ORIGINAL ARTICLE

Epidemiological Analysis of Elbow Fractures in Children of Urban Populations of the Third World Country

Ghazanfar Ali Shah[1], Mukesh Kumar[2], M. Sabir Memon[3], Affan Tayyab[4], Syed Muhammad Sibtain[5], and Imran Khan Mangi[6]

ABSTRACT

Objective: To evaluate the demographic patterns, injury mechanisms, fracture distribution, factors associated with delayed presentation, in children presenting with elbow fractures at a tertiary trauma center of Karachi
Methodology: This retrospective cross-sectional study was conducted at the department of orthopaedic surgery, Shaheed Mohtarma Benazir Bhutto Institute of Trauma (SMBBIT), Karachi from January 2022 to March 2024. All paediatric patients (<14 years) with radiologically confirmed elbow fractures requiring surgical intervention were included. The variables analyzed in this study included age, sex, injury mechanism, fracture type, laterality, bonesetter contact, time to presentation, swelling, neurovascular status, and treatment modality. Fisher's exact test assessed associations between bonesetter visits, delay, and swelling.
Results: A total of 180 patients with mean age 7.2 ± 3.6 years were included. Supracondylar fractures accounted for 73% of cases, predominantly affecting males (69.5%) and on the left side (66.7%). The most common mechanism of injury falls were during play (53.9%). Those patients who presented after 24 hours had visited bonesetters priorly and were all associated with significant swelling at presentation, and its association was confirmed with Fisher's test OR ~ 3.8, $p < 0.001$). In children who presented with Road Traffic Accident (RTA), about 2.8% had vascular injuries. The most frequently performed procedure was close reduction and percutaneous pinning (CRPP), followed by open reduction and internal fixation (ORIF), accounting for 60% and 35% of the cases, respectively.
Conclusion: The most common elbow fracture among children in Karachi was the supracondylar fracture. Delay in presentation was mainly due to initial consultations with bonesetters, which is a preventable factor that can be addressed through public awareness and early referral to reduce complications associated with this disabling condition.

Keywords: Bone-setter, child, elbow injuries, fractures, orthopaedic procedures, Pakistan, retrospective studies, traditional medicine

How to cite: Shah GA, Kumar M, Memon MS, Tayyab A, Sibtain SM, Mangi IK. Epidemiological analysis of elbow fractures in children of urban populations of the third world country. Ann Jinnah Sindh Med Uni. 2025; 11(2):57-61

DOI: https://doi.org/10.46663/ajsmu.v11i2.57-61

INTRODUCTION

Every year about 31 million children around the world suffer from bone fractures, making it a major global health issue. These injuries are especially common in low to middle income countries, where unsafe play areas, poor infrastructure, and limited access to medical care increase the risk and delay proper treatment[1]. Supracondylar elbow fractures are the most commonly seen injuries among children, making up nearly 16% of all childhood fractures[2]. In Pakistan, where children make up more than one-third of the population, these injuries are especially common in large cities like Karachi. The increasing number of cases is mainly due to unsafe play areas, lack of safety measures, crowded living conditions, and delays in receiving proper orthopaedic treatment[3].

Elbow fractures in children usually result from falls on an outstretched hand, playground accidents, or road traffic trauma. Supracondylar fractures are the most prevalent type, followed by fractures of the lateral condyle, medial epicondyle, and radial neck. Clinical features typically include pain, swelling, and restriction of elbow movement. Diagnosis is often challenging because the paediatric elbow contains cartilage and

Consultant Orthopaedic Surgeon[1]/Senior Registrar Orthopaedic Surgery[2]/Chief Orthopaedic Surgeon & Executive Director[3]/Fellow Orthopaedic Surgery[4]/Registrar Orthopaedic Surgeon[5]/Registrar[6], SMBBIT Karachi, Pakistan

Correspondence: Dr. Ghazanfar Ali Shah, Consultant Orthopaedic Surgeon, Department of Orthopaedic Surgery, Shaheed Mohtarma Benazir Bhutto Institute of Trauma, (SMBBIT), Karachi, Pakistan

Email: ghazi9321@gmail.com

Submitted: Oct. 20, 2025
Revised: Dec. 01, 2025 **Accepted:** Dec. 21, 2025

multiple developing ossification centers[4]. The financial constraints, traditional treatments by bonesetters, and poor referral system in developing countries are the sole predictors of delayed presentation and thereby leads to complication associated with it such as malunion, neurovascular injury, Volkmann's ischemic contracture, and joint stiffness[5,6].

Though, International researches provide valuable insights in paediatric elbow fracture, the local epidemiological data is scarce. This study aimed at paediatric elbow fractures managed at a tertiary trauma center (SMBBIT) of Karachi, providing insights about pattern of injury, mechanism of injury, their presentations, and contributing factors of these injuries. This research aims to enhance paediatric trauma management and support comprehensive care planning in the region.

METHODOLOGY

IRB/ERC Approval:

We conducted a retrospective cross-sectional study at the Department of Orthopaedic Surgery, SMBBIT Karachi, from January 2022 to March 2024. The study was approved by the ERC (ERC-000132/SMBBIT /Approval/2024) with an abandonment of informed consent.

The study included children aged 14 years or younger who had elbow fractures confirmed by X-ray and needed surgical treatment. We excluded cases with Gartland type I fractures treated conservatively, pathological fractures, polytrauma requiring transfer, and incomplete records. Fractures were classified by orthopaedic consultants using standard radiographs.

Variables included age, sex, mechanism of injury, fracture type, laterality, time to presentation, bonesetter contact, swelling, neurovascular status, and treatment modality. Delayed presentation was defined as 24 hours post-injury. Bonesetter visit was self-reported. Swelling was defined as a comparative increase in limb circumference with loss of skin wrinkles relative to the contralateral side. Neurovascular compromise included motor/sensory deficits or diminished pulses at presentation.

Descriptive statistics were expressed as mean ± SD or frequency (%). The relationships between bonesetter visits, delayed hospital presentation, and swelling were evaluated using the Chi-square test or Fisher's exact test, depending on data suitability. In situations where one group contained all the cases (perfect separation), odds ratios could not be calculated, and Fisher's exact test was used to determine significance at a 0.05 level (á = 0.05). Variables with less than 5% missing values were included in the analysis, and calculations were based on the available data without imputing any missing values to ensure the authenticity of the results. All analyses were performed using SPSS software version 26.0 (IBM Corp., Armonk, NY, USA). The study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines to ensure accuracy, transparency, and methodological consistency.

RESULTS

A total of 180 paediatric patients with radiographically confirmed elbow fractures were included in this study. The mean age was 7.2 ± 3.6 years, with a clear male predominance (male-to-female ratio: 2:1). The predominant mechanism of injury was a fall during play, accounting for 53.9% of cases (n = 97), followed by road traffic accidents (24.5%, n = 44) and falls from height (21.6%, n = 39). The left elbow was more frequently involved, representing nearly two-thirds of all cases, indicating a consistent lateralization trend across the cohort. Detailed demographic and injury characteristics are presented in Table 1.

Table 1: Descriptive Statistics

Variable (n = 180)		Mean ± SD or Frequency(%)
Age (years)		7.2 ± 3.6
Gender	Male	126 (69.5%)
	Female	54 (30.5%)
Injury Mechanism	Fall while playing Road Traffic Accident (RTA)	97 (53.9%)
		44 (24.5%)
	Fall from height	39 (21.6%)
Side of Injury	Right Side	60 (33.3%)
	Left Side	120 (66.7%)
	Both Sides	0
Bone Setter Visit	Yes	37 (20.6%)
	No	143 (79.4%)

Table 2 Association Between Bonesetter Visit and Time to Presentation

Time to Presentation	Bonesetter Visit – No	Bonesetter Visit – Yes	Total
< 24 hours	143	0	143
24-72 hours	0	23	23
>72 hours	0	14	14
Total	143	37	180

Table 3 Swelling on Presentation vs Bonesetter Visit

Time to Presentation	Bonesetter Visit – No	Bonesetter Visit – Yes	All	p-Value
No	143	0	143	<0.001
Yes	0	37	37	
All	143	37	180	

*Note: Odds ratio not estimable due to perfect separation; significance determined by Fisher's exact test ($p < 0.001$).

The most affected age group was 6 to 10 years, making up 53% of the cases (n = 95). Children aged 5 years or younger accounted for 25% of cases, while those aged 11 to 14 years made up 22%. This pattern indicates that children between 6 and 10 years are at the highest risk for elbow fractures, likely due to their increased physical activity and outdoor play. The age-wise distribution of cases is illustrated in Figure 1.

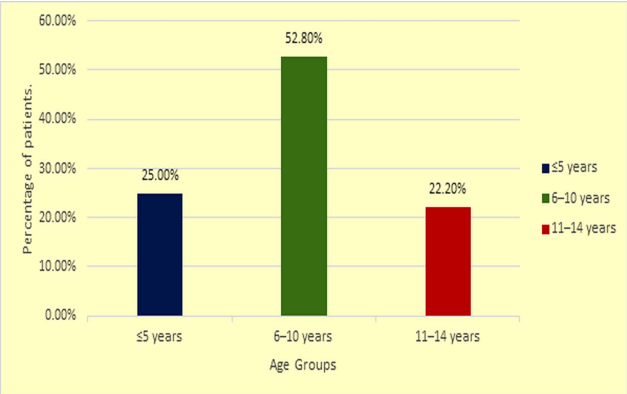

Figure 1: Age Distribution of Paediatric Elbow Fractures

Supracondylar fractures were the most common type of elbow injury in children, making up 73% of all cases. Other types of fractures included lateral condyle, medial epicondyle, and radial neck fractures, which were seen less often. A small number of patients had more complex injuries, such as elbow dislocations. The breakdown of fracture types is shown in Figure 2.

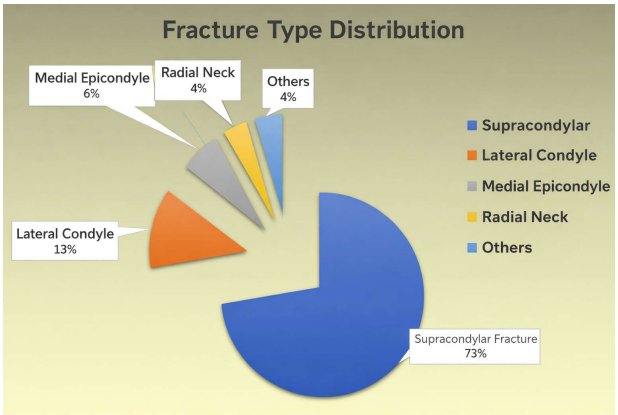

Figure 2: Distribution of Fracture Types in Paediatric Elbow Fractures

The majority of patients (79.4%, n = 143) presented to the hospital within 24 hours of injury, while rest were delayed presentations. All patients presenting after 24 hours had initially visited bonesetters and almost all of those patients presented with immense swelling. This routine traditional treatment seeking behavior and their outcomes, highlight the urgent need for community education to enhance timely referral to specialists. As presented in Table 2, Fisher's exact test confirmed a statistically significant association between preceding bonesetter contact and both delayed presentation and the presence of swelling ($p < 0.001$ for each). Due to perfect separation, the odds ratio could not be computed, as outlined in Table 3.

Five patients (2.8%) presented with vascular compromise, all secondary to RTA. One patient required amputation, while four underwent external fixation. These injuries were predominantly observed in the 6–10 years' age group and were associated with closed fractures in most cases.

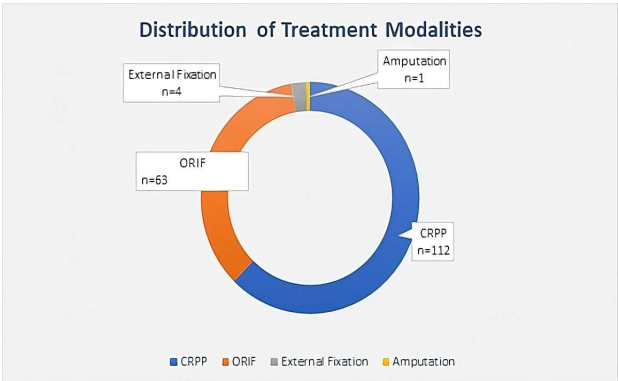

Figure 3: Distribution of Treatment Modalities

Out of 180 patients, approximately 60% (n=112) of patients underwent closed reduction and percutaneous pinning (CRPP), 35% (n=63) received open reduction and internal fixation (ORIF) with K-wires, 4 patients (2.2%) required external fixation, and one patient underwent amputation due to vascular compromise.

DISCUSSION

Our study highlighted that supracondylar humerus fractures in our population is accounted for 73% of paediatric elbow trauma, with less frequent injuries including lateral condyle, medial epicondyle, and radial neck fractures, and a small subset of dislocations/ fracture dislocations. This distribution reflects contemporary series where supracondylar fractures represent the dominant elbow pattern with leading indication for operative intervention, and the typical patient is a school-aged child (5–8 years) with male predominance, may be due to their activity exposure[7,8].

The left-sided predominance (66.7%) we observed is also widely reported and is commonly attributed to protective extension of the non-dominant limb during a fall; large retrospective series demonstrate similar laterality and link higher displacement grades to a greater risk of neurovascular injury[9].

Falls during play were the most common mechanism, aligning with global reports and highlighting environmental factors such as crowded playgrounds, variable surface compliance, and limited supervision, frequently observed in many low- and middle-income settings[10]. In contrast, high-income settings report proportionally more organized sports mechanisms, yet even there, falls from height/playground equipment remain prominent contributors to elbow injury. The understanding of injury mechanism matters because it predicts energy transfer: low-height falls tend to produce extension-type supracondylar fractures with intact soft tissue envelopes, while higher-energy mechanisms (e.g., trampolines, cycling) raise the index of suspicion for associated injuries and unstable patterns[11].

Our study strongly predicted an association of delayed presentation with prior bonesetter contact. All patients who presented after 24 hours of injury, had first visited traditional bonesetters and they all were associated with significant swelling. Fisher's exact testing confirmed significant associations for both delay and swelling (OR ˜ 3.8, $p < 0.001$). Similar patterns are documented across South Asia and sub-Saharan Africa, where traditional manipulation contributes to soft-tissue insult, mal-reduction, and later complications[12,13]. Outstandingly, many institutes and researches focusing on timing of surgical management of supracondylar fractures / paediatric elbow fractures support prioritizing early evaluation and splintage; however, early intervention vs delayed intervention has no significant difference in the postoperative outcomes or conversion to open reduction and internal fixation[9,14].

Although road-traffic accidents were less frequent, they were disproportionately severe: 2.8% presented with vascular compromise, all after RTA; four required external fixation and one amputation. Our vascular-injury fraction sits at the upper end for vessel compromise, consistent with high-energy mechanisms and delayed, pre-hospital manipulation.

Treatment choices in our series CRPP in about 60%, ORIF in 35%, a few external fixations, and one amputation, largely align with evidence-based paradigms. For non-SCHF elbow injuries, recent meta-analysis of lateral condyle fractures shows no difference in complications between CRPP and ORIF when reduction quality is equivalent, reinforcing that anatomic reduction and stable fixation is vital for better outcomes[10].

Limitations and Future Directions:

This was a single-center study, which may limit the generalizability of the findings to broader or rural populations.

Long-term follow-up was not performed, restricting evaluation of both functional recovery and radiographic healing outcomes.

Standardized patient-reported outcome measures (PROMs) and detailed assessments of bone remodeling were not included in the analysis.

Future studies should incorporate objective scoring systems, such as the Flynn criteria, along with validated PROMs to better assess recovery and compare results based on treatment delays and prior bonesetter interventions.

Implementation of early splinting protocols, creation of safe play environments, and establishment of structured referral systems are recommended to improve early management and reduce complications.

Development of a multicenter registry is suggested to enhance data sharing, facilitate long-term surveillance, and optimize paediatric orthopaedic care.

CONCLUSION

Supracondylar fractures are the most common paediatric elbow injury in Karachi, mainly caused by falls during play and more often affecting the left side. Delayed presentation due to prior bonesetter treatment is a key preventable factor linked to swelling and greater surgical difficulty. Early referral, community awareness, and improved trauma care systems are essential to reduce complications. These findings emphasize the need for early orthopaedic referral systems and community-based injury-prevention strategies to reduce paediatric elbow trauma and its complications.

Funding: Nil

Conflict of interest: Authors declare that there is no conflict of interest.

Authors' Contribution: GAS: Was responsible for data collection, methodology development, and patient recruitment. **MK:** Contributed to the study design, performed data analysis, and drafted the manuscript. **DS:** Handled radiological classification and conducted the literature review. **MSM:** Managed references and carried out proofreading. **SMS:** Performed the statistical analysis and assisted with manuscript editing. **DIKM:** Was involved in data curation and formatting of tables and figures.

REFERENCES

1. Lin X, Dai Z, Fang K. Global burden of pediatric fracture (1992–2021) and projections of future disease burden trends. BMC Pediatr. 2025;25(1):1–12. doi:10.1186/s12887-025-05767-6.
2. Micheloni GM, Novi M, Leigheb M, Giorgini A, Porcellini G, Tarallo L. Supracondylar fractures in children: management and treatment. Acta Biomed. 2021;92(Suppl 3):e2021015. doi:10.23750/abm.v92iS3.11725.
3. Mansoor K, Shahnawaz S, Ahmad A, Arif MM, Hamza M. Epidemiology of childhood fractures in the city of Karachi. J Ayub Med Coll Abbottabad. 2015;27(3):608–612.
4. Waseem M, Saeed W, Launico MV. Elbow fractures overview. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jul [cited 2025 Oct 11]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK441976/
5. Saaiq M. Clinical and demographic profile of Volkmann's ischemic contractures presenting at National Institute of Rehabilitation Medicine, Islamabad, Pakistan. World J Plast Surg. 2020;9(2):166–171. doi:10.29252/wjps.9.2.166.
6. Onyemaechi NO, Menson WNA, Goodman X, Slinkard S, Onwujekwe OE, Enweani UN, et al. Complications of traditional bonesetting in contemporary fracture care in low- and middle-income countries: a systematic review. Trop Med Int Health. 2021;26(11):1367–1377. doi:10.1111/tmi.13662.
7. Surd A, Muresan R, Ciongradi CI, Sur LM, Ardelean LR, Usatiuc LO, et al. Modern treatment of supracondylar humeral fractures in children. Children (Basel). 2025;12(5):556. doi:10.3390/children12050556.
8. Tomaszewski R, Pethe K, Kler J, Rutz E, Mayr J, Dajka J. Supracondylar fractures of the humerus: association of neurovascular lesions with degree of fracture displacement in children—a retrospective study. Children (Basel). 2022;9(3):308. doi:10.3390/children9030308.
9. Chaudhry S. Value-driven pediatric supracondylar humerus fracture care: implementing evidence-based practices. J Am Acad Orthop Surg Glob Res Rev. 2024;8(4):e24.00058. doi:10.5435/JAAOSGlobal-D-24-00058.
10. Zhu S, Zheng Y, Jiang Y, Yin H, Zhu D. Open versus closed reduction internal fixation for lateral condyle humeral fractures in children: a systematic review and meta-analysis. J Orthop Surg Res. 2023;18(1):1–7. doi:10.1186/s13018-023-03808-3.
11. Mayr J, Maspero C, van Bergen CJA, Colaris JW, Lewallen L, et al. Pediatric elbow dislocations and associated fractures. Children (Basel). 2023;10(6):993. doi:10.3390/children10060993.
12. Rokaya PK, Karki DB, Rawal M, Limbu D, Menyangbo S, Devkota H. Pattern of pediatric supracondylar fracture operated at a rural teaching hospital of Nepal: a descriptive cross-sectional study. JNMA J Nepal Med Assoc. 2020;58(223):153–157. doi:10.31729/jnma.4869.
13. Wagner F, Boeriu A, Eberz P, Weigert A, Holzapfel BM, Böcker W, et al. Intrainstitutional changes of the treatment of supracondylar humerus fracture in children over a period of 9 years. Children (Basel). 2024;11(1):27. doi:10.3390/children11010027.
14. Ismayl G, Kim WJ, Iqbal M, Sajid S. Early versus delayed treatment for Gartland type III supracondylar humeral fractures in children: a systematic review and meta-analysis. Indian J Orthop. 2022;56(11):1871–1881. doi:10.1007/s43465-022-00734-0.