

## Original Research Article

# Epidemiology of fractures of the humerus at the university college hospital Ibadan

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### ABSTRACT

**Background:** The humerus is one of the long bones of the upper limb. It may be fractured following traumatic or non-traumatic injury. Humeral shaft fractures account for 1-3% of all fractures. However supracondylar fracture of the humerus is more common amongst children accounting for about 16% of all pediatric fractures. Trauma especially from falls especially in both children and geriatric populations has been known to cause humeral fractures. Other causes had been documented also. This study was aimed at determining the incidence, cause and pattern of humeral fracture in patients who presented to the accident and emergency department of the University College Hospital, Ibadan, Oyo state, Nigeria.

**Methods:** Patients with radiologically confirmed humeral fractures who presented to the accident and emergency department of the hospital between January 2015 and December 2019 were included in the study. Data was obtained from the electronically stored data at the department of orthopedic surgery and trauma university college hospital Ibadan using a proforma and the data generated was analyzed using Statistical Package for the Social Sciences version 16.

**Results:** A total of 167 patients with humeral fractures were seen during the study period. Most of these patients are within the age range of 0-15 years. Male to female ratio was 1.7:1. Most humeral fractures were due to fall and the distal humerus was most commonly affected.

**Conclusions:** Humeral fractures occur in younger people and efforts should be geared towards preventing this trend in younger population.

**Keywords:** Humeral fracture, Incidence, Pattern

### INTRODUCTION

The humerus is the longest and the largest bone in the upper limb. It is made up of the proximal end, a shaft and the distal end. It articulates proximally with the scapular to form the glenohumeral joint and distally with the radius and ulnar to form the elbow joint.<sup>1</sup>

The proximal end of the humerus consists of a head, an anatomical neck as well as the greater and lesser tubercles. The proximal half of the shaft is cylindrical in

shape while the distal half is triangular with three borders namely the anterior, lateral and medial borders. The shaft also contains three surfaces namely the anteromedial, anterolateral and posterior surfaces.<sup>1</sup>

The distal end consists of both articular and non-articular parts. The articular part of the humerus consists of modified condyle which is wide transversely. It articulates with both the ulnar and radius. It consists of trochlea which is medial and capitulum which is on the lateral side, both separated by a groove. The non-articular

part consists of the medial and lateral epicondyles, the olecranon fossa, coronoid fossa as well as radial fossae.<sup>1</sup>

The incidence of fractures varies and ranges from 3.21 to 22.8/1000 per annum in the general population and extremity fracture accounted for about 82.1-94.7% of all fractures by anatomical region distribution.<sup>2-6</sup> In the United State of America, Garraway et al reported the incidence of limb fracture of 15.69/1000 person years in the setting of a developed country.<sup>5</sup>

Humeral shaft fractures account for 1% to 3% of all fractures as well as approximately 20% of all fractures involving the bone with a population-weighted incidence rate of 7.22 per 100,000 populations.<sup>7-10</sup> Supracondylar fracture of the humerus is common among children, accounting for about 16% of all pediatric fractures.<sup>11</sup> In China, traumatic humeral shaft fracture accounted for 1.17% of all fractures and up to 23.19% of all humeral fractures in 2010 and 2011.<sup>12</sup>

The most frequent cause of fracture of the humerus is direct trauma which could be as a result of falls especially among the pediatric and geriatric populations.<sup>2,5,13,14</sup> However other studies have shown trauma from motor vehicular collision as the predominant external cause of fractures, especially in regions where road traffic injury is common.<sup>5,15-17</sup> Fractures of the shaft of the humerus as a result of muscular exertion are uncommon with reports from several countries showing such fractures occur during activities such as throwing a baseball, javelin or hand grenades.<sup>18,19</sup>

Some factors such as smoking have been identified as an independent risk factor for humeral shaft fracture in men.<sup>12</sup> Alcohol consumption and menopause before the age of 46 years were also considered as independent risk factors for humeral fractures in women.<sup>12</sup> History of previous fracture is an independent risk factor in adults of both sexes.

This study was done to determine the incidence of humeral fracture at the university college hospital Ibadan as well as the causes and patterns of humeral fractures. This was done through a retrospective study of the data obtained from the department of orthopedic surgery and trauma of the university college hospital Ibadan between January 2015 and December 2019.

## **METHODS**

This was a retrospective hospital-based study to determine the incidence, causes and the patterns of humeral fracture in patients admitted through the accident and emergency department of the University College Hospital Ibadan.

The study was performed at the University College Hospital Ibadan which is an 850-bed teaching hospital between January 2015 and December 2019. University

College Hospital is located in Ibadan, the capital of Oyo state, Southwest Nigeria. It is also a referral centre for hospitals in the neighboring states. The patients were resuscitated at the accident and the emergency department, managed and subsequently recruited.

Patients with radiologically diagnosed humeral fractures who presented to the accident and emergency department of the hospital between January 2015 and December 2019 were included in the study.

Data was obtained using a predesigned pro forma which was completed from the electronically stored data at the department of orthopedic surgery and trauma of the hospital. Data captured included the patient's presenting complaint, the mechanism of injury, examination findings, radiological findings and treatment offered. The stored data used for this study were data that were obtained and recorded from the injured patients at the accident and emergency. This data was retrieved weekly from the accident and emergency and stored electronically in department of orthopedic surgery university college hospital Ibadan.

Other information retrieved included the biodata and the part of the humerus affected.

All the patients with radiologically diagnosed humeral fractures who presented at the accident and emergency department within the study period were included in the study. The data was reviewed over a 60 months period.

## **Exclusion criteria**

Patients who presented within the study period with fractures other than humeral fractures were excluded from the study.

Ethical approval was not required for this study.

## **Statistical analysis**

The data was analyzed using Statistical Package for the Social Sciences version 16.

## **RESULTS**

A total of 167 humeral fractures were seen at the accident and emergency department of the University College Hospital during the study period accounting for 3.8% of all surgical cases seen at the accident and emergency department.

The distribution by age group is presented in Figure 1. There were 66 (39.5%) patients within the age 0-14 years, 64 (38.3%) patients between ages 15-47 years, 25 (15%) patients between age 48-63 and 12 (7.2%) patients with humeral fracture presented in the elderly age group.

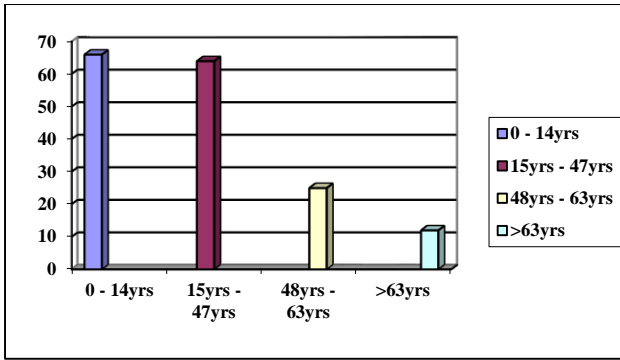


Figure 1: Age distribution.

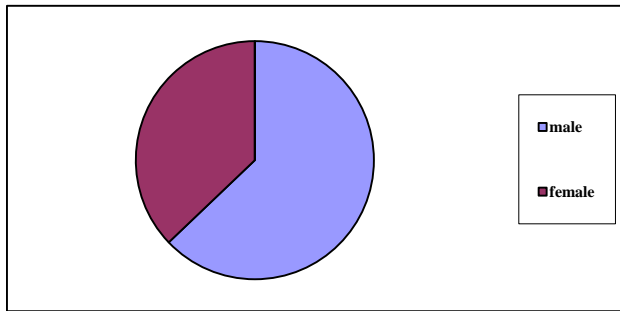


Figure 2: Gender distribution.

There were 105 males and 62 females with a male: female ratio of 1.7:1 (Figure 2).

Fall and motor vehicle road traffic accident were two most common mechanisms of injury (Table 1) accounting for 71 (42.5%) and 49 (29.34%) respectively. There were 81 humeral fractures in the left while 86 occurred in the right (Table 1).

Most fractures are closed and the distal part of the humerus was the most commonly fractured (Table 2) which accounted for 141 (84.43%) and 79 (47.3%) respectively. Transverse fracture was the most common fracture pattern observed (43.7%) while most of the fractures were managed without surgery (70.1%) (Table 2).

Table 1: Laterality of the patients and mechanism of injury.

<b>Left</b>	81
<b>Right</b>	86
<b>Total</b>	167
<b>Mechanism of injury</b>	
MVRTA	49
Fall	71
Gunshot	8
Tricycle	6
MBRTA	19
Birth Trauma	5
Others	9
<b>Total</b>	167

Table 2: Radiological findings and management modality of patient with humeral fracture.

<b>Fracture location</b>	
Proximal	49
Shaft	39
Distal	79
<b>Total</b>	167
<b>Type of fracture</b>	
Closed	141
Open	25
<b>Total</b>	167
<b>Fracture pattern</b>	
Transverse	73
Comminuted	42
Oblique	36
Spiral	6
Segmental	3
Impacted	3
Avulsion	4
<b>Modality of management</b>	
Operative	45
Non operative	117
DAMA	5

Table 3: Comparison of age and mechanism of injury.

Age (years)	MVRTA	Fall	Gunshot	Tricycle RTA	MBRTA	Birth trauma	Others	Total
<b>0-14</b>	5 (10.6%)	34 (72.3%)	0	1 (2.1%)	0	5 (10.6%)	2 (4.3%)	47 (100%)
<b>15-47</b>	32 (51.6%)	11 (17.7%)	6 (9.7%)	1 (1.6%)	7 (11.3%)	0	5 (8.1%)	62 (100%)
<b>48-63</b>	9 (26.5%)	11 (32.4%)	2 (5.9%)	3 (8.8%)	8 (23.5%)	0	1 (2.9%)	34 (100%)
<b>&gt;63</b>	3 (12.5%)	16 (66.7%)	0	0	4 (16.7%)	0	1 (4.3%)	24 (100%)
<b>Total</b>	49 (29.3%)	72 (43.1%)	8 (4.8%)	5 (3.0%)	19 (11.4%)	5 (3.0%)	9 (5.4%)	167 (100%)
	<b>Value</b>	<b>df</b>	<b>Asymptomatic significance</b>					
<b>Pearson <math>\chi^2</math></b>	77.235	18	0.000					

Most of the humeral fractures seen in the pediatric and geriatric age categories occurred following falls while motor vehicle road traffic accident (MVRTA) was the major cause of humeral fractures in the young adult and the middle-aged adult categories (Table 3).

**Table 4: Relationship of patient's gender with mechanism of injury.**

	Male	Female	Total
<b>MVRTA</b>	32	17	49
<b>Fall</b>	46	25	71
<b>Gunshot</b>	7	1	8
<b>Tricycle RTA</b>	2	3	5
<b>MBRTA</b>	9	10	19
<b>Birth trauma</b>	3	2	5
<b>Others</b>	6	3	9
<b>Total</b>	105	61	166

Fall and MVRTA occur more in the male gender (Table 4) and fractures involving the distal humerus occurred more in the pediatric age category (Table 5).

**Table 5: Relationship of patient's age with radiological findings.**

Age group (years)	Proximal	Middle	Distal	Total
<b>&lt;14</b>	6	10	45	61
	9.8%	16.4%	73.8%	
<b>15-47</b>	20	14	22	56
	35.7%	25%	39.3%	
<b>48-63</b>	13	11	9	36
	36.1%	30.6%	25%	
<b>&gt;63</b>	8	3	3	14
	57.1%	21.4%	21.4%	
<b>Total</b>	47	38	79	167

**DISCUSSION**

A total of 167 patients with humeral fracture presented at the accident and emergency department of the University College Hospital Ibadan within the study period. This accounted for about 3.8% of all the surgical emergency cases that presented at the accident and emergency department within the study period. Forty two percent (42%) of all emergency department visit involved upper extremity fractures in a study done in the Netherlands.<sup>18</sup> Previous studies done in our center among pediatrics and geriatric patients showed that fractures involving the upper extremity accounted for 62.31% and 23.47% respectively among patients that presented at the accident and emergency department.<sup>20,21</sup> This lower incidence of humeral fractures observed in this study may be due to a higher incidence of fracture involvement in the other bones of the upper extremity such as the radius and the ulnar bone, the scapular and the bones in the hand.

The age categories in our study showed that most humeral fractures occurred in patients within the pediatric age from 0-14 years with 66 patients as well as the young adults from 15 years to 47 years with 64 patients. Fall from increased mobility as well as during sporting activities may account for this increased occurrence in children as well as higher exposure to traumatic injury in the active individuals.

Humeral fractures were observed to be higher in the male gender.<sup>22</sup> It has been observed that males were 2.9 times more likely to sustain a fracture than female especially between ages 15 years to 49 years.<sup>23</sup>

Fall and road traffic crash were the major causes of humeral fractures in this study. Road traffic crash in this study consists of motor vehicle road traffic accident, motorcycle road traffic accident and tricycle road traffic accident. They caused 42.8% and 44.3% of humeral fractures observed in this study respectively. The risk factors for fall especially in the elderly population include restricted mobility, use of multiple medications, disturbance of gait, lighting change, an absent or abnormal plantar reflex, failure to wear prescribed spectacles while in the pediatric age group, the need to explore the environment as part of their development as well as participation in sporting activities may predispose them to falls.<sup>24-27</sup>

Over speeding by drivers, bad roads and poor maintenance of most vehicles are some of the factors that predisposing to road traffic crash in Nigeria.

Among the pediatric patients, fall and motor vehicle road traffic accident (MVRTA) are the common causes of humeral fractures. In the young adult and middle age adult categories, MVRTA is the most significant cause of humeral fractures while within the geriatric age group, fall accounted for more than 70% of the humeral fractures within this age category.

Young adults and the middle age adult are in the active age category and are highly mobile as such the need to move from one place to the other however road transportation is the most predominant means of transportation in Nigeria. This predisposes them to being involved in road traffic injuries.

Fall and road traffic accident were the common mechanisms of injury causing humeral fractures in all age group in the Netherlands.<sup>18</sup> Other causes of humeral fracture observed in our study include birth trauma and gunshot injury.

47.3% of the humeral fractures occurred in the distal part of the bone while 23.5% and 29.3% of the fractures involve shaft and the proximal part of the bone respectively. Similar study done in Rochester United kingdom showed the humeral fracture distribution with 33%, 47% and 20% involving the distal part, proximal

part and the humeral shaft respectively.<sup>28</sup> This pattern of distribution in our study may be due to the higher involvement of pediatric patients where distal humeral fractures have been observed to occur more.<sup>18</sup> Supracondylar fracture of the humerus accounted for two thirds of all hospitalization for pediatric elbow injuries and it is the most investigated pediatric fracture.<sup>29,30</sup> It is also more common in boys than girls.<sup>31,32</sup>

Humeral fractures in the geriatric population occurred more in the proximal in the proximal part of the bone. Other studies, showed higher involvement of the proximal part of the humerus in the geriatric population.<sup>18,28,33</sup>

The limitations of the study include the retrospective nature of the study as outcome and complications following treatment could not be assessed.

## CONCLUSION

Fractures of the humerus account for 3.8% of all surgical cases that presented in the accident and emergency of UCH. The male gender is affected more. Fall and road traffic crash were the most common causes of humeral fractures and the distal part of the bone being the most commonly involved. Reducing the incidence of falls as well as the risk of road traffic crash will reduce the incidence of sustaining fracture of the humerus.

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