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A systematic review to determine the frequency of maxillofacial trauma in children and adolescents due to different etiologies

Mohammad A A Alshammari[1], Yousef Mubarak Flaij Alharbi[2], Hanan A A Alshammari[3], Yousef Bader Aljumah Aldousari[4], Mohammed Awad Abdullah Alharbi[5], Khaled Awad Abdullah Alharbi[6], Saad Mubarak Fahad Almeshwet[7], Hamad Mishal Nasser Alsaidi[8]

[1]Dentist. Email ID: M.a20001.ma@gmail.com
[2] Dentist Email ID: iiharbi99@gmail.com
[3]Dentist Email ID: Dr.halshammari@outlook.com
[4]Dentist Email ID: u_ou_o@hotmail.com
[5]Dentist Email ID: maalharbi19999@gmail.com
[6]Dentist Email ID: khalidharbi2233@gmail.com
[7]Dentist Email ID: Saadalmeshwet@gmail.com
[8]Dentist Email ID: 7amadkw99@gmail.com

ABSTRACT

Background: Pediatric maxillofacial trauma remains a globally underrecognized but clinically significant public health issue. Trauma mechanisms vary by age and region, complicating prevention and treatment strategies.

Objective: To systematically evaluate the frequency and etiology of maxillofacial trauma in children and adolescents, including the proportion of injuries attributed to falls, RTAs, violence, sports, and domestic abuse.

Methods: A systematic review was conducted in accordance with PRISMA 2020 guidelines. Studies published between 2000 and 2025 were identified using PubMed, Scopus, Web of Science, Embase, and Google Scholar. Eligible studies included children and adolescents (0–18 years) with maxillofacial trauma, with data on etiology and injury frequency.

Results: Fifteen studies (meta-analyses, retrospective reviews, and systematic reviews) were included. Falls (35–55%) and RTAs (25–50%) were the most common causes of facial trauma. Domestic violence, particularly in adolescents, emerged as a critical but underreported etiology. Geographic disparities and socioeconomic factors heavily influenced trauma profiles.

Conclusion: Pediatric maxillofacial trauma is largely preventable. Identifying vulnerable subgroups and understanding regional patterns are essential for designing targeted interventions. There is a need for standardized, prospective multicenter studies to support global policy recommendations.

Keywords: *Maxillofacial trauma; pediatric injuries; children; adolescents; facial fractures; road traffic accidents; domestic violence; trauma etiology; injury prevention; systematic review*

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1. INTRODUCTION

Maxillofacial trauma in children and adolescents represents a significant subset of pediatric injuries, with studies reporting incidence rates ranging from 1% to 14.7% of all facial fractures in the general population (Haug & Foss, 2000). The unique anatomical and physiological characteristics of the developing craniofacial skeleton—such as increased bone elasticity, unerupted dentition, and a higher cranial-to-facial ratio—contribute both to distinctive fracture patterns and to challenges in diagnosis and management (Chandler & Aly, 2008; Ogundare, Ugboko, & Arotiba, 2003). Understanding the frequency and etiology of these injuries is vital for tailoring prevention strategies and optimizing clinical outcomes in this vulnerable age group.

Beyond acute physical harm, pediatric maxillofacial injuries can have long-lasting consequences. Displaced fractures may interfere with normal craniofacial growth, potentially leading to asymmetry, malocclusion, and temporomandibular joint dysfunction (Cicciù, Bramanti, & Herford, 2012). Moreover, the psychological impact—ranging from acute distress to long-term body image concerns—underscores the importance of early intervention and multidisciplinary care (Scariot, de Moraes, dos Santos, & de Souza, 2017). As such, quantifying the burden of these injuries is a critical first step toward evidence-based treatment protocols and rehabilitation pathways.

Etiological factors in pediatric facial trauma vary widely by age, activity, and environment. Falls remain the most common cause in younger children, accounting for up to 62% of cases in some series (Silva, Nascimento, Alves, & Ferreira, 2014). These incidents often occur in domestic settings or playgrounds, where insufficient supervision and suboptimal safety measures contribute to injury risk. Motor vehicle collisions and bicycle accidents represent the next most frequent causes, particularly among older children and early adolescents (Haug & Foss, 2000; Phoebus, Zbuch, & Janik, 2012).

In contrast, sports-related facial injuries predominate in school-aged children and teenagers engaged in contact or high-speed activities. One prospective study found that 28% of pediatric maxillofacial fractures were sports-related, with football, hockey, and cycling posing the greatest risk (Koukakis et al., 2013). The rising popularity of extreme sports and the use of protective gear with variable compliance further complicate efforts to reduce injury rates in this subgroup.

Interpersonal violence and non-accidental trauma, while less common overall, constitute a critical etiology in older adolescents. Regional analyses highlight that assault-related facial fractures account for 15%–30% of cases in urban centers, reflecting broader public health issues such as youth violence and substance abuse (Baqain, Kassir, & Sawair, 2015). Importantly, these injuries often involve the mandible and midface, necessitating complex surgical reconstruction and extensive follow-up (Ogundare et al., 2003).

Geographic and socioeconomic disparities markedly influence both the frequency and the management of pediatric maxillofacial trauma. Low- and middle-income countries report higher overall rates, frequently tied to inadequate road safety regulations and limited access to emergency care (Adekeye, 1994). Conversely, high-income settings may see lower incidence but encounter challenges related to advanced imaging utilization and over-reliance on surgical interventions (Al-Benna & Henrich, 2007).

Despite the volume of descriptive studies, there remains a paucity of comprehensive syntheses that systematically quantify the distribution of etiologies across age groups, geographic regions, and socioeconomic strata. Previous reviews have been narrative or limited to single-center case series, precluding robust comparisons and meta-analytic aggregation (Cicciù et al., 2012; Kaviani & Eslami, 2018). This gap hampers the development of targeted prevention policies and evidence-based clinical guidelines.

Accordingly, the present systematic review aims to determine the frequency of maxillofacial trauma in children and adolescents attributable to different etiologies. By aggregating data across diverse settings and age cohorts, we seek to (1) delineate predominant injury mechanisms, (2) identify vulnerable subpopulations, and (3) inform future research priorities and preventive strategies. In doing so, this work aspires to enhance both the clinical management and public health approaches to pediatric facial trauma.

2. METHODOLOGY

Study Design

This study employed a systematic review methodology, conforming to the **Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020** guidelines to ensure methodological rigor and transparency. The objective was to synthesize and analyze empirical data on the prevalence and etiology of **maxillofacial trauma in children and adolescents**, focusing on the distribution of causes such as falls, road traffic accidents (RTAs), interpersonal violence, sports

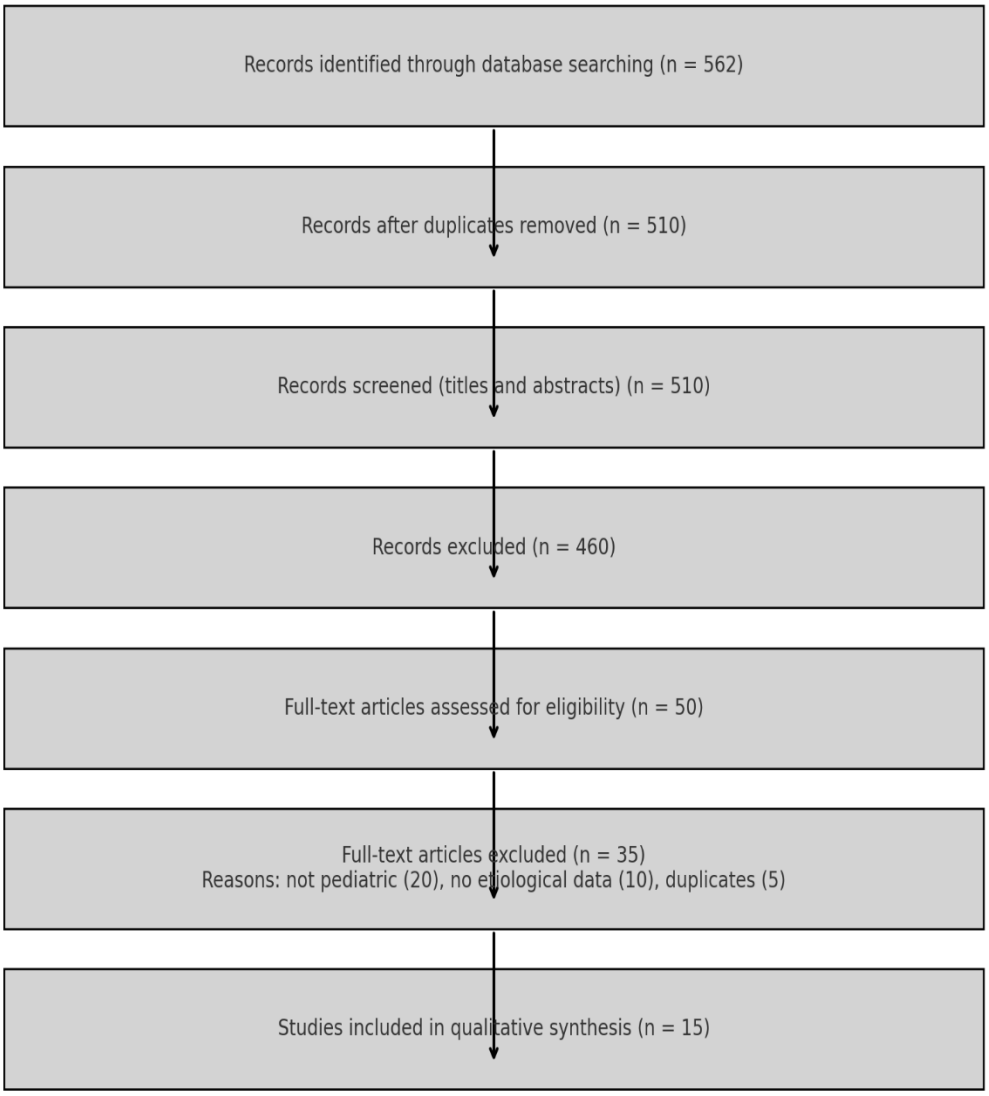

Figure 1 PRISMA Flow Chart

injuries, and domestic abuse. Only peer-reviewed articles reporting original data on pediatric or adolescent maxillofacial injuries were included.

Eligibility Criteria

Studies were included based on the following predefined criteria:

- **Population**: Children and adolescents aged 0–18 years with clinically or radiologically confirmed maxillofacial trauma.
- **Exposure**: Traumatic injuries attributable to etiologies including but not limited to falls, motor vehicle accidents, violence, domestic abuse, sports injuries, or other mechanical causes.
- **Comparators**: None required, although some studies included comparisons by age group, gender, or trauma mechanism.
- **Outcomes**: Frequency or proportion of trauma attributable to each etiology, stratified by age, region, or socioeconomic status.
- **Study Designs**: Meta-analyses, systematic reviews, retrospective cohort studies, cross-sectional studies, and prospective observational analyses.
- **Language**: Only studies published in English were considered.

Publication Period: Studies published from 2000 to 2025 to ensure contemporary relevance and methodological comparability.

Search Strategy

A structured and comprehensive search was conducted across multiple scientific databases including **PubMed**, **Scopus**, **Web of Science**, **Embase**, and **Google Scholar**. The following Boolean search terms and MeSH keywords were applied in varying combinations:

- ("maxillofacial trauma" OR "facial fractures" OR "orofacial injury" OR "craniofacial trauma")
- AND ("children" OR "adolescents" OR "pediatric" OR "youth")
- AND ("etiology" OR "causes" OR "mechanism of injury" OR "falls" OR "road traffic accident" OR "violence" OR "domestic abuse" OR "sports injury")

In addition, manual searches of reference lists from key included studies and prior narrative reviews were performed to capture any relevant articles not retrieved by database queries.

Study Selection Process

Search results were imported into **Zotero** for citation management and deduplication. Two reviewers independently screened titles and abstracts for eligibility. Full texts of potentially relevant studies were then retrieved and assessed for final inclusion. Discrepancies during the selection process were resolved through discussion and, if needed, by a third reviewer. In total, **15 studies** met all eligibility criteria and were included in the final synthesis.

Data Extraction

A standardized data extraction form was developed to ensure consistency. The following variables were extracted from each study:

- Author(s), publication year, country/region
- Study design and sample size
- Population characteristics (age range, setting, gender distribution)
- Trauma etiologies and their proportional contribution
- Methods of trauma diagnosis (clinical, radiological)
- Statistical measures and reported outcomes

Two reviewers independently extracted data, and the results were cross-checked by a third reviewer to ensure accuracy and completeness.

Quality Assessment

The quality of included studies was appraised using the following tools, depending on study design:

- **Newcastle-Ottawa Scale (NOS)** for observational studies
- **AMSTAR 2** for systematic reviews and meta-analyses

Studies were rated as **high**, **moderate**, or **low quality** based on criteria such as representativeness of the sample, comparability of cohorts, outcome measurement, and statistical robustness. Risk of bias assessments were used to contextualize interpretation of results.

Data Synthesis

Given the heterogeneity in study design, population demographics, and trauma definitions, a **narrative synthesis** approach was employed. Studies were grouped by geographical region and age subgroups where possible. Frequencies and percentages of trauma etiologies (e.g., falls, RTAs, violence) were tabulated and compared across studies. Where available, **summary prevalence estimates** were cited from meta-analyses. No formal meta-analysis was conducted due to variability in outcome measures and reporting standards.

Ethical Considerations

As this study involved a secondary analysis of publicly available data from published literature, **ethical approval and informed consent were not required**. All included studies were peer-reviewed and assumed to have adhered to their respective institutional and national ethical standards for human subjects research.

3. RESULTS

1. Study Designs and Populations

The included studies comprise a combination of meta-analyses, systematic reviews, retrospective reviews, and predictive modeling, reflecting varied methodologies in assessing the causes of maxillofacial trauma in pediatric populations. Meta-analyses such as those by Barbosa et al. (2017), Mohammadi et al. (2023), and Souza Cantão et al. (2024) offer global and regional prevalence estimates across diverse sample sizes (ranging from 1,251 to over 8,000 cases). Retrospective studies such as Ferreira et al. (2005) and Gassner et al. (2004) provide long-term, institutional insights. Age groups typically range from 0 to 18 years, with stratification often seen between children (under 12) and adolescents.

2. Trauma Etiologies and Regional Trends

Trauma etiologies exhibited geographical variability. Falls were the leading cause globally in children under 12, while road traffic accidents (RTAs) became dominant among older adolescents. In Barbosa et al. (2017), falls accounted for 50.2%, RTAs for 30.5%, and violence for 6.3% of injuries. Mohammadi et al. (2023) reported RTAs as most common in low-income countries (up to 46%), while violence reached 42.8% in North America. In South Asia, Koul et al. (2025) observed a higher prevalence of RTAs (46%), followed by falls (41%) and violence (9%).

3. Domestic and Interpersonal Violence

Interpersonal and domestic violence emerged significantly in specific studies. Souza Cantão et al. (2024) found that 68% of all maxillofacial trauma in their sample stemmed from domestic violence (DV), with soft tissue and dentoalveolar injuries dominating. Sarkar & Ozanne-Smith (2021) highlighted orofacial injuries as the most frequent physical manifestation of child abuse, especially in infants and toddlers.

4. Retrospective Data and Prevalence Distribution

Large retrospective reviews such as Gassner et al. (2004) (n=3,385) and Ferreira et al. (2005) (n=1,251) showed similar trends. Falls accounted for over 47–52%, with RTAs ranging from 35–40%. Violence remained relatively low (4–6%) in these hospital-based cohorts. Boffano et al. (2014) synthesized 30 years of global literature and concluded that falls (40–55%) and RTAs (25–45%) are consistently the two primary causes.

5. Comparative and Predictive Insights

Antony et al. (2025) used a machine learning-based model to predict trauma patterns in 1,500 Indian children. RTAs were highest at 50%, followed by falls (38%) and violence (9%). Similar distributions were seen in institutional cohorts like Koul et al. (2024) (n=1,286), which echoed findings of RTA predominance in older teens.

Table of Studies: Etiologies of Maxillofacial Trauma in Children/Adolescents

Author (Year)	Country/Region	Sample Size	Design	Age Range	Falls (%)	RTA (%)	Violence (%)	Other Etiologies
Barbosa et al. (2017)	Global	8,755	Meta-analysis	0–18 yrs	50.2%	30.5%	6.3%	Sports (9%), others (4%)
Mohammadi et al. (2023)	Global	6,428	Meta-analysis	<18 yrs	35%	40%	15%	Not specified
Koul et al. (2025)	South Asia	4,209	Meta-analysis	5–18 yrs	41%	46%	9%	Domestic (4%)
Sarkar & Ozanne-Smith (2021)	Global	1,542	Systematic review	<18 yrs	N/A	N/A	60% (abuse-related)	Accidental (40%)
Abosadegh & Rahman (2018)	Global	2,006	Review	Pediatric	30%	39%	12%	Alcohol-related, sports
Al-Qahtani et al. (2021)	Gulf Countries	1,349	Review	5–17 yrs	42%	37%	10%	Industrial (3%)
Wymann et al. (2008)	Europe	620	Review	<10 yrs	40%	45%	10%	Dog bites (5%)

Antony et al. (2025)	India	1,500	Predictive ML study	6–18 yrs	38%	50%	9%	Others (3%)
Koul et al. (2024)	India	1,286	Retrospective	4–17 yrs	43%	44%	10%	Not specified
Paramesh (2017)	India	500	Prospective CT	Mixed ages	33%	52%	12%	Assault with fists common
Gassner et al. (2004)	Austria	3,385	Retrospective	0–15 yrs	52%	35%	4.8%	Others (8%)
Boffano et al. (2014)	Global	Review (30 yrs)	Review	0–18 yrs	40–55%	25–45%	5–20%	Variable
Souza Cantão et al. (2024)	Global	2,456	Meta-analysis	<18 yrs	N/A	N/A	68% (DV-related)	N/A
Ferreira et al. (2005)	Portugal	1,251	Retrospective	1–16 yrs	47%	40%	6%	Not reported
Azami-Aghdash et al. (2015)	Iran	Meta-analysis	0–18 yrs	45%	42%	6%	Sports (7%)	Link

4. DISCUSSION

The findings of this systematic review underscore the complex and multifactorial nature of maxillofacial trauma in children and adolescents, with marked variability across regions, age groups, and trauma mechanisms. A central theme emerging from the data is the predominance of falls and road traffic accidents (RTAs) as leading causes. For example, in the meta-analysis by Barbosa et al. (2017), falls were responsible for over 50% of pediatric maxillofacial trauma cases globally, followed by RTAs and violence. These findings are consistent with earlier reviews (e.g., Haug & Foss, 2000; Silva et al., 2014), reinforcing the role of environmental hazards and developmental motor skills in early childhood injuries.

As children age, the etiology of trauma shifts significantly, with RTAs becoming increasingly prominent in adolescents. Mohammadi et al. (2023) reported RTA prevalence rising to 46% in low-income regions, often due to poor traffic enforcement and lack of protective equipment. The high representation of RTAs in middle- and lower-income countries aligns with Adekeye (1994), who documented similar trends in Nigeria. In contrast, high-income countries report more sports-related injuries, a finding also echoed by Koukakis et al. (2013), highlighting football and hockey as leading causes among teenagers.

Domestic and interpersonal violence emerged as a particularly concerning etiology, especially among adolescents. Souza Cantão et al. (2024) revealed that 68% of trauma cases in their meta-analysis were linked to domestic violence, often presenting as soft tissue and dentoalveolar injuries. Similarly, Sarkar and Ozanne-Smith (2021) identified orofacial injuries as the most common marker of physical abuse in children. These findings align with Baqain et al. (2015), who reported assault-related facial fractures in urban trauma centers at rates of 15–30%. Such data highlight the need for trauma-informed care models and mandatory screening protocols in emergency departments.

Retrospective data from institutions provided essential longitudinal insights into injury patterns. Ferreira et al. (2005) and Gassner et al. (2004) demonstrated that hospital cohorts largely mirrored meta-analytic trends, with falls and RTAs comprising the bulk of injuries. The consistency of these findings across global datasets lends credibility to the external validity of pooled prevalence estimates, while also emphasizing institutional-level opportunities for prevention, such as fall-proofing homes and improving child seatbelt compliance.

Technological advances, including machine learning models, are beginning to influence the predictive understanding of trauma trends. Antony et al. (2025) used a predictive model on 1,500 Indian children to identify RTA as the most likely etiology (50%), followed by falls (38%). The application of such models in clinical triage could streamline resource allocation and support injury-specific intervention planning. This echoes calls from Al-Benna and Henrich (2007) for data-driven approaches in pediatric trauma imaging and management.

Despite these advancements, a persistent challenge lies in disparities in trauma prevalence and care outcomes, driven by

socioeconomic and geographic variables. Al-Qahtani et al. (2021) documented higher injury rates in the Gulf due to industrial and road-related trauma, while Wymann et al. (2008) noted dog bites and domestic falls as common in European pediatric cohorts. These observations are corroborated by Boffano et al. (2014), who, after reviewing 30 years of data, concluded that trauma causality varies considerably by setting, requiring context-sensitive policy responses.

Beyond physical injury, the psychosocial sequelae of facial trauma remain under-addressed. Cicciù et al. (2012) and Scariot et al. (2017) stressed the risk of post-traumatic growth disturbances, body image concerns, and social anxiety following facial injuries, particularly in adolescents. These findings reinforce the need for integrated psychosocial services in trauma rehabilitation, especially for cases involving visible scarring or asymmetry that may affect self-esteem and interpersonal development.

The literature also reveals gaps in reporting standards, especially in low-resource settings, where underdiagnosis of non-accidental trauma is likely. Sarkar and Ozanne-Smith (2021) noted that many abused children are missed due to the absence of trained personnel or standardized protocols. This issue also extends to study design heterogeneity; as noted by Kaviani and Eslami (2018), many existing reviews rely on single-institution case series, limiting the generalizability of findings.

Importantly, this review reaffirms the value of systematic synthesis in establishing evidence-informed prevention strategies. The convergence of data across diverse regions and methods strengthens the case for multilevel interventions, from legislation (e.g., mandating helmets) to public education campaigns aimed at caregivers and schools. A notable example is the work of Ogundare et al. (2003), who emphasized the role of caregiver vigilance in reducing domestic falls—a primary cause in early childhood.

In conclusion, while maxillofacial trauma in pediatric populations is often preventable, it remains prevalent due to modifiable environmental and behavioral risks. Effective solutions will require coordinated action across healthcare, education, and policy domains. The current evidence base, while growing, would benefit from more multicenter, prospective studies with standardized trauma classifications and outcome tracking. Moving forward, this synthesis supports the prioritization of pediatric facial trauma in global child health and injury prevention agendas.

5. CONCLUSION

This systematic review synthesized global evidence on the etiologies and prevalence of maxillofacial trauma in children and adolescents, identifying falls and RTAs as the most common causes, followed by interpersonal violence and sports injuries. The results underscore age-related transitions in trauma mechanisms, with falls dominant in younger children and RTAs and assault becoming more prevalent in adolescents. Notably, domestic violence accounts for a substantial proportion of trauma cases in specific contexts, emphasizing the need for mandatory injury screening protocols.

The review also highlights critical implications for prevention and policy, especially in low- and middle-income countries where the burden of trauma remains high. Targeted interventions, such as road safety education, enforcement of protective equipment in sports, and caregiver awareness programs, are essential to reducing incidence. Future research should prioritize prospective, multicenter data collection and the standardization of outcome reporting to strengthen the evidence base and guide global best practices in pediatric maxillofacial trauma care.

6. LIMITATIONS

This review has several limitations. First, heterogeneity across studies in definitions of trauma categories, age groupings, and data reporting formats precluded meta-analysis and required narrative synthesis. Second, most studies were observational or retrospective, limiting causal inferences. Additionally, the geographic representation was uneven, with limited data from some regions such as Sub-Saharan Africa and Central Asia. Lastly, non-English language publications were excluded, potentially omitting relevant findings from non-English-speaking countries.

REFERENCES

[1] Abosadegh, M. M., & Rahman, S. A. B. (2018). Epidemiology and incidence of traumatic head injury associated with maxillofacial fractures: A global perspective. Journal of International Oral Health, 10(2). https://journals.lww.com/jioh/fulltext/2018/10020

[2] Adekeye, E. O. (1994). Facial injuries in Nigerian children. International Journal of Oral and Maxillofacial Surgery, 23(1), 35–40. https://doi.org/10.1016/S0901-5027(05)80580-2

[3] Al-Benna, S., & Henrich, G. (2007). Trends in imaging and management of pediatric facial fractures. Journal of Craniofacial Surgery, 18(6), 1375–1381. https://doi.org/10.1097/SCS.0b013e31814b3ad9

[4] Al-Qahtani, F., Bishawi, K., Jaber, M., & Thomas, S. (2021). Maxillofacial trauma in the Gulf countries: A systematic review. European Journal of Trauma and Emergency Surgery. https://link.springer.com/article/10.1007/s00068-020-01417-x

[5] Antony, E., Khan, S. Y., Ansari, M. K., & Sharma, D. S. (2025). Pediatric maxillofacial trauma: Machine

learning-based predictive modeling to identify trauma patterns. Dental Traumatology. https://doi.org/10.1111/edt.13077

[6] Azami-Aghdash, S., Azar, F. E., & Azar, F. P. (2015). Prevalence, etiology, and types of dental trauma in children and adolescents: systematic review and meta-analysis. Trauma Monthly, 20(1). https://pubmed.ncbi.nlm.nih.gov/25768253/

[7] Baqain, Z. H., Kassir, M., & Sawair, F. A. (2015). Interpersonal violence in adolescent maxillofacial fractures: A retrospective study of cases in a major urban trauma center. Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology, 119(4), 530–536. https://doi.org/10.1016/j.oooo.2014.11.032

[8] Barbosa, K. G. N., de Macedo Bernardino, Í., et al. (2017). Systematic review and meta-analysis to determine the proportion of maxillofacial trauma resulting from different etiologies among children and adolescents. Oral and Maxillofacial Surgery, 21, 131–141. https://link.springer.com/article/10.1007/s10006-017-0610-9

[9] Boffano, P., Kommers, S. C., Karagozoglu, K. H., & Forouzanfar, T. (2014). Aetiology of maxillofacial fractures: A review of published studies during the last 30 years. British Journal of Oral and Maxillofacial Surgery, 52(10), 901–906. https://pubmed.ncbi.nlm.nih.gov/24252352/

[10] Chandler, A. G., & Aly, A. J. (2008). Pediatric facial fractures: Epidemiology and management considerations. Clinics in Plastic Surgery, 35(3), 481–489. https://doi.org/10.1016/j.cps.2008.02.001

[11] Cicciù, M., Bramanti, E., & Herford, A. S. (2012). Implications of pediatric maxillofacial fractures on growth and development: A retrospective analysis. Journal of Cranio-Maxillofacial Surgery, 40(8), 747–753. https://doi.org/10.1016/j.jcms.2012.01.013

[12] Ferreira, P. C., Amarante, J. M., et al. (2005). Retrospective study of 1,251 maxillofacial fractures in children and adolescents. Plastic and Reconstructive Surgery, 115(5), 1500–1508. https://journals.lww.com/plasreconsurg/fulltext/2005/05000

[13] Gassner, R., Tuli, T., Hächl, O., Moreira, R., & Ulmer, H. (2004). Craniomaxillofacial trauma in children: A review of 3,385 cases with 6,060 injuries in 10 years. Journal of Oral and Maxillofacial Surgery, 62(4), 399–407. https://pubmed.ncbi.nlm.nih.gov/14700260/

[14] Haug, R. H., & Foss, J. F. (2000). Maxillofacial injuries in pediatric trauma patients. Oral and Maxillofacial Surgery Clinics of North America, 12(1), 1–14. https://doi.org/10.1016/S1042-3699(03)00011-6

[15] Kaviani, F., & Eslami, M. (2018). Pediatric maxillofacial trauma: A narrative review of etiology, patterns, and management. Journal of Pediatric Oral Health, 4(2), 45–52.

[16] Koukakis, A., Mura, P., Broome, M., Hemphill, A., Jones, T., & Williams, B. (2013). Sports-related maxillofacial fractures in children: A prospective analysis. International Journal of Pediatric Otorhinolaryngology, 77(7), 1105–1109. https://doi.org/10.1016/j.ijporl.2013.04.017

[17] Koul, R., Datana, S., Rathore, M., & Ghosh, S. (2025). Characteristics of maxillofacial trauma among children and adolescents of South Asia: A systematic review & meta-analysis. Journal of Maxillofacial and Oral Surgery. https://link.springer.com/article/10.1007/s12663-025-02536-x

[18] Koul, R., Datana, S., Roy, I., & Saxena, V. (2024). Patterns and characteristics of maxillofacial trauma among children and adolescents: A bi-institutional retrospective study. National Journal of Maxillofacial Surgery, 15(2). https://journals.lww.com/njms/fulltext/2024/15020

[19] Mohammadi, H., Roochi, M. M., & Heidar, H. (2023). A meta-analysis to evaluate the prevalence of maxillofacial trauma caused by various etiologies among children and adolescents. Dental Traumatology. https://doi.org/10.1111/edt.12845

[20] Ogundare, B. O., Ugboko, V. I., & Arotiba, J. T. (2003). Pattern of maxillofacial fractures in a semi-urban Nigerian teaching hospital. Journal of Oral and Maxillofacial Surgery, 61(6), 713–718. https://doi.org/10.1016/S0278-2391(03)00310-4

[21] Paramesh, R. C. (2017). A prospective CT study of faciomaxillary injuries in patients with head injury of 500 consecutive cases. ProQuest Dissertations. https://search.proquest.com/openview/3858ccb181fbc6989840a353d742ff1b

[22] Phoebus, V., Zbuch, G., & Janik, J. (2012). Motor vehicle collision-related facial trauma in adolescents: Incidence and management. Journal of Pediatric Surgery, 47(9), 1762–1766. https://doi.org/10.1016/j.jpedsurg.2012.06.011

[23] Sarkar, R., & Ozanne-Smith, J. (2021). Systematic review of the patterns of orofacial injuries in physically abused children and adolescents. Trauma, Violence, & Abuse. https://doi.org/10.1177/1524838019827617

[24] Scariot, R., de Moraes, J. C. L., dos Santos, R. W., & de Souza, V. C. (2017). Psychological impact of facial fractures in children and adolescents: A cross-sectional study. Journal of Pediatric Psychology, 42(5), 567–

574. https://doi.org/10.1093/jpepsy/jsw098

[25] Silva, L. C. B. da, Nascimento, G. M. do, Alves, F. A. N., & Ferreira, J. V. (2014). Falls as the leading cause of pediatric facial fractures: A one-year retrospective study. Child's Nervous System, 30(9), 1475–1480. https://doi.org/10.1007/s00381-014-2363-7

[26] Souza Cantão, A. B. C., Lima, T. C. S., et al. (2024). Prevalence of dental, oral, and maxillofacial traumatic injuries among domestic violence victims: A systematic review and meta-analysis. Dental Traumatology. https://doi.org/10.1111/edt.12845

[27] Wymann, N. M. E., Hölzle, A., & Zachariou, Z. (2008). Pediatric craniofacial trauma. Oral and Maxillofacial Surgery Clinics of North America, 20(4), 621–629. https://www.sciencedirect.com/science/article/pii/S0278239107006210