## **Original Article**

# Risk factors associated with distal humeral fractures: A radiological study of Nigerians admitted at National Orthopedic Hospital, Igbobi, Lagos State, Nigeria

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### Abstract

**Aim:** This study is aimed at investigating the possible risk factors associated with distal humeral fractures among Nigerians. **Materials and Methods:** The study was carried out retrospectively at the Department of Medical Records, National Orthopedic Hospital, Igbobi, Lagos State, Nigeria using Plain films of X-ray from a total number of 144 patients of ages from birth to 100 years (0–100 years), comprising of 88 males and 56 females. **Results:** It reveals that the age group 1–10 years were affected more than other age groups. This study also shows that fall is the main cause of distal humeral fractures (68.7%) followed by road traffic accidents (27.8%). The predominance of fracture of the left humerus in this study was statistically significant. **Conclusion:** Since distal humeral fracture is an issue of harsh economic consequences, various measures should be taken by all the parties involved so as to address the menace.

Key words: Distal, fracture, humerus, risk factors

#### **INTRODUCTION**

Distal humeral fractures makeup 0.5–2% of all fractures, but up to 30% of fractures involving the elbow (Webb, 2001). Distal humeral supracondylar fractures account

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for 17.9% of all fractures in pediatric populations, making them the second most common pediatric fracture (Cheng et al., 1999). Extension-type injuries, which result from force applied to a fully extended elbow, are reported in 99% of supracondylar fractures (Cheng et al., 2001). Past literatures had shown that these injuries are most commonly caused by falls (70%), most frequently occur between July and November, and occur in the nondominant arm in 61% of patients (Cheng *et al.*, 1999; Cheng et al., 2001). Several studies have established the median age at injury is between ages 3 and 8 years, whereas reports of sex predilection vary (Cheng et al., 1999; Houshian et al., 2001). Distal humeral fractures can generate complicated clinical scenarios, and definitive treatment remains controversial. The complexity of these fractures is due to the close relationship of anatomic structures within the elbow joint. Distal humeral fracture occurs in a bimodal distribution with the majority occurring in young males between the ages of 5 and 10.

The second most prevalent population is the elderly with osteoporosis. There is no literature available on the epidemiologic study of risk factors associated with distal humeral fractures among Nigerians. Hence, this study is aimed at investigating the possible risk factors associated with distal humeral fractures among Nigerians. It was hypothesized that age, gender, side affected, climatic season, fall and road traffic accidents are risk factors associated with distal humeral fractures.

#### MATERIALS AND METHODS

The study was carried out retrospectively at the Department of Medical Records, National Orthopedic Hospital, Igbobi, Lagos State, Nigeria using Plain films of X-ray (both anteroposterior and lateral views) that were taken between 2007 and 2012 from a total number of 144 patients of ages from birth to 100 years (0–100 years), comprising of 88 males and 56 females. The plain films that were selected for the study were strictly those of Nigerians based on the information given by the subjects and filled in their case notes.

Information that were gathered from the patients' case notes included age of the patients, gender of the patients, ethnic groups, side affected, cause of the fracture and date admitted. The causes were grouped into three: Those that occurred as a result of the fall, those occurred as a result of road traffic accident (RTA) and those that occurred as a result of other causes (these included birth injuries, pathological, industrial machines and cutlass). The ages were grouped thus; at birth, 1–10 years, 11–20 years... 61–70 years and above 70 years.

The analyses were done using Statistical Package for Social Sciences (SPSS) version 16.0 (Chicago, SPSS Inc.) and presented in bar charts. The frequencies were reported as percentages. The differences in frequencies were compared using Chi-square test. The differences were considered statistically significant at 95% confidence level, that is, when (P < 0.05).

#### RESULTS

From Figure 1 when both sides are combined, the frequency of distal humeral fracture was significantly higher (P < 0.05) in males than in females. Moreso, on the right side, the frequency of distal humeral fracture was significantly higher (P < 0.05) than in females. However, on the left side, there was no significant difference (P > 0.05) on the frequency of distal humeral fracture between males and females.

From Figure 2 when both genders were combined, the frequency of distal humeral fracture was significantly higher (P < 0.05) on the left side than on the right side.

Moreso, in females, the frequency of distal humeral fracture is significantly higher (P < 0.05) on the left side than on the right side. However, in males, there was no statistically significant difference (P > 0.05) on the frequency of the distal humeral fractures between the right and left sides.

From Figure 3 the frequency of distal humeral fracture was significantly higher (P < 0.05) in age group 1–10 years than all other age groups in both males and females and when genders were combined.

From Figure 4 the major cause of distal humeral fractures was fall which was significantly higher (P < 0.05) than those caused by road traffic accident. Furthermore, the frequency of those caused by road traffic accident was significantly higher (P < 0.05) than those as a result of miscellaneous causes.

From Figure 5 a total of 82.5% of the subjects that had distal humeral fractures as a result of road traffic accident were aged between 21 and 60 years while a total of 79.8% of the subjects that had distal humeral fractures as a result of the fall were aged between 1 and 10 years. These findings were statistically significant (P < 0.05).

From Figure 6 the frequency of males that had distal humeral fracture as a result of road traffic accident was significantly higher ( $P < 0.05^*$ ) than that of females. However, there was no statistically significant difference (P > 0.05) between the frequencies of males and females that had distal humeral fractures as a result of the fall. The frequency of males that had distal humeral fracture as a result of miscellaneous causes was significantly higher ( $P < 0.05^*$ ) than that of females.

From Figure 7 there was no statistically significant difference (P > 0.05) on the frequencies of distal humeral fractures caused by road traffic accidents between right and left sides. However, the frequency of distal humeral fractures caused by fall was significantly higher (P < 0.05) on the left side than on the right side. There was no statistically significant difference (P > 0.05) on the frequencies of distal humeral fractures as a result of miscellaneous causes between right and left sides.

From Figure 8 a significant proportion (P < 0.05) of subjects aged between 1 and 10 years and above 70 years had distal humeral fracture as a result of falls. A significant proportion (P < 0.05) of subjects aged between 21 and 60 years had distal humeral fracture as a result of road traffic accidents.

#### DISCUSSION

Trauma has remained the leading cause of death and morbidity world over in persons aged 1–34 years and



Figure 1: Comparison between males and females



Figure 2: Comparison between right and left



Figure 3: Comparison between age groups

a major contributor to health cost (Boffard and Bowley, 2004). The present study presents some of the risk factors associated with distal humeral fractures. It reveals that the age group 1–10 years were affected more than

other age groups. It is likely that this group of children are of school age or engaged in street hawking, for the less-privileged, and are certainly out of parental control for most of the day.









Figure 5: Relationship between causes and age groups



Figure 6: Relationship between causes and genders

Increased fracture risk is a known result of elevated activity levels, decreased parental supervision, and public playground activity, all of which may increase once a child reaches school age (Gofin *et al.*, 2012; Spinks *et al.*, 2004; Petridou *et al.*, 2002). Distractions are occurring during social play and the experimentation that accompanies the





Figure 7: Comparison of the causes of distal humeral fractures between left and right sides



Figure 8: Relationship between causes of distal humeral fractures and age groups

learning of new skills may also contribute to increased fracture risk. Therefore, school-age social development may explain the current findings of peak injury frequency in this age group.

Furthermore, at this age, the supracondylar area is undergoing remodeling and is typically thinner with a more slender cortex, predisposing this area to fracture. The typical mechanism is a fall onto an outstretched hand that puts a hyperextension load on the arm. The distal fragment displaces posteriorly in over 95% of cases (Skaggs and Pershad, 1997). As the elbow is forced into hyperextension, the olecranon serves as a fulcrum and focuses the stress on the distal humerus causing fracture (Abraham *et al.*, 1982). The rare flexion-type supracondylar fracture is often the result of a fall directly onto a flexed elbow.

In our environment, much attention has not been given to the epidemiology of fractures resulting from these injuries in children in the literature despite the teeming association between fractures and pediatric trauma. The situation is similar to that of other African countries where the burden of malaria, infectious diseases and malnutrition has blurred the focus on pediatric trauma in public health research and policies (Adesunkanmi *et al.*, 2000; Adeyemi-Doro, 2003).

Similar to previous studies (Cheng *et al.*, 1999; Cheng *et al.*, 2001; Houshian *et al.*, 2001), this study shows a rapid decline in distal humeral fracture frequency after age group 1–10 years. The decline in fracture frequency may be attributed to continued growth without dramatic behavior change, as might be observed when a child begins attending school. As age increases, so do bone mineral density and bone mineral content (Kalkwarf *et al.*, 2007; Zemel *et al.*, 2011). Greater bone mineral density and bone mineral content have been reported to reduce fracture risk in pediatric populations (Kalkwarf *et al.*, 2011; Clark *et al.*, 2008).

This study also shows that fall is the main cause of distal humeral fractures (68.7%) followed by road traffic accidents (27.8%). A further analysis in this study indicated that fall was the major cause of distal humeral fracture in age group 1–10 years and those above 70 years while road traffic accident was the main cause of distal humeral fractures in age group 21-60 years. A study by of pediatric fractures in Maiduguri, Nigeria by (Tahir and Hassan 1998) found fall related injuries to be responsible for 75% of fractures in children seen in that environment while road traffic accidents accounted for only 23%. Another study of pediatric injuries in (Tehran by Zagar et al., 2003) found road traffic accidents to be second to fall in the etiology of pediatric trauma. However, a study by (Nwadinigwe et al., 2006) found road traffic accidents as the most common cause of pediatric fractures. These discrepancies could be explained by the differences in road traffic densities and vast cultural differences between the areas studied (Nwadinigwe et al., 2006). However, a multi-centre study is required to harmonize these findings.

The predominance of males in distal humeral fractures in this study is in agreement with other studies (Tripathi *et al.*, 2009; Iqbal 1974; Hanlon and Estes 1954; Lichenberg 1954; Reed 1977). This could be due to their higher level of exposure and active behavior. The present study goes further to show than this male predominance of distal humeral fracture is on the right side but not on the left side.

The predominance of fracture of the left humerus in this study was statistically significant. However, when genders were separated, it was discovered that this left predominance is only significant in the females but not in males. It is likely that left upper extremity assumes the protective role during injury while the right upper limb is in use; regardless of the hand dominance. The less mature neuromuscular co-ordination in nondominant limb may also be responsible (Mortensson, 1991; Tripathi *et al.*, 2009).

This study reveals that there was no significant difference between male and females that had distal humeral fracture as a result of the fall but that the frequency of males that had distal humeral fracture as a road traffic accident (RTA) was significantly higher than females. This study went further to reveal that there was no statistically significant difference between the subjects that had distal humeral fractures as an RTA while the frequency of subjects that had distal humeral fractures on the left side as a result of the fall were significantly higher than on the right side.

#### CONCLUSION

Since distal humeral fracture is an issue of harsh economic consequences, various measures should be taken by all the parties involved so as to address the menace.

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