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EFFECTIVENESS OF ANTIBIOTIC TREATMENT IN REDUCING PAIN AND TRISMUS POST IMPACTED MANDIBULAR THIRD MOLAR SURGICAL EXTRACTION. A RANDOMIZED CLINICAL TRIAL

Original Research

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ABSTRACT

Background: Impacted mandibular third molars frequently necessitate surgical extraction, often resulting in postoperative complications such as pain and trismus. While antibiotics are commonly prescribed, their routine use remains a subject of debate due to concerns over resistance and varying clinical outcomes. Understanding the role of postoperative antibiotic therapy in enhancing recovery is particularly important in settings where minimizing complications can alleviate patient burden and resource strain.

Objective: To assess and compare the effectiveness of postoperative antibiotic therapy versus no antibiotic therapy in reducing pain and trismus following surgical removal of impacted mandibular third molars.

Methods: A randomized clinical trial was conducted at the 30 Military Dental Centre, CMH Peshawar, from August 2023 to February 2024. Sixty patients aged 20–35 years undergoing impacted mandibular third molar extraction were randomly allocated into two equal groups (n=30 each). Group I received amoxicillin-clavulanic acid (625 mg three times daily) and metronidazole (400 mg twice daily) along with ibuprofen (400 mg twice daily) for five days. Group II received only ibuprofen at the same dosage. Pain was evaluated using a visual analog scale (VAS), and trismus was measured by interincisal mouth opening on the second and fifth postoperative days. Data were analyzed using SPSS version 28 with $p \leq 0.05$ considered statistically significant.

Results: On the fifth postoperative day, Group I exhibited significantly improved mouth opening (33.23 ± 1.18 mm) compared to Group II (30.17 ± 1.19 mm) ($p=0.0001$). Pain reduction was also more prevalent in Group I (83.3%) than in Group II (56.7%) ($p=0.02$).

Conclusion: Postoperative antibiotic therapy demonstrated a significant benefit in improving mouth opening and reducing pain following third molar extraction, supporting its selective use in surgical dental care.

Keywords: Amoxicillin-Clavulanate, Anti-Bacterial Agents, Molar Third, Pain Management, Postoperative Care, Tooth Extraction, Trismus.

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INTRODUCTION

Impacted teeth refer to those that remain partially or completely unerupted and are obstructed by adjacent teeth, bone, or soft tissue, making further eruption unlikely. The classification of impacted teeth primarily depends on their anatomical positioning. Among the most commonly impacted teeth are the third molars, often referred to as wisdom teeth. These typically erupt between the ages of 17 and 21 years, though eruption may begin as early as 14 years and can be delayed up to 26 years depending on individual and population-specific factors (1,2). Approximately 73% of young adults are affected by third molar impaction, underscoring its prevalence (2). The etiology of third molar impaction is multifactorial, with evolutionary and environmental influences playing key roles. One prominent theory attributes impaction to a gradual reduction in jaw size over human evolution, resulting in insufficient space within the mandible and maxilla to accommodate molars (3). Modern dietary patterns have also contributed to this phenomenon. The contemporary diet often requires less mastication compared to ancestral diets, leading to inadequate stimulation of jaw growth during critical developmental periods. As a result, there has been a noticeable increase in the prevalence of impacted and unerupted teeth in present-day populations. Furthermore, early-life factors such as artificial feeding practices, poor oral habits developed during childhood, and the high intake of sugary foods among children and adolescents have been implicated in disrupting normal jaw growth and dental alignment (4,5).

In cases where third molars are impacted and require surgical removal, antibiotic prophylaxis is frequently considered, yet remains a subject of ongoing debate. Although surgical extraction of third molars is generally classified as a clean-contaminated procedure, the indiscriminate use of antibiotics has raised concerns among clinicians (6,7). The rationale for administering antibiotics lies in preventing postoperative infections, particularly in immunocompromised patients or in those undergoing procedures that may predispose them to systemic complications such as bacterial endocarditis (8). Nevertheless, some researchers argue that postoperative complications often arise more from the trauma of surgery itself than from infection, challenging the universal need for antibiotic use (9,10). Despite the low overall incidence of infection, postoperative complications related to mandibular third molar surgery can significantly impact recovery. As a precaution, antibiotics are frequently prescribed postoperatively, although studies have yielded conflicting evidence regarding their effectiveness in minimizing inflammatory outcomes. Some studies suggest a notable reduction in postoperative pain and complications with antibiotic administration, while others report minimal differences between treated and untreated groups (11–13). These inconsistencies highlight a critical need for further evidence-based evaluation, particularly in regions with limited healthcare resources where indiscriminate antibiotic use could have wider public health implications. This study aims to evaluate the effectiveness of antibiotic treatment following the surgical removal of impacted mandibular third molars. By addressing a gap in the local literature, the findings will offer insights into whether routine antibiotic use is justified in this context, ultimately guiding clinical practice in resource-constrained settings.

METHODS

This randomized clinical trial was conducted at the 30 Military Dental Centre, Combined Military Hospital (CMH), Peshawar, over a six-month period from August 9, 2023, to February 9, 2024, following ethical approval from the hospital's Institutional Review Board (IRB). A total of 60 patients, aged between 20 and 35 years, requiring surgical extraction of impacted mandibular third molars, were recruited through consecutive sampling. Sample size determination was based on a previously reported difference in pain reduction on the fifth postoperative day—95% in the antibiotic group and 65% in the non-antibiotic group—with a power of 90% and a significance level of 5% (13). Patients provided informed written consent prior to participation. Exclusion criteria included individuals with systemic illnesses such as diabetes mellitus, hepatic or renal impairment, immunocompromised status, pregnancy, or known hypersensitivity to local anesthetics or antibiotics. Participants were randomized into two equal groups. Group I received postoperative antibiotics—amoxicillin-clavulanic acid 625 mg thrice daily and metronidazole 400 mg twice daily—along with ibuprofen 400 mg twice daily for five days. Group II was administered only ibuprofen 400 mg twice daily for the same duration. All procedures were performed under strict aseptic conditions by a single experienced consultant to minimize variability in surgical technique. Local anesthesia was administered using 2% lignocaine with 1:100,000 adrenaline via inferior alveolar, lingual, and long buccal nerve blocks. The surgical protocol involved mucoperiosteal flap elevation, tooth sectioning, and bone removal with ample saline irrigation, followed by tooth extraction using elevators and forceps. The extraction site was thoroughly debrided, irrigated, and closed with 3-0 silk sutures.

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Postoperative evaluations were conducted on the second and fifth days. Pain intensity was assessed using a standardized visual analog scale (VAS), while trismus was measured by determining the interincisal distance in millimeters with Vernier calipers. Data were analyzed using SPSS version 28. Continuous variables such as age and mouth opening were expressed as means and standard deviations, while categorical variables including gender and pain reduction were reported in frequencies and percentages. Between-group comparisons were performed using the independent t-test for continuous variables and the chi-square test for categorical variables, with a p-value of ≤ 0.05 considered statistically significant. Age and gender were also stratified to examine their association with the primary outcomes.

RESULTS

The study included 60 patients divided equally into two groups. The mean age in Group I (with antibiotics) was 29.03 ± 4.78 years, whereas in Group II (without antibiotics), it was 26.97 ± 5.31 years. Gender distribution in Group I comprised 53.3% males and 46.7% females, while Group II had 60.0% males and 40.0% females. Mouth opening, measured in millimeters, showed a statistically significant difference between the groups on both the second and fifth postoperative days. On the second day, Group I exhibited a mean opening of 30.37 ± 1.46 mm, while Group II had 29.55 ± 1.45 mm ($p = 0.03$). By the fifth day, a greater improvement was observed in Group I with a mean of 33.23 ± 1.18 mm compared to 30.17 ± 1.19 mm in Group II ($p = 0.0001$). Pain reduction was also assessed. On the second day, 66.7% of patients in Group I reported reduced pain, compared to 46.7% in Group II; this difference was not statistically significant ($p = 0.11$). However, by the fifth postoperative day, 83.3% of patients in Group I experienced pain relief, compared to 56.7% in Group II, showing a statistically significant difference ($p = 0.02$). Stratification by age demonstrated that among patients aged 20–27 years, those in Group I had significantly better mouth opening on the fifth day (33.94 ± 0.90 mm) than those in Group II (30.12 ± 1.19 mm) ($p = 0.0001$). A similar significant difference was observed in patients over 27 years, with Group I showing 32.87 ± 1.15 mm and Group II showing 30.23 ± 1.21 mm ($p = 0.0001$). Regarding pain, on the second day, 70.0% of younger patients (20–27 years) in Group I reported pain relief, compared to only 29.4% in Group II ($p = 0.04$). However, no significant age-related difference in pain reduction was noted by the fifth day ($p = 0.24$). When stratified by gender, males in Group I had significantly better mouth opening on the fifth day (33.11 ± 1.12 mm) than males in Group II (30.12 ± 1.20 mm) ($p = 0.0001$), with a similar trend observed among females (33.37 ± 1.26 mm in Group I vs. 30.23 ± 1.20 mm in Group II, $p = 0.0001$). In terms of pain reduction, 81.2% of males in Group I reported relief by the fifth day, compared to only 38.9% in Group II ($p = 0.01$). Among females, pain reduction rates were similar between groups (85.7% in Group I and 83.3% in Group II, $p = 0.86$).

Table 1: Comparison of mouth opening between both groups

	Groups	N	Mean	Std. Deviation	P value
Mouth opening on 2nd day (mm)	Group I (With antibiotics)	30	30.3653	1.46457	0.03
	Group II (Without antibiotics)	30	29.5477	1.45000	
Mouth opening on 5th day (mm)	Group I (With antibiotics)	30	33.2290	1.18186	0.0001
	Group II (Without antibiotics)	30	30.1663	1.18567	

Table 2: Comparison of reduction in pain between both groups

		Groups				P value
		Group I (With antibiotics)		Group II (Without antibiotics)		
		Frequency	Percentage	Frequency	Percentage	
Reduction in pain on 2nd day	Yes	20	66.7%	14	46.7%	0.11
	No	10	33.3%	16	53.3%	
Reduction in pain on 5th day	Yes	25	83.3%	17	56.7%	0.02
	No	5	16.7%	13	43.3%	

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Table 3: Comparison of mouth opening between both groups w.r.t age

Age distribution (Years)		Groups	N	Mean	Std. Deviation	P value
20 to 27	Mouth opening on 2nd day (mm)	Group I (With antibiotics)	10	30.1210	1.44650	0.09
		Group II (Without antibiotics)	17	29.1029	1.51575	
	Mouth opening on 5th day (mm)	Group I (With antibiotics)	10	33.9430	.90202	0.0001
		Group II (Without antibiotics)	17	30.1159	1.19528	
> 27	Mouth opening on 2nd day (mm)	Group I (With antibiotics)	20	30.4875	1.49520	0.47
		Group II (Without antibiotics)	13	30.1292	1.17096	
	Mouth opening on 5th day (mm)	Group I (With antibiotics)	20	32.8720	1.15934	0.0001
		Group II (Without antibiotics)	13	30.2323	1.21825	

Table 4: Comparison of mouth opening between both groups w.r.t gender

Gender		Groups	N	Mean	Std. Deviation	P value
Male	Mouth opening on 2nd day (mm)	Group I (With antibiotics)	16	29.9837	1.44084	0.24
		Group II (Without antibiotics)	18	29.3828	1.47834	
	Mouth opening on 5th day (mm)	Group I (With antibiotics)	16	33.1069	1.12974	0.0001
		Group II (Without antibiotics)	18	30.1233	1.20350	
Female	Mouth opening on 2nd day (mm)	Group I (With antibiotics)	14	30.8014	1.41615	0.08
		Group II (Without antibiotics)	12	29.7950	1.43323	
	Mouth opening on 5th day (mm)	Group I (With antibiotics)	14	33.3686	1.26646	0.0001
		Group II (Without antibiotics)	12	30.2308	1.20838	

Table 5: Comparison of reduction in pain between both groups w.r.t age

				Groups				P value
				Group I (With antibiotics)		Group II (Without antibiotics)		
				N	%	N	%	
Age distribution (Years)	20 to 27	Reduction in pain on 2nd day	Yes	7	70.0%	5	29.4%	0.04
			No	3	30.0%	12	70.6%	
		Reduction in pain on 5th day	Yes	7	70.0%	8	47.1%	0.24
			No	3	30.0%	9	52.9%	
	> 27	Reduction in pain on 2nd day	Yes	13	65.0%	9	69.2%	0.80
			No	7	35.0%	4	30.8%	
		Reduction in pain on 5th day	Yes	18	90.0%	9	69.2%	0.13
			No	2	10.0%	4	30.8%	

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Table 6: Comparison of reduction in pain between both groups w.r.t gender

				Groups				P value
				Group I (With antibiotics)		Group II (Without antibiotics)		
				N	%	N	%	
Gender	Male	Reduction in pain on 2nd day	Yes	8	50.0%	6	33.3%	0.32
			No	8	50.0%	12	66.7%	
		Reduction in pain on 5th day	Yes	13	81.2%	7	38.9%	0.01
			No	3	18.8%	11	61.1%	
	Female	Reduction in pain on 2nd day	Yes	12	85.7%	8	66.7%	0.25
			No	2	14.3%	4	33.3%	
		Reduction in pain on 5th day	Yes	12	85.7%	10	83.3%	0.86
			No	2	14.3%	2	16.7%	

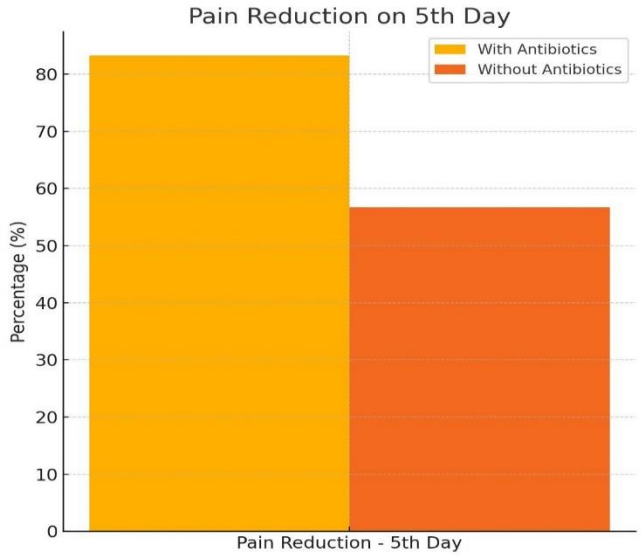

Figure 1 Pain Reduction on 5th Day

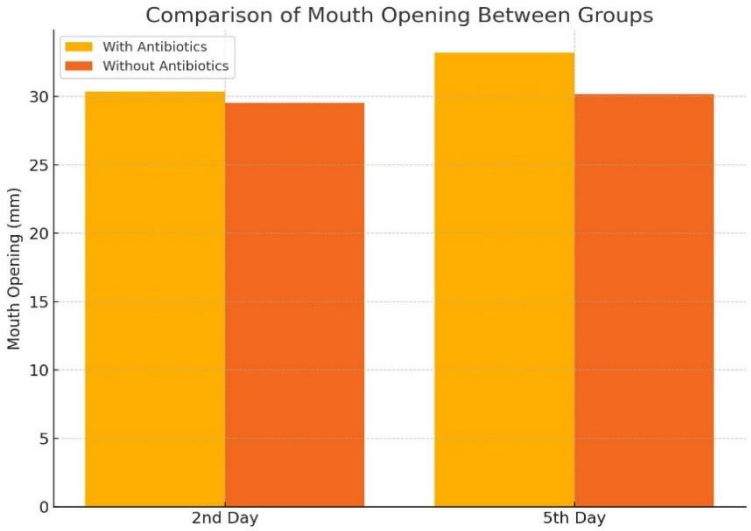

Figure 2 Comparison of Mouth Opening Between Groups

DISCUSSION

The present study evaluated postoperative outcomes following the surgical removal of impacted mandibular third molars by comparing a cohort receiving antibiotics with a cohort managed without antibiotics. The findings demonstrated that patients who received antibiotics exhibited significantly greater mouth opening on both the second and fifth postoperative days, indicating reduced trismus and enhanced functional recovery. Pain reduction was also more pronounced in the antibiotic group by the fifth day, though no significant difference was observed on the second postoperative day. These results suggest a potential short-term benefit of postoperative antibiotic therapy, particularly in reducing inflammation-related complications during the early healing phase. In relation to existing literature, the observed early pain outcomes align with findings reported in other studies where no significant difference was observed between antibiotic and non-antibiotic groups in the immediate postoperative phase (14). However, the marked improvement in mouth opening and pain by the fifth day in the antibiotic group aligns with research supporting the use of specific antibiotic regimens, such as amoxicillin-clavulanic acid combined with metronidazole, in reducing delayed onset complications. Some studies that employed different antibiotics or dosing schedules have failed to observe such late-stage improvements, indicating that the therapeutic impact may be influenced by the choice and dosage of antibiotics, surgical trauma, or intraoperative asepsis standards (15).

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Broader reviews have emphasized that the use of antibiotics, particularly amoxicillin-clavulanic acid, is effective in reducing the risk of complications such as dry socket and localized infections, which supports the current study's observation of improved clinical recovery in the antibiotic group (16). Nonetheless, the literature also cautions against the routine use of antibiotics due to the associated risks of antimicrobial resistance, adverse systemic reactions, and unnecessary healthcare costs (17). These concerns highlight the importance of tailoring antibiotic use based on individual patient risk factors rather than applying a uniform prophylactic approach. Although the current study did not assess infection rates, swelling, or dry socket occurrence, which are important indicators of antibiotic efficacy, the significant improvements in mouth opening and pain suggest that antibiotics may provide functional benefits in the early recovery period. These findings are further reinforced by studies showing that antibiotics such as amoxicillin-clavulanic acid yield better outcomes than monotherapy with amoxicillin, particularly in complex extractions or high-risk patients (18). Furthermore, systematic reviews have confirmed the safety and prophylactic value of this combination while simultaneously warning against overuse in routine cases, where surgeon experience and surgical duration may play more decisive roles in determining patient outcomes than antibiotics alone (19,20).

One of the strengths of the present study is its randomized clinical design and standardized surgical protocol conducted by a single operator, which minimizes variability. The use of objective measures such as VAS for pain and millimeter-scale trismus assessments adds to the reliability of the results. However, several limitations must be acknowledged. The study did not assess long-term complications beyond the fifth postoperative day, nor did it evaluate infection-specific outcomes such as pus discharge, swelling, or fever, which limits the comprehensive understanding of antibiotic efficacy. Additionally, the relatively small sample size and single-center design may limit the generalizability of the findings. Future research should aim to include larger, multicenter trials with longer follow-up periods and expanded outcome parameters to assess the broader clinical relevance of antibiotic use in third molar surgeries. Studies comparing different classes and durations of antibiotics, as well as evaluating cost-benefit ratios and resistance patterns, would further strengthen clinical guidelines. While the findings of this study do not advocate for indiscriminate antibiotic use, they support a selective, evidence-informed approach in which antibiotics may offer tangible benefits, particularly for patients undergoing complex surgical extractions or those with immunocompromised status.

CONCLUSION

In conclusion, the findings of this study highlight that postoperative antibiotic therapy following the surgical extraction of impacted mandibular third molars contributed to a smoother recovery by alleviating pain and enhancing functional mouth opening, particularly by the fifth postoperative day. These outcomes suggest that antibiotics may offer clinical value in improving early postoperative comfort and mobility, especially in patients prone to delayed healing. The study underscores the importance of considering targeted antibiotic use as part of a patient-centered approach to optimize recovery after third molar surgery.

AUTHOR CONTRIBUTION

Author	**Contribution**
Maleeha Latif*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Chaudhry Muhammad Usman	Substantial Contribution to study design, interpretation of Data Critical Review Has given Final Approval of the version to be published
Muhammad Afzal	Review of Literature
Hafiz Abubakar Ghufran	Critical Input
Aminah Khan	Review of Literature

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