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Prevalence and Etiology of Pediatric Maxillofacial Injuries

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ABSTRACT

Background: The prevalence of maxillofacial injuries in children is less than in adults; however, the presence of ongoing facial growth and development makes these injuries more challenging. Such injuries may have important physical or psychological effects, so prompt and adequate treatment is needed. to assess the frequency, causes, anatomical distribution, and treatment outcomes of maxillofacial injuries in children presenting to Jinnah Postgraduate Medical Centre (JPMC), Karachi. **Methods:** A descriptive cross-sectional study was conducted at JPMC for one year, from January 2023 to December 2023, in which 103 children between the ages of 1-15 years with diagnosed maxillofacial trauma were registered. Information regarding age, sex, cause of injury, site of involvement, treatment, and clinical outcome was gathered using structured proformas and clinical record forms. The relationships between gender and injury-related factors were assessed using Chi-square tests, with significance defined as $p \leq 0.05$. **Results:** Most of the injuries sustained were in children between the ages of 6 and 10, with a slight male predominance. The predominant causes of trauma were falls and road traffic accidents. The facial bone that sustained the greatest injury was the mandible, followed by the zygomatic and maxillary bones. The bulk of the patients were treated conservatively, while a smaller subset required surgical intervention. Most patients recovered without complications; however, a small number suffered from infections or malunion. **Conclusion:** In children, particularly in boys, the leading causes of maxillofacial injuries are also associated with falls and road accidents. Familiarity with the prevailing trends of injury enables quick intervention and focused management, which are critical in effective treatment and prevention mechanisms. To alleviate the incidence of such problems, there is a need to focus on child care and education as well as traffic laws.

INTRODUCTION

Facial trauma in children poses a distinctive blend of clinical, psychological, and anatomical difficulties. The face of growing children and its skeleton is evidently different compared to an adult baby; therefore, even small injuries can result in growth, functional, and cosmetic complications (1) While maxillofacial injuries in the pediatric population are not as common as in adults, they have been on the rise in recent years due to urbanization, increased motor traffic, lack of protective measures, and inadequate supervision of children (2, 3).

Because of their tendency to be more active, explore their surroundings, and lack motor control, children devices face injuries much easier than adults (4, 5). Children, unlike adults, do not take protective measures such as covering their face during falls or collisions. The presence of developing teeth, and the elasticity of pediatric bones, often makes clinical management of facial trauma much more complicated, needing a specialized approach (6).

The etiology and features of these injuries are strikingly different depending on the gender, age, and socio-economic geographic context. In some of the lower income countries, the majority of these incidents stem from falls off unsecured platforms, motorcycle and unrestrained passenger car accidents, and various home accidents (7, 8). Understanding these patterns facilitates accurate diagnosis and appropriate management, as well as assists in the formulation of preventive measures.

Despite the growing concern, literature specific to pediatric maxillofacial injuries remains relatively limited in Pakistan. Most available data are either generalized or focused on adult populations. Therefore, this study was designed to assess the frequency, causes, anatomical distribution, and treatment outcomes of maxillofacial injuries in children presenting to Jinnah Postgraduate Medical Centre (JPMC), Karachi. Understanding these factors in a local context will not only aid clinicians in making informed decisions but also guide public health initiatives aimed at reducing the

incidence of such injuries among children.

METHODOLOGY

This descriptive cross-sectional study was done at the Department of Oral and Maxillofacial Surgery of Jinnah Postgraduate Medical Centre (JPMC), Karachi. JPMC is one of the larger tertiary care centers in Pakistan and has a large influx of pediatric trauma admissions, making it a suitable site for research on maxillofacial injuries. The study protocol was reviewed and approved by the Institutional Review Board of Jinnah Postgraduate Medical Centre, Karachi, dated 20th January 2023. Informed consent was taken from all guardians prior to participation. All information pertaining to the patients was kept confidential, and patients had the freedom to withdraw at any time.

The data were collected over a period of one year, from January 2023 to December 2023.

A total of 103 pediatric patients were included in the study. The sample size was calculated using a 95% confidence level and 5% margin of error, assuming a prevalence of pediatric maxillofacial injuries from existing local literature. A non-probability consecutive sampling technique was employed, where all eligible cases presenting to the department during the study period were enrolled.

Inclusion Criteria

- Children aged between 1 and 15 years.
- Patients with clinically or radiologically confirmed maxillofacial injuries.
- Those who presented within 7 days of injury onset.
- Informed consent obtained from parents or legal guardians.

Exclusion Criteria

- Patients older than 15 years.
- Children with only dental trauma or minor soft tissue abrasions not requiring treatment.
- Recurrent injuries or follow-up visits for old trauma.
- Cases with incomplete records or lack of consent.

Data Collection Procedure

After obtaining ethical approval and informed consent, data were recorded on a structured proforma. Demographic information such as age, gender, and residence was documented. Detailed history was taken from caregivers, including the time and cause of injury. A clinical examination was carried out to identify the type and site of injury. Radiological imaging (X-rays or CT scans) was used where necessary to confirm fractures. Treatment details, mode of intervention, and post-treatment outcomes were also noted.

The study variables included demographic details (age group, gender, residence), etiology of injury (road traffic accident, fall, assault), type of injury (soft tissue or bony), anatomical site involved (mandible, maxilla, nasal bone, etc.), mode of treatment (conservative or surgical), and final outcome (complication-free recovery, infection, malunion).

Data were entered and analyzed using SPSS version 25. Descriptive statistics were used to summarize age, gender, etiology, injury type, treatment method, and outcome. Frequencies and percentages were calculated for categorical variables. The Chi-square test was applied to examine associations between gender and other variables, with a p-value ≤ 0.05 considered statistically significant.

RESULTS

The distribution of maxillofacial injuries across age groups revealed that children aged 6 to 10 years were the most commonly affected, followed closely by the under-five age group. There was no major difference observed between boys and girls in terms of age-related injury frequency. The statistical analysis confirmed that the variation in age group distribution between genders was not significant ($p = 0.8089$), suggesting that age does not play a gender-specific role in the occurrence of such injuries.

Table 1

Age Group and Gender Distribution

Age Group	Female	Male	p-value
<5 years	15	18	0.8089
6–10 years	16	20	
11–15 years	13	21	

Among the causes of pediatric maxillofacial injuries, falls and road traffic accidents were the most frequently reported, especially among male children. Sports and domestic accidents were more commonly seen in females, while assault-related injuries were nearly equally distributed. Although there were apparent differences in frequency, they did not reach statistical significance ($p = 0.1532$), indicating that etiology was not strongly associated with gender in this sample.

Table 2

Etiology of Injury by Gender

Etiology	Female	Male	p-value
RTA	5	14	0.1532
Fall	7	17	
Assault	9	8	
Sports	12	11	
Domestic	11	9	

In terms of injury location, the mandible was the most frequently involved site, particularly among male children. Other commonly affected areas included the zygomatic and maxillary bones. Nasal injuries were less frequent. The differences in site distribution between genders were not statistically significant ($p = 0.2556$), suggesting that the anatomical site of injury is not

gender-dependent in this pediatric population.

Table 3
Site of Maxillofacial Injury by Gender

Site of Injury	Female	Male	p-value
Mandible	11	19	0.2556
Maxilla	12	14	
Nasal	5	13	
Zygomatic	16	13	

When looking at the treatment approach, a conservative method was more commonly adopted for both males and females. Surgical intervention was also performed in a notable proportion of cases but was not limited by gender. With a p-value of 0.7336, there was no statistically significant association between the mode of treatment and gender, indicating that treatment choice was likely based more on injury severity and location than on sex.

Table 4
Mode of Treatment by Gender

Treatment Mode	Female	Male	p-value
Conservative	23	34	0.7336
Surgical	21	25	

Most of the children in this study recovered without complications. However, some experienced infections and malunion, particularly among males. Although the outcome differences appeared somewhat gender-skewed, statistical testing revealed that these were not significant (p = 0.4957). This implies that post-treatment complications did not show a strong gender bias.

Table 5
Outcome of Injury by Gender

Outcome	Female	Male	p-value
No Complication	17	25	0.4957
Infection	15	14	
Malunion	12	20	

Figure 1

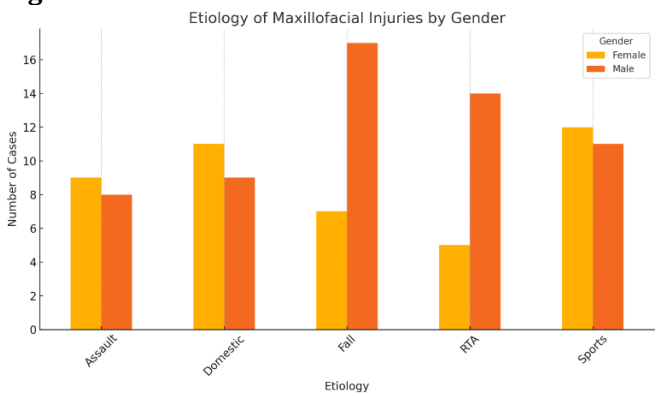

Figure 1: The graph illustrates the distribution of various causes of pediatric maxillofacial injuries across male and female patients. Among all etiologies, falls and road traffic accidents were the most frequent, particularly among boys. Female children, on the other hand, showed a relatively higher frequency of injuries due to domestic incidents and sports. Assault-related injuries appeared nearly equal between genders. Overall, the visual trend indicates that boys are more prone to high-impact traumas like RTAs and falls, while girls experience more home-based or activity-related injuries. This pattern reflects possible differences in exposure to risk factors based on gender-specific behaviors or environments.

DISCUSSION

Pediatric maxillofacial trauma represents a distinct clinical challenge due to the anatomical, physiological, and behavioral characteristics of children. This study explored the patterns, causes, and outcomes of such injuries among children presenting to Jinnah Postgraduate Medical Centre (JPMC), Karachi.

In our findings, children aged 6 to 10 years were the most commonly affected group, which aligns with results from similar regional studies that also reported that school-going children are at a higher risk due to increased outdoor activity and limited coordination skills. Younger children (<5 years) were also significantly affected, which could be attributed to a lack of environmental safety and caregiver supervision(9-11). Gender-based trends revealed that boys sustained more injuries than girls, although the difference was not statistically significant. This pattern was consistent with studies which noted higher male involvement due to more aggressive play and greater exposure to risky environments(12-14).

Etiologically, falls and road traffic accidents (RTAs) were the leading causes, a finding echoed in multiple regional and global studies. In particular, road traffic accidents remain a significant contributor in South Asian countries where traffic regulation enforcement is often weak and the use of safety restraints in children is minimal. Studies similarly highlighted that falls from stairs, rooftops, or unprotected furniture were a primary cause of injury in children from low-income areas (15-17).

Anatomically, the mandible was the most commonly fractured bone, consistent with studies. The high frequency of mandibular injuries may be due to its prominence and exposure during impact. Other sites such as the maxilla, zygoma, and nasal bones were also involved but less frequently (18, 19).

Treatment approaches in this study leaned more toward conservative management, especially in minor or non-displaced fractures, which reflects a cautious approach in pediatric trauma care to avoid growth disturbances. Surgical intervention was reserved for displaced or functionally compromising injuries, in line with modern trauma protocols. Similar studies emphasizing minimal

invasiveness in pediatric facial trauma unless absolutely necessary (20-22).

Post-treatment outcomes were generally favorable, with most patients recovering without complications. However, cases of infection and malunion were observed, especially in fractures that were either left untreated initially or those with delayed hospital presentation. This underlines the importance of early intervention and proper follow-up care.

While the study provides valuable insight into pediatric facial trauma, it is not without limitations. Being a single-center study, the findings may not fully represent patterns in other regions. Additionally, factors such as socioeconomic status, parental awareness, and injury recurrence could not be deeply explored.

CONCLUSION

This study highlights that pediatric maxillofacial injuries are most commonly caused by falls and road traffic accidents, with boys being slightly more affected. The mandible remains the most frequent site of fracture, and while most injuries are managed conservatively, some require surgical intervention. Early diagnosis and prompt treatment are essential for preventing complications and ensuring favorable outcomes. The findings stress the need for improved injury prevention strategies, parental education, and stricter traffic safety measures to reduce the burden of facial trauma in children.

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