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The incidence of supracondylar fracture of children in Al-kindy Teaching Hospital

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

صَدَقَ اللَّهُ الْعَلِيُّ الْعَظِيمُ

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Abstract

Purpose: To study the epidemiology of patients with supracondylar fractures in children treated in a hospital and Identify neurovascular injuries associated with supracondylar fracture and the management of this fractures

Methods: The data were collected from patients while they are in the emergency wards and when they come to the hospital in the period from 1/11/2022 to 1/5/2023 .The questionnaire consist of 10 questions, include questions on the patients' demographic information (age, gender and where dose the patient live) while the second part of the questionnaire which included questions about (causes , types, symptoms, serious complications and management of the fracture) .

Results: During the period of the study which extended for 6 months (November, 1/11/2022 to May, 1/5/2023), the number of supracondylar humeral fractures in children registered in Al-kindy Teaching Hospital was 25 patient, and most of the fractures were seen in (5-9) year age group with a mean of 8 years. The incidence in males : females ratio is (2:1) with (17 68.0% male and 8 32.0% female). In our series, the incidence of nerve injuries was only one case of ulnar nerve injury associated with Extension type III fracture., including two patients with associated brachial artery injury requiring repair. Gartland type III fractures constituted 60% of patients, followed by type II (24%) and flexion type (12%).

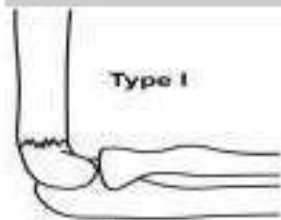
Conclusion: This study has shown a significant correlation between increasing fall height and fracture severity in supracondylar humerus fractures classified according to Gartland's classification. Furthermore, children with Extension type III supracondylar fractures are more likely to develop complications or restrictions in movement than children with Extension type I and II fractures.

Introduction:

Supracondylar humerus fractures are one of the most common injuries in childhood and adolescence with an incidence of 14% [1]. In the elbow joint, supracondylar humerus fractures account for more than two-thirds of all injuries [2,3] and occur most frequently between the age of 5 and 7 years [4,5,6]. The gender distribution of patients with supracondylar humerus fractures as well as the eventual differences in injury mechanism, pattern, therapy and outcome are controversially discussed in the literature [5,7,8]. The most common cause of injury leading to supracondylar humerus fractures is children falling from various heights onto an outstretched arm. Since this is the most common mechanism of injury, a correlation between the height of the fall and the severity of the fracture may be assumed. However, there are currently no studies to describe this. These fractures occur in both low-energy trauma, such as playground accidents, and high-energy trauma, such as sports [9]. Supracondylar fractures are commonly classified according to the Gartland's classification [Extension type I(non-displaced), Extension type II(displaced having angulation and intact posterior cortex), Extension type III(displaced) and Flexion type]. The treatment of type I supracondylar fractures is standardized, while treatment of Fractures of Gartland types II, III, and Flexion type are usually managed by closed reduction and surgical stabilization. The preferred surgical technique to stabilize supracondylar fractures is K-wire fixation, most commonly by inserting two parallel or diverging K-wires from the lateral side of the humerus [10]. Neurovascular complications are the most severe complications, with a frequency of between 5% and 19% of displaced fractures, due to the proximity of structures such as the brachial artery and anterior interosseous nerve. They are often combined with fractures of the radius and distal ulnar, at a lower percentage rate [11]. The most common complications are varus or valgus deformities of the elbow and mobility limitations.

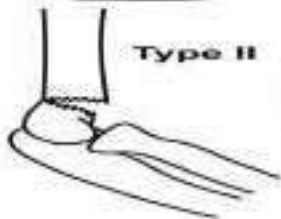
Increases in the frequency of fractures have usually been associated with holiday periods and leisure activities in the park. However, few studies have scientifically demonstrated these events.[12]

Gartland Classification of Supracondylar Fracture



Type I

Non-Displaced Fractures



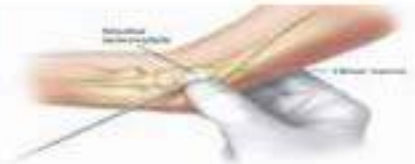
Type II

Displaced having an angulation, but maintain an intact posterior cortex



Type III

The distal fragment is displaced posteriorly, and there is no cortical contact. But they have a periosteal hinge intact either.



Aims of study :

- 1- To study the epidemiology of patients with supracondylar fractures in children treated in a hospital.
- 2- To study the type of the fracture in children and its relationship to cause.
- 3- Describe the clinical and radiological features of supracondylar fracture in children
- 4- Identify neurovascular injuries associated with supracondylar fracture and the management of this fractures

METHODOLOGY

This is a cross sectional study, the sample included were patients from Al-Kindy teaching hospital .

The data were collected from patients while they are in the emergency wards and when they come to the hospital in the period from 1/11/2022 to 1/5/2023 .

The questionnaire consist of 10 questions, include questions on the patients' demographic information (age, gender and where dose the patient live) while the second part of the questionnaire which included questions about (causes , types, signs and symptoms, serious complications and management of the fractures)

the answers of the questions were analyzed using descriptive statistics in SPSS.

Statistical significance and considered whenever the p values significant (equal or less than 0.05)

no. of study sample : 25 patients with ages (under 15 years old)

The questions was as the following :

1. Gender : (Male , Female)

2. Age

3. where dose the patient live? (City , Rural areas)

4. cause of the fracture ?

5. Other associated fractures?

.Type of fracture?

- ✚ Extension type I (non-displaced fracture)
- ✚ Extension type II (displaced having angulation and intact posterior cortex)
- ✚ Extension type III (displaced)
- ✚ Flexion type

7. Sign and symptom?

- ✚ Pain
- ✚ Swelling
- ✚ Tenderness
- ✚ Deformity

8. What is the most serious complication?

- ✚ Vascular injury
- ✚ Nerve injury
- ✚ Ecchymosis

9. Diagnosis ?

- ✚ X-ray

10. Treatment ?

- ✚ Back slab immobilization
- ✚ Surgery
- ✚ Closed reduction

Results :

During the period of the study which extended for 6 months (November, 1/11/2022 to May, 1/5/2023), the number of supracondylar humeral fractures in children registered in Al-kindy Teaching Hospital was 25 patient.

32.0% were female vs. 68.0% were males.

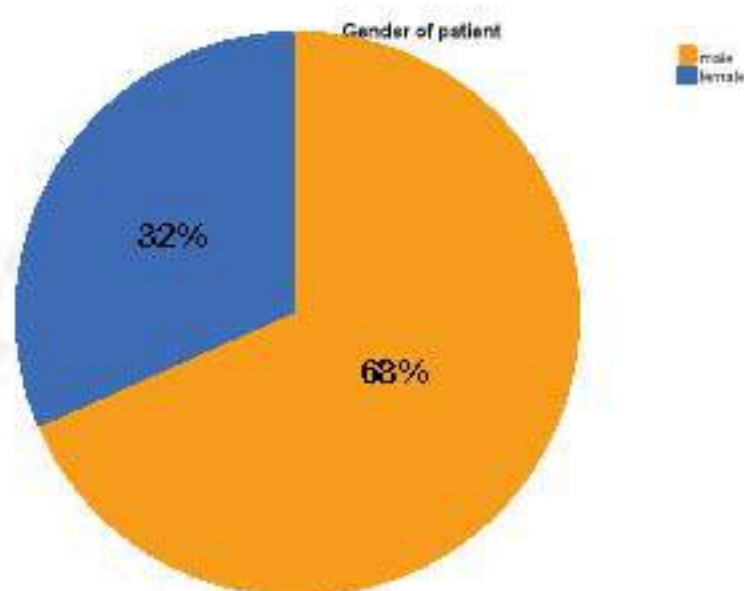


Figure 1 : Gender

*Classification of the patients according to their age were as the following (figure 2):
The minimum age is (2) and the maximum age is (15) with mean of age (8)*

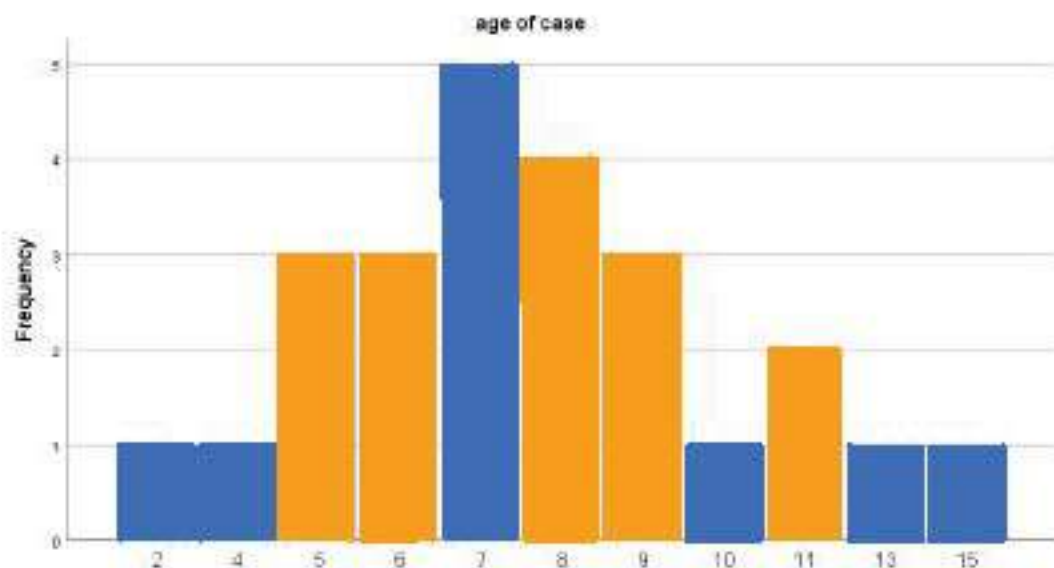


Figure 2 : Age

Our third Question was (where dose the patient live? (City , Rural areas)
The information about living was as follows:

- **Most of the patients (about 18 "72.0%") was (living in city)**
- **And 7 of the patient (28.0%) was with (rural areas)**

The information of the patients are explained in : (table 1) , (figure 3)

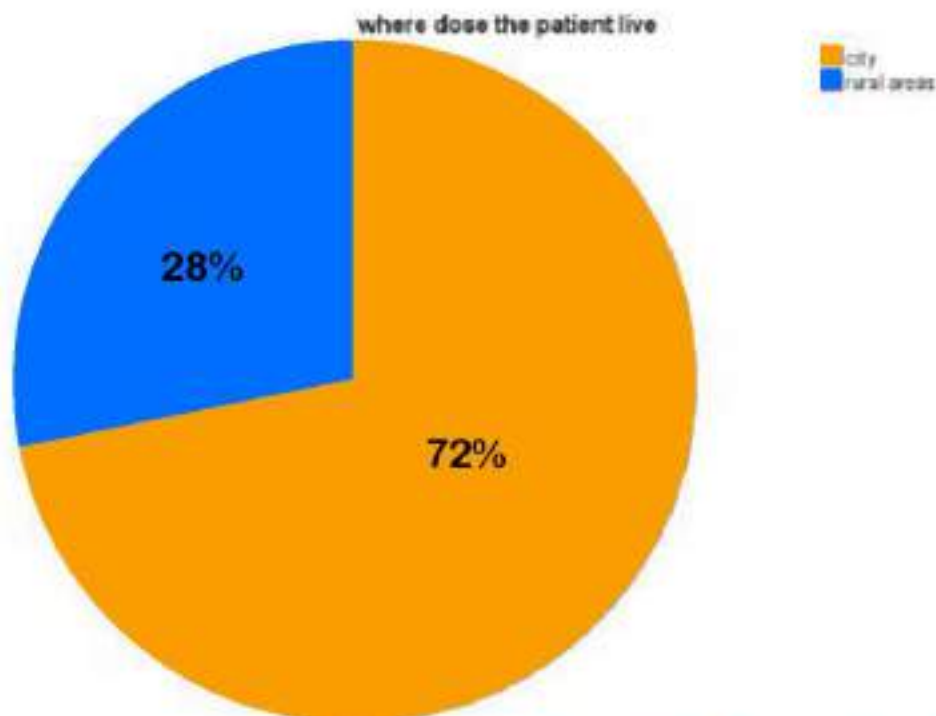


Figure 3 : where does the patient live

		Frequency	Percent	Valid Percent	
Valid	city	18	72.0	72.0	
	rural areas	7	28.0	28.0	
	Total	25	100.0	100.0	

Table 1: where does the patient live

Our fourth Question was(Type of the fracture " Extension type I(non-displaced) , Extension type II(displaced having angulation and intact posterior cortex), Extension type III(displaced), Flexion type

The information about the types of fractures was taken from the resident and was as follows:

- Patients with Extension type I was (1) with (4.0% of total fracture type)
- Patients with Extension type II was (6) with (24.0% of total fracture type)
- Patients with Extension type III was (15) with (60.0% of total fracture type)
- Patient with Flexion type was (3) with (12.0% of total fracture type)

The information of the patients are explained in : (table 2) , (figure 4)

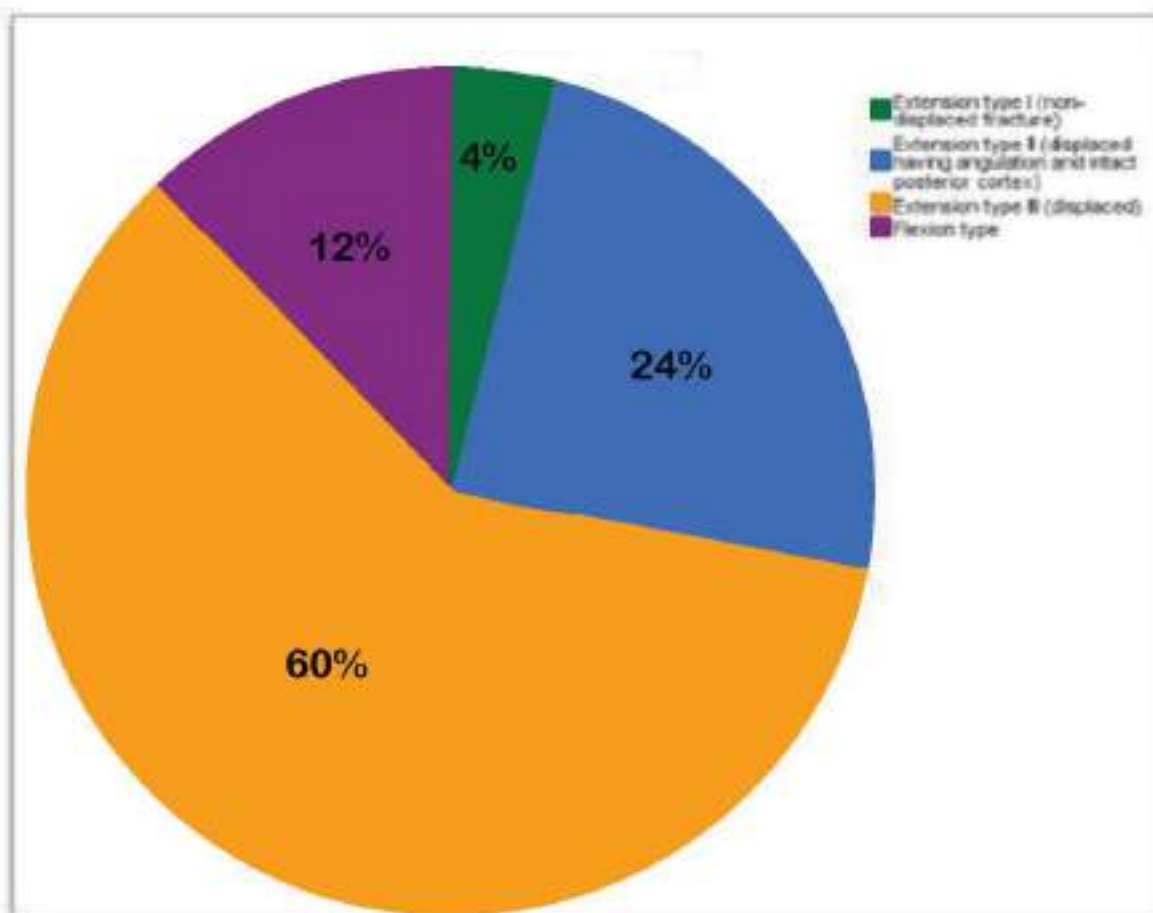


Figure 4 : Type of fractures

		Frequency	Percent	Valid Percent
Valid	Extension type I (non-displaced fracture)	1	4.0	4.0
	Extension type II (displaced having angulation and intact posterior cortex)	6	24.0	24.0
	Extension type III (displaced)	15	60.0	60.0
	Flexion type	3	12.0	12.0
	Total	25	100.0	100.0

Table 2 : Type of fractures.

Next Question was about the causes of fractures.

The information according to the patients As the following :

- Most of the patients (about 22 " 88.0%") was with (Fall on out stretch hand)
- And 3 of the patient (12.0%) was with (Road Traffic accident {RTA})

More details about the answers of this question are explained in (figure 5),(table 3)

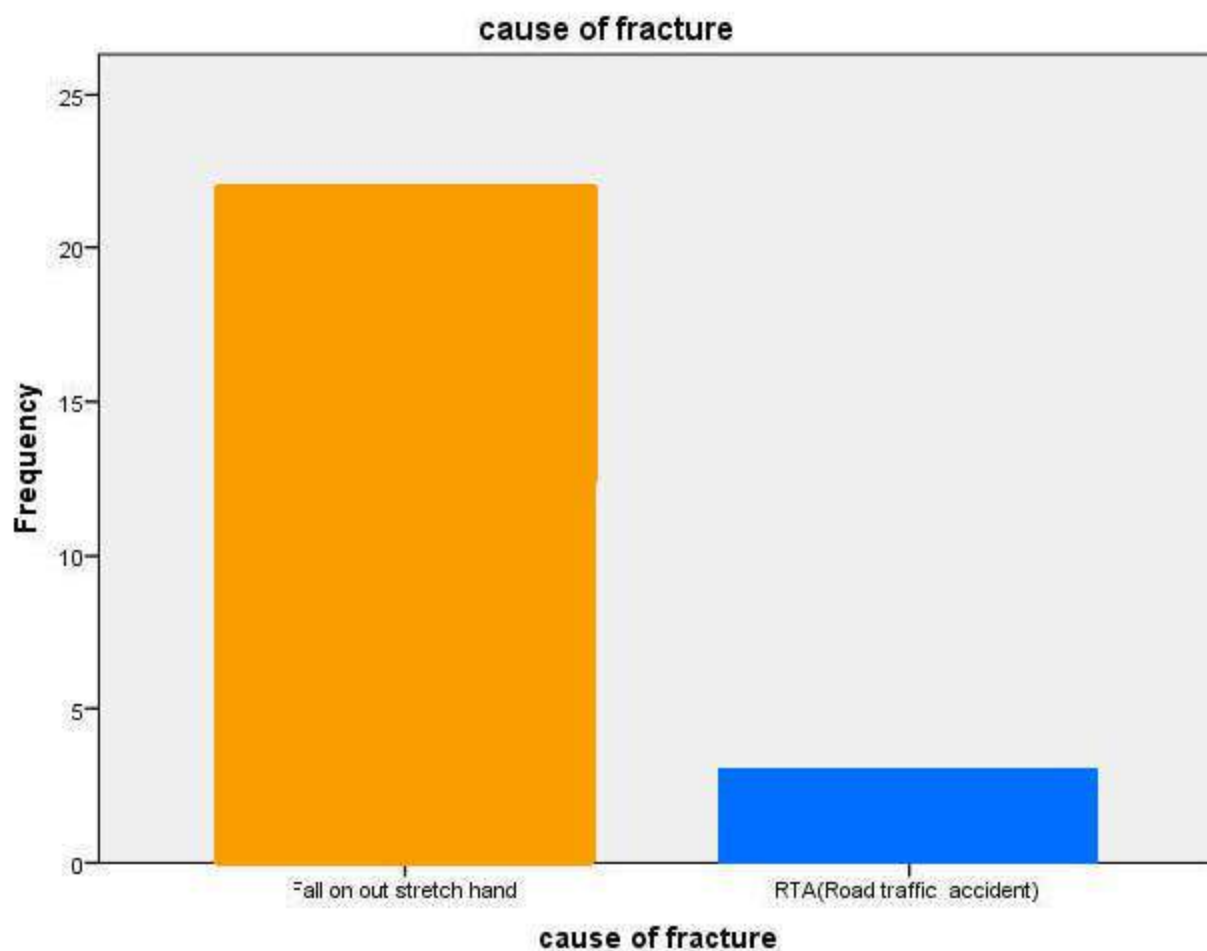


Figure 5 : cause of fracture

		Frequency	Percent	Valid Percent
Valid	Fall on out stretch hand	22	88.0	88.0
	RTA(Road traffic accident)	3	12.0	12.0
	Total	25	100.0	100.0

Table 3 : cause of fracture

Here we asked if patients have any other associated fractures and the answer was as following :

- 22 of them (88.0 %) was NO
- 3 of them (12.0 %) was YES

More details about the answers of this question are explained in (figure 6),(table 4)

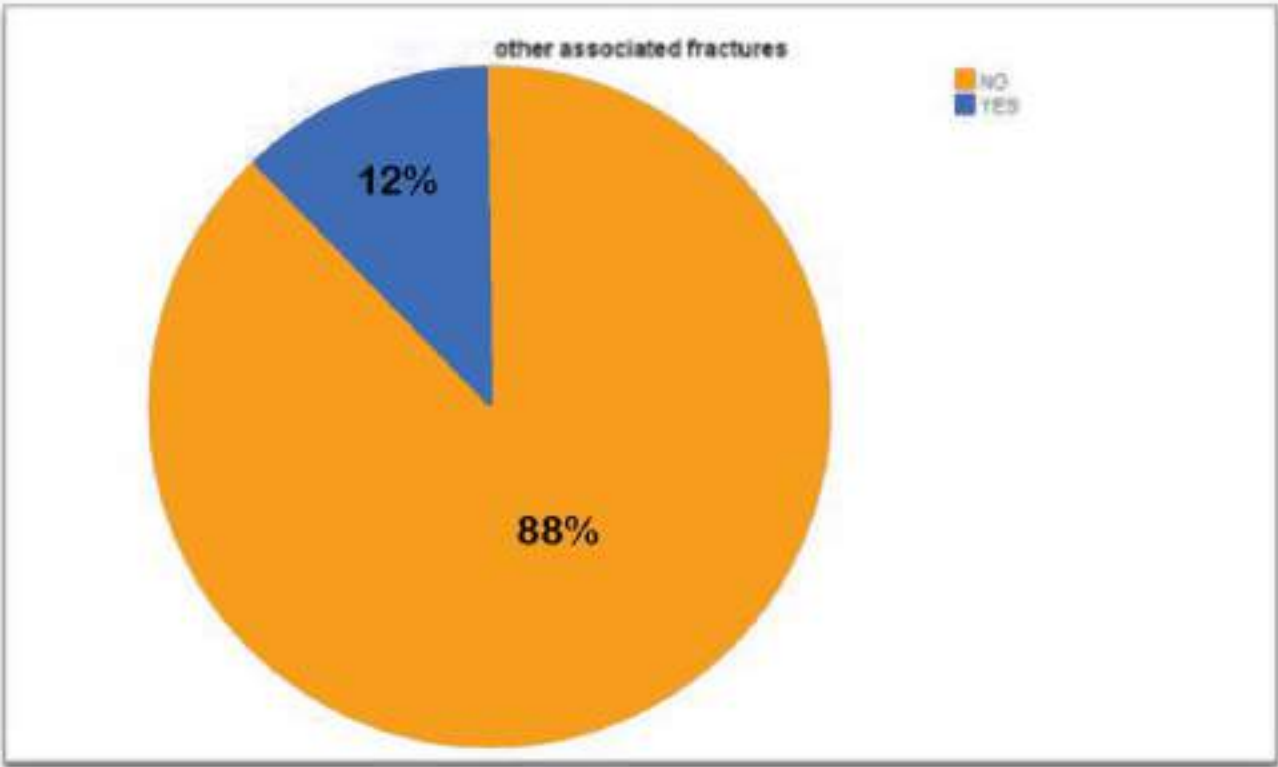


Figure 6 : Other associated fractures

		Frequency	Percent	Valid Percent
Valid	NO	22	88.0	88.0
	YES	3	12.0	12.0
	Total	25	100.0	100.0

Table 4 : Other associated fractures

Next question were about the signs and symptoms that patient suffer from .

The information according to the patients came as the following :

- 14 (56.0%) of the patients was suffering from (PAIN, SWELLING, TENDERNESS and DEFORMITY)
- While 6 (24.0%) of the patients was suffering from only (PAIN)
- While 3 (12.0%) of them was suffering from (PAIN, SWELLING and DEFORMITY)
- While 2 (8,0%) of them was suffering from (PAIN, SWELLING and TENDERNESS)

The details of the patients are explained in (table 5) ,(Figure7)

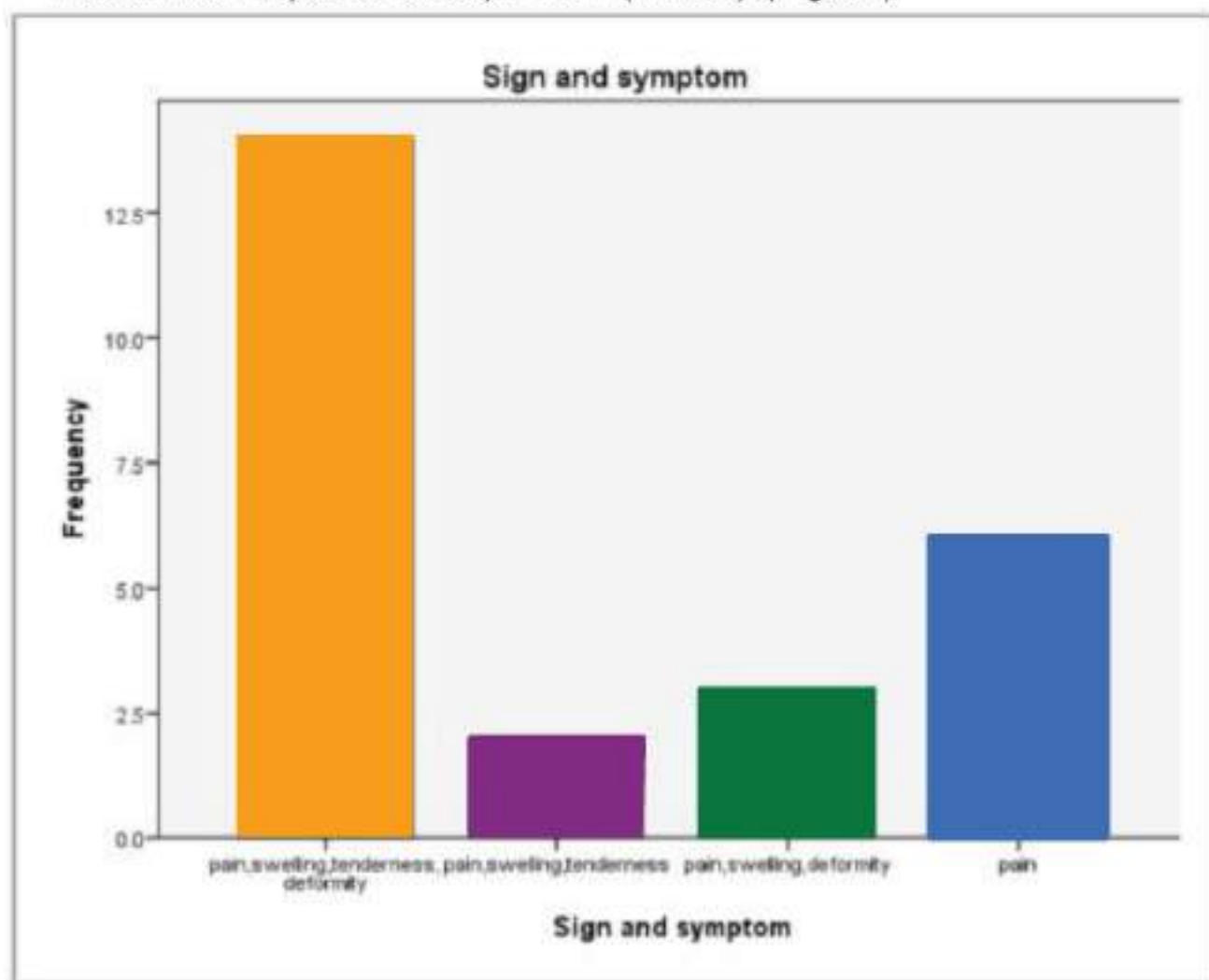


Figure 7 : Signs and symptoms of patient

		Frequency	Percent	Valid Percent
Valid	Pain ,swelling ,tenderness ,deformity	14	56.0	56.0
	Pain ,swelling ,tenderness	2	8.0	8.0
	Pain ,swelling ,deformity	3	12.0	12.0
	pain	6	24.0	24.0
	Total	25	100.0	100.0

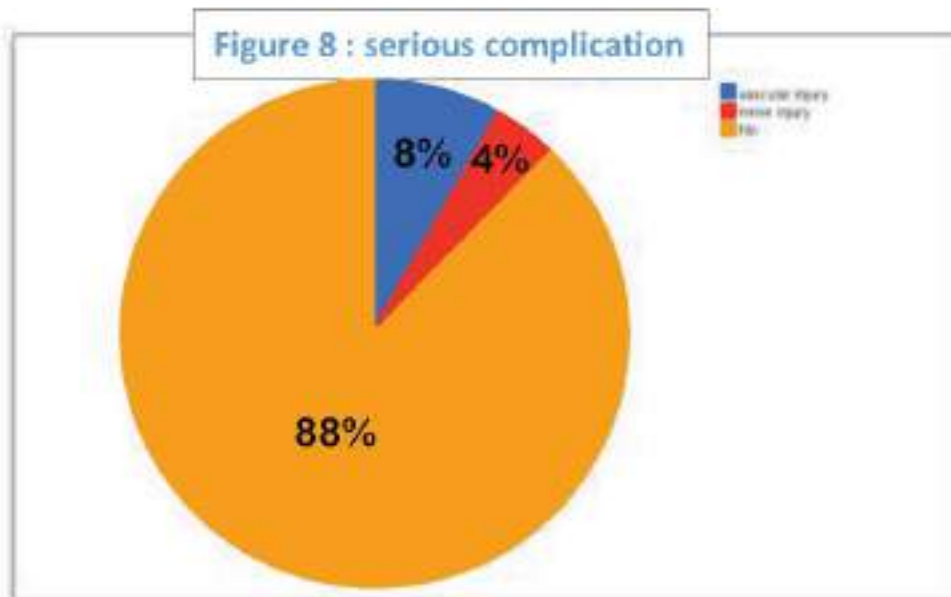
Table 5 : Signs and symptoms of patient

Here we recorded the most complication of the patient

The information that record came as the following :

- Most of the patients (22 " 88.0 % ") was (**No**)
- Two of the patients (8.0 %) was (**Vascular injury only**)
- Only one of the patients (4.0%) was (**Nerve injury only**)

The details of record are explained in (figure 8 and 9) , (table 6)



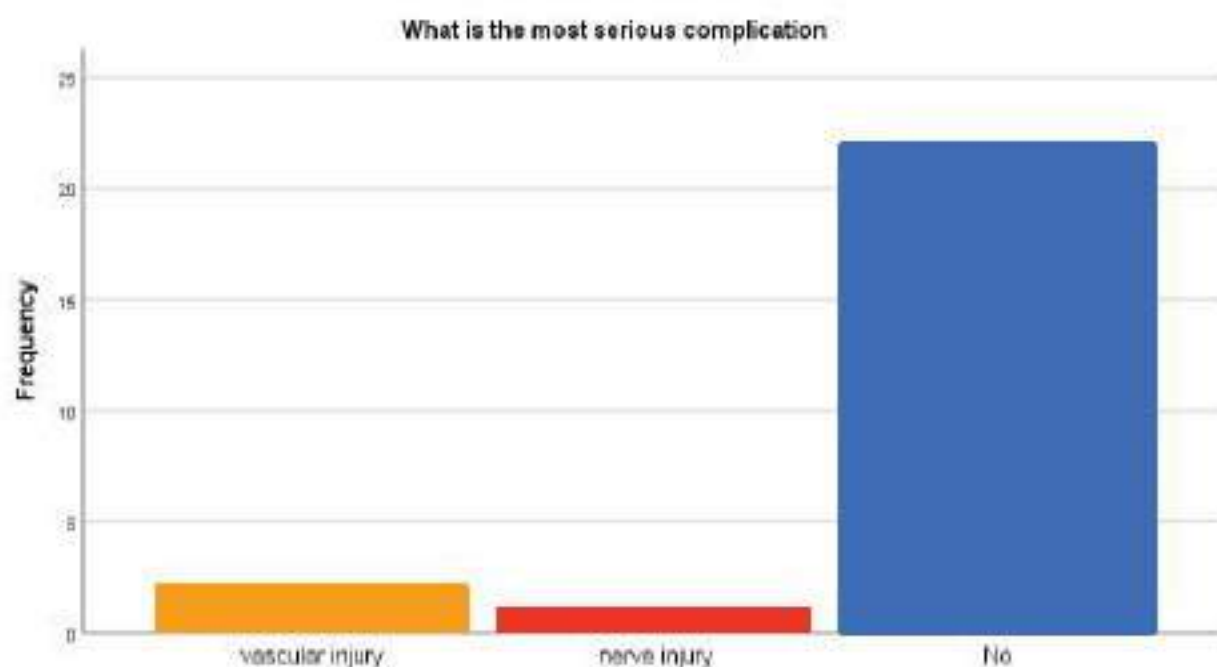


Figure 9 :serious complication

		Frequency	Percent	Valid Percent
Valid	vascular injury	2	8.0	8.0
	nerve injury	1	4.0	4.0
	No	22	88.0	88.0
	Total	25	100.0	100.0

Table 6 : serious complication

Here We asked about how the doctors Confirm the diagnosis of fractures

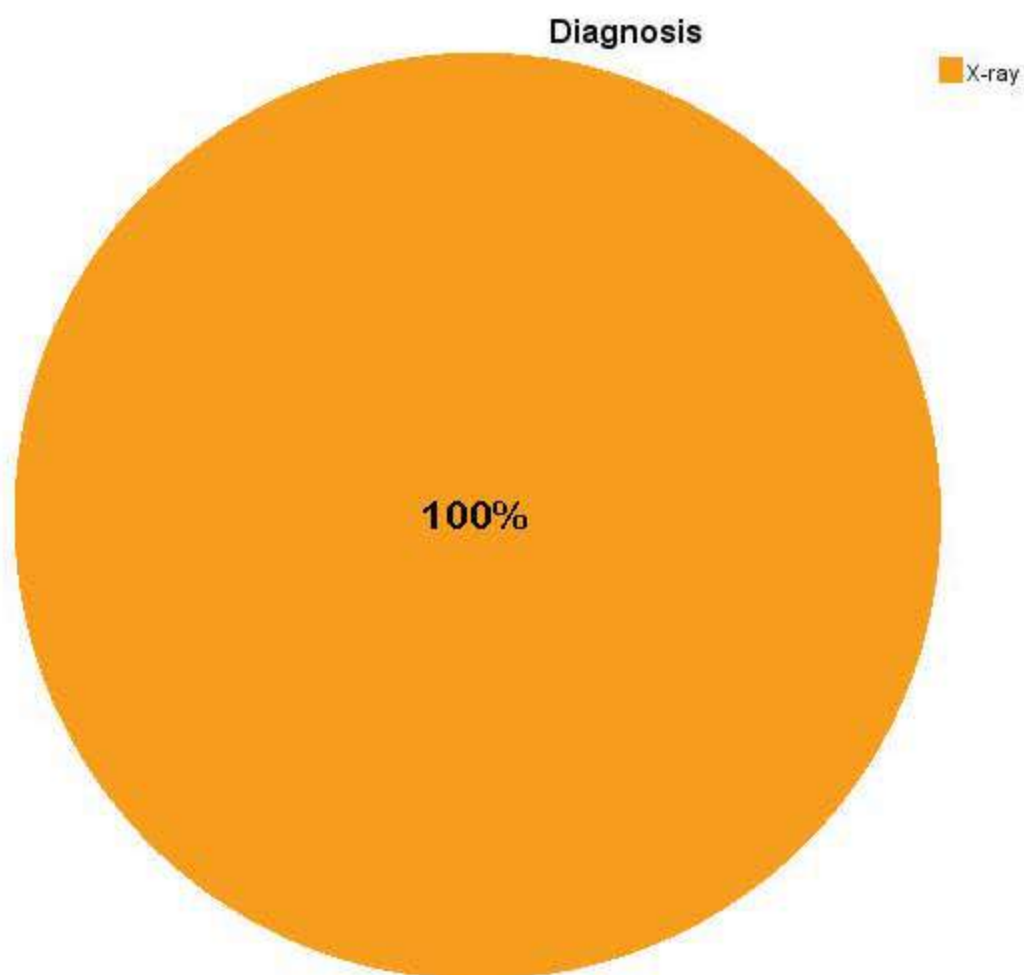


Figure 10 : Diagnosis

The last question in our Questioner was about who the doctors deal or management with the patients.

- Most of the patients (22 “ 88.0 % “) was **(SURGERY)**
- While 3 of them was not management by surgery

One of them (4% with type I) **(BACKSLAB IMMOBILIZATION)**

Two of them (8% with type II) (Closed Reduction)

The details of the patients are explained in (table 7) ,(Figure 11)

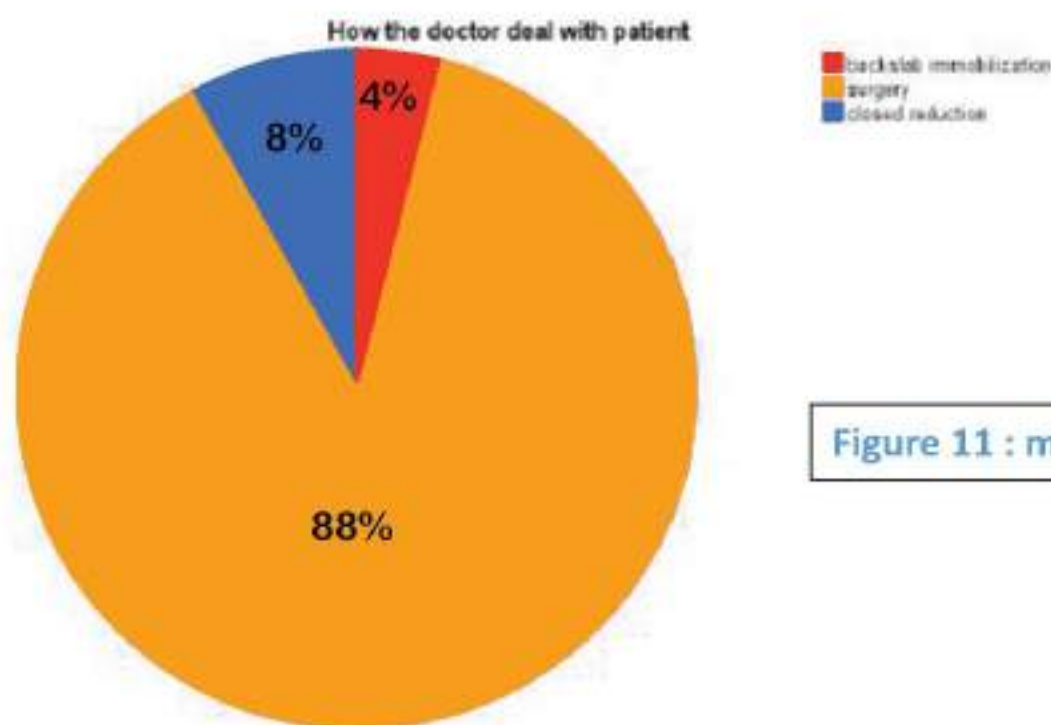


Figure 11 : management

		Frequency	Percent	Valid Percent
Valid	backslab immobilization	1	4.0	4.0
	surgery	22	88.0	88.0
	closed reduction	2	8.0	8.0
	Total	25	100.0	100.0

Table 7 : management

Discussion

The increasing frequency of pediatric supracondylar humerus fractures in recent years, which is reflected in the results of this work, has also been described by other authors, such as LiBrizzi et al. and Barr et al. [7,13]. With reference to the patient cross sectional study to study the epidemiology of patients with supracondylar fractures in children treated in a hospital and to Identify neurovascular injuries associated with supracondylar fracture and the management of this fractures in total 25 patients, the female: male ratio was 1:2 as more male (17; 68.0%) than female (8; 32.0%) patients were treated for a supracondylar humerus fracture. This gender difference is also shown in previous studies that depicted a higher frequency of male patients by about 60% [3,5,6,8,14]. Apart from that, other studies describe an equal incidence [15,16] or even a female predominance as shown by LiBrizzi et al. who referred to further studies showing this trend [7]. Supracondylar fracture of humerus is the most common pediatric elbow fracture, constituting about 15% of all pediatric fractures and more than half of pediatric elbow fractures. These fractures have a peak incidence at the age of (5-7) years, [19,20] The peak incidence of Frequency of common ages in our series was at the age of (5-9) years. The results were consistent with the previous studies. The commonest mechanism of supracondylar fractures is fall on outstretched hand with elbow extended, leading to extension injury, while flexion injury results from fall on flexed elbow. [21,22] Our series regarded fall on outstretched hand from height (rooftop/stairs) and while they playing as the predominant mode of trauma followed by RTA (road traffic accident). The houses in rural regions of Iraq mostly lack protection over rooftops to prevent accidental falls, usually wooden or steel made, which explains our common mode of trauma. Moreover, the use of a ladder (wooden) to reach roof was another common preventable cause of falls in this age group. Extension type of supracondylar fracture was the most common type seen in our series accounting for 88% and only three cases of flexion fractures were reported, which was consistent with previous studies (97%-99%). [23] Gartland type III was the predominant type in our series (60.0%) and type II was the least common (24.0%), which was

comparable to most series. However, many studies reported type I fractures to be the least common owing to their non-operative management available at healthcare centers. Gartland type 3 supracondylar fractures are mostly managed by surgery, either by closed or open reduction and stabilization with three K-wires is a standard protocol described and followed [24]. Though the surgery appears to be simple but complications are not uncommon. Iatrogenic ulnar nerve injury is one such complication known to be associated with insertion of K-wire from medial side of the elbow joint.[25,26] Brachial artery injury has been noted during the manipulation of fracture fragments.[27] Supracondylar humeral fractures complicated by nerve injury comprised of (3% - 22%) in different studies.[28] In our series, the incidence of nerve injuries was only one case of ulnar nerve injury associated with Extension type III fracture., including two patients with associated brachial artery injury requiring repair. Associated injuries included fractures of ipsilateral forearm, proximal humerus and clavicle, with an incidence of less than 5% in different studies.[4,29 ,30] In our study, 3 had associated injuries accounting for (12.0%), including (2) ipsilateral forearm fractures and one ipsilateral clavicle fracture.

CONCLUSION

This study has shown a significant correlation between increasing fall height and fracture severity in supracondylar humerus fractures classified according to Gartland's classification. Furthermore, children with Extension type III supracondylar fractures are more likely to develop complications or restrictions in movement than children with Extension type I and II fractures. Data illustrate that the more severe the fractures (Extension type III and Flexion type) are, the higher the risk of experiencing complications and an impaired outcome. Hence, the fall height may be an indirect indicator of a more or less favorable outcome.

Recommendation

We recommended educating people in rural areas, preventing children from playing over rooftops lacking railing and securing the rooftop with protective decks

For the treatment of displaced supracondylar humerus fractures, we recommend closed reduction and stabilization by K-wires inserted percutaneously from the lateral aspect of the distal humerus. If the impaired perfusion of the forearm persists after fracture reduction and stabilization or if complete nerve paralysis or iatrogenic nerve lesion develops, surgical treatments of these neurovascular complications should be considered.

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