	0.258	0.001
Year of graduation	0.171	0.023	0.096	0.203	0.100	0.188	0.066	0.386	0.180	0.017
Age	0.103	0.173	0.151	0.046	0.193	0.010	0.133	0.079	0.177	0.019
Gender	0.059	0.439	0.020	0.795	0.41	0.588	0.006	0.936	0.066	0.387

P= P value r= Correlation Coefficient

a significant correlation between all emotional competencies with the academic performance of the students in the practical component of the annual examination (Table III). There was also a significant correlation between the emotional intelligence and success of students in the annual examination which means that students with higher emotional intelligence are least likely to fail in their practical examination (Table III). The failure rate was higher in the students with low emotional intelligence. A correlational analysis also showed that self-awareness and social skills had a positive correlation with the year of graduation of the students. This correlation was however insignificant for the emotional competencies of managing emotions, motivating oneself and empathy (Table III). The students with higher age in the study group showed a statistically significant correlation with emotional competencies of managing emotions, motivating oneself and social skills. However, gender had no statistically significant correlation with emotional intelligence (Table III).

DISCUSSION

The study showed that emotional intelligence is a predictor of academic success in the practical examination of both fourth-year and final-year medical students. Chew et al proved that the students with higher emotional intelligence perform better during the summative assessment.[3,5] The emotional intelligence affects the ability of the students to perceive and manage emotions and motivate oneself. It also helps to improve social skills in the students which in turn help them to perform well during practical and OSPE (Objective Structured Practical Examination) examinations.[3]

Schuttle et al mentioned that measurement of emotional intelligence at the beginning of the academic year can help to predict their GPE (Grade Point Equivalent) at the end of their course which favors the findings of this study.[18] This result is supported by a study conducted at Sri Lankan University, which found that final-year medical students who were more emotionally intelligent performed better academically.[19] However, Bastain et al showed that there was no statistically significant correlation between the emotional intelligence and academic performance of the students which was contrary to the finding of this study.[20] The possible reason for this lack of correlation has been explained by the fact that the emotions and emotional abilities of the students are not taken into account by traditional assessment techniques. The assessment techniques used by the traditional educational system measure the ability of students to memorize and reproduce the information correctly.[3]

The study revealed that the emotional competencies of self-awareness and social skills were higher in the students of final year, as compared to the fourth-year students. This showed that the level of emotional intelligence of students increases during the progress in the academic years. Similar findings were seen in another study, which showed that the students in the early academic year had a positive correlation between formative assessment and emotional intelligence, while the student of the final year showed a positive correlation between summative assessment and emotional intelligence.[3,21] This is probably because the final year students become more mature by facing their formative assessments of practical skills over the years. The influence of emotional intelligence in facing final examination is more apparent in students of the final year as compared to the fourth year because it involves multiple tests and more practical examinations, and it spans over several days. An explanation for this significance could be that the final year of study is particularly emotionally demanding due to the packed academic curriculum and intensive clinical rotations. This phase serves as a crucial period for students to cultivate emotional competencies.[3]

Gender had no statistically significant correlation

with emotional intelligence in this study. A study on Iranian nursing students showed that female students got higher empathy scores than male students.[21]

Malik et al explain the positive relationship of emotional intelligence with age.[22] This study also showed similar findings. There was a positive correlation between emotional competencies of managing emotions, motivating oneself, empathy, social skills, and the age of students. In this study, the value of Pearson correlation for all the emotional competencies related to emotional intelligence showed a positive relationship between academic performance and emotional intelligence. Another study showed that a weak relationship existed between trait emotional intelligence and academic performance.[22]

In this study, the level of emotional intelligence was found to be lowest in the students who performed poorly during the annual practical examination and the students who had good and fair performance during the annual practical examination showed more strength in their emotional competencies. Another study, however, showed that the students with higher and lower GPAs had no difference in emotional intelligence.[22]

The study was conducted on only fourth-year and final-year MBBS students of one private medical college, which lacked generalizability. There is a need to collect data from junior classes as well and interpret the results related to the effect of age and year of graduation on the emotional intelligence of the students. One other limitation was that the questionnaire was filled out by the students themselves and was based on collecting their views about their behavior and emotional abilities.

CONCLUSION

This study concludes that emotional intelligence is an important factor that affects the medical student's academic performance in practical examinations. Medical students with higher emotional competencies perform better during academic evaluation exams. Students with low emotional intelligence have lower grades with poor academic performance. Further studies can be conducted by determining the emotional intelligence of medical students with their theory exam scores and practical exam scores separately and doing a comparison of the two.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Zahoor H	✓	×	✓	×	✓	×
Hayat K	✓	✓	×	✓	✓	×
Hayat T.	✓	×	×	✓	×	×

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

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RHABDOMYOSARCOMA IN A 16-YEAR-OLD BOY: A RARE CASE REPORT

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ABSTRACT

The urinary bladder is a prominent site for rhabdomyosarcoma (RMS), the second most common malignant soft tissue sarcoma in children and adolescents after osteosarcoma. RMS is an uncommon and occasionally fatal malignancy that affects youngsters. Despite extensive treatment plans that combine radiation therapy, dose-intensive combination chemotherapy, and surgery, the prognosis for individuals with metastatic disease is still dismal.

Keywords: Immunohistochemical findings, Rhabdomyosarcoma, Urinary bladder.

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INTRODUCTION

The most prevalent soft-tissue sarcoma in children is called rhabdomyosarcoma (RMS). Rhabdomyosarcomas make up 40% of soft tissue sarcomas, which make up about 7% of all malignancies in children and adolescents. [1] Nonetheless, they are uncommon, making up only 3% to 4% of all paediatric malignancies.

In patients with bladder rhabdomyosarcoma, lower urinary tract symptoms include hematuria, dysuria, frequent urination, and desire to urinate are frequently present. Nonetheless, some conditions might be asymptomatic and discovered by chance 2.

RMS is divided histologically into two primary subgroups: alveolar RMS (ARMS), which only accounts for 20%–30% of cases, and embryonal RMS (ERMS), which accounts for 60%–70% of cases 3. RMS's aetiology is still a mystery.

CASE REPORT

A 16-old boy was referred to our institution with a pre-diagnosis of Malignant neoplasm of bladder and prostate. On history taking, boy who was vitally stable, reported that he felt burning during micturition along with urine obstruction, incomplete emptying of bladder plus weak stream, hematuria few months ago was advised for ultrasound kidney ureter bladder (KUB) showed right ureteric obstruction, thick-walled urinary bladder as well as bladder outflow obstruction.

His digital rectum examination showed stony hard prostate. His computerized tomography (CT) KUB without contrast was done showed thickening of bladder wall in the multiple places including the left anterior and posterior wall; the bladder trigone and right posterior wall causing obstruction of the right ureter with right side hydronephrosis and enlarged edematous right kidney.

There were multiple enlarged lymph nodes in the pelvis. His Cystoscopy plus transurethral resection of a bladder tumor (TURBT) was done. His histopathology specimen taken after surgery was from bladder neck trigone of urinary bladder, median lobe of prostate and deep muscle sites diagnosed as Rhabdomyosarcoma whereas deep muscle sites showed ulcerated mucosa and detrusor muscle.

After TURBT few days back patient felt severe pain left flank. His ultrasound KUB was repeated after surgery whose impression showed diffused circumferential marked wall thickening/ residual tumor resulting in bilateral hydroureteronephrosis more on right side. Bilateral grade 1 renal parenchymal changed.

His MRI was repeated reports were worrisome for malignant neoplasm of urinary bladder and right distal ureter with bilateral pelvic and retroperitoneal lymphadenopathy as the biopsy reported Rhabdomyosarcoma with creatinine 1.52 (Figure 1).

Meanwhile patient received chemotherapy of vincristine, Actinomycin D and cyclophosphamide (VAC) and Ifosfamide and etoposide (IE).

After that PET CT scan was done to evaluate the response of chemotherapy and it was also compared and correlated with previous PET CT and MRI pelvis. Results

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showed that residual bladder thickening along the left posterolateral aspect where metabolic activity cannot be commented upon due to physiologic excretion of radiotracer through bladder. A few non-enlarged bilateral pelvic sidewall nodes were metabolically insignificantt. After few days, his MRI was repeated to compare with the last MRI as the patient had no active complain.

This time MRI report concluded as unremarkable appearance of urinary bladder with no measurable disease as well as no size significant pelvic lymph nodes observed. Meanwhile two cycles of chemotherapy were repeated. Now his MRI was repeated from our institution and is compared with previous investigations. Results concluded no evidence of any significant bladder wall thickening.

Bladder rhabdomyosarcomas are rare mesenchymal malignancies in children with a poor prognosis. Here, in our case, surgical treatment like cystectomy and radiotherapy is not applicable for treatment for localized forms. Chemotherapy was done in past 8 months as mentioned earlier in which of seven cycles of vincristine, Actinomycin D and cyclophosphamide (VAC) and six cycles of Ifosfamide and etoposide (IE) with gap of two weeks. The role of chemotherapy in the management of metastatic forms worked.

Figure 1: MRI Pelvis with contrast
(Red arrows show bladder wall growth)

DISCUSSION

Children aged 1-4 years have the highest incidence of RMS, followed by those aged 10–14 years and 15–19 years with the lowest frequency. Our patient was a 16-year-old boy who was quite high-risk. These tumours grow rapidly and aggressively, enlarge rapidly, are typically painless, and are associated with high recurrence rates and widespread metastases via hematogenic and/or lymphatic pathways. [4] Thankfully, in this instance, the patient's guardians' cooperation, timely consultation for adjuvant treatment, and follow-up at our institution may have favored the tumor's quick advancement and care and, as a result, lessened the severity of the disease. Paediatric patients with bladder and prostate embryonal rhabdomyosarcoma have a worse prognosis than those with the illness in the vagina, uterus, or Para testicular area (respectively, 70%-73% and 84%-89%). [5] Due to its rarity, the prognosis and ideal care of adult embryonal rhabdomyosarcoma are unknown.

There is no set course of action providing for improved survival. Although several treatments have been suggested, it appears that a multimodal approach is required. Transurethral bladder resection, chemotherapy, radiation, and total or partial cystectomy are among the available treatments. [6,7]

We chose chemotherapy following TURB since, in our situation, RMS was shown to be metastatic, which allowed the haematuria to stop. The best treatment option for localised RMS is still radical cystectomy combined with bilateral lymph node dissection. Neo-adjuvant chemotherapy may be performed before this major operation. In cases of embryonal RMS of the bladder in children, radiation therapy used in conjunction with surgery produces great results. When the tumour is tiny (less than 3 cm) and situated at the level of the dome, partial cystectomy can be suggested for young men who wish to father children. [8]

CONCLUSIONS

A multidisciplinary strategy is necessary to overcome advance staging to provide timely therapy. As RMS tends to spread to the bone marrow, it entails surgical excision of the tumour followed by multi-agent chemotherapy with or without radiotherapy. Our case is the first one we are aware of that successfully managed RMS of the urinary bladder by chemotherapy and surgery. Nonetheless, regular follow-up and patient compliance also contribute to the success of the treatment.

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xi) Departmental Permission Letter for the study.
xii) Letter of ethical review of concerned hospital/study place.
xiii) Bank draft for Rs. 5000/- (Rs. Five Thousand) in the name of Journal of Medical Sciences, Peshawar, Pakistan/or deposit in cash with Managing Editor Account No. 4048685170 (3548-9) Can be transferred ONLINE to the Account No. 4048685170 (3548-9) Branch Code 0388 at National Bank of Pakistan, University Campus Branch, Peshawar.

EDITORIAL POLICY

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

Overview

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

A MISSION OF JMS

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

B OBJECTIVES OF JMS

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

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

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

C EDITORIAL POLICY

1 Open access

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

2 Peer review process

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

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

3 Authorship

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

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

4 Submission of manuscript

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

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

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

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

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

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

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

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

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

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

5 Institutional Research and Ethics Board (IREB) certificate

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

6 Conflict of interest

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

7 Confidentiality

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

8 Correction and retraction of articles

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

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

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

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

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

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

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

9- Correspondence

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

10- The fee submission process

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

Peshawar, Pakistan) as follows:

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

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

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

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

11 Roles of the editorial board, editors, and members

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

11.1: The roles of the Editorial Board are:

11.1.1: To offer expertise in their specialist area

11.1.2: To review submitted manuscripts

11.1.3: To advise on journal policy and scope

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

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

11.1.6: To attract new and established authors and articles

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

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

11.2: The Patron:

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

11.3: The Chief Editor:

11.3.1: The criteria for selection of Chief Editor are:

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

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

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

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

v. Enthusiasm to undertake the Editor role

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

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

11.3.2: The roles of the Chief Editor are:

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

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

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

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

11.3.3: Managing editor:

i. The roles of managing editor are:

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

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

iv. To regularly evaluate the research work

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

11.3.4: Executive editor:

The roles of the executive editor are:

i. To evaluate the research articles presented for publication

ii. To help the editorial board in policymaking

iii. They help the editorial board in smooth publishing

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

11.3.5: Section editors:

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

i. Bibliography

ii. Proof-reading

iii. Academic writing reviewing, grammar, and spell checking

iv. Dissemination of articles for review

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

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

vii. others

11.3.5: Editorial advisory board:

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

12 Policy regarding recruitment and continuation of the editorial board

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

13 Plagiarism policy

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

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

14 Allegations of research Misconduct

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

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

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

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

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

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

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

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

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

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

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

15 Appeal and complaint process

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

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

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

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

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

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

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

16 Contact information

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

17 Archiving and Data Repository

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

References

ICMJE recommendations

COPE guidelines

SCOPUS

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

KHYBER MEDICAL COLLEGE, PESHAWAR - PAKISTAN