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Original Article

Prevalence of Postoperative Infections in Pediatric Maxillofacial Trauma Patients: A Cross-Sectional Study

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Abstract

Background: Pediatric maxillofacial trauma requires tailored surgical management, but postoperative infection rates in low- and middle-income country settings remain underreported. Understanding procedure-specific and demographic patterns is essential for preventive strategies.

Objective: To determine the prevalence of postoperative infections in pediatric maxillofacial trauma patients.

Methods: This cross-sectional study was conducted at Liberty Hospital Limited, Dhaka, Bangladesh, from January 2023 to December 2025. Using purposive sampling, 72 pediatric patients (aged ≤18 years) with maxillofacial trauma requiring surgical intervention were enrolled. Surgical procedures included ORIF (19 cases), closed reduction (31 cases), and soft tissue repair (22 cases). Postoperative infection was defined as purulent discharge, positive culture, or inflammation requiring antibiotics within 30 days. Data were analyzed using SPSS version 25.0.

Results: Postoperative infection prevalence was 13.9% among 72 patients. Age distribution was 52.8% (14–16 years) and 47.2% (>16 years). Males comprised 68.1%. Mandibular trauma was most common (43.1%), followed by maxillary (25.0%), zygomatic (16.7%), and multiple fractures (15.3%). Infection rates were 16.3% in males and 8.7% in females (p=0.382). ORIF had the highest infection rate (26.3%), followed by closed reduction (9.7%) and soft tissue repair (9.1%). Surgery ≥2 hours and hospital stay ≥5 days were significantly associated with infection (p=0.007 each).

Conclusion: Postoperative infection occurred in 13.9% of pediatric maxillofacial trauma patients. Longer surgery duration and prolonged hospital stay were significantly associated with infection. ORIF carried the highest risk. Routine surveillance and tailored antibiotic protocols are recommended.

Keywords: Infection, Maxillofacial injuries, Open fracture reduction, Postoperative complications, Wound infection

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Introduction

Pediatric maxillofacial trauma represents a significant proportion of injuries in children and adolescents, accounting for approximately 15% of all maxillofacial trauma cases globally [1]. These injuries pose unique clinical challenges due to ongoing facial growth, developing dentition, and distinct fracture patterns that differ substantially from those observed in adults. The epidemiological profile of pediatric maxillofacial fractures varies considerably across different age groups and geographical regions, with road traffic accidents emerging as the

predominant cause in many low- and middle-income countries [2]. The management of pediatric maxillofacial fractures requires careful consideration of multiple factors, including the patient's age, fracture location, degree of displacement, and associated soft tissue injuries [3]. Treatment modalities range from closed reduction and observation to open reduction with internal fixation (ORIF). The choice of surgical approach significantly influences postoperative outcomes, particularly the risk of surgical site infections [4]. Recent evidence suggests that the proportion of pediatric patients undergoing ORIF increases with age, reflecting the transition toward treatment patterns resembling those in adults [1]. Surgical site infection remains a concerning complication following maxillofacial procedures. The oral cavity hosts a diverse polymicrobial flora, making clean-contaminated surgeries particularly susceptible to infectious complications [5]. While the overall prevalence of surgical site infections following ORIF for mandibular fractures has been estimated at 4.2% in mixed adult and pediatric populations, procedure-specific and age-stratified data remain limited [6]. Moreover, most existing evidence derives from high-income country settings, with a notable scarcity of region-specific data from South Asia, including Bangladesh [7]. Several risk factors have been identified for postoperative infections following maxillofacial trauma surgery. Prolonged operative duration, extended hospital stay, fracture complexity, and the presence of multiple injuries have all been associated with increased infection risk [8]. In pediatric patients, additional age-related factors, including immune system maturation and adherence to postoperative care instructions, may further modulate infection susceptibility [9]. Understanding these risk factors is essential for developing effective preventive strategies and optimizing perioperative antibiotic protocols [10]. The coronavirus disease 2019 (COVID-19) pandemic has also influenced pediatric trauma patterns and surgical services in Bangladesh, with trauma becoming the most common cause of pediatric surgical admissions during the pandemic period [11]. This shift underscores the continued relevance of trauma-related research in the region. Despite growing awareness of pediatric maxillofacial trauma, comprehensive data on postoperative infection prevalence following different surgical interventions in Bangladeshi children remain sparse. Most published studies have focused on adult populations or have been conducted in settings with different demographic and healthcare infrastructure characteristics [12,13]. This knowledge gap hampers evidence-based decision-making regarding surgical technique selection, antibiotic prophylaxis, and postoperative monitoring protocols. Given these considerations, this study aimed to determine the prevalence of postoperative infections among pediatric maxillofacial trauma patients undergoing surgical intervention at a tertiary care hospital in Dhaka, Bangladesh, and to describe its distribution by age, gender, clinical characteristics, and type of surgical procedure.

Methodology

This cross-sectional study included pediatric patients with maxillofacial trauma who underwent surgical intervention at Liberty Hospital Limited, Dhaka, Bangladesh, between January 2023 and December 2025. A total of 72 patients were enrolled using purposive sampling.

Inclusion criteria: Patients aged 18 years or younger with radiologically confirmed maxillofacial fractures or soft tissue injuries requiring surgical management were included. Both sexes were eligible.

Exclusion criteria: Patients with pre-existing craniofacial anomalies, previous maxillofacial surgery, active systemic or local infection at presentation, antibiotic use within 48 hours prior to injury, or immunocompromised status were excluded from the study.

Study procedure: All patients underwent either open reduction and internal fixation (ORIF), closed reduction, or soft tissue repair under general anesthesia. Postoperative infection was defined as the presence of wound dehiscence with purulent discharge, a positive microbial culture from the surgical site, or clinical signs of inflammation (erythema, warmth, swelling) requiring antibiotic therapy within 30 days following surgery [14]. No validated scoring system or risk prediction tool was used in this study, as the primary outcome was simple binary classification of infection status.

Data analysis: Data were recorded on a structured proforma and analyzed using SPSS version 25.0. Categorical variables were presented as percentages. Associations between categorical variables and postoperative infection were assessed using the Chi-square test. A p-value less than 0.05 was considered statistically significant.

Result

A total of 72 pediatric maxillofacial trauma patients were included in this cross-sectional study. The age distribution showed two subgroups of interest: patients aged 14–16 years accounted for 52.8%, while those aged greater than 16 years comprised 47.2%. Male patients predominated, with 68.1% compared to 31.9% females. Regarding clinical characteristics, mandibular trauma was the most common injury type, observed in 43.1%, followed by maxillary trauma in 25.0%, zygomatic trauma in 16.7%, and multiple fractures in 15.3%. In terms of surgical management, closed reduction was performed most frequently in 43.1%, followed by soft tissue repair in 30.5% and open reduction and internal fixation (ORIF) in 26.4%. Postoperative infection was documented in 13.9%

of patients, while the remaining 86.1% had an uncomplicated postoperative course. When analyzing infection by gender, infections occurred in 16.3% of males and 8.7% of females, but this difference was not statistically significant (p = 0.382). No significant association was found between trauma type and postoperative infection (p = 0.433); however, the highest infection proportion was observed in patients with multiple fractures at 27.3%, followed by mandibular trauma at 12.9%, maxillary trauma at 11.1%, and zygomatic trauma at 8.3%. A statistically significant association was observed between duration of surgery and postoperative infection (p = 0.007). Patients with surgery lasting two hours or more had an infection rate of 25.0%, whereas those with surgery lasting less than two hours had an infection rate of 2.8%. Hospital stay was also significantly associated with infection (p = 0.007): patients hospitalized for five days or more had an infection rate of 25.0%, compared with 2.8% among those hospitalized for less than five days. Additionally, procedure type demonstrated a notable difference in infection rates, with ORIF carrying the highest infection rate at 26.3%, followed by closed reduction at 9.7% and soft tissue repair at 9.1%.

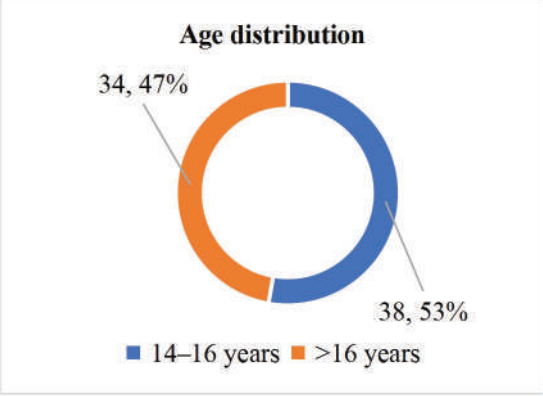


Figure 1: Age distribution of pediatric maxillofacial trauma patients (n=72)

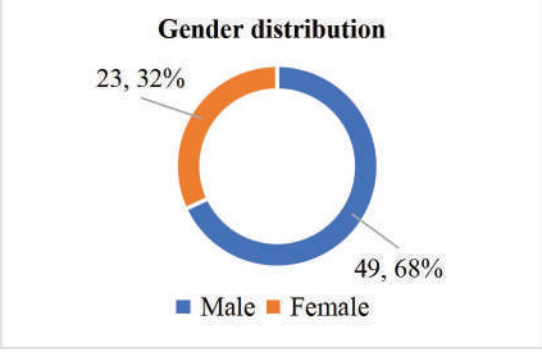


Table 2: Gender distribution of pediatric maxillofacial trauma patients

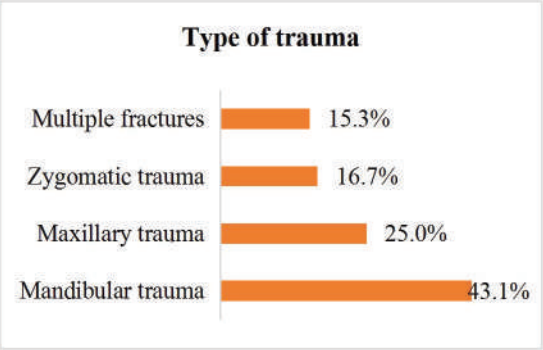
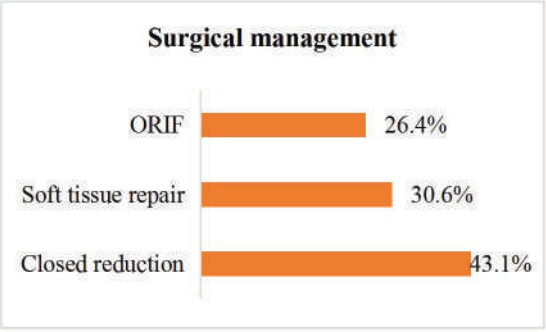


Figure 3: Type of trauma



ORIF: Open reduction and internal fixation
Figure 4: Surgical management

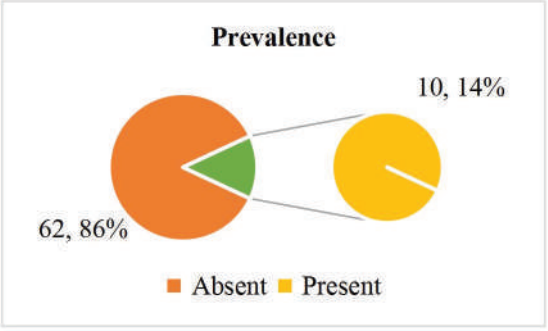


Figure 5: Prevalence of postoperative infections among participants

Table 1: Association between gender and postoperative infection

Gender	Infection		Total	Rate
	Yes	No		
	n	n	n	%
Male	8	41	49	16.3
Female	2	21	23	8.7
Total	10	62	72	13.9

Table 2. Association between trauma type and postoperative infection

Trauma type	Infection		Total	Rate
	Yes	No		
	n	n	n	%
Mandibular	4	27	31	12.9
Maxillary	2	16	18	11.1
Zygomatic	1	11	12	8.3
Multiple fractures	3	8	11	27.3
Total	10	62	72	13.9

Table 3. Association Between Duration of Surgery and Postoperative Infection

Duration	Infection		Total	Rate
	Yes	No		
	n	n	n	%
<2 hours	1	35	36	2.8
≥2 hours	9	27	36	25
Total	10	62	72	13.9

Table 4: Association between hospital stay and postoperative infection

Stay	Infection		Total	Rate
	Yes	No		
	n	n	n	%
<5 days	1	35	36	2.8
≥5 days	9	27	36	25
Total	10	62	72	13.9

Discussion

The present study found a postoperative infection prevalence of 13.9% among pediatric maxillofacial trauma patients undergoing surgical intervention at a tertiary hospital in Dhaka, Bangladesh. This figure is substantially higher than the 4.2% pooled prevalence reported in a recent systematic review and meta-analysis of surgical site infections following ORIF for mandibular fractures [6]. Several factors may explain this discrepancy. First, the present study included all types of maxillofacial procedures (ORIF, closed reduction, and soft tissue repair) rather than exclusively ORIF cases. Second, the meta-analysis [6] predominantly included studies from high-income countries with established perioperative antibiotic protocols and infection control infrastructure, whereas the present study reflects real-world practice in a lower-middle-income setting [7,11]. The infection rate following ORIF in this study (26.3%) is notably higher than the 5% to 15% range reported in previous pediatric maxillofacial series [15]. This elevated rate may be attributed to several factors, including delayed presentation, limited access to perioperative resources, and a higher proportion of contaminated fractures at the time of surgery. A study from India reported comparable ORIF infection rates (22.7%) in a resource-limited setting, suggesting that contextual factors significantly influence postoperative outcomes [16]. Duration of surgery of two hours or more was significantly associated with infection ($p = 0.007$), with an infection rate of 25.0% compared to 2.8% for procedures lasting less than two hours. This finding aligns with previous evidence demonstrating that prolonged operative time increases bacterial exposure, tissue desiccation, and surgical stress, all of which predispose to surgical site infections [17]. Similar associations have been reported in maxillofacial trauma populations, where each additional hour of surgery increased infection risk by approximately 30% [8,18]. Hospital stay of five days or more was also significantly associated with infection ($p = 0.007$). While prolonged hospitalization may reflect greater injury severity or postoperative complications, it also increases exposure to nosocomial pathogens. A prospective study from Bangladesh found that hospital-acquired infections occurred in 18% of pediatric surgical patients with stays exceeding five days, consistent with the present findings [19]. No significant associations were observed between gender and infection ($p = 0.382$) or between trauma type and infection ($p = 0.433$). However, the highest infection proportion was observed in patients with multiple fractures (27.3%), which is consistent with the concept that greater fracture complexity and soft tissue disruption increase infection vulnerability [20]. The present study provides important region-specific data from a lower-middle-income country where such evidence is scarce [7,13,21]. The findings suggest that infection rates in Bangladeshi pediatric maxillofacial trauma patients exceed those reported in high-income settings, highlighting the need for context-appropriate infection control protocols [22]. Future multicenter prospective studies with larger sample sizes are needed to identify independent risk factors and to evaluate the effectiveness of enhanced perioperative antibiotic protocols, preoperative oral decontamination, and postoperative surveillance systems in reducing infection rates [23].

Limitations

This study has several limitations. The purposive sampling technique may introduce selection bias. The small sample size precludes multivariable analysis. Antibiotic prophylaxis regimens, time from injury to surgery, and microbiological profiles were not documented.

Conclusion

Postoperative infection occurred in 13.9% of pediatric maxillofacial trauma patients, with significantly higher rates associated with surgery duration of two hours or more and hospital stay of five days or more. ORIF carried the highest infection risk (26.3%). These findings highlight the need for enhanced infection prevention strategies in this population.

Recommendation

Routine infection surveillance, strict perioperative antibiotic protocols, and minimizing operative time are recommended. Future multicenter studies with larger samples should identify additional risk factors to guide preventive interventions in resource-limited settings.

Conflict of Interest Statement: The authors declare no conflicts of interest. No funding was received for this study. The corresponding author had full access to all data and final responsibility for the decision to submit for publication.

Limitations

Artificial intelligence tools contributed marginally to manuscript preparation and development. All core scientific content was human-verified.

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