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ASSESSMENT OF EXTREMITY BONE FRACTURES AND ASSOCIATED FACTORS AMONG ADULT PATIENTS IN DEBRE MARKOS REFERRAL HOSPITAL, EAST GOJJAM ZONE, NORTHERN ETHIOPIA

A RESEARCH THESIS SUBMITTED TO JIMMA UNIVERSITY, INSTITUTE OF HEALTH SCIENCES, DEPARTMENT OF BIOMEDICAL SCIENCES, ANATOMY UNIT FOR PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR MASTERS OF SCIENCE IN CLINICAL ANATOMY

BY: YOSEPH MERKEB (BSc.)

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JIMMA, ETHIOPIA

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BY: YOSEPH MERKEB (BSc.)

E-mail: yosefmerkebu@gmail.com

Mobile Phone: +25109 67 10 83 67

ADVISORS:

PRINCIPAL ADVISOR

Mr. ASFAW GERBI (BSc., MSc., PhD fellow)

Mobile Phone: +251 09-11-08-03-22

E-mail:asfuug@gmail.com/asfaw.gerbi@ju.edu.et

CO – ADVISORS:

Mr. GETACHEW CHANE (BSc., MSc.)

Mobile Phone: +251 09 13 70 72 63

E-mail: getachewchine@gmail.com

Mr. MENGISTU AYELE (BSc., MSc.)

Mobile Phone: +251 09 29 04 67 17

E-mail: mengistuayele@gmail.com

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JIMMA, ETHIOPIA

ABSTRACT

***Background**: The increasing prevalence of extremity bone fracture can be attributed to modernization, industrialization and increased rate of bone fracture in the society. The occurrences of extremity bone fractures are very common worldwide. Extremity bone fracture is the leading cause of functional disability and death in different age groups in both sex. It may result from road traffic accidents, falls, gunshot, machines, attacks as well as sports. Fracture statistics in Ethiopia provides little knowledge about its prevalence and associated factors needed for prevention. The present study, therefore, aims to determine extremity bone fracture and associated factors in Debre Markos referral Hospital.*

***Objective**: The aim of the study was to assess extremity bone fractures and associated factors among adult patients, in Debre Markos referral Hospital.*

***Methods**: Institution based cross sectional study design was applied among adult patients with extremity bone fractures who were attended surgical ward and orthopedic Emergency department during the study period. Patients who have extremity bone fracture diagnosed by the physician, their age 18+ years and voluntary to participate was included in this study. Patients' age less than 18 years and critical ill patients excluded in this study. Consecutive sampling technique was used based on the availability Patients, who have extremity bone fractures, coming to the hospital during the study period April 21,2018 to June 21,2018.*

***Result:** A total of 144 adult patients who had extremity bone fractures and attended in Debre Markos Referral Hospital from April to June, 2018 were our study subjects. Ninety-two (63.9%) were males and 52(36.1%) were females and their age range from 26 to 77 years (mean age = 52.19 and SD = 10.90). About 77.8% and 56.8% of extremity bone fracture occurred in age group 40 – 50 years and above 72 years in male and female respectively. The chance of exposure to bone fracture was increased in patients who drink alcohol and fighting with people by the factor of 3.91 (AOR [95% CI] 3.91(1.47, 10.38) as compared to those who do not drink alcohol and not fight.*

***Conclusion and Recommendation:** Extremity bone fractures are high in distribution caused by RTA, so that appropriate prevention strategies should be designed and implemented against extremity fractures.*

***Keywords:** Adult, Associated Factors, Debre Markos Referral Hospital, Extremity Fracture, Northern Ethiopia*

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ABBREVIATIONS

BSc	Bachelor of Science
DMRH	Debre Markos Referral Hospital
E.C	Ethiopian Calendar
F.D.R.E	Federal Democratic Republic of Ethiopia
ID	Identification
Km	Kilo Meter
MSC	Master of Science
m^2	Meter square
RTAs	Road Traffic Accidents
SNNP	South Nation Nationalities and People
SPSS	Statistical Package for Social Science
UK	United Kingdom
WHO	World Health Organization

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1. INTRODUCTION

1.1. Background

In adult human there are named 206 bones, the appendicular skeleton (extremities) comprises 126 bones. A limb or extremity is appendage of the human skeleton consists upper and lower limbs, shoulder and pelvic girdles. Fracture is a surgical condition in which there is damage in the continuity of the bone. Fracture may be the result of high force impact or stress, or a minimal trauma injury as a result of certain medical conditions that weaken the bones. Fracture to limb is not only the leading cause of death but also the leading cause of functional disability in adults younger than 45 years of age (1). The occurrence of limb fracture is very common worldwide. Their increasing rate, especially accidental ones, can be attributed to modernization, industrialization and increased rate of violence in the society (38). Medical conditions that can cause extremity fractures includes: osteoporosis, osteopenia, bone cancer, or ontogenesis imperfecta, where the fracture is then properly termed a pathologic fracture (42).

Limb fracture may involve the upper limbs and the lower limbs. It may occur in isolation association with injuries to other parts of the body and may result from road traffic accidents, falls, gunshot, ranked ninth globally among the leading causes of disability adjusted life years lost, and the industrial accidents, attack as well as sports. In fact, currently, the rank of fracture due to road traffic injuries are projected to rise to third position by 2020 (1).

Injury-related fractures contribute to an increase in mortality, morbidity, disability, and health expenditures across the age span. The incidence of fracture is caused by many factors including age, sex, physiology, food habits, occupation, environmental exposure to fracture-producing injury mechanisms and access to prevention programs(2).

Fractures may occur under a variety of clinical circumstances. It is a leading cause of death and disability for people under 45 years in the industrialized world (3). These rates are declining in developed countries but fracture are important and a largely neglected health problem in developing countries(3).The major patterns of fractures include; transverse fractures are those that run at right angles orthogonal to the long axis of the affected bone.

Oblique fractures, cross the shaft at an angle. If the injury involved significant torsion, a spiral fracture may occur; the fragments created by a spiral fracture are often very sharp and pointed, and may cause significant soft tissue injury. Any fracture that divides the bone into more than two separate fragments is said to be comminuted; the degree of comminution is often directly related to the force of the injury (4).

In general, the location of fractures involving the shaft of a long bone can be described by dividing the shaft into thirds (proximal, middle, and distal), and placing the injury by reference to this division (e.g. 'junction of the proximal and middle third of the shaft', 'mid-shaft'). Fractures extending right across a bone (i.e. involving 'both cortices' radio graphically) are called complete fractures. Moreover, fractures that do not extend all the way across the bone are referred to as incomplete (3, 4).

Osteoporosis is generally thought of as a "woman's disease" because the prevalence of osteoporosis and the rate of fractures are much higher in postmenopausal women than in older men. In USA the National Osteoporosis Foundation estimates there are 9.1 million women with osteoporosis and an additional 26 million with low bone mass, which far exceeds the estimated 2.8 million men with osteoporosis and 14.4 million men with low bone mass (41).

In many developing countries, not only is the incidence of various injuries increasing but also the causative factors are changing from the historical patterns such as falling from trees to injuries due to occupational hazards, interpersonal violence and road traffic injuries, which appear to be the leading cause of traumatic fractures (3). Among African nations the rate of injury related limb fracture mortality in 2004 was the highest in Nigeria and the lowest in Egypt (39). South Africa and Ethiopia were second and third, respectively (4). Recent reports from Nigeria indicate that injuries related limb fracture are fast taking over as the leading cause of disability and death in Nigeria, often described as a "hidden disease of epidemic proportion" (39). Injury related bone fracture deaths attributable to road traffic accident was the highest in Egypt (41%) followed by Ethiopia (30%) in 2004(4).

1.2. Statement of the Problem

Injury-related limb fractures contribute to an increase in mortality, morbidity, disability, and health expenditures across the age span. The incidence of limb fracture is impacted by many factors including age, sex, physiology, food habits, occupation and environmental exposure to fracture-producing injury mechanisms and access to prevention programs (6).

In United States the total number of fractures of the upper and lower extremities, fluctuating from year to year, has varied between 12 million and 15 million from 1998 to 2010. Upper limb fractures, including those of the arm, forearm, wrist, hand, and fingers, have accounted for slightly more than one-half of all fractures, with a range of 52% to 59%. In recent years, upper arm fractures have accounted for about 20% of total upper limb fractures. Fractures of the wrist, hand, and fingers occur slightly more often than fractures of the forearm. Lower limb fractures, which include those of the hip and upper leg (femur), lower leg, ankle, foot, and toes, are reported in similar numbers to upper limb fractures, ranging from 11 million to 15 million. Between two-third and three-fourth of lower limb fractures occur in the ankle, foot, and toes. Breaks of the lower leg (tibia and fibula) are the least common overall (51).

A prospective study of the incidence of fracture in the adult population of Edinburgh, related to age and sex show that, there was a higher incidence of fractures in men than women in all age groups from 15 to 49 years, and under the age of 35 years' males are 2.9 times more likely to sustain a fracture than females (6). The peaks were in the third and seventh decades. In the under 50-year group, 70% of the fractures occurred in men and over two thirds were the result of moderate to severe trauma. Over 60% of fractures occurred in middle segment of the shaft of the humerus (8).Other study was done on fracture of the clavicle in the adult, there was an increase in severity of the fractures with age, and was open fractures 59.8%. Fractures of the middle and distal thirds were relatively common. Road- traffic accidents 37.5% and sport 30.9% accounted for most tibialdiaphyseal fractures with simple falls causing most fractures in the elderly. The fibula was intact in 22.3% of the tibialdiaphyseal fractures (9).The USA National Trauma Databank study showed that bicycle-related injuries involving motor vehicles are associated with a high incidence of extremity fractures. Age plays a critical role in the severity and anatomic distribution of injuries sustained, with a stepwise increase in mortality

with increasing age (45). In China, the study done in patients with traffic trauma showed that fracture of extremities (53.3%) occurred most often, pelvic fracture (4.18%) (43).

In Africa, a retrospective analysis of nonfatal road traffic crash victims showed that the commonest injuries were fractures (69.0%) with the tibia/fibula being the most fractured bones (30.3%). Age group of 15–44 years was the most affected (81.9%) (44). A study done in Khartoum revealed that none road-accidents accounted for 84% of the fractures mainly due to sports, domestic injuries and falls; whereas road traffic accidents were 16%. The long bones were affected in 91% of all fractures, the commonest site being the distal end of forearm 26%, followed by supracondylar fracture of the humerus 15%. Open fractures constituted 9.8% (10).

A study done in, AAU, Ethiopia Considering the pattern of fractures as complete or incomplete; two hundred sixty-eights were complete whereas only 57 fractures were incomplete. Although not statistically significant, analysis of the distribution of fractures with regard to bone involvement revealed that fracture is common on the right side for radio-ulnar, ulna, Hand, femur, tibio-fibular, Ankle and Foot. Fracture is more common on the left side for humerus, radius, pectorial girdle, tibia, fibula and Patellar fractures. The proportion of fractures was similar on both sides for pelvic fractures (11). Similar study done in AAU showed that upper and lower limbs were fractured in almost equal proportions, 49.7% and 43.5% respectively.

Other study done in AAU different variants in the nature, pattern and type of fracture were observed. The nature of the majority of fractures noticed were closed fractures accounting (78.68%).The pattern of the majority of the fractures that occurred was complete in (63.5%). With respect to the pattern of fractures, transverse fractures stood out the first (54.9%) followed by oblique (19.4%) and comminuted (17.5%) at the 2nd and 3rd place respectively among the different specific type of fracture. Spiral fractures were (2.6%) and amputated fracture, 2(0.5%), accounted for the least proportion of patterns of fractures. Farther more, the study revealed that closed fracture was significantly more common than compound fracture (3, 40). Concerning in the study area no previous study in extremity fractures. Therefore, the purpose of this study is to investigate the distribution, associated factors of extremity fractures in DMRH.

1.3. Significance of the Study

Even though high magnitude of extremity fracture is reported in Ethiopia, no study has done in DMRH. The knowledge of the magnitude, nature, pattern, causes, factors and site of fractures commonly presenting to an institution helps in planning on their treatment (Surgical and conservative) and it also helps in terms of directing resources (implants and physiotherapy).
The findings may help to identify potential risk factors of extremity fracture, and individuals who are more likely at risk of extremity fracture; addressing those risk factors may help to design strategies to reduce extremity fracture. The result of the study will help hospital managers, regional and national policy makers to understand the magnitude of the problem and factors associated with it; so that it will help the managers and policy makers to come up with appropriate policies and guidelines to prevent the problem.

Thus identification of the condition as one priority area coupled with effective and efficient resource allocation, health policy and management would make a difference in the diagnostic and therapeutic perspective of limb fractures. Therefore, the purpose of this study is to investigate the prevalence, associated factors of extremity fracture and provide baseline information on the same issue in Debre Markos referral Hospital.

2. LITERATURE REVIEW

2.1. Introduction

The global burden of disease study estimated that 5.8 million people die worldwide each year from injuries related fracture that accounts for 10% of the world's deaths, which corresponds to a rate of 97.9 per 100000 populations. Of these 5.8 million people, 3.8 million were male and 2.0 million were female (23). Fractures may occur under a variety of clinical circumstances (25).

2.2. Prevalence and factors associated with extremity fracture

An international evaluation of the Global Burden of Diseases, fractures, and Risk Factors Study 2010 (GBD 2010), identifying all available data on causes of death for 187 countries from 1980 to 2010, showed that the fraction of global deaths due to injuries associated fracture was marginally higher in 2010 (9.6%) compared with two decades earlier (8.8%). This was driven by a 46% rise in worldwide deaths due to road traffic accidents and a rise in deaths from falls (48). Humeral shaft fractures represent approximately 1-5 % of all fractures, in North America. There is a bimodal distribution with peaks primarily in young male patients, 21–30 years of age, and a larger peak in older females from 60–80 years of age (13).

Fracture among the Pakistan's' in Lahore population in decreasing frequency order, involved fractures of the tibia, femur, humerus, ulna and radius. Seventy-one percent (71%) were closed, 29% open fractures (14). According to the study done at UK, the sex specific and age specific pattern of lower limb fracture incidence we observed—namely, a higher incidence of lower limb fractures among men through the first four decades of life and a higher incidence among women older than 50—is also similar to the sex specific, age standardized pattern reported for all fractures (16). Fracture of the tibia/fibula (combined) was the most common 38.5% and multiple limb fracture 21.5% (1).

A study on epidemiology upper extremity fractures was done in Scotland; fractures were defined by their morphology, position, age and sex of the patient and the mechanism of injury, analysis showed that a distribution of the fractures and the peaks were in the third and seventh decades with the division at 50 years of age. In the under 50-year group, 70% of the fractures

occurred in men and over two thirds were the result of moderate to severe trauma. Over 60% of fractures occurred in middle segment of the shaft of the humerus. Less than 10% of the fractures were open (8). Road- traffic accidents 37.5% and sport 30.9% accounted for most tibialdiaphyseal fractures with simple falls causing most fractures in the elderly (9). The study done in Charles University, Europe, the most common fracture in the group was that of the scapular body (52%), followed by fractures of the glenoid fossa (29%), fractures of the processes (11%) and fractures of the scapular neck (8%). The most frequent associated injuries to the ipsilateral shoulder girdle were clavicular fractures (19%) (49). With similar study Clavicle fracture can be grossly divided into three distinct anatomical sites; the medial clavicle, shaft and lateral end. Mid-shaft clavicle fractures are most common, with an incidence of up to 82% of all clavicle fractures. Medial and lateral end fractures account for approximately 18 and 2% respectively, and the prevalence of fractures to the clavicle has been seen to decrease with every decade, after a patient is 20 years of age. However, the ratio of female to male increases with age (50). Other study was done on fracture of the clavicle in the adult, open fractures were 59.8%. Fractures of the middle and distal thirds were relatively common (8).

In Pakistan, victims of road traffic accident (RTAs), there were 67% males and 65% aged 16–35 years, and minor injuries (65%) and fractures (25%) were the most reported (46). Another hospital-based study of admitted patients due to traffic accidents in India revealed that the commonest type of injury was fracture (49.33%) and the most common site of fracture was lower limb (48.2%), and several risk factors such as age, sex, type of vehicle, use of alcohol, absence of driving license and nonuse of helmets are associated with increased occurrence of road traffic accidents (47). In the present study, sex, age, were significant risk factors of the most orthopedic fractures among traffic incidents related inpatients in Taiwan (47).

In Africa, a retrospective analysis of nonfatal road traffic crash victims showed that the commonest injuries were fractures (69.0%) with the tibia/fibula being the most fractured bones (30.3%). Age group of 15–44 years was the most affected (81.9%) (44). A study done in Khartoum disclosed that none road-accidents accounted for 84% of the fractures mainly due to sports, domestic injuries and falls; whereas road traffic accidents were 16%. The long bones were affected in 91% of all fractures, the commonest site being the distal end of forearm 26%, followed by supracondylar fracture of the humerus 15%. Open fractures constituted 9.8% of

the series (10). Study done in Kampala revealed that the road traffic accident accounted for 35.1 % of all limb fracture cases (16). Similar study done in Nigeria teaching hospital showed that RTA which accounted 38.8% of all limb fracture (17).

The study done on orthopedic and major limb Trauma in Adiss Ababa University Hospital, Addis Ababa, Ethiopia showed that males were more affected (73.3%) than female (26.7%)giving a male to female ratio 3:1. The study also revealed that fractures are more common in daily labor (3). Similar study done in Addis Ababa indicate that the highest age group mostly affected was between 21-30 year, 36.5% and the highest peak of male to female ratio occurred in the age group between 31 to 40 years was 5.2: 1. In all age groups the proportion of males is higher for males than for females. The majority of the subjects 81.5% were urban residents whereas only 18.5% were from rural settings. About 21.5% were daily laborers, 15.4% house wives, 12.6% farmers, 12.6% students, 10.9% office workers, 5.2% merchants 4.8% drivers and others 17% by occupation. The proportion of daily laborers, house wives and farmers and students constitute the first three ranks respectively with the proportion of males in daily laborers, farmers and students being higher than females. Several causes responsible as to the etiology of fracture from traumatic to none traumatic factors were identified and nearly all the fractures 99.5% were due to traumatic incidents but only 0.5% were due to pathological fracture. Road traffic accident constitutes the largest proportion, 47.9%, among traumatic causes followed by fall down accident 29.9 % and assaults 6.6 % (16).

The study done in North Gondar, with regard to bone involvement, the highest frequency of fractures occurred in the femur 15.1% followed by tibio-fibular 14% and humerus 13.5%. It was evident that upper limbs or lower limbs were included solely or simultaneously. Fracture to the upper limb alone accounted for 50.53% whereas the proportion of fracture for the lower limbs was 49.42%. It was also recognized that the fracture was either single or multiple at different sites. The proportions of fractures at a single site or multiple sites were 99.55% and 0.44% respectively. Different variants in the nature, pattern and type of fracture were observed. The nature of the majority of fractures noticed were closed fractures accounting 78.68%, compound fractures were smaller in number and proportions only responsible for 21.3%. The pattern of the majority of the fractures that occurred was complete in 63.5% (21). With respect

to the pattern of fractures, transverse fractures stand out the first 54.9% fallowed by oblique 19.4% and comminuted 17.5% at the 2nd and 3rd place respectively among the different specific type of fracture. Spiral fractures were 2.6% and amputated fracture, 0.5%, accounted for the least proportion of patterns of fractures. Similar study done in North Gondar revealed that the proximal and distal fractures for humerus occurred with similar proportion, 36.1% for each while mid shaft fracture accounted for 26% of fracture of the humerus. For radio-ulnar fractures the distal third fracture, 73% accounted for the majority of fractures. The distal fractures accounted for the largest proportion 91.3% of fractures of the radius as compared with the proximal, 6.5% and multiple, 2.2% fractures. Femoral fractures were higher in proximal third 44.1% fallowed by middle third 41.1% and distal third 11.8%. Tibia fractures were higher in the distal third 42.8% followed by middle and distal third each 28.5%. Fibular fractures were higher in the distal third 55.5% followed by proximal third 33.6% and middle third 16.6%. Tibio-fibular fractures were higher in the distal third 68.2% fallowed by middle third 19% and proximal third 12.6% (19).

2.3. Conceptual framework

The Conceptual framework of the study is developed after reviewing previous similar studies to conceptualize the whole research process and to aid as guide for tool development and analysis. The most important factors are classified based on Haddon Matrix.

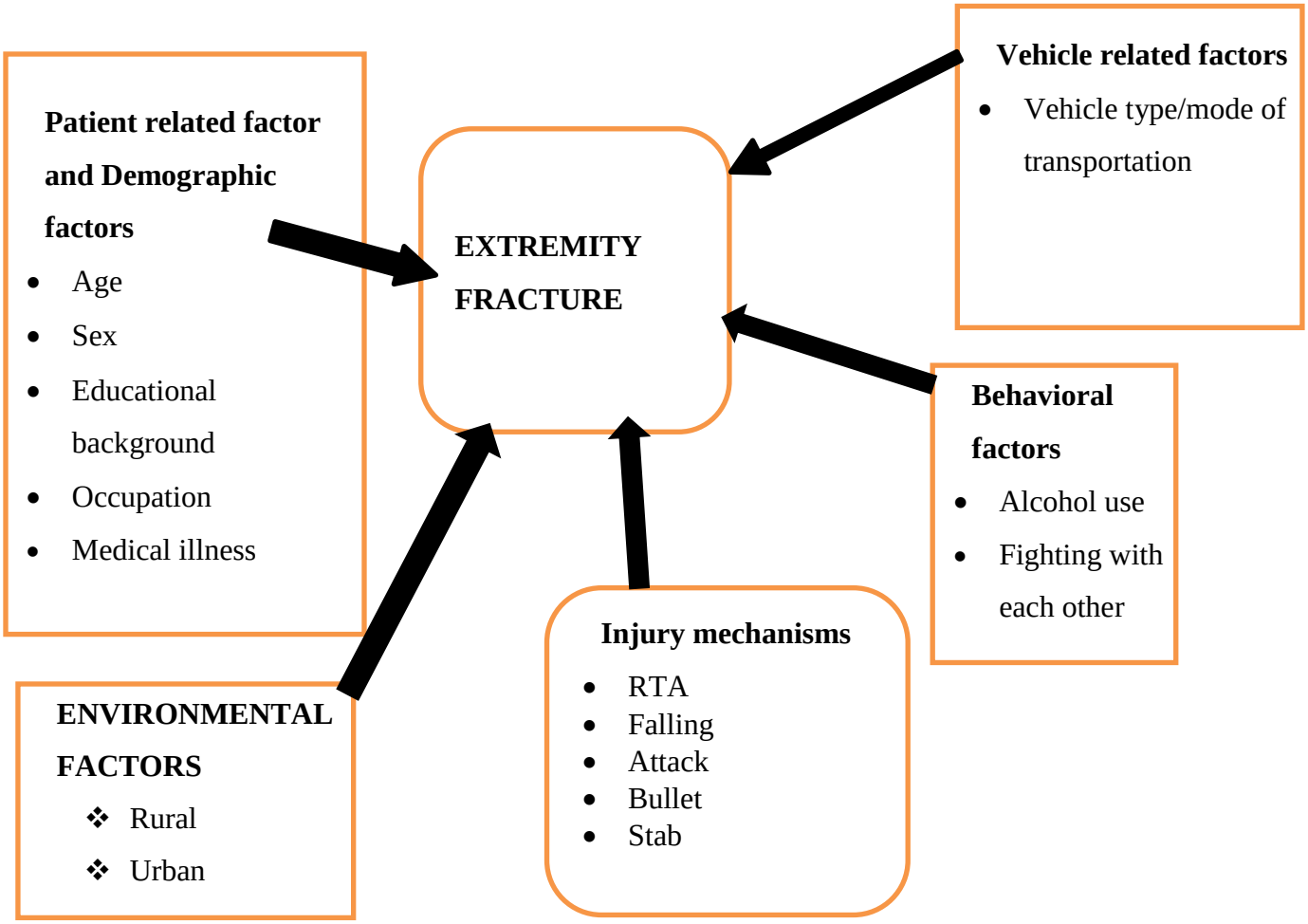

Figure 1: Conceptual framework shows factors related with the extremity bone fracture developed by principal investigator after reviewing various literatures.

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3. OBJECTIVES

3.1. General Objective

- To assess extremity bone fractures and associated factors among adult patients at Debre Markos Referral Hospital, East Gojjam Zone, Northern Ethiopia

3.2. Specific Objectives

- To determine the distribution of extremity bone fractures in the study area.
- To identify factors associated with extremity bone fractures in the study area.

4. MATERIALS AND METHODS

4. 1. Study Area and Period

This study was conducted at Debre Markos Referral Hospital (DMRH) located in Debre Markos Town, the capital of East Gojjam, North Ethiopia. It is located in the North West, Addis Ababa at a distance of 300kms and South West the capital of Amhara Regional State, Bahir Dar at the distance of 265 kms to Debre Markos Referral Hospital is found in this town. It was established in 1957 E.C by Emperor Haile Selassie and covers the area of 30,020 m^2.

DMRH provides health care for patients from a catchment area of 3.5 million populations. One hundred health centers and four district hospitals are available in the catchment area of the referral hospital. The hospital has a total of 210 beds. Currently, the hospital has 150 Nurses, 30 midwives, three health officers, 50 General practitioners, 4 emergency surgeons, and 20 specialists and 156 administrative staffs (source: DMRH human resources, 2018). It serves in patient and emergency care including; Internal Medicine, Surgery, Obstetrics and Gynecology, Anesthesia, Dentistry Ophthalmology, Psychiatry, Pharmacy, Medical Laboratory and Radiology. Data were collected from April 21, 2018 to June 21, 2018.

4. 2. Study Design

Institution based cross sectional study design was conducted among all extremity trauma adult patients with extremity bone fractures who were attending the surgical ward and orthopedic Emergency department.

4. 3. Population

4.3.1. Source Population

All adult patients who have sustained trauma and come to Debre Markos Referral Hospital.

4.3.2. Study population

All adult patients who have extremity bone fracture and come to Debre Markos Referral Hospital during the study period.

4. 4. Inclusion and exclusion criteria

4.4.1. Inclusion criteria

Patients who have extremity bone fracture diagnosed by the physician, their age 18+ years and voluntary to participate was included in this study.

4.4.2. Exclusion criteria

Patients' age less than 18 years and critical ill patients were excluded in this study.

4. 5. Sample size and sampling technique

Consecutive sampling technique was used based on the availability Patients, who have extremity bone fractures, coming to the hospital during the study period.

4. 6. Study variables

4.6.1. Outcome (dependent) variable

- Extremity bone fractures

4.6.2. Independent variables

- Socio-demographic factors
    - Age
    - Sex
    - Educational background
    - Occupation
- Behavioral
    - Alcohol use and fighting
- Medical illness

4.7.Data collection methods and Technique

The data were collected by nurses, trained for the data collection using checklist and questionnaire prepared for the data collection.

4.8. Data collection tools

Data were collected using a structured checklist that was developed by adapting from the World Health Organization's injury surveillance guideline. The tools consist ten parts: Socio-Demographic data, Site of Fracture, Nature of Fracture, Types of Fracture, Patterns of Fracture, Causes of Fracture**,** Behavioral Factors, Vehicle Types, Environmental Factors and Medical Illness.

4.9. Data collectors

Two data collectors (BSc. Nurses) and one supervisor (BSc. Nurse) were assigned. The data were collected by nurses working in the hospital who were trained on data collection tools for two days and the data collection process was supervised by the supervisor and principal investigator in order to maintain the quality of the data.

4.10. Data quality control

Data collectors were trained for two days by experienced trainer on data recording activities. The check list and questioner for data collection were pretested in Lumame Hospital for easy use on 5% of the study population. Based on the findings of the pre-test with respect to the level of difficult of the questionnaire entry and logical coherence the check list/questionnaire necessary adjustment was incorporated to the checklist. The modified checklist was used for actual data collection. The process of data collection was supervised by the investigator on daily bases. The collected data was checked for completeness, accuracy, and consistency every day by investigator. And before data analysis the coded data was checked for consistency completeness using SPSS version 20 software.

4.11. Operational definitions and terms

Adults: Patients' age 18 years old and above (55)**.**

Fracture: It is the result of a force acting on normal bone and disrupting the normal bony architecture (42).

Injury: Physical damage that results when human body is suddenly subjected to intolerable levels of energy (56).

Mechanism/pattern of injury: causes of injury in all fractured patients during the study period.

Critical fractured ill patients: patients who have fractured with unable to communicate during data collection.

4.12. Data analysis

The data were coded, entered into SPSS version 20.0. A descriptive analysis was carried out to explore the socio-demographic characteristics and aggregated results were presented in statements, tables and graphs. Prevalence of extremity fracture was calculated. Bivariate and multivariate analyses were carried out to examine the relationship between the outcome variable and predictors. Bivariate analysis used for selection of candidate for multivariate analysis (if $p < 0.25$).

4.13. Ethical considerations

The study protocol was approved and ethically cleared by Health Research Review Board of Jimma University. Official letter of co-operation was written to Debre Markos Referral Hospital from JUIH and letter of permission was sent to Debre Markos Referral Hospital. In order to protect the confidentiality of the information, personal identifiers such as names was not used during the data collection analysis and reporting of findings.

5. RESULTS

5.1. Socio-demographic Characteristics of Respondents

One hundred and forty-four adult patients who had extremity fractures and attended in Debre Markos referral Hospital were our study subjects. Out of 144 patients 92 (63.9%) were males and 52(36.1%) were females. The respondents found in age group 26 to 77years (mean = 52.19 and SD = 10.90). Concerning place of resident of the respondents 55(38.2%) and 89(61.8 %) were lived in urban and rural respectively. Thirty-one (21.5%) of the respondents were attended their education in colleges and above. One hundred thirteen (78.5%) of the respondents were Amhara by Ethnicity and 120(83.3%) of the respondents were orthodox by religion and 32(22.2%) were farmers (Table1).

Table 1:Socio-demographic Characteristics of the participants, Debre Markos referral Hospital, East Gojjam Zone, Northern Ethiopia, 2018.

Variables	Categories	n (%)
Sex	Male	92(63.9)
	Female	52(36.1)
Religions	Orthodox	120(83.3)
	Muslim	24(16.7)
Ethnicity	Amhara	113(78.5)
	Oromo	16(11.1)
	Tigray	15(10.4)
Marital status	Single	20(13.9)
	Married	85(59.0)
	Divorced	23(16.0)
	Widowed	16(11.1)
Educational status	No formal education	47(32.6)
	Elementary	32(22.2)
	High school	18(12.5)
	Preparatory	16(11.1)
	College and above	31(21.5)
Occupation	Governmental employee	15(10.4)
	Farmer	32(22.2)
	Merchant	18(12.5)
	House wife	13(9.0)
	Daily labor	16(11.1)
	Student	13(9.0)
	Unemployed	14(9.7)
	Other(drivers and construction workers)	23(16.0)

5.2. Prevalence of Fractures by Age and Sex

About 45(68.2%) and 21(31.8%) males and females patients had upper extremity fractures. About 48(68.6%) and 22(31.4%) males and females patients had lower extremity fractures respectively. About 8(0.6%) patients had both extremities fractures. About 77.8% and 56.8% of extremity fracture occurred in age group 40 – 50 years and above 72 years in male and female respectively (figure 2).

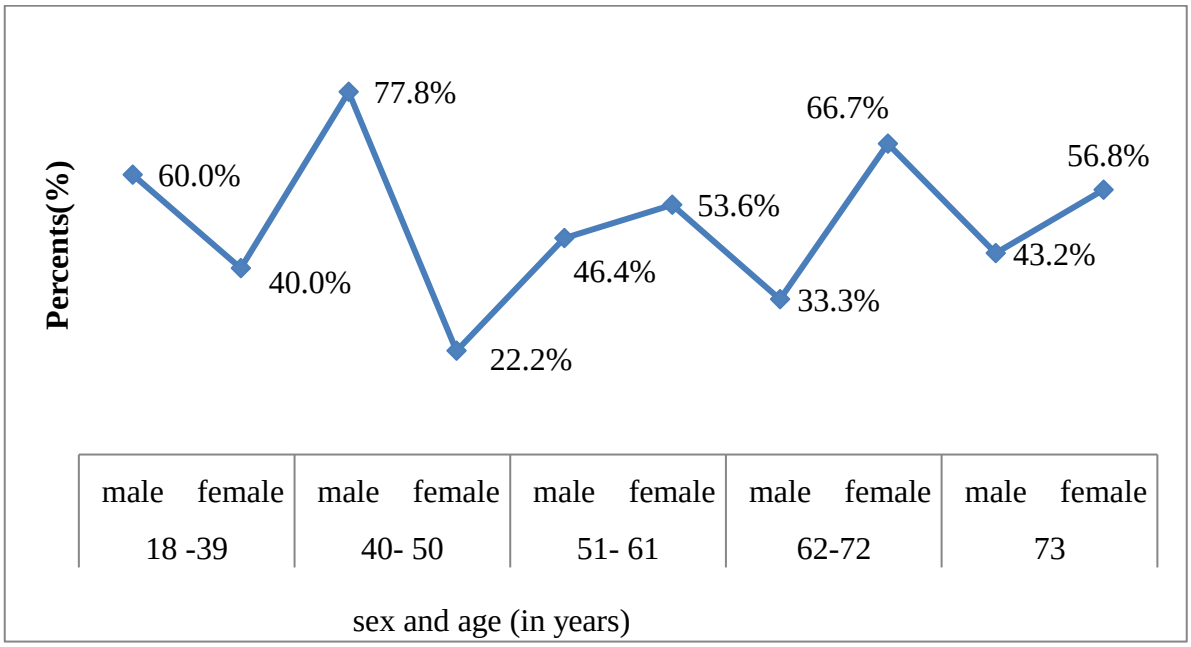

Figure 2 : Prevalence of extremity fractures by age and sex among adult patients in DMRH, East Gojjam Zone, Northern Ethiopia, 2018.

This figure (2) shows the prevalence of extremity fractures by sex for each age group showed that fractures were more common among males than among females in the younger age groups (up to 18–39 years old). The prevalence for 51–61 years old men and women were almost similar to each other. Among subjects 62–72 years and older, the prevalence of the fractures was higher in women than in men, and the difference increased with increasing age. Among the oldest age group (73+), the prevalence fractures were higher in females than males.

5.3. Type of Bone Fractured in Adult Patient

Concerning to type of bone fractured in upper and lower limbs were almost equal proportions 66 (45.8%) and 70 (48.6%) respectively. It was also identified that the fracture was either single or multiple at different sites. In the upper extremities, the majority of fractures occurred

in the phalanges 18(12%), ulna 12 (8.3%) followed by proximal humerus 8(5.6%), proximal radius 8 (5.6%) (Table 2)

Table 2: Type of Bone Fractured among adult patients in DMRH, East Gojjam Zone, Northern Ethiopia, 2018.

Variables	Specific sites	n (%)
Humerus	Proximal	8(5.6)
	Inta-Articular	2(1.4)
	Multiple	2(1.4)
Radius	Proximal	8(5.6)
	Midshaft	4(2.8)
	Multiple	2(1.4)
Ulnar	Midshaft	2(1.4)
	Distal	12(8.3)
	Multiple	2(1.4)
Radioulna	Proximal	2(1.4)
	Midshaft	2(1.4)
	Distal	4(2.8)
	Multiple	2(1.4)
Carpal	Scaphoid	6(4.2)
Metacarpal	Multifocal	2(1.4)
	First	2(1.4)
	Second	2(1.4)
	Fourth	1(.7)
	Fifth	1(.7)
	Multiple	2(1.4)
Phalanges	First	3(2.1)
	Second	2(1.4)
	Third	4(2.8)
	Fourth	4(2.8)
	Fifth	3(2.1)
	Multiple	2(1.4)
Clavicle	Outer Third	4(2.8)
	Middle Third	4(2.8)
	Multiple	2(1.4)
Scapula	Body	2(1.4)
	Spine	2(1.4)
	Acromion	4(2.8)
	Multiple	2(1.4)

Table 2: Continued

Variables	Specific sites	N (%)
Femur	Proximal	6(4.2)
	Midshaft	2(1.4)
	Distal	8(5.6)
	Inta-Articular	2(1.4)
	Multiple	2(1.4)
Tibia	Distal	2(1.4)
	Intra articular	2(1.4)
	Multiple	2(1.4)
Fibula	Midshaft	2(1.4)
	Distal	8(5.6)
	Inta-Articular	2(1.4)
	Multiple	2(1.4)
Tibiofibular	Proximal	8(5.6)
	Midshaft	4(2.8)
	Distal	2(1.4)
	Multiple	2(1.4)
Patella	Vertical	8(5.6)
	Tranverse	4(2.8)
	Distal pole	4(2.8)
	Multiple	2(1.4)
Ankle	Lateral malleolus	4(2.8)
	Medial Malleolus	2(1.4)
	Multiple	2(1.4)
Tarsal	Tarsus	4(2.8)
	Navicular	2(1.4)
	Cuboid	2(1.4)
Metatarsal	Multiple	4(2.8)
Phalanges	Multiple	4(2.8)
Pelvic	Pubic	14(9.7)
	Combined	2(1.4)

5.4. Distribution of Fractures by Anatomical Sites and Sex

Concerning to distribution of bone fractured by anatomical sites and sex in upper and lower limbs were almost equal proportions 66 (45.8%) and 70 (48.6%) respectively and based on sex site of fractures were phalanges 15(16.4%) in males, humerus 7(13.4%) in females and femur 12(13%) in males, pelvic 10(19.2%) in females in upper and lower extremities respectively. It was also identified that the fracture was either single or multiple at different sites. In the lower

extremities (in both sex), the majorities of fractures occurred in the femur 20(14%), patella 18(12.6%), and tibiofibular 16(11.2). 18(12%) respectively as shown in (table 3)

Table 3 : Distribution of fractures by anatomic sites and sex among adult patients in DMRH, East Gojjam Zone, Northern Ethiopia, 2018.

Anatomic site (variables)	Specific sites	Sex of the respondents	
		Male	Female
		n (%)	n (%)
Humerus	Proximal	3(3.3)	5(9.6)
	Inta-Articular	2(2.2)	-
	Multiple	-	2(3.8)
Radius	Proximal	6(6.5)	2(3.8)
	Midshaft	2(2.2)	2(3.8)
	Multiple	-	2(3.8)
	Midshaft	-	2(3.8)
	Distal	10(10.9)	2(3.8)
	Multiple	-	2(3.8)
Radio ulna	Proximal	2(2.2)	-
	Midshaft	2(2.2)	-
	Distal	4(4.3)	-
	Multiple		2(3.8)
Carpal	Scaphoid	6(6.5)	-
	Multifocal	-	2(3.8)
Metacarpal	First	2(2.2)	-
	Second	2(2.2)	-
	Fourth	1(1.1)	-
	Fifth	1(1.1)	-
	Multiple	-	2(3.8)
Pharynges	First	3(3.3)	-
	Second	2(2.2)	-
	Third	3(3.3)	1(1.9)
	Fourth	4(4.3)	-
	Fifth	3(3.3)	-
	Multiple	-	2(3.8)
Clavicle	Outer Third	-	4(7.7)
	Middle Third	4(4.3)	-
	Multiple	-	2(3.8)

Table 3: Continued

Anatomic site (variables)	Specific sites	Sex of the respondents	
		Male	Female
		n (%)	n (%)
Scapula	Body	2(2.2)	-
	Spine	2(2.2)	-
	Acromion	-	4(7.7)
	Multiple	-	2(3.8)
Femur	Proximal	4(4.3)	2(3.8)
	Midshaft	2(2.2)	-
	Distal	4(4.3)	4(7.7)
	Inta-Articular	2(2.2)	-
	Multiple	-	2(3.8)
	Distal	2(2.2)	-
	Inta-Articular	2(2.2)	-
	Multiple	-	2(3.8)
Fibula	Midshaft	2(2.2)	-
	Distal	6(6.5)	2(3.8)
	Inta-Articular	2(2.2)	-
	Multiple	-	2(3.8)
Tibiofibular	Proximal	6(6.5)	2(3.8)
	Midshaft	-	4(7.7)
	Distal	2(2.2)	-
	Multiple	-	2(3.8)
Patelar	Vertical	8(8.7)	-
	Tranverse	-	4(7.7)
	Distal pole	4(4.3)	-
	Multiple	-	2(3.8)
Ankle	Lateral malleolus	-	4(7.7)
	Bimaleolar	2(2.2)	-
	Multiple	-	2(3.8)
Tarsal	Tarsus	-	4(7.7)
	Navicular	2(2.2)	-
	Cuboid	-	2(3.8)
Metatarsal	Multiple	2(2.2)	2(3.8)
Phalanges	Multiple	2(2.2)	2(3.8)
Pelvic	Pubic	6(6.5)	8(15.4)
	Combined	-	2(3.8)

5.5. Fracture Prevalence by Fracture Mechanisms and Locations

Several causes responsible as to the etiology of fracture from traumatic to none traumatic factors were identified and nearly all the fractures 132(91.7%) were due to traumatic incidents but only 12(8.3%) were due to non-traumatic (pathological) fracture. Road traffic accident constitutes the largest proportion, 30(20.8%), among traumatic causes followed by fall down accident 23(16.0 %) and hit by stick 22(15.3%). RTA (travelers and pedestrians) 30(20.8%) of which 70% and 30% occurred in urban and rural respectively (figure 3).

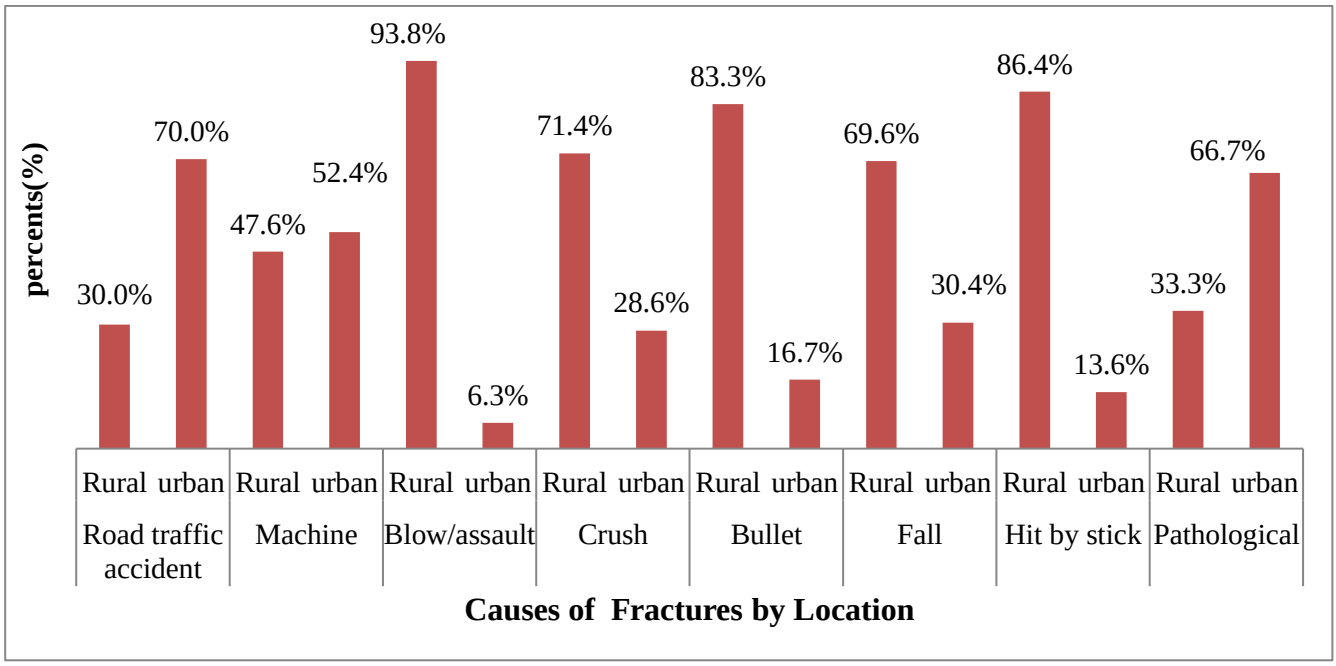

Figure 3 : Fracture prevalence by fracture mechanisms and location among adult patients in DMRH, East Gojjam Zone, Northern Ethiopia, 2018.

5.6. Nature of fractures

About 76(52.8%) and 68(47.2%) patients had open and closed extremity fractures respectively.

5.7. Pattern and Degree of Fractures of Adult Limb Fractures

Regarding to severity or degree of fractures about 114(79.2%) and 30(20.8%) of patients had incomplete and complete fractures. The most common patterns of fractures were oblique 37(25%), transverse 34(23.6%) and comminuted 26(18.1%).

Among oblique fractures about 67.6% and 32.4% were incomplete and complete fractures respectively (figure 5).

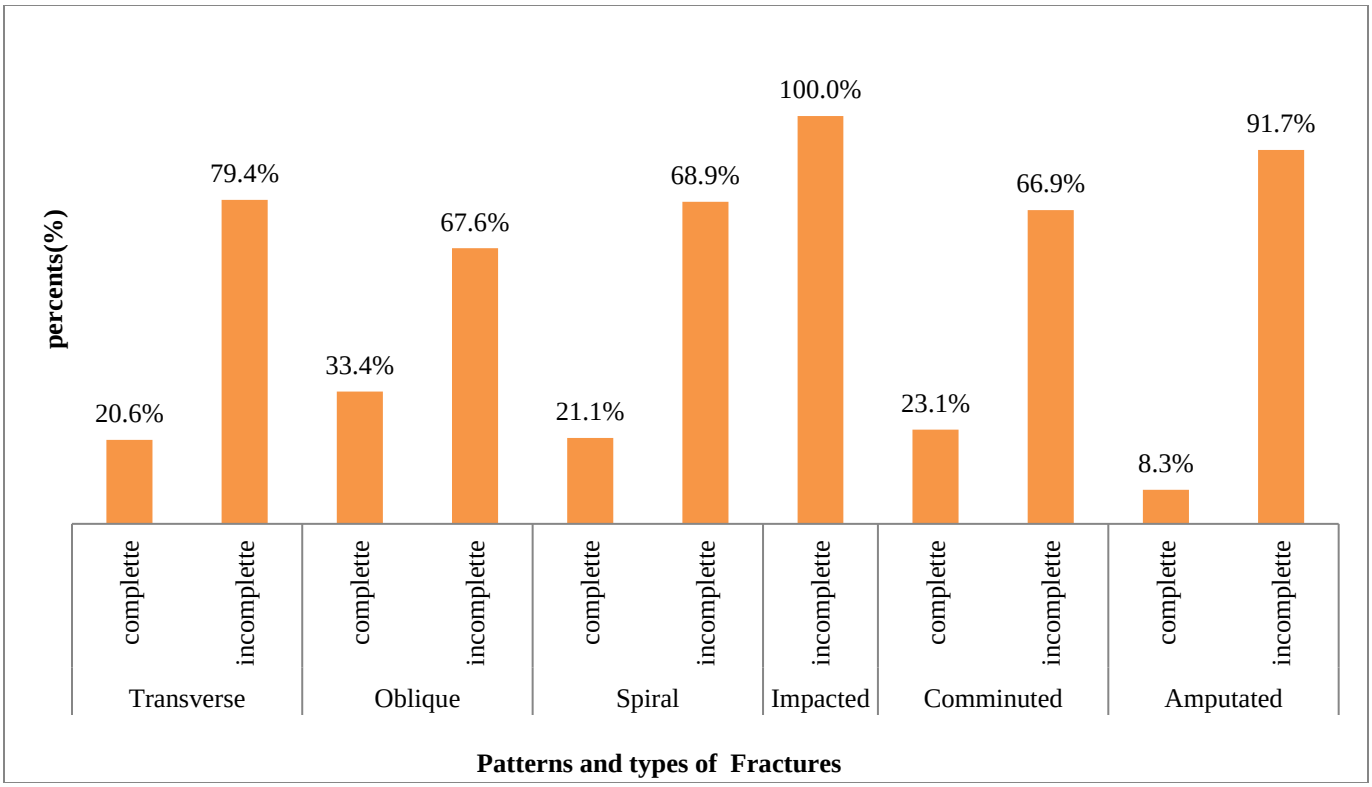

Figure 4 : Pattern and degree of fractures among adult patients in DMRH, East Gojjam Zone, Northern Ethiopia, 2018.

5.8. Associated Factors of Extremity Fractures

5.8.1 Patient Related Factors and Demographic Factors

Socio-demographic characteristics such as sex and age had an association with extremity fractures. As age increases the prevalence of extremity fracture increases. This study showed that the highest age group mostly affected was between 40 to 50 years (77.8%) and 62 to 72 years (66.7%) in males and females respectively.

5.8.2 Injury Mechanisms and Behavioral Factors

The majority of the cause of extremity fractures was RTA (20.8%). This had related with behavioral factors of the victim and the results showed that among the respondents who had behavioral factors such as using alcohol and fighting was 55% and 23% respectively.

5.8.3 Environmental and Vehicle Related Factors

The majority of the respondents came from rural (61.1%) and among RTA, vehicle types were Isuzu and Bajaj, 11.1% and 9.7 % respectively. This result showed that extremity fracture is more common in rural than urban and Isuzu was the commonest cause of RTA.

5.9 Individual Factors Associated with Extremity Fractures in Binary Logistic Regression

To identify associated factors of extremity fractures among patients, binary logistic regression was computed. Those variables with P-value < 0.25 in bivariate analysis were entered into multivariate analysis using multiple logistic regressions in order to control confounders and to predict factors associated with extremity fractures at p value less than 0.05 (Table 4 and Table 5).This study showed that as the age increases the prevalence of extremity fractures also increase in both sexes. The findings showed that Socio-demographic characteristics can be the risk factors for extremity fractures. As a result, about 32(22.2%) respondents were farmers and followed by construction workers 23(16.6%) and daily labors 16(11.1%) respectively. As the study showed that about 40(60%) had experienced in closed fractures. In addition, behavioral factors can be attributed for extremity fractures. Besides, the location of the accidents had a contribution for fractures. Therefore, about 36(54.5%) and 30(45.5%) the accident was occurred in rural and urban respectively. Moreover, other medical illness had also the risk factors for the prevalence of the fractures.

Table 4 : Binary logistic regression of Individuals factors of the respondents for upper extremity fractures among adult patients in DMRH, East Gojjam Zone, Northern Ethiopia, 2018.

Variables	Categories	Upper Extremity Fracture		P value	COR 95% CI
		Yes	No		
		n(%)	n(%)		
Age	18 -39	10(15.2)	5(6.4)	**.123**	**.380(.111, 1.298)***
	40- 50	9(13.6)	9(11.5)	.625	.760(.253, 2.283)
	51- 61	12(18.2)	16(20.5)	.978	1.013(.389, 2.639)
	62-72	16(24.2)	23(29.5)	.843	1.092(.456, 2.617)
	+73	19(28.8)	25(32.1)		1
Ethnicity	Amhara	51(77.3)	62(79.5)	.283	1.824(.609, 5.464)
	Oromo	6(9.1)	10(12.8)	**.214**	**2.500(.589, 10.617)***
	Tigray	9(13.6)	6(7.7)		1
Marital status	Single	8(12.1)	12(15.4)	**.184**	**2.500(.648, 9.651)***
	Married	37(56.1)	48(61.5)	**.169**	**2.162(.720, 6.490)***
	Divorced	11(16.7)	12(15.4)	.368	1.818(.495, 6.681)
	Widowed	10(15.2)	6(7.7)		1
Nature of fracture	Closed	40(60.6)	28(35.9)	**.003**	**.364(.185, .716)****
	Open	26(39.4)	50(64.1)		1
Behavioral factor	Yes	44(66.7)	34(43.6)	**.006**	**.386(.196, .763)****
	No	22(33.3)	44(56.4)		1
Residence	Rural	36(54.5)	52(66.70	**.138**	**1.667(.848, 3.275)***
	Urban	30(45.5)	26(33.3)		1
Medical illness	Yes	25(37.9)	20(25.6)	**.116**	**.566(.278, 1.152)***
	No	41(62.1)	58(74.4)		1
Types of Medical illness	Diabetes mellitus	9(13.6)	6(7.7)	**.115**	**2.398(.808, 7.117)***
	Hypertension	6(9.1)	7(9.0)	.886	1.111(.262, 4.719)
	Rheumatoid arthritis	10(15.2)	6(7.7)		1

Abbreviations: COR, Crude Odd Ratio; CI, Confidence Interval. Significant *, P-value <0.25, statically significant **; P-value < 0.05

Table 5: Binary logistic regression of Individuals factors of the respondents for lower extremity fractures among adult patients in DMRH, East Gojjam Zone, Northern Ethiopia, 2018.

Variables	Categories	Lower Extremity Fractures		P values	COR 95% CI
		Yes	No		
		n (%)	n(%)		
Sex	Male	48(68.60	44(59.5)	.256	.672(.339, 1.334)
	Female	22(31.4)	30(40.5)		1
Age	18 -39	8(11.4)	7(9.5)	.252	.500(.153, 1.637)
	40 -50	9(12.9)	9(12.2)	.323	.571(.188, 1.733)
	51 -61	15(21.4)	13(17.6)	**.153**	**.495(.189, 1.298)***
	62 -72	22(31.4)	17(23.0)	**.069**	**.442(.183, 1.067)***
	+73	16(22.9)	28(37.8)		1
educational Status	No formal education	27(38.6)	20(27.0)	**.247**	**1.719(.686, 4.302)***
	Elementary	18(25.7)	14(18.9)	.533	1.371(.509, 3.698)
	High school	6(8.6)	12(16.2)	.629	1.333(.415, 4.281)
	Preparatory	6(8.6)	10(13.5)	.478	.640(.186, 2.196)
	College and above	13(18.6)	18(24.3)		1
Occupation	Governmental employee	9(12.9)	6(8.1)	**.041**	**.235(.059, .945)****
	Farmer	19(27.1)	13(17.6)	**.017**	**.241(.075, .776)****
	Merchant	9(12.9)	9(12.2)	**.120**	**.353(.095, 1.310)***
	House wife	7(10.0)	6(8.1)	**.102**	**.303(.072, 1.269)***
	Daily labor	8(11.4)	8(10.8)	**.131**	**.353(.091, 1.363)***
	Student	6(8.6)	7(9.5)	**.225**	.412(.098, 1.727)*
	Unemployed	6(8.6)	8(10.8)	.295	.471(.115, 1.927)
	Constructors	6(8.6)	17(23.0)		1
Patterns of fracture	Transverse	11(15.7)	23(31.1)	.281	2.091(.547,7.989)
	Oblique	17(24.3)	20(27.0)	.807	1.176(.320, 4.331)
	Spiral	6(8.6)	13(17.6)	.309	2.167(.489, 9.601)
	Impacted	10(14.3)	6(8.1)	.510	.600(.131, 2.738)
	Comminuted	20(28.6)	6(8.1)	**.104**	**.300(.070, 1.283)***
	Amputated	6(8.6)	6(8.1)		1

Table 5: Continued

Abbreviations: COR, Crude Odd Ratio; CI, Confidence Interval. Significant *, P-value <0.25,

Variables	Categories	Lower Extremity Fractures		P values	COR 95% CI
		Yes	No		
		n (%)	n(%)		
Alcohol use	Yes	23(32.9)	37(50.0)	**.038**	**2.043(1.040, 4.016)****
	No	47(67.1)	37(50.0)		1
Fighting	Yes	8(11.4)	15(20.3)	**.153**	**1.970(.778, 4.990)***
	No	62(88.6)	59(79.7)		1
Location of accident	Rural	47(67.1)	41(55.4)	**.140**	**.585(.287, 1.192)***
	Urban	23(32.9)	33(44.6)		1
Medical illness	Yes	26(37.1)	19(25.7)	**.140**	**.585(.287, 1.192)***
	No	44(62.9)	55(74.3)		1
Types of Medical illness	Diabetes mellitus	8(11.4)	7(9.5)	**.199**	**2.037(.688, 6.035)***
	Hypertension	7(10.0)	6(8.1)	.606	1.458(.348, 6.112)
	Rheumatoid arthritis	10(14.3)	6(8.1)		1

statically significant **; P-value < 0.05

5.10 Factors associated with extremity fractures in multivariable logistic regression

Variables which were significant in the first model (p < 0.25) were taken and analyzed together by multivariable logistic regression in order to predict factors associated with extremity fracture at a P value less than 0.05. Therefore, being the remaining variables constant, being farmer the probability of having lower extremity fractures was decreased by the odds of 0.114 times (AOR [95% CI] 0.114(0.025, 0.509) as compared to being construction workers.

With other variables making constant, being government employer, merchant, house wife, students, and unemployed the chance of having extremity fractures were decreased by the odds of 0.034 times (AOR [95% CI] 0.034(0.004, 0.298), 0.083 times (AOR [95% CI] 0.083(0.014, 0.486), 0.131times (AOR [95% CI] 0.92(0.015, 0.572), 0.131 times (AOR [95% CI] 0.131(0.021, 0.815) and 0.077 times (AOR [95% CI] 0.077(0.011, 0.540), respectively as compared to being construction workers (table 5).

Patients who had behavioral factors (using alcohol and fighting) chance of fracture was increased by the odds of 3.911 times (AOR [95% CI] 3.911(1.473, 10.384) as compared to

those who had no behavioral factors. Patients who used alcohol and had fighting behavior the chance of extremity fractures were increased by the odds of 2.989 times (AOR [95% CI] 2.989(1.408, 6.348) and 3.725 times (AOR [95% CI] 3.725(1.319, 10.524) respectively. Being urban the chance of fractures was decreased by 54% as compared being rural.

The probability of open fractures in upper extremity were decreased by the odds of 0.346times (AOR [95% CI] 0.346(0.185, 0.716) as compared to closed fractures. The chances of upper extremity fractures in patients who had no behavioral factors (alcohol using and fighting) were decreased by the odds of 0.371 times (AOR [955 CI] 0.371(0.177, 0.776) as compared to patients who had no behavioral factors. The probability of the occurrence of fractures in rural were more likely 2.491 times (AOR [95% CI] 2.491(1.160, 5.347) as compare to urban (Table 6).

Table 6: Multiple logistic regression of Individuals factors of the respondents for upper extremity fractures among adult patients in DMRH, East Gojjam Zone, Northern Ethiopia, 2018.

Variables	Categories	Upper Extremity Fracture		P value	COR 95% CI	P value	AOR 95% CI
		Yes	No				
		n(%)	n(%)				
Nature of fracture	Closed	40(60.6)	28(35.9)		**1**		**1**
	Open	26(39.4)	50(64.1)	.003	.364(.185, .716)**	.003	.364(.185, .716)**
Behavioral factor	Yes	44(66.7)	34(43.6)		1		1
	No	22(33.3)	44(56.4)	.006	.386(.196, .763)**	.008	.371(.177, .776)**
Location of the accident	Rural	36(54.5)	52(66.70	.138	1.667(.848, 3.275)*	.019	2.491(1.160,5.347) **
	Urban	30(45.5)	26(33.3)		1		1

Abbreviations: COR, Crude Odd Ratio; CI, Confidence Interval. Significant *, P-value <0.25, statically significant **; P-value < 0.05

Table 7: Multiple logistic regression of Individuals factors of the respondents for lower extremity fractures among adult patients in DMRH, East Gojjam Zone, Northern Ethiopia, 2018.

Variables	Categories	Lower Extremity Fractures					
		Yes	No	P value	COR 95% CI	P value	AOR 95% CI
		n (%)	n(%)				
Occupation	Governmental employee	9(12.9)	6(8.1)	**.041**	**.235(.059, .945)****	**.002**	**.034(.004, .298)****
	Farmer	19(27.1)	13(17.6)	**.017**	**.241(.075, .776)****	.004	**.114(.025, .509)****
	Merchant	9(12.9)	9(12.2)	**.120**	**.353(.095, 1.310)***	**.006**	**.083(.014, .486)****
	House wife	7(10.0)	6(8.1)	**.102**	**.303(.072, 1.269)***	**.011**	**.092(.015, .572)****
	Daily labor	8(11.4)	8(10.8)	**.131**	**.353(.091, 1.363)***	.159	.285(.050, 1.634)
	Student	6(8.6)	7(9.5)	**.225**	.412(.098, 1.727)*	**.029**	**.131(.021, .815)****
	Unemployed	6(8.6)	8(10.8)	.295	.471(.115, 1.927)	**.010**	**.077(.011, .540)****
	Constructors	6(8.6)	17(23.0)		1		1
Behavioral factor	Yes	30(42.9)	48(64.9)	**.009**	**2.462(1.257, 4.821)***	**.006**	**3.911(1.473, 10.384)****
	No	40(57.1)	26(35.1)		1		1
Alcohol use	Yes	23(32.9)	37(50.0)	**.038**	**2.043(1.040, 4.016)****	**.004**	**2.989(1.408, 6.348)****
	No	47(67.1)	37(50.0)		1		1
Fighting	Yes	8(11.4)	15(20.3)	**.153**	**1.970(.778, 4.990)***	**.013**	**3.725(1.319, 10.524)****
	No	62(88.6)	59(79.7)		1		1
Resident	Rural	47(67.1)	41(55.4)		**1**		**1**
	Urban	23(32.9)	33(44.6)	**.140**	**.585(.287, 1.192)***	**.038**	**.458(.219, .957)****

Abbreviations: COR, Crude Odd Ratio; CI, Confidence Interval. Significant *, P-value <0.25, statically significant **; P-value < 0.05

6. DISCUSSION

The purpose of the study was to assess extremity bone fracture and associated factors among adult patients in DMRH. In this study, 77.8% and 56.8% of extremity fracture occurred in age group 40 – 50 years and above 72 years in male and female respectively. Socio-demographic characteristics such as sex, age, occupation, location and behavioral factors such as drinking alcohol and fighting had an association with extremity fractures.

The study revealed that 16(11.1%) were daily laborer, 13(9.0%) house wife, 32(22.2%) farmers, 13(9.0%) students, 15(10.4%) civil servants, 18(12.5%) merchants, 14(9.7%) unemployed, and 23(16%) drivers and construction workers. Other study done in Addis Ababa revealed that 21.5% were daily laborers, 15.4% house wives, 12.6% farmers, 12.6% students, 10.9% civil servants, 5.2% merchants, 4.8% drivers and others 17% by occupation (21). This difference may be due to occupational difference in the compared area and the study area.

This study showed that being government employer, merchant, house wife, students, and unemployed the chance of having extremity fractures were decreased by the odds of 0.034 times (AOR [95% CI] 0.034(0.004, 0.298), 0.083 times (AOR [95% CI] 0.083(0.014, 0.486), 0.131 times (AOR [95% CI] 0.92(0.015, 0.572), 0.131 times (AOR [95% CI] 0.131(0.021, 0.815) and 0.077 times (AOR [95% CI] 0.077(0.011, 0.540), respectively as compared to being construction workers. This might be due to being construction workers are at risk of injury and falling that causes fractures.

A prospective study of the incidence of fracture in the adult population of Edinburgh, related to age and sex show that, there was a higher incidence of fractures in men than women in all age groups from 15 to 49 years, and under the age of 35 years' males are 2.9 times more likely to sustain a fracture than females (6). Similarly, the study done in Addis Ababa revealed that the highest age group mostly affected was between 21-30 year, 36.5% and the highest peak of male to female ratio occurred in the age group between 31 to 40 years which was 5.2: 1(21). However, in the present study 77.8% and 56.8% of extremity fracture occurred in age group 40 – 50 years and above 72 years in male and female respectively. This is may be due to high occupational difference that cause fractures in the study area and males are mainly participating in physical works like construction and outdoor activities.

The study done in UK, limb fractures were more common among males than among females in the younger age groups (up to 30–39 years old). The incidence rates for 40–49-year-old men

and women were closely similar to each other. Among subjects 50–59 years and older, the incidence of lower limb fractures was higher in women than in men, and the difference increased with increasing age. Among the oldest age group (>90 years old), the incidence of lower limb fractures was approximately twice as high in women as in men. Within age groups, the proportions of fractures that occurred at different anatomic sites in limbs were generally similar between males and females (53). In line with this study, the current study showed that the prevalence of extremity fractures by sex for each age group showed that fractures were more common among males than among females in the younger age groups (up to 18–50 years old). The prevalence for 51–61 years old men and women were almost similar to each other. Among subjects 62–72 years and older, the prevalence of the fractures was higher in women than in men, and the difference increased with increasing age. Among the oldest age group (73+), the prevalence fractures were higher in females than males. This may be due to high outdoor activities in male and osteoporosis (due to decreasing estrogen and progesterone) in female in this age group.

Concerning the distribution of bone fractured by anatomical sites and sex in upper and lower limbs were almost equal proportions 66 (45.8%) and 70 (48.6%) respectively and based on sex and the most site of fractures were phalanges 15(16.4%) in male, humerus 7(13.4%) in female and femur 12(13%) in male, pelvic 10(19.2%) in female in upper and lower extremities respectively. The study done in UK showed that, within age groups, the proportions of fractures that occurred at different anatomic sites in the extremities were generally similar between males and females (53).

The study showed that the majority of the respondents 88(61.1%) and 56(39.9%) were rural and urban respectively. Other study done in Addis Ababa revealed that the majority of the subjects 81.5% were urban residents whereas only 18.5% were from rural settings (21). This difference may be due to high urban population in Adiss Ababa as compare to the study area. In this study showed that the probability of the occurrence of fractures in rural were more likely 2.491 times (AOR [95% CI] 2.491(1.160, 5.347) as compare to urban. The this may be due to lack of awareness about traffic rules and high risk behavior (fighting each other and drinking alcohol) in rural area.

The overall prevalence of upper, lower and both extremity fractures were 45.8%, 48.6% and 5.6% respectively. The study done in North Gondar showed that fracture to the upper limb

alone accounted for 50.53% whereas the proportion of fracture for the lower limbs was 49.42% and it was also recognized that the fracture was either single or multiple at different sites. The proportions of fractures at a single site or multiple sites were 99.55% and 0.44% respectively (22). In contrast to this, a review of fracture location in India showed that 82.2% were in the upper limb, 17.3% were in the lower limb (52).

The study done in Charles University, Europe, the most common fracture in the group was that of the scapular body (52%), followed by fractures of the glenoid fossa (29%), fractures of the processes (11%) and fractures of the scapular neck (8%). The most frequent associated injuries to the ipsilateral shoulder girdle were clavicular fractures (19%) (49).This difference may be due to difference in the study setting as well as study time.

In the current study, in the upper extremities, the majority of fractures occurred in the ulna 16(11.1), phalanges 15(10.5%), radius 14(9.7%), humerus 12(8.3 %) and, in the lower extremities, the majorities of fractures occurred in femur 20(13.9%), patella 18(12.5%) and tibia – fibula 16(11.1%). Study done in AAU, showed that the highest frequency of fractures occurred in the femur 32 (15.8%) followed by tibia-fibular 29 (14.4%) and humerus 26 (12.9%). Isolated patellar fracture occurred in 22 (10%), Ankle fractures accounted for 9 (4.5%) patients; Pelvic fracture was seen in 6 (3%) patients (19).

Road traffic accident constitutes the largest proportion, 30(20.8%), among traumatic causes followed by fall down accident 23(16.0 %) and hit by stick 22(15.3%). RTA 30(20.8%) of which 70% and 30% occurred in urban and rural respectively. The most causes of fracture in male and female were RTA (22.8%) and fall (21.2%) respectively. Other study done in Scotland, on extremity bone fracture, there was an increase in severity of the fractures with age, and was open fractures 59.8%. Road- traffic accidents 37.5% and sport 30.9% accounted for most tibialdiaphyseal fractures with simple falls causing most fractures in the elderly (9). In contrast to this, a study done in Khartoum revealed that none road-accidents accounted for 84% of the fractures mainly due to sports, domestic injuries and falls; whereas road traffic accidents were 16 %(10). In Pakistan, of the 132,504 victims of road traffic crashes (RTCs), there were 67% males and 65% aged 16–35 years, and minor injuries (65%) and fractures (25%) were the most reported (46). Another hospital-based study of admitted patients due to traffic accidents in India revealed that the commonest type of injury was fracture (49.33%) and the most common site of fracture was lower limb (48.2%), and several risk factors such as age,

sex, type of vehicle, use of alcohol, absence of driving license, nonuse of helmets, and casual attitude are associated with increased occurrence of road traffic accidents (47). This may be due to that RTA is the leading causes of fracture in both developed and developing countries.

Regarding to patterns of fractures about 114(79.2%) and 30(20.8%) of patients had incomplete and complete fractures. The most common specific sites of fractures were oblique 37(25%), transverse 34(23.6%) and comminuted 26(18.1%). Among oblique fractures about 67.6% and 32.4% were incomplete and complete fractures respectively. A study done in AAU the nature of the majority of fractures noticed were closed fractures accounting (78. 68%).The pattern of the majority of the fractures that occurred was complete in (63.5%) (3). With respect to the pattern of fractures, transverse fractures stand out the first (54.9%) fallowed by oblique (19.4%) and comminuted (17.5%) at the 2nd and 3rd place respectively among the different specific type of fracture**.** Spiral fractures were (2.6%) and amputated fracture, 2(0.5%), accounted for the least proportion of patterns of fractures (40).

About 76(52.8%) and 68(47.2%) patients had open and closed extremity fractures respectively. The study done in AAU, the majority of fractures were closed fractures, accounting 166 (82.2%). Open fractures were 36 (17.8%) (19). The study done in North Gondar, the nature of the majority of fractures noticed were closed fractures accounting 78.68%, compound fractures were 21.3%(21).

The study done in Canada, alcohol intake was associated with an increased risk of fracture (risk ratio [RR] =1.23; 95% CI, 1.06–1.43) (54). In line with this, the current study showed that Patients who used alcohol chance of fracture was increased by the odds of 3.911 times (AOR [95% CI] 3.911(1.473, 10.384) as compared to those who did not use. Patients who used alcohol and had fighting behavior the chance of extremity fractures were increased by the odds of 2.989 times (AOR [95% CI] 2.989(1.408, 6.348) and 3.725 times (AOR [95% CI] 3.725(1.319, 10.524) respectively.

The Study conducted elsewhere, analysis of the nature of the fracture revealed that closed fracture was significantly more common than compound fracture 78.68% and 21.32% respectively (3, 40). However, the current study showed that 76(52.8%) and 68(47.2%) patients had open or compound and closed extremity fractures respectively. The difference presumably due to high RTA that causes high collision in the mechanisms of injury in the current study.

6. LIMITATION OF THE STUDY

- Small sample size and shortage of study period
- Use of only one hospital

7. CONCLUSION AND RECOMMENDATION

7.1 CONCLUSION

As the study showed, economically productive age groups (18-50 years) & males were the principal involved populations. RTA, assault/fighting, and falls down are the most causes of fractures. This result also showed that extremities fractures occur in different sites. The study result identified different factors of fracture.

7.2 RECOMMENDATION

Community: Should avoid behavioral factors like fighting and alcohol use.

Researchers: Need to perform further research with large sample size in this specific group of population to identify high risk groups.

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9 ANNEXES

Information sheet

Good morning/afternoon. My name is _____. I am final year post graduate student in Jimma University, Biomedical sciences Department and conducting a research about prevalence of extremity fractures and associated factors among adult Patients in Debre Markos Referral Hospital.

Participating in the study will not impose any risk on you, and you can discontinue to participate in the study any time you want. However, your honest response to this question will help us to better understand the prevalence of extremity fracture and associated factors. We would greatly appreciate your help in responding to these questions. It will take about 15 to 20 minutes and there is no benefit or payment that you get for your participation in this study. However, your honest &genuine response to each question will play a major role in the attainment of the objective of the study. Therefore, we thank you in advance and greatly appreciate your help.

Consent Form

I understood the purpose, benefit and what is required from me if I take part in the study. I understood that all information regarding me and all answers given by me are secret and confidential. I also understand that I can decide whether or not to take part in the study or even withdraw from the study at any time. So I am willing to participate in the study.

If Yes: Proceed with the participation

Signature of participant----------Date----------

If No: Terminate the participation

Thank you!!!

Data collector Name---------- sign----------Date----------

Contact Address of the Investigator:

Yoseph Merkeb

Tel no: +251967108367

Email: yosefmerkebu@gmail.com

Questionnaires and Checklists

Part I: Socio-Demographic Data

Card number: …….

1. Sex of respondent

   □ Male □ female

2. Age (in years) ____

3. Religion

   1. Orthodox
   2. Muslim
   3. Protestant
   4. Catholic
   5. Other (specify)

4. Ethnicity

   1. Amhara
   2. Oromo
   3. Tigray
   4. SNNP
   5. Other (specify)

5. Marital status:

   1. Single
   2. Married
   3. Divorced
   4. Widowed

6. Educational status: -

   1. No formal education
   2. Elementary
   3. High school
   4. Preparatory
   5. College and above

7. Occupation:

   1. Governmental employee
   2. Farmer
   3. Merchant
   4. House wife
   5. Daily labor
   6. Student
   7. Unemployed
   8. Other (specify)

Instructions: For the following checklist tick (√) according to the questions.

Part II: Specific Site of Fractures

□ Upper Extremity:

1. right
2. left
3. both

□ Humerus:

1. *Proximal:*
    a. *surgical neck*
    b. *Anatomical neck*
2. *Mid shaft*
3. *Distal*
4. *Inta-Articular*
5. *Multiple*
6. *Other(specify)*

□ Radius**:**

1. Proximal
2. Midshaft
3. Distal
4. Inta-Articular
5. Multiple
6. Other(specify

□ Ulna**:**

1. Proximal
2. Midshaft
3. Distal
4. Inta-Articular
5. Multiple

□ Radio- Ulnar:

1. Proximal
2. Midshaft
3. Distal
4. Inta-Articular
5. Multiple
6. Other(specify)

□ Hand:

□ Carpal:

1. Scaphoid
2. Lunate
3. Triquetrum
4. Pisiform
5. Trapezoid
6. Capitate
7. Hamate
8. Trapezius
9. Multifocal

□ Metacarpal:

□ First:

☐ Base ☐ Shaft ☐ Head

☐ Second:

☐ Base ☐ Shaft ☐ Head

☐ Third**:**

☐Base ☐ Shaft ☐ Head

☐ Fourth:

☐ Base ☐ Shaft ☐ Head

☐ Fifth:

☐ Base ☐ Shaft ☐ Head

☐ Multiple

☐ Other(specify)

☐ Phalanges:

☐ First:

☐Base ☐ Shaft ☐ Head

☐ Second:

☐Base ☐ Shaft ☐Head

☐ Third:

☐Base ☐ Shaft ☐ Head

☐ Fourth:

☐ Base ☐ Shaft ☐ Head

☐ Fifth:

☐ Base ☐ Shaft ☐ Head

☐ Multiple

☐ other(specify)

☐ Shoulder:

☐ Clavicle:

☐ Outer Third ☐ Inner Third

☐ Middle Third ☐ Other(specify)

☐ Scapula:

- ☐ Body
- ☐ spine
- ☐ Acromion
- ☐ Glenoid
- ☐ Other(specify)

☐ Lower Extremity:

- ☐ Right
- ☐ Left
- ☐ Both

☐ Femur:

- ☐ *Proximal:*
  - *a.* head
  - *b.* neck
  - *c.* trochanters greater
- ☐ trochanterslesser
- ☐ *Midshaft*
- ☐ *Distal*
- ☐ *Inta-Articular*
- ☐ *Multiple*

☐ *Tibia:*

- ☐ *Proximal*
- ☐ *Midshaft*
- ☐ *Distal*
- ☐ *Inta-Articular*
- ☐ *Multiple*

☐ *Fibula:*

- ☐ *Proximal*
- ☐ *Midshaft*
- ☐ *Distal*
- ☐ *Inta-Articular*
- ☐ *Multiple*

☐ *Tibiofibular:*

- ☐ *Proximal*
- ☐ *Midshaft*
- ☐ *Distal*
- ☐ *Inta-Articular*
- ☐ *Multiple*
- ☐ *Other(specify)*

☐ *Pattelar:*

- ☐ *Vertical*
- ☐ *Tranverse*

☐ *Distal pole*

☐ *Other(specify)*

Ankle:

☐ *Lateral maleolus*

☐ *Bimaleolar*

☐ *Medial maleeolus*

☐ *Other(specify)*

☐ *Foot*

☐ *Tarsal:*

☐ *Calcaneos*

☐ *Cuboid*

☐ tarsus

☐ *Cuneiform(medial(1st),intermediate(2^n),lateral(3^{rd})*

☐ *Navicular*

☐ *Metatarsal:*

☐ *First*

☐ *Base* ☐ *Shaft* ☐ *Head*

☐ *Second*

☐ *Base* ☐ *Shaft* ☐ *Head*

☐ *Third*

☐ *Base* ☐ *Shaft* ☐ *Head*

☐ *Fourth*

☐ *Base* ☐ *Shaft* ☐ *Head*

☐ *Fifth*

☐ *Base* ☐ *Shaft* ☐ *Head*

☐ *Multiple*

☐ *Other(specify)*

☐ *Phalanges:*

☐ *Base* ☐ *Shaft* ☐ *Head*

☐ *First*

☐ *Base* ☐ *Shaft* ☐ *Head*

☐ *Second*

☐ *Third*

☐ *Base* ☐ *Shaft* ☐ *Head*

☐ *Fourth*

☐ *Base* ☐ *Shaft* ☐ *Head*

☐ *Fifth*

☐ *Base* ☐ *Shaft* ☐ *Head*

☐ *Multiple*

☐ *Other(specify)*

☐ *Pelvic*

☐ Aright ☐ left ☐ both

☐ *Parts*

☐ *Iliac* ☐ *Combined*

☐ *Pubic* ☐ *Other(specify)*

☐ *Ischium*

Part III: Nature of Fracture

☐ Closed*/simple* ☐ *Open/Compound*

☐ Others (specify)

Part IV: Types of Fracture

☐ *Complete* ☐ *Incomplete* ☐ *Others(specify)*

Part V: Patterns of Fracture

☐ *Transverse* ☐ *Comminuted*

☐ *Oblique* ☐ *Amputated*

☐ *Spiral* ☐ *Other(specify)*

☐ *Impacted*

Part VI: Causes of Fracture

- ☐ *RTA*
- ☐ *Machine*
- ☐ *Crush/ compression*
- ☐ *Bullet*
- ☐ *Hit by stick*
- ☐ *Fall*
- ☐ *Assault/domestic attack*
- ☐ *Pathological*
- ☐ *Stab*

Part VII: Behavioral Factors

- ☐ *Alcohol use*
- ☐ *Chat use*
- ☐ *Fighting*
- ☐ *Others (specify)*

Part VIII: Vehicle Types

- ☐ *Motorcycle*
- ☐ *Bicycle*
- ☐ *Bajaj*
- ☐ *Others(specify)*
- ☐ *Bus*
- ☐ *Taxi*
- ☐ *Isuzu*
- ☐ *Sino track*

Part IX: Environmental Factors

☐ *Location of the accident*

- ☐ *Rural*
- ☐ *Urban*

Part X: Medical Illness

a. *Yes*
b. *No*

*From the above(x) question if the answer is"**yes** "what is it?*

- ☐ *Diabetes mellitus*
- ☐ *Hypertension*
- ☐ *Rheumatoid arthritis*
- ☐ *Bone cancer*
- ☐ *Others (specify)*

DECLARATION

I, the undersigned, declare that this thesis is my original work, has not been presented for a degree in this or any other university and that all sources of materials used for the thesis have been fully acknowledged.

Name of the student:

Signature: _____

Name of the institution:

Date of submission: _____

This thesis has been submitted for examination with my approval as University advisor

Name and Signature of the first advisor

_____

Name and Signature of the second advisor

_____

Name and Signature of the external examiner

_____

_____

Name and Signature of the internal examiner

_____

_____