

Epidemiological analysis of elbow fractures in Kashmiri children

Shamim Ahmad Bhat¹, Raja Rameez Farouqi², Mehmood Ul Hassan²,
Tabish Tahir Kirmani², Khurshid Ahmad Kangoo³, Asif Nazir Baba⁴

¹Senior Resident SMS&R Greater Noida

²Resident, ³Professor, ⁴Assistant Professor, Dept. of Orthopaedics,
Govt. Medical College, Srinagar

***Corresponding Author:**

E-mail: shamim_asc@yahoo.com

Abstract

Background: The aim of this study was to look at the epidemiology of elbow fractures in children in Kashmir region who were treated at a major trauma institute, the hospital for Bone and Joint Surgery Srinagar for two years.

Method: In this retrospective study over a two year period we studied 550 children with elbow fractures who were treated at Bone and Joint Surgery Hospital Srinagar, Kashmir. Each case was studied with respect to age, sex, trauma side, fracture type, associated injuries and the mechanism leading to trauma.

Results: annual incidence of elbow fractures was 275. Among all fractures analyzed during this interval of time, elbow fractures accounted for 31.51% of all fractures, which was second only to forearm fractures (35.53%) and femur fractures constituted the third (26%). Rest of the fractures (8%) constituted fractures of leg bone, clavicle, proximal humerus and others. Average age was 6 years. Most of the children were of age group 4 to 6 years. Among all elbow fractures males constituted 72% of all fractures and female children were 28% with male to female ratio of 3: 1. Left side dominated among all fracture types and constituted 70% of all fractures. Supracondylar fractures constituted 65% of all fractures. Most common mechanism of trauma was due to fall in recreational accidents (90%). Compound fractures constituted 2% of all fractures and the associated lesions were present in 5% of cases. Most of the associated injuries were fractures of the distal forearm(44%) and mid forearm(20%). Rest associated fractures included fracture clavicle(15%), proximal humerus (14%), hand (5%) and scapula(2%)

Key words: Elbow, Children, Fracture, Supracondylar, Kashmir, Injury, Retrospective.

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Introduction

Pediatric Fractures around elbow region constitute a large burden of fractures to be treated in trauma hospitals. Most of these fractures are treated in emergency department at the time of admission. Because children tend to fall with their out-streched arms, fractures of the upper extremity constitute 65 to 75% of all fractures. The most common area of the upper extremity injured is distal forearm^{1,10}, and about 8 to 10% of upper extremity fractures involve the elbow. Distal humerus accounts for around 85% of fractures around elbow. Supracondylar fractures constitute the majority of fractures, reported to occur in 55-75% of patients with elbow fractures. Lateral condyle fractures are second followed by medial epicondylar fractures. Fractures of radial head and neck, olecranon, T condylar types are less common. Many authors have reported peak age of distal humerus fractures between 5 and 10 years of age⁸. These elbow fractures are more common in boys. Distal humeral physeal injuries as opposed to most parts of the body, where they occur

around puberty, have peak age of 4 to 5 years in girls and 5 to 8 years in boys. In the literature, studies focusing on the epidemiological aspect of elbow fractures in children are rare.

In Kashmir Valley, there has been no study about the epidemiology of elbow fractures in children, thus the aim of our study was to determine the epidemiological profile of fractures of the elbow in children at Bone and Joint Hospital Srinagar which is an apex orthopedic centre in the valley

Patients and methods

This work represents a retrospective study conducted for a period of 2 years from 1st April 2013 to March 31, 2015. From the hospital inpatient records, we collected all the children with elbow trauma who were treated within this time frame. 550 cases of children with elbow trauma were managed in the Bone and joint Hospital Srinagar, Kashmir for whom full documentation of trauma mechanism and other parameters for study were available.

For each case, the following parameters were studied to know the frequency, age, sex, circumstances of occurrence, the mechanism, the side sustained, the anatomical lesion, and associated lesions. All those patients about whom some data pertaining to above mentioned parameters were missing, were excluded from our study. We then compared our results with literature data.

Results of the study

Epidemiology

The frequency: In a period of 2 years we identified 550 cases of elbow fractures with an annual incidence of 275. During this time period, 1745 fractures in children were recorded. Fractures of the elbow (31.51% of cases) come in second place after fractures of the distal forearm (35.53% of cases) as shown in Table 1. Most of these cases are reported between April to September (65%) as compared to Oct – March(35%). In Kashmir Valley, children don't participate in recreational activities in winters and mostly stay indoor accounting for low incidence during winters

The Age: The average age of children was 6 years, ranging from 9 months to 14 years. A peak incidence was noted in the age group of 5 to 6 years (Figure 1).

The Sex: Male predominance was noted with 396 cases compared to 154 cases of female children with a sex ratio of 3: 1.

The circumstances of occurrence: The occurrence circumstances of the elbow fracture are most frequent in recreational accidents with 63% of cases. This is followed by domestic accidents with 17% of cases and sports accidents with 11% of cases as shown in Table 2.

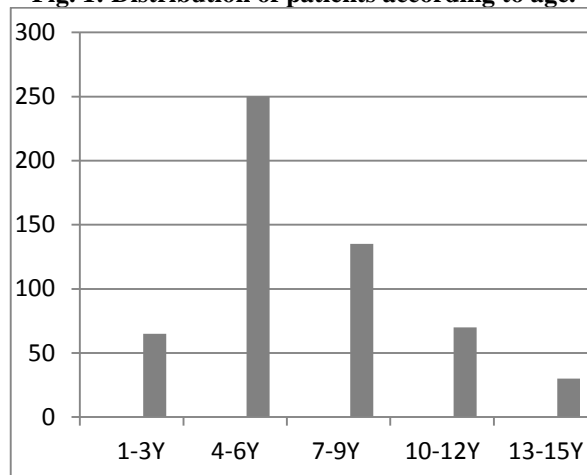
The mechanism: Fall was the most common mechanism with 90% of cases. The fracture had occurred at the waning of a fall landing on the palm of the hand, and hyperextended elbow in 84.8% of cases. The direct impact was found in 4.2% of cases as shown in Table 3.

Clinical and biological aspects: Injury sustained side. Left elbow fractures occurred in 69% of cases and the right elbow in 31% cases. Fractures occurred on the left side in 76% of cases when the dominant limb was right side as shown in Table 4.

The anatomical lesions: The supracondylar fractures were most common (65% of cases) followed by fractures of the lateral epicondyle (22% of cases) and fractures of the medial epicondyle (9% of cases) . Rest of the 4% includes fractures of olecranon, radial head and neck and T condylar fractures as shown in Table 5.

Associated injuries: Associated injuries accounted for 5% of cases. The soft tissue lesions noted by large ecchymosis and puckering were noted in 3.4% of cases. The elbow fracture was associated with other bone lesions in 5% of cases. It was associated in 12 cases with fracture of the distal quarter of the two bones of the forearm and 6 cases of fractures of the middle 1/3 of the two bones of the forearm. Fractures of proximal humerus and clavicle were present in minority of the patients. Of all the fractures, nearly 2% were compound.

Fig. 1: Distribution of patients according to age.



Horizontal: age group in years

Vertical: no. of patients

Table 1: Distribution of fractures recorded during the study period.

Fracture site	Number	Percentage
femur	454	26%
elbow	550	31.51%
leg	61	3.5%
foot	35	2%
forearm	620	35.53%
others	35	2%
Total	1745	100

Table 2: Distribution of patients according to the circumstances of occurrence

Circumstances	Number	Percentage
Recreational accident	347	63.1%
Domestic accident	94	17.1%
Fall from height	22	4%
Road accident	26	4.7%
Sports	61	11.1%
Total	550	100

Table 4: Distribution of patients by mechanism of injury.

Mechanism	Number	Percentage
Fall with outstretched arm	466	84.8%
Fall with elbow flexed	51	9.3%
Direct blow	23	4.2%
Twisting injury	10	1.8%
Total	550	100

Table 4: location of the fracture relative to the dominant member.

Dominant member	Location of the lesion		Total
	R	L	
Right	145	288	433
Left	27	90	117
Total	172	378	550

Table 5: Distribution of patients according to anatomical lesion.

Anatomical lesion	Number	Percentage
Supracondylar	358	65.1%
Lateral condyle	121	22%
Medial epicondyle	50	9.1%
Olecranon	11	2%
Radial head or neck	8	1.4%
T condylor	2	0.36%
Total	550	100

Of all the 358 supracondylar fractures, as examined separately, we found left side predominance by 68.5% as compared to right (31.5%). Boys constituted 67% of all patients. Flexion type of injury as documented on case sheet constituted 1.7% of all cases. Pointing index suggestive of median nerve injury constituted 2.8% of all cases. We did not report in our study radial and ulnar nerve injury. We further did not report about vascular injuries associated with supracondylar fractures.

Discussion

Epidemiology: Houshian et al.⁹ reported that the average age of 355 children with elbow fractures was 7.9 years (7.2 years in boys and 8.5 years in girls). Contrary to other reports, these investigators found elbow fractures more frequent in girls (54%) than in boys. Landin¹⁰ had recorded over 10 years, 589 fractures of the elbow is an annual incidence of 58.9. Marchand et al¹¹ in France, found an annual incidence of 40 fractures of the elbow. Cheng et al.³ found a median age of 6 years (6.6 years in boys and 5 years in girls) and a predominance of injuries 63% in boys. Elbow fractures account for some European authors^{3,11,16} between 8 and 16% of all fractures in children. They come in third place after fractures of the wrist and carpal and hand. In our study, unlike these European studies, they come in the second position after fractures of the forearm bones. Fractures of femur occupy a third position.

Climate has its own effect altering the incidence of such fractures. Although reported to be higher in temperate areas, in our study majority of such fractures occur in summer. In Kashmir Valley, cold climate prevents young children from outdoor activities during winters, hence the fracture. So geographical variations

from region to region has its own but significant effect on occurrence of elbow injuries.

The predominance of males were reported in the literature by many authors^{7,10,16} with figures ranging between 60 and 75%. In our study we found that dominance with a higher number of boys with 72%. In our study the mean age was 6 years with a peak incidence between 4 and 6 years. Houshian et al in their report had near identical figures with an average age of 7.9 years and a peak incidence between 4 and 6 years. Although not explained, the literature review shows that the peak incidence is between 4 and 9 years.

Clinical and biological aspects: Circumstances and mechanisms of occurrence vary from series to series. In European studies^{9,11} domestic accidents and sports injuries are in the foreground. Landin¹⁰ in his study found fractures of the elbow occurred in 10% of cases when practicing sports, 8% during the practice bike and only 2% during an accident in the street with participation a car. Marchand¹¹ found they occurred in 24% of the time when domestic accidents, while 16% of sports injuries, accidents at 3% and 1% of bicycle accidents in the street. In the study of Houshian⁹, sports accidents were more frequent with 49% of cases. In our study recreational accidents are the greatest purveyors of elbow fractures in children with 63% of cases. This observation is partly explained by the socio-economic and geographic factors. In fact many observers found significant variations so far as circumstances leading to fracture is concerned. Landin¹⁰ who reviewed 589 fractures of the elbow, had attached himself to study the mechanism. So for him, falls were the most common mechanism and in 58% of cases, trauma was slight: fall from a height or less than 50 cm. Many^{4,7,16} authors had made the same conclusions. In our study the fall was also the most common mechanism with 90% of cases. According to Wilkins¹⁶ 98% of fractures did occur while fall with elbow in extension. In our study we made the same observation with 84.8% of fractures in extension. In our study the left side was more affected than the right side while 78.72% were right-handed children. This left predominance was reported by most authors^{7,8,11} In accordance with multiple investigators, we found that the lesion was most often the non-dominant side of the limb. This can be explained by an attempt to amortizing the fall by the non-dominant side.

The supracondylar fracture is by far the most common fracture of the elbow in children with figures ranging between 40 and 70% of cases^{5,7,8}. In our study we found that dominance with 65% of supracondylar fractures. They are followed by fractures of the lateral condyle medial epicondyle, the olecranon and the radial head. Some rare fractures namely the medial condyle, capitellum and the Monteggia fracture, have been reported by some authors^{7,8}. We did not rate these fractures. For fractures of the elbow, it is essentially the supracondylar fractures that are complicated with skin

lesions, nerve or vascular lesions^{2,12}. Nerve injury has been documented mostly in supracondylar fractures. In their study O Ndour et al.¹³ reported skin lesions were found in 2.3% of cases. In our study we noted soft tissue lesions characterized by large ecchymosis and puckering were noted in 3.4% of cases. Frank compound injuries were present in 2% of cases. It is difficult to assess the incidence of fractures associated with regards to literature, both figures are discordant. Thus for Farnsworth⁷ who reviewed 391 supracondylar fractures, 11% had another associated fracture and in half of the cases, it was fracture of the forearm. In our study we also found forearm fracture the commonest one as well as most common associated fracture with elbow trauma. Landin et al.¹⁰, reviewed 589 fractures of the elbow, associated fractures represented only 1.7% of cases. In our study, 5% had another associated fractures and it was most often fracture of the two bones of the forearm. In our study, 9% of the medial epicondyle fractures were associated with elbow dislocation.

Conclusion

Fractures of the elbow are the most frequent after fractures of the forearm bones in our context. They mostly concern boys with a peak incidence between 4 and 6 years. These fractures occur mostly during summer season as a result of fall during accidental playful and often reach the left elbow.

Conflict of Interest: None

Source of Support: Nil

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