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Epidemiology of femur fractures in a tertiary hospital in the South-West of Nigeria

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Abstract
The femur is one of the major load-bearing bones in the lower limbs often fractured during traumatic events such as road traffic crashes, falls from heights, gunshot injuries, assaults, and industrial accidents. Some other risk factors predisposing the femur to fracture are advanced age, osteoporosis, and prior fragility fracture.
The study was a 5-year retrospective study carried out on orthopaedics patients who presented to the Emergency Departments of a tertiary hospital in the South-West of Nigeria. It aimed to determine the incidence and pattern of femur fractures in the city. Two hundred and sixty-nine patients with femur fractures presented to the hospital within the study period. The M:F ratio was 2:1. Most fractures occurred in the 36-65 years age group. Road traffic accidents were the commonest aetiology followed by falls. The femoral shaft accounted for 60% of fractures. There were more fractures in the shaft than in any other region ($P < 0.0001$). Young adults were more likely to leave the hospital against medical advice $P = 0.001$).
Introducing environmental designs and road use policies to reduce the incidence of falls and road traffic crashes will significantly reduce the risks of femur fractures.

Keywords: *Fracture, femur, pattern, prevalence*

Abstrait
Le fémur est l'un des principaux os porteurs des membres inférieurs souvent fracturé lors d'événements traumatisants tels que les accidents de la route, les chutes de hauteur, les blessures par balle, les agressions et les accidents industriels. Certains autres facteurs de risque prédisposant le fémur à la fracture sont l'âge avancé, l'ostéoporose et les antécédents de fracture de fragilité.
L'étude était une étude rétrospective de 5 ans menée sur des patients en orthopédie qui se sont présentés aux services d'urgence d'un hôpital tertiaire dans le sud-ouest du Nigeria. Il visait à déterminer l'incidence et le schéma des fractures du fémur dans la ville. Deux cent soixante-neuf patients avec des fractures du fémur se sont présentés à l'hôpital au cours de la période d'étude. Le rapport M:F était de 2:1. La plupart des fractures sont survenues dans le groupe d'âge 36-65 ans. Les accidents de la circulation étaient l'étiologie la plus fréquente suivis des chutes. La diaphyse fémorale représentait 60% des fractures. Il y avait plus de fractures dans la diaphyse que dans toute autre région ($P < 0.0001$). Les jeunes adultes étaient plus susceptibles de quitter l'hôpital contre l'avis médical ($P = 0.001$).
L'introduction de conceptions environnementales et de politiques d'utilisation des routes pour réduire l'incidence des chutes et des accidents de la route réduira considérablement les risques de fractures du fémur.

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Introduction

The femur is one of the major load-bearing bones in the lower limbs as well as the longest, strongest, largest, and heaviest tubular bone in the human body [1,2]. The femur bone is made up of the head, which articulates with the acetabulum, the neck, the greater trochanter as well as the lesser trochanter proximally. It has a shaft that ends distally with the medial and lateral condyles [3]. All the parts of the femur can be fractured.

Traumatic events such as those arising from road traffic crashes, falls from height, gunshot injuries, assaults, and industrial accidents usually cause fractures in patients with normal bone strength [4]. Analysis of road traffic crashes shows that motor vehicle crashes, motorcycle, and pedestrian accidents are the most common variants, while in extremity gunshot injuries, the femur bone is the most common site of fractures [5].

Fractures of the femur are among the most common fractures encountered in orthopaedic practice [6], as well as the most common musculoskeletal injury accounting for 9% of all non-fatal injuries. The incidence of femoral fractures was reported as 9.5 – 18.9 fractures per 100,000 population per year [7]. Fractures involving the femur shaft constitute over 50% of all femoral fractures, and most of them occur in the middle third of the femur [8]. In the West African subregion, femur shaft fractures account for about 50% of femoral fractures in Nigeria,[8] while 12.9% of limb fractures occur in the femur in Burkina Faso [9].

There is, therefore, the need to make adequate and proper planning toward managing these types of fractures in our environment, and this has led to the need to determine the incidence and the pattern of femur fractures among patients who presented at the emergency department of the hospital.

Methods

The study was a retrospective hospital-based study to determine the incidence and pattern of femur bone fracture among orthopaedic patients who presented at the Accident and Emergency Department and the Children's Emergency Department, and the Neonatal wards of the hospital.

The hospital is an 850-bed teaching hospital. It is located in a city in the South-West of Nigeria and is a referral centre for hospitals in most of the neighbouring states.

All patients with radiologically diagnosed femur fractures who presented to the hospital between January 2015 and December 2019 were included in the study. The data was obtained through a predesigned proforma completed from the electronically stored data at the Emergency Department and the Department of Orthopaedic and Trauma Surgery. The data was analyzed using Statistical Package for the Social Sciences (SPSS) version 23.

The study was carried out in compliance with the standard requirements of the Ethics Committee of the University of Ibadan/University College Hospital Research Ethics Committee.

Results

Of a total of 1320 patients with orthopaedic trauma presented to the Accidents and Emergency Department for care within the study period, 269 (19.6%) patients with femur fractures were included in the study, with an age range of 0 to 101 years. The mean age of the patients included was 41.25 years (± 27.62 years). Of the 269, 182 (67.7%) of them were male with a male-to-female ratio of 2:1. The highest incidence of femur fracture occurred in the adult age group (36 – 65 years) with 82 (30.5%) patients. Table 1 summarizes the patients' distribution by age. Figure 1 illustrates the sex distribution by age groups, showing that males dominated in all the age categories but were statistically significant between 16 – 65 years (Chi-square (X^2) = 15.464, P = 0.001).

Table 1: Patients' distribution by age

Variable	N (%)
Age (years)	
0 - 15	57 (21.2)
16 - 35	68 (25.3)
36 - 65	82 (30.5)
> 65	62 (23.1)
Total	**269 (100)**

The 269 patients presented with 255 unilateral fractured femurs (more fractures occurred on the left 144 (56.5%) than on the right) and 14 patients had bilateral femur fractures. Of these 283 fractured femurs, three had fractures in two different regions. For all fractured regions, closed fractures were more common than open fractures with 247 (86.4%) and 39 (13.6%), respectively.

The most common aetiology of these femur fractures was road traffic accidents (motor vehicle and motorbike), accounting for 151 (56.1%) of the patients (see Figure 2). This was observed in the young adults (16 – 35 years) and middle-aged (36 – 65 years) patients. Falls accounted for 97 (36%) of femur fractures and were the most common cause in children (0 - 15 years) and the elderly (> 65 years).

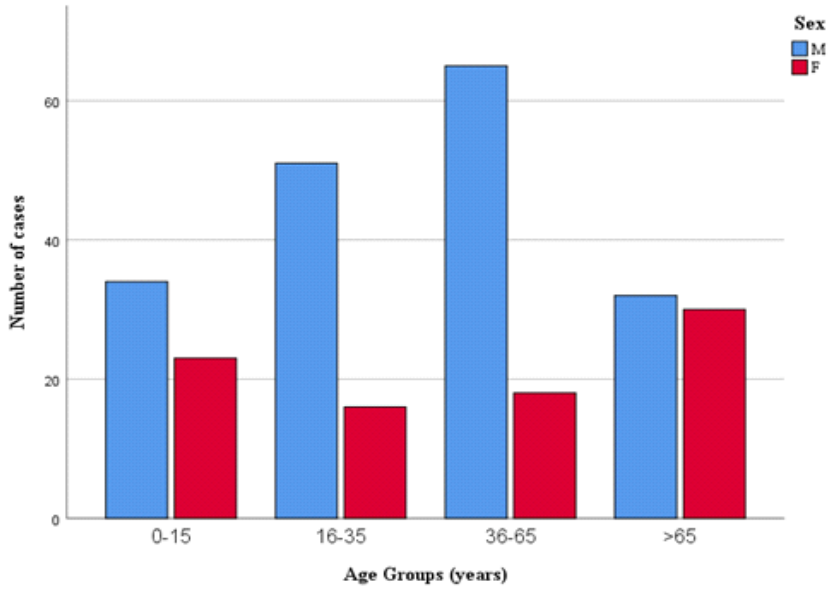

Figure 1: Distribution of sex across age groups

Birth trauma and other causes such as gunshot injuries, and pathologic fractures accounted for the remaining fractures. The relationship between the age groups and the aetiology of the fracture showed statistical significance (Chi-square (X^2) = 139.004, $P < 0.0001$). Table 2 summarizes the distribution of aetiology according to the age groups.

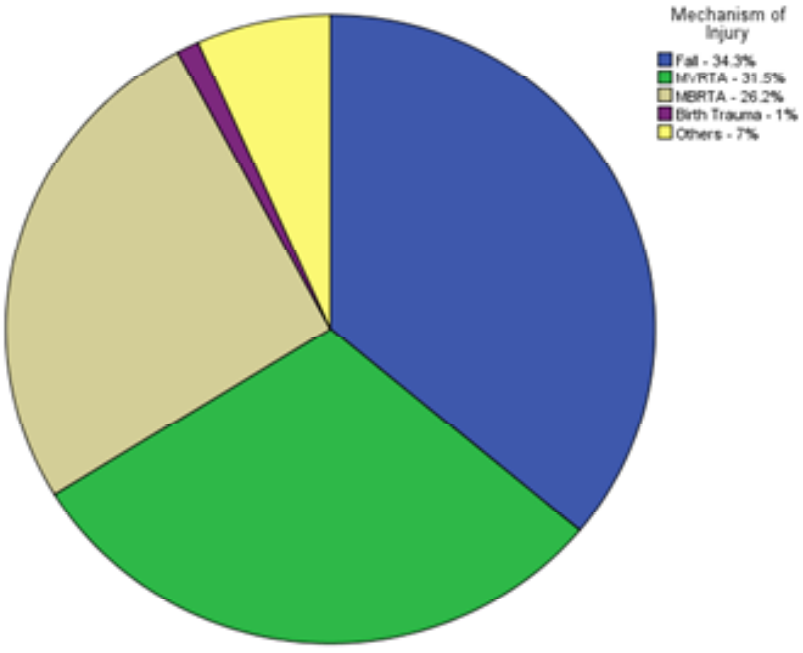

Figure 2: Aetiology of femur fractures

Table 2: Distribution of fracture aetiology by patients' age

Variable	Fall n (%)	MVRTA n (%)	MBRTA n (%)	Birth trauma n (%)	Others n (%)	Total
Age (years)						
0 - 15	26 (26.8)	16 (19.8)	7 (10.1)	5 (100)	3 (17.6)	57 (21.2)
16 - 35	6 (6.2)	29 (35.8)	30 (43.5)	-	3 (17.6)	68 (25.3)
36 - 65	13 (13.4)	34 (42)	24 (34.5)	-	9 (52.9)	80 (29.7)
> 65	52 (53.6)	2 (2.5)	8 (11.6)	-	2 (11.8)	64 (23.8)
Total	97 (100)	81 (100)	69 (100)	5 (100)	17 (100)	269 (100)

Chi-square (X^2) – 139.004, $P < 0.0001$.

Most of the fractures involved the femoral shaft [173 (60.5%)], while the fractures around the trochanters, femoral neck, and condyles accounted for 47 (16.4%), 31 (10.8%), and 14 (4.9%), respectively. Fractures involving the shaft occur more in the pediatric, young adult, and adult age groups. In contrast, proximal fractures such as fractured neck and pertrochanteric fractures occurred more in the elderly. The relationship between the age groups and the fractured region showed statistical significance (Chi-square (X^2) = 135.608, $P < 0.0001$). See Table 3.

Table 3: Distribution of femur fractures by age and fracture regions

Variable	Head	Neck	Pertrochanteric	Subtrochanteric	Shaft	Supracondylar	Condylar
Age (years)							
0 - 15	0	1	2	0	54	1	3
16 - 35	0	1	4	5	49	7	6
36 - 65	1	6	8	1	60	10	4
> 65	0	23	23	4	10	2	1
Total (%)	1 (0.3)	31 (10.8)	37 (12.9)	10 (3.5)	173 (60.5)	20 (7)	14 (4.9)

N = 286, 3 patients had fractures in 2 different regions. Chi-square (X^2) – 135.608, $P < 0.001$.

Fracture comminution was seen in 164 (57.3%) of all fractures and was the most common pattern seen across all regions. Figure 3 illustrates the distribution of fracture patterns across the regions of the femur where about 3% of fractures of the neck were oblique while the rest were comminuted and for fractures of the shaft, 39.3% were comminuted, 34.1% were transverse and the rest were shared between spiral, oblique and segmental patterns. This was also a statistically significant finding. (Chi-square (X^2) = 77.092, P < 0.0001).

Most of the fractures were managed through surgical intervention (184 (65%)), which included open reduction and internal fixation with plates and screws, intramedullary nails, hemiarthroplasty, and external fixation. Non-operative management for 66 (23.3%) of the fractures was by closed manipulation and immobilization in a cast, as well as the use of skeletal traction. Thirty (11.2%) patients left the hospital against medical advice, and young adults made up 53.3% of these (Chi-square (X^{22}) = 15.531, $P = 0.001$).

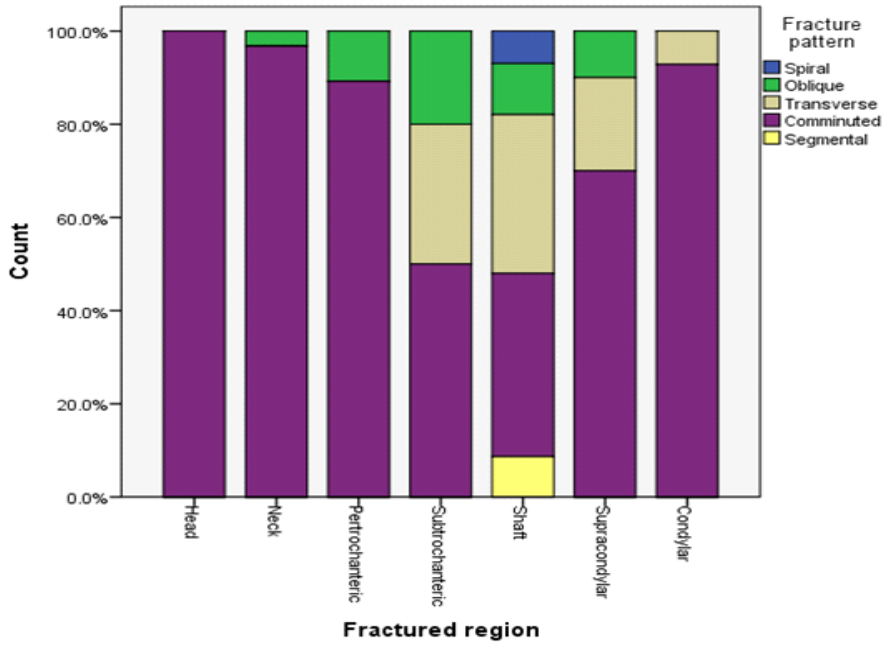

Figure 3: Demonstrating the proportion of fracture patterns by region for femur fractures.

Discussion

Fractures involving the femur lead to a profound economic impact on such individuals (and their dependents), especially in the active age group, as well as on the survival, morbidity, and quality of life of such individuals.

The majority of femur fractures in this study occurred within the adult age group (30.5%) and the young adult (25.3%). This group (16 – 65 years) is both the active and the productive age group as such femur fracture result in a severe economic impact [10]. Most of the femur fractures in this study occur in the male gender at a ratio of 2:1. The study done by Ekwunife et al. in Enugu, Nigeria, found a similar gender distribution with a ratio of 2.3:1 [10]. Femur fractures were bilateral in 14 individuals accounting for 5.2%. A similar study showed a 1.8% bilateral involvement with an equal incidence of right and left femur involvement [11]. Bilateral involvement of these bones showed the high energy of the force causing this fracture. About eighty-six per cent of the fractures were closed. A similar study done elsewhere showed that 78% of the fractures were closed [12].

We found falls to be the most common cause of femur fractures in the studied population (36%), and this was followed by injuries from motor vehicle road traffic accidents (31.5%). Femur fractures from falls occur mostly in the elderly and children (<15 years). Some of the reasons for such an outcome include gait disturbance, restricted mobility as well as the use of multiple medications were found to be responsible in the elderly, while curiosity to explore the environment, and playing unsupervised in the pediatric age group.[13,14] The elderly population, apart from being involved in a road traffic crash, is also predisposed to sustaining femur fractures from falls due to factors such as advanced age, female gender, physical inactivity, alcohol and tobacco consumption, diabetes mellitus, osteoporosis, cerebrovascular accident, hypothyroidism, and other chronic diseases [15]. The pediatric age group accounted for 21.2% of femur fractures. The absence of an appropriate playground for children in our environment as well as the engagement of children in street hawking may be some of the predisposing factors for this incidence in these patients [13].

Like in this study, femur fracture as a result of motor vehicle and motorcycle road traffic accidents occurs more in the active age group with higher incidences among young adults and adults. This is because of the increase in the use of these means of transportation as a way of income generation in public transportation [14]. Other studies showed road traffic crashes as the most common cause of femur fracture, especially the shaft of the femur [16].

Most of the fractures involved the shaft of the femur bone (60.5%), while pertrochanteric and neck of the femur fractures were also of relatively higher incidence in this study, 13.8% and 10.8%, respectively. The shaft of the femur is the longest part of the femur and extends from about 5cm below the lesser trochanter to about 5cm above the adductor tubercle [3] and as such, it is exposed to the high-impact trauma of the injury [17]. Femoral shaft fractures are common injuries in childhood. In a Swedish study, children less than 4 years old in

Sweden had their femur shaft fracture following falls, while those between 4 and 12 years had most of their fractures following a sporting activity, and those above 13 years had most of their injuries following a road traffic crash [18]. In adults, femur shaft fracture was observed to have a similar risk in both males and females [19], and 78% of femur shaft fractures were observed to be secondary to road traffic accidents [16]. Pertrochanteric and femur neck fractures may follow an indirect trauma mechanism coupled with associated underlying conditions such as osteoporosis, cerebrovascular accident, and advanced age may also account for the prevalence of these types of fractures in the elderly [15,17]. The fracture involving the femur head is the least observed in this study (0.3%) because it is hidden in the acetabulum and this was comparable to observations by Anyaehie and colleagues [8].

The most common fracture pattern was comminuted. Other fracture patterns include transverse, oblique, and spiral varieties. These classifications are based on roentgenographic appearances and observations confirmed at surgery where applicable. Comminuted fractures were the most common fracture pattern observed in this study. This finding was similar to that observed by Magerl et al., with comminuted fracture patterns accounting for 63% [20]. However, Salawu et al. reported transverse fractures as the commonest fracture pattern, accounting for up to 53.5% of the fracture patterns [21]. Operative fixation was done for most (value) of the fractures observed in this study.

The young adult population of this study were more likely to leave against medical advice. This corroborated an earlier study done in this centre which found finance to be the main reason for the decision to leave in hopes of getting cheaper treatment with the traditional bonesetters [22].

For this study, we could have employed a more universally transmissible classification system like the AO/OTA classification. This was a limitation of the retrospective design of the study.

Conclusion

Fall is the most common cause of femur fracture in our environment, and it occurs more in the elderly and the paediatrics, while road traffic crashes following motor vehicle and motorbike accidents occurred more in young adults and adults. The femur shaft is the most commonly involved region. Introducing environmental designs and road use policies aimed at reducing the incidence of falls and road traffic crashes will reduce the risk of femur fractures significantly.

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