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Paediatric Maxillofacial Trauma: An Integrated Approach to Imaging, Dental Care, and Therapeutic Management

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Abstract

Background: Paediatric maxillofacial trauma is a significant source of morbidity in children, occurring during critical periods of craniofacial growth. Its incidence is rising in many developing nations due to factors like increased motorization and interpersonal violence. Managing these injuries is complex due to the unique anatomical and developmental considerations of the paediatric facial skeleton.

Aim: This study aimed to characterize the epidemiology, injury patterns, and management outcomes of paediatric maxillofacial trauma in a cohort of 225 patients over a five-year period (2017-2022), and to compare findings with existing international literature.

Methods: A detailed observational study was conducted, analyzing demographic data, mechanisms of injury, clinical presentation, and treatment modalities. Statistical analyses, including chi-square tests, were used to identify significant associations between variables such as age, cause of injury, and injury type.

Results: The study found a male predominance (2:1 ratio) and identified self-fall (45%) as the most common cause. A significant finding was that 40% of patients experienced loss of consciousness, highlighting associated head injury risks. Soft-tissue injuries (58%) were most frequent, followed by dentoalveolar (30%) and mandibular fractures (20%). Conservative management was employed in 86% of cases, while open reduction and internal fixation (ORIF) was the primary surgical approach (62% of operative cases). Significant statistical associations were found between patient age and the cause of injury, as well as the type of soft- and hard-tissue injuries sustained.

Conclusion: The findings underscore the need for a vigilant, multidisciplinary approach that includes prompt neurological assessment, addresses delays in presentation, and employs age-specific, often conservative, management strategies to preserve long-term craniofacial growth and function.

Keywords: Paediatric maxillofacial trauma, facial fractures, epidemiology, conservative management, trauma surgery..

Introduction

Paediatric maxillofacial trauma, defined as injury to the facial skeleton and associated soft tissues resulting from external physical forces, constitutes a substantial source of morbidity and, in severe cases, mortality among children.[1,2] These injuries are particularly concerning in the paediatric age group because they occur during critical periods of craniofacial growth and psychosocial development. In recent decades, an upward trend in the incidence of such trauma has been documented in many developing nations, a change largely attributed to sociocultural and economic factors such as the persistence of child labour, increased exposure to interpersonal violence, expanding motorization with inadequate road safety measures, and the emergence of more aggressive assault techniques.[3] Despite this general rise, the global prevalence of paediatric maxillofacial trauma is highly variable, reflecting differences in reporting systems, trauma patterns, and healthcare infrastructure. Reported rates range from as low as 3.3% in Zimbabwe to as high as 30.2% in the United Kingdom, underscoring striking regional disparities in risk exposure and diagnostic capture.[4] In the United

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States alone, approximately 22 million children sustain injuries annually, yet maxillofacial trauma represents only a relatively small fraction of these events, accounting for an estimated 1% to 15% of all facial fractures in the paediatric population.[5] This apparent numerical modesty should not be misinterpreted as clinical insignificance, as even a single facial fracture in a growing child may have complex functional and aesthetic consequences.

The etiological spectrum of paediatric maxillofacial trauma is broad and context-dependent, with mechanisms differing across regions and age categories. In India, epidemiological data consistently identify road traffic accidents as the predominant cause, responsible for approximately 59.4% of cases.[6] This reflects the combined impact of rapidly increasing vehicular density, inconsistent implementation of road safety regulations, and limited use of protective devices such as seatbelts and helmets among children. Within the Indian context, the age group most vulnerable to such injuries lies between 7 and 12 years, with a marked peak around the age of 10.[7] This age range coincides with increased independence, school-related travel, and participation in outdoor activities, while children remain developmentally immature in terms of risk perception and injury avoidance.

Longitudinal epidemiological investigations in India highlight a significant rise in the proportion of paediatric maxillofacial injuries over time, from 5.5% in 1988 to 11% in 2007.[8] This upward trend may reflect a genuine increase in trauma incidence, improved access to care, or better recognition and documentation of facial injuries in children. These injuries occur disproportionately in boys, who constitute between 53.7% and 80% of affected patients in various series, a gender disparity often attributed to higher levels of physical activity, risk-taking behaviour, and outdoor exposure among male children.[8] The mechanisms implicated include motor vehicle collisions, falls, interpersonal violence, and sports-related accidents.[9] In younger children, particularly those under six years of age, falls within the home environment are especially prevalent, often resulting from unsecured furniture, unprotected staircases, or inadequate supervision. As children progress into adolescence, sports-related trauma and violence become increasingly prominent etiologies, reflecting evolving social interactions and recreational patterns.[9]

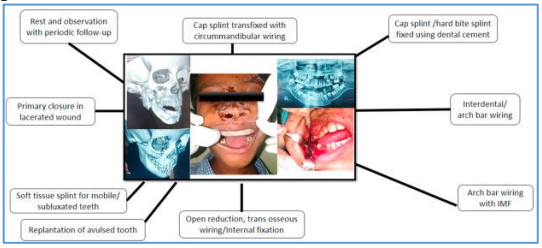

Fig. 1: Pediatric Maxillofacial Trauma.

If inadequately recognized or improperly managed, paediatric maxillofacial injuries can exert profound and lasting effects on facial skeletal growth, culminating in craniofacial deformities and functional impairment.[10,11] Disruptions to the growth centres of the maxilla or mandible, for example, may cause asymmetries, malocclusion, or alteration of the facial profile that persist into adulthood and may necessitate complex secondary reconstructive procedures. Nonetheless, children possess several inherent anatomical features that provide a degree of protection against facial fractures. The presence of unerupted permanent teeth embedded within the jaws contributes to structural reinforcement, effectively acting as internal buttresses that stabilize the facial skeleton.[12] Similarly, the incomplete development of the paranasal sinuses in younger children results in a relatively more solid facial architecture, reducing the prevalence of certain fracture patterns commonly observed in adults.[12] Despite these advantages, the relatively larger cranial mass in proportion to total body size in younger children renders them particularly prone to craniofacial trauma when exposed to similar external forces.[13] Consequently, when facial fractures do occur in paediatric patients, the force required to produce such injuries is often considerable, and the likelihood of concomitant trauma, including cranio-spinal injuries, rises substantially.[14] This association underscores the need for a vigilant, multidisciplinary assessment whenever paediatric facial fractures are identified.

Clinical and radiological evaluation of paediatric maxillofacial trauma is often more challenging than in adults. Children may be frightened, uncooperative, or unable to articulate their symptoms clearly, complicating the physical examination. From a technical standpoint, conventional fixation techniques that rely on the dentition are not always easily applicable. Deciduous teeth may be insufficient in number, irregularly distributed, or in variable stages of root resorption, limiting their utility as stable anchors.[15] The morphology of primary crowns, which are typically bell-shaped with relatively smooth contours and limited undercuts, further compromises the retention of wires, arch bars, or splints designed for adults.[16] These anatomical and developmental features necessitate careful adaptation of standard techniques and may favour alternative modalities such as acrylic splints, resorbable fixation, or minimally invasive methods tailored to the child's stage of dental development and growth.

Within the Indian healthcare context, the management of paediatric maxillofacial trauma is complicated by a constellation of systemic and social challenges. Low levels of public awareness regarding injury prevention and the importance of early medical evaluation often lead to delays in presentation. Socioeconomic constraints can restrict access to

specialized care, while limited availability of well-equipped medical facilities and trained maxillofacial surgeons in rural or underserved regions may compromise the quality and timeliness of treatment.[2] Deficiencies in transportation infrastructure further impede rapid referral to tertiary centres. Inadequate health education, both at the community and school levels, hampers efforts to promote preventive strategies such as seatbelt use, helmet compliance, and safer play environments. For the maxillofacial surgeon, these structural limitations are compounded by the need to address not only the anatomical and functional consequences of trauma but also the psychological impact on the paediatric patient, who may develop anxiety, fear, altered self-image, or behavioural changes in response to disfiguring injuries and hospitalization.[2] Taken together, these factors underscore that paediatric maxillofacial trauma is not merely an isolated surgical problem but a complex public health and psychosocial issue requiring a comprehensive, multidisciplinary, and context-sensitive approach.

Observed Results:

Between 2017 and 2012, a detailed observational study was undertaken to characterize the epidemiology, pattern, and management of paediatric maxillofacial injuries in a cohort of 225 children and adolescents presenting with facial trauma. The principal aims of the investigation were to delineate the occurrence and complexity of maxillofacial injuries in this population, to evaluate the therapeutic approaches employed, and to compare the findings with trends reported in international literature. Within this sample, there were 148 male and 77 female patients, yielding a male-to-female ratio of approximately 2:1, a distribution that aligns with the widely documented male predominance in paediatric trauma. This sex difference likely reflects behavioural and social factors, including greater involvement of boys in outdoor activities, risk-taking behaviour, and sports, which collectively increase exposure to injury-prone environments. One of the notable clinical observations in the present study was the relatively high frequency of neurological compromise associated with facial trauma. Loss of consciousness was documented in 40% of cases, underscoring the severity of the traumatic forces involved and highlighting the close anatomical and functional relationship between the cranial and facial skeleton in children. This figure suggests that a significant subset of paediatric maxillofacial injuries occurs in the context of high-impact trauma with a non-negligible risk of concomitant head injury. The temporal pattern of presentation to hospital following injury also revealed important insights into health-seeking behaviour and access to care. Approximately 20% of patients presented more than 24 hours after the traumatic event, suggesting either delays in recognizing the seriousness of the injury, logistic and transport constraints, or limited immediate access to specialized healthcare facilities. In contrast, only 11% of patients reached hospital within the first hour after trauma, the so-called “golden hour” during which early intervention may favorably influence outcomes. This delayed presentation profile has implications for early diagnosis, timely management, and the prevention of secondary complications and may reflect broader systemic issues within the healthcare and referral infrastructure.

A subset analysis of 35 patients with documented head injuries allowed for further exploration of the relationship between timing of admission and associated cranial trauma. Statistical analysis of admission times in this group revealed a positive correlation, indicating that certain patterns of delayed presentation may be linked with specific clinical or socio-demographic features. Age-stratified analysis demonstrated that the 12–16-year age group was the most affected by maxillofacial trauma, comprising 36% of the total sample. In contrast, the lowest incidence was observed in children aged 1–4 years. This age distribution suggests that as children grow older and become more independent, their exposure to environmental risks, including road traffic, sports, and unsupervised play, increases significantly. Younger children, while vulnerable, may be more closely supervised, and their activities are usually confined to more controlled settings. The etiological profile of injuries in this cohort revealed that self-fall was the most common cause of maxillofacial trauma, responsible for 45% of cases. This finding highlights the prominence of everyday accidents, including falls from height, slips, and domestic mishaps, in the causation of facial injuries in children. Importantly, there were no recorded cases of child abuse, and assault-related injuries were comparatively uncommon, accounting for only 9% of cases. While these data suggest a relatively low incidence of intentional injury in this population, the possibility of under-reporting or under-recognition of abuse cannot be entirely excluded and remains an important consideration in paediatric trauma assessment. Statistical testing identified a significant association between the patient’s age and the cause of injury ($P < 0.01$), indicating that specific mechanisms of trauma are more prevalent in certain age groups. For example, younger children may be more prone to domestic falls, whereas older adolescents may be at greater risk from road traffic incidents or interpersonal violence. Such patterns have important implications for targeted prevention strategies.

When anatomical injury sites were analyzed in relation to age, no statistically significant association was found ($P > 0.05$), suggesting that, within this cohort, children of different ages were equally likely to sustain trauma to similar facial regions. However, a significant correlation was identified between the cause of injury and the anatomical site affected ($P < 0.05$). This finding indicates that different mechanisms of trauma impart

distinctive force vectors and impact zones, leading to characteristic patterns of injury. For instance, high-velocity road traffic collisions may more often involve the mandible or midface, whereas falls might preferentially affect the perioral or periorbital regions, depending on the direction of impact. In terms of presenting complaints, the symptom profile mirrored the underlying pathology and provided additional insight into the clinical spectrum of paediatric maxillofacial trauma. Swelling was the most frequently reported symptom, occurring in 24% of patients, followed closely by oral bleeding, which was documented in 23% of cases. These symptoms likely reflect the prevalence of soft-tissue lacerations, contusions, and dentoalveolar injuries. Vomiting, reported by 11% of patients, may be indicative of associated head injury, concussion, or pain-related distress and warrants careful neurological evaluation. Less common but clinically important symptoms included ear bleeding (5%) and ecchymosis (5%), which may signal basal skull fractures, temporal bone injury, or deeper soft-tissue trauma. Collectively, these findings underscore the need for a systematic and thorough clinical assessment in children presenting with facial trauma, including careful evaluation for concomitant cranial and systemic injuries.

Soft-tissue injuries represented a substantial proportion of the observed trauma burden, accounting for 58% of cases. Within this category, lacerations were the most common subtype (41%), closely followed by abrasions (40%). This pattern is consistent with the exposed and delicate nature of the facial soft tissues in children, which are prone to tearing or scraping upon impact. Tissue loss, a more severe form of soft-tissue injury with potential for long-term aesthetic and functional sequelae, was documented in 14% of cases. Statistical analysis demonstrated a significant relationship between patient age and the type of soft-tissue injury sustained ($P < 0.05$). This likely reflects differences in trauma mechanisms and behaviours across age groups; for instance, higher-energy mechanisms in older children might result in more complex lacerations or avulsive injuries, whereas minor falls in younger children may more commonly cause superficial abrasions. Hard-tissue injuries were also prominent in this series, with 229 distinct fractures or bony injuries identified. This number exceeds the total number of patients, indicating that some children sustained multiple fractures. Dentoalveolar fractures, involving the teeth and supporting alveolar bone, constituted the largest single category at 30%, followed by mandibular fractures, which accounted for 20% of hard-tissue injuries. These findings are concordant with the prominent role of the mandible in facial impact and the vulnerability of the dentoalveolar structures to direct blows and occlusal forces. Chi-square analysis revealed a statistically significant association between age and the pattern of hard-tissue injury ($P < 0.05$), suggesting that certain fracture types of cluster within specific age brackets [Table 2]. For example, younger children with mixed dentition may be more susceptible to dentoalveolar trauma, while older adolescents may be more prone to mandibular fractures, particularly in the parasymphysis and body regions, due to high-energy impacts such as road traffic accidents or interpersonal violence.

The characterization of fracture displacement further clarified the severity of the injuries sustained. Among the hard-tissue fractures, 40% were displaced, 40% were undisplaced, and 20% were compound fractures, the latter involving communication with the external environment through mucosal or skin breaches. Displaced and compound fractures carry increased risks of malocclusion, infection, and long-term deformity, and thus often require more intensive intervention. Despite this, the overall therapeutic strategy employed in the study cohort favored conservative management wherever clinically feasible. A conservative approach was selected in 86% of cases, reflecting a preference for preserving growth potential, minimizing surgical morbidity, and utilising the inherent healing capacity of paediatric tissues. The most commonly employed conservative techniques included suturing of soft-tissue lacerations (30%) and wound dressing (23%), interventions aimed at promoting optimal healing, preventing infection, and achieving satisfactory aesthetic outcomes. For the subset of patients requiring operative management, surgical intervention was tailored to the specific fracture type, anatomical location, and degree of displacement, with appropriate consideration of the child's age and stage of craniofacial development. Open reduction and internal fixation (ORIF) was the principal surgical modality, performed in 62% of surgically managed cases. The parasymphysis of the mandible emerged as the most common site of ORIF (29%), followed by the mandibular body (21%). These regions are critical to occlusal function and mandibular contour, and significant displacement in these areas often necessitates anatomical realignment and rigid or semi-rigid fixation to restore function and aesthetics. Closed reduction techniques, such as manual manipulation and splinting, were utilized in selected cases, including closed reduction of nasal bone fractures, which was undertaken in 8% of patients. Nasal fractures, while often managed conservatively, may require timely reduction to prevent long-term cosmetic deformity or airway compromise. A significant association was identified between patient age and the choice of surgical management modality ($P < 0.01$), indicating that differing growth considerations, bone quality, and fracture patterns influence operative decision-making across the paediatric age spectrum.

Taken together, the findings of this study provide a comprehensive overview of the incidence, clinical characteristics, and management strategies for

paediatric maxillofacial trauma within the examined cohort. The data confirm several patterns consistent with international reports, such as the predominance of male patients, the frequent involvement of older children and adolescents, and the importance of falls and traffic-related incidents as major etiological factors. At the same time, the study underscores critical contextual issues, including delayed presentation to hospital and the predominance of conservative treatment modalities, which may reflect both resource considerations and a cautious approach to surgical intervention in growing children. The observation of statistically significant associations between age, mechanisms of injury, and patterns of both soft- and hard-tissue trauma offers valuable insight into risk stratification and can inform age-specific preventive strategies. Moreover, the analysis of management outcomes suggests that, in many cases, paediatric maxillofacial injuries can be effectively treated with conservative or minimally invasive techniques, provided that diagnosis is timely and follow-up is adequate. The selective use of ORIF and closed reduction for more complex fractures demonstrates the importance of an individualized, anatomically guided approach that balances immediate functional needs with long-term growth considerations. In summary, this investigation makes an important contribution to the understanding of paediatric maxillofacial injuries, reinforcing the need for heightened awareness, prompt evaluation, and tailored management protocols. It also highlights the value of ongoing research and international comparison to refine clinical guidelines and improve outcomes for children affected by facial trauma.

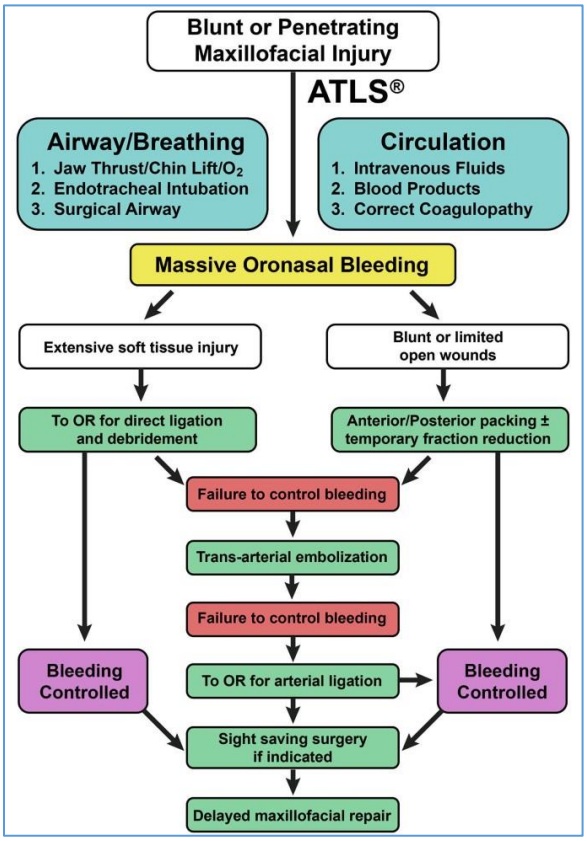

Fig. 2: Pediatric maxillofacial trauma algorithm.

DISCUSSION

The present study offers an in-depth evaluation of paediatric maxillofacial trauma over a 5-year period from 2017 to 2022, encompassing a cohort of 225 patients under 16 years of age who presented with maxillofacial injuries. By systematically analyzing demographic trends, mechanisms of injury, clinical presentation, and management strategies, the study provides a structured overview of the burden and characteristics of facial trauma in the paediatric population. These findings not only corroborate key patterns reported in the existing literature but also highlight context-specific challenges and opportunities for improving care delivery and preventive strategies in this vulnerable age group. One of the most striking demographic findings is the clear male predominance, with a male-to-female ratio of 2:1. This pattern is concordant with numerous previous reports, which consistently indicate that boys experience maxillofacial trauma more frequently than girls.[6,17,18] The reasons for this disparity are likely multifactorial. Boys are generally more involved in high-energy physical activities, outdoor play, contact sports, and behaviours that may involve greater environmental risk. Sociocultural expectations may also permit or even encourage more adventurous or risk-taking behaviour in male children compared with females. From a public health perspective, this observation underscores the importance of designing injury-prevention campaigns that particularly target male adolescents and school-aged boys, while still

remaining inclusive of all children. The data regarding sex distribution therefore serve not only as a descriptive statistic but also as a basis for tailoring preventive messaging, supervision practices, and safety regulations. The study's finding that 40% of patients experienced a loss of consciousness is clinically significant and speaks to the severity of the trauma sustained by a substantial proportion of the cohort. Loss of consciousness is a well-established marker of possible head injury and may reflect concussive forces, intracranial haemorrhage, or more subtle diffuse brain injury. In the context of maxillofacial trauma, such a high proportion of patients with altered consciousness highlights the close anatomical interplay between cranial and facial structures and the magnitude of impact required to injure both regions. These data emphasize the necessity of incorporating a thorough neurological evaluation into the initial assessment of every paediatric patient presenting with facial trauma, regardless of the apparent localization of injuries. They also support the routine use of validated head injury assessment protocols and, where appropriate, neuroimaging, particularly in cases of reported or witnessed loss of consciousness.

Equally important is the study's analysis of the timing of hospital admission after the traumatic event. The observation that approximately one-fifth of patients presented more than 24 hours after injury is concerning and raises critical questions regarding delayed recognition of injury severity, access to healthcare, and patterns of care-seeking behaviour. Only 11% of patients reached the hospital within the first hour following trauma, a period often termed the "golden hour," during which timely intervention can mitigate complications and improve outcomes. Delayed presentation may allow the progression of soft-tissue oedema, infection, malocclusion, or undetected intracranial injury, thereby complicating both diagnosis and treatment. These findings support the need for sustained public education efforts directed at parents, caregivers, teachers, and community leaders to reinforce the importance of rapidly seeking professional evaluation after facial or head trauma, even when initial symptoms appear mild. They also resonate with the broader literature, which has repeatedly underscored the problem of underreporting and delayed presentation in paediatric trauma.[19,20] The subset of 35 patients with documented head injuries offers additional insight into the interplay between facial and intracranial trauma. The positive correlation between admission times and the presence of head injuries suggests that those with more severe or clinically obvious neurological compromise may be more likely to be brought to medical attention earlier, whereas children with apparently isolated facial injuries may present later. This pattern underscores the importance of maintaining a high index of suspicion for occult cranial involvement even in cases that initially appear to be confined to the maxillofacial region. The age distribution, in which the 12–16-year age group represented the most affected segment, further reinforces the well-recognized vulnerability of adolescents to trauma.[21,22] At this stage of development, young people often experience increased autonomy, travel independently, engage in sports, and spend more time away from direct adult supervision, all of which contribute to elevated exposure to environmental hazards.

The analysis of injury mechanisms reveals that self-fall was the single most common cause of paediatric maxillofacial trauma, accounting for 45% of cases. This finding underscores the significance of everyday domestic and environmental hazards—such as unprotected staircases, slippery surfaces, unsecured furniture, and unsafe play areas—as key contributors to facial injury. The lack of reported child abuse and the relatively low incidence of assault (9%) provide some reassurance regarding the predominance of accidental rather than intentional trauma in this cohort. However, the complete absence of recorded abuse cases must be interpreted cautiously, as underrecognition or underreporting of non-accidental injury in children remains a known issue in many settings. Nonetheless, the statistically significant association between age and cause of injury suggests that specific mechanisms predominate at different developmental stages, which has direct implications for prevention. Younger children may sustain injuries predominantly from falls in the home or school environment, whereas older adolescents may be at greater risk from sports, road traffic accidents, or interpersonal violence. Age-specific injury-prevention measures, such as improving home safety for toddlers and promoting helmet and seatbelt use in older children, can therefore be rationally prioritized. Clinically, the symptom profile described in the study reflects the underlying pattern of trauma. Swelling and oral bleeding emerged as the most commonly reported complaints, consistent with soft-tissue contusions, lacerations, and dentoalveolar injuries in the facial region.[21] Vomiting, ear bleeding, and ecchymosis, although less frequently observed, are particularly important red-flag symptoms, signaling the possibility of associated head injury, temporal bone fracture, or blunt trauma to deeper tissues. The predominance of soft-tissue injuries, which accounted for 58% of the cohort, underscores that not all paediatric facial trauma results in fracture. Within this category, lacerations and abrasions were the primary subtypes, reflecting the exposed and delicate nature of paediatric facial skin and mucosa. The statistically significant correlation between age and type of soft-tissue injury suggests that as children grow older and engage in higher-energy activities, they may sustain more complex or extensive lacerations rather than superficial abrasions.[12,23] For clinicians, recognizing age-linked patterns in soft-tissue injury

can facilitate anticipatory guidance and tailored management strategies, including timely wound closure, infection prevention, and optimization of cosmetic outcomes.

Hard-tissue injuries were also common, with 229 fractures recorded in the cohort, indicating that many children sustained multiple bony injuries. Dentoalveolar fractures and mandibular fractures constituted the majority, consistent with previous studies that highlight the vulnerability of the mandible and dental structures in paediatric trauma.[24] The high frequency of dentoalveolar fractures is not surprising given the transitional nature of the mixed dentition period and the relative prominence of the maxillary and mandibular incisors in younger children. Mandibular fractures, particularly in the parasymphysis and body regions, are often the result of significant force, such as that encountered in vehicular collisions or sports injuries. The study's finding that a large proportion of fractures were displaced or compound underscores the severity of the trauma and the potential for long-term functional and aesthetic sequelae if not adequately treated. The predominance of conservative management in 86% of cases is an important aspect of this study and highlights the fundamental principle that, whenever feasible, paediatric facial injuries should be treated with the least invasive methods consistent with functional and aesthetic restoration. The high healing potential of paediatric bone, coupled with ongoing craniofacial growth, often permits successful outcomes through non-operative measures, provided that accurate diagnosis and appropriate follow-up are ensured. Suturing of soft-tissue wounds and careful wound dressing were the most frequently employed conservative techniques, emphasizing the centrality of meticulous soft-tissue management in paediatric maxillofacial care. Such approaches not only promote optimal healing and reduce infection risk but also have important psychosocial implications, as facial appearance plays a critical role in a child's self-image and social interactions. For those patients in whom conservative measures were insufficient, the study describes a rational, anatomy-driven use of surgical interventions. Open reduction and internal fixation (ORIF) was the principal operative technique, particularly for displaced mandibular fractures in the parasymphysis and body, where restoration of occlusion, mandibular continuity, and facial symmetry is essential. The selective use of ORIF reflects a careful balancing of the need for stable fracture fixation against the long-term considerations of growth, tooth development, and potential hardware-related complications. Closed reduction techniques, such as the manual reduction of nasal fractures performed in 8% of cases, remain relevant for certain fracture types where less invasive manipulation can restore form and function. The statistically significant association between age and the choice of surgical modality ($P < 0.01$) suggests that younger children may be more likely to receive conservative or minimally invasive treatments, whereas older adolescents, whose facial growth is closer to completion, may be suitable candidates for more definitive fixation. These findings support an age-sensitive, individualized approach to the surgical management of paediatric facial trauma [24].

The broader contribution of this study lies in the way it integrates epidemiological, clinical, and management data to offer a coherent picture of paediatric maxillofacial injuries over a defined period. By demonstrating statistically significant associations between key variables—such as age and injury mechanism, age and type of soft- or hard-tissue injury, and age and surgical management—this work moves beyond simple descriptive reporting to provide a nuanced understanding of how demographic and clinical factors interact. Such insights are invaluable for clinicians planning treatment, for healthcare systems designing service provision, and for policymakers and educators tasked with developing injury-prevention strategies. At the same time, the findings should be interpreted in light of certain inherent limitations, which, although not the primary focus of the study, are common to observational analyses of this type. The data likely reflect the experience of one or a limited number of centres and may not capture cases managed in non-specialist settings or those that never present to medical attention. As other authors have noted, paediatric trauma is frequently underreported, particularly in resource-constrained environments.[19,20] Furthermore, the study does not elaborate in detail on long-term functional or aesthetic outcomes, quality of life, or psychological sequelae, all of which are critical domains in paediatric trauma care and merit further investigation. Prospective longitudinal studies that incorporate growth monitoring, functional assessment, and patient-reported outcomes would be a logical next step in building upon the present work. In conclusion, this study provides a robust and comprehensive discussion of paediatric maxillofacial trauma in a sizeable cohort of children and adolescents. It confirms key patterns recognized in the international literature, such as male predominance, the prominence of falls and traffic incidents as causal mechanisms, and the central role of dentoalveolar and mandibular fractures. At the same time, it contributes new insights into local patterns of delayed presentation, age-specific injury distributions, and management preferences. Collectively, these findings underscore the importance of early recognition, age-appropriate management, and multidisciplinary collaboration in the care of paediatric patients with facial injuries. They also highlight the critical need for targeted prevention strategies and public education aimed at reducing the incidence and impact of paediatric maxillofacial trauma [24].

Conclusion:

In conclusion, this comprehensive study provides critical insights into the patterns and management of paediatric maxillofacial trauma, reinforcing the need for a specialized approach distinct from adult care. The findings confirm a clear male predominance and identify self-fall as the leading etiology, with older children (12-16 years) being most vulnerable. The high incidence of loss of consciousness (40%) underscores the severe nature of these injuries and the imperative for integrated neurological assessment to rule out concomitant head trauma. A major concern identified is the delayed presentation to hospital for a significant portion of patients, which highlights systemic issues in healthcare access and public awareness, necessitating targeted community education on the importance of immediate medical evaluation following facial injury. The management strategy overwhelmingly favored conservative techniques, reflecting a prudent approach to preserve the growth potential of the developing craniofacial skeleton. However, for complex or displaced fractures, a tailored surgical approach, primarily Open Reduction and Internal Fixation (ORIF), was effectively employed. The statistically significant associations between patient age and the cause, type, and management of injuries provide a robust foundation for developing age-specific prevention programs and clinical guidelines. Ultimately, optimizing outcomes for these young patients requires a multifaceted strategy that combines heightened clinical vigilance, a multidisciplinary team approach, and public health initiatives aimed at reducing common environmental hazards. Future research should focus on long-term longitudinal studies to monitor growth outcomes and the psychological impact of these traumatic injuries.

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