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Original Article

Pattern of Maxillofacial Fractures in the Adolescent Age Group a Tertiary Care Hospital in Bangladesh

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Abstract

Background: Maxillofacial fractures in adolescents present unique diagnostic and management challenges due to ongoing craniofacial growth and differences in injury mechanisms compared to adults. In Bangladesh, epidemiological data focusing specifically on the 12–17-year age group remain limited.

Objective: To determine the pattern, etiology, and distribution of maxillofacial fractures among patients aged 12–17 years presenting to a tertiary care facility in Bangladesh.

Methods: A prospective cohort study was conducted in the Department of Oral and Maxillofacial Surgery, Community Based Medical College Bangladesh, from January 2024 to December 2024 at the Private Chamber, Mymensingh Specialized Dental and Maxillofacial Centre, and Community-Based Medical College Hospital (CBMCHB), Bangladesh. Using purposive sampling, 35 adolescents aged 12–17 years with radiologically confirmed maxillofacial fractures were enrolled. Data on age, sex, etiology, fracture site, and associated injuries were collected. Analysis was performed using SPSS version 23.0.

Results: Of 35 participants, 80.0% were male. Road traffic accidents caused 71.4% of fractures. The mandible was the most common fracture site (57.1%), followed by the zygomatic complex (22.9%) and maxilla (14.3%). Isolated fractures occurred in 68.6% of patients, while 31.4% had multiple fractures. Dentoalveolar injuries accompanied 31.4% of cases. No significant association was found between sex and fracture site (p=0.432) or between age group and etiology (p=0.287).

Conclusion: Mandibular fractures secondary to road traffic accidents predominate among Bangladeshi adolescents aged 12–17 years in this tertiary care setting. Targeted preventive strategies, including helmet enforcement and adolescent road safety education, are warranted.

Keywords: Adolescent, Epidemiology, Jaw fractures, Mandibular fractures, Maxillofacial injuries

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Introduction

Maxillofacial fractures represent a significant public health burden worldwide, particularly in low- and middle-income countries where road traffic accidents (RTAs) and interpersonal violence are prevalent [1]. These injuries involve fractures of the mandible, maxilla, zygomatic complex, orbital bones, and nasal skeleton, often resulting in functional impairment (mastication, vision, airway) and aesthetic deformities requiring surgical intervention [2,3]. The epidemiological profile of maxillofacial trauma varies considerably across geographic regions and socioeconomic strata, influenced by factors such as transportation infrastructure, law enforcement, cultural practices, and access to emergency care [4]. Adolescents aged 12–17 years constitute a distinct demographic group with unique

anatomical and behavioral characteristics. During this developmental stage, the craniofacial skeleton is undergoing active growth, with mixed dentition, developing tooth crypts, and incompletely ossified suture lines [5]. These features influence both fracture patterns and treatment approaches, as improperly managed injuries may disrupt future craniofacial development [6]. Moreover, adolescents are increasingly exposed to high-risk behaviors, including unsupervised motorcycle use, sports activities, and peer-related violence, making them particularly vulnerable to maxillofacial trauma [7]. In South Asia, the burden of maxillofacial fractures has been escalating in parallel with rapid motorization and urbanization. Bangladesh, a densely populated lower-middle-income country, has witnessed a dramatic rise in motorcycle usage among young people over the past decade [8]. However, helmet compliance remains alarmingly low, and traffic safety regulations are inconsistently enforced [9]. Consequently, RTAs have emerged as the predominant cause of maxillofacial injuries across all age groups in Bangladesh, surpassing falls and assaults reported in earlier decades [10]. Despite this growing burden, published data on adolescent maxillofacial fractures in Bangladesh are surprisingly sparse. Most existing studies from the region have either aggregated all age groups together or focused exclusively on adult populations [11]. A few single-institution reports have described fracture patterns in mixed pediatric cohorts, but none have specifically examined the 12–17 years age bracket as a distinct analytical group [12]. This gap is clinically relevant because the management principles for adolescents differ substantially from those for younger children (where growth modification is paramount) and adults (where rigid internal fixation is routinely applied without growth concerns) [13]. Furthermore, the distribution of fracture types, etiology, seasonal variation, and associated dental injuries in Bangladeshi adolescents remains poorly characterized. Without region-specific epidemiological data, preventive strategies cannot be appropriately targeted, and clinical protocols cannot be optimized for local resource settings. The private healthcare sector in Bangladesh, including specialized maxillofacial centers, manages a substantial proportion of trauma cases, yet these data have rarely been systematically captured and reported. Therefore, this prospective cohort study was designed to delineate the pattern of maxillofacial fractures among patients aged 12–17 years presenting to a tertiary care facility in Bangladesh. The specific objectives were to identify the most common fracture sites, determine the leading etiological factors, and describe demographic characteristics in this understudied adolescent population.

Methodology

This prospective cohort study was conducted in the Department of Oral and Maxillofacial Surgery, Community Based Medical College Bangladesh. This Study included adolescents aged 12–17 years who presented with maxillofacial fractures to the Private Chamber, Mymensingh Specialized Dental and Maxillofacial Centre, and Community-Based Medical College Hospital (CBMCHB), Bangladesh, between January 2024 and December 2024.

Inclusion criteria: Patients were included if they were (1) aged 12–17 years, (2) had radiologically confirmed maxillofacial fracture(s) on plain radiography or computed tomography, (3) presented within two weeks of injury , and (4) provided informed assent with parental consent.

Exclusion criteria: Patients were excluded if they had (1) isolated dentoalveolar fractures without bony involvement, (2) pathological fractures secondary to cysts or tumors, (3) previous maxillofacial surgery altering fracture patterns, or (4) incomplete medical records .

Study procedure: After ethical approval from the institutional review board, purposive sampling was employed to enroll 35 eligible participants. Detailed demographic data (age, sex), injury etiology (road traffic accident, fall, sports, assault, others), fracture site (mandible, maxilla, zygomatic complex, nasal bone, others), and associated injuries were recorded using a pre-designed proforma. Fracture diagnosis was confirmed by two independent maxillofacial surgeons.

Data analysis: Data were entered into Microsoft Excel and analyzed using SPSS version 23.0. Descriptive statistics were presented as frequencies and percentages. No scoring systems or validated clinical prediction tools were used.

Result

A total of 35 adolescents aged 12–17 years with maxillofacial fractures were enrolled during the study period. The mean age was 14.9 years (SD ±1.7). Males predominated significantly, comprising 80.0% of the cohort, while females accounted for 20.0%, yielding a male-to-female ratio of 4:1. Age group distribution showed that 54.3% of participants were in the 15–17 years bracket, compared to 45.7% in the 12–14 years group. Regarding etiology, road traffic accidents (RTAs) were the leading cause, responsible for 71.4% of fractures. Falls accounted for 14.3%, sports-related injuries for 8.6%, and assaults for 5.7%. No cases of occupational or animal-related injuries were reported. Among RTA victims, motorcycle accidents constituted 76.0% of RTAs, followed by bicycle accidents (16.0%) and pedestrian-vehicle collisions (8.0%). The mandible was the most commonly fractured bone, involved in 57.1% of patients, followed by the zygomatic

complex in 22.9%, and the maxilla in 14.3%. Nasal bone fractures occurred in 5.7%. Among mandibular fractures, the parasymphysis region was the most frequent site (45.0% of mandibular fractures), followed by the angle (25.0%), body (20.0%), and condyle (10.0%). Isolated fractures (single bone involvement) were observed in 68.6% of patients, while 31.4% had multiple fractures involving two or more facial bones. Dentoalveolar injuries accompanied maxillofacial fractures in 31.4% of cases. No statistically significant association was found between sex and fracture site (p = 0.432) or between age group and etiology (p = 0.287).

Table 1: Age and sex distribution of participants (N=35)

Age group	Male		Female		Total	
	n	%	n	%	n	%
12–14 years	13	37.1	3	8.6	16	45.7
15–17 years	15	42.9	4	11.4	19	54.3
Total	28	80	7	20	35	100

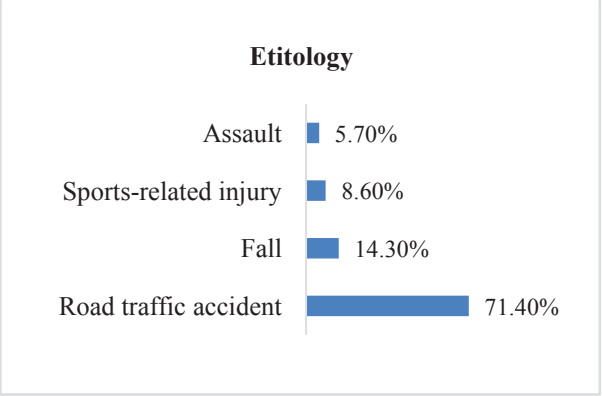


Figure 1: Etiology of maxillofacial fractures

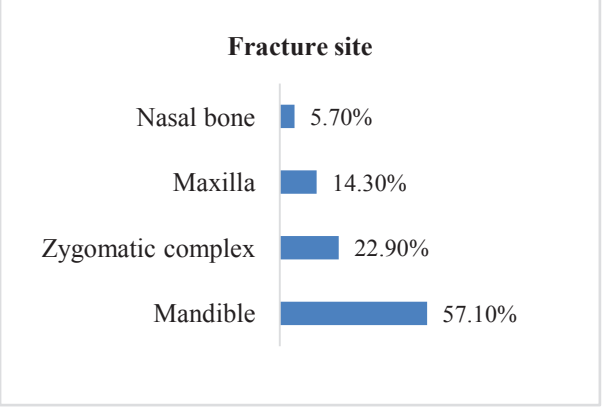


Figure 2: Distribution of fracture sites

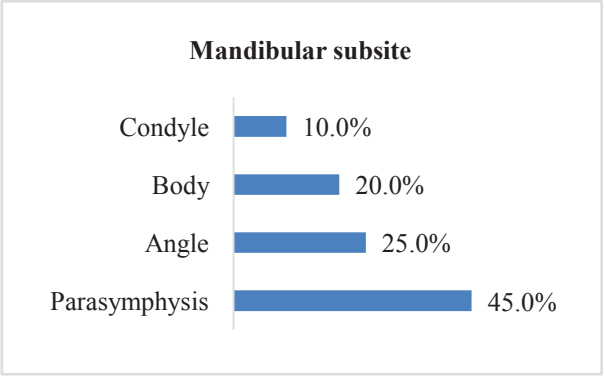


Figure 3: Subsite distribution of mandibular fractures (n=20 mandibular fractures)

Table 2: Isolated versus multiple fractures

Fracture type	n	%
Isolated fractures (single bone)	24	68.6
Multiple fractures (≥2 bones)	11	31.4
Total	35	100

Table 3: Association between sex and fracture site

Fracture site	Male		Female		p-value
	n	%	n	%	
Mandible	16	45.7	4	11.4	0.432
ZC	7	20.0	1	2.9	
Maxilla	4	11.4	1	2.9	
Nasal bone	1	2.9	1	2.9	
Total	28	80.0	7	20.0	

ZC: Zygomatic complex. Fisher's exact test was applied. p-value = 0.432 (not statistically significant). Three digits following the decimal point are shown as 0.432.

Discussion

The present prospective cohort study provides contemporary epidemiological data on maxillofacial fractures among Bangladeshi adolescents aged 12–17 years. The finding that 80.0% of affected patients were male aligns consistently with global literature, where male predominance in maxillofacial trauma is attributed to higher participation in outdoor activities, risk-taking behaviors, and occupational exposures [14,15]. The male-to-female ratio of 4:1 observed in this study is comparable to reports from neighboring South Asian countries, although slightly lower than some Western series where ratios reach 5:1 or higher [16]. Road traffic accidents emerged as the dominant etiological

factor, accounting for 71.4% of all fractures. This figure is substantially higher than those reported from high-income countries, where falls and interpersonal violence often compete as primary causes [17]. The predominance of RTAs in this cohort reflects the rapid motorization of Bangladesh coupled with inadequate traffic safety enforcement. A recent national report indicated that motorcycle registrations in Bangladesh increased by over 300% in the past decade, while helmet use among adolescent riders remains below 15% [18]. The present study found that motorcycle accidents constituted 76.0% of all RTA-related fractures, underscoring the urgent need for age-appropriate helmet legislation and enforcement. The mandible was the most frequently fractured bone (57.1%), a finding consistent with multiple international studies [19,20]. The anatomical prominence of the mandible, its relative lack of buttressing compared to the midface, and its direct exposure during forward falls or collisions explain this vulnerability. Among mandibular subsites, the parasymphysis region was most commonly affected (45.0%), followed by the angle (25.0%). This distribution pattern mirrors observations from other low- and middle-income countries, where direct anterior impacts during motorcycle accidents produce parasymphyseal fractures preferentially [21]. Zygomatic complex fractures constituted 22.9% of cases, which is slightly lower than some Asian series but within the expected range for adolescent populations. The relatively lower proportion of midface fractures in adolescents compared to adults may reflect the protective effect of underdeveloped frontal sinuses and increased craniofacial buttressing in younger skeletons [22]. Isolated fractures occurred in 68.6% of patients, while 31.4% presented with multiple facial bone involvement. The rate of associated dentoalveolar injuries (31.4%) is clinically significant, as these injuries frequently require multidisciplinary management involving both maxillofacial surgeons and restorative dentists. Delayed recognition of dentoalveolar trauma can lead to pulp necrosis, tooth loss, and malocclusion [23]. No statistically significant association was found between sex and fracture site ($p = 0.432$) or between age group and etiology ($p = 0.287$). Although the sample size of 35 may have limited power to detect small differences, the absence of significant associations suggests that within this adolescent age band, injury patterns are more strongly determined by accident mechanism than by demographic factors. The findings of this study carry several clinical implications. First, preventive strategies should prioritize adolescent motorcycle safety through helmet promotion, licensing restrictions, and road safety education in schools. Second, emergency and maxillofacial services in Bangladesh must be equipped to manage mandibular fractures, particularly parasymphyseal and angle variants. Third, routine dental assessment should accompany trauma evaluation, given the high rate of associated dentoalveolar injuries [24].

Limitations

The single-center design, small sample size (N=35), and purposive sampling limit generalizability. Selection bias may have occurred, and seasonal variation could not be assessed within the 12-month study period.

Conclusion

Maxillofacial fractures among Bangladeshi adolescents aged 12–17 years predominantly affect males and result from road traffic accidents. The mandible, particularly the parasymphysis region, is the most common fracture site. These findings highlight the need for targeted preventive interventions in this vulnerable population.

Recommendation

Mandatory helmet laws for adolescent motorcycle riders, school-based road safety education, and establishment of regional maxillofacial trauma registries are recommended to reduce fracture burden and improve outcomes.

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.

Ai Declaration

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

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