



FREQUENCY AND PATTERN OF FACIAL FRACTURES IN PRE-SCHOOL AND SCHOOL AGED CHILDREN IN TERTIARY HEALTHCARE CENTER PAKISTAN

Dr. Arif Mansoor^{*1}, Dr. Mohammad Ishaq², Dr. Umair Sajid³, Dr. Nimra Pir Nasir⁴,
Dr. Adeena Abid⁵, Dr. Ahsan Shahzad⁶

^{*1}Trainee Oral and Maxillofacial surgery, PNS Shifa, Karachi.

²Supervisor Oral and Maxillofacial surgery, PNS Shifa, Karachi.

³House Officer, department of Oral and Maxillofacial surgery, PNS Shifa, Karachi

⁴MSPH Researcher

⁵Trainee Oral and Maxillofacial Surgery, PNS Shifa, Karachi.

⁶Trainee Oral and Maxillofacial surgery, PNS Shifa, Karachi.

^{*1}drarifmansoor@gmail.com, ²drishaqkhan32@yahoo.com, ³Theumairsajid@gmail.com,
Nimrapeer.97@gmail.com ⁴adeenaabid123@outlook.com⁵, ahsanshahzad88@gmail.com⁶

DOI: <https://doi.org/10.5281/zenodo.17303603>

Keywords

Pediatric facial fractures;
Preschool children; School-
aged children; Etiology;
Mandibular fracture;
Dentoalveolar fracture; Road
traffic accidents; Pakistan

Article History

Received on 28 April 2025

Accepted on 28 May 2025

Published on 05 June 2025

Copyright @Author

Corresponding Author: *

Dr Arif Mansoor

Abstract

Background:

Pediatric facial fractures, though less frequent than in adults, can significantly affect facial growth, function, and aesthetics. The epidemiology and patterns of these injuries vary by age and environment. Limited data exist for Pakistani children, particularly comparing preschool- and school-aged groups.

Objectives:

To determine the frequency, etiology, and patterns of facial fractures in preschool and school-aged children presenting to a tertiary healthcare hospital in Karachi, Pakistan.

Methods:

A descriptive cross-sectional study was conducted in the Department of Oral and Maxillofacial Surgery, PNS Shifa Hospital, Karachi, between 2024 and 2025. A total of 137 children with facial fractures aged 1–16 years were enrolled using non-probability consecutive sampling. Children were stratified into preschool (1–5 years) and school-aged (6–16 years) groups. Demographic data, etiology of trauma, and fracture patterns were recorded following clinical and radiological evaluation (orthopantomogram, periapical radiographs, and CT scans with 3D reconstruction). Data were analyzed using SPSS version 20. Chi-square and Fisher's exact tests were applied, with $p \leq 0.05$ considered statistically significant.

Results:

Of the 137 patients, 52 (38%) were ≤ 5 years and 85 (62%) were > 5 years, with a male-to-female ratio of approximately 2:1 (mean age 7.8 ± 2.4 years). Road traffic accidents were the leading cause of injury (45 cases; 32.8%), followed by falls (40; 29.2%) and sports-related injuries (32; 23.4%). Dentoalveolar fractures were the most common pattern (55 cases; 40.1%), followed by mandibular (28; 20.4%) and zygomatic (18; 13.1%) fractures. In children ≤ 5 years, mandibular fractures and falls predominated, whereas in

children >5 years, dentoalveolar and zygomatic fractures were more frequent, mainly due to RTAs and sports injuries.

Conclusion:

Pediatric facial fractures in this Pakistani cohort showed a male predominance, with dentoalveolar and mandibular fractures being most frequent. Road traffic accidents were the leading cause overall, while falls were more common in younger children. The differing etiologies and fracture patterns between age groups underscore the need for targeted preventive measures, including traffic safety, playground improvements, and protective sports gear.

INTRODUCTION

Facial fractures in children are clinically important because of their potential impact on growth, esthetics, function, and psychosocial outcomes. Although pediatric facial fractures are less common than in adults—owing principally to unique anatomical and biomechanical properties in children such as more flexible bone, thicker soft tissue, and ongoing craniofacial growth—they present distinct patterns of injury and etiologies that vary by age, gender, and geography [1].

The incidence of facial fractures increases with age, especially once children become school-aged, engage in more independent outdoor activities, sports, and traffic exposure. Younger children (preschool to early school age) tend to sustain injuries from low-energy mechanisms like falls, while older children and adolescents are more likely to suffer higher-energy trauma such as road traffic accidents (RTAs), sports injuries, or interpersonal violence [2].

Patterns of fracture locations also shift with age. The mandible is frequently involved across many pediatric studies, often being the most common facial bone fractured. Other frequent sites include nasal bones, zygomatic, orbit, and dentoalveolar regions. Moreover, the relative rarity of mid-face fractures in very young children is often attributed to the under-development of sinus structure and greater elasticity of the facial skeleton [3,4].

Within Pakistan, existing studies underscore similar trends. For example, a cross-sectional study from Jinnah Postgraduate Medical Centre (Karachi) reported falls and RTAs as leading causes of pediatric maxillofacial injuries, with the mandible being the most affected bone followed by maxilla and zygoma [5]. Another study in Pakistan observed dentoalveolar fractures to be

more common than mandibular fractures, but also noted considerable variability in fracture site according to age group [6].

Despite this, there remains a paucity of detailed data comparing preschool age (commonly 1-5 years) versus school-aged children (6-16 years) in Karachi, especially in a tertiary hospital setting. Such data are critical for tailoring prevention efforts (traffic safety, child supervision, playground design), for planning hospital resources, and for optimizing treatment protocols specific to age-related anatomy and risk exposure [7].

Therefore, this study aims to determine the frequency, etiology, and pattern of facial fractures in preschool and school-aged children presenting to a tertiary healthcare hospital in Karachi. Specifically, we compare causes of injury, anatomical fracture sites, and demographic factors between these age groups to inform both clinical management and preventive strategies.

Materials and Methods

A descriptive cross-sectional study was conducted in the Department of Oral and Maxillofacial Surgery, PNS Shifa Hospital, Karachi, Pakistan, between January 2024 and June 2025. The study aimed to determine the frequency, etiology, and patterns of facial fractures in preschool and school-aged children presenting to a tertiary healthcare hospital.

Children aged 1-16 years presenting with facial trauma were consecutively recruited using non-probability sampling. The cohort was stratified into two age groups: preschool (1-5 years) and school-aged (6-16 years). Children with uncontrolled systemic illnesses or gunshot injuries were excluded. Written informed consent was obtained from parents or legal guardians before enrolment. Approval was obtained from the

Institutional Ethical Review Committee of PNS Shifa Hospital.

Demographic details (age, gender, address) and socioeconomic status were recorded at presentation. A detailed history of trauma, including cause and mechanism of injury, was

Time between injury and presentation

Treatment classification

Treatment modalities were classified as conservative or surgical based on the extent and displacement of the fracture and on occlusal disturbance:



taken. All patients underwent thorough extra- and intraoral examinations. Radiographic evaluation included orthopantomogram (OPG), periapical radiographs, and computed tomography (CT) scans with three-dimensional facial reconstruction where indicated.

The following variables were documented for each patient:

- Age group (preschool vs. school-aged)
- Gender
- Etiology of trauma (road traffic accident, falls, sports-related injury, assault/child abuse, others)
- Type and anatomical site of fracture (mandibular, dentoalveolar, zygomatic complex, Le Fort/midface, nasal, frontal/orbital)
- Treatment modality (conservative vs. surgical)

Conservative management included close observation, soft or liquid diet, analgesics, and activity restriction, with regular follow-up. This approach was used for most nondisplaced mandibular fractures, intracapsular condylar fractures without significant malocclusion, and minor dentoalveolar injuries.

Surgical management included closed reduction with immobilization using arch bars and intermaxillary fixation (IMF), circummandibular wiring, pyriform aperture suspension wiring, open reduction and internal fixation (ORIF) with titanium miniplates and monocortical screws, and external splinting or manipulation of nasal fractures or dentoalveolar injuries when indicated. (Fig:1 and fig:2)

Fig.1: A panoramic view of a 16-year-old patient with left parasymphiseal fracture of the mandible treated with 2 titanium miniplates and the fracture of angle treated with a single titanium miniplate



Fig.2: A panoramic view of a 4 year old patient showing left parasymphysal fracture of the mandible treated with a titanium miniplate and screws

All patients were followed up for at least 6 weeks post-treatment. Any complications (e.g. malocclusion, deviation on opening) were documented.

Operational definitions

Facial fractures were diagnosed based on clinical findings corroborated by radiographs and/or CT imaging. Dentoalveolar injuries were defined as fractures involving alveolar bone with or without associated tooth injury. Midface fractures included Le Fort, maxilla, and zygomatic complex injuries.

Statistical analysis

Data were entered and analyzed using IBM SPSS Statistics version 20 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean $\pm$ standard deviation (SD). Categorical variables were presented as frequencies and

percentages. Normality was assessed using the Shapiro-Wilk test. Associations between age group and fracture characteristics were evaluated using the Chi-square test or Fisher's exact test where appropriate. A p-value ≤ 0.05 was considered statistically significant.

Results

A total of 137 pediatric patients with facial fractures were included. The mean age was 7.8 ± 2.4 years, ranging from 1 to 16 years, with a male-to-female ratio of approximately 2:1. Fifty-two patients (38%) were in the preschool group (≤ 5 years) and eighty-five patients (62%) were in the school-aged group (> 5 years).

Table 1 presents the distribution of etiology of trauma by age group. Overall, road traffic accidents (RTAs) were the leading cause (32.8%), followed by falls (29.2%) and sports-related injuries (23.4%). Assault/child abuse and other causes each accounted for 7.3%. Falls were most common in preschool children, whereas RTAs and sports-related injuries predominated in school-aged children.

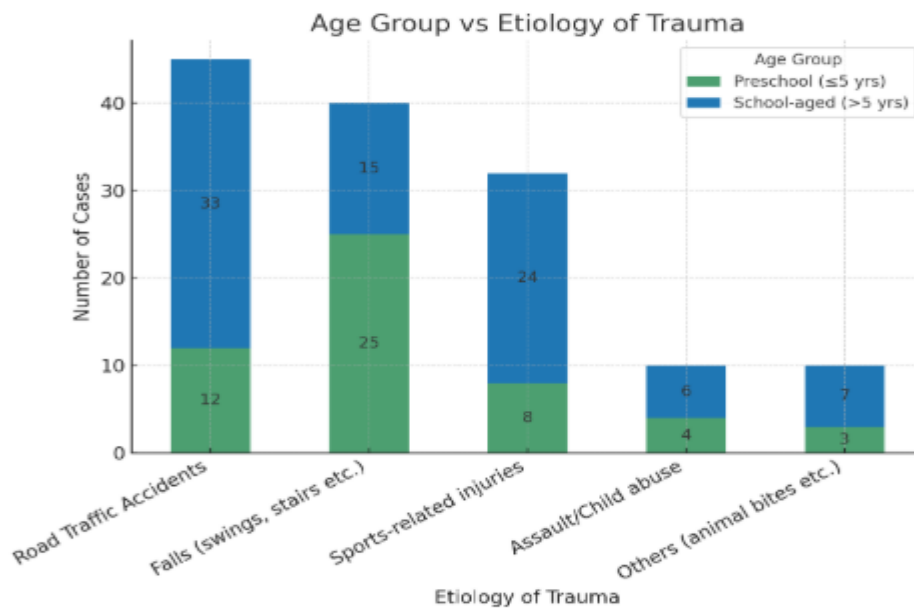


Figure No. 1 Age group vs Etiology of trauma

Table 1: Age group vs Etiology of trauma

Etiology	Preschool (≤5 yrs)	School-aged (>5 yrs)	Total (n=137)
Road Traffic Accidents	12	33	45
Falls (swings, stairs etc.)	25	15	40
Sports-related injuries	8	24	32
Assault/Child abuse	4	6	10
Others (animal bites etc.)	3	7	10

Table 2 summarizes the fracture types according to age group. Dentoalveolar fractures were the most common (40.1%), followed by mandibular fractures (20.4%) and zygomatic complex fractures (13.1%). Less frequent injuries included Le Fort/midface (10.2%), nasal (8.8%), and

frontal/orbital fractures (7.3%). In preschool children, mandibular and dentoalveolar fractures predominated, mostly secondary to falls. In school-aged children, dentoalveolar and zygomatic fractures were more common, mainly due to RTAs and sports-related trauma.

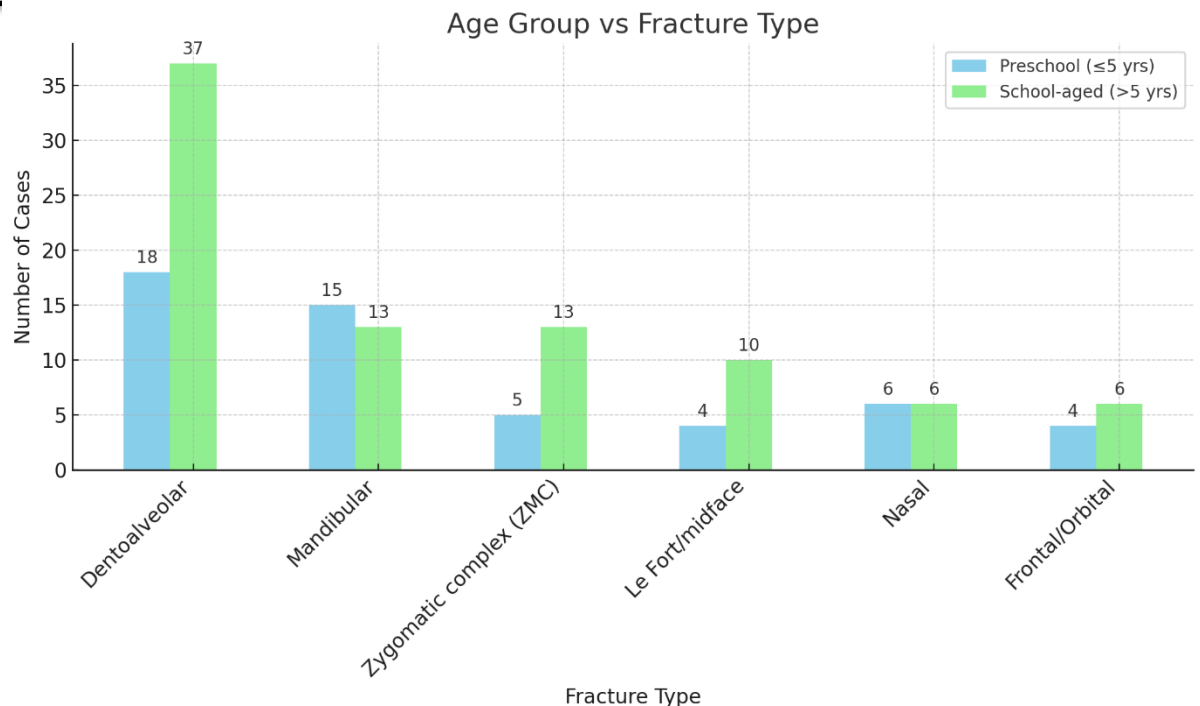


Figure No. 2 Age group vs Fracture type

Table 2: Age group vs Fracture type

Fracture type	Preschool (≤5 yrs)	School-aged (>5 yrs)	Total (n=137)
Dentoalveolar	18	37	55
Mandibular	15	13	28
Zygomatic complex (ZMC)	5	13	18
Le Fort/midface	4	10	14
Nasal	6	6	12
Frontal/Orbital	4	6	10

Our findings reinforce that in Pakistani children, facial fracture epidemiology follows many global trends—but also reflects local context. Preventive efforts should differ by age: for preschool children, home safety and fall prevention are key; for older children, traffic safety regulations, child helmet use, and protective gear during sports may reduce incidence. Clinically, a tailored approach to treatment that balances fracture stability and growth preservation is essential.

The present study of 137 pediatric facial fracture cases in Karachi highlights several important patterns and supports findings from regional and international literature.

Our finding that road traffic accidents (RTAs) are the leading cause overall, with falls being more dominant among preschool-aged children, is consistent with many studies globally [8]. A study

in Peshawar, Pakistan, of 178 pediatric patients showed that falls were the predominant mechanism in the younger group (0-6 years), while older children had more fractures from RTAs [8]. Similarly, a large retrospective series in Pakistan found that mandible fractures were most common, with RTAs and falls being major etiologies [9].

A study in Burdwan, India of 206 children found similar proportions: falls accounted for 44.2% and motor vehicle accidents for 31.5% of facial fractures, with the 6-9-year age group being most affected [10]. These comparisons reinforce that as children age, exposure to high-energy trauma increases, altering both cause and injury severity.

Our observation that dentoalveolar and mandibular fractures predominate, with

increasing mid-face / zygomatic involvement among older children, is likewise supported in the literature. In the Multan study, mandibular fractures were most frequent (30.36%), followed by dentoalveolar and midface fractures [2]. The Burdwan cohort also showed a similar distribution of facial fracture sites in different age groups [10]. International data from a study in China also report that mandibular and nasal bones are the most commonly fractured, with a peak in incidence among adolescents, reflecting similar developmental and exposure dynamics [11].

Given many fractures in younger children are minimally displaced and their greater capacity for bone remodeling, conservative management is frequently sufficient and preferred, reducing risk of complications. The retrospective Pakistani and Indian series often report a substantial fraction of fractures managed non-operatively in younger patients, reserving surgery for cases with displacement, occlusal dysfunction, or aesthetic/functional compromise [9,10]. In the study “Aetiology, prevalence, fracture site and management of maxillofacial trauma” approximately 42% were treated with closed methods, reflecting that surgical intervention is not always the first line [12].

Although our primary dataset did not include long-term follow-up for growth or developmental sequelae, literature shows that combined or displaced fractures and those requiring surgical fixation are more likely to result in adverse outcomes. For example, in a study of 177 children, surgery was associated with a higher rate of adverse outcomes compared with isolated fractures or conservative treatment [14]. This underlines the importance of minimizing displacement where possible and monitoring children over time to 1) identify late complications such as malocclusion, asymmetry, or growth disturbances.

Based on both our findings and comparison with the literature, preventive strategies need to be age- 2) targeted. For preschool children, home safety (stairs, play equipment) and supervision are critical. For school-aged children, improving road safety (pedestrian protection, traffic regulation enforcement), use of protective gear in sports, and community awareness are crucial. Clinically,

emphasizing conservative management when feasible may reduce morbidity, cost, and surgical risks. For displaced or functional fractures, early, appropriate surgical management is necessary with awareness of potential impacts on facial growth, especially in younger children.

Some limitations deserve mention: our study is single-center and retrospective, which may introduce selection bias and limit generalizability. Our follow-up period was relatively short (or not uniformly long) so long-term outcomes (growth, facial symmetry) were not fully captured. Also, specific differentiation by school age subgroups (e.g. 6-10 vs 11-16) might show differing patterns which our broad stratification may miss.

Conclusion

Pediatric facial fractures in our cohort showed a clear male predominance and distinct age-related differences in etiology and injury patterns. Road traffic accidents emerged as the leading cause overall, whereas falls were more frequent among preschool children. Dentoalveolar and mandibular fractures were the most common injuries, with zygomatic and other midface fractures becoming more frequent in older children.

These findings, which mirror but also extend previous reports from the region, underscore the importance of age-specific preventive strategies—improving home safety and supervision for younger children and enforcing traffic laws and promoting protective sports gear for older children. A largely conservative management approach remains appropriate for most pediatric fractures, with surgical intervention reserved for displaced or functionally compromising injuries to minimize adverse effects on craniofacial growth.

References

- 1) Zimmermann CE, Troulis MJ, Kaban LB. Pediatric facial fractures: recent advances in prevention, diagnosis and management. *Int J Oral Maxillofac Surg.* 2006 Jan;35(1):2-13. doi: 10.1016/j.ijom.2005.09.014. PMID: 16425444.
- 2) Patel K, Thornton B, Ma B, Ying Y, Castro-Nunez J. Mechanism patterns and age variations in pediatric cranio-maxillofacial trauma: a 5-year analysis of the national trauma data bank. *Oral Maxillofac Surg.* 2025 Sep 16;29(1):153. doi: 10.1007/s10006-025-01450-3. PMID: 40956362; PMCID: PMC12441080.

- 3) Hong K, Jeong J, Susson YN, Abramowicz S. Patterns of Pediatric Facial Fractures. *Craniomaxillofac Trauma Reconstr.* 2021 Dec;14(4):325-329. doi: 10.1177/1943387521991738. Epub 2021 Feb 3. PMID: 34707793; PMCID: PMC8543594.
- 4) Cleveland CN, Kelly A, DeGiovanni J, Ong AA, Carr MM. Maxillofacial trauma in children: Association between age and mandibular fracture site. *Am J Otolaryngol.* 2021 Mar-Apr;42(2):102874. doi: 10.1016/j.amjoto.2020.102874. Epub 2020 Dec 29. PMID: 33418178.
- 5) Salah S, Alam J, Shah R, Akhtar Z, Naseem S, Ahmed J. Prevalence and Etiology of Pediatric Maxillofacial Injuries. *Indus J Biosci Res.* 2023;3(5):1330. doi:10.70749/ijbr.v3i5.1330.
- 6) Khan, M. A., Ishfaq, M., Akhtar, M., Rana, S. A. A., & Kashif, M. (2017). Frequency of paediatric facial trauma in a tertiary care dental hospital. *International Surgery Journal*, 5(1), 310-314. <https://doi.org/10.18203/2349-2902.isj20175917>
- 7) Lim RB, Hopper RA. Pediatric Facial Fractures. *Semin Plast Surg.* 2021 Oct 11;35(4):284-291. doi: 10.1055/s-0041-1736484. PMID: 34819811; PMCID: PMC8604614.
- 8) Hasan, M. A., Mazumder, M. T. R., Motari, M. C., Shourov, M. S. H., Sarkar, M., & Toma, T. A. (2025). Assessing the effectiveness of AI chatbots in reducing no-shows and improving patient satisfaction in US primary and specialized health care. *AVE Trends in Intelligent Health Letters*, 2 (1), 1-15.
- 9) Khan, R. ., Salman Ashraf, Khan, M. I. ., Jehangir Khan, Eruj Shuja, Amna Muzaffar, Muhammad Ilyas, & Manzoor Khan. (2025). PATTERNS OF ORAL & MAXILLOFACIAL INJURIES IN PEDIATRIC PATIENTS: A RETROSPECTIVE CHART REVIEW. *JOURNAL OF KHYBER COLLEGE OF DENTISTRY*, 15(02), 46-50. <https://doi.org/10.33279/jkcd.v15i02.919>
- 10) Khan, M. A., Ishfaq, M., Akhtar, M., Rana, S. A. A., & Kashif, M. (2017). Frequency of paediatric facial trauma in a tertiary care dental hospital. *International Surgery Journal*, 5(1), 310-314. <https://doi.org/10.18203/2349-2902.isj20175917>
- 11) Goswami S. Pediatric patients with facial fractures: a retrospective study. *J Inj Violence Res.* 2024 Jan;16(1):71-76. doi: 10.5249/jivr.v16i1.1835. Epub 2024 Apr 28. PMID: 38680062; PMCID: PMC11684848.
- 12) Ali, S., Raza, M. A., Fazal, S., Ahmad, R. T., Fatima, M., Shahid, A., & Khatoon, F. (2025). Exploring the Association Between Passive Exposure to Household Smoking and Frequency of Recurrent Wheezing in Children. *Journal of Health, Wellness and Community Research*, e308-e308.
- 13) Wang H, Song G, Ren W, Zhou Y, Li C, Ou L, Liu J, Xiang L. Traumatic Facial Fractures in Children and Adolescents. *J Craniofac Surg.* 2018 Oct;29(7):1809-1812. doi: 10.1097/SCS.00000000000004964. PMID: 30234718.
- 14) Rottgers SA, Decesare G, Chao M, Smith DM, Cray JJ, Naran S, Vecchione L, Grunwaldt L, Losee JE. Outcomes in pediatric facial fractures: early follow-up in 177 children and classification scheme. *J Craniofac Surg.* 2011 Jul;22(4):1260-5. doi: 10.1097/SCS.0b013e31821c6ab7. PMID: 21772202.