Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(5), 2275-2279 | ISSN:2251-6727

Paediatric Maxillofacial Fractures: A Five-Year Retrospective Review of Patterns, Management and Outcomes

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(Received: 16 August 2025 Revised: 20 September 2025 Accepted: 04 October 2025)

KEYWORDS

Paediatric trauma; mandibular fractures; craniofacial growth; closed reduction; open reduction and internal fixation.

ABSTRACT:

Introduction: Facial fractures in children are far less common than in adults but pose greater management challenges because of skeletal growth and developing dentition. This study reviewed the distribution of paediatric facial fractures, treatment methods, and short-term outcomes at a tertiary oral and maxillofacial unit.

Methods: Records of all patients aged ≤18 years with radiologically confirmed facial fractures treated between January 2019 and December 2023 were retrospectively examined. Data collected included demographics, cause of injury, fracture site, management, and outcome. Fractures were classified as mandibular subsites, midfacial/zygomatic, or other mandibular regions. Outcomes were judged by healing, occlusion, facial symmetry, and complications.

Results: Sixty children (mean age 12.4 years, range 2–18) were included. Males were the majority (68.3%). Falls were the most frequent cause (61.7%), followed by road traffic accidents (28.3%). Mandibular fractures predominated (68.3%). Closed reduction was undertaken in 40% of cases, while 60% required open reduction and internal fixation (ORIF). The choice of treatment was strongly linked to the fracture site (χ^2=9.47, p=0.003). At a mean follow-up of 10.3 months, 95% achieved satisfactory outcomes, with only three minor complications (two malocclusions, one local infection).

Conclusions: The mandible is the most commonly fractured facial bone in children. While many injuries respond to conservative care, displaced fractures often need ORIF. Careful case selection allows excellent outcomes with minimal complications. Long-term surveillance is vital to detect potential growth-related sequelae.

1. Introduction

Paediatric facial fractures make up only a small proportion of all maxillofacial injuries, usually between 5–15% in most reported series. Their relative rarity belies their clinical importance, as their management is complicated by unique anatomical and physiological features of the growing skeleton.[1] Children's facial bones are more elastic, contain more cancellous bone, and are supported by a thicker periosteum, all of which provide considerable resistance to fracture and enhanced healing potential[2].Despite this resilience, fractures that involve developing teeth or growth centres can create long-term consequences if handled improperly, including malocclusion, skeletal asymmetry, or growth disturbances. Pediatric maxillofacial fractures are usually treated by conservative method instead of Open reduction. However during the Primary and Mixed dentition stages clinicians encounter numerous anatomical challenges associated with MMF procedures. Thus, the treatment of paediatric facial fractures demands a delicate balance: clinicians must achieve stability and restore function while protecting future growth [3,4].

The mandible is consistently the most frequently fractured bone due to its anatomical location, particularly in the parasymphysis, body, and condylar regions. Midfacial and zygomatic fractures, though less common, may be complex and carry significant impact to the facial structures and will be difficult to treat with. The mechanism of injury varies with age in infants and younger children, low-impact trauma such as skid and falls are most common. In contrast, adolescents more often sustain high-energy injuries such as road traffic accidents or sports traumatic morbidity [5]. Treatment

Journal of Chemical Health Risks
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JCHR (2025) 15(5), 2275-2279 | ISSN:2251-6727

options are influenced by age, fracture type and degree of displacement, type of dentition. Closed reduction or conservative management is often sufficient for stable, non-displaced injuries. However, open reduction and internal fixation (ORIF) is generally required when displacement causes malocclusion or functional compromise. Debate continues regarding the potential effect of rigid fixation on growth, but evidence suggests that with careful technique and proper selection of case and better execution of the treatment plan, complications are rare [6,7].

This study reviews the clinical experience of a tertiary maxillofacial centre over five years, focusing on evaluation of fracture patterns, treatment modalities, and short-term outcomes in paediatric patients.

2. Material and Methods

Study Design and Ethical Approval

A retrospective review was undertaken for children ≤18 years of age with confirmed facial fractures presented to the Department of Oral and Maxillofacial Surgery, [Institution], between January 2019 and December 2023. Institutional review board approval was obtained (Ref. OMFS/2024/017), and parental or guardian consent was secured for inclusion.

Eligibility Criteria

Inclusion: patients ≤18 years with radiographically confirmed fractures of the facial skeleton.

Exclusion: isolated dental trauma, pathological fractures, incomplete records, or less than six months' follow-up.

Data Collection

Extracted variables included age, sex, mechanism of injury, fracture site, management strategy, and clinical outcomes. Causes of injury were grouped as falls, road traffic accidents, sports injuries, and interpersonal violence. Fractures were categorised into mandibular subsites, midfacial/zygomatic, or other mandibular regions.

Management Protocol

Treatment decisions were based on fracture displacement, occlusal involvement, and aesthetic concerns. Non-displaced fractures were treated with conservative or closed methods, including immobilisation. Displaced fractures leading to malocclusion or deformity underwent ORIF using titanium miniplates. All procedures followed established paediatric trauma protocols.[15]

Outcome Measures

Follow-up included clinical and radiographic assessment. A good outcome was defined as bone union, normal occlusion, satisfactory facial symmetry, and unimpaired mandibular function. Complications recorded included infection, malocclusion, ankylosis, or hardware failure.

Statistical Analysis

Data were analysed using descriptive statistics. Chi-square testing examined associations between fracture site and treatment modality. A p-value <0.05 was considered significant.

3. Results

Patient Selection A total of 78 patient records were identified. After applying exclusion criteria (12 with isolated dental trauma, 4 with incomplete records, and 2 lost to follow-up), 60 patients were included in the final analysis.

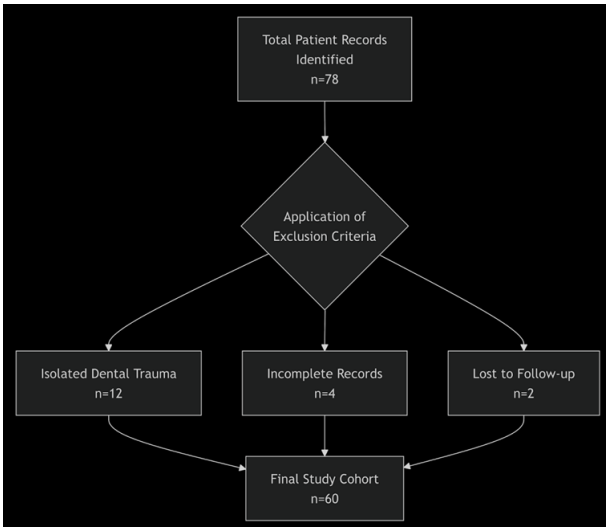

Figure 1. Flow chart representing the study pattern

Demographics

Sixty children were included. Mean age was 12.4 years (SD 4.6; range 2–18). There was a male predominance: 41 boys (68.3%) and 19 girls (31.7%).

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Causes of Injury

Falls accounted for 37 cases (61.7%), making them the leading cause of injury. Road traffic accidents caused 17 cases (28.3%), sports-related injuries were responsible for four cases (6.7%), and interpersonal violence accounted for two cases (3.3%).

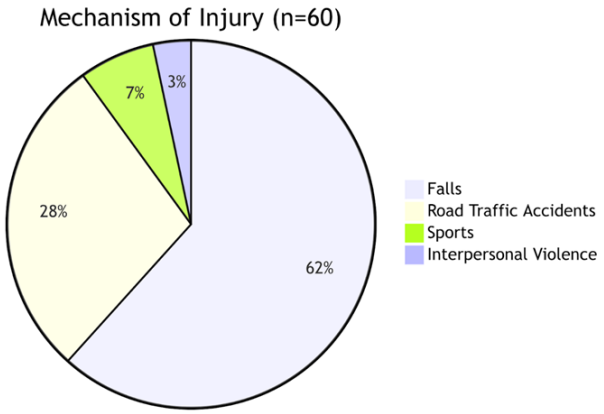


Figure 2. pie chart representing the mechanism of injury

Fracture Distribution

Mandibular fractures predominated (41 cases, 68.3%). Midfacial/zygomatic fractures were noted in seven children (11.7%), and other mandibular regions in 12 (20%).

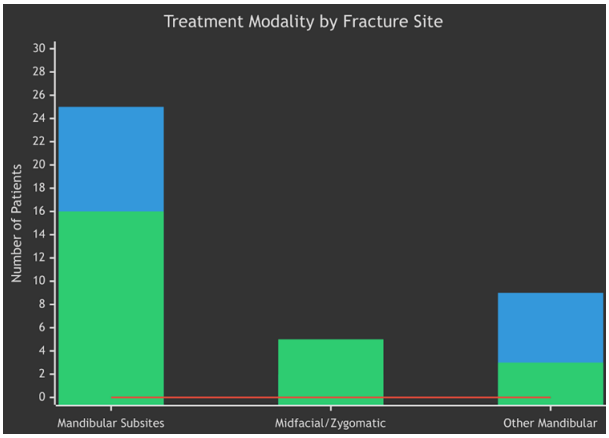
Table 1. Distribution of Fracture Sites

Site	Number of Patients	Percentage
Mandibular subsites (Parasymphysis, Body, Condyle)	41	68.3%
Midfacial/Zygomatic	7	11.7%
Other mandibular regions (Angle, Ramus, Dentoalveolar)	12	20.0%
Total	**60**	**100%**

Treatment Modalities

Site	Closed Reduction	Open Reduction and Internal Fixation (ORIF)
Mandibular subsites (n=41)	16	25
Midfacial/Zygomatic (n=7)	5	2
Other mandibular regions (n=12)	3	9
Total	**24**	**36**

Closed reduction was performed in 24 children (40%), while 36 (60%) underwent ORIF. The relationship between fracture site and management was statistically significant (χ^2=9.47, p=0.003).



Outcomes

Mean follow-up was 10.3 months (SD 3.1). Fifty-seven children (95%) recovered with satisfactory function and appearance. Minor complications included two transient malocclusions (3.3%) and one case of localised infection (1.7%). No non-unions, ankyloses, or growth disturbances were observed within the follow-up period.

4. Discussion

This review shows that mandibular fractures account for the majority of facial injuries in children. The prominence of the mandible and its mechanical vulnerability during impact largely explain its high fracture rate, a finding consistent with earlier studies. The predominance of boys is also well recognized, likely reflecting greater exposure to outdoor activities and risk-taking behaviors [8,9].

Falls were the most common cause of injury in younger children, whereas road traffic accidents predominated among adolescents. These observations are in line with international trends, highlighting both developmental and environmental influences on trauma patterns [8,9]. With regard to fracture distribution, parasymphysis and body fractures were the most frequent, while condylar fractures, though less common, remain clinically important due to their potential to disturb mandibular growth. Midfacial and zygomatic fractures were rare, most likely because of the elasticity of pediatric bone and the protective effect of soft tissues [8,9].

Treatment strategies depended on the type and severity of fracture. Stable injuries could be managed conservatively, but displaced fractures associated with malocclusion generally required surgical stabilization. In

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this series, the proportion of ORIF (60%) was higher than that reported in some other studies, possibly due to referral bias to a tertiary trauma center. Outcomes were excellent with minimal complications, supporting the safety of rigid fixation in carefully selected cases [10,11]. A few children in this series were treated with circummandibular wiring, and these cases also healed well, suggesting that this simpler technique remains a useful option for younger patients where protection of developing tooth buds and growth centers is a priority.

The exceptional healing potential of children was clearly evident: 95% of patients achieved complete recovery with only minor complications. This finding supports earlier research showing rapid bone healing and low infection rates in pediatric patients. Nevertheless, long-term concerns remain. Growth disturbances, particularly in condylar fractures, may appear years later, emphasizing the importance of long-term follow-up (12,13).

The study's limitations include its retrospective nature, modest sample size, and single-center scope. Despite this, it provides valuable insight into the epidemiology, treatment patterns, and outcomes of pediatric mandibular fractures in a tertiary care setting [14].

5. Conclusion

Pediatric maxillofacial fractures, though relatively uncommon, remain clinically important because of their potential impact on growth and development. In this study, the mandible emerged as the most frequently affected site, with falls being the predominant cause in younger children and road traffic accidents more common in adolescents. Management approaches varied according to fracture type and severity: while many fractures were successfully treated with conservative methods, displaced injuries often required open reduction and internal fixation (ORIF). A few cases were also managed with circummandibular wiring, which provided satisfactory stability in younger patients.

Both conservative treatment and ORIF achieved excellent short-term outcomes with minimal complications, reflecting the remarkable healing capacity of children. Importantly, 95% of patients made a complete recovery, underscoring the effectiveness of timely and appropriate intervention. However, long-term concerns cannot be overlooked. Growth disturbances, particularly in condylar fractures, may arise years after the initial injury or treatment. This highlights the importance of ongoing follow-up well into adolescence to ensure normal development and function.

Overall, these findings emphasize that early diagnosis, individualized treatment planning, and long-term monitoring are key to optimizing outcomes in pediatric facial trauma. By carefully balancing the need for stability with the preservation of growth potential, clinicians can achieve excellent functional and aesthetic results while minimizing long-term risks.

References:

1. Mukherjee CG, Mukherjee U. Maxillofacial trauma in children. Int J Clin Pediatr Dent. 2012 Sep;5(3):231-6. doi: 10.5005/jp-journals-10005-1174. Epub 2012 Dec 5. PMID: 25206176; PMCID: PMC4155887.Mukherjee CG, Mukherjee U. Maxillofacial trauma in children. Int J Clin Pediatr Dent. 2012 Sep;5(3):231-6. doi: 10.5005/jp-journals-10005-1174. Epub 2012 Dec 5. PMID: 25206176; PMCID: PMC4155887.
2. Hinson M, Wright A, Davidson A, Kogan S, Runyan C. Pediatric Facial Fractures: A Multi-Institutional Level 1 Trauma Center Analysis of Incidence, Interventions, and Outcomes. Craniomaxillofac Trauma Reconstr. 2024 Dec;17(4):NP192-NP203. doi: 10.1177/19433875241272430. Epub 2024 Aug 5. PMID: 39553822; PMCID: PMC11562978.
3. Wheeler J, Phillips J. Pediatric facial fractures and potential long-term growth disturbances. Craniomaxillofac Trauma Reconstr. 2011 Mar;4(1):43-52. doi: 10.1055/s-0031-1272901. PMID: 22379506; PMCID: PMC3208338.
4. Chao MT, Losee JE. Complications in pediatric facial fractures. Craniomaxillofac Trauma Reconstr. 2009 May;2(2):103-12. doi: 10.1055/s-0029-1215873. PMID: 22110803; PMCID: PMC3052670.
5. Panesar K, Susarla SM. Mandibular Fractures: Diagnosis and Management. Semin Plast Surg. 2021 Oct 11;35(4):238-249. doi: 10.1055/s-0041-1735818. PMID: 34819805; PMCID: PMC8604616.
6. Sharma S, Vashistha A, Chugh A, Kumar D, Bihani U, Trehan M, Nigam AG. Pediatric

mandibular fractures: a review. Int J Clin Pediatr Dent. 2009 May;2(2):1-5. doi: 10.5005/jp-journals-10005-1022. Epub 2009 Aug 26. PMID: 25206104; PMCID: PMC4086564.

7. Verma G, Gothi B, Tiwari AK, Agrawal A. Management of Maxillofacial Fracture in Pediatric Patients Using Skeletal Suspension Wiring: A Case Report. *The Traumaxilla*. 2022;1 (2-3):81-83. doi: 10.1177/26323273211072349
8. Sharma A, Patidar DC, Gandhi G, Soodan KS, Patidar D. Mandibular Fracture in Children: A New Approach for Management and Review of Literature. Int J Clin Pediatr Dent. 2019 Jul-Aug;12(4):356-359. doi: 10.5005/jp-journals-10005-1643. PMID: 31866724; PMCID: PMC 6898861.
9. Smartt, James & Low, David & Bartlett, Scott. (2005). The Pediatric Mandible: II. Management of Traumatic Injury or Fracture. Plastic and reconstructive surgery. 116. 28e-41e. 10.1097/01. prs.0000173445.10908.f8.
10. Barde D, Mudhol A, Madan R. Prevalence and pattern of mandibular fracture in Central India. Natl J Maxillofac Surg. 2014 Jul-Dec;5(2):153-6. doi: 10.4103/0975-5950.154818. PMID: 259377 25; PMCID: PMC4405956.
11. Gadicherla S, Sasikumar P, Gill SS, Bhagania M, Kamath AT, Pentapati KC. Mandibular Fractures and Associated Factors at a Tertiary Care Hospital. Arch Trauma Res. 2016 Sep 19;5(4): e30574. doi: 10.5812/atr.30574. PMID: 281445 99; PMCID: PMC5253199.
12. Hussain, Alikunju & Michael, Manoj & George, Julie & K D, Divya & Dominic, Shiney & Mathew, Tony. (2022). Occurrence and pattern of mandibular fractures in maxillofacial trauma of Kerala population: A one year retrospective study. International journal of health sciences. 6784-6800. 10.53730/ijhs.v6nS6.11306.
13. Sawyer JR, Flynn JM, Dormans JP, Catalano J, Drummond DS. Fracture patterns in children and young adults who fall from significant heights. J Pediatr Orthop. 2000 Mar-Apr;20(2):197-202. PMID: 10739282.
14. Sharma, B.; Agcon, A.M.B.; Agriantonis, G.; Cheerasarn, S.; Bhatia, N.D.; Shafaee, Z.; Whittington, J.; Twelker, K. Clinical Outcomes and Patterns of Traumatic Injuries Associated with Subway Incidents at a Level 1 Trauma Center. *Life* **2025**, *15*, 51. https://doi.org/10.3390/ life15010051