Vol. 37, No. 2 February, 2026

ISSN 1029 - 385 X (Print) ISSN 2519 - 7134 (Online)

MEDICAL FORUM MONTHLY

RECOGNISED BY PMDC & HEC

APNS Member CPNE Member ABC Certified

On OJS

Journal of all Specialities

"Medical Forum" Monthly Recognised, Indexed and Abstracted by

- PMDC with Index Pakistan No.48 since 1998
- HEC since 2009
- Pakmedinet Since 2011
- Medlip (CPSP) Since 2000
- PASTIC & PSA Since 2000
- NLP Since 2000
- WHO, Index Medicus (IMEMR) Since 1997
- EXCERPTA MEDICA, Netherlands Since 2000
- EMBASE SCOPUS Database Since 2000
- Registered with International Standard Serial Number of France bearing ISSN 1029-385X (Print), ISSN 2519-7134 (Online) Since 1992
- Registered with Press Registrar Govt. of Pak bearing No.1221-B Copr. Since 2009
- ABC Certification Since 1992
- On Central Media List Since 1995
- Medical Forum Affiliated with Medical Academic Foundation (MAF)
- On OJS, SCOPUS, Open Access, Online, Peer Reviewed Journal
- EScience Press (CrossRef DOI)
- Email: med_forum@hotmail.com, medicalforum@gmail.cicalom
- website: www.medicalforummonthly.com, www.medforum.pk

MEDICAL FORUM MONTHLY

ISSN 1029 - 385 X (Print) ISSN 2519 - 7134 (Online)

APNS Member ✸ CPNE Member ✸ ABC Certified

Online Journal Published Since 1989

Online www.medicalforummonthly.com

on OJS Scopus Open Access Peer Reviewed

Affiliation With: Medial Academic Foundation (MAF) (Regd.)

Recognized, Indexed & Abstracted by

PMDC-IP-0048 (1998), HEC-Y-Category (2009), Excerpta Medica Netherlands (2000), EMBASE SCOPUS Database (2000), Index Medicus (IMEMR) WHO (1997), Cross Ref (DOI), SJR, HJRS, SCI Journal, Research Gate, Resurchify, Editage, Enago, Research Bib, Research Bite, Pastic and PSA, NLP, Pakmedinet & CPSP

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doi:10.60110/medforum

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E-mail: med_forum@hotmail.com, medicalforum@gmail.com
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Printed By: **Naqvi Brothers Printing Press, Darbar Market, Lahore.**

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Med. Forum, Vol. 37, No.2 February, 2026 ISSN 1029-385-X (Print) ISSN 2519-7134 (Online)

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Editorial

Prevalence of Diabetes and its Non-Pharmacological Management

Prof. Dr. Azhar Masud Bhatti
Editor-in-Chief

In 1993, the World Health Organization (WHO) Diabetes Reporting Group published standardized global estimates for the prevalence of diabetes and impaired glucose tolerance in adults, based on data from 75 communities in 32 countries[1].

In a study, data from the global database collected by WHO with demographic estimates and projections issued by the United Nations to estimate the number of people with diabetes in all countries of the world for three points in time, i.e., the years 1995, 2000, and 2025. In addition, the data have been analyzed in terms of certain additional parameters, such as sex ratio, urban-rural ratio, and the age structure of the diabetic population.

In accordance with United Nations convention, Europe, North America, Australia, New Zealand, and Japan were considered "developed" countries, with all other countries designated as "developing" countries. For regional groupings, the aggregations proposed by the World Development Report 1993 were adopted[2].

However, for developing countries, rural and urban areas were considered separately, since prevalence is known to differ markedly with differences in diet, physical exercise, and other socioeconomic factors. Estimates for present and future urbanization patterns are also available from the United Nations Population Division[3,4].

For China, data from the 1994 National Diabetes Survey of 250,000 subjects in 16 provinces were aggregated into rural and urban estimates. For the U.K., two surveys were combined. For the U.S., National Health and Nutrition Examination Survey II data were used for ages 20-74 years.

Prevalence of diabetes in adults worldwide was estimated to be 4.0% in 1995 and to rise to 5.4% by the year 2025. It is higher in developed than in developing countries. The number of adults with diabetes in the world will rise from 135 million in 1995 to 300 million in the year 2025. The major part of this increase will occur in developing countries.

There will be a 42% increase, from 51 to 72 million, in the developed countries and a 170% increase, from 84 to 228 million, in the developing countries. Thus, by the year 2025, >75% of people with diabetes will reside in developing countries, as compared with 62% in 1995. The countries with the largest number of people with diabetes are, and will be in the year 2025, India, China, and the U.S. In developing countries, the majority of people with diabetes are in the age range of 45-64 years. In the developed countries, the majority of people with diabetes are aged >65 years. This pattern will be accentuated by the year 2025. There are more women than men with diabetes, especially in developed countries. In the future, diabetes will be increasingly concentrated in urban areas.

The "Top 10" countries of the world, in terms of the number of people with diabetes, are shown for 1995 and 2025 in Table 1. At both points in time, the three countries with the largest number of people with diabetes are India, China, and the U.S. For 1995, others in the Top 10 are the Russian Federation, Japan, Brazil, Indonesia, Pakistan, Mexico, and the Ukraine. For 2025, the others in the Top 10 are Pakistan, Indonesia, Russian Federation, Mexico, Brazil, Egypt, and Japan. Thus, there will be a tendency for certain developing countries to move up the list and for certain industrialized countries to move down it. In both time periods, the Top 10 countries will account for approximately two-thirds of all diabetes in the world.

Some recent reports have suggested quite substantial increases in prevalences in countries such as India[5] and Korea[6]. A recent report from Nigeria[7].

Table No. 1: Top ten countries for estimated number of adults with diabetes, 1995 and 2025

	Country	1995 (million)	Country	2025 (millions)
Rank				
1	India	19.4	India	57.2
2	China	16.0	China	37.6
3	U.S.	13.9	U.S.	21.9
4	Russian Federation	8.9	Pakistan	14.5
5	Japan	6.3	Indonesia	12.4
6	Brazil	4.9	Russian Federation	12.2
7	Indonesia	4.5	Mexico	11.7
8	Pakistan	4.3	Brazil	11.6
9	Mexico	3.8	Egypt	8.8
10	Ukraine	3.6	Japan	8.5
All other countries		49.7		103.6
Total		135.3		300.0

The database is a contribution to an ongoing process of worldwide surveillance of diabetes, its complications, and related disorders, which recently led the WHO to recommend prevalence of diabetes as one of the "basic health indicators" for its member states[8]. Such surveillance is a first step toward the integrated prevention and control of diabetes and other non-communicable diseases, which is now recognized as an urgent priority for national and international health authorities[9].

Non pharmacological interventions have a much greater role in the management of non-insulin dependent diabetes mellitus (NIDDM) as compared to the management of insulin dependent diabetes mellitus (IDDM) and every effort should be made to manage NIDDM by non-pharmacological means before restoring the use of drugs.

DIET: Is an integral part of the management of both NIDDM and IDDM.

EXERCISE: Should be considered and integral part of the management of NIDDM. However, IDDM patients who wish to exercise must be given proper guidance.

STRESS MANAGEMENT: Must be an integral part of management of NIDDM if glycemic control is to be attained. However, stress management will also improve the quality of life for individual with IDDM or NIDDM.

GOALS FOR DIETRY MANAGEMENT OF DIABETES:

1. Maintain adequate nutrient intake for growth, other psychological needs and/or maintain ideal body weight.
2. Maintain blood glucose as near normal as possible to prevent hyper and/or hypoglycemia and to maintain optimal blood lipid levels so as to prevent or delay the development of long term cardiovascular, renal, retinal and neurologic complications associated with diabetes.
3. Stay consistent in timings of meals and snacks to prevent swings in blood glucose levels for the people on insulin therapy.
4. Determine the meal plan appropriate for the individual's life style, based on diet history.
5. Manage weight for obese people with NIDDM. Weight management involves specific changes in food related behavior and eating patterns as well as increased activity level. Continued support and follow-up by health professionals are needed if long term life style changes to be made.

DIET RECOMMENDATIONS:

CALORIES: Calories should be prescribed to achieve and maintain a desirable body weight. To determine calorie level to prescribe for patients with NIDDM, multiply present body weight in pounds by 13 and minus 500-1000 calories depending on the individual patients readiness and ability to cut down on food intake and the amount of weight to be lost. In no case should the intake be less than 1000 calories for females and 1200 calories for males.

CARBOHYDERATES:

1) 60% of the calories can come from carbohydrates thus a 1000 calories diet may contain upto 150 g CHO. The amount of carbohydrates must be individualized depending on blood glucose and lipid levels as well as eating patterns.
2) Whatever acceptable substitute unrefined carbohydrates with fiber for refined carbohydrates e.g. "Atta" instead of "Maida".

PROTEIN: The recommended intake of protein is 0.8 g/kg of body weight for adults. For Pakistanis that works out to be about 45g for females and 55g for males. Plant and fish protein should be used in addition to other animal protein sources such as meat, milk and egg. High protein intake should be avoided. There is growing evidence that lower protein intakes delay the progression of renal disease.

FAT & CHOLESTROL: Total fat intake ≤ 30% of calories. For 1000 kcal this equals approximately 33g fat or 6-7 teaspoons fat. Since foods such as meat, milk and nuts also contain fats, the amount of cooking fat allowed on a 1000 kcal diet will depend on how much these foods are used.

Saturated Fats 1/3 of fat intake

PUFA 1/3 of fat intakes

Cholesterol ≤ 300 mg/day. 1 oz meat 23 mg.

SALT: Recommended 1 g/1000 kcal. One teaspoon salt 5000mg NaCl or 2300 mg Na.

FIBER: Recommendation 40 g/day	Foods high in fiber:	
Beans (Lobia & Cholla)	½ cup cooked	6g
Dals	½ cup cooked	3.5-4g
Fruits & Vegetables	1 or ½ cups	1.5-2g
Unrefined cereals and grains	1 serving	1.5-2g

ALTERNATIVE SWEETENERS: The use of various nutritive (e.g. aspartame) and non-nutritive sweeteners (e.g. saccharin) is acceptable in the management of diabetes.

EXERCISE

NON_INSULIN DEPENDENT DIABETES

An appropriate exercise program should be an integral part of the management program along with diet and/or drug therapy, to improve glycemic control, reduce certain cardiovascular risk factors and increase psychological well-being in individuals with NIDDM. The benefits of exercise out-weigh the risks; however attention must be paid to minimize potential exercise related complications.

INSULIN DEPENDENT DIABETES

Exercise programs have not clearly shown to improve long-term glycemic control in people with IDDM. However, people with IDDM should be encouraged to exercise in order to improve cardiovascular fitness and psychological well-being.

RISKS OF PHYSICAL EXERCISE IN IDDM: Hypoglycemia, hyperglycemia, ketosis, cardiovascular ischemia and arrhythmia, exacerbation of proliferative retinopathy and lower extremity injuries. Many variables affect the metabolic response to exercise therefore the health profession must take into consideration the following factors when counseling insulin dependent diabetes exercise.

Table No.2: Exercise Recommended for Patients with NIDDM

Screening	Search for vascular and neurological complications including silent ischemic heart disease. Stress Electrocardiogram in patients > 35 years of age may be required.
Exercise Program	
Type	Aerobic
Intensity	50 – 70% of maximum aerobic capacity
Duration	20 – 60 minutes
Frequency	3 – 5 times /week
Avoid complication	Warm up and cool down Careful selection of exercise type and intensity Patient education Monitoring of blood glucose by patient and overall program by medical personnel
Compliance	Make exercise enjoyable Convenient location Positive feed back from involved medical personnel and family

Consideration before Exercise for Individuals with IDDM

Type of exercise:

Estimated intensity and duration of exercise

Estimated caloric expenditure

Is the exercise habitual or unusual?

How does the exercise relate to the level of physical conditioning?

Blood Glucose:

If < 100 mg/dl, take pre-exercise snack

If 100 – 250 mg/dl, all right to exercise

If > 250 mg/dl, delay exercise, check urine ketones

Urine Ketones: If negative, all right to exercise. If positive, take insulin don't exercise until ketones are negative

Insulin: Type and dose, time of injection, site of injection

Food: Time of last meal, Pre-exercise snack, Carbohydrate feedings during exercise, Extra food after exercise

Strategies to Avoid Hypo or Hyperglycemia with Exercise:

Food: Eat a meal 1 – 3 hours before exercise. Take supplemental carbohydrate feedings during exercise, at least every 30 minutes if exercise is vigorous and of long duration. Increase food intake ≤ 24 hours after exercise, depending on intensity & duration of exercise

Insulin: Take insulin > 1 hour before exercise. Decrease insulin dose before exercise. After daily insulin schedule

Blood Glucose Monitoring: Monitor blood glucose before, during and after exercise. Delay exercise if blood glucose is > 250 mg/dl and ketones are present. Learn individual glucose response to different types of exercise

STRESS: There is mounting experimental evidence of altered sympathetic nervous system activity in NIDDM as evidenced by a hyper-responsiveness to epinephrine resulting in an exaggerated suppression of insulin secretion and profound hyperglycemia. It has also been reported that glycemia control is improved in individual with NIDDM when they are trained in relaxation techniques. Thus the health professional must take into account the life experiences of the patient with NIDDM and be in a position to provide support and guidance in ways to reduce stress in the individual's life or refer the patient to an appropriate source of help. Stress management should be seen as an adjunct to diet and exercise in the non-pharmacological management of diabetes aimed at improving both glycemic control and the quality of life of the individual with NIDDM.

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Original Article

The Prevalence and Anatomical Characteristics of Accessory Mental Foramen in Qassim Population, Saudi Arabia – A Cone-Beam Computed Tomography Study

Anas Abdul Khader

ABSTRACT

Objective: To establish the prevalence, anatomy, and demographic correlates of AMF in a Saudi sub-population in the Qassim region using Cone-Beam Computed Tomography (CBCT).

Study Design: Cross-sectional retrospective study

Place and Duration of Study: This study was conducted at the Department of Oral and Maxillofacial Radiology, College of Dentistry, Qassim University, Kingdom of Saudi Arabia from August 2025 to October 2025.

Methods: 415 CBCT scans were used to evaluate the frequency, laterality and location of AMFs in relation to mental foramen. SPSS version 2.0 was used for statistical evaluation of correlations with gender and side of occurrence.

Results: AMF was found in 3.4% of the population under study. The diversity was mainly on the left side (78.6%), located superior to the mental foramen (35.7%). Majority (85.7%) cases had one accessory foramen. There was no statistically significant difference in terms of gender or age as per AMF characteristics.

Conclusion: Even a low prevalence of AMFs has significant implications for dental implants in the mandibular premolar region, emphasizing the essential role of preoperative CBCT to ensure safe and precise implant placement.

Key Words: Accessory mental foramen, CBCT, Mental foramen, Anatomical variation

Citation of article: Khader AA. The Prevalence and Anatomical Characteristics of Accessory Mental Foramen in Qassim Population, Saudi Arabia – A Cone-Beam Computed Tomography Study. Med Forum 2026;37(2):4-9. doi:10.60110/medforum.370201.

INTRODUCTION

The mental foramen is an important anatomical structure that appears on the anterolateral side of the mandible and is the conduit of the mental nerve and vessels that serve the lower lip, chin and other soft tissues. Its morphology, location, and its potential anatomical changes directly relate to local anesthesia, implantation, endodontic treatment, and managing trauma.[1,2] These variations include the accessory mental foramen (AMF), which is an extra opening through which branches of the mental nerve can be found, mostly as a result of patterns of neural branching during early mandibular development.[3]

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Received: November, 2025
Reviewed: December, 2025
Accepted: January, 2026

The presence of AMF can increase the risk of anesthesia failure, compromised implant osteotomy, postoperative neurosensory deficits, and unintended neurovascular injury during implant placement in the mandibular premolar region.[4]

AMFs have a significant degree of variation among populations. The reported prevalence can be as low as 1% and as high as over 10% based on ethnicity, sample features, and the imaging technique.[5,6] The prevalence estimates are more likely to increase when assessment is performed with CBCT, which is more sensitive in the detection of small accessory foramina.[7,8] Muinelo-Lorenzo et al. explained a high heterogeneity of AMF dimensions and laterality, highlighting the necessity of region-specific anatomical databases.[3] Morphometric variations were observed in Brazilian and Turkish populations.[2,9] Similar variations in ethnic populations in South and West Asia were linked to genetic or developmental factors.[10,11]

In Saudi Arabia, AMFs literature is still small even though there is now developing evidence that mandibular neurovascular anatomy exhibits population-specific features. A multicenter CBCT study in a Saudi-based cohort indicated that detailed mapping of these structures is necessary.[12] Bilateral asymmetry and other anatomical diversity should be incorporated in clinical treatment planning.[13]

The accidental damage of accessory mental branches is likely to cause neurosensory losses that are challenging to undo and create complications in the treatment process. Orofacial injury and post-surgery nerve complications are a non-trivial global burden that can lead to functional impairment, decreased oral health-related quality of life, and increased healthcare utilization. By utilizing CBCT, proper identification of AMFs are needed to reduce avoidable iatrogenic damages.

There exists a significant gap in AMF-specific information in the Qassim region, a central population in Saudi that has very specific demographic features. The prevailing national literature has been, in most cases, multicentric or concerned itself with overall morphology of foramen of the mesencephalon without in-depth studies of accessory foramina. Since AMFs have clinical relevance, and geographical variability in the mandibular anatomy is known, the evidence required to establish safe clinical practice and improve surgical planning is region-specific.

The present research offers a CBCT-based analysis of prevalence, laterality, frequency, morphometry, and the related demographic traits of AMFs within a Qassim subpopulation. The study aims to present clinically utilizable anatomical information, to enhance safer and more accurate dental and maxillofacial practices in the area.

METHODS

This cross-sectional, retrospective study was done at the Department of Oral and Maxillofacial Radiology at Qassim University, over a period of 3 months. Ethical clearance was obtained from the institutional ethics committee, with order number 25-37-19. Strict confidentiality was followed by anonymizing the data before analysis. The CBCTs were retrieved from the radiology archives. The sample size was determined to be 415; calculated by taking the expected prevalence of 8.9%.

Inclusion criteria included the presence of high-quality CBCTs of patients of at least 18 years of age (both genders), that were scanned within the period of 2021 to 2025 and had a clear visualization of the mental foramen area. Patients with history of craniofacial syndromes, congenital anomalies, mandibular fractures, prior mandibular surgeries or bone pathology were excluded. Two independent examiners with experience in the special imaging programs were asked to analyze the CBCT images and evaluate the presence, location, side, and number of AMFs. A third expert validated the findings. Position of the AMF was determined in relation to the mental foramen.

SPSS version 26.0 was used to record and analyze data. The data were summarized using descriptive statistics (frequency, meaning percentage, mean, and standard deviation). Categorical differences (gender and side of occurrence) were determined by chi-square tests, whereas continuous variables (age or distance to the mental foramen) were compared with the help of t-tests. p-value below 0.05 was assumed to be statistically significant.

RESULTS

The scans included 260 males (62.7%) and 155 females (37.3%). 14 participants (3.4%) showed the presence of AMF (Figure 1), which were mostly unilateral. 78.6% (n=11) occurrence was on the left side. A single accessory foramen was the most frequent presentation (85.7%. n=12), while 14.3% (n=2) had two accessory foramina.

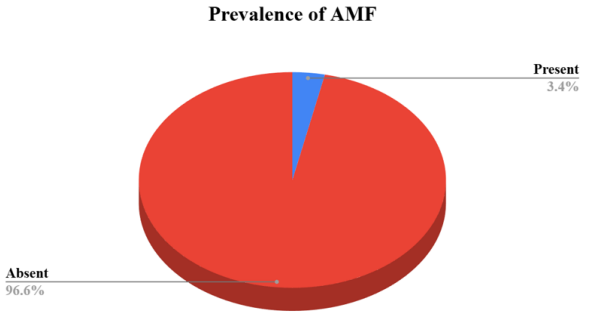

Figure No. 1: Pie Chart representing the prevalence of AMF

The AMF position relative to the primary Mental Foramen (MF) varied (Table 1). The highest prevalence was in the superior aspect of the MF (35.7%).

Table No. 1: Anatomical Location of Accessory Mental Foramina Relative to the Mental Foramen (n=14)

Location Relative to MF	Frequency (n)	Percentage (%)
Superior	5	35.7
Posterior	3	21.4
Anterior	2	14.3
Inferior	2	14.3
Anterior and Inferior	1	7.1
Posterior and Superior	1	7.1
Total	**14**	**100.0**

Of the 14 positive cases,11 were male and 3 were female, with the mean age of the sample being 30.14 years (SD ± 8.23).

Table No. 2: Distribution of Accessory Mental Foramina Characteristics by Gender (n=14)

Charac-teristic	Category	Female	Male	Total
Side of Occurrence	Left	2	9	11
	Right	1	2	3
Location Relative to MF	Anterior	0	2	2
	Anterior and Inferior	0	1	1
	Inferior	2	0	2
	Posterior	0	3	3
	Posterior and Superior	0	1	1
	Superior	1	4	5

Most of the males presented with AMF on the left-side (n=9). The superior position was most prevalent in males (n=4), and in females the most prevalent position was inferior to the MF (n=2). (Table 2)

The mean distance between the AMF and the Mental Foramen was 4.82 mm (SD ± 2.21), and had a range of 3.20 mm to 12.00 mm. (Table 3)

Table No. 3: Descriptive Statistics of AMF–MF Distance

Para-meter	Mean ± SD (mm)	Median (mm)	Min. (mm)	Max. (mm)	IQR (Q1–Q3) (mm)
AMF–MF Distance	4.82 ± 2.21	4.54	3.20	12.00	3.60 – 5.10

There were no significant gender differences in relation to age (p=0.63) or distance of the AMF to the MF (p=0.489) (Table 4).

Table No. 4: Comparison of Age and AMF–MF Distance Between Male and Female Subjects

Variable	Gender	N	Mean	Std. Deviation	P-Value
Age (years)	Male	11	30.73	9.06	0.630
	Female	3	28.00	4.58	
Distance from MF (mm)	Male	11	5.05	2.43	0.489
	Female	3	4.00	0.96	

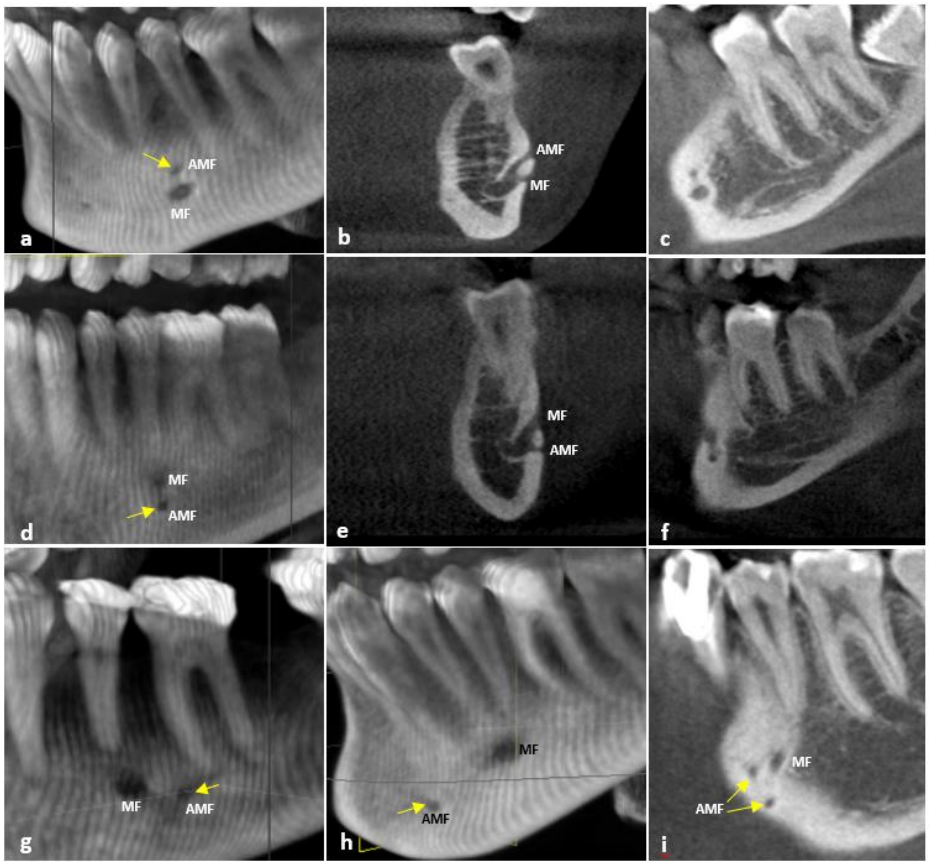

Figure No. 2: Position of AMF (a, b, c – Superior to MF: d, e, f - Inferior to MF: g - Posterior to MF: h – Anterior to MF: i – Multiple AMFs.)

Figure 2 illustrates the various positional relationships of AMFs relative to the primary mental foramen (MF), and multiple accessory openings as visualized on CBCT images.

DISCUSSION

The current study adds to an accumulating literature which shows that mandibular neurovascular heterogeneity is much more intricate and population-based, and suggests that AMFs, despite being historically discussed as rare anatomical anomalies, do have frequent occurrence such that they should be regarded as common clinical entities.[6] The observations are in agreement with multiethnic studies that suggest that superior imaging modalities significantly enhance the identification of small accessory openings.[3,7] Studies that use CBCT always indicate relatively high rates of AMF, which supports the methodological assumption that underreporting in the past was not as a result of biological rarity.[5,14]

Relative studies with global data shows that there is a large dispersion among the populations. Barbosa et al. showed significant diversity of AMF dimensions in Brazilian people, whereas Alma Voljekova et al. showed the clinical significance of AMF morphology in Bosnian groups.[9,15] AMFs were found in Turkish cohorts with a range of variability in the number, diameter, and neurovascular pathway.[2] Coban et al. proposed that craniofacial patterns in the past could be a root of regional variation.[2,16] Results of studies in Iranian, Indian, and Chinese subpopulations also provide generalized morphometric results, which would support the safe practice of oral surgery.[10,11,17-19]

The patterns of lateralities in the present research are similar to a number of published data. Bruna-Mejias et al. reported that unilateral double mental foramina prevailed, however Sakalem et al. reported bilateral replications in a smaller proportion of specimens pointing to a possible developmental process in which bilateral replications are rarer than bilateral divergences.[4,20] The bilateral AMF case-report described by Karabıyık and Kıranatlı is another example of how extensive an anatomical variation can be.[21] The morphometric parameters in the current study; especially the distance between AMFs and the primary mental foramen, is in line with previous studies, which found that most AMFs are positioned closely to the main mental foramen, and that accessory branches are likely to arise due to early bifurcation of the mental nerve.[22-25]

The demographic variable is still not fully comprehended, as the data shows that there is inconsistent correlation between AMF characteristics, age, and gender. Khalifa and Ahmad et al. found gender-specific variations in general anatomy of mental foramen, although they seldom touch conclusively on AMFs.[26,27] CBCT studies by Mostafavi et al and Çimen et al. have shown no significant demographic effects.[5,6] The lack of effective demographic predictors in the current results may indicate that AMF formation can be more tied to the developmental morphology rather than the sex-based or age-related variance.

Shan et al. and Muinelo-Lorenzo et al. showed through pooled studies that accessory foramina form a nontrivial anatomical category in world populations, which go against the assumption they are rare anomalies.[3,8] Thomaidi et al, further explored this knowledge by combining the methods of dry mandible analyses and meta-analytic synthesis, finding that AMFs are present in a wide variety of human populations, albeit with significant changes in their level of expression. Such multi-study syntheses reinforce the interpretive case that AMFs should not be treated as exceptions but as morphological variants to which considerable clinical implications can be expected.[28]

The results of the current study also add to the overall research of the variations of the mandibular canal and the neural pathways. An example is a study by Muley et al in which the mandibular arch is often characterized by complex accessory canals, making the operation in the areas around the premolar area difficult.[29] In a similar vein, Shan et al. found heterogeneity in the mandibular canal branching, among which AMFs are a peripheral expression.[8] Placed in this anatomical context, the existing data supports the notion of the mandibular neurovascular system as a complex construct that can vary and be highly patterned and needs to be captured accurately with regard to safe intervention.

These studies highlight that AMFs are not rare to be considered not of clinical significance. Regional difference is a significant predictor of the anatomical structure.[30] CBCT is the most dependable method of identification of accessory foramina and surgical planning. The results of the current research can help advance this dynamic area by determining baseline AMF features in the Qassim region. AMFs and their morphometry have a direct impact on surgical safety in case of implant placement, apical surgery, premolar extraction, genioplasty, and periapical curettage. Clinicians must incorporate AMF mapping in their regular diagnostic procedures particularly during the procedures undertaken in the premolar area. In terms of research, the results indicate that more regional databases that would reflect the anatomical variation of the Saudi subpopulations are necessary. In the future, multi-center datasets and three-dimensional mapping of nerve trajectories should be included to better establish

functional pathways associated with accessory foramina.

CONCLUSION

The present research contributes to the anatomical literature on AMFs, with strong region-specific evidence of the existence of anatomically significant variation and quantifiable prevalence in a Qassim subpopulation. Placed in the wider context of the international evidence base, the results support the fact that AMFs are a consistent morphological type that has high implications to dental and maxillofacial interventions.

Acknowledgments

The author acknowledges the support of Dr. Abdul Kalam Azad and Dr. Shaul Hameed Kolarkodi for assisting with the evaluation of the CBCTs.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Anas Abdul Khader
Drafting or Revising Critically:	Anas Abdul Khader
Final Approval of version:	The above author
Agreement to accountable for all aspects of work:	The above author

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.35-37-19 Dated 13.05.2025

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Original Article

Peri Ilioinguinal Nerve Block Versus Subcutaneous Infiltration with Bupivacaine in Pediatric Below Umbilical Surgery – Randomized Control Trial

Compare Periilioinguinal Nerve Block with Subcutaneous Wound Infiltration

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ABSTRACT

Objective: To compare periilioinguinal nerve block with subcutaneous wound infiltration in below umbilical surgeries in pediatric surgical patients.

Study Design: Randomised control trial study

Place and Duration of Study: This study was conducted at the department of Anaesthesiology, ICU and Pain medicine at Mohiuddin Islamic Medical College teaching hospital, Mirpur, AJK from 12th May till November, 2025.

Methods: This study included fifty ASA I and II elective surgical pediatric patients in a teaching tertiary care hospital. Patients were randomized into group P (Periilioinguinal block) and group S (Subcutaneous infiltration). Endotracheal tube was inserted after general anesthesia induction with ketamine and propofol.

Results: Fifty elective surgery patients were randomly assigned in two groups, group P (Periilioinguinal) and group S (Subcutaneous infiltration). The minimum age in group P and S was 10 months and maximum in group P is 9 years and group S is 8 years. There were 24 males in group P and 21 males in group S while 1 females in group P and 4 females in group S. Using FLACC score, no pain noted in thirteen patients in P group vs 5 in S group which was statistically significant at 1st hour postoperatively ($p<0.005$). Using NRS score, no pain noted in 13 patients in P group while 5 in S group which was statistically significant at 1st hour postoperatively ($p<0.005$). At 6th and 12 hours, more pain noted in S than P group but not statistically significant. (p 0.345).

Conclusion: Periilioinguinal nerve block improves the pain management of pediatric surgical patients compared to subcutaneous wound infiltration with bupivavaine technique making it a valuable choice in multimodal analgesia in low income countries for elective and emergency surgeries pediatric anaesthesia.

Key Words: Periilioinguinal, subcutaneous, pain, complications.

Citation of article: Shazad M, Ismail S, Hassan, Jalil O, Ikram A, Ghazanfar D. Peri Ilioinguinal Nerve Block Versus Subcutaneous Infiltration with Bupivacaine in Pediatric Below Umbilical Surgery – Randomized Control Trial. Med Forum 2026;37(2):10-14. doi:10.60110/medforum.370202.

INTRODUCTION

In low income countries (LIC's), we always strive for an anesthesia management plan that is cost effective with fast recovery. Ultrasound becomes a gold standard for pain blocks but cost involved is still a burden difficult to bear. Different ultrasound techniques used to make it spot on for best clinical outcomes.

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Received: November, 2025
Reviewed: December, 2025
Accepted: January, 2026

No one anesthesia technique can be fit for all patients but different approaches like opioid free and opioid sparing moved forward for better anesthesia and surgical outcomes. A multimodal opioid sparing technique remains ideal. In opioid free anesthesia often five to six different adjuvants polypharmacy used make increasing risks of errors also made attaining desirable balanced anesthesia depth challenging.

Paediatric surgeries always an enormous challenges for surgeons and anaesthetists globally. Pain management is the backbone of balanced anesthesia for pediatric surgeries whch have increased globally[1]. Below umbilical surgeries mainly make ilioinguinal and iliohypogastric target nerves in most cases. Every innovation related with pain management studied in this area signified the same target nerves[2]. Target nerve blocks with local anesthetics proven useful for providing analgesia for inguinal hernia repair, orchidopexy, hydrocoele repair and varicocoele surgery. Land mark techniques are associated with failures as high as 40%, gut injuries, hematoma

formation and transient femoral nerve blocks.[3] Pre emptive analgesia to multi modal analgesia, opioid free to opioid sparing analgesia, new and latest equipments for delivery of analgesia, use of nociception and BIS monitoring for gauging analgesia and anesthesia all strive forward for a balanced analgesia and anaesthesia technique. Use of targeted nerve blocks help in reducing the use of opioids and reduction of complications. Enhanced recovery after surgery is incomplete without use of local anaesthetics for pain management. Nerve stimulators and ultrasound revolutionalised the field of pain medicine. Optimal dose of local anaesthetics with minimal concentration helps in maximum analgesia and fewer adverse effects. Anatomical variations in inguinal region in children is mainly because of it's small size and thin abdominal tissue wall. This makes the patients prone to injury to visceras in abdomen by needle as distance is too small between puncture point to the target nerves .[4] Supine position anatomical variations also makes it challenging for non routine users.[5] Even with ultrasound expert hands required to overcome the challenges in technique and anatomical variations .[6,7] Even variable positions in placement of ultrasound probe been tested for an accurate position of ilioinguinal and iliohypogastric nerves path between internal oblique and transversus abdominis muscles for preventing the localization mistakes [8,9] with variable clinical effects in search for reducing injury complications[10].

Landmark techniques, nerve stimulators and different ultrasound probe techniques all for avoiding opioid induced adverse effects and a perfect pain management plan so we performed a periilioinguinal technique with no special equipment or additional costs but surgeons employing it under vision with precision.[11]

METHODS

The study was conducted after approval from ethical review committee of Mohiuddin Islamic Medical College , Mirpur, Azad Kashmir . Informed written consent taken from all study participants. Fifty consecutive patients meeting the inclusion criteria divided into two groups, group P (Peri ilioinguinal group) and group S (Subcutaneous infiltration group) each with twenty five patients. . Randomisation was conducted using a computer-generated randomisation sequence to ensure allocation concealment. Group assignments were placed in sealed opaque envelopes that were opened sequentially by medical officers immediately before administering the allocated intervention. This ensured strict adherence to the randomisation protocol and prevented selection bias. All patients had a running intravenous cannula and standard monitors (non invasive blood pressure, pulse oximeter and ECG) before starting. A baseline heart rate and blood pressure taken. Ringer's lactate using 4:2:1 weight based formula for intravenous fluids. All patients in group P received intravenous 1 mg/kg ketamine over 30 seconds. Atracurium 0.5 mg/kg given intravenously. The endotracheal tube inserted after loss of consciousness and eye lash reflex. In case , eye lash reflex is still intact further boluses of 0.5mg/kg ketamine intravenously will be used. In group S , patient received intravenous 1mg/kg Propofol over 30 seconds. Nalbuphine 0.1 mg/kg given. The endotracheal tube was inserted after loss of consciousness and eye lash reflex. In case , eye lash reflex is still intact further boluses of 0.5mg/kg propofol intravenously given. All endotracheal tube insertions was done by consultant anaesthetist. After the surgeon disinfected and laid the drapes, the operation began. Heart rate, blood pressure, and SpO2 were recorded before and after skin incision and during peritoneal traction. Group P also received periilioinguinal block with intravenous dexamethasone 0.1mg/kg while group S will receive subcutaneous nerve infiltration at incision site by the operating surgeon. Bupivacaine 0.25% in a safe dose of 1mg/kg given in both groups. After confirming the periilioinguinal plane by surgeon, 0.4 mL/kg of local anesthetic solution was injected. The body movement situation that affected the surgical process during the operation was recorded. The occurrence of SpO2 < 90% in the child during the operation was recorded. The vital signs and surgical incision pain of the child were recorded.

RESULTS

Data entry and analysis was done by using SPSS version 27. This study included fifty elective pediatric surgical patients divided into two groups. Group P consisted of 24 males and 1 female and with a minimum age was 10 months and maximum 9 years. Group S consisted of 21 males and 4 females with minimum age of 10 months and maximum 8 years.

Table No. 1: General demographics of the study

Category	Periilioinguinal nerve block group	Subcutaneous infiltration group	P value
Age	10 Months 9 Years	10 Months 8 Years	
Gender	Male 24 Female 1	Male 21 Female 4	
Weight	Male: 6.7 KG Female: 34 KG	Male: 4.5 KG Female: 37 KG	P= 0.782
ASA	I 9 II 16	I 8 II 17	P= 0.785
Propofol		1.9 MG/KG MEAN	
Ketamine	1.7 MG/KG MEAN		

Table No. 2: FLACC score in no. of patients in group P & S

Groups	No Pain	Mild Pain	Moderate Pain	Severe Pain	P Value
		FLACC	1ST Hour		
Group P Group S	13 5	11 10	01 10	0 0	0.004
		FLACC	6TH Hour		
Group P Group S	12 8	11 12	2 5	0 0	0.345
		FLACC	12TH Hour		
Group P Group S	20 22	4 2	1 1	0 0	0.683

Table No. 3: NRS Pain score in no. of patients in group P & S

Groups	No Pain	Mild Pain	Moderate Pain	Severe Pain	P Value
		NRS	1ST Hour		
Group P Group S	13 5	10 8	2 12	0 0	0.004
		NRS	6TH Hour		
Group P Group S	12 5	8 11	5 9	0 0	0.105
		NRS	12TH Hour		
Group P Group S	19 17	5 7	1 1	0 0	0.801

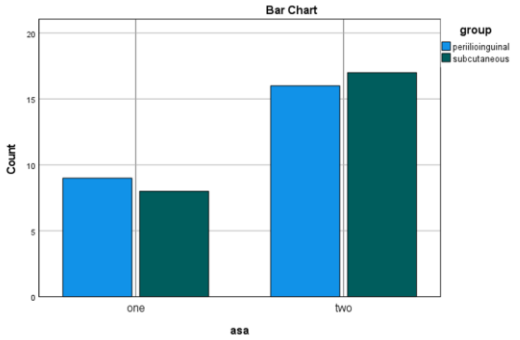

Figure No.1: Bar chart

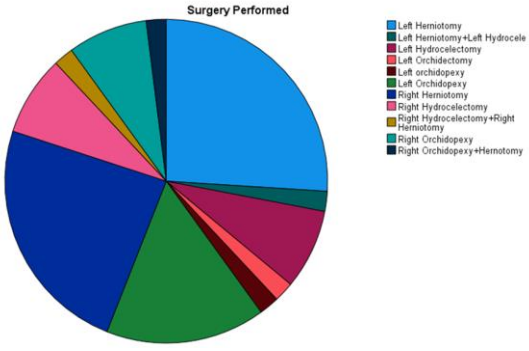

Figure No.2: Surgery performed

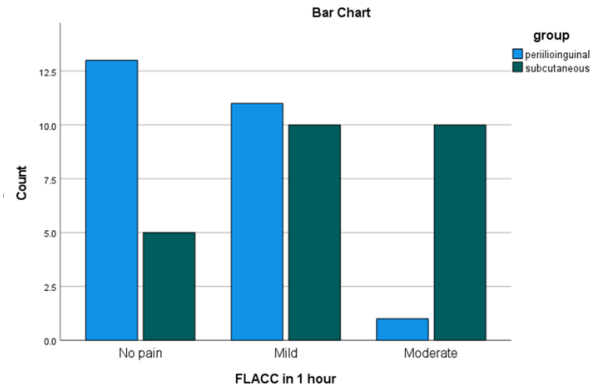

Figure No.3: Bar Chart - FLACC in 1 hour

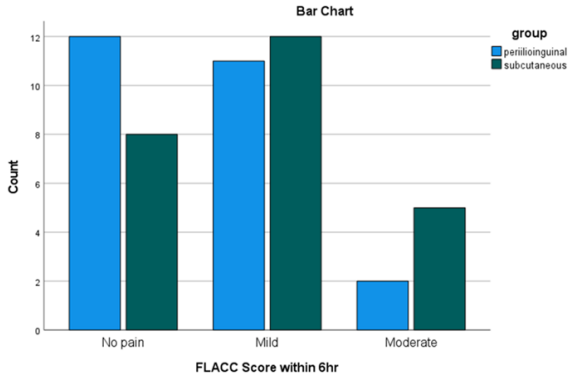

Figure No.4: Bar Chart - FLACC Score within 6hr

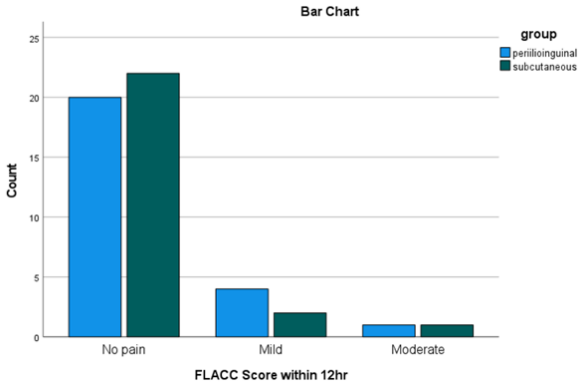

Figure No.5: Bar Chart - FLACC Score within 12hr

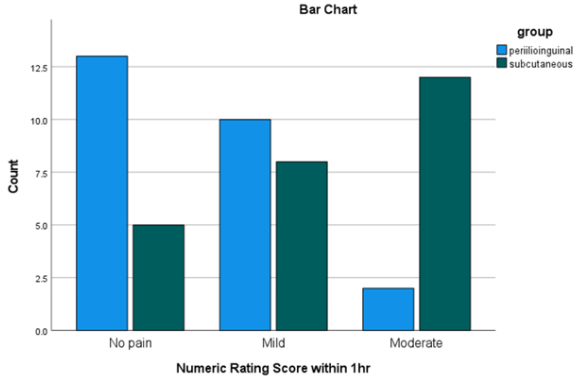

Figure No.6: Numeric rating score within 1hr

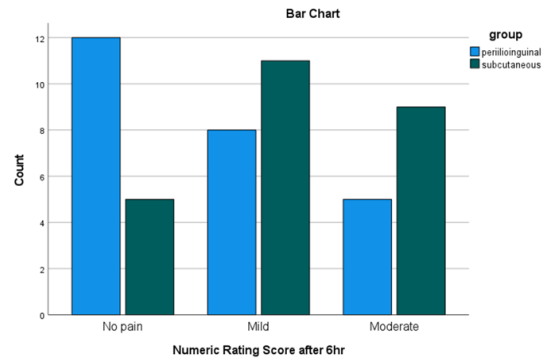

Figure No.7: Numeric rating score within 6hr

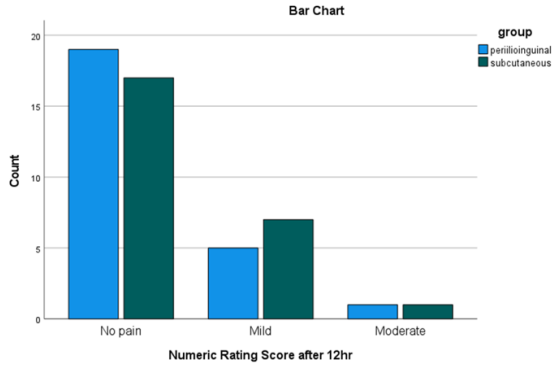

Figure No.8: Numeric rating score within 12hr

ASA I nine patients in group P while eight in group S. ASA II sixteen patients in group P while seventeen in group S. fig. 1. Most surgical patients 28 (56%) included underwent herniotomy as surgical distribution been shown in fig. 2. General demographics, propofol and ketamine mean findings shown in table 1. The primary outcome measure of this study was the incidence of postoperative pain with FLACC and NRS was more at 1st,6th and 12 hours in group S when compared with group P (Table 2, 3 fig. 3,4,5,6,7,8). The secondary outcome measure of abnormal body movements during surgery were only found in two patients in group S. SPO_2 remained stable and more than 95 % in both study group patients intraoperatively and in PACU. The statistically significant difference considered as $p < 0.05$ level.

DISCUSSION

Pain management is of pivotal importance in post surgical patients. Pain incidence is multifactorial depending on patient, surgical and anesthesia factors. Our study compared the Periilioinguinal block and subcutaneous infiltration of wound with ketamine and propofol induction to strive forward for an anesthesia technique suitable for both elective and emergency pediatric surgeries with minimum resources and less complications. The results found significant reduction in pain at 1st postoperative hour in periilioinguinal block in comparison to subcutaneous infiltration of wound with ketamine induction. The incidence of any intraoperative abnormal patient movements also reduced in periilioinguinal block group in comparison to subcutaneous group.

Surgery and opioids always found a routine as an essential component in general anesthesia [12,13]. It's been linked with any opioid abuse in future life [12,14]. In our study we used ketamine with periilioinguinal block to make it an opioid free technique. In subcutaneous group we used propofol in combination with nalbuphine. It's predicted that if opioid is in plan of pain management in a pediatric surgical patient it increases risk of abuse and dependence later in life of these agents [12,15]. Therefore we successfully avoided any opioid use with ketamine induction and mean dose of ketamine remained lower than propofol during these procedures. The concern regarding dependence on opioids remained a grave concern in pediatric and adult patients [16]. Avoidance or minimal sparing usage techniques been employed using multiple non opioid adjuvants [17]. We used ketorolac in rescue analgesia and it's requirement remained lower in periilioinguinal group during first twelve hours of recovery. All these adjuvants been employed with a simple and single purpose of developing a safe and efficient technique with minimal adverse effects [17,18]. Instead of landmark technique this periilioinguinal block is with more success and less failure mainly because employed under vision by surgeons. Patients outcomes, recovery and minimal or no adverse effects are of prime importance in every anesthesia plan [19]. Analgesic effect of subcutaneous group may be lower initially in 1st hour but improved remarkably during 6th and 12th hour as we proved using multiple pain scales using FLACC and NRS pain system. We considered the FLACC scale for measuring observational pain in infants and children as in comparison with other pain scales assessing pain in children is more convenient and practical in recording pain[20].Combining it with NRS it to improve the validity of our results and management plans.[21]

Limitations: This study has several limitations. Firstly, the sample size was relatively small, which may have introduced a statistical bias. Secondly, majority of patients were males so we need a larger group with more females representation. Third, new novel agents like esketamine and dexmedetomidine needs to compare with ketamine for ideal outcomes in a larger diversified groups.

CONCLUSION

Periilioinguinal nerve block improves the pain management of pediatric surgical patients compared to subcutaneous wound infiltration with bupivavaine technique making it a valuable choice in multimodal analgesia in low income countries for elective and emergency surgeries pediatric anaesthesia.

Acknowledgement: Mr. Mubashar Hussain, Biostatistician in reviewing data and Mr. Muhammad Bilal, Anesthesia technologist for valuable contributions in data collection.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Muhammad Shazad, Saqib Ismail, Hassan
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Final Approval of version:	All the above authors
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Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.1-2/25-MIMC/ERB/A-3492 Dated 30.05.2025

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Original Article

Effects of Therapeutic Back Massage on Pulmonary Functions, Frequency of Asthmatic Attacks and Anxiety in Asthmatic Patients

Rab Nawaz[1], Azeem Kaleem[2] and Sarfraz Masih[3]

ABSTRACT

Objective: The purpose of this study was to assess how therapeutic back massage affected asthmatic patients' anxiety levels, pulmonary functioning, and asthma attacks.

Study Design: Quasi-experimental study

Place and Duration of Study: This study was conducted at the Lahore School of Nursing, The University of Lahore from August 2025 to November 2025.

Methods: A quasi-experimental study design, involving asthma patients at a tertiary care hospital in Rawalpindi who were assigned to either an intervention or control group. A convenient sample of n=35 asthma patients was recruited in each group. The intervention group received structured back massage sessions in addition to routine medical care, while the control group continued to receive standard care alone. Pulmonary function parameters were assessed using a digital spirometer, anxiety levels were evaluated using the Beck Anxiety Inventory, and the frequency of asthma attacks was recorded before and after the intervention. At the end of data collection, the data were entered and analyzed using SPSS version 25, considering a P-value < 0.05 as significant.

Results: The findings revealed a statistically significant improvement in pulmonary function, such as Forced Expiratory Volume in 1 second and Peak Expiratory Flow, Anxiety level, and Asthma attack among patients who received therapeutic back massage compared to those in the control group $p < 0.001$), at the second and third follow-up after 2 months from the start of the therapeutic back massage.

Conclusion: The study concludes that back massage is an effective, safe, and cost-efficient complementary therapy that positively influences both physiological and psychological outcomes in asthma patients.

Key Words: Back Massage, Pulmonary functions, Anxiety level, Asthmatic attack, Forced expiratory volume, Peak expiratory flow, Asthma patient

Citation of article: Nawaz R, Kaleem A, Masih S. Effects of Therapeutic Back Massage on Pulmonary Functions, Frequency of Asthmatic Attacks, And Anxiety in Asthmatic Patients. Med Forum 2026;37(2): 15-19. doi:10.60110/medforum.370203.

INTRODUCTION

Asthma is a respiratory condition characterized by recurring airway obstructions[1], leading to breathlessness, wheezing, chest tightness, increased bronchial mucus production, and coughing[2]. Despite advancements in medical approaches, many asthmatic patients experience persistent symptoms and seek alternative methods to solve the problem of their difficult respiration[3].

Asthma is a worldwide prevalent disease[4]. 27% of people suffer from asthma worldwide, of which 14 % are females, and 13% are males, but due to more cigarette smoking, males are more prone to developing asthma[5]. Asthma affects all stages of life for people around the world[6]. Asthma affects children, adolescents, and older adults similarly all over the world.

In Pakistan, the prevalence of asthma is very high[7]. Pakistan is the fifth most populous country in the world, with approximately 221 million people. 4.3% of them are suspected to suffer from asthma, with 5/1000 annual new cases and 2.9/1000 of them bearing inpatient hospital stays every year[8]. This high prevalence of asthma causes serious concerns for healthcare services because there is much evidence that many deaths caused by asthma can be prevented through efficient management[9].

Asthma has deep roots in Pulmonary functions[10,11]. People with reduced pulmonary function are managed with pharmacological methods[12] to restore airway patency[13]. One understudied complementary management of asthma with the potential to improve pulmonary function is therapeutic back massage[14]. Researchers hypothesized that reduced pulmonary function may respond to therapeutic back massage

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Received: December, 2025
Reviewed: January, 2026
Accepted: January, 2026

interventions[15] and subsequently improve asthma symptoms[16]. In all known asthma interventions, it is evident that asthmatic patients are not getting sufficient relief from conventional treatment of asthmatic attacks[17]. Therapeutic back massage is one of them[18]. It has been proven that therapeutic back massage is effective in improving lung function by increasing circulatory flow towards the lungs[19].

METHODS

A quasi-experimental two-group case–control study was conducted among adult male asthma patients (18–65 years) at a tertiary care hospital in Rawalpindi from August to November 2025. Using non-probability convenience sampling, 70 patients were enrolled (35 intervention, 35 control) after ethical approval and informed consent. Baseline data on demographics, anxiety, frequency of asthmatic attacks, and pulmonary functions (FEV_1 and PEF) were collected. The intervention group received therapeutic back massage for 20 minutes daily for one month along with routine treatment, while the control group received routine care only; family members were trained to continue massage at home with educational support and follow-up. Outcomes were assessed at 15 days, one month, and two months post-intervention. Data were analyzed using SPSS version 25 with descriptive statistics and inferential tests (independent t-test and Mann-Whitney U test), considering $p < 0.05$ as statistically significant.

RESULTS

Table 1 summarizes the demographic characteristics of participants in the control and intervention groups. Participants were similarly distributed across age groups, with most falling between 30–50 years in both groups. All participants were male, as per inclusion criteria. The majority in both groups had a height of 161–170 cm and weighed between 61–70 kg. Regarding smoking status, nearly half of the participants in both groups were non-smokers, followed by past smokers, while current smokers constituted the smallest proportion in each group.

Table 2 presents inferential comparisons of FEV_1% between the control and intervention groups across four assessments. No significant difference was observed at baseline or the first follow-up.

Tables No. 1: Demographic characteristics of the control group (n=35) & interventional group (n=35)

Demographic characteristics	Control F (%)	Interventional group F (%)
Age		
18-30 years	7 (20%)	7 (20%)
31-40 years	14 (40%)	12 (34.3%)
41-50 years	9 (25.7%)	10 (28.6%)
51-65 Years	5 (14.3%)	6 (17.1%)
Gender		
Male	35 (100%)	35 (100%)
Height in Cm		
150-160 Cm	4 (11.4%)	6 (17.1%)
161-170 Cm	23 (65.8%)	20 (57.1%)
More than 170 Cm	8 (22.8%)	9 (25.8%)
Weight in Kg		
61-70Kg	23 (60%)	16 (45.7%)
71-80Kg	11 (31.42%)	16 (45.7%)
>80Kg	3 (8.6%)	3 (8.6%)
Smoking Status		
Never Smoked	16 (45.7%)	17 (48.6%)
Current Smokers	4 (11.4%)	4 (11.4%)
Past smoking	15 (42.9%)	14 (40%)

Table No. 2: Inferential statistics Lung Functions (FEV1) Control versus intervention (n=70)

FEV1 (%) Assessments	Control Group	Intervention group	Mean Difference	t	Significance (2-tailed)
	Mean + SD	Mean + SD			P. value
Base Line	65.54± 4.828	66.17± 4.920	-.629	**-.539**	.591
1st Follow Up	66.71± 4.631	68.20± 4.910	-1.486	-1.302	.197
2nd Follow Up	67.66± 4.505	78.86± 4.723	-11.200	-10.153	.000
3rd Follow Up	68.63± 4.466	79.63± 4.366	-11.00	-10.419	.000

Independent t- test with p<.05 value as significant

Table No. 3: Inferential statistics Lung Functions (PEF) Control versus intervention (n=70)

Assessments	Control Group	Intervention group	Mean Difference	t	Significance (2-tailed)
	Mean + SD	Mean + SD			P. value
Base Line	191.43± 17.34	191.83± 13.603	-.400	**-.107**	.917
1st Follow Up	198.40±27.307	203.83±16.017	-5.429	-1.014	.314
2nd Follow Up	201.49±21.485	264.57±33.139	-63.086	-9.450	.000
3rd Follow Up	205.6± 20.770	279.23±36.703	-74.171	-10.404	.000

Independent t- test with p<.05 value as significant

Table No. 4: Inferential statistics Anxiety Control versus intervention (n=70)

Variable	Status	Control (Mean Rank ± SD)	Interventional (Mean Rank ± SD)	Z test	p-value
Anxiety	Pre Intervention	38.76 ± 3.633	32.24 + 3.705	-1.347	0.178
	1st follow-up	36.99± 1.781	34.01 + 4.878	-.619	0.536
	2nd follow-up	52.66 ± 3.813	18.34 ± 9 .286	-7.080	0.000
	3rd Follow-up	50.54 ± 10.769	20.46 ± 8.241	-6.203	0.000

Mann-Whitney U test with p<.05 value as significant

Table No. 5: Inferential statistics Asthma Control, Control versus intervention (n=70)

Variable	Status	Control (Mean Rank ± SD)	Interventional (Mean Rank ± SD)	Z test	p-value
Asthma Control	Pre Intervention	36.49 ± 1.110	34.51 + .657	-.430	0.668
	1st follow-up	30.67± 1.147	40.33 + 1.629	-2.074	0.038
	2nd follow-up	18.00 ± .822	53.00 ± .453	-7.473	0.000
	3rd Follow-up	18.00 ± 1.485	53.00 ± .631	-7.317	0.000

Mann-Whitney U test with p<.05 value as significant

However, from the second follow-up onward, the intervention group showed a highly significant improvement in FEV_1 compared with the control group ($p < 0.001$). Overall, the findings indicate a strong positive effect of the intervention on lung function, while changes in the control group remained minimal.

Table 3 presents inferential comparisons of PEF between the control and intervention groups across four assessments. No significant differences were observed at baseline or the first follow-up. However, the intervention group showed a highly significant improvement in PEF from the second follow-up onward compared to the control group ($p < 0.001$), and this improvement was sustained at the third follow-up. Overall, the findings indicate a strong positive effect of the intervention on lung function, while the control group showed minimal change.

Table 4 shows the Mann–Whitney U test results comparing anxiety levels between control and intervention groups (n=70) across four assessments. Anxiety levels were similar at pre-intervention (p=0.178) and first follow-up (p=0.536). Significant reductions in anxiety were observed in the intervention group at the second (p<0.001) and third follow-ups (p<0.001), indicating the intervention effectively decreased anxiety over time.

Table 5 presents Mann–Whitney U test comparisons of asthma control scores between the control and intervention groups across four assessments. Both groups had similar baseline scores (p=0.668). The intervention group showed significant improvement at the first follow-up (p=0.038) and highly significant improvements at the second and third follow-ups (p<0.001), while the control group showed no meaningful change. These results indicate the intervention produced a significant and sustained enhancement in asthma control.

DISCUSSION

Forced Expiratory Volume in one second (FEV1), a measure of lung function, showed a clinically significant improvement in the intervention group. The current study's results are in excellent agreement with an increasing amount of data demonstrating the efficacy of supplementary and nursing-led treatment approaches in enhancing lung function[20]. Similar to this, a previous study found that a structured thoracic massage intervention given over six consecutive days significantly improved pyrometric parameters, including FEV_1, and that these improvements persisted across several follow-up periods[21]. Previous studies with varied intervention durations and participant demographics also reported significant post-intervention improvements in FEV_1, with the intervention group demonstrating superior outcomes[22]. Additionally, a significant improvement in mean FEV_1 values from 1.91 ± 0.51 to 2.45 ± 0.34 after intervention ($p = 0.0001$) was found by[23], supporting the physiological advantages of organized therapy techniques.

After receiving a back massage, the participants in the intervention group showed a significant and clinically significant improvement in peak expiratory flow (PEF), according to the current study. The current study's results are in line with a previous study found that patients with COPD who got back massage nurse treatments had significantly higher PEF than those who received standard care in a randomized controlled trial. In particular, the intervention group's post-intervention PEF values were considerably higher than those of the control group[20]. Further evidence is provided by[24], who found that the experimental group's mean PEF values increased statistically significantly after manual therapy, from 296.3 ± 110.8 to 316.1 ± 119.1 ($p = 0.018$).

After receiving a back massage, individuals in the intervention group showed a marked and statistically

significant decrease in anxiety, according to the current study. The current study's findings are in line with a previous study, patients who received massage-based therapies had significantly lower anxiety scores than those who received standard care[25]. Similarly, patients who got massage therapy in addition to noninvasive positive pressure ventilation (NIPPV) showed a significant reduction in anxiety and a shorter period of ventilator dependence than those who had NIPPV alone[28]. These results imply that for individuals with respiratory impairment, massage therapy may improve both clinical outcomes and psychological comfort.

Asthma control scores significantly increased from 7.54 ± 0.66 at baseline to 21.69 ± 0.63 at the third follow-up, indicating significant improvements in overall asthma symptom management after the intervention. The noted gains are in line with other research demonstrating that organized interventions can greatly improve asthma outcomes, such as lowering exacerbations and enhancing control[27]. This is similar to the increases in control scores observed in the current trial, where fewer exacerbations were probably caused[20] by better symptom awareness, self-management, and physiological function.

CONCLUSION

According to the study's findings, back massage is a useful, non-pharmacological supplemental therapy for enhancing lung function and lessening the frequency and intensity of asthma attacks in asthmatic patients. The results suggest that organized back massage recipients significantly improved important lung measures, indicating improved airway function and respiratory efficiency. These physiological advantages imply that back massage may increase ventilation, encourage respiratory muscle relaxation, and enable better chest wall expansion. All things considered, this study offers compelling proof that back massage is a safe, affordable, and simple nursing intervention that may be included in standard asthma care.

Recommendations of Study: Based on the findings of this study, the following recommendations can be made: Larger sample sizes from a variety of healthcare settings should be used in future research to improve the findings' external validity and generalizability.

To assess the long-term and sustained effects of back massage on asthma control and lung function, longitudinal studies with prolonged intervention and follow-up periods are advised.

Future research should utilize rigorous randomized controlled trial designs with appropriate allocation concealment to strengthen causal inference and minimize bias.

Consistency and reproducibility across studies will be enhanced by creating and evaluating standardized, evidence-based massage protocols (duration, frequency, pressure, and methods).

The best supplementary strategy may be found by comparing back massage with other non-pharmacological treatments (such as breathing techniques, relaxation therapy, or aromatherapy).

Ethics, Approval, and consent to participate: The rules and regulations set by the research ethical committee (REC) of the University of Lahore were followed while conducting the research, and the rights of the research participants were respected. Written informed consent was taken from all the participants. All information and data collection were kept confidential. Participants were kept anonymous throughout the study.

After receiving approvals from the REC, permission was granted from the administration of the selected setting. The asthma patients were informed about the study during an introduction session. Participants gave their informed consent to participate in the study.

Availability of data and materials: Due to a data protection policy, the datasets created and/or analyzed during the current work are not publicly available, although they can be obtained from the corresponding author upon reasonable request.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Rab Nawaz, Azeem Kaleem
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Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.UOL/IREB/25/0015 Dated 22.08.2025

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Original Article

Effects of Artificial Intelligence (AI) Platforms on Medical Education Among Medical Students in Majmaah University

AI Platforms on Medical Education Among Medical Students

Abdulmalik B Albaker

ABSTRACT

Objective: To assess the effects of AI platforms on learning outcomes, study behavior, and academic performance among medical students at Majmaah University.

Study Design: Descriptive cross-sectional study

Place and Duration of Study: This study was conducted at the Majmaah University, Saudi Arabia from July 2025 to August 2025.

Methods: This descriptive cross-sectional study included 510 medical students selected through non-probability sampling. Data were collected using a structured electronic questionnaire that assessed demographic characteristics, AI usage patterns, perceived educational benefits and challenges, and academic performance indicators.

Results: Most students (78%) used AI tools regularly, with ChatGPT being the most common platform. Higher usage frequency was strongly associated with better theoretical understanding (mean score 4.7 ± 0.5), enhanced clinical reasoning (4.4 ± 0.6), improved exam preparation efficiency (4.7 ± 0.5), and increased study motivation (4.2 ± 0.7). Students who used AI daily demonstrated significantly higher GPAs (3.78 ± 0.41) and greater improvement in test scores (18.4 ± 6.2%) than low users.

Conclusion: AI platforms substantially enhance medical students' academic performance, conceptual understanding, and study efficiency; however, risks related to misinformation and dependency highlight the need for structured, ethical, and guided integration into medical education.

Key Words: artificial intelligence, medical education, AI platforms, academic performance, medical students

Citation of article: Albaker AB. Effects of Artificial Intelligence (AI) Platforms on Medical Education Among Medical Students in Majmaah University. Med Forum 2026;37(2):20-24. doi:10.60110/medforum.370204.

INTRODUCTION

The high rate of artificial intelligence (AI) platforms development has transformed various industries, and the field of medicine education has been one of the most severely impacted spheres[1]. With the further deployment of AI technologies in the healthcare sector, clinical decision-making, and biomedical research, medical schools all around the world are under the pressure to enhance their curriculum with the skills necessary to engage with, assess, and adequately use AI-based systems[2]. The current AI systems such as large language models, virtual simulation, adaptive learning systems, and clinical reasoning algorithms provide unprecedented chances to the field of individualized learning, automation of routine academic tasks and improvement of clinical thinking abilities[3]. They are now being utilized to automate the processes of studying, to give real-time feedback, to simulate patient interactions and to generate practice questions to convert the conventional medical-learning environment into one that is more dynamic and interactive[4]. Medical students worldwide have become increasingly reliant on AI-based systems to prepare for exams, explain complex phenomena in the biomedical sciences, and develop clinical skills[5]. With the assistance of AI tools, learners can access real-time clarifications, differential diagnoses, and evidence-based recommendations, thereby enhancing their theoretical knowledge base and problem-solving skills. The transition is consistent with competency-based models of medical education, which focus on self-directed learning and assessment of learning. Simultaneously, the institutions consider AI literacy to be a mandatory requirement for future physicians due to the rapid penetration of AI technologies into the field of radiology, pathology, surgery, and internal medicine[6].

Nevertheless, it remains important to be concerned about the overuse of AI tools, the risk of misinformation, diminished critical thinking, and ethical considerations regarding data privacy and academic integrity. On the one hand, AI platforms can

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Received: September, 2025
Reviewed: October-November, 2025
Accepted: December, 2025

help to improve the efficiency of the educational process; however, they also can be abused to provide shallow knowledge or can inhibit the abilities of individual thinking. Moreover, disparities in access and in digital literacy can result in unequal learning opportunities among students[7,8]. Here, it is necessary to consider the role AI platform plays with medical students, whether it improves academic performance, and what part of the learning process it affects the most, such, but not limited to, theoretical knowledge, clinical judgment, acquisition of skills, or exam preparation. Although there is a global interest in this, the amounts of data on Middle Eastern medical institutions on the educational impact of AI platforms among undergraduate medical students are still scarce.

METHODS

This was a descriptive, cross-sectional study conducted at Majmaah University from July 2025 to August 2025, including 510 medical students enrolled in various academic years.

Inclusion Criteria

- Medical students currently enrolled in MBBS program (all years).
- Students who have used any AI platform at least once for academic purposes.

Exclusion Criteria

- Students who have never used AI tools for learning.
- Incomplete or improperly filled questionnaires.

Data Collection

A structured, self-administered questionnaire that was distributed electronically was used to collect the data among all the eligible students. The questionnaire featured a section on demographic data, the patterns of AI tools use, the frequency and the purpose of the use, the perceived influence on the theoretical learning, the clinical reasoning, the preparation of exams, and the acquisition of the skills. Other items assessed satisfaction, perceived utility, moral concerns, risks of dependency, and issues related to AI use.

Statistical Analysis

Data were analyzed using SPSS version 26.0. Quantitative variables like the number of hours dedicated to AI tools and the perceived academic improvement scores were presented in the form of the mean +- standard deviation. They also gave categorical variables of frequency of AI use, type of AI platform and perceived benefits in terms of frequencies and percentages. The statistically significant value was taken as < 0.05.

RESULTS

The group of medical students used in the study was 510 in number, and a small majority were females (272) than the males (238). Mean age was 21.8±2.1 years with a slight difference in age of males 22.1±2.2 years and females 21.5± 2.0 years ($p = 0.04$). The distribution of students was even in all the five years of study. The Equated GPA was 3.62 ±0.48 and the difference in GPA was not significant between males and females. The students in medical school were reported to have done prior AI exposure before joining the school (28.2%). Table 1.

AI usage varied widely among students, with 186 low users, 168 moderate users, and 156 daily high users. ChatGPT was the most commonly used tool (398 students). Weekly AI usage time increased substantially across groups, from 2.4 ± 1.1 hours in low users to 5.3 ± 1.6 hours in moderate users and 9.6 ± 2.4 hours among daily users ($p < 0.001$). Table 2.

Theoretical understanding improved from an average score of 3.5 ± 0.8 in low users to 4.0 ± 0.6 in moderate users and 4.7 ± 0.5 in high users ($p < 0.001$). Clinical reasoning scores increased similarly—from 3.2 ± 0.9 to 3.7 ± 0.7 to 4.4 ± 0.6 ($p < 0.001$). Exam preparation efficiency was rated highly overall, rising from 3.9 ± 0.7 in low users to 4.7 ± 0.5 in high users. Motivation scores improved from 3.2 ± 1.0 to 4.2 ± 0.7, while perceived reduction in study burden improved significantly from 3.4 ± 0.9 to 4.6 ± 0.6 ($p < 0.001$). Table 3.

Despite strong benefits, students expressed notable concerns. Misinformation risk was the most commonly agreed concern (63.1%), with a severity score of 3.6 ± 0.9, significantly higher among frequent users ($p = 0.04$). Concerns about reduced critical thinking (56.4%, severity 3.4 ± 1.0) and AI overdependence (59.6%, severity 3.7 ± 0.8) were also prominent, especially among heavy users (both $p \leq 0.01$). Table 4.

GPA increased progressively from 3.49 ± 0.42 in low users to 3.62 ± 0.45 in moderate users and 3.78 ± 0.41 in high users ($p < 0.001$). Improvement in test scores followed the same trend, increasing from 8.2 ± 4.1% to 12.6 ± 5.9% to 18.4 ± 6.2% across groups ($p < 0.001$). Academic confidence improved from 3.4 ± 0.7 to 4.3 ± 0.5, and study hours saved increased from 1.1 ± 0.6 to 3.8 ± 1.4. Table 5.

Table No. 1: Demographic Characteristics of Medical Students (n = 510)

Variable	Male (n = 238)	Female (n = 272)	p-value
Mean age (years), mean ± SD	22.1 ± 2.2	21.5 ± 2.0	0.04
Academic year (1st–5th), n (%)	48 / 50 / 44 / 52 / 44	54 / 46 / 54 / 60 / 58	0.32
GPA (0–5 scale), mean ± SD	3.58 ± 0.51	3.65 ± 0.45	0.18
Prior AI exposure before medical school, n (%)	76 (31.9%)	68 (25.0%)	0.09
Daily study hours, mean ± SD	3.1 ± 1.5	3.6 ± 1.7	0.02

Table No. 2: Patterns of AI Platform Usage Among Medical Students

Usage Variable	Low Users (<3 times/week) (n = 186)	Moderate Users (3–6 times/week) (n = 168)	High Users (Daily) (n = 156)	p-value
Primary AI tools used (ChatGPT/Bard/Bing AI), n (%)	140 / 18 / 28	130 / 16 / 22	128 / 18 / 10	0.21
Average weekly usage hours, mean ± SD	2.4 ± 1.1	5.3 ± 1.6	9.6 ± 2.4	<0.001
Main purpose (theory/clinical/exam prep), n (%)	80 / 61 / 45	68 / 60 / 40	62 / 43 / 51	0.03
Device used (Laptop/Mobile), n (%)	126 / 60	98 / 70	88 / 68	0.09

Table No. 3: Perceived Educational Impact of AI Platforms

Impact Domain	Low Users Mean ± SD	Moderate Users Mean ± SD	High Users Mean ± SD	p-value
Improved understanding of theory	3.5 ± 0.8	4.0 ± 0.6	4.7 ± 0.5	<0.001
Enhanced clinical reasoning	3.2 ± 0.9	3.7 ± 0.7	4.4 ± 0.6	<0.001
Better exam preparation efficiency	3.9 ± 0.7	4.2 ± 0.6	4.7 ± 0.5	<0.001
Increased study motivation	3.2 ± 1.0	3.6 ± 0.8	4.2 ± 0.7	<0.001
Reduced study time burden	3.4 ± 0.9	4.0 ± 0.8	4.6 ± 0.6	<0.001

Scores measured on a 1–5 Likert scale.

Table No. 4: Challenges and Concerns Related to AI Usage

Concern	Total (n = 510)	Agreement (%)	Mean Severity Score ± SD
Risk of misinformation	322 (63.1%)	3.6 ± 0.9	0.04
Reduced critical thinking	288 (56.4%)	3.4 ± 1.0	0.01
Overdependence on AI	304 (59.6%)	3.7 ± 0.8	<0.001
Ethical concerns (privacy/accuracy)	260 (51.0%)	3.2 ± 0.9	0.18
Fear of academic dishonesty	198 (38.8%)	3.0 ± 1.0	0.09

Severity measured on a 1–5 scale.

Table No. 5: Relationship Between AI Usage and Academic Performance

Variable	Low Users (n = 186)	Moderate Users (n = 168)	High Users (n = 156)	p-value
GPA (mean ± SD)	3.49 ± 0.42	3.62 ± 0.45	3.78 ± 0.41	<0.001
Improvement in test scores (%)	8.2 ± 4.1	12.6 ± 5.9	18.4 ± 6.2	<0.001
Self-reported academic confidence	3.4 ± 0.7	3.8 ± 0.6	4.3 ± 0.5	<0.001
Number of study hours saved weekly	1.1 ± 0.6	2.3 ± 1.0	3.8 ± 1.4	<0.001
Likelihood of recommending AI tools (%)	68%	84%	97%	<0.001

DISCUSSION

The research paper demonstrates that AI platforms have turned into part of the medical education of students of the Majmaah University, and there are distinct trends that the greater the use of AI is, the better the academic achievements, the best learning process, and the more motivation students have. The demographic information shows that the adoption of AI is universal in all the years of study and that students who used AI more frequently (Particularly those who used it daily) described their knowledge of theoretical information, clinical reasoning, and preparation to the exams as significantly higher. These results are consistent with the findings of the previous studies, in which AI-enhanced learning conditions led to a consistent increase in knowledge retention and cognitive load, especially in the case of self-directed learners[9]. The findings associated with patterns of usage highlight that those students that have more interactions with AI platforms dedicate significantly more time to working with AI per week, which indicates that they rely on AI as a source of study support. The same tendencies were observed in past studies, in which greater exposure to the use of AI learning tools was associated with enhanced engagement and support of academic performance as perceived[10]. Further, a large language model was the most frequented AI tool, which has been reported in the existing literature, these both types are prevalent in medical education because of their

accessibility, flexibility, and simplification capabilities. This relationship, based on dose, resembles earlier studies showing that repeated, meaningful communication with AI systems increases the depth of learning, problem-solving ability, and active recollection[11]. Interestingly, there was also an improvement in motivation scores caused by the increased use of AI which was also reflected in the past studies that credited the enhancement of motivation to the capabilities of AI tools that provided personal feedback and immediate clarification. High-frequency users were more concerned with this, which indicates that despite the academic benefits of AI, it brings about the risks of overreliance and passive learning. The same has been expressed in prior studies where students who have overused AI have been found to lack confidence in their independent decision-making capacity and becoming vulnerable to AI-generated mistakes. There were also ethical concerns, such as privacy and academic dishonesty, which aligns with earlier studies that indicated that AI use should be responsible and should not disrupt the academic environment[12].

A connection between the use of AI and academic performance was notable especially. Students who utilized AI on a regular basis had better GPAs, better gains in test scores, more academic confidence and time efficiency than their low users[13]. Moreover, the abundance of the chances that AI tools are suggested to the most frequent users highlights the perceived usefulness of the platforms in facilitating academic achievement. On the whole, such results prove the existence of a strong positive association between the use of AI and educational achievements, as well as confirm the necessity to discuss the issues of misinformation, the presence of ethical standards, and the ability to retain critical thinking abilities.

CONCLUSION

It is concluded that AI platforms positively influence medical education among students at Majmaah University significantly, and the greater the AI use, the better the theoretical knowledge, clinical reasoning, efficiency in exam preparation, and academic confidence. Those students who made more frequent use of AI tools had higher academic performance and better time-saving advantages, which proves the usefulness of AI in supporting students with learning activities. Nevertheless, the issues with misinformation, lower level of critical thinking, and possible overdependence accentuate the importance of the structured guidelines and responsible strategies of usage.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Abdulmalik B Albaker
Drafting or Revising Critically:	Abdulmalik B Albaker
Final Approval of version:	The above author
Agreement to accountable for all aspects of work:	The above author

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: ECM No.2025-7865/MU/ERC Dated 09.06.2025

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Original Article

Tumor Necrosis Factor-alpha (TNF-α) Expression and Role of Cytokines in Type 2 Diabetes Mellitus

Adnan Jehangir[1], Farhana Ayub[2] and Ayesha Almas[3]

ABSTRACT

Objective: The basic aim of this study is to find the TNF-α expression and role of different cytokines in type 2 diabetes mellitus patients.

Study Design: Cross-sectional study

Place and Duration of Study: This study was conducted at the CMH Rawalakot from June 2025 to August 2025.

Methods: Patients diagnosed with diabetes and having age >18 years were included in the study. Patients with Type 1 diabetes mellitus and individuals with malignancies or autoimmune diseases were excluded. Plasma levels of pro-inflammatory cytokines, including TNF-α, IL-6, and IL-1β, were measured using enzyme-linked immunosorbent assay (ELISA) kits.

Results: Data were collected from 550 participants in this study. Mean age of participants was 58.6 ± 10.2 year and mean BMI was 29.4 ± 5.6 kg/m^2. Mean duration of DM in participants was 8.5 ± 5.3 years. Patients in the uncontrolled diabetes group had higher fasting plasma glucose levels (168.9 ± 38.2 mg/dL vs. 142.6 ± 28.9 mg/dL, $p < 0.001$) and higher BMI (31.5 ± 6.2 kg/m² vs. 28.1 ± 4.9 kg/m², $p < 0.001$). TNF-α gene expression was moderately correlated with HbA1c levels ($r = 0.42$, $p < 0.001$), indicating that higher TNF-α expression is associated with poorer glycemic control. There was also a positive correlation with BMI ($r = 0.35$, $p < 0.001$), suggesting a link between increased TNF-α expression and higher body mass index.

Conclusion: Elevated TNF-α gene expression and pro-inflammatory cytokine levels are prominent features of Type 2 Diabetes Mellitus (T2DM), correlating with glycemic control and metabolic dysfunction.

Key Words: TNF-α, T2DM, Glycemic control, Pro-inflammatory, BMI, Correlation

Citation of article: Jehangir A, Ayub F, Almas A. Tumor Necrosis Factor-alpha (TNF-α) Expression and Role of Cytokines in Type 2 Diabetes Mellitus. Med Forum 2026;37(2):25-29. doi:10.60110/medforum.370205.

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a complex metabolic disorder characterized by insulin resistance, impaired insulin secretion, and chronic inflammation. One of the critical molecular players implicated in the pathogenesis of T2DM is Tumor Necrosis Factor-alpha (TNF-α), a pro-inflammatory cytokine[1]. The following are the factors that have been associated with T2DM development; Genetic and environmental factors are the main causes of T2DM and the condition is also associated with obesity and being overweight[2].

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Received: September, 2025
Reviewed: October, 2025
Accepted: November, 2025

Obesity prompts adipose tissue hypertrophy and shifts in stromovascular cell population to solve pro-inflammatory state to foster the interactions between adaptive cells and adipose tissue macrophage to shift their activation status[3]. It is also proposed that the inflammatory and immune-mediated T2DM due to cytokines like IL-6, TNF-a, IL-1, IL-10, and TGF-ß are another factor causing DM. Also, genetic variation in specific genes of pro-inflammatory and anti-inflammatory cytokines such as TNF-α and IL-10 is being reported as one of the most common risk factor for diabetic population[4].

Interleukin 1β (IL-1β), Interleukin 6 (IL-6), and Tumor Necrosis Factor alpha (TNF-α), are frequently associated with the development of Type-2 DM[5]. In particular, it has been described that the rise in IL-1β is capable of enhancing the killing of pancreatic β-cells (Banerjee and Saxena 2012 Additionally, TNF-α and IL-6 can induce insulin resistance in peripheral tissues by altering the expression of insulin signaling pathway components. IL-10 has been described as having potent and pleiotropic anti-inflammatory effects, including the down regulation of proinflammatory cytokines and APCs, stimulation of tissue repair mechanisms, and regulation of excessive inflammation[6]. IL-10 is known to have multiple effects in the immune system, and

thus, is an important modulator of the balance that is required to allow the body to protect itself from infection[7]. This prevents the expression of several inflammatory cytokines while having a positive effect on the proliferation of B-lymphocytes and the prevention of cell growth and apoptosis[8]. Within this context, IL-10 provides broad and manifold anti-inflammatory actions, including the suppression of pro-inflammatory cytokines and antigen presenting cells, the support of tissue repair mechanisms and it is crucial in the regulation of inflammation. However, the mechanism of IL-10 in preventing β-cell damage and in the development of T1DM remains a point of debate[9]. In the context of T2DM, pro-inflammatory cytokines such as interleukin-6 (IL-6), interleukin-1β (IL-1β), and TNF-α are upregulated, leading to a chronic low-grade inflammatory state. This inflammation is primarily driven by adipose tissue macrophages, which increase in number and secrete higher levels of cytokines in obese individuals, a common condition associated with T2DM[10].

METHODS

This study was a cross-sectional study conducted at CMH Rawalakot from June to August 2025, included total 550 participants suffering from T2DM. Patients diagnosed with diabetes and having age >18 years were included in the study. patients with Type 1 diabetes mellitus, pregnant or lactating women, and individuals with malignancies or autoimmune diseases. These criteria ensured a homogeneous study population representative of the typical T2DM patient profile. Blood samples were collected and approximately 10 mL of venous blood was drawn into EDTA tubes. These samples were used for both plasma and peripheral blood mononuclear cells (PBMC) isolation.

RNA Extraction and TNF-α Gene Expression Analysis: PBMCs collected from the subjects were then subjected to the Total RNA extraction using TRIzol reagent as per the described protocols to obtain the highest yield and quality of RNA. The extracted RNA was used to synthesize cDNA through the reverse transcription process using a commercial reverse transcription kit, thereby preparing the sample for an analysis of its quantities. They wanted to ascertain the expression levels of the TNF-α gene thus quantitative Real-Time PCR (qRT-PCR) was used on tissues samples and mouse ears, utilizing specific primers for TNF-α gene while GAPDH was used as the reference gene.

Cytokine Measurement: Enzyme-linked immunosorbent assay (ELISA) kits were used to measure plasma concentrations of pro-inflammatory cytokines such as TNF-α, IL-6 and IL-1β. ELISA provided sensitive and specific quantification of these cytokines, here, the test was done as directed by the manufacturer to enable quantifications that could be easily tabulated.

Clinical and Biochemical Assessments: Participants underwent a comprehensive clinical evaluation, which included measuring body mass index (BMI) and blood pressure. Fasting plasma glucose (FPG) and HbA1c levels were assessed to evaluate glycemic control. Lipid profiles, including total cholesterol, LDL-C, HDL-C, and triglycerides, were measured to assess cardiovascular risk factors. These clinical and biochemical assessments provided a detailed characterization of the study population, allowing for a thorough analysis of the relationships between metabolic parameters and inflammatory markers.

Statistical Analysis: Data analysis was performed using SPSS v29 software. Comparative analyses of TNF-α expression and cytokine levels between different subgroups versus uncontrolled diabetes, were conducted using t-tests.

RESULTS

Data were collected from 550 participants in this study. Mean age of participants was 58.6 ± 10.2 year and mean BMI was 29.4 ± 5.6 kg/m^2. Mean duration of DM in participants was 8.5 ± 5.3 years. Patients in the uncontrolled diabetes group had higher fasting plasma glucose levels (168.9 ± 38.2 mg/dL vs. 142.6 ± 28.9 mg/dL, $p < 0.001$) and higher BMI (31.5 ± 6.2 kg/m² vs. 28.1 ± 4.9 kg/m², $p < 0.001$). Additionally, the uncontrolled group exhibited elevated total cholesterol (200.5 ± 35.7 mg/dL vs. 185.2 ± 26.3 mg/dL, $p = 0.012$), LDL cholesterol (125.8 ± 30.6 mg/dL vs. 110.6 ± 20.5 mg/dL, $p = 0.008$), and triglycerides (198.3 ± 55.6 mg/dL vs. 165.4 ± 48.9 mg/dL, $p < 0.001$), along with lower HDL cholesterol levels (40.4 ± 6.5 mg/dL vs. 45.7 ± 7.2 mg/dL, $p < 0.001$).

Table No.1: Comparison of clinical parameters between controlled and uncontrolled DM

Clinical Parameter	Controlled Diabetes (HbA1c < 7%)	Uncontrolled Diabetes (HbA1c ≥ 7%)	p-value
Fasting Plasma Glucose (mg/dL)	142.6 ± 28.9	168.9 ± 38.2	<0.001
BMI (kg/m²)	28.1 ± 4.9	31.5 ± 6.2	<0.001
Total Cholesterol (mg/dL)	185.2 ± 26.3	200.5 ± 35.7	0.012
LDL Cholesterol (mg/dL)	110.6 ± 20.5	125.8 ± 30.6	0.008
HDL Cholesterol (mg/dL)	45.7 ± 7.2	40.4 ± 6.5	<0.001
Triglycerides (mg/dL)	165.4 ± 48.9	198.3 ± 55.6	<0.001

In T2DM patients, the relative expression of the TNF-α gene was markedly higher (2.5 ± 1.3) compared to the control group (1.0 ± 0.5). Plasma TNF-α levels were also significantly elevated in T2DM patients (15.4 ± 5.2 pg/mL) versus controls (7.8 ± 2.1 pg/mL). Additionally, pro-inflammatory cytokines IL-6 and IL-1β were substantially higher in the T2DM cohort, with IL-6 levels at 12.6 ± 4.8 pg/mL compared to 4.2 ± 1.5 pg/mL in controls, and IL-1β levels at 8.3 ± 3.2 pg/mL versus 2.9 ± 1.1 pg/mL in the control group.

Table No.2: TNF- α expression and cytokine levels

Parameter	T2DM Patients (n=550)	Control Group (n=100)
TNF-α Gene Expression (Relative to Control)	2.5 ± 1.3	1.0 ± 0.5
TNF-α (pg/mL)	15.4 ± 5.2	7.8 ± 2.1
IL-6 (pg/mL)	12.6 ± 4.8	4.2 ± 1.5
IL-1β (pg/mL)	8.3 ± 3.2	2.9 ± 1.1

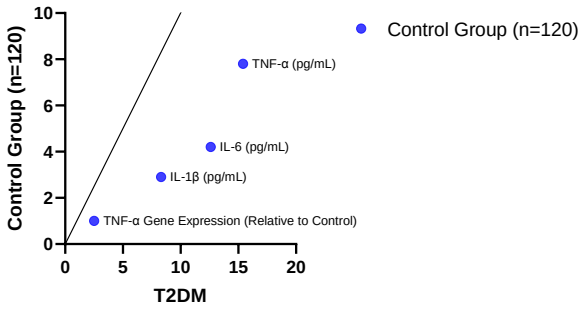

Figure No.1: Control Groups

TNF-α gene expression was moderately correlated with HbA1c levels ($r = 0.42$, $p < 0.001$), indicating that higher TNF-α expression is associated with poorer glycemic control. There was also a positive correlation with BMI ($r = 0.35$, $p < 0.001$), suggesting a link between increased TNF-α expression and higher body mass index. Additionally, TNF-α expression correlated with fasting plasma glucose levels ($r = 0.39$, $p < 0.001$).

Table No.3: Correlation between TNF- α and clinical parameters in DM

Clinical Parameter	Correlation (r)	p-value
HbA1c (%)	0.42	<0.001
BMI (kg/m²)	0.35	<0.001
Fasting Plasma Glucose (mg/dL)	0.39	<0.001

TNF-α gene expression was strongly correlated with IL-6 levels ($r = 0.58$, $p < 0.001$), indicating a robust association between these two inflammatory markers. Additionally, there was a moderate positive correlation with IL-1β levels ($r = 0.47$, $p < 0.001$).

Table No. 4: Correlation between TNF- α and cytokine levels

Cytokine	Correlation with TNF-α Expression (r)	p-value
IL-6 (pg/mL)	0.58	<0.001
IL-1β (pg/mL)	0.47	<0.001

Table No. 5: Comparative analysis of controlled vs uncontrolled DM

Parameter	Controlled Diabetes (HbA1c < 7%)	Uncontrolled Diabetes (HbA1c ≥ 7%)
TNF-α Gene Expression (Relative to Control)	1.7 ± 0.8	3.1 ± 1.4
TNF-α (pg/mL)	12.3 ± 3.6	17.2 ± 5.8

DISCUSSION

The result of this research confirms increased TNF-α gene expression and increased pro-inflammatory cytokines concentrations in T2DM patients such as TNF-alpha, IL-6, and IL-beta. These findings agree with studies performed earlier where inflammation was identified as playing a critical step in the development of T2DM[11]. The COI observation and HI and LO investigation revealed that the TNF-α gene participates in the development of chronic low-grade inflammation in T2DM by increasing its expression and causing insulin resistance and metabolic disorder[12]. The Concierge Strategy of TNF-α was related to the severity and progression of T2DM by revealing the positive relationships of TNF-α expression with such clinical determinants. TNF-α was directly associated with HbA1c, more heightened inflammation exacerbating glycemic control[13]. Moreover, TNF-α levels also showed a significant positive correlation with BMI and fasting plasma glucose supporting inflammation relation with metabolic deficits in T2DM. Baseline comparison of both control and uncontrolled diabetes stated higher level of TNF- α gene expression and plasma concentration in uncontrolled diabetes[14]. This brings to light that spontaneous secretion of TNF-α might play a role in the compromised glycemic management of T2DM patients. Further, the compliance between TNF-α expression and the HbA1c score highlighted TNF-α's application for informing disease progression and therapeutic outcomes in T2DM[15]. This clearly points towards the fact that there appears to be a link between TNF-α and insulin resistance, which means that targeting the cytokine and other inflammatory cytokines has the potential to provide beneficial results in the treatment of T2DM patients[16]. Inflammation is a modifiable factor, and strategies that seek to modulate inflammation including anti-TNF-α therapies or diet and exercise interventions to reverse adipose tissue inflammation could be

valuable approaches to enhance glycaemia and diminish the threat of diabetes complications[17,18]. However, several limitations of this study are, despite the fact that this study has highlighted the role of TNF-α and cytokines in T2DM, there is still a possibility that the findings of this study could be biased. Also, the present study only investigated the role of one cytokine pathway, therefore, more experimental studies should be done in the context of understanding the cross talk between TNF-α and other inflammatory markers in T2DM aetiopathogenesis.

CONCLUSION

It is concluded that elevated TNF-α gene expression and pro-inflammatory cytokine levels are prominent features of Type 2 Diabetes Mellitus (T2DM), correlating with glycemic control and metabolic dysfunction. These findings highlight the critical role of inflammation in T2DM pathogenesis and highlight TNF-α as a potential biomarker for disease severity and therapeutic target. Targeting inflammatory pathways, including TNF-α, may offer promising avenues for improving treatment outcomes and reducing the burden of T2DM-related complications.

Author's Contribution:

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Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.CMH/IRB/2024/198 Dated 11.01.2025

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Original Article

Topical 5% Tranexamic Acid in Melasma

Effectiveness of Topical 5% Tranexamic Acid in the Treatment of Melasma

Farhad Ali, Yamna Hassan, Humaira Wazir and Kashmala

ABSTRACT

Objective: To evaluate the efficacy and safety of topical 5% tranexamic acid in the treatment of moderate to severe melasma.

Study Design: Prospective interventional study

Place and Duration of Study: This study was conducted at the Department of Dermatology, Lady Reading Hospital, Peshawar, between November 6, 2021, and May 6, 2022.

Methods: After giving informed consent, 99 patients aged between 18 - 50 years of both genders with a clinically diagnosed moderate to severe melasma were enrolled. Topical 5% tranexamic acid cream, which was put daily in two applications during one week, was used to treat patients over 12 weeks, as well as to use broad-spectrum sunscreen (SPF 50+). The effectiveness of the treatment was measured by the Melasma Area and Severity Index (MASI) score at baseline and week 12. Physician Global Assessment (PGA) and patient satisfaction were taken as secondary outcomes. Safety was assessed by conducting clinical check-ups and reporting of adverse events.

Results: The mean age of participants was 32.25 ± 9.65 years, with a female predominance (57.6%). Overall clinical effectiveness was observed in 63 patients (63.6%) following 12 weeks of treatment. No statistically significant association was found between treatment response and age (p=0.61), gender (p=0.90), or disease duration (p=0.27). Topical tranexamic acid was well tolerated, and no major adverse effects were reported during the study period.

Conclusion: Topical 5% tranexamic acid is an effective and safe treatment option for moderate to severe melasma. Its favorable efficacy, good tolerability, and lack of significant influence by demographic or disease-related factors make it a useful therapeutic alternative in routine clinical practice.

Key Words: Melasma, Tranexamic acid, Topical therapy, MASI score, Hyperpigmentation

Citation of article: Ali F, Hassan Y, Wazir H, Kashmala. Effectiveness of Topical 5% Tranexamic Acid in the Treatment of Melasma. Med Forum 2026;37(2):30-34. doi:10.60110/medforum.370206.

INTRODUCTION

Melasma is an acquired, non-progressive, skin condition that is hyperpigmentary, symmetrical, irregular brown to gray-brown macules and patches of the sun-exposed skin, mostly the face. It predominates in Fitzpatrick skin phototypes III-V, and its prevalence is heavily higher in women, with a high burden in terms of psychology, usually reducing the quality of life as it is chronic, relapsing, and treatment-resistant[1,2]. The pathogenesis is complex, and it comprises genetic predisposition, ultraviolet (UV) radiation, visible light, hormonal factors, and vascular elements, all of which trigger melanogenesis and heighten activity in melanocytes[3]. The traditional first-line treatments are directed at the melanin production and transfer and encompass topical agents like hydroquinone, retinoids, corticosteroids and their combination[4]. They are, however, often constrained by concerns on skin irritation, ochronosis (especially with long-term hydroquinone) and a high incidence of recurrence when stopped. This has resulted in a need to have safer, well-tolerated, and effective therapeutic alternatives[5].

A synthetic derivative of lysine amino acid, tranexamic acid (TXA) has become a promising agent. Its original therapeutic use as an antifibrinolytic systemically has been shown to have applications in melasma due to its inhibition of plasminogen activation, consequently lowering the relationship between keratinocytes and melanocytes, by reducing arachidonic acid and alpha-melanocyte-stimulating hormone (alpha-MSH) levels[6]. It is also hypothesized to counter UV-induced melanogenesis by disrupting platelet-activating factor receptor pathway and inhibit angiogenesis to cover the vascular aspect that is becoming more important in melasma.

Although oral tranexamic acid has shown high effectiveness, its application is moderated by the fact

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Received: May, 2025
Reviewed: June-July, 2025
Accepted: August, 2025

that it carries strong side effects on the body with the most infamous being the possibility of promoting thromboembolic occurrences, thus it requires selective use of patients and restricting its unlimited use[7,8]. This has raised significant curiosity about topical preparations as a method of administering the medicine specifically to the target skin and reducing the systemic absorption and other risks. Topical TXA, especially at 5% has been studied, with initial research indicating that it has the capacity to reduce the weight of melasma by inhibiting a range of pathways in its pathogenesis, with a less adverse profile than its oral counterpart[9,10].

The main Aim of the proposed study is to compare the clinical efficacy and safety of topical 5 percent tranexamic acid in the management of moderate to severe facial melasma. This involves measuring the level of pigment lightening, increase in melasma area and severity index (MASI) scores, patient satisfaction, and observation of local or systemic adverse effects of any kind within a stipulated treatment period. Our hypothesis is that topical 5% TXA will be an effective and well-tolerated therapeutic modality, and it will be a valuable addition to the existing armamentarium in dealing with this difficult dermatological condition.

METHODS

This prospective interventional study was carried out at the Department of Dermatology, Lady Reading Hospital, Peshawar, between November 6, 2021, and May 6, 2022. The study was approved by the Institutional Review Board of the hospital, and the informed consent of all participants was obtained in writing before study enrollment.

A total of 99 patients aged 18-50 years, both sexes, with clinically diagnosed moderate to severe melasma (of symmetrical or asymmetrical distribution) were included. The exclusion criteria were pregnancy, lactation, taking oral contraceptive pills, known hypersensitivity to tranexamic acid, and a history of major systemic diseases (e.g., myocardial infarction, chronic kidney disease) that may conflict with taking the study medication or result in follow-up.

The participants were all given a topical 5% tranexamic acid cream and told to apply it to the entire affected part of their face in a thin layer 2 times per day (morning and evening). The patients were expected to apply a broad-spectrum sunscreen (SPF 50 or higher) to their face every morning and were told not to use any other topical depigmenting product, or a procedure to treat melasma over the course of the study.

The first efficacy outcome was the change in the severity of melasma which was measured by the Melasma Area and Severity Index (MASI) score. A single dermatologist was asked to determine the MASI score at baseline (week 0) and at the last visit (week 12) to limit the effect of inter-observer variability. Secondary outcomes were Physician Global Assessment (PGA) of improvement (graded out of 5 points) and patient satisfaction, which was measured by the use of a structured questionnaire (5-point Likert scale) at the treatment end. The safety was assessed by direct clinical examination and patient adverse events (e.g, erythema, irritation, burning, peeling) at every visit.

Statistical software SPSS version 25.0 (IBM Corp., Armonk, NY, USA) was used to analyze the statistics. The Shapiro-Wilk test was used to determine the normality of data. The continuous variables were reported in the form of mean ± standard deviation, and the categorical variables were reported in terms of frequencies and percentages. Paired-sample t-test (in case of normally distributed data) or Wilcoxon signed-rank test (in case of non-parametric data) was conducted on the difference between the MASI score at the baseline and week 12. The value of $p < 0.05$ was taken as significant. The sample size was calculated to be 99 to give power of 80% to identify a clinically meaningful change in MASI score (effect size 0.5) at a two sided alpha level of 0.05, using past studies of topical tranexamic acid in melasma.

RESULTS

The research sample involved 99 patients with moderate to severe melasma. The average age of the study subjects was 32.25 years with a standard deviation of 9.65, and the average length of illness was 3.67 months with a standard deviation of 1.70 months. Most of the patients (54.5, n=54) fell within the age group of 16 and 30 years. The female dominance was predominant as 57 female (57.6) and 42 male (42.4) participants were included (Table 1).

Table No. 1: Baseline Demographic and Clinical Characteristics (n=99)

Characteristic	**Mean ± SD / Frequency (%)**
Age (Years)	32.25 ± 9.65
Duration of disease (months)	3.67 ± 1.70
Age Distribution	
16 - 30 years	54 (54.5%)
31 - 40 years	23 (23.2%)
41 - 50 years	22 (22.2%)
Gender	
Male	42 (42.4%)
Female	57 (57.6%)

Topical treatment with 5% tranexamic acid was proved to be clinically effective on 63 patients which resulted in an overall effectiveness rate of 63.6% (Figure-1).

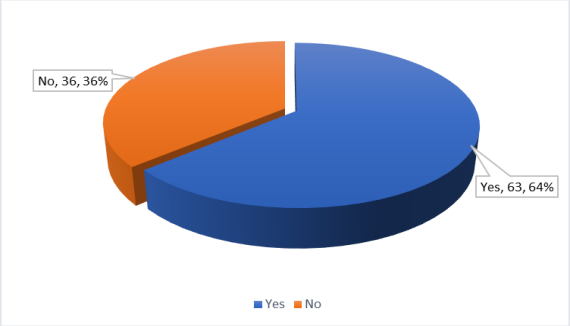

Figure No. 1: Overall effectiveness of topical 5% Tranexamic Acid

Subgroup analysis was conducted on the effect of age, gender and disease duration on the response to treatment. The rate of effectiveness in the various age groups was 50.8% (16-30 years), 25.4% (31-40 years), and 23.8% (41-50 years). Statistical results indicated that there was no significant correlation between the effectiveness of the treatment and age (p=0.60). Table-2.

Equally, there was no marked gender disparity in response (p=0.90), and the effectiveness rates of 42.9% in males and 57.1% in females were found. Table-3.

The time taken with disease was also not a predictive factor (p=0.61) because efficacy was similar in patients with disease duration of 1-3 months (41.3%) and those with disease duration of more than 3 months (58.7%). Table 4.

Table No. 2: Effectiveness stratified by age group

Age Group	Effective, n/N (%)	Not Effective, n/N (%)	p-value
16 - 30 years	32/54 (59.3)	22/54 (40.7)	0.610
31 - 40 years	16/23 (69.6)	7/23 (30.4)	
41 - 50 years	15/22 (68.2)	7/22 (31.8)	
χ^2 test for independence.			

Table 3: Effectiveness stratified by gender

Gender	Effective, n/N (%)	Not Effective, n/N (%)	p-value
Male	27/42 (64.3)	15/42 (35.7)	0.906
Female	36/57 (63.2)	21/57 (36.8)	
χ^2 test with Yates' correction.			

Table No. 4: Effectiveness stratified by disease duration

Duration	Effective, n/N (%)	Not Effective, n/N (%)	p-value
1 - 3 months	26/45 (57.8)	19/45 (42.2)	0.269
> 3 months	37/54 (68.5)	17/54 (31.5)	
χ^2 test.			

DISCUSSION

Melasma is a recurring and persistent pigmentary disease, which can be a therapeutic challenge due to its multifactorial etiology and a high recurrence rate. Tranexamic acid (TXA), the antifibrinolytic agent has received growing interest in recent years because of its abilities to inhibit the ultraviolet induced plasmin activity in the keratinocytes leading to an inhibition in melanocyte activation and synthesis of melanin. The current study tested the effectiveness of topical 5% tranexamic acid in individuals with moderate and severe melasma and showed a positive clinical response in almost two-thirds of the study population.

An overall effectiveness rate of 63.67% was found at 12 weeks of the treatment in the present study. The result is widely in line with other studies that have been published to evaluate topical TXA on melasma. Sim et al found that topical tranexamic acid showed significant improvement on MASI scores, with clinical response rates of 55 70, based on baseline severity and treatment duration[11]. Similarly, another study reported significant reduction of MASI score using topical TXA which proved the effectiveness of topical TXA as a depigmenting agent. The similarity in efficacy levels in these studies could be due to the similar concentration of TXA, treatment time and the instruments used to measure the outcome especially the MASI scoring.

The age of patients in this study (32.25 ± 9.65 years) and the predominance of female (57.6%) are in line with the epidemiological profile of melasma that is published in the literature. Multiple studies have observed that the occurrence of melasma is higher among women of reproductive age, probably due to hormonal factors, ultraviolet radiation and genetic factors. The marginally reduced female preponderance in the current study relative to certain international reports could be attributable to regional sociocultural influences, the amount of sun exposure that men have

to at work, and the healthcare-seeking attitude among the locals.

The stratified analysis did not show any statistically significant relationship between the response to treatment and age, gender or duration of the disease. These results align with the results of Srishti et al[12] who found that response to TXA therapy was not dependent on demographic factors. Other authors have however indicated that shorter period of illness might have a positive outcome because there will be reduced dermal melanophages and vascular involvement[13]. The absence of a meaningful connection in the current study, may be due to the relativity of the period of the disease among the subjects and the small size of the sample, which may have been too small to detect the slightest differences between subgroups.

Topical application of TXA was highly acceptable in this study and none of the significant adverse effects were reported. This safety profile is in line with previous works which have indicated the benefit of topical TXA compared to oral preparations which have theoretical risk of thromboembolism. Bagherani et al[14] have also highlighted that topical application offers localized action and has low systemic absorption, thus indicating that it is an appropriate choice of long-term management specifically in patients whose systemic therapy is contraindicated.

Tranexamic acid has a clear mechanism of action over other topical agents that have been used traditionally to treat melasma, such as hydroquinone, retinoids and corticosteroid combinations as well as a reduced side effect profile including irritant dermatitis, ochronosis, and rebound hyperpigmentation[15]. Despite the fact that triple-combination therapy is the gold standard in most of the guidelines, recent comparative studies indicate that TXA could be especially efficient in patients who are not able to tolerate hydroquinone, or as an adjunction with the purpose to increase and sustain therapy response[16]. The disparity in reported efficacy of TXA and conventional depigmenting agents between studies could be due to differences in formulation, adherence, sun protection habits and severity baseline.

Despite its favourable results, the current study has some limitations which must be taken into consideration. The lack of a control or comparator group restrains the direct attribution of improvements observed to tranexamic acid only, but using sunscreen by all participants is a measure that indicates actual real-life clinical practice. Further, the comparatively brief follow-up period does not allow any evaluation of long-term response and recurrence rates as it is clinically important in melasma. Randomized controlled studies involving larger samples, extended follow-up, and direct comparison with recognized treatment should be conducted in the future to further clarify the place of topical TXA in the treatment of melasma.

CONCLUSION

This research has shown that topical 5% tranexamic acid is a safe and effective treatment method to be used in the management of moderate to severe melasma. It has been found that almost two-thirds of patients showed a clinically significant improvement in response to 12 weeks of treatment with high tolerability and no serious adverse effects. There was no significant difference between the treatment response based on age, gender, and disease duration, and this means that the treatment is effective regardless of the patient subgroup. Topical tranexamic acid is a potentially useful adjunct or substitution to conventional depigmenting treatment, due to its good safety profile and acceptable clinical results, which can be considered practical as part of a regular dermatological treatment. Longer follow-up randomized controlled trials should be considered to determine the long-term efficacy and recurrence.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Farhad Ali, Yamna Hassan
Drafting or Revising Critically:	Humaira Wazir, Kashmala
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.103/LRH/MTI Dated 01.11.2021

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Original Article

Assessment of Rheological Properties and Three-Dimensional Root Canal Filling Quality of Obturating Materials in Primary Teeth

Mohamed Tharwat Salama[1,3] and Punit Fulzele[2]

ABSTRACT

Objective: Rheology of four pulpectomy materials for primary teeth obturation was compared, and the relationship between flow behavior and 3-dimensional obturation quality on CBCT was tested.

Study Design: In vitro study

Place and Duration of Study: This study was conducted at the Pediatric and Preventive Dentistry Department, Sharad Pawar Dental College and Hospital, Datta Meghe Institute of Higher Education and Research (DMIHER) Sawangi (Meghe) Wardha 442001, Maharashtra, India from August 2024 to August 2025.

Methods: Endoflas, Metapex, Metapaste, and Zinc Oxide-Eugenol were tested. Apparent viscosity of six samples of each material was measured with a strain-controlled rheometer following ISO 6876 standard at 2 minutes and at a later anchor point after mixing and/or extrusion. Eighty extracted primary mandibular second molars were prepared with standardized access, working length, instrumentation, irrigation, and syringe obturation with uniform technique. CBCT evaluation of obturation quality was performed 24 hours post-obturation with blinded evaluation by two independent scorers with high inter-rater agreement. One-way ANOVA for multiple means at $\alpha = 0.05$ was used for statistical analysis.

Results: Significantly different viscosities were measured for the four materials at both points ($p<0.0001$). Endoflas showed the highest initial viscosity, while ZOE showed the lowest viscosity among the tested materials. CBCT evaluation showed the highest quality of obturation with Endoflas (91%), then with Metapex (87%), ZOE (74%), and Metapaste (68%).

Conclusion: Rheology of the tested pulpectomy materials for primary teeth obturation is strongly correlated with the quality of obturation, with the materials with the best rheology, Endoflas and Metapex, showing the best quality.

Key Words: Pulpectomy; Primary teeth; Root canal obturation; Rheology; Cone-beam computed tomography

Citation of article: Salama MT, Fulzele P. Assessment of Rheological Properties and Three-Dimensional Root Canal Filling Quality of Obturating Materials in Primary Teeth. Med Forum 2026;37(2):35-39. doi:10.60110/medforum.370207.

INTRODUCTION

The goal of a pulpectomy of primary teeth is to maintain the integrity of the dental arch, chewing, and speech, and to guide the permanent successors' eruption. For long-term success, chemomechanical debridement and a three-dimensionally optimal obturation with minimal space for microbes and possible reinfection are required[1,2]. Primary molar roots are technically challenging because of their complex canal anatomy, small dentinal walls, and physiological root resorption, making the procedure more difficult than in permanent teeth[2,3]. Therefore, the material and the application method are critical for the predictability of the procedure's success[1,4].

The optimal material for obturating primary teeth would be biocompatible, antimicrobial, and seal the canal hermetically, and resorb physiologically without impeding exfoliation[1,3,5]. Zinc oxide-eugenol paste has traditionally been used for the procedure, but some disadvantages of ZOE include the slow resorption of the extruded material and tissue irritation. To overcome some of the disadvantages of ZOE, calcium hydroxide-iodoform has also been proposed for the procedure, but the application may be variable and may interfere with the continuity of the obturation material[1,6,7].

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Received: September, 2025
Reviewed: October-November, 2025
Accepted: December, 2025

Rheological properties of the paste, especially viscosity and time-dependent viscosity, determine the apical passage, canal wall contact, and minimum space for microbes for the obturation material when delivered at a clinically realistic pressure[8]. If the paste is too viscous, coronal advancement may be impeded and apical space may be left unfilled, while if the viscosity is too low, the risk of extrusion increases and the space may still be left unfilled if the material separates and moves unevenly within the canal's complex anatomy[8,9]. Nevertheless, the most common evaluation of the obturation procedure for primary teeth has been based on two-dimensional radiographs, which may not be entirely accurate because of superimposition of the canal's anatomy and the obturation material[9,10]. Three-dimensional non-destructive evaluation of the canal and the obturation material has become possible with the advent of CBCT and has become a common practice for evaluating the success of the procedure in experimental endodontic studies[9,11,12].

The current in vitro study compares the rheological properties of the most common materials for the procedure and relates the viscosity profiles of the materials to the three-dimensional obturation success evaluated by CBCT and a standard syringe application method.

METHODS

This in vitro study was conducted 12 months after receiving ethical clearance from the institution for the use of extracted primary teeth from August 2024 Till August 2025.

Specimen Selection: Eighty primary mandibular second molars, which had at least two-thirds root length remaining and minimal apical resorption, were used for the study. These teeth were excluded if they had fractures, perforations, significant resorption, or calcifications. These teeth were stored in 0.1% thymol at 4°C.

Access, Instrumentation, and Canal Preparation: Standardized access cavities were prepared using water-cooled diamond burs. The working length was taken 1 mm short from the visible apex using a size 10 K-file. The canal was then instrumented using ProTaper rotary files, where SX was used for coronal flaring, and S2 was used to the working length at 300 revolutions per minute using an ENDO-MATE TC2 handpiece. Sodium hypochlorite at 1% concentration, alternating with normal saline, was used for irrigation via a 27-gauge needle. The canal was dried using paper points. The rotary files were discarded after using six canals to reduce file fatigue[13].

Materials Used: There were four different materials used, namely, Endoflas, which is a zinc oxide-eugenol paste combined with iodoform, Metapex, which is a calcium hydroxide/iodoform premixed paste, Metapaste, which is a calcium hydroxide premixed paste, and a conventional zinc oxide-eugenol mix prepared from zinc oxide powder and eugenol.

Rheological assessment: Six separate samples of each material (n=24) were tested in a strain-controlled rheometer (MCR 92; Anton Paar, Austria) with a parallel plate geometry (8mm plates with a 0.50mm gap). Each sample (0.025 mL) was subjected to steady-shear testing according to ISO 6876 for flow measurements. Apparent viscosity measurements were recorded at an initial point and subsequently at an anchor point to measure the reduction in viscosity with time.

Obturation procedure: After preparation, all samples were obturated using a standardized syringe technique. For all samples in each group, the syringe needle was positioned close to the working length of the canal and gradually removed while dispensing a continuous syringe stream of obturating material without warm compaction.

CBCT acquisition and analysis: Samples were scanned 24 hours post-obturation with standardized CBCT settings (Field of View 5 x 5 cm, voxel size 90µm). Multi-planar reconstruction images were used to classify samples as underfilled, appropriately filled, or overfilled. Two calibrated examiners analyzed samples in blind fashion to group allocation. Inter-examiner agreement was recorded using intra-class correlation coefficient.

Statistical analysis: Data analysis was performed using SPSS software version 26. Normality of viscosity values was tested using the Shapiro-Wilk normality test. For group comparison, one-way ANOVA was used to compare the results among the groups. Significance was set at $p<0.05$.

RESULTS

Rheological results: Apparent viscosity varied significantly among the four materials at the initial as well as the later anchor points (ANOVA, $p<0.0001$). Initially, the highest viscosity values were recorded in Endoflas (mean=12.4543×10^6 mPa·s), followed by Metapex (mean=1.9836×10^6 mPa·s), Metapaste (mean=1.0002×10^6 mPa·s), and ZOE (mean=0.4341×10^6 mPa·s) (Table 1). All materials demonstrated a significant reduction in viscosity over time (paired t-tests, $p<0.0001$), indicating time-dependent behavior. At the later anchor point, the highest viscosity values were recorded in Metapaste (mean=0.0263×10^6 mPa·s), followed by Metapex (mean=0.0114×10^6 mPa·s), Endoflas (mean=0.0092×10^6 mPa·s), and ZOE (mean=0.0014×10^6 mPa·s) (Table 1; Figure 1).

CBCT-based assessment of obturation quality: CBCT results demonstrated that the four materials varied significantly with regard to the continuity and quality of obturation (Table 2). Endoflas demonstrated the highest percentage of appropriately obturated root canal spaces (91%), followed by Metapex (87%), ZOE (74%), and Metapaste (68%). (Figure 1)

Table No. 1: Rheological measurements (apparent viscosity) of the tested obturating materials (n=6 per group).

Material	Mean Initial ($\times 10^6$ mPa·s)	SD Initial	Mean Final ($\times 10^6$ mPa·s)	SD Final	P (initial vs final)
ZOE	0.4341	0.0179	0.0014	0.0001	<0.0001
Metapaste	1.0002	0.0188	0.0263	0.0012	<0.0001
Metapex	1.9836	0.0573	0.0114	0.0006	<0.0001
Endoflas	12.4543	0.5425	0.0092	0.0003	<0.0001

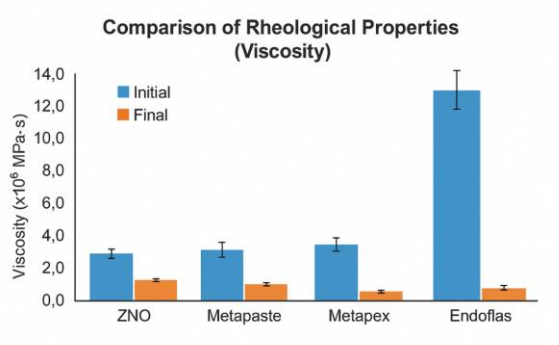

Figure No.1: All four materials exhibited a dramatic drop in viscosity from the initial to the final value, with Endoflas starting at the highest and ZOE at the lowest, and final values clustering near zero. Metapaste remained relatively high at the end.

Table No. 2: CBCT-based assessment of canal filling adequacy (n=20 teeth per group).

Material	Teeth (n)	Estimated canals*	Adequately filled canals (%)
ZOE	20	60–80	74
Metapex	20	60–80	87
Metapaste	20	60–80	68
Endoflas	20	60–80	91

*Each mandibular primary second molar typically has 3–4 canals.

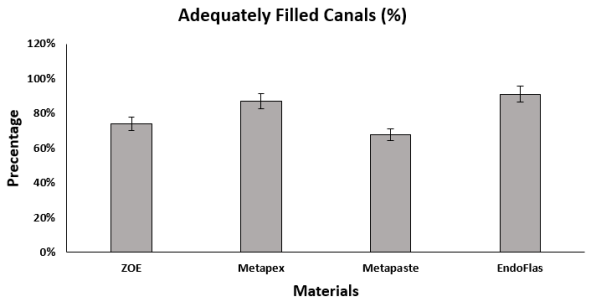

Figure No. 2: Proportion of adequately filled canals by material on CBCT analysis (Endoflas and Metapex highest; Metapaste lowest).

DISCUSSION

This study established a correlation between differences in paste rheology and three-dimensional obturation outcomes in primary molar teeth. It found that the material with the highest initial viscosity, Endoflas, and the combination with Metapex produced the most consistent three-dimensional obturation outcomes on CBCT. It also found a correlation with more inadequate three-dimensional obturation outcomes with ZOE and Metapaste, specifically with apical short fill and dispersed voids.

Viscosity is a measure of resistance to deformation under shear stress and is a factor in apical advancement when used with a syringe or needle. Previous studies on endodontic materials have emphasized the flow behavior of endodontic materials and have stressed the importance of this factor in endodontic treatment. Flow behavior is clinically important but cannot be predicted based on composition alone[14,15]. In this study, all materials had a marked reduction in viscosity over time. This finding is consistent with previous studies and underscores the need to standardize time in material use in endodontic treatment and in material comparisons. In addition, despite having the highest initial viscosity, Endoflas had a marked reduction in viscosity at the later time point. This finding might explain the easy handling of this material in endodontic treatment and the dense three-dimensional adaptation to the root canal.

The study found a correlation with previous studies on three-dimensional obturation outcomes in primary molar teeth and with the sensitivity of primary molar endodontic treatment outcomes to instrumentation and material handling techniques. It found that pediatric rotary instruments improved the consistency of shaping outcomes and produced a more homogeneous three-dimensional obturation outcome compared with a manual instrument approach. This study used a standardized approach with pediatric rotary instruments and found material differences in three-dimensional obturation outcome continuity consistent with clinical and systematic reviews on endodontic treatment outcomes with different materials. The systematic reviews found similar short-term outcomes with different materials but a trend toward favorable radiographic outcomes with Endoflas and calcium hydroxide/iodoform formulations in selected contexts.

CBCT showed clear advantages over 2D radiographs for the evaluation of the obturation quality and the location of underfilling, particularly within the apical third where overlap can obscure the presence of these defects on periapical radiographs[16,17,18]. Since voids and apical discontinuities can facilitate microleakage, the

three-dimensional evaluation of the obturating materials strengthened the internal validity of the in vitro comparisons, possibly providing an explanation for the material variability reported[19].

Clinical application of the data needs to be viewed with some caution, as the outcome of a successful pulpectomy of a primary tooth has multiple determinants, including disinfection, coronal sealing, and biological responses. However, rheological profiling offered a useful, mechanistic alternative to clinical outcome, potentially informing the choice of material for syringe delivery systems used for obturation. Antimicrobial properties and biocompatibility were also important, with variable antimicrobial properties of the pediatric obturating materials reported by in vitro investigations, potentially impacting the outcome of infected canals[20,21,22].

Shortcomings of the Study: This was an in vitro evaluation, and only the viscosity properties of the materials were examined, and it is proposed that further investigations be carried out to evaluate the viscoelastic, thixotropic, and dimensional stability properties of the materials. A single syringe system was used to evaluate the materials, and this allowed for the isolation of the rheological properties of the materials.

CONCLUSION

In the context of this in vitro investigation, the rheological properties of the obturating materials for primary teeth were found to be differentiated according to the three-dimensional quality of obturation. Endoflas and Metapex, which have balanced viscosity and time-dependent flow properties, were found to have the highest CBCT-based rates of well-filled canals. ZOE was more commonly associated with apical underfilling, and Metapaste was found to have the highest percentage of discontinuous void patterns. The inclusion of rheological properties in the assessment of the obturating materials may aid in the evidence-based selection of the obturating materials in pediatric endodontics.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Mohamed Tharwat Salama, Punit Fulzele
Drafting or Revising Critically:	Mohamed Tharwat Salama, Punit Fulzele
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.DHIHER(DU)/IEC/2024/126 Dated 30.01.2024

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Original Article

Association of Serum Calcium Levels with Clinical Severity of Acute Ischemic Stroke

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ABSTRACT

Objective: To determine the association of serum calcium levels with clinical severity of acute ischemic stroke.
Study Design: Cross-sectional study
Place and Duration of Study: This study was conducted at the General Medicine Department, Khyber Teaching Hospital, Peshawar, from January 2025 till June 2025.
Methods: A total of 63 patients aged 30–70 years presenting with acute ischemic stroke were enrolled. Serum calcium levels were measured at admission, and stroke severity was assessed using the NIH Stroke Scale. Patients were categorized into two groups based on serum calcium levels: <8.5 mg/dL and ≥8.5 mg/dL. Demographic variables, comorbidities, and risk factors were recorded.
Results: The mean age of the patients was 51.86 ± 10.903 years, while the mean BMI was 26.17 ± 4.81 kg/m². The average duration since stroke onset was 37.48 ± 20.07 hours, and the mean serum calcium level was 8.43 ± 1.06 mg/dL. Patients with lower calcium levels had a higher proportion of moderate, moderate-to-severe, and severe stroke categories. A significant association was found between serum calcium levels and stroke severity (p = 0.03).
Conclusion: Lower serum calcium levels were significantly associated with increased clinical severity of acute ischemic stroke. Serum calcium may serve as a simple and useful marker for early risk stratification in acute stroke.

Key Words: Acute ischemic stroke, serum calcium, NIHSS, stroke severity, electrolyte imbalance.

Citation of article: Hassan E, Haroon M, Umam S, Khan S, Aitizaz M. Association of Serum Calcium Levels with Clinical Severity of Acute Ischemic Stroke. Med Forum 2026;37(2):40-44. doi:10.60110/medforum.370208.

INTRODUCTION

Stroke is characterized by elevated disability, morbidity, and mortality rates, posing a considerable challenge to global health. The statistics show 12.2 million cases of incidence, 101 million prevalence and 6.55 million deaths caused by stroke which just underlines the urgency of introducing effective prediction efforts[1]. Ischemic stroke constitutes the most common type of stroke, which is 70 per cent of all stroke attacks[1,2]. The number of deaths that are as a result of IS all over the world is 3.29 million, and there is a projection that it may increase to 4.9 million by 2030[2].

Based on the importance of such statistics, it is necessary to find an early and readily available predictor to make an informed clinical decision and implement appropriate treatment. Calcium is the most common mineral in the human body, which is of paramount importance in many physiological functions, including nerve conductivity, cell wall integrity, coagulation, muscular contraction, fluid, and endocrine and immune system functions[3,4].

Although the role of calcium is of critical importance, the area of correlation of serum calcium levels and the results of Acute Ischemic Stroke is under researched, and its results are rather inconsistent. A number of studies have shown the existence of correlations between the low and the high levels of calcium in the serum and the poor results of insulin sensitivity[5]. On the other hand, other studies have found a non-linear association between serum total calcium concentration and all-cause deaths in one year. Other researches have suggested that there are no significant relationships between serum calcium level and the outcome in acute ischemic stroke[6].

These differences in calcium markers and the endpoints of the studies also make one raise an inquiry on whether the conflicting results are caused by such differences[7]. One of the studies reported relationship between serum calcium levels (ionized) and clinical severity of acute ischemic stroke. i.e. patients with stroke were subset in two groups where serum calcium below 4.5 mg/dl as (minor stroke in 6.66%, moderate stroke in 36.66, moderateo-severe stroke in 50, and severe stroke in 6.66), and serum calcium above 4.5mg/dl as (Minor

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Received: July, 2025
Reviewed: August-September, 2025
Accepted: October, 2025

stroke in 36.66, moderate stroke in 53. Aboriginal calcium levels in serum have been identified as having been specifically related to poorer clinical outcomes among stroke patients, which could be worsening the neuronal damage and contributing to the magnitude of disability[8-11]. Since there are no such studies on this topic in the area, this research aims to identify the correlation between serum calcium levels and clinical severity of the acute ischemic stroke in our health facility.

METHODS

This Cross-sectional study was conducted at the General Medicine Department of Khyber Teaching Hospital, Peshawar, from January 2025 till June 2025. WHO sample size calculator was used to calculate the sample size, keeping the following assumptions. Serum calcium <4.5 mg/dl was observed in 6.6% of minor stroke patients [8]. Margin of error 6.2%, and confidence level 95%. Calculated sample size was 63. Data were collected through non-Probability Consecutive Sampling

Inclusion criteria

- Gender (Male/Female)
- Age range 30-70 Years
- Patients with acute ischemic stroke as defined in the operational definition.

Exclusion criteria

- Patients with hemorrhagic stroke
- Patients with malignancy
- Patients with autoimmune diseases

Data collection

The study commenced after approval was obtained from the hospital's ethical review board and the CPSP research unit. All individuals who met the selection criteria were enrolled. The objectives, potential benefits, and possible risks of the study were explained to each participant, after which informed written consent was taken. Baseline demographic information, including age, BMI, gender, education status, employment status, residence, and socioeconomic status, was recorded. For assessment of ionized serum calcium, 5–10 mL of venous blood was drawn using a sterile needle and collected in an appropriate container for laboratory analysis. Stroke severity was evaluated using the NIH Stroke Scale (NIHSS) as per the operational definition. All assessments were performed under the supervision of a consultant with at least five years of post-fellowship experience. All patient information was documented on a structured proforma.

Data Analysis

Data were analyzed using IBM SPSS version 27. Numerical variables such as age, BMI, duration of stroke, and serum calcium levels were presented as mean ± standard deviation or median (IQR), depending on the distribution. The Shapiro–Wilk test was applied to assess normality. Categorical data such as gender, stroke severity (minor, moderate, moderate-to-severe, severe), calcium level categories, hypertension, diabetes, smoking status, education level, employment status, residence, and socioeconomic status were presented as frequencies and percentages. The association between serum calcium levels and stroke severity was assessed using the Chi-square test, with $p < 0.05$ considered statistically significant.

RESULTS

Data were collected from 63 patients, mean age of the participants was 51.86 ± 10.903 years, indicating a predominantly middle-aged population. The average BMI was 26.17 ± 4.81 kg/m², placing most individuals in the overweight range. The mean duration since stroke onset was 37.48 ± 20.07 hours. The mean serum calcium level was 8.43 ± 1.06 mg/dL. Gender distribution was nearly equal, with males accounting for 49.2% and females for 50.8%. Regarding education, 36.5% of the subjects had no formal education, while 19.0% had higher education. Employment trends showed that 38.1% were self-employed, 33.3% unemployed, and 28.6% employed. A majority of patients belonged to urban areas (57.1%), while 42.9% resided in rural regions. Socioeconomic stratification showed that 46.0% of participants belonged to the middle socioeconomic group, followed by 34.9% in the low and 19.0% in the high socioeconomic groups. Hypertension and diabetes were common comorbidities, affecting 55.6% and 52.4% of participants, respectively. Smoking status revealed that 38.1% were smokers, 33.3% were non-smokers, and 28.6% were ex-smokers. Table 1.

Patients with low serum calcium levels (<8.5 mg/dL) predominantly fell into moderate (30.8%), moderate-to-severe (30.8%), and severe (23.1%) stroke categories, with only 15.4% classified as minor stroke. In contrast, individuals with normal calcium levels (≥8.5 mg/dL) showed a higher proportion of minor strokes (33.3%) and fewer severe strokes (15.4%). The association between serum calcium level and stroke severity was statistically significant ($p = 0.03$). Table 2.

Hypertension showed a clear trend toward higher severity, with 34.2% of hypertensive patients presenting with moderate stroke and 26.3% with moderate-to-severe stroke. A small proportion (18.4%) had severe stroke. A similar pattern was observed for diabetes: 31.0% of diabetic patients had moderate stroke, and 27.6% had moderate-to-severe stroke. Smoking status also demonstrated variation across severity levels. Smokers most frequently fell in the moderate category (35.3%), while non-smokers were more evenly distributed. Ex-smokers showed higher proportions in minor (30.0%) and severe (30.0%) categories. Table 3.

Patients with minor stroke had the highest mean calcium level (8.72 ± 0.88 mg/dL), followed by moderate stroke (8.46 ± 0.97 mg/dL) and moderate-to-severe stroke (8.12 ± 1.05 mg/dL). The lowest mean calcium level was observed in patients with severe stroke (7.89 ± 1.14 mg/dL). The difference in mean calcium values across severity groups was statistically significant ($p = 0.04$). Table 4.

Table No. 1: Descriptive and Frequency Distribution of Study Variables (N = 63)

Variable	Category / Statistic	n (%) / Mean ± SD
Age (years)	Mean ± SD	51.86 ± 10.903
BMI (kg/m²)	Mean ± SD	26.17 ± 4.81
Duration of Stroke (hours)	Mean ± SD	37.48 ± 20.07
Serum Calcium (mg/dL)	Mean ± SD	8.43 ± 1.06
Gender	Male	31 (49.2)
	Female	32 (50.8)
Education Status	None	23 (36.5)
	Primary	18 (28.6)
	Secondary	10 (15.9)
	Higher	12 (19.0)
Employment Status	Unemployed	21 (33.3)
	Employed	18 (28.6)
	Self-employed	24 (38.1)
Residence	Rural	27 (42.9)
	Urban	36 (57.1)
Socioeconomic Status	Low	22 (34.9)
	Middle	29 (46.0)
	High	12 (19.0)
Hypertension	Yes	35 (55.6)
	No	28 (44.4)
Diabetes	Yes	33 (52.4)
	No	30 (47.6)
Smoking Status	Non-smoker	21 (33.3)
	Smoker	24 (38.1)
	Ex-smoker	18 (28.6)
Stroke Severity (NIHSS Category)	Minor	20 (31.7)
	Moderate-to-severe	13 (20.6)
	Severe	30 (47.6)

Table No. 2: Association of Serum Calcium Levels with Stroke Severity

Serum Calcium Level	Minor n (%)	Moderate n (%)	Moderate-to-severe n (%)	Severe n (%)	p-value
Low (<8.5 mg/dL)	4 (15.4)	8 (30.8)	8 (30.8)	6 (23.1)	0.03
Normal (≥8.5 mg/dL)	13 (33.3)	11 (28.2)	7 (17.9)	6 (15.4)	—

Table No. 3: Risk Factors Across Stroke Severity

Risk Factor	Minor n (%)	Moderate n (%)	Moderate-to-severe n (%)	Severe n (%)	Total n (%)
Hypertension	8 (21.1)	13 (34.2)	10 (26.3)	7 (18.4)	35 (55.6)
No Hypertension	9 (36.0)	6 (24.0)	5 (20.0)	5 (20.0)	28 (44.4)
Diabetes	7 (24.1)	9 (31.0)	8 (27.6)	5 (17.2)	33 (52.4)
No Diabetes	10 (29.4)	10 (29.4)	7 (20.6)	7 (20.6)	30 (47.6)
Smoker	4 (23.5)	6 (35.3)	4 (23.5)	3 (17.6)	24 (38.1)
Non-smoker	10 (27.8)	11 (30.6)	9 (25.0)	6 (16.7)	21 (33.3)
Ex-smoker	3 (30.0)	2 (20.0)	2 (20.0)	3 (30.0)	18 (28.6)

Table No. 4: Comparison of Mean Serum Calcium Across Stroke Severity

Stroke Severity	Mean Calcium (mg/dL) ± SD	p-value
Minor	8.72 ± 0.88	0.04
Moderate	8.46 ± 0.97	
Moderate-to-severe	8.12 ± 1.05	
Severe	7.89 ± 1.14	

DISCUSSION

This study explored the association between serum calcium levels and the clinical severity of acute ischemic stroke among patients presenting to a tertiary care hospital. The results showed a strong regularity: the lower were the levels of serum calcium the higher were the categories of NIHSS severity which showed the significant correlation between calcium homeostasis and the degree of a neurological impairment. The number of moderate, moderate-to-severe and severe strokes among patients with a calcium level under 8.5 mg/dL was higher than among patients with normal calcium level and this fact was statistically significant. The findings corroborate the increasing evidence that electrolyte imbalances, especially those in calcium, can affect ischemic neuronal damage. The relationship that is observed is biologically plausible. The critical functions of calcium include stability of neuronal membranes, transmission of neuronal synapses, and blood vessel tone. In cerebral ischemia disrupted autoregulation and excitotoxicity cause intracellular calcium overload which boosts neuronal apoptosis and expansion of the infarct. Reduced extracellular serum calcium can also contribute to the further destabilization of neuronal activity and inhibition of the buffering of brain against ischemic damage[12]. The trend in this paper is similar to the mechanistic interpretation that has been suggested in other studies that have also indicated that hypocalcemia is associated with greater infarct size, more significant neurological impairments, and worse clinical outcomes[13].

The proportion of patients with more severe stroke had more frequent hypertension, diabetes, and smoking, as well which is in line with known epidemiology of strokes. These comorbidities are established causes of cerebrovascular pathology by the mechanisms of dysfunction of endothelial functions, accelerated atherosclerosis, and dysfunction in microvascular autoregulation. Although these factors were not the main interest of the study they can be still justified by their presence in the categories of severity and prove the further relevance of the burden of ischemic stroke[14]. The trend was similar to that found in earlier studies that indicated a similar tendency of the cardiovascular risk factors clustering within patients who suffered more significant neurological impairment. The average serum calcium level in the present study was slightly low in the moderate-severe and severe groups than that of the mild group. The differences are not very large in numbers, but considering the trend, there is an increasing downward trend in the severity categories. These gradients were also reported in earlier studies, which substantiate the assumption that clinical effects of even minor changes in serum calcium can occur in acute stroke[15]. Calcium is simple to detect, is commonplace and cheap, and could therefore prove useful as an early prognostic indicator, particularly in resource-constrained environments[16,17]. There are a number of limitations associated with this study, which ought to be considered when interpreting the results. To begin with, the cross-sectional study did not allow testing any causal relationship between serum calcium level and stroke severity, thus only associations could be determined. Second, serum calcium was only determined at one time, which might not be indicative of the changes at the acute period of ischemia. Serial calcium patterns may be more insightful on the dynamics of calcium during stroke. Third, the research was carried out in one center and the sample size is quite small (63); therefore, it might not apply to larger populations. Fourth, no assessment of potential confounders, including nutritional status, levels of vitamin D, parathyroid hormone, renal functioning, and history of medication, was conducted, which can determine serum calcium levels. And finally, some variables might lack sociodemographic as well as clinical data, which could have resulted in classification bias.

CONCLUSION

It is concluded that lower serum calcium levels are significantly associated with greater clinical severity of acute ischemic stroke. Patients presenting with reduced calcium levels were more likely to fall into higher NIHSS categories, indicating more substantial neurological impairment. Because serum calcium measurement is simple, rapid, and routinely available in emergency settings, it may serve as a useful adjunct marker for early risk stratification. Further large-scale, prospective studies are recommended to validate this association and to determine whether correcting calcium imbalance could offer therapeutic benefit in improving stroke outcomes.

Author's Contribution:

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Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.980/DME/KMC Dated 06.12.2024

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Original Article

Impaired Glucose Regulation Among Thalassemia Major Patients on Blood Transfusions with or without Proper Chelation Therapy

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ABSTRACT

Objective: To evaluate transfusion and chelation status among thalassemia patients, determine the prevalence of hyperglycemia, and assess whether adherence to chelation therapy is associated with differences in hyperglycemia severity.

Study Design: Descriptive cross-sectional study

Place and Duration of Study: This study was conducted at the Department of Pathology (Hematology) in collaboration with the Department of Pediatrics, Pakistan Railways Hospital (PRH), and the Thalassemia Center, Rawalpindi from September 2023 to September 2024.

Methods: A total of 137 patients with thalassemia major were assessed. Patients were categorized into three management groups: well transfused and adequately chelated (12.4%), well transfused but inadequately chelated (29.9%), and irregularly transfused with inadequate chelation (57.7%). Glycemic status was classified as normal, impaired glucose regulation, or diabetes mellitus.

Results: Among the 137 patients, 55.5% had normal glucose levels, 32.8% had impaired glucose regulation, and 11.7% were diabetic. Diabetes showed a significant association with irregular transfusion and inadequate chelation ($p < 0.001$). Of the diabetic patients, 78.5% were irregularly transfused and inadequately chelated, while 21.5% were well transfused but inadequately chelated. Importantly, none of the well transfused and adequately chelated patients were diabetic.

Conclusion: Effective transfusion schedules combined with adequate chelation therapy appear protective against the development of diabetes in thalassemia major. Poor adherence to transfusion and chelation regimens is strongly linked with hyperglycemia and diabetes, underscoring the need for strengthened patient education, monitoring, and early intervention strategies to prevent iron-related endocrine complications.

Key Words: Impaired Glucose, Thalassemia Major, Blood Transfusions, Chelation Therapy

Citation of article: Javed R, Nayyar A, Rana SS, Salman S, Mohsin M, Javed A. Impaired Glucose Regulation Among Thalassemia Major Patients on Blood Transfusions with or without Proper Chelation Therapy. Med Forum 2026;37(2):45-50. doi:10.60110/medforum.370209.

INTRODUCTION

Thalassemia major is a severe hereditary blood disorder characterized by the body's inability to produce adequate hemoglobin, demanding regular blood transfusions for survival[1]. These transfusions, while lifesaving, introduce significant complications, one of the most critical being iron overload[2].

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Received: July, 2025
Reviewed: August-September, 2025
Accepted: October, 2025

The excess iron deposited in various organs, including the liver, heart, and endocrine glands, can lead to many health issues[3]. Among these, impaired glucose regulation stands out as a significant concern due to its potential to evolve into diabetes mellitus, further complicating the clinical management of thalassemia patients[4]. Impaired glucose regulation in thalassemia major patients is a multifaceted issue, primarily rooted in the pathophysiological impact of iron overload on pancreatic beta cells. These cells, which play a crucial role in insulin production, are particularly vulnerable to the toxic effects of excessive iron deposition[5]. The pancreas, particularly its beta cells, is one of the primary targets of iron-induced damage. Beta cells produce insulin, a hormone crucial for regulating blood glucose levels. Iron overload in thalassemia patients leads to the accumulation of iron in these cells, which triggers oxidative stress[6]. Oxidative stress occurs when there is an imbalance between the production of reactive oxygen species (ROS) and the body's ability to

detoxify these harmful byproducts. Excessive ROS can damage cellular structures, including lipids, proteins, and DNA[7]. Several studies have shown that iron overload disrupts mitochondrial function in beta cells, leading to decreased ATP production. ATP is essential for insulin secretion, and its reduction directly impacts the beta cells' ability to produce and release insulin in response to glucose. Additionally, oxidative stress can activate pathways that lead to beta-cell apoptosis (programmed cell death), further reducing the number of functional insulin-producing cells[8]. The initial manifestation of this damage is often impaired glucose tolerance (IGT), a condition characterized by higher-than-normal blood glucose levels after eating but not high enough to be classified as diabetes. IGT represents an intermediate stage in the spectrum of glucose dysregulation. If left unmanaged, it can progress to diabetes mellitus. Diabetes mellitus in thalassemia major patients typically presents as type 2 diabetes, characterized by both insulin resistance and beta-cell dysfunction[9]. The transition from IGT to diabetes mellitus involves multiple factors. Chronic iron overload continuously stresses the beta cells, diminishing their insulin-producing capacity over time. As the beta-cell mass and function decline, the body becomes less able to maintain normal glucose homeostasis. Concurrently, iron overload can induce insulin resistance in peripheral tissues such as the liver, muscle, and adipose tissue. Insulin resistance further exacerbates hyperglycemia and increases the demand on already compromised beta cells, accelerating their dysfunction[10]. Iron overload also affects other endocrine functions that indirectly impact glucose metabolism[11]. Iron deposition in the liver can impair hepatic insulin clearance, leading to hyperinsulinemia and subsequent insulin resistance. Furthermore, iron-induced damage to the hypothalamic-pituitary axis can result in hormonal imbalances, such as hypogonadism, which are known to exacerbate insulin resistance[12]. Certain genetic polymorphisms in genes involved in glucose metabolism and insulin signaling pathways may increase the susceptibility of TM patients to diabetes. Identifying these genetic markers could help stratify patients based on risk and tailor preventive and therapeutic strategies accordingly[13]. The function of cardiometabolic characteristics and α-thalassemia-related erythrocyte indicators in diabetes susceptibility are elucidated by establishing causal linkages.

METHODS

This was a descriptive cross-sectional study, conducted in the Department of Pathology (Hematology) in collaboration with the Department of Pediatrics, Pakistan Railways Hospital (PRH), and the Thalassemia Center, Rawalpindi from September 2023 to September 2024, following approval from the Institutional Review Committee of Riphah International University, Islamabad. A non-probability convenience sampling technique was used for patient recruitment. The sample size was calculated using a reported 9.0% prevalence of diabetes mellitus among thalassemia patients, a 95% confidence level, 80% study power, and a 5% margin of error. The estimated sample size was 125.8, which was adjusted to 137 participants to account for precision requirements.

Inclusion Criteria

- Diagnosed cases of thalassemia major
- Age 5–20 years
- Receiving regular blood transfusions for ≥1 year
- No known diagnosis of diabetes or glucose metabolism disorders
- Availability of complete medical records for at least one year

Exclusion Criteria

- Family history of diabetes mellitus
- Systemic illnesses including chronic liver, renal, or cardiovascular disease
- Severe psychiatric or cognitive impairment
- History of surgical procedures affecting glucose homeostasis

Data Collection

A total of 137 patients fulfilling the eligibility criteria were recruited from the pediatric outpatient clinics and inpatient wards of PRH and the Thalassemia Center. After obtaining informed consent, a structured proforma was used to record demographic information, clinical history, transfusion frequency, chelation therapy practices, and previous laboratory results. Blood samples were collected to measure hemoglobin concentration, serum ferritin, and fasting plasma glucose. Based on transfusion regularity and chelation adequacy, patients were classified into three groups: well transfused and adequately chelated, well transfused but inadequately chelated, and irregularly or inadequately transfused. Fasting glucose levels were categorized as normal, impaired fasting glucose, or diabetic using ADA guidelines.

Laboratory Procedures:

All laboratory analyses were conducted using standardized and validated equipment. Complete blood count was performed using the Mindray BC-5000 hematology analyzer after appropriate sample mixing and barcode verification. Serum ferritin was measured using a Rayto RT-6000 Microplate Reader following an ELISA-based protocol involving reagent preparation, incubation, washing, and absorbance measurement at 450 nm. Fasting plasma glucose was analyzed using the Selectra Pro M chemistry analyzer after calibration verification and quality control processing. All procedures adhered strictly to manufacturer instructions and departmental SOPs. Quality assurance measures were implemented throughout the analytical process to ensure accuracy and reproducibility. Samples were checked for hemolysis, clotting, proper volume,

labeling accuracy, and correct timing of collection. SOPs were followed rigorously during sample handling, storage, and processing. Hematology cell controls, internal quality control sera, and analyzer-based validation checks were performed regularly. Only results meeting acceptable quality control standards were included in the final analysis.

Data Analysis

Data were analyzed using IBM SPSS version 23. Numerical variables were expressed as mean ± standard deviation, while categorical variables were summarized as frequencies and percentages. Differences in mean values between two groups were assessed using the independent samples t-test, while comparisons across more than two groups employed one-way ANOVA. A p-value of less than 0.05 was considered statistically significant.

RESULTS

There was total 137 thalassemia patients were included in the study. Out of 137, there were 66 (48.2%) males and 71 (51.8%) females in the study. Age distribution showed that 40 (29.2%) participants belonged to 5-10 years of age group, followed by 43 (31.4%) and belonging to 11-15 and 16-20 years of age group, respectively. The mean age was calculated to be 13.16±4.5 years (age range 5 to 20). In terms of residential area, 75 (54.7%) participants were from rural area while 62 (45.3%) were from urban settings. Table 1.

Table 1: Socio-demographic characteristics (n=137)

Variables		Count (n)	%)age
Gender	Male	66	48.2%
	Female	71	51.8%
	Total	**137**	**100%**
Age Group	5-10 years	40	29.2%
	11-15 years	43	31.4%
	16-20 years	54	39.4%
	Total	**137**	**100%**
Area	Rural	75	54.7%
	Urban	62	45.3%
	Total	**137**	**100%**

Hemoglobin levels were highest in the well-transfused, adequately and inadequately chelated groups (10.8 ± 0.73 g/dL and 10.9 ± 0.86 g/dL), both tightly clustered around similar confidence intervals, while the irregularly transfused and inadequately chelated group demonstrated a much lower mean hemoglobin of 7.6 ± 0.95 g/dL, reflecting significant anemia. A similar trend appeared in the platelet counts: both well-transfused groups maintained higher platelet levels (136.3 ± 31.52 and 135.7 ± 27.32 $\times 10^9$/L), whereas irregular transfusion was associated with marked thrombocytopenia (77.4 ± 28.44 $\times 10^9$/L). Interestingly, WBC counts followed the opposite pattern, remaining lowest in adequately and inadequately chelated groups (8.3 ± 2.07 and 7.8 ± 1.94 $\times 10^9$/L) while rising sharply in the irregularly transfused group (11.7 ± 6.65 $\times 10^9$/L), suggesting inflammatory stress or recurrent infections in poorly managed patients. Table 2.

Table No. 2: Comparison of laboratory parameters among study groups

Parameter	Group	n	Mean ± SD	95% CI (Lower–Upper)
Hemoglobin (g/dL)	Well transfused / adequately chelated	17	10.8 ± 0.73	10.4–11.2
	Well transfused / inadequately chelated	41	10.9 ± 0.86	10.6–11.1
	Irregularly transfused / chelated	79	7.6 ± 0.95	7.4–7.8
	Total	**137**	**9.0 ± 1.82**	**8.7–9.3**
WBCs ($\times 10^9$/L)	Well transfused / adequately chelated	17	8.3 ± 2.07	7.3–9.4
	Well transfused / inadequately chelated	41	7.8 ± 1.94	7.2–8.5
	Irregularly transfused / chelated	79	11.7 ± 6.65	10.3–13.2
	Total	**137**	**10.2 ± 5.51**	**9.2–11.1**
Platelets ($\times 10^9$/L)	Well transfused / adequately chelated	17	136.3 ± 31.52	120.1–152.5
	Well transfused / inadequately chelated	41	135.7 ± 27.32	127.1–144.3
	Irregularly transfused / chelated	79	77.4 ± 28.44	71.0–83.8
	Total	**137**	**102.2 ± 40.51**	**95.3–109.0**

Adequately chelated patients showed the lowest iron burden, with a mean ferritin of 832.3 ± 165.4 µg/L (95% CI: 747.2–917.3), aligning with adequate chelation efficacy. In contrast, ferritin rose dramatically in both inadequately chelated groups: 1583.7 ± 383.5 µg/L in the well-transfused but poorly chelated group and 1615.6 ± 560.4 µg/L in the irregularly transfused and inadequately chelated group. Their confidence intervals overlapped substantially, indicating consistently high iron overload regardless of transfusion regularity when chelation was poor. Table 3.

Normal glucose levels were slightly more frequent in females (33.6%) than males (27.0%), while impaired glucose was comparable between genders (15.3% in males vs. 13.9% in females). Diabetes was present in 5.8% of males and 4.4% of females, again demonstrating no major gender-based differences. Out of 137 patients, 83 had normal glucose, 40 showed impaired glucose tolerance, and 14 were diabetic, indicating that more than one-third of the cohort had some form of dysglycemia.

Table No. 3. Comparison of Mean Ferritin Levels Between the Three Study Groups (n = 137)

Group	n	Mean ± SD (µg/L)	95% CI (Lower–Upper)
Well transfused / adequately chelated	17	832.3 ± 165.4	747.2–917.3
Well transfused / inadequately chelated	41	1583.7 ± 383.5	1462.7–1704.8
Irregularly transfused / inadequately chelated	79	1615.6 ± 560.4	1490.0–1741.1
Total	**137**	**1508.8 ± 540.5**	**1417.5–1600.2**

Table No. 4. Distribution of Blood Glucose Levels by Gender (n = 137)

Gender	Normal	Impaired Glucose	Diabetes	Total (n)
Male	37 (27.0%)	21 (15.3%)	8 (5.8%)	66
Female	46 (33.6%)	19 (13.9%)	6 (4.4%)	71
Total	**83**	**40**	**14**	**137**

Table 5. Comparison of Glucose Levels with Transfusion and Chelation Status (n = 137)

Status	Normal	Impaired Glucose	Diabetes	Total (n)
Well transfused / adequately chelated	16 (94.1%)	1 (5.9%)	0 (0.0%)	17
Well transfused / inadequately chelated	23 (56.1%)	13 (31.7%)	5 (12.2%)	41
Irregularly transfused / inadequately chelated	37 (46.8%)	31 (39.2%)	11 (13.9%)	79
Total	**76 (55.5%)**	**45 (32.8%)**	**16 (11.7%)**	**137**

The well-transfused and adequately chelated group had overwhelmingly normal glucose levels (94.1%) with almost no impaired glucose (5.9%) and no diabetes at all. In contrast, glucose abnormalities increased sharply when chelation was inadequate. In the well-transfused but inadequately chelated group, only 56.1% remained normoglycemic, while 31.7% had impaired glucose and 12.2% developed diabetes. The poorest outcomes were seen in the irregularly transfused and inadequately chelated group: normal glucose dropped to 46.8%, impaired glucose rose to 39.2%, and diabetes reached the highest frequency (13.9%). Table 5.

DISCUSSION

Thalassemia major is a hereditary blood disorder that requires lifelong blood transfusions for patient survival. The excess iron gets deposited in various body organs if chelation therapy following blood transfusions is not properly done and the iron overload then causes malfunctioning of involved body organs. Liver and pancreas are one of the main organs that gets effected by iron deposition leading to blood glucose imbalance. Therefore, it is important to identify this problem in thalassemia major patients, timely addressing a prevalent complication that significantly impacts patient outcomes. The purpose of this study was to determine the blood transfusion and chelation status in thalassemia patients reporting to our center, to assess the presence of hyperglycemia among them and to explore if severity of hyperglycemia vary between thalassemia major patients who receive proper chelation therapy versus those who do not adhere to or have inadequate chelation therapy. In this study, data was analyzed from 137 thalassemia patients, and categorized them according to the transfusion and chelation status. There were only 12.4% (17/137) thalassemia patients found to be well transfused and adequately chelated and 29.9% (41/137) were well transfused but inadequately chelated. While on the other hand, majority of the thalassemia patients, 57.7% (79/137) were found to have been irregularly transfused and inadequately chelated. Similarly, the blood glycemic status was also explored in terms of normal blood glucose, impaired glucose and diabetes, and it was compared against different groups made as per transfusion and chelation status. Among included thalassemia patients, where 11.7% (16/137) were found to be diabetic, followed by 32.8% (45/137) with impaired blood glucose levels and remaining majority of 55.5% (76/137) were found to have normal blood glucose levels. Comparing the transfusion status and diabetes among included thalassemia patients it was reported that diabetes was significantly associated with irregular transfusion and inadequate chelation. Among 14 diabetic patients, 11 (78.5%) had irregular transfusion and inadequate chelation, while 5 (21.5%) had regular transfusion and inadequate chelation

($p<0.001$)[14]. None of the well transfused and adequately chelated thalassemia patient was found to be diabetic in this study. This type of grouping and comparison was not reported in any other study previously in the literature, focus was mainly on prevalence of blood metabolic and endocrine disorders among thalassemia major patients[15-17].

In literature, various studies reported prevalence of diabetes and endocrine disorders as discussed here. A study conducted in Pakistan included 120 thalassemia major patients, where 60% patients were female and mean age was 21.6±8.23 (Ahmad et al, 2022). Similarly, in our study females (51.8%) were more in number as compared to males, and 39.5% patients belonged to age group of 16-20 years. In study by Ahmed et al, frequency of diabetes was reported to be 9.0% among thalassemia major patients, while in our study the prevalence of diabetes was 11.7%[18]. Ahmed et al reported that diabetes was found to be more common among males as compared to females (66.7% vs 33.3%), similarly patients belonging of age group of more than 25 years, having ferritin levels more than 6000 ng/ml and longer blood transfusion duration also had high prevalence of diabetes. In our study similar results were found where diabetes was more common among males as compared to females (11.2% vs 9.0%). The authors concluded that nine percent of significant thalassemia patients had diabetes, with men making up the majority of cases. We think this is related to being older, having a higher mean ferritin level over the course of five years, and receiving more blood transfusions[19].

This study has several limitations that should be considered when interpreting the findings. The cross-sectional design restricts the ability to establish causal relationships between transfusion chelation status, iron overload, and glucose abnormalities. Data were collected from a single center, which may limit generalizability to broader thalassemia populations with different treatment protocols or resource availability. Laboratory values were taken at a single time point, so fluctuations in hemoglobin, ferritin, and glucose levels over time could not be assessed. Self-reported adherence to chelation therapy may also introduce recall or reporting bias.

CONCLUSION

The study highlights the critical role of proper transfusion and chelation therapy in thalassemia major patients to prevent complications such as hyperglycemia and diabetes. A significant proportion of thalassemia patients were found to have irregular transfusion and inadequate chelation, which is strongly associated with an increased risk of developing diabetes. Conversely, patients who were well transfused and adequately chelated showed no signs of diabetes, underscoring the importance of adherence to chelation therapy. Early identification and management of glycemic abnormalities are essential to improving the overall outcomes and quality of life of thalassemia major patients.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Rahmat Javed, Ayesha Nayyar, Sana Saleem Rana
Drafting or Revising Critically:	Sehrish Salman, Mehak Mohsin, Amna Javed
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.ERB/RIPH/23-235 Dated 19.07.2023

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Original Article

Efficacy of Cognitive Behavior Therapy in the Treatment of Chronic Pelvic Pain in Women: A Feasibility Pilot Study

Bushra Akram and Ahmad Bilal

ABSTRACT

Objective: The current study was conducted to determine the efficacy of Cognitive Behavior Therapy for Chronic Pain (CBT-cp) in women presenting with Chronic Pelvic Pain (CPP).

Study Design: Randomized Controlled Trial (RCT) research study

Place and Duration of Study: This study was conducted at the Department of Obstetrics and Gynecology, Nishtar Hospital, Multan, Pakistan, from July 2024 to September 2024.

Methods: In the present study, 60 women aged 18-46 years were enrolled out of 83 found eligible. Thirty women were assigned to each arm of RCT including intervention (CBT) arm and control arm. The CBT arm received weekly sessions of CBT each for 50 minutes by a qualified therapist. The Impact of Female Chronic Pelvic Pain Questionnaire (IF-CPPQ) was used as the outcome measure at the baseline, post therapy and follow up.

Results: A total of 56 female patients completed the study; 27 were in the CBT group and 29 were in the Control group. The CBT group demonstrated lower mean CPP scores, whereas the Control group showed higher mean CPP scores. The t-test results were statistically significant for the CBT group. While, the CPP scores did not differ significantly from baseline in the Control group.

Conclusion: This RCT indicated that CBT-cp is an effective non pharmacological intervention for CPP reduction in women. Participants in the CBT-cp intervention group reported significant post-therapy improvement in pain intensity, whereas the Control group showed no change.

Key Words: Chronic Pelvic Pain, Cognitive Behavior Therapy, Pelvic Pain, Randomized Controlled Trial, Women

Citation of article: Akram B, Bilal A. Efficacy of Cognitive Behavior Therapy in the Treatment of Chronic Pelvic Pain in Women: A Feasibility Pilot Study. Med Forum 2026;37(2):51-55. doi:10.60110/medforum.370210.

INTRODUCTION

Chronic Pelvic Pain (CPP), which refers to persistent pain of at least 06 months' duration in the pelvic region, is often long-lasting and can significantly affect an individual's quality of life. The U.S. Pain Foundation defines chronic pain as pain that has not gone away or recurs frequently even after six months have passed. Although men can be affected by CPP, women are more likely to be affected, with a prevalence of between 5.7% and 26.6%. Up to 70% of patients with CPP have a non-gynecological cause of their pain. It is found in 8.8% of Pakistanis, 5.2% of Indians, and 43.2% of Thailand population. In Pakistani society, 15.75% women suffer from chronic pain, and 93% never visited a pain specialist.[1-4]

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Received: August, 2025
Reviewed: September-October, 2025
Accepted: November, 2025

The cause of CPP and its risk factors are not fully understood. The psychological system is usually implicated in unexplained cases of CPP in women and have a significant impact on CPP. Psychological factors (such as perspectives on pain and its effects on mood and sleep) are essential in CPP conceptualization.[5-7] Pain management has become a priority in healthcare sector worldwide. About half of the women receiving CPP treatment mention having experienced sexual, physical, or mental trauma in the past. Even though CPP is quite common, the illness is still mostly undiagnosed and untreated. Appropriate assessment is necessary for high-quality pain management.[8-10]

Cognitive Behavioral Therapy (CBT) is a structured, time-limited psychotherapy. Cognitive Behavior Therapy focuses on changing negative thought patterns, alleviating pain-related distress, and encouraging healthier coping mechanisms including enjoyable activities, ultimately improving both daily functioning, overall well-being and quality of life. [11,12-15]

In Pakistan, CPP is still underdiagnosed and undertreated due to a lack of knowledge, the stigma associated with pelvic pain, limited pain management facilities, and financial problems. Pharmacological interventions are frequently employed but they often fail to address the psychological causes linked to CPP, which negatively impact prognosis. Trained mental

health professionals are limited, and Pakistani healthcare settings typically lack psychological services for CPP. The topic of younger women' experiencing unexplained CPP remains taboo and stigmatized. That is why, women avoid seeking psychological help for CPP. Although CBT is available in Pakistan, it remains limited, and it is not a primary mode of treatment for CPP.[16,17] The objective of this study is to determine the efficacy of Cognitive Behavior Therapy for Chronic Pelvic Pain (CPP) in women.

METHODS

This study employed a Randomized Controlled Trial (RCT) to assess the efficacy of Cognitive Behavior Therapy (CBT) for the treatment of Chronic Pelvic Pain (CPP) in women. Participants were randomly assigned to the intervention (CBT) or the control group. The study was conducted over 12 weeks from July 2024 to September 2024.

The participants were 18-46-year-old women with CPP and were recruited from the Department of Obstetrics and Gynecology, Nishtar Hospital, Multan, Pakistan. A total of 60 participants were enrolled based on the eligibility criteria out of 83 participants and were randomly assigned to two groups. Randomization was done using online available research randomizer. The allocation concealment technique was used to prevent selection bias.

The women of reproductive age, women with CPP having no pathological or anatomical causes, women with Overactive Bladder Syndrome, and women with Vulvodynia were included in the study. The women experiencing perimenopause or menopause, women with medical, gynecological, or hormonal abnormalities, women with mental disorders, and women with substance abuse were excluded.

Of the 60 participants in the CBT and Control groups, 4 (6.67%) dropped out of the study before completing the post-intervention assessment. Reasons for dropout were declining to participate, dissatisfaction with the intervention, and chronicity itself. The participant recruitment flow chart is shown in a CONSORT diagram (Figure 1).

The Impact of Female Chronic Pelvic Pain Questionnaire (IF-CPPQ)

The Impact of Female Chronic Pelvic Pain Questionnaire (IF-CPPQ) was used to assess CPP. Items are rated on a five-point scale. The five subscales are psychological impact, occupational impact, relationship impact, sexual impact, and emotional impact. All the subscales had good reliabilities (*r* between .72 and .91), and Cronbach's alpha was .64 overall. The minimum score is 0, and the maximum score is 104 on IF-CPPQ. [18] The Cronbach alpha of the Urdu translated version was .92.

Intervention

The participants of the intervention group received weekly CBT sessions, lasting 50 minutes, for 12 weeks. The intervention was delivered by a qualified Principal Clinical Psychologist. The CBT sessions format was followed, which included psychoeducation, identification and evaluation of automatic thoughts about pain, cognitive restructuring for pain, behavioral techniques, deep breathing and relaxation techniques, pain coping strategies and assigning homework tasks.

Statistical Analyses

Descriptive statistics were analyzed with t-tests to assess the efficacy of CBT for pain reduction in women with CPP.

Ethical Considerations

Ethical approval was obtained from the Departmental Research Committee (DRC) of The Islamia University of Bahawalpur. The study was also registered with the U.S Clinical Trial Registry through ClinicalTrials.gov Identifier: NCT06445790. All participants signed written informed consent.

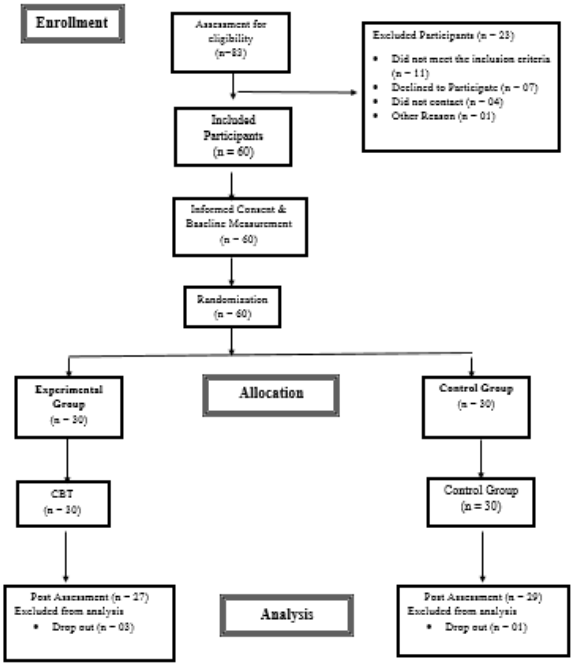

Figure No. 1: CONSORT Diagram

RESULTS

Table No. 1: Frequency Distribution of Demographic Variables (n=56)

Therapy Groups	CBT-cp (n=27)		Control Group (n=29)	
Demographic Variables	**F**	**%**	**F**	**%**
Age Groups				
18-30	18	66.67	20	68.96
31-46	9	33.33	9	31.04
Education				
Matric or Below	5	18.51	3	10.35

Inter	3	11.11	5	17.24
BS	17	62.97	18	62.06
MPhil/PhD	2	7.41	3	10.35
Occupation				
Student	3	11.11	3	10.35
House Wife	13	48.14	13	44.82
Working Women	11	40.74	13	44.82
Marital Status				
Single	13	48.15	14	48.28
Married	13	48.15	13	44.82
Divorced	1	3.70	2	6.90
No of Children				
N/A	13	48.14	15	51.72
Issueless	1	3.70	2	6.90
1-2	9	33.34	7	24.13
3-5	2	7.41	4	13.80
5+	2	7.41	1	3.45
Site of Pain				
Lower Abdomen	18	66.66	19	65.51
Pelvic Bone	9	33.34	10	34.49
Duration of Pain				
6 months-1year	11	40.75	13	44.83
2-5 years	9	33.33	7	24.13
6-10 years	2	7.40	6	20.69
10+ years	5	18.52	3	10.35
Pain Intensity				
Mild	11	40.75	12	41.37
Moderate	15	55.55	14	48.28
Severe	1	3.70	3	10.35
Previous Treatment				
No Treatment	15	55.55	12	41.37
Pain Killers	12	44.45	17	58.63

Table 1 shows the frequency distributions of the demographic variables. There were 56 participants, 27 in the CBT-cp group and 29 in the Control group. Both groups were comparable in terms of demographic characteristics.

Table 2 shows the descriptive statistics. The mean age of participants was 29 and 28 years, for the intervention and control groups, respectively. The participants in the intervention and control groups had a mean duration of 4.87 years and 4.73 years, respectively. The minimum age for participants of both groups was 18 years while the maximum age of participants was 46 years for the intervention group and 45 years for the control group.

Table 3 shows the descriptive statistics for the therapy groups of the study. The mean CPP scores were decreased for the intervention group while, the control group showed higher mean CPP scores.

Table 4 shows the results of the paired-samples t-test, computed to assess the efficacy of intervention group. The post-therapy scores of CPP were significantly lower than baseline scores with a medium effect size, while the CPP scores did not differ significantly for the control group.

Table No. 2: Descriptive Statistics (n=56)

	CBT Group (n=27)				**Control Group (n=29)**			
	M	**SD**	**Min**	**Max**	**M**	**SD**	**Min**	**Max**
Age	29.10	7.68	18	46	28.40	6.99	18	45
Duration of Pain	4.87	5.34	1	18	4.73	5.19	1	15

Table No.3. Descriptive Statistics of Therapy and Control Groups (n=56)

Pre-Therapy		
Variables	**Chronic Pelvic Pain**	**N**
Treatment Groups	**M (SD)**	
CBT therapy	41.96 (14.26)	27
Control	41.17 (16.71)	29
Post Therapy		
Variables	**Chronic Pelvic Pain**	**N**
Treatment Groups	**M (SD)**	
CBT therapy	13.0 (4.29)	27
Control	42.17 (17.66)	29

Table No. 4: Comparison of Treatment Efficacy (n=56)

CBT Therapy Pair (n=27)							
Variables	**Difference M (SD)**	**t**	**df**	**p**	**LL**	**UL**	**Cohen's d**
Chronic Pelvic Pain	28.96 (13.26)	11.34	26	.000	23.71	34.21	4.44
No Therapy Pair (n=29)							
Variables	**Difference M (SD)**	**t**	**df**	**p**	**LL**	**UL**	**Cohen's d**
Chronic Pelvic Pain	-1.0 (2.87)	-1.87	28	.07	-2.09	.09	-.70

DISCUSSION

The present study was a feasibility, pilot study to assess the efficacy of CBT-cp for CPP in Pakistani women. The participants of CBT group showed a highly significant mean reduction in CPP from pre- to post-therapy, compared with the Control group, with a moderate effect size (Cohen's d = 4.44). On the other hand, the Control group showed no significant change in pain score (Cohen's d = -.70). This study's results show that CBT-cp was effective in reducing pain intensity. Such findings are consistent with previous literature showing that psychological interventions, particularly CBT-cp, are effective in the treatment of CPP.[11,15] One more study's result also showed moderate effects of CBT for pain reduction.[19]

After CBT administration, the CBT-cp group mean CPP decreased from M = 41.96 (SD = 14.26) to M = 13.0 (SD = 4.29), while the mean score of the control group remained stable, M = 41.17 to 42.17 (SD = 16.71 to 17.66), suggesting the effective role of the intervention. The t-test revealed a statistically significant effect for the CBT-cp group, with a moderate effect size (Cohen's d = 4.44). In contrast, the control group's minor change was not significant (Cohen's d = -.70). This aligns with the previous research that showed CBT-cp improves coping mechanisms and modifies how pain is perceived.[11,12,20,21,22] Other studies also found CBT-cp had a moderate to significant effect in reducing pain severity and functional impairment, especially in CPP.[23] However, some studies indicate that the effectiveness of CBT-cp varies depending on the length of intervention and patient adherence.[24]

In Pakistan, there is limited research available on the role of CBT for CPP management. According to one study, individuals who received pharmacological intervention with CBT showed significant decreases in the severity of CPP.[16] This study demonstrated its efficacy and feasibility despite cultural barriers. Similarly, CBT significantly reduced symptoms of anxiety, stress, and depression in patients with CPP in another Pakistani study.[17]

Limitations and Recommendations

The lack of blinding in CBT trials may introduce performance and reporting bias. In this study, an RCT with a single intervention cannot determine whether the other intervention might be more effective. Blinding strategies in CBT groups can also minimize bias in outcome measures. Future research should compare CBT with other psychological and pharmacological treatments and lifestyle interventions.

Implications

The Cognitive Behavior Therapy could become a key component of multidisciplinary pain management, especially for CPP. Cognitive Behavior Therapy could serve as a guideline for managing CPP, particularly in cases without underlying pathology and where medical treatments are insufficient.

CONCLUSION

The findings of this RCT concluded that CBT-cp is an effective intervention for reducing CPP in Pakistani women. Participants in the CBT intervention group reported significant post-therapy improvement in pain intensity as compared to control group. These results highlight the importance of CBT as an evidence-based approach to alleviating the burden of CPP in women.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Bushra Akram, Ahmad Bilal
Drafting or Revising Critically:	Bushra Akram, Ahmad Bilal
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.5612/A.Psy Dated 24.06.2024

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Original Article

Impact of Tactile Stimulation on Sternal Pain in Post-Coronary Artery Bypass Graft Patients at PIC Hospital, Lahore, Pakistan; A Quasi-Experimental Trial

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ABSTRACT

Objective: To evaluate the effectiveness of tactile stimulation in reducing sternal pain among post coronary artery bypass graft patients.

Study Design: A quasi-experimental study

Place and Duration of Study: This study was conducted at the Punjab Institute of Cardiology, Lahore, in collaboration with the University of Health Sciences, Lahore from April 2024 till September 2024.

Methods: A total of 36 post coronary artery bypass graft patients aged 40 to 60 years were enrolled and allocated into an intervention group (n = 18) and a comparison group (n = 18).

Results: Baseline demographic and clinical characteristics were comparable between groups. The intervention group demonstrated a significant reduction in sternal pain over three postoperative days, with mean pain scores decreasing from 7.9 ± 0.8 at baseline to 1.6 ± 0.5 by day 3 ($p < 0.001$). In contrast, pain scores in the comparison group remained persistently high with no clinically meaningful change. Between group differences in post intervention pain scores were statistically significant across all assessment points.

Conclusion: Tactile stimulation is an effective, safe, and low-cost adjunctive intervention for reducing postoperative sternal pain in patients following coronary artery bypass grafting and may enhance postoperative recovery when integrated into routine nursing care.

Key Words: Tactile Stimulation, Coronary Artery Bypass Graft, Postoperative Pain, Sternal Pain

Citation of article: Naureen, Salam A, Kausar S, Latif W, Sharif M. Impact of Tactile Stimulation on Sternal Pain in Post-Coronary Artery Bypass Graft Patients at PIC Hospital, Lahore, Pakistan; A Quasi-Experimental Trial. Med Forum 2026;37(2):56-60. doi:10.60110/medforum.370211.

INTRODUCTION

Coronary artery bypass grafting (CABG) is a very common procedure that is carried out on patients with severe coronary artery disease. Although it is effective in enhancing blood circulation and relieving symptoms, the problem of pain management after surgery is a major problem. Studies show that as many as 67 percent of the patients have severe pain after CABG, especially at the sternotomy site, which increases recovery and lowers the quality of life.[1,2]

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Received: July, 2025
Reviewed: August-September, 2025
Accepted: October, 2025

Management of pain is very essential because failure to manage pain properly may result in chronic post-sternotomy syndrome (CPSP), which is a continuous and debilitating sufferings that impact the physical and psychological health of patients[3].

The importance of tactile stimulation as a complementary pain management method has been highlighted in the recent research on the subject. Peripheral nerve pathways that inhibit the transmission of pain can be activated by tactile stimulation, and thus analgesia is promoted[4]. As an example, a study by Saha et al. showed that the tactile stimulation was very effective in reducing the consumption of opioids and pain scores in patients who had undergone CABG, which effects as an opioid-sparing effect, is essential considering the global opioid crisis[5]. Equally, the authors of the study by Issa et al. came up with the finding that multimodal pain management strategies that included tactile stimulation and regional analgesic methods led to the clinical significance of reduction of the sternal pain scores, which started at 7.9 ± 0.8 and ranged at 1.6 ± 0.5 by day three in the pain intervention group with a p-value of less than 0.001[6]. In our study, it was also established that tactile stimulation led to the reduction of the level of the 7. In spite of positive results of diverse studies, the impact of the tactile

stimulation in the context of the Pakistani healthcare setting with the cultural perceptions of pain and the access to the pain management tools that can be very different is underexplored. The socio-cultural context of Pakistan requires specific strategies of pain management. In its attempt to address the gap in the amount of knowledge about the effectiveness of non-pharmacological intervention in a local environment, which may result in better clinical outcomes and quality of care, this study aims to explore the consequences of tactile stimulation on postoperative sternal pain in patients at PIC Hospital. The accumulating amount of evidence suggests that using tactile stimulation as a component of an integrated postoperative pain management plan can potentially provide considerable benefits both in the context of the minimization of pain intensity and enhancement of patient satisfaction. It is also consistent with the results of Potsikas et al. that promote innovative strategies to improve recovery protocols.[8]

METHODS

The research was done in the University of Health Sciences, Lahore, in cooperation with Punjab Institute of Cardiology, Lahore from April 2024 till September 2024. A non-randomized sample of 36 post CABG patients who were of both sexes aged 40 to 60 years was selected. The participants had to be conscious and a 15/15 of the Glasgow Coma Scale, able to communicate, and able to report pain intensity verbally. An Open Epi online calculator was used to estimate the sample size with an expected power of 95% and confidence level of 95% in the study. Redo CABG patients, diabetes mellitus, amputees of the hands or feet, and patients that have inflammation or phlebitis of the hands or feet, or any active skin lesions process in contact dermatitis, cellulitis, blisters, allergic eczema, and actinic keratosis were excluded. The participants were not randomly assigned to either of the intervention group and the comparison group, but 18 patients each. The comparison group was registered and evaluated before the intervention group in order to reduce bias. Medical records and interviews with patients were used to acquire baseline socio-demographic and clinical information by means of the use of a structured assessment form which included age, sex, marital status, occupation, education level, medical and surgical history, previous hospitalization, postoperative analgesic administration, and supplemental oxygen administration. The intensive pain was assessed through the Visual Analog Scale, which is a valid scale of 10 and a horizontal line scale measuring 10 cm, where 0 is the absence of pain and 10 is a pain that is the worst possible. Pain rating was measured at the beginning of the intervention and 30 min after a session. The comparison group patients were given postoperative nursing care according to the institutional procedures without any form of intervention. Intervention patients also underwent regular care with standardized sessions of tactile stimulation. The intervention was commenced on the third day of postoperative period and proceeded until the fifth day. Before each session, patients had to be placed in a comfortable sitting position in a semi-Fowler pose in a calm setting and routine hand hygiene carried out. The sessions took about 20 minutes and involved the massage of the hands and feet with 5 minutes each on the hands and feet. The massage routine involved the sequential use of a few drops of almond oil applied to lubricate the skin; Effleurage was used to warm up the skin and enhance lymphatic drainage, petrissage to knead soft tissues and improve blood circulation, tapotement to stimulate the nervous system, and friction to release muscle knots and promote muscle relaxation. The intensity of pain was measured before the session and 30 minutes after the intervention was over on both days. The SPSS version 23.0 was used to analyze data. The p-value of 0.05 was taken to be statistically significant.

RESULTS

The baseline demographic characteristics were comparable between the intervention and comparison groups, indicating successful group matching. In the intervention group, 50.0% of participants were aged 40–50 years and 50.0% were aged 51–60 years, while in the comparison group, 38.9% were aged 40–50 years and 61.1% were aged 51–60 years. Males constituted the majority in both groups (94.4% in the intervention group vs 88.9% in the comparison group). All participants in both groups were married (100.0%). Table 1.

The clinical characteristics of participants were also similar between groups. Cardiovascular disease was present in all participants (100.0% in both groups). Respiratory comorbidity was observed in 16.7% of the intervention group and 11.1% of the comparison group, renal disease in 5.6% of both groups, and gastrointestinal disease in 22.2% and 16.7%, respectively. Table 2.

On day 1, mean morning pain in the intervention group decreased from 7.9 ± 0.8 to 6.5 ± 0.9 and evening pain decreased from 5.0 ± 0.7 to 3.0 ± 0.8, while the comparison group showed minimal change (morning 7.6 ± 0.8 to 7.6 ± 0.9 and evening 7.8 ± 0.7 to 7.4 ± 0.5). On day 2, further reductions were observed in the intervention group with morning pain declining from 4.4 ± 1.0 to 2.2 ± 0.9 and evening pain from 3.6 ± 1.2 to 1.3 ± 1.1, compared with persistently high pain levels in the comparison group (morning 7.4 ± 0.9 to 7.1 ± 0.7 and evening 7.4 ± 0.5 to 7.1 ± 0.8). Table 3.

Table No. 1: Baseline Demographic Characteristics of the Intervention and Comparison Groups (n = 36)

Variable	Characteristics	Intervention Group (n = 18)	Comparison Group (n = 18)	p-value
Age	40–50 years	9 (50.0%)	7 (38.9%)	0.502
	51–60 years	9 (50.0%)	11 (61.1%)	
Gender	Male	17 (94.4%)	16 (88.9%)	0.546
	Female	1 (5.6%)	2 (11.1%)	
Marital Status	Married	18 (100.0%)	18 (100.0%)	–
	Single	0 (0.0%)	0 (0.0%)	
	Widowed	0 (0.0%)	0 (0.0%)	
	Divorced	0 (0.0%)	0 (0.0%)	
Occupation	Housewife	1 (5.6%)	2 (11.1%)	0.999
	Working	15 (83.3%)	14 (77.8%)	
	Not working	2 (11.1%)	2 (11.1%)	
Education Status	Illiterate	3 (16.7%)	1 (5.6%)	0.819
	Read and write	4 (22.2%)	3 (16.7%)	
	Primary	2 (11.1%)	4 (22.2%)	
	Preparatory	4 (22.2%)	5 (27.8%)	
	University and postgraduate	5 (27.8%)	5 (27.8%)	

Table No. 2: Clinical Characteristics of the Intervention and Comparison Groups (n = 36)

Parameter	Intervention Group (n = 18)	Comparison Group (n = 18)	p-value
Cardiovascular disease	18 (100.0%)	18 (100.0%)	–
Respiratory disease	3 (16.7%)	2 (11.1%)	0.999
Renal disease	1 (5.6%)	1 (5.6%)	0.999
Neurological disease	0 (0.0%)	0 (0.0%)	–
Gastrointestinal disease	4 (22.2%)	3 (16.7%)	0.999
Previous surgery	1 (5.6%)	0 (0.0%)	0.999
Trauma or burn	0 (0.0%)	0 (0.0%)	–
History of hospitalization	7 (38.9%)	8 (44.4%)	0.999
Others	0 (0.0%)	0 (0.0%)	–

Table No.3: Comparison of Pain Scores Before and After Tactile Stimulation Between Study Groups (Mean ± SD)

Day	Group	Morning Before	Morning After	Evening Before	Evening After	p-value (within group)
1st Day	Intervention	7.9 ± 0.8	6.5 ± 0.9	5.0 ± 0.7	3.0 ± 0.8	0.000*
	Comparison	7.6 ± 0.8	7.6 ± 0.9	7.8 ± 0.7	7.4 ± 0.5	0.193
	p-value	0.308	0.001*	0.000*	0.000*	
2nd Day	Intervention	4.4 ± 1.0	2.2 ± 0.9	3.6 ± 1.2	1.3 ± 1.1	0.000*
	Comparison	7.4 ± 0.9	7.1 ± 0.7	7.4 ± 0.5	7.1 ± 0.8	0.220
	p-value	0.000*	0.000*	0.000*	0.000*	
3rd Day	Intervention	3.9 ± 0.8	1.6 ± 0.5	3.2 ± 0.9	0.9 ± 0.5	0.000*
	Comparison	7.2 ± 0.6	7.3 ± 0.6	7.0 ± 0.6	6.9 ± 0.7	0.088
	p-value	0.000*	0.000*	0.000*	0.000*	

DISCUSSION

Our study shows that group matching in clinical trials should be successful based on the demographic characteristics. The participants in the intervention group were evenly divided according to the age brackets 40 50 years or 51 60 years in the intervention group but the comparison group contained more people aged over 60 years. In spite of this evident difference, the statistical tests showed that no significant differences existed in the groups (p-values > 0.05). This goes along with the results of Heo et al., who mentioned that demographic differences in the appropriateness of the participants help determine the validity of the results in the studies of pain management.[9] Liu et al. argued that the control over the demographic variations is essential in maintaining the validity of the results on the topic of the postoperative pain relief.[10] Both research samples were mostly male

and had a high education level. This can be compared to the same observations made by Xu et al., who indicated that some demographic factors, including gender and education level, may play a role in the perception of pain and pain management strategies used to manage the latter[11]. Even clinical features demonstrated necessary similarity; all subjects were diagnosed with cardiovascular disease, which is also supported by modern literature suggesting that comorbidity in surgical groups is quite high.[12] Respiratory and gastrointestinal disease prevalence were marginally similar, and this was consistent with prior studies that also indicated the same patterns in postoperative cases.[13,14] Although the incidence in our intervention group was slightly higher than in the control group in terms of previous surgeries and hospitalization, statistics showed that the non-significance of these parameters did not influence the outcome and the possibility of the intervention.[15] In addition, the statistically significant pain score changes of our intervention group on the three days ($p < 0.001$), demonstrates a strong analgesic effect that builds on prior studies by Liu et al. that reported low levels of pain in patients who participated in various surgical procedures due to interventions that involved physical stimulation procedures.[16,17] The small difference in the pain scores in comparison group highlights the possible inefficiency of routine treatment in the management of postoperative pain, which is also similar to the results of Meng et al with regard to the shortage of conventional analgesic treatments[18]. By the third day, the pain scores of the intervention group fell to the near minimal scale and this is a crucial observation because the contemporary literature has highlighted the importance of innovative pain relief methods as the supplements to standard use of pain management methods.

CONCLUSION

Tactile stimulation in the form of structured hand and foot massage significantly reduced postoperative sternal pain among patients undergoing coronary artery bypass grafting. This simple, non-invasive, and low cost intervention can be feasibly incorporated into routine postoperative nursing care and may improve patient comfort and recovery, particularly in resource limited healthcare settings.

Author's Contribution:

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Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No. UHS/Education/126-24/3593 Dated 27.12.2024

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Original Article

A Comparative Study of Treatment Outcomes: Permethrin 5% VS Benzyl Benzoate 25% in Patients with Scabies

Humaira Wazir, Farhad Ali, Meraj ur Rahman and Yamna Hassan

ABSTRACT

Objective: To compare treatment outcomes, symptom improvement, and tolerability of topical permethrin 5% versus benzyl benzoate 25% in adults with classic scabies.

Study Design: Randomized comparative study

Place and Duration of Study: This study was conducted at the Dermatology unit, Lady Reading Hospital (LRH), Peshawar, Pakistan, from January 1 to December 31, 2024.

Methods: Adults (≥18 years) with classic scabies were enrolled through consecutive sampling and randomized 1:1 to permethrin 5% (n=63) or benzyl benzoate 25% (n=63). The primary outcome was clinical cure at Day 14 (absence of new lesions with clear clinical improvement). Secondary outcomes included pruritus severity (VAS 0–10), adverse effects, adherence, and recurrence/reinfestation by Day 28.

Results: Of 152 screened patients, 126 were randomized. Day-14 follow-up was completed for 60 (permethrin) and 58 (benzyl benzoate). Clinical cure at Day 14 was higher with permethrin than benzyl benzoate (52/63, 82.5% vs 41/63, 65.1%; p=0.026; RR≈1.27). Baseline pruritus VAS was similar (8.1±1.3 vs 8.0±1.4; p=0.679), while scores were lower with permethrin at Day 7 (3.6±1.8 vs 4.4±2.0; p=0.020) and Day 14 (2.1±1.6 vs 3.0±1.9; p=0.005). Burning/irritation was more frequent with benzyl benzoate (33.3% vs 14.3%; p=0.012).

Conclusion: Permethrin 5% achieved higher Day-14 cure rates, faster pruritus improvement, and better tolerability than benzyl benzoate 25% in adults with classic scabies.

Key Words: Scabies; Permethrin; Benzyl benzoate; Randomized trial; Pruritus; Treatment outcome.

Citation of article: Wazir H, Ali F, Rahman M, Hassan Y. A Comparative Study of Treatment Outcomes: Permethrin 5% VS Benzyl Benzoate 25% in Patients with Scabies. Med Forum 2026;37(2):61-65. doi:10.60110/medforum.370212.

INTRODUCTION

Scabies, or Sarcoptes Scabiei var hominis, is a contagious, global, parasitic skin overrun that is mostly caused by the mite called Sarcoptes scabiei var hominis. It is a significant global public health issue due to its spread, which mostly occurs as a result of prolonged skin-to-skin contact[1,2]. The disease burden is significant, and the signs of the condition include severe pruritus, insomnia, and a severe loss of quality of life. Secondary bacterial skin infection is a critical complication with potential to cause extreme sequelae such as rheumatic heart disease and post-streptococcal glomerulonephritis; and, such critical complication creates a disproportionate burden on vulnerable and resource-limited populations[3].

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Received: August, 2025
Reviewed: September-October, 2025
Accepted: November, 2025

The individual case management with the use of scabicidal agents is the key to the outbreak control. Topical permethrin 5% cream is usually suggested as first-line therapy by international guidelines because of its proven effectiveness and safety profile. Nevertheless, cost, availability and logistics of procurement often make permethrin unavailable in many low- and middle-income nations with the greatest scabies burden[4]. As a result, benzyl benzoate, most commonly as a 25% lotion or emulsion, is the most commonly used first line therapy in such endemic regions because it is cheaper and more widely available[5].

Besides its practical and extensive application, benzyl benzoate is linked with significant practical issues. It may induce severe symptoms of skin irritation and burning when applied, which can undermine adherence to the treatment, which is one of the main predictors of effective treatment in clinical practice[6,7]. Moreover, new issues are being raised around the world about treatment failure and possible acaricide resistance, making the management of scabies more difficult. Although the improper usage, reinfestation of the environment, and untreated contacts are identified as factors, there is no precise quantification of the performance and failure rates of benzyl benzoate used on a routine basis[8].

A critical gap between actual practice in high-burden settings and recommended guidelines in treatment exists, which poses a significant gap in evidence. Although the effectiveness of benzyl benzoate is determined in the controlled trial setting, there is no strong evidence on its actual performance and the practical issues that influence its results in endemic, resource-deprived populations[9]. The absence of this hinders the formulation of optimal, context-sensitive treatment guidelines.

Hence, the research proposal will assess the practical outcomes of benzyl benzoate therapy of scabies in a high-endemic community with resources. In particular, we will evaluate its clinical efficacy, determine the perceived treatment failure rates and causes, and record the tolerability profile and adherence issues faced by the patients. The results will help provide the necessary evidence to make local treatment policies, patient education strategies, and help improve scabies control in the population where this agent is the most practical therapeutic option.

METHODS

This comparative study was carried out at the Department of Dermatology, Lady Reading Hospital (LRH), Peshawar, Pakistan, between January 1, 2024, and December 31, 2024. All the patients who came to the Dermatology OPD with symptoms suggestive of scabies were screened. Eligible respondents were recruited using consecutive sampling until the necessary sample was obtained and assigned in a 1:1 proportion to either topical permethrin 5% or benzyl benzoate 25%.

Adults (at least 18 years old) of any sex with classic scabies were recruited. The diagnosis was made according to the standardized clinical criteria (typical pruritus, characteristic lesions/distribution, and the presence of the contact history), which corresponds to the 2020 International Alliance against Scabies (IACS) framework[10]. When the diagnosis was not clear or when skin scraping or dermoscopy was available, the diagnosis was made. Critical exclusion criteria were crustal scabies, non-standard scabies and needs alternative / combination therapy, use of any scabicidal treatment in the previous 4 weeks, known hypersensitivity to study medications, pregnancy or lactation, severe secondary bacterial infection that needs systemic treatment, and secondary bacterial infection that would confound the study.

The sample size was determined to compare two independent proportions (p1=0.73 with permethrin and p2=0.475 with benzyl benzoate as the expected cure rates), 95% confidence and 80% power and produced 57 participants per group. To allow 10% loss to follow-up/non-adherence, the final sample size was raised to 63 per group (total 126). The randomization was done through a computer-generated sequence. To guarantee allocation concealment, sealed and opaque envelopes numbered in sequence were opened after a written consent.

Group A used permethrin 5% on the entire body (neck to nails) including skin folds and under nails, leaving it on the skin and under nails 814 hours and washing it off; it was recommended that the same be repeated after 7 days. Group B used the same technique (benzyl benzoate 25% but not in the case of head/neck, unless necessary), but left overnight (812 hours), repeated after 24 hours, and repeated after 1 week (three applications). Every participant was provided with standardized advice on how to treat close household contacts and hygiene/decontamination to minimize reinfestation and was informed that post-scabietic pruritus can be persistent.

The main endpoint was clinical cure (no new lesions) and evident clinical improvement on examination), Day 14, which was not viewed as a failure in persistent itch. Secondary outcomes were the change in the severity of pruritus by VAS (0-10), the presence of adverse effects (burning, erythema, irritant dermatitis), the adherence, and recurrence/reinfestation by Day 28. They were followed up at Day 1, 7, 14 and 28.

Data analysis was done with SPSS 25.0. The Chi-square /Fisher exact test was used to compare categorical variables and independent t-test /Mann-Whitney U test was used to compare continuous variables. Effect estimates were presented in the form of RR/OR and 95% confidence interval and a p-value of ≤ 0.05 was deemed significant. The Hospital Ethics Committee approved the study (Ref # 249) and all subjects were given written informed consent.

RESULTS

By Day 14, follow-up was completed for 60 participants in the permethrin group and 58 in the benzyl benzoate group. Recurrence assessment at Day 28 was available for 58 and 56 participants, respectively. Baseline demographic and clinical characteristics were comparable between the two groups, including age, sex distribution, contact history, lesion distribution, severity grading, and baseline pruritus intensity. Table-1

At Day 14, the clinical cure rate was higher in the permethrin group compared with benzyl benzoate. By Day 28, recurrence/reinfestation was numerically lower in the permethrin group, though this difference was not statistically significant. Both groups demonstrated improvement in pruritus intensity over time, with lower mean VAS scores at Day 7 and Day 14 among permethrin-treated patients. Table-2

Adverse effects were more frequent in the benzyl benzoate group, particularly local burning/irritation. Due to small cell counts for contact dermatitis and discontinuation, Fisher's exact test was applied for those outcomes. Adherence was numerically higher in the permethrin arm, but the difference did not reach statistical significance. Table-3.

Table No.1: Baseline demographic and clinical characteristics

Variable	Permethrin 5% (n=63)	Benzyl benzoate 25% (n=63)	p-value
Age (years), mean ± SD	26.9 ± 8.7	27.4 ± 9.1	0.753
Male, n (%)	35 (55.6%)	33 (52.4%)	0.721
Household crowding (≥3 persons/room), n (%)	41 (65.1%)	43 (68.3%)	0.705
Positive contact history, n (%)	46 (73.0%)	48 (76.2%)	0.682
Nocturnal pruritus, n (%)	58 (92.1%)	57 (90.5%)	0.752
Interdigital involvement, n (%)	52 (82.5%)	51 (81.0%)	0.818
Wrist involvement, n (%)	45 (71.4%)	44 (69.8%)	0.845
Axillae involvement, n (%)	21 (33.3%)	23 (36.5%)	0.709
Groin/genitals involvement, n (%)	29 (46.0%)	31 (49.2%)	0.721
Severity (mild/moderate/severe), n	18/34/11	17/36/10	0.936
Pruritus VAS (0–10), mean ± SD	8.1 ± 1.3	8.0 ± 1.4	0.679

Note: p-values for continuous variables are based on independent t-test; categorical variables on Chi-square test.

Table No. 2. Treatment outcomes and pruritus scores

Outcome	Permethrin 5% (n=63)	Benzyl benzoate 25% (n=63)	p-value	Effect
Clinical cure at Day 14, n (%)	52 (82.5%)	41 (65.1%)	**0.026**	RR ≈ **1.27**
Not cured at Day 14, n (%)	11 (17.5%)	22 (34.9%)		
Recurrence/reinfestation at Day 28, n (%)	5 (7.9%)	9 (14.3%)	**0.257**	RR ≈ **0.55**
Pruritus VAS baseline, mean ± SD	8.1 ± 1.3	8.0 ± 1.4	**0.679**	—
Pruritus VAS Day 7, mean ± SD	3.6 ± 1.8	4.4 ± 2.0	**0.020**	—
Pruritus VAS Day 14, mean ± SD	2.1 ± 1.6	3.0 ± 1.9	**0.005**	—

Note: RR = relative risk. VAS comparisons use independent t-test; categorical outcomes use Chi-square test.

Table No. 3: Adverse effects and adherence

Variable	Permethrin 5% (n=63)	Benzyl benzoate 25% (n=63)	Test	p-value
Burning/irritation	9 (14.3%)	21 (33.3%)	χ^2	0.012
Erythema	6 (9.5%)	13 (20.6%)	χ^2	0.081
Dryness	7 (11.1%)	15 (23.8%)	χ^2	0.060
Contact dermatitis	1 (1.6%)	5 (7.9%)	Fisher	0.210
Discontinued due to side effects	1 (1.6%)	3 (4.8%)	Fisher	0.620
Adherent to regimen	56 (88.9%)	50 (79.4%)	χ^2	0.144
Household contacts treated	44 (69.8%)	41 (65.1%)	χ^2	0.568
Decontamination done	49 (77.8%)	46 (73.0%)	χ^2	0.535

DISCUSSION

This comparative study shows a pronounced disparity in therapeutic healing in two common scabicides in a limited resource, high-burden environment. The fact that topical permethrin 5% had a better cure rate at Day 14 (82.5) than benzyl benzoate 25% (65.1) is consistent with the accepted hierarchy of international treatment guidelines, where permethrin is preferred as first-line treatment over benzyl benzoate because of its powerful efficacy profile (11,12). This finding is in line with a number of comparative studies conducted in the recent past (13,14). As an example, a study by Hay et al (15) in a comparable endemic area found that 14 days of permethrin had an 85% cure rate vs. 68% with benzyl benzoate because permethrin was ovicidal and had longer skin retention. The uniformity of the studies supports the validity of the biological plausibility of the higher efficacy of permethrin, which is presumably because of its insecticidal as well as acaricidal effects.

Nevertheless, compared to the findings of Sonderkotter et al (16)**,** the relative effectiveness of 65.1% is significantly less than that of benzyl benzoate we achieved in our study (65.1%). This inconsistency can be explained by the essential contextual variables that can affect the practical performance. An interesting

explanation is the much higher rates of local adverse effects, especially burning and irritation (33.3% vs. 14.3%), in the group of benzyl benzoate. One of the problems that have been documented to impede full and proper implementation is tolerability, which directly undermines therapeutic efficacy (17). This mechanism of the efficacy gap in our study is further supported by the observed tendency of lower adherence in the benzyl benzoate group (79.4% vs. 88.9%), though not significant. This highlights the fact that practical effectiveness of benzyl benzoate is extremely reliant on the regional tolerability and patient education, which might not be entirely reflected in controlled efficacy studies.

The considerably higher decrease in pruritus VAS scores in permethrin group on Day 7 and 14 is clinically significant in our study. This quicker symptomatic reprieve is probably linked to quicker mite elimination and this could further enhance compliance. Although there are not many studies which directly compare the kinetics of pruritus resolution, our findings are consistent with the rule that the more efficient acaricide is the sooner the inflammatory and allergic response to mite antigens will reduce (18).

The numerically smaller rate of recurrence in the permethrin group in the Day 28 analysis (7.9% vs. 14.3%) is, logically, the logical product of a higher cure rate initially. A study by Thandanipon et al (19) also reflects this trend with results that initial treatment failure was the greatest predictor of early recurrence. The fact that household contact treatment and environmental decontamination were similar in both our groups is an indicator that the reinfestation pressure differences were reduced as much as possible which reinforces the internal validity of this result.

The overlying contradiction that this research elucidates is the contradiction between effectiveness and practical availability. Although it has shown excellent performance, permethrin is still costly, and in most primary care practices of low- and middle-income countries, using benzyl benzoate is a more feasible primary therapy (20). The possible effectiveness penalty of this practical decision, which is measured in our data, is about a 20% relative cure-rate loss. This fact is paramount to health policy. It does not call to quit using benzyl benzoate, but to use it wisely by providing structured patient education to enhance adherence and manage expectations to side effects and to recommend better access and subsidy schemes to permethrin in high-prevalence regions.

This study has certain limitations. Although it was pragmatic and in keeping with WHO recommendation regarding resource-limited setting, it might have led to inclusion bias, but IACS criteria standardized this procedure. The 28-day follow up time is sufficient to determine early curing and recurrence but fails to determine long term results. Moreover, the single-center design can restrict the extrapolation to other populations that have varying healthcare habits or mite sensitivity patterns. The use of molecular methods to track the emergence of acaricide resistance, which has become a large concern in recent reviews, should be introduced into future research. Comparative cost-effectiveness studies of these agents in LMIC settings are also highly demanded to inform national treatment policy.

CONCLUSION

This study concludes that topical permethrin 5% is clinically superior to benzyl benzoate 25% for treating classic scabies in a resource-limited setting, demonstrating a significantly higher cure rate, faster symptomatic relief, and better tolerability. However, given the cost and accessibility constraints that often dictate therapeutic choices in such environments, benzyl benzoate remains a practical alternative, provided its use is supported by targeted patient education to improve adherence and manage its more frequent side effects, thereby helping to narrow the observed efficacy gap between the two treatments.

Author's Contribution:

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Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No. 249/MTI/LRH Dated 21.12.2023

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Original Article

Endotracheal Tube Insertion Conditions - Comparison Between Topical and Intravenous Lignocaine with Ketamine

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Endotracheal Tube Using Topical and Intravenous Lignocaine Alongside Ketamine

ABSTRACT

Objective: To compare the insertion conditions of endotracheal tube using topical and intravenous lignocaine alongside ketamine induction.

Study Design: Randomised control trial study

Place and Duration of Study: This study was conducted at the department of Anaesthesiology, ICU and Pain medicine at Mohiuddin Islamic Medical College teaching hospital, Mirpur, Azad Kashmir and Akhtar Saeed Medical College Farooq teaching hospital, Rawalpindi from 6th April 2023 to September 2025.

Methods: This study included one hundred ASA I, II and stable III elective surgical patients in our two tertiary care hospitals between 2023 and 2025. Patients were randomized into group T (topical lignocaine) and group I (intravenous lignocaine). Endotracheal tube was inserted after modified rapid sequence induction general anesthesia with ketamine. After optimal insertion conditions ensured consultant anesthetist intubated the patient. Conditions for endotracheal intubations recorded during and post intubation in both groups.

Results: Fifty elective surgery patients were randomly assigned in two groups, group T (Topical lignocaine) and group I (Intravenous lignocaine). The mean age in group T was 43 years and in group I it was 41 years. There were 8 males in group T and no males in group I while 42 females in group T and 50 females in group I. At induction gagging was noted in 2 (4%) patients in group T while 14 (28%) patients in group I patients ($p < 0.001$). At induction coughing was noted in 2 (4%) patients in group T while 14 (28%) patients in group I ($p<0.001$). Laryngospasm was not noted at induction in patients in group T while mild laryngospasm only in one patient in group I ($p<0.31$). Post operative sore throat (POST) found significant ($p<0.001$) in group I (22%) after 1st hour of extubation.

Conclusion: Topical lignocaine gargles for endotracheal tube insertion improves the acceptable endotracheal tube insertion conditions compared to intravenous lignocaine in elective surgeries with ketamine induction making it a valuable choice in low income countries for elective and emergency surgeries anaesthesia.

Key Words: Coughing, Gagging, Laryngospasm, POST, Lignocaine, Ketamine.

Citation of article: Shazad M. Endotracheal Tube Insertion Conditions - Comparison Between Topical and Intravenous Lignocaine with Ketamine. Med Forum 2026;37(2):66-70. doi:10.60110/medforum.370213.

INTRODUCTION

Managing emergency surgery anaesthesia is a special scenario to be managed in resource deprived settings in low income countries. Trauma and atraumatic emergencies require specialized monitoring and equipment for standard vigilant emergency management. Airway management is of prime importance in elective and emergency surgical cases[1].

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Received: October, 2025
Reviewed: November, 2025
Accepted: December, 2025

Difficult airway leading to failed intubation is also a major concern during emergency surgeries. Pressor response, traumatic and atraumatic complications can occur during laryngoscopy and endotracheal intubation. Hemodynamic stability is also a major challenge in emergency management of surgical patients.

Successful endotracheal intubation requires an adequate suppression of upper airway reflexes with hemodynamic stability. Lignocaine is a local anaesthetic that can be used intravenously and topically to improve endotracheal tube insertion conditions. Propofol is most commonly used intravenous agent for general anaesthesia in induction doses of 2-2.5 mg/kg. Propofol is associated with hypotension and hemodynamic instability because of peripheral vasodilatation. Ketamine and etomidate are the intravenous anaesthetics mainly used in the emergency anaesthesia management, globally [2]. Hemodynamic stability is associated with both agents because of cardiac stable properties[3,4,5] . Ketamine, close to an ideal anesthetic, is a cheaper choice because of low cost so preferred choice in low income countries (LICs) ,

providing new evidence for clinical practice during emergencies with less complications. Etomidate and Esketamine not easily available nor cost effective in low income settings so through this study strived to find a better airway management plan with minimal resources and complications during elective and emergency surgeries.

METHODS

The study was conducted at the department of Anaesthesia, Akhtar Saeed Medical college Farooq teaching hospital, Murree expressway, Rawalpindi and Mohiuddin Islamic Medical College, Mirpur, Azad Kashmir after proper approval from institutional ethical review committees. The patients were classified as Class I-II-III according to the American Society of Anesthesiologists (ASA) classification. Exclusion criteria was any emergency or refusal to consent, allergic to any study drugs, hepatic and renal function impairments or difficult airway. Randomisation was conducted using a computer-generated randomisation sequence to ensure allocation concealment. Group assignments were placed in sealed opaque envelopes that were opened sequentially by an anesthesia technologist immediately before administering the allocated intervention. This ensured strict adherence to the randomisation protocol and prevented selection bias.

One hundred consecutive patients meeting the inclusion criteria divided into two groups, group I (intravenous lignocaine group) and group T (topical lignocaine group) each with fifty patients. All patients will have a running intravenous cannula and standard monitors (non invasive blood pressure, pulse oximeter and ECG) before starting. Group 1 will receive intravenous lignocaine 1.5 mg/kg followed by pre-oxygenation for three minutes. Group 2 will receive 4mg/kg of 4% lignocaine for oral gargles by patients till tolerated in sitting position. The patient will be turned supine immediately followed by pre-oxygenation for 3 minutes. After 3 minutes pre-oxygenation, both groups will receive intravenous nalbuphine 150 mcg/kg followed by 1 mg/kg ketamine over 45 seconds. Suxamethonium 1 mg/kg will be given intravenously. All patients received midazolam 0.05mg/kg. The endotracheal tube inserted 45 seconds post suxamethonium after loss of consciousness and eye lash reflex. In case, eye lash reflex is still intact further boluses of 0.5mg/kg ketamine intravenously used. All endotracheal tube insertions done by consultant anaesthetist. The endotracheal tube insertion conditions assessed by a person blinded with the induction method. The number of attempts made at endotracheal tube insertion and the number of patients requiring top-up doses of ketamine noted. The data recorded on the study proforma.

RESULTS

Data entry and analysis was done by using SPSS version 27. This study included 100 elective surgical patients divided into two groups. Group T consisted of 8 males and 42 females and with a mean age was 41.8 years, and Group I consisted of no males and 50 females with mean age of 43.5 years. ASA I two patients in group I while no one in group T. ASA II , 27 patients in group I while 45 in group T. ASA III, 21 patients in group I while 5 in group T (fig. 2). Most surgical patients 96% included underwent laparoscopic cholecystectomy as been shown in fig. 1.

Table No. 1: General Mean Findings

ASA Intravenous Topical	II 27 I 2 III 45 I 0	III 21 III 05
Weight Intravenous Topical	 72 KG 70 KG	
Height Intravenous Topical	 154 CM 157 CM	
BMI Intravenous Topical	 30 KG.M^2 28 KG.M^2	
Nalbuphine Intravenous Topical	 0.15 MG 0.15 MG	
Ketamine Intravenous Topical	 1.16 MG 1.0 MG	

Table No.2: Inter group comparison of gagging

Gagging	Group T N = 50	Group I N = 50	P Value
Induction	2 (4%)	14 (28%)	0.001
1 Minute	2 (4%)	11 (22%)	0.007
2 Minutes	0	4 (8%)	0,041
5 Minutes	0	0	-
10 Minutes	0	0	-

Table No.3: Inter group comparison of coughing

Coughing	Group T N = 50	Group I N = 50	P Value
Induction	2 (4%)	14 (28%)	0.001
1 Minute	2 (4%)	11 (22%)	0.007
2 Minutes	0	4 (8%)	0.041
5 Minutes	0	0	-
10 Minutes	0	0	-

General demographics, nalbuphine and ketamine mean findings shown in table 1. The primary outcome measure of this study was the incidence of Postoperative sore throat (POST) was more at 1st,6th and 24 hours in group I when compared with group T (Table 5, fig. 3,4). The secondary outcome measures

gagging, coughing and laryngospasm were also found significant in group I in comparison with group T (Table 2,3,4). The statistically significant difference considered as p <0.05 level.

Table No.4: Inter group comparison of laryngospasm

Laryngospasm	Group T N = 50	Group I N = 50	P Value
Induction	0	1 (2%)	0.31
1 Minute	0	0	-
2 Minutes	0	0	-
5 Minutes	0	0	-
10 Minutes	0	0	-

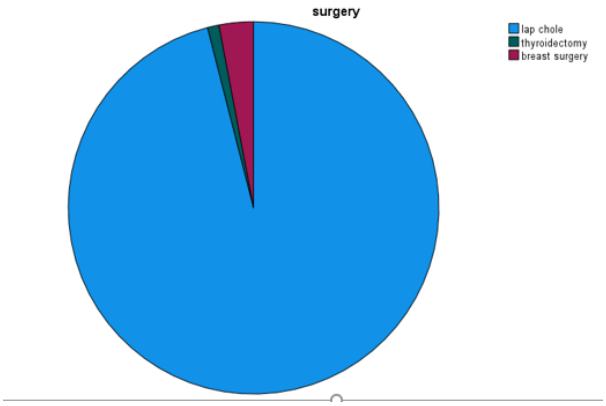

Figure No. 1: Surgery Distribution

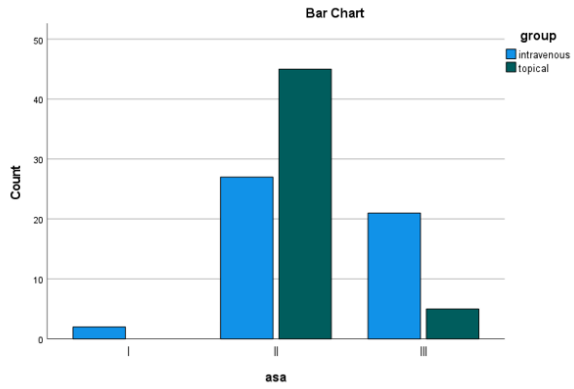

Figure No. 2: ASA Groups

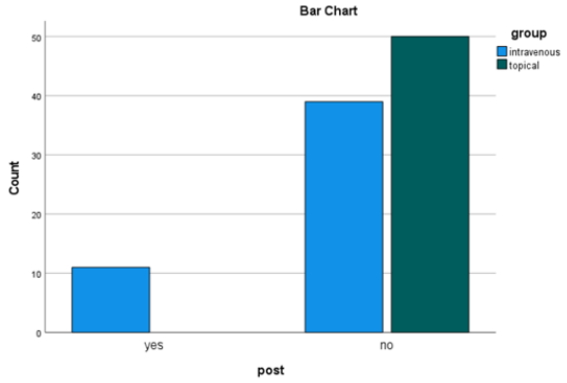

Figure No. 3: Post in 1ST Hour

Table No.5: Inter-group comparison post operative sore throat (POST)

Post	Group T N = 50	Group I N = 50	P Value
Post 1	0	11 (22%)	0.001
Post 6	5 (10%)	15 (30%)	0.01
Post 24	5 (10%)	15 (30%)	0.01

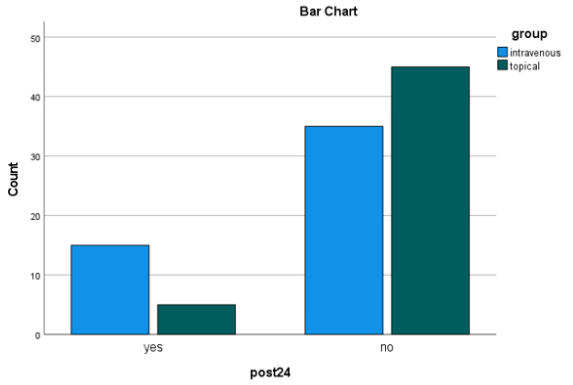

Figure No.4: Post 24 Hours

DISCUSSION

Post-operative sore throat (POST) may be any discomfort in throat post extubation ranging from pain in throat to dysphagia[6]. POST incidence is multifactorial depending on every step of intubation and induction[7]. Our study compared the topical and intravenous lignocaine with ketamine to strive forward for a technique suitable for both elective and emergency surgeries with minimum complications. The results found significant differences in reducing coughing, gagging and laryngospasm with topical lignocaine administration with ketamine induction. The incidence of postoperative sore throat (POST) also reduced significantly in topical lignocaine group.

Cost reduction in low income countries is not merely low prices of medications but freedom from complications and fast rehabilitation. Recently, Jun Ji et al [8] published an excellent study on reducing incidence of coughing [9,10] associated with Sufentanil. High risk of aspiration pneumonitis if airway conditions not adequate for airway management especially in emergency cases.[11] A new version of Ketamine, Esketamine gaining acceptance because of lower incidence of adverse reactions[12]. Historically, low-dose ketamine successfully reduced fentanyl-induced cough during the induction of anaesthesia[13], and esketamine, as the S-enantiomer of ketamine, acts strongly on glutamate through the N-methyl-D-aspartate (NMDA) receptor with about twice the potency of ketamine not adding value immediately but also in reduction of opioids usage postoperatively. Both ketamine and esketamine proposed to inhibit the cough response through the modulation of the N-methyl-D-aspartate (NMDA)

receptors. Lignocaine synergistic role with ketamine already gaining acceptance especially in suppressing opioid induced coughing[14]. Lignocaine was tested with thiopentone using intravenous and topical modes of administration. Topical lignocaine provided superior LMA insertion conditions (86%) than intravenous lignocaine (63%) when used with thiopentone. Intravenous lignocaine can be effective for decreasing airway sensitivity (55%) to instrumentation by depressing airway reflexes and decreasing calcium flux in airway smooth muscles. The overall incidence of postoperative sore throat (POST) after general anesthesia ranges from 20% to 74%[15] but this is with different set of medications available in different regions. Putting 2% lignocaine into the ETT cuff lowers the risk of and severity of POST because it acts as a local anesthetic and lowers inflammation in the trachea[16]. The various pharmacological agents studied to reduce the incidence of POST are corticosteroids, lidocaine, NSAIDs, NMDA receptor antagonists and the list goes on[17]. In the past, we published a study on LMA insertion conditions using topical and intravenous lignocaine with propofol induction[18]. Moving forward now studied the inter group POST incidence at different time intervals along with endotracheal tube insertion conditions. We found that the incidence of POST in group T was negligible while in group I, it was 16% at 1hour interval but decreases significantly after 6 and 24 hours. Similarly, incidence of gagging and coughing remained more in topical lignocaine group in comparison with intravenous group.

This study has several limitations. Firstly, the sample size was relatively small, which may have introduced a statistical bias. Secondly, majority of patients were females so we need a larger group with more males representation. Third, new novel agents like esketamine and dexmedetomidine needs to compare for ideal outcomes in larger diversified groups.

CONCLUSION

This study demonstrates that topical lignocaine with ketamine is an effective and safe option for reducing the incidence and severity of post operative sore throat alongwith gagging, coughing and laryngospasm in patients undergoing general anaesthesia making it a reliable preventive measure in clinical practice in emergency and elective procedures under general anesthesia.

Acknowledgement: Mr. Mubashar Hussain, Biostatistician in reviewing data and Mr. Muhammad Bilal, Anesthesia technologist for valuable contributions in data collection.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Muhammad Shazad
Drafting or Revising Critically:	Muhammad Shazad
Final Approval of version:	The above author
Agreement to accountable for all aspects of work:	The above author

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No. RAC&IRB-05/04/2023 Dated 06.04.2023

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Original Article

Mitigating Symptoms of Premenstrual Syndrome and Enhancing Quality of Life among School Students

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ABSTRACT

Objective: To assess the effects of group counseling in mitigating symptoms of premenstrual syndrome, and examine the quality of life in students based on group counselling sessions.

Study Design: Quasi-experimental pre–post study

Place and Duration of Study: This study was conducted in the Lahore School of Nursing, The University of Lahore from March 2025 to June 2025.

Methods: In this study sample was of 44 female students was taken aged 13 to 16 years from Government Higher Secondary School City DG Khan after the permission of school authority. This study investigated the connection between group counseling interventions and the enhancement of quality of life among a sample of the students. The data was collected using the Premenstrual Symptoms Screening Tool (PSST) and WHO Quality of Life-BREF (WHOQOL-BREF).

Results: The total mean score on the Premenstrual Symptoms Screening Tool (PSST) decreased significantly from 35.02 to 29.20 (p<0.001). Significant improvements were noted across all domains, including affective (p=0.001), behavioral (p<0.001), cognitive (p=0.001), somatic (p=0.001), and functional impairment (p<0.001). Specifically, severe interference with education decreased from 15.9% to 2.3%. The general quality of life score saw a substantial increase from 80.43 to 91.70 (p<0.001). A Pearson correlation analysis showing negative correlations was significantly reduced. This suggests the intervention effectively mitigated the negative effect of symptoms on daily functioning, helping students build better coping abilities and adaptability.

Conclusion: Group counseling intervention is effective in significantly reducing PMS symptoms across all observed domains, including affective, behavioral, cognitive, somatic, and functional impairment. Early intervention can encourage positive attitudes toward premenstrual syndrome and help manage symptoms before they escalate into more severe conditions.

Key Words: Premenstrual syndrome, Group counseling, Quality of life

Citation of article: Gondal SM, Saifullah M, Masih S. Mitigating Symptoms of Premenstrual Syndrome and Enhancing Quality of Life among School Students. Med Forum 2026;37(2):71-75. doi:10.60110/medforum. 370214.

INTRODUCTION

Menstruation is a normal physiological process, which is cyclically associated with the flow of endometrial and blood from uterus cavity. The physical and psychological symptoms that often accompany this episodic hormonal pattern are known as premenstrual syndrome (PMS). A constellation of cyclic and recurrent physical, cognitive, emotional, and behavioral symptoms affecting women which occur during the luteal phase of the menstrual cycle that commonly ends at or shortly after menstruation is referred to as premenstrual syndrome.[1]

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Received: September, 2025
Reviewed: October-November, 2025
Accepted: December, 2025

Menstrual discomfort, or dysmenorrhea, is brought on by the prostaglandins produced throughout the menstrual cycle and the adequate contraction of the uterine muscles to expel menstrual blood.[2] Premenstrual syndrome is a pathological state of premenstrual symptoms. Premenstrual syndrome which are a group of illnesses that can impair quality of life and cause difficulties with day-to-day functioning.[3]

The most frequently reported symptoms of PMS include mood fluctuations, anxiety or tension, feelings of sadness, abdominal bloating, breast tenderness, pain, headaches, body aches, reduced concentration, diminished interest in activities, social withdrawal, irritability, and a perceived loss of control. These symptoms may vary in severity and can be classified as mild, moderate, or severe.[4] The academic study and other facets of life were negatively impacted by somatic symptoms including lower backache, fatigue, breast soreness, etc., as well as certain psychological symptoms like loneliness, irritation, and outbursts of wrath. Both, doing daily tasks and paying attention in class become difficult as a result of this. This makes

determining how much PMS affects students vital to take the appropriate steps to lessen it.[5]

Premenstrual mood and physical symptoms are prevalent and have a big impact on students' lives. Nevertheless, approximately 20% of women are thought to experience premenstrual symptoms of sufficient severity to be considered clinically significant.[6] The excess consumption of certain foods increases inflammation in the body, impacting a person's mental health. Consuming these meals regularly makes the inflammation worse. Numerous lifestyle factors, including inactivity, sleep deprivation, caffeine use, and eating unhealthy meals, have been linked to PMS, according to a study.[7] Menstrual issues like PMS can affect students' academic performance, emotional well-being, and quality of life. Over 2.5 million women are thought to suffer from irregular menstruation each year. Ovulation and hormones are thought to be the causes of PMS imbalances, as well as elevated prostaglandin synthesis, which results in uncomfortable uterine contractions and reduced blood flow. The literature documented a high correlation between the intensity of PMS symptoms and quality of life. The issues because of PMS led to a decrease in academic performance, social life problems, and school absences.[8]

Quality of life is greatly impacted by premenstrual syndrome. Physical discomfort, mood swings, and burn out are examples of disruptive and periodic symptoms that can cause decreased productivity, elevated stress levels, and emotional difficulties. Improving self-care, increasing knowledge, and putting focused interventions into place is essential for enhancing the general quality of life.[9] Engaging in regular physical activity is highly effective for women in managing stress and promoting chemical balance in the brain. Exercise helps by increasing endorphin levels and lowering adrenal cortisol, which can reduce PMS-related discomfort, enhance pain tolerance, and improve mood by decreasing anxiety, sadness, and other associated issues. Exercises such as walking, cycling, swimming, and jogging are believed to be an excellent ways to control premenstrual syndrome and reduce stress.[10] In certain countries, including Pakistan, women demonstrated lower awareness of PMS compared to their counterparts in Europe which needs to be addressed.[11]

Health professionals need to have a thorough understanding of nutrition and health in order to educate women about the multiple factors affecting PMS and the importance of training and guidance in self-care strategies for its management.[12] Premenstrual syndrome was observed to occur more frequently among students. Group counseling was shown to be highly effective in alleviating PMS symptoms. Some participants suggested that increasing public discussion about PMS could help raise awareness and promote acceptance (e.g. make it more spoken about in public). Premenstrual syndrome clinical manifestations and their impact on daily living activities were studied in Pakistani women. The serious effect of PMS on day to day activities was found to be highly significant. Girls frequently do not get the education they need about menstruation. In Pakistan, girls have a generally bad experience at menarche and during the reproductive years that follow due to a lack of understanding, widespread misconceptions, and the social taboo around menstruation and premenstrual symptoms. The goals of treatment are symptom reduction, and improvement in daily life functioning.[13]

METHODS

This quasi-experimental study was conducted Lahore School of Nursing, The University of Lahore from 1st March 2025 to June 2025. vide letter No. 70146519 date 17th March 2025. In this study sample was of 44 female students was taken aged 13 to 16 years from Government Higher Secondary School City DG Khan after the permission of school authority.

The effects of group counseling among students with premenstrual syndrome and improvement in their quality of life with all its outcomes were observed. A total of 44 students were included. An overall of three tools consisted of the sociodemographic, which includes name, age, education, Premenstrual Symptoms Screening Tool (PSST), which contained 19 items and QOL was measured by the WHOQOL-BREF, which consisted of 26 items. It was rated on a 5-point Likert scale. Before the intervention, they accomplished a structured pre-intervention questionnaire that involved informed consent, demographic information (name, age, and education), PSST, and WHOQOL-BREF Questionnaire for data collection. Likewise they were assessed by PSST and WHOQOL-BREF Questionnaire after intervention for pre-post comparison. The data was entered and analyzed through SPSS-23. A combined sample T-test was practical to compare the status of pre-post data related to PMMS and WHOQOL-BREF having 4 and 8 domains respectively. P-value ≤ 0.05 was statistically significant. Shapiro-Wilk for normality of the PSST and quality of life domains were applied. The paired t-test was used to compare Quality of Life and PMS symptoms before and after the intervention. The significance levels of the results in the study is $p < 0.05$.

RESULTS

There were 90.9% of participants aged 14 to 15 years with mean age was 14.6 years. The majority were enrolled in the tenth grade (n=27; 61.4%), while the remaining 38.7% (n=17) were in the ninth grade. 59.1% (n=26) were recruited from the Government Higher Secondary School (City), and 40.9% (n=18) from the Center of Excellence (Table 1).

The intervention resulted in a highly significant reduction in overall PMS symptom severity, with mean PSST scores decreasing from 35.02 to 29.20 ($p<0.001$). Behavioral symptoms and functional impairment showed the most considerable improvements, indicating a widespread reduction of emotional and physical distress (Table 2).The students showed a statistically significant increase across all WHOQOL-BREF domains, with the overall quality of life score rising from 80.43 to 91.70 ($p<0.001$). The major enhancements occurred in physical health and sleep satisfaction, suggesting that reducing somatic symptoms directly translated into better daily functioning (Table 3). A Pearson correlation analysis was performed to determine the linear associations between the five domains of the Premenstrual Symptoms Screening Tool (PSST) and the four domains of the WHOQOL-BREF. The results indicate a significant statistical relationship between premenstrual distress and quality of life, which indicate a profound shift following the counseling intervention (Table 4).

Table No. 1: Sociodemographic data (N=44)

Variable	No.	%
Age (years)		
13	4	9.1
14	19	43.2
15	21	47.7
Class		
Ninth	17	38.7
Tenth	27	61.4
Institute		
Govt. Higher Secondary School	26	59.1
Center of Excellence	18	40.9

Table No. 2: Mean of different domains of PMS Symptoms pre-post Intervention (N=44)

PSST Symptom Domain	Pre-Test	Post-Test	Mean difference	p-value
Affective Symptoms	7.23±2.32	6.00±2.32	1.23	0.001
Behavioral Symptoms	6.11±2.17	4.86±2.17	1.25	<0.001
Cognitive Symptoms	3.82±1.42	3.07±1.42	0.75	0.001
Somatic Symptoms	9.18±2.25	7.98±2.25	1.20	0.001
Functional Impairment	8.68±2.01	7.30±2.01	1.39	<0.001
Overall PSST Score	35.02±6.91	29.20±6.91	5.82	<0.001

Table No. 3: Mean of different domains of WHOQOL-BREF pre-post Intervention (N=44)

QOL Domain	Pre-Test	Post-Test	Mean difference	p-value
Physical Health	22.86±4.54	27.09±4.54	–4.23	<0.001
Psychological Health	18.41±4.94	22.23±4.94	–3.82	<0.001
Social Health	11.77±2.45	12.66±2.45	–0.89	0.021
Environmental Health	27.39±5.63	29.73±5.63	–2.34	0.008
Overall QOL Score	80.43±10.18	91.70±10.18	–11.27	<0.001

Table No. 4: Pearson Correlation between PSST Domains and WHOQOL-BREF (Pre / Post Intervention, N=44)

PSST Item	Mean ± SD (Pre/Post)	Physical (Pre/Post)	Psychological (Pre/Post)	Social (Pre/Post)	Environmental (Pre/Post)	Overall QOL (Pre/Post)
Affective	7.23±2.3/6.00±2.3	-.496**/-.207	-.474**/.205	.149/.168	.078/-.132	-.359*/-.077
Behavioral	6.11±2.2/4.86±2.2	-.475**/.192	-.276/-.161	.139/-.233	-.058/.228	-.323*/.153
Cognitive	3.82±1.4/3.07±1.4	-.550**/-.087	-.336*/-.061	-.096/-.213	-.120/.381**	-.455**/.196
Somatic	9.18±2.3/7.98±2.3	-.597**/-.007	-.352*/-.014	.237/-.020	.214/.133	-.278/.095
Functional	8.68±2.0/7.30±2.0	-.441**/-.111	-.324*/-.025	.259/.132	.065/-.020	-.253/-.047
Overall	35.02±6.9/29.20±6.9	-.512**/-.044	-.352*/-.011	.137/.033	.019/.118	-.333*/.064

** Relationship is significant at the 0.01 level (2-tailed); * Significant at the 0.05 level (2-tailed)

DISCUSSION

The premenstrual syndrome (PMS) is a multidimensional illness that impacts the emotional, behavioral, cognitive, somatic, and functional well-being of women and it is known that quality of life is highly disrupted. The major purpose of the research

was to determine the effectiveness of the intervention in decrease of PMS symptoms and quality of life among the participants. The findings indicated a statistically significant reduction in the severity and quality-of-life outcomes of PMS symptoms pre-intervention and post-intervention ($p<0.05$). In all domains, most of the participants reported mild or moderate PMS symptoms before the intervention and a significant proportion of the participants reported severe symptoms. At the affective domain, 54.5% of all participants reported moderate levels of anger and irritability, and 36.4% reported moderate levels of anxiety and tension. Tearfulness and emotional sensitivity were also likely, with almost one-third (29.5) having severe symptoms. Low back discomfort was the most reported premenstrual symptom in 72% of females, with headaches (22%), poor mood (40%), and body edema (18%). Also, the participants cited social obligations and an apparent household chores derailment is (37%). This is in line with past[14] where 33.5% of senior high school students had prevalence of PMS. The most prevalent somatic symptom and affective symptoms were unable to concentrate and fatigue respectively.[14] Such behavioral symptoms as lack of interest in work (43.2% moderate, 31.8% severe) and household activities (38.6% moderate to severe) were the leading ones, which means that motivation and productivity are impaired. Cognitive symptoms, especially issues with concentration (43.2% moderate) and somatic symptoms, like fatigue (54.5% moderate), physical discomfort (52.3% moderate) indicate the all-inclusive effect of PMS on the day-to-day functioning. The results of our research are in line with a study which identified that women who had the symptoms of pre-menstrual syndrome had problems that affected their capacity to pursue occupations such as self-care, productivity and leisure which interrupted their work routine and interpersonal relationship.[15] After the intervention, the level of symptoms severely reduced in all domains. The severity of affective symptoms improved significantly and severe anger and irritability dropped to 11.4% to 2.3% and severe tearfulness dropped to 29.5 to 4.5. Behavioral symptoms also improved, disinterest in work reduced to severe (31.8) to mild (11.4), and household activity impairment also had reduced to severe (38.6) to mild (6.8). Cognitive symptoms were dominated by mild levels and somatic symptoms were significantly improved, especially fatigue which fell to 2.3% compared to the 34.1%. The functional impairment also declined, and severe educational interference dropped to 2.3% down to 15.9%. These results are in line with other studies that have employed positive approach to counseling has proved to be effective in reducing severity of PMS symptoms in the short run. Although any woman can be the beneficiary of such interventions, focusing on adolescents is especially a winning move because early interventions can contribute to a positive attitude toward menstruation.[16]

Participants were reporting an average overall quality of life, better social and environmental support, and deteriorated psychological well-being before the intervention. Even though 27.3% of them rated their quality of life as extremely good, a high percentage said they had negative feelings including anxiety and low mood very frequently (45.5%). and other psychological and physical symptoms. 66.2% of the respondents said that PMD symptoms had a negative influence on daily activities. Health-related issues such as headaches, chronic pain, diabetes, thyroid disorders, gynaecological and mood disorders were also shown to have a significant relationship with certain PMS symptoms, such as painful/swollen breasts and food cravings.[17] Quality of life after the intervention also increased particularly across all domains of the WHOQOL-BREF. There was a significant improvement in physical health. The level of psychological health was significantly enhanced, which can be measured by the fact that the enjoyment of life, self-satisfaction, concentration, and emotional distress were improved. The entire quality of life improved substantially by 80.43 to 91.70 ($p<0.001$).These results are consistent with earlier studies showing that effective PMS management is associated with improved physical, emotional, and social well-being. Group counseling improved the students' quality of life and lesser severity of the Premenstrual Syndrome symptoms.[18]

Somatic symptoms demonstrated the strongest negative association with physical health, while affective and cognitive symptoms were closely linked to poorer psychological well-being. Overall quality of life was negatively affected by all PMS symptom domains, with cognitive symptoms exerting the greatest impact. These findings support previous evidence that menstrual disorders were highly prevalent with negative effects on QOL and class attendance.[19] After the intervention, these negative correlations were substantially reduced. PMS symptoms exhibited weak or negligible associations with physical, psychological, and overall quality of life, suggesting that the intervention mitigated the adverse effects of PMS on daily functioning. The findings indicate improved coping ability and resilience among participants, allowing better maintenance of quality of life despite residual symptoms. A study revealed that after intervention for coping with premenstrual symptoms it found to decrease symptoms and improve quality of life.[20]

CONCLUSION

Premenstrual syndrome is a common syndrome among students. The negative relationship between the symptoms of PMS and the quality of life was lowered significantly. Regarding the effectiveness of group

counseling in this study, it can be used to improve the students' quality of life and symptom severity among students with premenstrual syndrome.

Author's Contribution:

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Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No. 70146519 date 17th March 2025

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Narrative Review

Advances in Root Canal Filling Materials for Primary Teeth: How Rheology Helps Predict Obturation Success

Pediatric Obturation Materials and Rheology

Mohamed Tharwat Salama[1,3] and Punit Fulzele[2]

ABSTRACT

Purpose: The success of a pulpectomy in primary teeth depends on the material used in the root canal filling process. This material needs to have a complex anatomy and a small volume of empty space. It also needs to be resorbed at a similar rate to the root. This article aims to highlight the latest developments in primary teeth root canal fillings and their materials and the role of their rheological properties.

Methods: This is a narrative review of lab, in vitro, and clinical studies on four different types of root canal fillings: zinc oxide-eugenol, calcium hydroxide paste, iodoform paste, and bioactive and bioceramic materials from March 2025 till August 2025.

Results: The most important factor is the material's apparent viscosity and flow under shear stress. Thixotropy is also a critical factor in root canal fillings. The yield stress is a measure of the material's resistance to flow when there is a force applied. The time dependency is a measure of the material's flow when time is a factor.

Conclusion: The success of a root canal filling is dependent on the three-dimensional material used. Rheological properties play a critical role in the success of a root canal filling in primary teeth.

Key Words: Primary teeth; Root canal obturation materials; Rheology

Citation of Narrative Review: Salama MT, Fulzele P. Advances in Root Canal Filling Materials for Primary Teeth: How Rheology Helps Predict Obturation Success. Med Forum 2026;37(2):76-80. doi:10.60110/medforum.370215.

INTRODUCTION

The retention of primary teeth with pulpal infection is of paramount importance for pain relief, mastication, speech development, and arch length space preservation until the time of exfoliation. The success of a pulpectomy procedure lies in the removal of the lower microbial load and the canal being sealed to prevent leakage and reinfection[1-2].

The obturation of primary molar teeth has proven to be technically challenging. The primary molar canal is ribbon-shaped and irregular. The presence of many accessory canals and the thin dentinal walls make the procedure even more challenging. The process of root resorption also makes the apical anatomy of the primary molar more challenging and increases the risk of overextending the canal during the obturation process[3-5].

The success of an obturation paste lies in its biological properties and its physical properties and behavior. The physical property of interest in this case would be the rheology of the paste. The rheology of the paste would determine its flow behavior and the success of the obturation process[6-8].

This review aims to discuss the commonly used pediatric obturation materials and the newer obturation materials being introduced into the field. The review would also discuss the relationship between rheology and the success of the obturation process. The gaps in the literature and the recommendations would also be discussed.

SEARCH STRATEGY AND SCOPE OF THE REVIEW

This narrative literature review is specifically designed to be of interest to clinicians and researchers. Information is based on peer-reviewed dental literature and appropriate literature in material sciences, including systematic reviews, randomized controlled trials, and in vitro studies. It deals with (i) material types used in primary tooth pulpectomy, (ii) rheological properties that are significant in syringe delivery and 3D filling, and (iii) rheological properties and their

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Received: September, 2025
Reviewed: October-November, 2025
Accepted: December, 2025

relation to resorption and sealing in the special biological environment of primary teeth. No changes are made to the references, and tense is appropriate.

WHY RHEOLOGY MATTERS IN PRIMARY-TOOTH OBTURATION

Rheology is defined as the study of the deformation and flow of a material under stress and the material's response when stress is relieved. In the context of paste materials used in endodontic obturation, this means the material's ability to reach the working length, flow into canals and irregularities, and maintain stability after placement[6,7]. Canals in primary teeth are challenging due to their irregular cross-sections and short working times. In addition, there is a need to minimize time in the dental chair when working with children. This makes syringe delivery a popular approach. Lack of flow means potential areas for bacteria to reside, and too much flow means a potential increase in extrusion forces with the possibility of irritating tissues or the developing tooth[3-5,8].

Rheology is clinically relevant in two ways: it is used to predict material handling or ease of placement and the material's ability to fill the canal space uniformly under clinically relevant shear conditions[8,9].

KEY RHEOLOGICAL PARAMETERS AND CLINICAL INTERPRETATION

Table No. 1: Rheological parameters and their clinical relevance for obturation in primary teeth.

Parameter	What it means	Why it matters in primary teeth	Practical target (conceptual)
Apparent viscosity	Resistance to flow	Controls penetration vs. extrusion	Moderate; not too stiff or too soft
Shear-thinning	Viscosity falls under injection shear	Improves filling of irregular canals	Clear shear-thinning with recovery at rest
Thixotropy	Time-dependent thinning and recovery	Helps controlled placement in short working times	Rapid recovery after injection
Yield stress	Stress needed to begin flow	Limits migration in resorbing apices	Enough to prevent drift; low enough for syringe placement
Time dependence	Viscosity changes after mixing	Affects chairside reliability	Stable within clinical working time

Apparent viscosity: This is the measure of resistance to flow when subjected to a certain amount of shear. High viscosity may prevent apical penetration in narrow canal spaces, while low viscosity may cause uncontrolled flow or extrusion[7,9].

Shear thinning behavior: Shear thinning behavior or pseudoplasticity is also a desirable property of dental pastes. Shear thinning behavior occurs when the viscosity of the paste decreases with increased shear rate[8-10].

Thixotropy or time-dependent recovery: This property is desirable in dental pastes as it reduces the formation of voids or extrusion of the paste when subjected to a certain amount of shear. This is particularly desirable when the placement process is interrupted or when the process is repeated[9,10].

Yield stress: This is the minimum amount of stress required to initiate the flow of the paste. This property is desirable in dental pastes as it prevents the movement of the paste in resorbed canal spaces while allowing placement under syringe pressure[9,10,11].

Working time and temperature sensitivity: Some dental pastes exhibit changes in viscosity with time or with changes in temperature. This may affect the placement of the material in the canal space, resulting in voids when the working time is exceeded.[6,12].

RHEOLOGY OF COMMON PEDIATRIC OBTURATION MATERIALS

Zinc Oxide–Eugenol (ZOE): ZOE is still an important reference material because of long clinical experience and its antimicrobial properties. Nevertheless, ZOE's rheology is operator-dependent, with powder-liquid mix ratios and mixing times significantly affecting material viscosity and flow[13,14]. ZOE materials can be quite viscous, and there can be some limitation in flow into small canals and accessory anatomy, particularly in multi-rooted primary teeth. Inconsistencies in material flow can affect void formation and three-dimensional adaptation[13,15]. Concerns with ZOE's use are those of long resorption times in situations where material extrudes beyond the apex, which can cause tissue irritation and delay exfoliation[3,16]. This is the reason ZOE is being compared with calcium hydroxide and iodoform paste in contemporary trials and systematic reviews[17].

Calcium Hydroxide–Based Pastes: Calcium hydroxide pastes have been introduced to enhance biocompatibility and facilitate resorption in a physiological manner, in sync with root resorption. In general, many of these have shown improved injectability characteristics over conventional ZOE[18,19]. In terms of rheology, vehicle composition and filler content can affect viscosity, yield stress, and time dependency. Some of these materials, however, may have a tendency to resorb too quickly, which can compromise a long-term seal and potentially lead to

internal voids and spaces[18,20]. However, available evidence suggests that maintaining a consistent and well-controlled flow is more critical than simply achieving a high flow rate. As a result, researchers have proposed viscosity-optimized and otherwise modified formulations to better support this stability[21,22].

Iodoform-Containing Pastes (e.g., Vitapex/Metapex)

The use of iodoform pastes has been favored owing to convenience and premixed formulations in syringe form. The flow and shear-thinning properties of the pastes favor canal filling in complex anatomy and minimize operator variability[19,23]. The drawback of using resorbable pastes has been resorption beyond physiological root resorption if extruded or in thin layers, potentially causing canal voids and reinfection[24,25]. Consequently, studies have focused on modifying the iodoform pastes and using optimized pastes containing iodide in the context of improving rheological stability and reducing canal filling failure[21,26].

Bioactive and Bioceramic Materials: Bioactive or bioceramic materials are also being explored in pediatric obturation procedures to offer control in terms of flow, sealing, and bioactivity. For example, calcium silicates or calcium phosphates may induce apatite formation while providing stability to the interfaces with dentin tissue[29-31]. From a rheological point of view, most modern bioceramic materials are capable of providing standardized flow values and film thickness requirements. However, research studies on bioceramic materials have utilized different approaches to rheometry studies, making it difficult to compare results directly[6,30]. Some initial in-lab studies indicate favorable results in terms of sealing and handling properties, although more research is needed to evaluate the long-term clinical results in primary teeth[28–31].

CLINICAL IMPLICATIONS: LINKING RHEOLOGY TO OUTCOMES

From a clinical standpoint, the main factors in the failure of the obturation in primary teeth include insufficient fill volume (voids and short fillings), as well as uncontrolled over-extension. These are related to the material's flow under syringe pressure and recovery after injection[8-9,32].

Shear-thinning and thixotropic recovery in controlled materials are likely to result in better fillings in complex spaces and maintain the material after injection. This might help in minimizing the formation of internal spaces and maintaining the seal in the course of physiological resorption[11,33].

It is worth noting that the technique of delivery is also related to rheology. The needle depth, the rate of injection, and withdrawal might influence the shear. Standardization of the delivery technique is important in comparing the results and relating the rheology to the clinical results[32,34].

INNOVATIONS AND EMERGING TRENDS

Recent innovations address three issues simultaneously: antimicrobial activity, predictable rheology, and resorption in line with primary tooth resorption[28,29,35]. Nanoparticles in pastes containing silver and hydroxyapatite aim to increase antimicrobial activity and alter rheological behavior. Although in vitro studies indicate promise in this regard, safety in pediatric populations and standardization of rheological behavior must be established before use[36–38]. Herbal and ozone-based systems containing plant extracts like Ocimum sanctum and ozonated oils represent alternatives to systems containing eugenol. Although studies indicate satisfactory results in the short term, there is considerable variability in the results and formulations. In addition, the rheological behavior must be established to determine when they can be effective in reducing voids without increasing extrusion[19]. The use of polymers and hydrogels in the form of injectable systems has also been proposed. These systems underscore the importance of matching resorption kinetics to primary tooth resorption in addition to the immediate density of obturation[31].

EVIDENCE GAPS AND RESEARCH PRIORITIES

There are two main areas where a lack of good clinical guidance exists. One is the lack of well-designed randomized trials that evaluate contemporary pastes with controlled delivery method and operator effects. The other is the lack of standardization in rheological tests used in various studies. For example, temperatures and units used in rheological tests are inconsistent. This limits the ability to make a cross-comparison[6,17].

In future studies, the following are recommended: the need to standardize rheology tests that are pertinent to syringe delivery systems, including time-dependent properties; the need to provide clinically relevant benchmarks, such as the range of viscosities at given rates; the need to evaluate resorption in harmony with longitudinal imaging; and the need to relate rheology to hard clinical endpoints such as healing and survival[24,28,29,33].

CONCLUSION

Based on current evidence, a practical conclusion can be drawn rheology is an important factor in the quality of obturation, particularly in primary teeth, as the procedure can be considered a flow process. A material that exhibits good rheology, characterized by appropriate shear-thinning and recovery, will produce more homogeneous fillings, reduce the incidence of empty spaces, and minimize the risk of uncontrolled extrusion. Zinc oxide-eugenol (ZOE) cement, although considered a traditional material, is limited by its operator-dependent rheology and slow resorption when

used for extrusion. Calcium hydroxide and iodoform-based materials, although characterized by easy syringe placement, may present problems related to early resorption and loss of seal. Bioactive and bioceramic materials have been shown to be good candidates, although more long-term studies and standardized rheology reporting are needed. The use of rheology benchmarks can be considered an important step towards more evidence-based material selection for pediatric obturation.

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Case Report

Bullous Pemphigoid in a 53-Year-Old Man with Rapid Response to Corticosteroid Therapy: A Case Report

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ABSTRACT

Bullous pemphigoid (BP) is an autoimmune disease marked by tense subepidermal bullae. The incidence of BP is very low and remains rarely reported. In Indonesia, there are no published data regarding the incidence or prevalence of BP. We report a 53-year-old male patient who presented with fluid-filled blisters involving almost the entire body, accompanied by pruritus for one month. Several blisters had ruptured, causing pain and a burning sensation. Dermatological examination revealed generalized multiple tense bullae filled with clear fluid, some of which were flaccid, arising on partially erythematous and partially normal skin. Most lesions had ruptured, resulting in erythematous macules, hyperpigmented and hypopigmented macules, and multiple erosions. Histopathological examination supported the diagnosis by demonstrating subepidermal bullae formation. The patient was treated with a combination of topical and oral corticosteroids and showed rapid clinical improvement within two months. Bullous pemphigoid has a good prognosis when treated adequately.

Key Words: Autoimmune, Bullous Pemphigoid, Corticosteroid

Citation of Case Report: Yudiana HS, Siahaan WM, Handayani L. Bullous Pemphigoid in a 53-Year-Old Man with Rapid Response to Corticosteroid Therapy: A Case Report. Med Forum 2026;37(2):81-84. doi:10.60110/medforum.370216.

INTRODUCTION

Bullous pemphigoid (BP) is an autoimmune disease characterized by tense subepidermal bullae, primarily impacting the elderly population. The incidence of BP is low and remains rarely reported in the global. To date, there are no published data regarding the incidence or prevalence of BP in Indonesia. BP is caused by autoantibodies targeting hemidesmosomal antigens, resulting in structural damage at the supepidermal.[1–6] The diagnosis of BP is established based on clinical features, histopathological findings, and immunofluorescence examination.[4,7] Corticosteroids remain to be the primary option of BP treatment; however, their duration and dosage should be carefully limited due to potential adverse effects.[1,3–5] We report a case of bullous pemphigoid in a 53-year-old male patient who treated with a combination of topical and oral corticosteroids and showed rapid clinical improvement within two months.

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Received: October, 2025
Reviewed: November-December, 2025
Accepted: January, 2026

CASE REPORT

A 53-year-old man came to the Dermatology and Venereology Outpatient Clinic of dr. Chasbullah Abdulmadjid Regional General Hospital, Bekasi, with complaints of fluid-filled blisters affecting almost the entire body, accompanied by pruritus for one month. Two months ago, the patient initially experienced pruritus in the thigh region. One week later, pruritic blisters appeared at the same site and over time spread to almost the entire body, excluding the oral mucosa and genital region. Several blisters had ruptured, causing pain and a burning sensation. The patient denied any history of medication use, systemic diseases, or family history of the disease. He worked as a car washer with daily outdoor activities and prolonged exposure to sunlight.

General and physical examination were within normal limit. Patient's body weight was 53 kg. Dermatological examination revealed generalized skin lesions in the form of multiple discrete bullae containing clear fluid, with tense walls, some of which had become flaccid. The bases of the bullae were partially erythematous and partially normal skin. Lesions varied in size from lenticular to nummular. several bullae had ruptured, resulting in multiple erosions and erythematous macules, as well as hyperpigmented and hypopigmented macules with well-demarcated borders, the size is from 0.5×0.5cm to 10×5cm. Nikolsky and Asboe-Hansen signs were negative.

A skin biopsy was performed, and histopathological examination revealed hyperkeratotic epidermis with

subepidermal bullae formation containing eosinophils, neutrophils, and erythrocytes. The dermis showed fibrotic changes accompanied by chronic perivascular inflammatory cell infiltration.

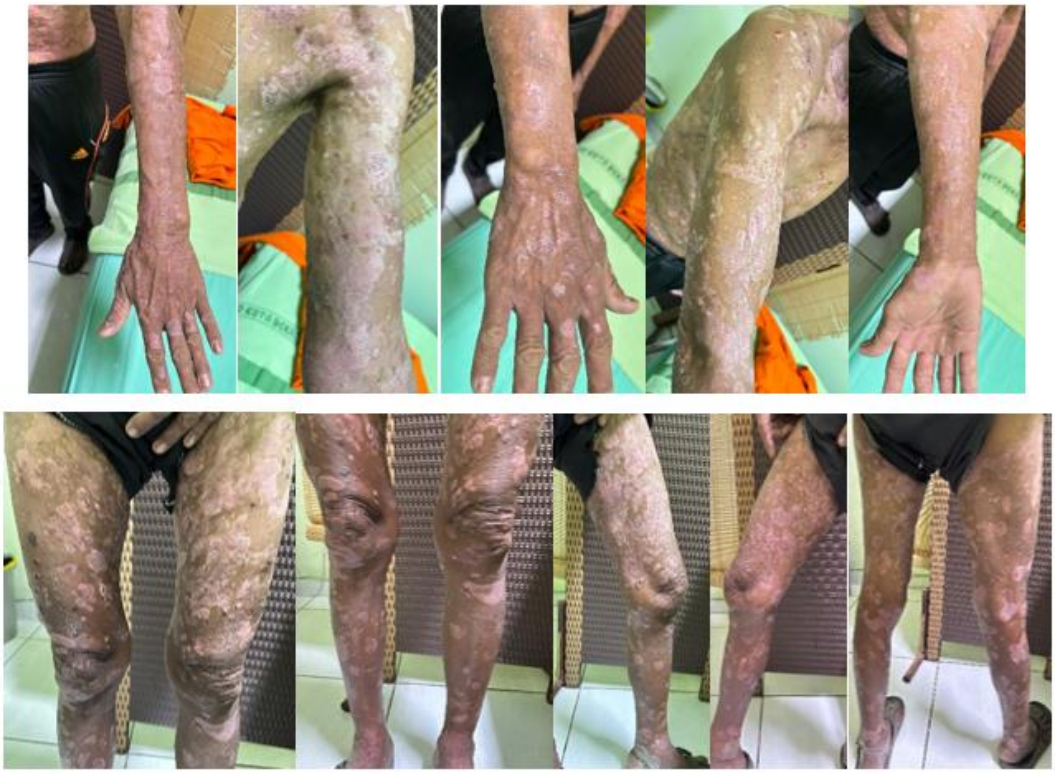


Figure No.1: Clinical presentation of the patient at the initial visit

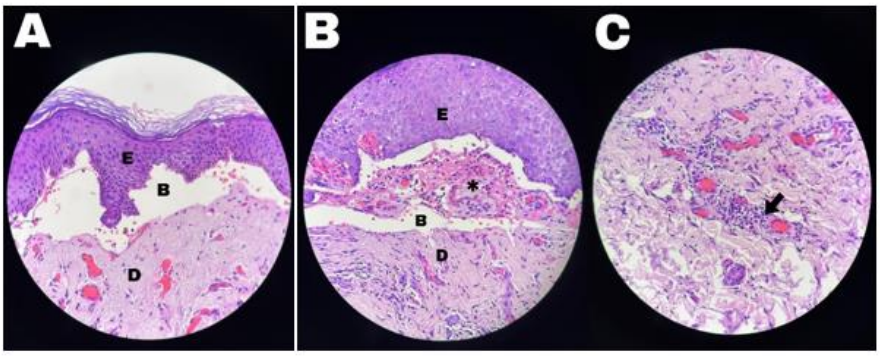
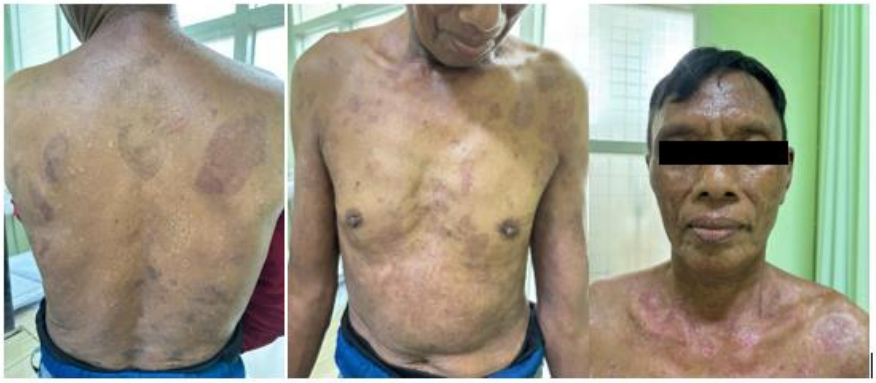


Figure No. 2: Histopathological examination. (A) dan (B) subepidermal bullae, (C) inflammatory cells infiltration E: epidermis, B: subepidermal bullae, D: dermis, *: inflammatory cells



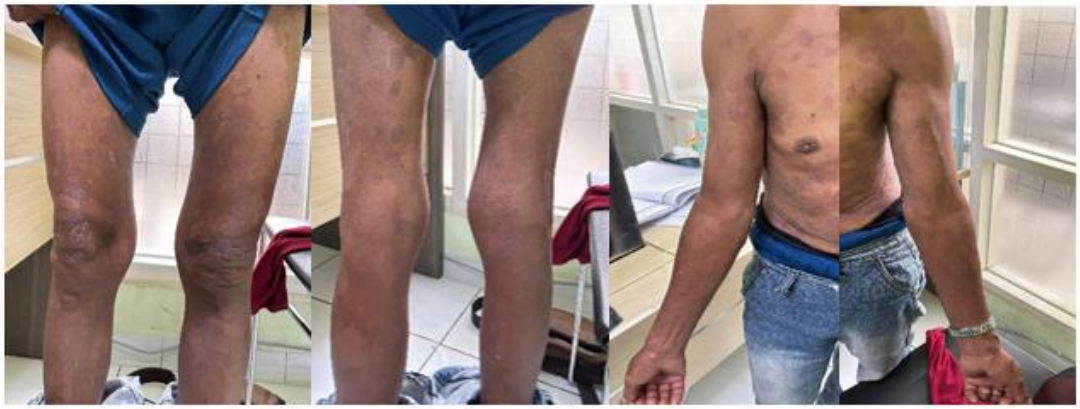


Figure No. 3: Clinical presentation of the patient after two months of therapy shows clinical improvement with no new bullae formation and post-bullous hyperpigmented and hypopigmented macules without scarring

At the initial visit, the patient was treated with oral methylprednisolone 32 mg daily for seven days. Clinical improvement was observed, there is no new bullae formation, and the methylprednisolone dose was subsequently tapered by 4 mg weekly. The treatment was combined with topical clobetasol propionate 0.05% cream applied twice daily, mupirocin cream for erosions, and cetirizine 10 mg once daily to reduce pruritus. After two months of therapy, the patient's condition stabilized with no new bullae, and all medications were discontinued.

DISCUSSION

Bullous pemphigoid often begins with a prodromal phase characterized by pruritus without bullae formation, which may last for days to months. The classic presentation of BP is tense, pruritic subepidermal bullae containing clear fluid. When bullae rupture, extensive erosions may develop but typically heal spontaneously without scarring. BP most commonly affects the flexural region, the lower abdomen, and the thighs, although other body regions may also be involved. Mucosal involvement is rare, but have a high mortality and morbidity rate.[1–3,8]

The incidence of BP escalates with age, exhibiting a significantly elevated risk in elderly populations.[5] It is thought to associated with immune system dysregulation called immunosenescence and age-associated changes in skin barrier integrity. Ultraviolet (UV) radiation, medications, and certain systemic diseases have also been implicated as potential triggering factors for BP. UV exposure may alter antigenic structures in the basement membrane zone, inducing autoantibody formation.[9,10] In this case, the patient was younger than the typical age group affected by BP. No identifiable triggering factors were found other than prolonged sunlight exposure, which was suspected to play a role as a precipitating factor.

Histopathological examination for the diagnosis of BP should be obtained from a new and intact small bullae, revealing subepidermal bullae with superficial dermal infiltration consisting of eosinophils, neutrophils, lymphocytes, monocytes, and macrophages.[1,2,4] In this patient, classic clinical features of BP were observed, and histopathological findings supported the diagnosis. Direct immunofluorescence examination was not performed due to limited facility availability.

Treatment of BP depends on the extent of skin involvement and the presence of comorbidities. Localized BP can often be successfully managed with high-potency topical corticosteroids alone, whereas extensive or generalized disease requires systemic corticosteroids such as prednisone. The recommended initial dose of prednisone is 0.75–1 mg/kg/day. Once clinical improvement is attained, gradually tapering off the prednisone dose by approximately 5 mg per week is recommended to minimize adverse effects associated with long-term high-dose steroid use. Immunosuppressive agents may also be considered as steroid-sparing therapies.[1,3–5] In this case, the patient received combination therapy with topical and systemic corticosteroids at the lowest dose and achieved rapid clinical improvement within two months without recurrence.

CONCLUSION

Bullous pemphigoid is a relatively rare autoimmune disease associated with high morbidity and mortality rate. However, when promptly and accurately diagnosed and treated with appropriate therapy, it can have a favorable prognosis.

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