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Patterns of traumatic long-bone fractures in North-Eastern Nigeria: a prospective multicenter study in 5 tertiary hospitals in Nigeria

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ABSTRACT

Background: Traumatic musculoskeletal injuries have formed a significant burden on healthcare delivery worldwide. Long bone fractures are the most common musculoskeletal injuries encountered in this category and with the advent of insurgency in the northeastern part of Nigeria, there has been a rising incidence of assaults, gunshots, and other traumatic causes of long bone fractures.
Methods: A prospective cross-sectional study of patients with traumatic long-bone fractures in north-east Nigeria presenting in the tertiary hospitals involved in the study during the 6months study period (September, 2023 to February 2024). information of all patients presenting with traumatic long bone fractures were collected; biodata, presenting complains and findings on examination including the Glasgow coma scores were collected and documented. Radiological findings and intervention given. All information were collected and documented using a structured questionnaire. Data collected were analyzed using SPSS version 29.
Results: 227 patients were seen from the five major tertiary centers in north-eastern Nigeria that participated in the study. The 123 patients (54.2%) from Abubakar Tafawa Balewa university teaching hospital (ATBUTH)-Bauchi, 43 patients (18.9%) from Modibo university teaching hospital (MAUTH)-Yola, 32 patients (14.1%) were seen in Federal medical center (FMC)-Jalingo, 18 patients (7.9%) from federal teaching hospital (FTH)-Gombe and 11 patients (4.8%) from Maiduguri teaching hospital Maiduguri (UMTH)-Maiduguri. The 178 (79.1%) were males and 47(20.9%) females, making a male to female ratio of 4:1.
Conclusions: Long bone fracture causes a significant health care burden in north-East Nigeria with a high incidence of road traffic accidents, assaults and gunshots likely from the increasing effects of insurgency and kidnappings activities in this region.

Keywords: Trauma, Long bone, Fractures, Mortality, Head injury

INTRODUCTION

Significant proportion of the total world health expenses is attributed to musculoskeletal injuries. One of the frequent non-fatal injuries reported worldwide is long bone fracture attributed to trauma, osteoporosis etc.[1]

According to world health organization (WHO), global burden of disease estimated a combined extremity injury including long bones fractures (LBF) from falls and road traffic crashes (RTC) ranged between 1000-2600 per 100,000 per year in low- and middle-income countries.[2]

Musculoskeletal trauma remains a global health burden, with no reliable population-base incidence. The occurrence of fractures with specific age and gender-pattern has been recognized. However, the fracture epidemiology is bound to change overtime with societal and regional differences.[3]

A fracture is any loss in the continuity of a bone. Long bones in the body are femur, tibia, fibular, humerus, radius, ulnar and clavicle. The distribution of LBF varies with the etiological factors such as RTC-speed of the vehicle and type of vehicle, height in falls, types of weapons in assaults.[4] this factor varies from country to country, region to sub-regions. In countries with little or no traffic regulations, motor vehicular collision remains major external cause of fracture.[5]

The type and pattern distribution of diaphyseal LBF is entirely dependent on age, degree of the severity of the injury and involvement of surrounding soft tissue.[3,5]

The fracture pattern is basically classified into open or closed. In open fractures there is a communication between the fracture site and or fracture hematoma with the external environment.[5,6]

Lower extremity are more commonly exposed to traumatic injuries than other anatomical part of the body and the personality of the fracture are basically classified into simple fracture, wedge fracture and complex fracture. These comprise the following subtypes transverse, oblique or butterfly, spiral, segmental and comminuted. Essentially the classification was based on stability of the fractures, degree of soft tissue involvement, and prognosis for recovery.[5] comminuted fracture with stellate pattern were also reported in ballistics injuries.[7]

This study aims to establish a database for the pattern of presentation of all traumatic long bone fractures in the north-eastern part of Nigeria including but not exclusive of age and sex distribution. To have an overview of the pattern of presentation of such fractures and the earliest methods of bone stabilization employed, to establish the prevalence of such injuries, possible contribution to its severity, presence or absence of accompanying head injury, and the commonest recurrent mechanism of these injuries. The injury pattern in patients with trauma has been established to be highly influential; in mortality, post-traumatic course, the physical and psychological outcome as well as the post-traumatic quality of life.[8]

METHODS

This is prospective cross-sectional study of all patients who present with traumatic long-bone fractures in the tertiary hospitals involved in the study during the 6months study period, (September, 2023 to February 2024). The tertiary center located in each state of north-eastern Nigeria of the country included; ATBUTH- Bauchi state. FTH, Gombe state. FMC Jalingo, Taraba State. MAUTH-Yola, Adamawa State. And university of, UMTH Borno state. These hospitals are the major referral centers that see must trauma cases and injuries that happen within the region of study and form the most significant ring of care for all traumatic injuries and fractures in these regions. Ethical clearance for the study was gotten from ethical committee of all the participating hospitals before the commencement of the study. The patients were informed of the study after which informed consent was gotten from them if they choose to participate. The study duration lasted for 6 months during which data of all patients presenting with traumatic long bone fractures who gave informed consent were collected. Information such as the biodata of the patients, the presenting complains and findings on examination including the Glasgow coma scores were noted and documented. Radiological findings of the fractures were also documented. Inclusion criteria; Patients of all age groups and gender presenting during the period of study with long bone fractures who agreed to participate. Exclusion criteria: all other fractures other than long bone fractures and Patients who do not give informed consent. Data collected was analyzed using SPSS version 29.0.

RESULTS

During the period of study, a total of 227 patients were seen from the five major tertiary centers in north-eastern Nigeria that participated in the study. 123 patients (54.2%) were seen in ATBUTH-Bauchi, 43 patients (18.9%) were seen in MAUTH-Yola, 32 patients (14.1%) were seen in FMC-Jalingo, 18 patients (7.9%) from FTH-Gombe and 11 patients (4.8%) from UMTH-Maiduguri. 178 (78%) were males and 49(22%) females, making a male to female ratio of 4:1. The commonest ethnic groups are Hausa (42.7%) and Fulani (23.8%), other ethnicity includes; Igbo, Kilba, Kanuri, Michika etc.

The major age groups affected are those between the age of 15-34 years (52%) and 35-54 years (26.4%) that is age groups 15-54 and those least affected are age group >75 years (1.8%), other age groups; <15 years (11%) and 55-74 years (8.8%). The major occupation is business (15.6%), students (13.4%), farming (12.5%), artisans and civil servants (9.4%), drivers (8.9%), housewife (8.9%). 82.4% of the patients have normal weight by BMI whereas 14.5% are overweight, 2.3% are underweight.

One hundred and twenty-two (54.2%) were open fractures and 103(45.8%) of the fractures were closed. Of the open fractures, 30.3% were Gustilo-Anderson (GA) type IIIA, GA II (27.9%), GA IIIB (23.8%), GA I (11.5%) and GA IIIC (6.6%). The fractures involve mainly; Tibiofibular 35.2%, femur 34%, radioulnar 15.5% humerus 14.4%. Figure 1 shows cause of the fractures in 139 patients (61.2%) was road traffic accidents, assaults 21 (9.3%), pedestrian ran over 17 (7.5%), fall from height 15 (6.6%), gunshot 13 (5.7%), domestic accident 13 (5.7%), among the road traffic accidents victims, 67.2% were passengers while 32.8% were drivers. Among the passengers, 50.5% were sitting at the back seats, 25.3% on the front seats while 24.2% were seated on the middle seats. Still on the road traffic accidents, the major types of collision were heads-on collision 24.8%, car veering off the road 17.2%, side-on collision 15.9%, hitting passers-by/animals 8.9%, (Figure 2).

One hundred and fifty nine of the patients (79.1%) presented with accompanying head injury, 42 (20.9%) without head injury, however, 51.2% of the head injuries were mild, 26.8% were severe head injury and 22% were moderate head injuries.

The commonest radiological pattern of fracture was transverse 33.5%, oblique 26.3%, comminated 20.6%, segmental 6.7%, spiral 5.3%, crushed 2.4%, greenstick 0.5% (Figure 3).

Majority of the patients had no comorbidity 89.4%, 4.5% were hypertensives, 2.6% had diabetes mellitus and 1.6% were hepatitis B positive. Only 4.8% of the patients smoke cigarette the rest were nonsmokers. The commonest methods of skeletal stabilization were external fixators (15.2%), open reduction and internal fixation (ORIF) with plate and screw (12.2%), plaster-of-Paris cast (11.2%), ORIF with IM nail 9.8%. About 5.4 of the patients signed to leave against medical advice to seek care from traditional bone setters.

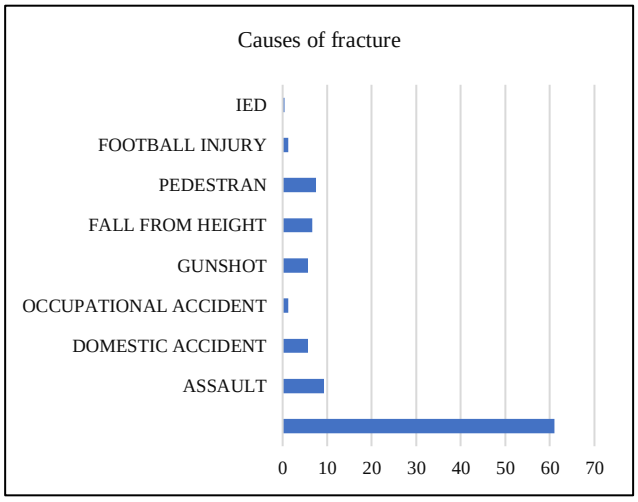

Figure 1: Causes of long bone fractures versus frequency in percentage.

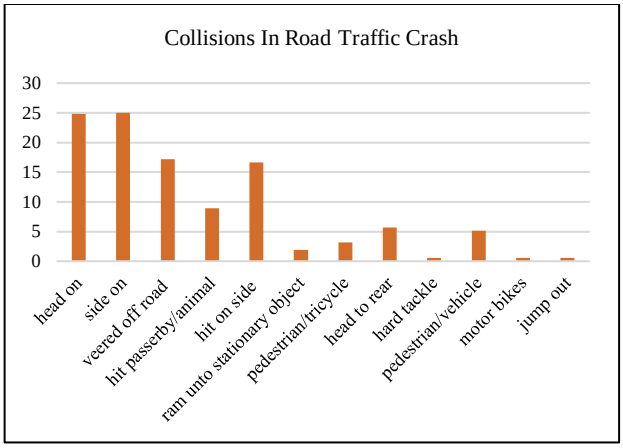

Figure 2: Types of collision seen in RTC versus frequency in percentage.

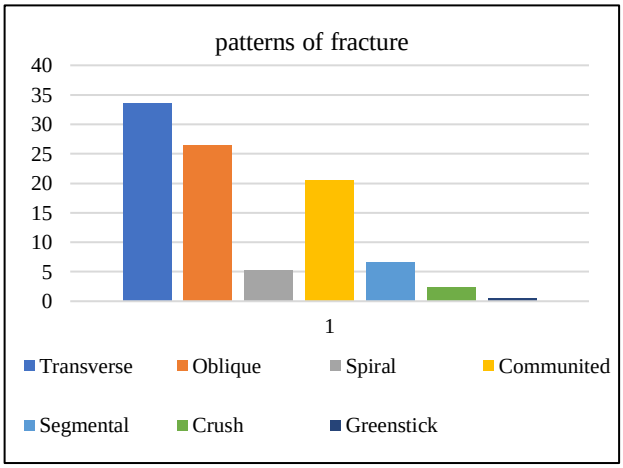

Figure 3: Patterns of long bone fractures versus frequency in percentage.

Table 1: Demographic information of patients studied.

Demography	N	Percentages (%)
Sex		
Male	178	78
Female	49	22
Age (in years)		
<15	25	11
15-34	118	52
35-54	60	26.4
55-77	20	8.8
>75	4	1.8
Occupation		
Business	35	15.6
Students	46	20.5
Farmers	28	12.5
Artisan	21	9.4
Civil servants	21	9.4
Drivers	20	8.9
House wives	20	8.9
Others	36	14.8

Others: Herder, hunter, retired CV and laborer

DISCUSSION

This was a prospective multi-center study aimed at identifying the patterns of traumatic long bone fractures focused on the North Eastern region of Nigeria. A total of 227 patients were seen within the period from the five tertiary health facilities in this region involved in the study. One twenty-three of the patients were seen in ATBUTH-Bauchi, accounting for 54.2%, others as thus; 43 patients (18.9%) were seen in MAUTH-Yola, 32 patients (14.1%) were seen in FMC-Jalingo, 18 patients (7.9%) from FTH-Gombe and the least being 11 patients (4.8%) from UMTH-Maiduguri likely because of good road networks, reduction in insurgency activities and state policy to limit commercial motorcycle activities.

Socio-demography

The predominant ethnicity was Hausa and Fulani, accounting for 42.7% and 23.8% respectively; reflecting the sociodemographic distribution of residents in Northeastern Nigeria.

Males were mostly affected, accounting for 79.1% while female account for 20.9%, making a male to female ratio of 4:1. Nana et al in Cameroon found a male to female ratio of 3.1:1.[6] A study by Terje et al found a bimodal distribution with a male to female ratio of 2:1 for those under the age of 50years and 1:3 in favor of the females for those above the age of 50 years. This is because younger men are more likely to take up jobs, engage in sports and adventures that have higher risk for fractures than females, while above the age of 50 years more women have become menopausal thus losing the protective effects of estrogen and become more prone to fractures.[9-11]

Majority of the patients were business men (16.6%), although the data shows that trauma affected a wide range of people regardless of their occupation. Able bodied young men in their daily routine actively working, travelling and seeking income are exposed to risk of road traffic accidents and long bone fractures as data from this study shows. This is also consistent with patterns of male predominance of LBF as in previous studies.[10-12]

The ages range between 15 and 34 years, accounting for majority (55.4%) of patients; Closely followed by middle aged men between the ages of 35 and 54 years, accounting for 24.8%.

Most of those involved had no comorbidities. As expected, comorbidities like hypertension and diabetes mellitus are not commonly associated with the young age group.

Only 5.5% of them were smokers and only 6.7% had a previous history of fracture, this is in keeping with other studies that have established a relationship between a previous history of fracture with a possible refracture, usually seen with low energy fracture and fracture in middle age women.[13,14]

Cause of fracture

In North Eastern Nigeria, motor vehicular road traffic accident is the predominant cause of trauma (62.9%) and majority of the victims are back seat passengers (52.8%). Similar findings were made in South-west region of Cameroon.[6] Assault is another significant cause of long bone fractures in the region (9.9%) and gunshot injuries (5.7%), these may be related to the security challenges with increasing insurgency and kidnappings that have bedeviled this region over the past years. It is also in contrast with the finding in south-eastern region of Nigeria where assaults and gunshots constitute lowest risk factors for fracture.[5]

Fall from height accounted for (6.6%) this is in contrast to a study of fractures in children in the south-west Nigeria which attributed fall from height as the commonest cause, and also the study of Nubian long bone fractures from examination of Christian cemetery shows accidental falls as the most common cause of long bone fractures.[15-17]

The contribution of domestic injury to traumatic long bone fractures in North-Eastern Nigeria cannot be overlooked, which accounts for 5.7%. This mainly involved the elderly who miss their step or slip on wet floors and fall inside the house sustaining lower extremity fractures.

Pattern of fracture

The pattern of fractures sustained were predominantly open fractures (54.2%) of the lower extremities involving the tibiofibular (35.2%). This is consistent with findings from previous studies.[18] Majority of these fractures were associated with significant soft tissue injuries GA class IIIa (30.3%), followed by class II open fracture 27.9%. A significant proportion (21.5%) of the fractures had significant soft tissue disruption with periosteal striping leaving exposed bone with its attendant challenge of management with some requiring amputation. The degree of soft tissue disruption associated with these fractures indicate the high energy nature of these injuries. This pattern is similar to findings by Kironde et al and findings in Cameroon.[6,18]

In the upper limb, radioulnar fractures were more (15.5%), while humerus fractures accounted for 14.6%. various studies also show that long bone fractures of the upper limb were less than lower limb fractures.[19,20]

Majority of the fractures were transverse (33.5 %), oblique (26.3%) and comminuted (20.6%), in keeping with the high energy nature of road traffic accident crashes. This is similar to a finding in South-West Nigeria with higher incidence of transverse fracture followed by communicated frcture, also for Loder et al who reviewed mostly battered children over a 2-years period.[16,21] Finding is however in contrast to that of Nana et al who reported higher comminution rate of up to 64.6%.[6] Probable difference may be in the mode of transportation in these

regions with higher usage of motor-bikes and tricycles which can be contributory to the variation in these patterns and can be a subject of further study.

Among the road traffic crash patients, 50.5% were rear/back seaters, 25.3% were front seaters and 24.2% sat in the middle. This high percentage of fracture among rear seaters may be because they are least likely to use seat belts, more studies is also needed on this.

Over 82.4% of the patients had normal BMI while 14.5% were underweight, the association of BMI with the risk of fracture has been explored, low BMI was shown to increase the risk of fracture likely due to; reduced bone mineral density, less soft tissue cushion, and possibility of muscle weakness.[22]

With regards to intervention and skeletal stabilization, 15.2% had wound debridement with external fixation, consistent with the principle of management of open fractures. ORIF with plates and screws was done for 12.5% of patients, while 11.2% had stabilization with casting. It would be expected that since majority of the fractures were open with significant soft tissue involvement, a higher proportion would have surgical debridement and external fixation, however affordability and costs of implants surgery play a major role in the choice of treatment that patients opt for in this region.

Limitation of this study being a cross sectional prospective study will be the cumbersome nature of follow up of the patients, also, patients can get lost to follow up. A change in in location can also make follow up impossible.

CONCLUSION

Long bone fracture is a significant cause of health burden in North-East Nigeria with a high incidence of road traffic accidents, assaults and gunshots likely from the increasing effects of insurgency and kidnappings activities in this region. Significant number of patients still opt for traditional means of fracture care hence, proper awareness is necessary to curtail this and reduce the deleterious outcomes witnessed often following traditional bone setters' intervention. Government should prioritize health policies that will support resource allocation for trauma and fracture care in this region.

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