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Original Research Article

Pediatric facial trauma in a tertiary care hospital: an epidemiological overview in Mexico

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ABSTRACT

Background: Pediatric facial trauma is a major public health concern because of its functional, aesthetic, and psychological impact on growing patients. Injury patterns vary according to age, sex, and trauma mechanism, with motor vehicle accidents (MVCs) and falls being the most common causes. Epidemiological data from Mexico remain limited.
Methods: A retrospective descriptive study was conducted on patients <18 years old with facial fractures treated at the Plastic and Reconstructive Surgery Service of the General Hospital of Mexico "Dr. Eduardo Liceaga" between January 2019 and January 2025. Demographic characteristics, trauma mechanisms, fracture location, and treatment modality were analyzed. All fractures were confirmed by computed tomography.
Results: Fourteen patients were included; 64.3% were male and 78.6% were students. MVCs were the most frequent mechanism of injury (35.7%), followed by falls from height (21.4%). Adolescents aged 16–20 years represented the most affected group (42.9%). Midface fractures were the most common injuries (42.9%), especially orbital floor and multiple fractures. Upper-third fractures involving the orbital roof and frontal region accounted for 14.3% each. Conservative treatment was performed in 57.1% of patients, whereas 42.9% required surgery. High-energy trauma was associated with more complex fractures.
Conclusions: Pediatric facial trauma predominantly affected male adolescents and was mainly associated with MVCs. Midface fractures were the most frequent injuries, emphasizing the importance of prevention strategies and optimized management protocols.

Keywords: Pediatric facial trauma, Facial fractures, Maxillofacial injuries, Epidemiology, Motor vehicle accidents

INTRODUCTION

Facial trauma in children represents a relevant public health issue due to its potential short- and long-term aesthetic and functional consequences. Although pediatric facial fractures are less common than those observed in adults, they frequently coexist with soft-tissue injuries, including erosions, contusions, lacerations, and avulsions, which may lead to hemorrhage, trismus, dental mobility, and displacement of bone fragments.[1,2] Anatomical characteristics typical of childhood—such as greater bone elasticity, a higher cranial-to-facial ratio, and the presence of developing dentition—modify both the presentation and severity of these injuries.[3,4] These structural differences may also complicate diagnosis, particularly in nondisplaced fractures or those masked by soft-tissue edema.[5]

Trauma remains a leading cause of injury and mortality in the pediatric population, and craniofacial injuries constitute a substantial portion of these events.[1-6] Several epidemiological analyses report that the face represents one of the most frequently affected anatomical regions in children, following the head and extremities.[2,7] In national and international series, facial fractures represent between 4–10% of all pediatric trauma cases, with a progressive increase in incidence during adolescence.[3,6,8] Multiple studies demonstrate a marked male predominance, consistently attributed to higher exposure to risk activities.[1,4,5]

The distribution of facial fractures varies according to age. Younger children (0–5 years) sustain injuries mostly from falls, often presenting with soft-tissue trauma and isolated nondisplaced fractures.[5,9] In contrast, children aged 6–11 years tend to experience trauma related to recreational activities and sports, while adolescents demonstrate the highest incidence of fractures related to motor vehicle accidents, bicycle injuries, and interpersonal violence.[3,4,10] In several population-based cohorts, falls account for up to 60% of injuries in children under 10 years, while motor vehicle collisions (MVCs) become predominant from 12 years onward.[6,9-11] These trends have been replicated in different regions, including North America, Europe, and Asia.

Regarding fracture patterns, nasal and orbital fractures are frequently reported among pediatric patients, followed by mandibular fractures, particularly involving the condyle, angle, and symphyseal region.[6,8,11,12] Orbital fractures account for approximately 21–38% of pediatric cases in large series, whereas nasal fractures remain the most common isolated injury in many cohorts.[6,8] Mandibular fractures, although less common in younger children, become increasingly prevalent with age, particularly in adolescents.[5,11,12] High-energy trauma mechanisms, such as MVCs, are associated with more severe injuries, including complex midface fractures and associated systemic trauma.[10,11] Recent studies also highlight the influence of trauma mechanisms on injury severity. High-energy MVCs have been associated with complex fractures, zygomatic injuries, and concomitant soft-tissue lesions.[10,13] Although less frequent, interpersonal violence and non-accidental trauma continue to represent relevant etiologies in specific pediatric subgroups, especially among children under 5 years.[1,7]

Given the important epidemiological variations across age, sex, mechanism, and anatomical distribution, as well as the limited literature available in Mexico on pediatric facial fractures, it is essential to characterize the patterns observed in local healthcare institutions.

METHODS

The present study aims to determine the prevalence, etiology, and most affected fracture sites in pediatric patients treated at the Plastic and Reconstructive Surgery Service of the General Hospital of Mexico, analyzing their relationship with age and gender to better understand the patterns of facial trauma in our population. A retrospective descriptive observational study was conducted through a review of medical records of pediatric patients aged 0 to less than 18 years with facial trauma admitted to the Plastic and Reconstructive Surgery Unit of the General Hospital of Mexico “Dr. Eduardo Liceaga” from 01 January 2019, to 01 January 2025.

Inclusion criteria comprised pediatric age (<18 years), complete clinical records, imaging studies confirming facial trauma by computed tomography (CT) scan or facial bone radiography, diagnosis of facial trauma, and documentation of either surgical or conservative management in the medical record. Exclusion criteria included patients older than 18 years, incomplete clinical records, and absence of imaging studies confirming facial trauma.

In each case, the diagnosis upon admission, age, sex, mechanism of injury, affected facial region by thirds, and treatment modality were identified. Injury mechanisms were classified according to the most common causes found in our search: falls from standing height, motor vehicle accidents, falls from a height greater than 3 meters, firearm injuries, direct blunt trauma, and explosive impacts. Facial fractures were categorized as fractures involving the orbit, frontal bone, zygoma, maxilla, mandible, nasal bone, ethmoid, and sphenoid. All fractures included in this study were confirmed through imaging studies. Microsoft Excel was used for database management and percentage analysis.

RESULTS

A total of 14 pediatric patients with facial trauma were analyzed. Of the total patients, n=5 (35.7%) was female and n=9 (64.3%) was male (Figure 1). Regarding occupation, n=2 (14.3%) patients were unemployed, n=1 (7.1%) patient was employed, and n=11 (78.6%) patients were students. In terms of residence, n=5 (35.7%) patients resided in Mexico City, and n=9 (64.3%) patients came from other states (Table 1).

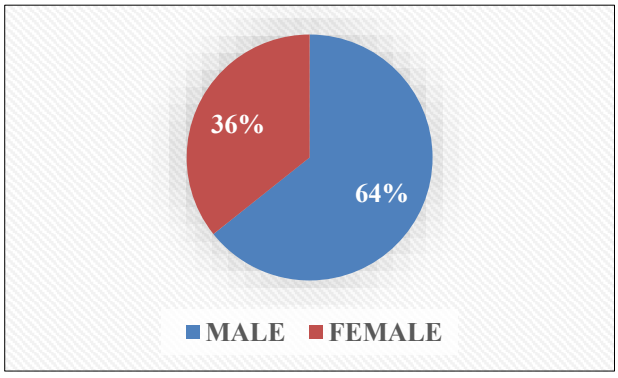

Figure 1: Distribution of patients by sex and age group.

The most frequent injury mechanism was motor vehicle accidents, accounting for n=5 (35.7%) cases, followed by falls from height with n=3 (21.4%) cases. Falls from their own standing height accounted for n=2 (14.3%) cases, firearm projectiles for n=1 (7.1%) case, blunt trauma for n=1 (7.1%) case, and explosive impacts for n=1 (7.1%).

In the analysis of craniofacial fractures among the 14 patients, a greater involvement of the midface was identified compared to the upper third. As shown in Table 1, orbital roof fractures represented n=2 (14.3%) of the cases, while multiple fractures primarily affecting the frontal bone and orbital roof in this region had the same incidence (n=2, 14.3%). No isolated fractures were observed in the frontal bone or the superior orbital rim. Conversely, in the midface, multiple fractures were the most frequent, with an incidence of n=6 (42.9%). Orbital floor fractures occurred in n=3 (21.4%) of the patients, followed by nasal and maxillary fractures, both with an incidence of n=1 (7.1%) each. No fractures were recorded in the lateral and medial orbital walls, the zygoma, or in the bone structures of the maxillary sinus or ethmoid (Table 2).

Table 1: Demographic characteristics of the study population (n=14).

Variables		Frequency (N)	Percentage (%)
Gender	Male	9	64.3
	Female	5	35.7
Age group (years)	1	2	14.3
	6-10	2	14.3
	11-15	4	28.6
	16-20*	6	42.
Occupation	Students	11	78.6
	Employed	1	7.1
	Unemployed	2	14.3
Residence	Mexico C	5	35.7
	Other States	9	64.3

Table 2: Distribution of maxillofacial fractures by anatomical region.

Bones involved		Total, cases	Incidence (%)
Upper third (superior third)	Frontal bone	0	0.00
	Orbital roof	2	14.30
	Supraorbital rim	0	0.00
	Multiple fractures	2	14.30
Middle third (midface)	Nasal bones	1	7.10
	Lateral orbital wall	0	0.00
	Medial orbital wall	0	0.00
	Orbital floor	3	21.40
	Inferior orbital rim	0	0.00
	Zygoma (zygomatic bone)	0	0.00
	Maxilla	1	7.10
	Sphenozygomatic suture	0	0.00
	Lateral wall of maxillary sinus	0	0.00
	Medial wall of maxillary sinus	0	0.00
	Anterior wall of maxillary sinus	0	0.00
	Ethmoid bone	0	0.00
	Multiple fractures	6	42.90

Regarding treatment, n=8 (57.1%) patients received conservative treatment, while n=6 (42.9%) patients required surgical treatment (Figure 2). These results reflect the distribution of facial injuries in pediatric patients, highlighting that the midface was the most affected and that the majority of cases were resolved with conservative treatment. The age range with the highest number of cases was 16 to 20 years, with n=6 (42.9%) patients affected. This was followed by the 11 to 15 years group, with n=4 (28.6%) cases. The age ranges of 1 to 5 years and 6 to 10 years presented the lowest number of patients, with n=2 (14.3%) cases each.

These data suggest that adolescents and young adults (11-20 years) were the most affected by facial trauma in this case series, which may be related to greater exposure to high-risk activities, accidents, or more severe trauma mechanisms at these ages.

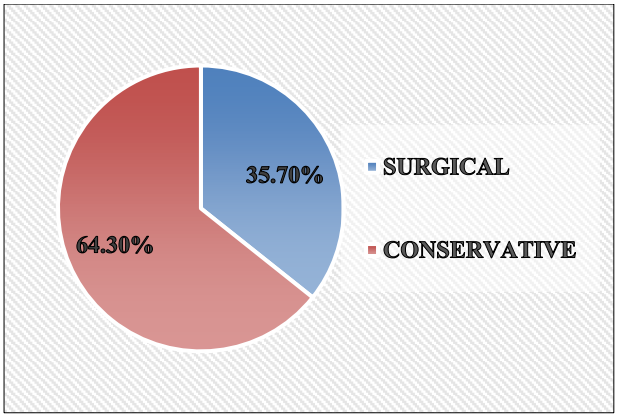

Figure 2: Management modalities in pediatric facial trauma: conservative versus surgical treatment.

DISCUSSION

In our case series, the majority of facial traumas occurred in adolescents and young adults, with the highest number of cases observed in the 16–20 years age group. This differs from various international cohorts reporting a higher frequency of injuries in younger children, particularly those under 11 years, where falls constitute the predominant mechanism.[5,9,11] Several authors describe a clear age-related shift in trauma patterns: falls dominate early childhood, whereas recreational injuries, sports, and motor vehicle accidents gradually increase with age, peaking during adolescence.[3,6,10] Our findings align with this transition, although the predominance of motor vehicle accidents in our population is particularly notable.

When analyzing fracture distribution, the midface—especially the orbital floor—was the most frequently affected region in our series. This is consistent with larger cohorts in which orbital fractures represent 21–38% of all pediatric facial fractures.[6,8] Hong et al similarly reported a high frequency of orbital and midface injuries, particularly in the context of MVCs and sports-related trauma. In our study, multiple fractures were also common, suggesting higher-impact mechanisms.

Motor vehicle accidents were the primary cause of injury in our cohort, contrasting with studies where falls remain the most frequent etiology.[5,9] However, several authors have documented a rising proportion of MVC-related fractures in older pediatric groups, especially adolescents.[10,11,13]

Our data also mirror this tendency, with motorcycle-related accidents being especially prevalent and strongly associated with the absence of protective equipment. This pattern has been observed in comparable Latin American settings, where socioeconomic factors, limited enforcement of traffic regulations, and reduced use of helmets or restraints contribute to increased trauma severity.[1,7]

Regarding management, 42.9% of our pediatric patients required surgical treatment, a considerably higher percentage than the 10–15% reported in large epidemiological series.[8,11] This discrepancy may be explained by the predominance of high-energy mechanisms in our population, leading to more complex fractures, particularly of the midface. In the literature, surgical intervention is most commonly indicated for displaced mandibular fractures, Le Fort injuries, and unstable orbital floor fractures.[12-14] Our series shows a similar pattern, with midface fractures requiring open reduction and internal fixation using orbital meshes and 1.5-mm plates and screws.

Interpersonal violence and non-accidental trauma, although relevant etiologies in certain pediatric subgroups were not predominant in our series.[1,3] This contrasts with reports in other regions where interpersonal violence contributes up to 10–15% of pediatric facial trauma, particularly among adolescent males.[1,11]

The differences observed between our findings and those reported internationally underscore the importance of considering regional context when interpreting epidemiological patterns of pediatric facial trauma. The predominance of motorcycle-related accidents highlights a preventable mechanism, emphasizing the need for public health strategies aimed at reinforcing the use of child restraint systems, helmets, and broader traffic safety interventions.

Although the number of pediatric facial trauma cases identified in our series was relatively limited, our findings demonstrate the availability of adequate diagnostic and therapeutic resources for the management of these patients, including advanced imaging studies and specialized surgical treatment when required. This may reflect under-referral of pediatric facial trauma cases rather than limited institutional capacity. Greater awareness of the availability of specialized reconstructive trauma care could contribute to optimizing referral pathways and potentially reduce the burden on high-volume centers that currently manage most pediatric facial trauma patients.

Literature specifically focused on pediatric facial trauma in Mexico remains limited, complicating the comparison of local data with international patterns. Given the unique anatomical and developmental characteristics of pediatric patients, standardized diagnostic and therapeutic approaches are essential to minimize complications, optimize functional outcomes, and prevent long-term sequelae. Our findings contribute to filling this gap by providing updated data derived from a tertiary care center with extensive experience in reconstructive trauma.

CONCLUSION

Pediatric facial trauma predominantly affected male adolescents and was most commonly associated with high-energy mechanisms, particularly motor vehicle accidents.

Midface injuries, especially orbital floor and multiple fractures, represented the most frequent fracture patterns identified. Although most patients were managed conservatively, a considerable proportion required surgical intervention, reflecting the severity and complexity associated with high-impact trauma.

These findings demonstrate important epidemiological variations in pediatric facial trauma according to age and mechanism of injury, emphasizing the influence of high-risk activities during adolescence. The predominance of preventable trauma mechanisms highlights the need for strengthened public health strategies focused on traffic safety, helmet use, child restraint systems, and injury prevention programs.

Despite the relatively low number of pediatric cases identified, the availability of specialized diagnostic and surgical resources demonstrates the capacity for appropriate management of pediatric facial trauma. Greater awareness of the institution's capabilities may contribute to improved referral strategies and help reduce the burden on high-volume centers that currently receive the majority of pediatric facial trauma cases.

Given the unique anatomical and developmental characteristics of pediatric patients, early diagnosis and individualized management are essential to minimize functional, aesthetic, and long-term sequelae. Further multicenter studies with larger sample sizes are necessary to better characterize pediatric facial trauma patterns and optimize prevention and treatment protocols in this vulnerable population.

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