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An Insight to Patterns of Femoral Diaphyseal Fractures among Adult Nigerians: University of Benin Teaching Hospital Experience

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ABSTRACT
Femoral shaft fractures had been noted to be life-threatening. The purpose of this radiologic study was to investigate the patterns of femoral shaft fractures among patients admitted in the University of Benin Teaching Hospital between 2007 and 2011. Plain films from a total number of 203 patients aged between eighteen and sixty seven years were collected, comprising of 118 males and 85 females, from the Department of Radiology, University of Benin Teaching Hospital in Benin City, Edo state, Nigeria. Fracture morphology was classified according to the AO (Arbeitsgemeinschaft für Osteosynthesefragen), the Association for the Study of Internal Fixation. The frequency of femoral shaft fracture was significantly higher in males than in females. There was no significant difference in frequency of femoral shaft fracture between the right and left sides. The highest frequencies of femoral shaft fracture were recorded between ages 18 to 47 years. After age 47, there was a significant reduction in the frequencies of femoral shaft fracture. The most frequent type of femoral shaft fracture is the simple types. The most frequent type of femoral shaft fracture is road traffic accident. The most prevalent group of simple femoral fracture type is the transverse group. All the simple fractures studied occurred in the middle zone. In conclusion, since femoral shaft fracture is an issue of harsh economic consequences, various should be taken by all the parties involved so as to address this menace.

Keywords: fracture, radiology, femoral shaft

INTRODUCTION

The femur (thigh bone) is the longest, strongest, largest and heaviest tubular bone in the human body [1,2,3,4] and one of the principal load-bearing bones in the lower extremity [4].

In spite of the femur's strengths it is not immune to injury and when the femur is injured the situation may become life threatening [4]. Since the femur is such a strong bone with ample protection supplied by large muscle it can only be injured by significant force or by being weakened by age or disease. Femur fractures are seen most commonly in two age groups.

The first age group is individuals that are less than 25 years old. The most common mechanism of injury for this age group is on and off-road vehicular accidents. Victims in this age group are also more likely to take part in high impact sports. Individuals who participate in low impact sports are not free of risk. Sports that put repetitive stress on the femur such as running or tennis are at risk of stress fractures and femoral neck fractures. Since these fractures are caused by trauma they referred to as traumatic fractures.

The second age group is individuals older than 65 years old. While this age group is not the only group to suffer from bone weakening cancer and osteoporosis, it is the group that has the greatest occurrence of this problem. Chronic diseases and age weakens the bones and this is reason that this age group is at high risk of femur fracture. Disease may weaken the entire bone and fractures may occur in the hip and femoral neck as well as the mid-shaft. In most cases active individuals are mostly affected. The fractures occur after falls or as a result of repetitive stress being placed on the bone. An individual who has a history of bone weakening disease does not need to be active to suffer a fracture. In some cases, fractures can occur in bed bound patients while the patient is being moved for bathing or sheet changing. In cases where a fracture has occurred in the absence of significant trauma the fracture would be called a pathologic fracture.

Femoral shaft fractures often result from high energy forces associated with possible multiple system injuries [1,4,5]. Fractures of the femoral diaphysis can be life-threatening on account of an open wound, fat embolism, adult respiratory distress syndrome (ARDS) [6], or resultant multiple organ failure [1,5,7].

Femoral shaft fractures can lead to a major physical impairment, not because of disturbed fracture healing, but rather due to fracture shortening, fracture mal-alignment, or prolonged immobilization of the extremity by traction or casting in an attempt to maintain the fracture length and alignment during the early phases of healing [1]. Even minor degrees of shortening and mal-alignment can eventuate in a limp and posttraumatic arthritis [1,5].

Femoral shaft fractures are among the most common major injuries that an orthopedic surgeon will be required to treat [4,8]. Although most musculoskeletal injuries occur in a predictable manner, as dictated by the forces involved and the structure of the region, there are always certain fractures that are unique to each injury [8]. The art of femoral shaft fracture care is a constant balancing of the often conflicting goals of anatomic alignment and early functional rehabilitation of the limb [1].

Femoral shaft fractures are commonly thought to be primarily associated with severe trauma in young persons. Low energy violence as a cause of these fractures, especially among the elderly, has been mentioned only sporadically in epidemiologic studies of fractures of the femoral shaft [9,10,11,12]

Researches investigating the sites and types of femoral shaft fractures are not very common and even much scantier. Although demographic data of the patients have been analyzed in some populations [9,10,11,12,13] little attention has been paid to the characterization of the fracture patterns using morphologic classification systems in Nigeria. Thus, the purpose of this study was to investigate the frequent femoral shaft fractures encountered among Nigerians and their causes. Epidemiologic studies such as this offer important data contributing to improved fracture treatment or better patient care. Surgeons should have knowledge of the spectrum of fractures they treat, not only for an intrinsic educational value, but also to allow resources to be allocated on the basis of projected numbers of patients. The ability to predict the level of admissions to a trauma unit is useful for administrative and training purposes.

MATERIALS AND METHODS

The study was carried out retrospectively in the Department of Radiology, University of Benin Teaching Hospital in Benin City, Edo State, Nigeria. Plain films of X-ray (both anteroposterior and lateral views) from a total number of 203 patients aged between eighteen and sixty seven years (18years – 67years) taken between 2007 and 2012 were used for the study. These comprised of 118 males and 85 females. The plain films that were selected for the study were strictly those of Adult Nigerians based on the information given by the subjects and filled in their cards. Non-Nigerians were not included in the study.

Fracture morphology was classified according to the AO (Arbeitsgemeinschaft für Osteosynthesefragen), the Association for the Study of Internal Fixation [14] into three main types (simple, wedge and complex) with three main groups (spiral, oblique and transverse for simple fractures; spiral, bending or fragmented wedge for wedge fractures; and spiral, segmental, and irregular for complex fractures) The fracture angle was estimated between a line perpendicular to the long axis of the femur and the main fracture line. Fractures with an angle of less than 30 degrees were considered transverse [14].

Causes of fractures were grouped into 3; those caused by road traffic accidents, those caused by falls and those as a result of various other causes.

The data were analyzed using Statistical Package for Social Sciences (SPSS) version 16.0. The frequencies of femoral shaft fractures were reported as numbers and percentages. The differences in frequencies were compared using Chi-Square Test. The differences were considered statistically significant at 95% confidence level i.e. when probability is less than 0.05 ($P<0.05$).

RESULTS

Results of this study are shown in figure 1-9.

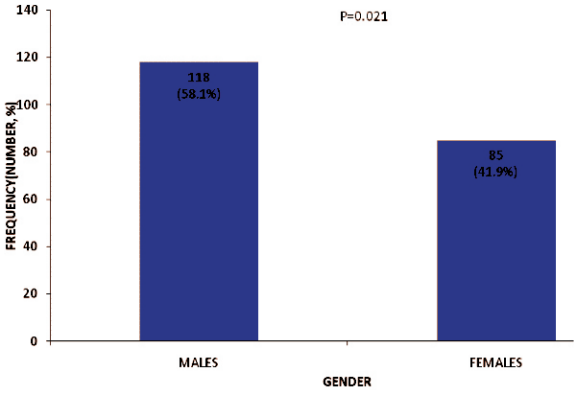

Figure 1: Comparison Between The Frequencies Of Femoral Shaft Fractures In Males And Females From figure 1 above, the frequency of femoral shaft fractures was significantly higher ($P<0.05$) in males than in females.

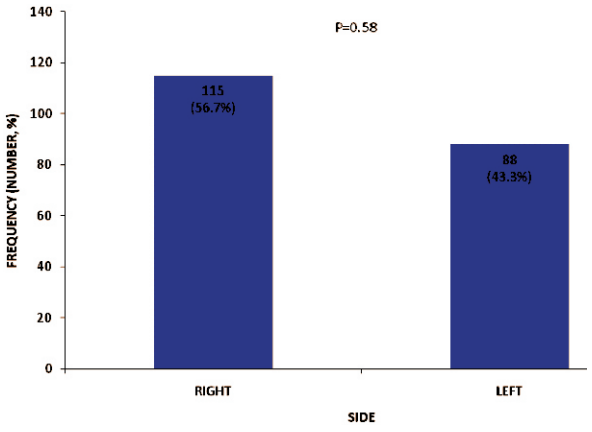

Figure 2: Comparison Between Frequencies Of Femoral Shaft Fractures On The Right And Left Sides

From figure 2 above, there was no statistically significant difference (P>0.05) between the frequency of femoral shaft fractures on the right and left sides.

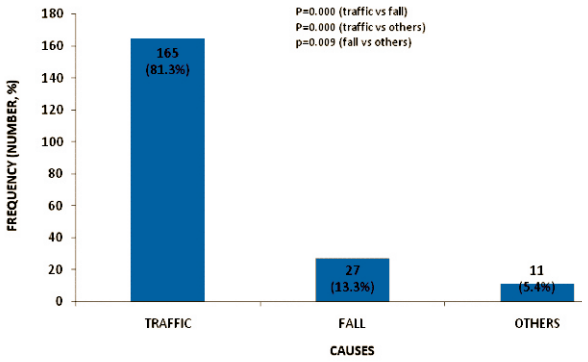

Figure 3: Comparisons Between Different Causes of Femoral Shaft Fractures From figure 3 above, frequency of femoral shaft fractures caused by road traffic accidents was significantly higher (P<0.05) than those caused by falls and other causes. Moreso, the frequency of femoral shaft fractures caused by falls was significantly higher (P<0.05) than those caused by other causes apart from road traffic accidents.

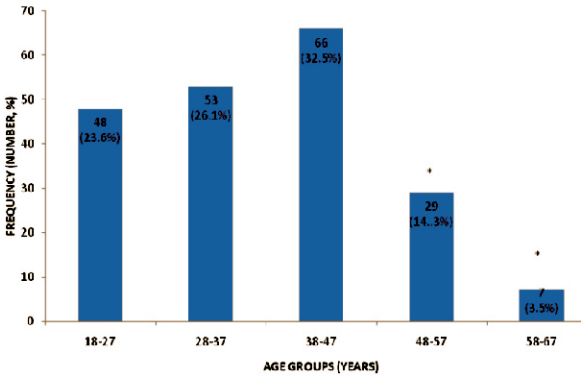

Figure 4: Comparisons Between Frequencies of Femoral Shaft Fractures in Different Age Groups From figure 4 above, there was increase in frequency with increase in age from age group 18-27 years to38-47 years. However, there was no statistically significant difference (P>0.05) between the frequencies of femoral shaft fractures in age groups 18-27, 28-37 and 38-47. Thereafter, there was a significant reduction (p<0.05) in the frequency of femoral shaft fracture with increase in age.

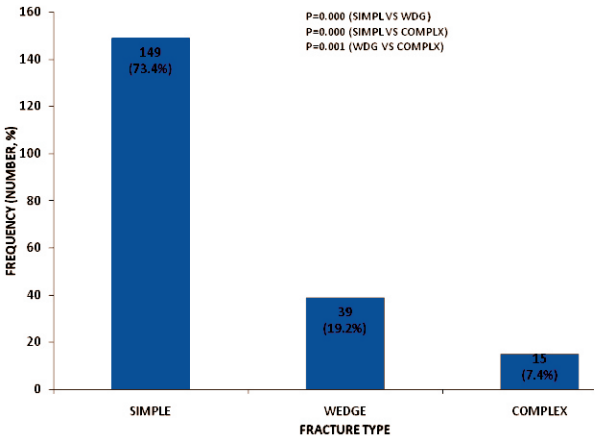

Figure 5: Comparisons Between the Frequencies of Femoral Shaft Fracture Types From figure 5 above, the frequency of the simple type of femoral shaft fracture was significantly higher (P<0.05) than those of the wedge and complex types whereas the frequency of the wedge type was significantly higher (P<0.05) than that of the complex type.

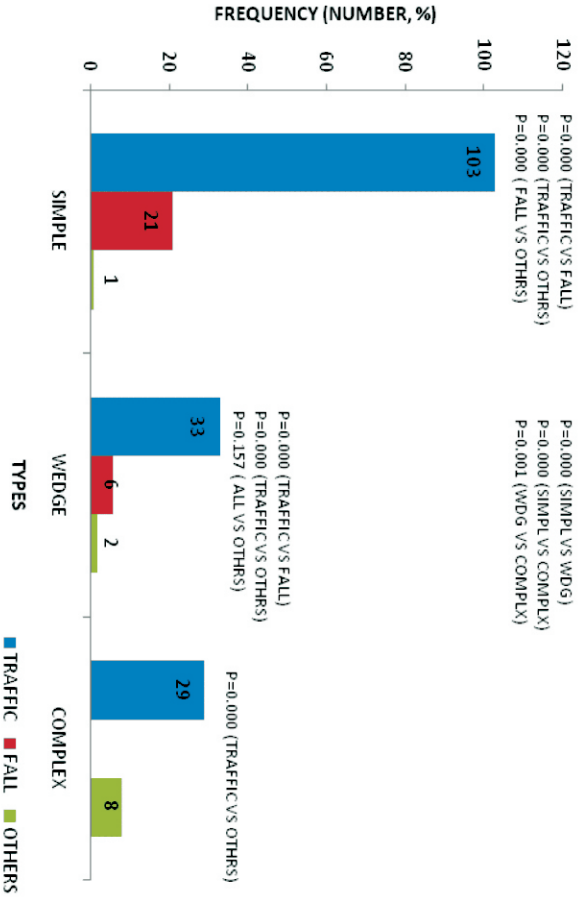

Figure 6: Comparisons Between Different Causes in Different Types of Femoral Shaft Fractures From figure 6 above, the most significant cause (P<0.05) of all types of femoral shaft fracture was road traffic. Furthermore, the frequency of simple type of femoral shaft fractures caused by fall was significantly higher (P<0.05) than those from other causes. In wedge type, there was no statistically significant difference (P>0.05) between the ones caused by falls and those from other causes. In complex type, there was no fracture as a result of falls.

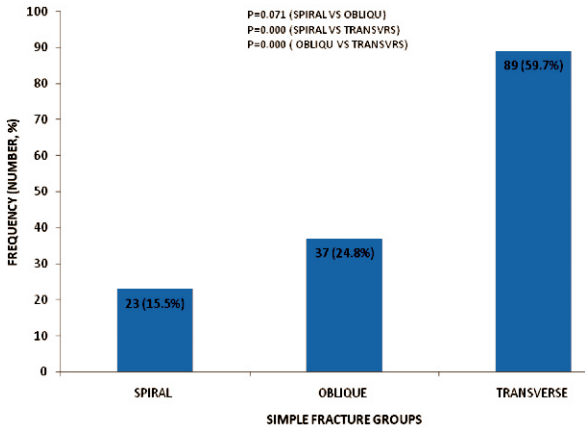

Figure 7: Comparisons Between Groups of Simple Femoral Shaft Fractures From figure 7 above, the frequency of the transverse group was significantly higher (P<0.05) than those of the spiral and oblique groups. There was no statistically significant difference (P>0.05) between the frequencies of the spiral and oblique groups.

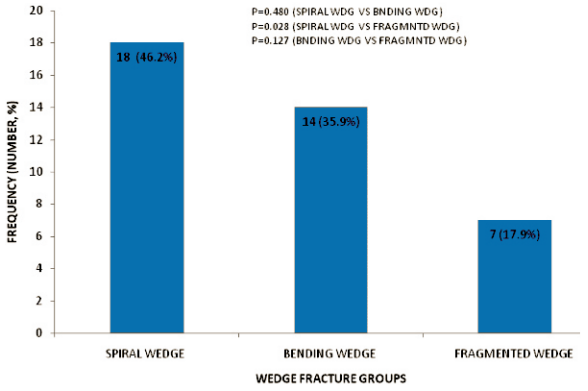

Figure 8: Comparisons Between Groups of Wedge Femoral Shaft Fractures. From figure 8 above, the frequency of the spiral group was significantly higher (P<0.05) than that of the fragmented group. There was no statistically significant difference (P>0.05) between the frequencies of the spiral and bending groups. Moreso, there was no statistically significant difference (P>0.05) between the frequencies of the fragmented and bending groups.

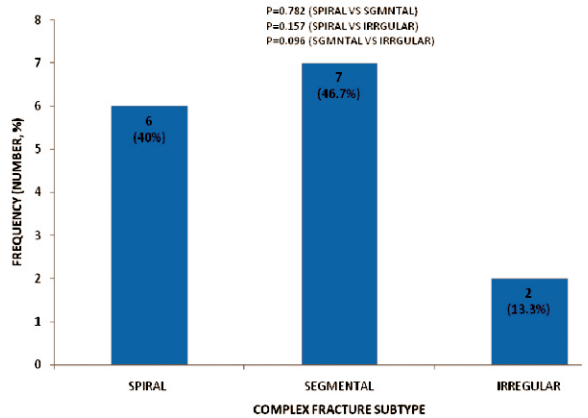

Figure 9: Comparisons Between Groups of Complex Femoral Shaft Fractures. From figure 9 above, there was no statistically significant difference (P>0.05) between the frequencies of all the groups of complex fractures.

DISCUSSION

This study presents pattern of femoral diaphyseal fracture among Nigerians. The greater percentage of the subjects used in this study was those who were fortunate enough to be alive and be taken to the hospital after been involved in road traffic accident. However, there remain some groups who unfortunately lost their lives as a result of which there was no need for them to be admitted to the hospital.

Road traffic accident is one of the leading causes of deaths worldwide with the developing world most hit. Previous studies [15] has shown that lack of airbags in vehicle, non-usage of helmets and over speeding as important factors associated with road traffic accidents. Bad road conditions such as pot holes, sharp bends, and unstable bridges are all conditions seen in most African and Asian countries [16,17,18].

It is estimated that deaths resulting from road traffic accidents is almost 1.2 million worldwide while injuries from such accidents is estimated at 50 million [19]. Motor vehicle accidents ranked 9th in order of disease burden and was projected to be ranked third in the year 2020 [20]. Nearly three quarters of deaths resulting from motor vehicle crashes occur in developing countries [21].

In Nigeria the commander Federal Road Safety Corps (corps marshal) declared in April 2009 that 5,157 deaths occur through road traffic accidents in the last 3 years out of 18,308 accidents reported while 13,251 had different forms of injuries [22,23]. Also in Nigeria reports showed an average of 23 daily accidents and 3 deaths per day between January to March, 2009 [18]. Statistics shows that while developing countries own only 32% of the world's vehicles, they account for 75% of annual accident fatalities [24].

Nigeria is ranked 191 out of 192 countries in the world (second worst) with unsafe roads with 162 death rate per 100,000 population from road traffic accidents [18]. Factors responsible for the increase in road traffic accident include human, vehicle and road factors. Nigerians have a general apathy to obeying law and order. Most motorist never attended driving schools, thus are ignorant of road traffic laws.

Moreso, social habits of smoking and drinking is not uncommon among road transport workers in Nigeria and is a major cause of fatal road traffic accidents.

Menaces resulting from road traffic accidents in our region are on the increase and is in tandem with reports from other regions of the country and Worldwide. The present study investigated the prevalence of various types of femoral shaft fractures among patients admitted in the University of Benin Teaching Hospital, Benin City, Edo state, Nigeria.

The frequency of femoral shaft in this study was found

to be significantly higher (P>0.05) in males than in females. This could be as a result of the fact that men in our society are more mobile, able to take more risks and involved in more dangerous activities than the females. However, there was no statistically significant difference found between the frequencies of femoral shaft fractures on the right and left sides. This could be as a result of similar tensile strengths on both femurs. This is however subject to further studies.

The most prevalent type of femoral shaft fracture recorded was simple fracture (73.4% of all the fractures studied) of which the transverse group was the most dominant (59.7% of the simple fractures and 43.8% of all the fractures studied). This corresponds to a previous work by Admassie *et al.* [25].The dominance of simple transverse fractures calls for setting a day care surgery for operatively fixing the fractures. This will help to increase the turnover of patients occupying beds – a major problem in developing countries. Findings in this study also call for a need to collaborate with the public, drivers, the police, policy makers and health service providers for interventions in prevention and effectively treating femoral fractures and other road traffic injuries. However, there is need to collect supporting national data and information on road traffic injuries in order to develop specific intervention at different levels.

The distribution of femoral shaft fractures according to the AO Type in the epidemiologic study (I): Type A(simple) 73.4%; Type B (wedge) 19.2%; and Type C (complex) 7.4%, was dissimilar to the percentages reported by some AO clinics (Type A 53%, Type B 34%, and Type C 13%) [14]. However, with 27 subgroups with additional ramifications, the AO classification seems unnecessarily detailed and complex in classifying femoral shaft fractures. This observation has been pointed out by other authors as well [5,26,27].

The highest frequency of femoral shaft occurred within the 3rd to 5th decade of life is consistent with other studies in Nigeria and Western World [16,17,18]. This could be due to the fact that this consists of the agile, active and very mobile age range associated with increase transit from place to place, increase in risk taking and it's the age range associated with increased use of alcohol and drug intoxication.

The very low incidence of femoral shaft fractures amongst the elderly, greater than 50 years of age could be due to the fact that they are the geriatric group associated with decreased mobility, most are retired or too sickly therefore are Sedentary and seldom found travelling on the roads. This pattern is also observed in other studies [16,17,18].

It is recommended that the Government should equip law enforcement agents involved in regulating and monitoring road users to ensure and enforce safe driving. Road networks in the state and country entirely should be repaired, properly maintained, widened and fully equipped with road signs to assist motorists. Drivers' license should be issued only to qualified people. Our health facilities should be modernized and fully equipped with emergency gadgets and drugs with adequate manpower to man them.

Furthermore, citizens should change their attitudes positively, stop reckless driving, obey traffic codes, stop alcohol or drug intoxication. All road traffic accident deaths according to Nigerian Law are Coroner cases and should be reported to police for investigations.

Moreso, corruptions on road law enforcement should stop. Drivers' licenses should be issued to qualified people. Vehicles that are not road worthy should be stopped from plying the roads which should be cleared of broken down vehicles.

In conclusion, since femoral shaft fracture is an issue of harsh economic consequences, various should be taken by all the parties involved so as to address this menace.

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