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COLLEGE OF HEALTH SCIENCES

SCHOOL OF MEDICINE

DEPARTMENT OF ANATOMY

**CLINICAL PROFILE AND PATTERNS OF EXTREMITY FRACTURES
AMONG PATIENTS VISITING ORTHOPEDICS DEPARTMENT IN
TIKUR ANBESSA SPECIALIZED HOSPITAL, ETHIOPIA**

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IDENTIFICATION

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ABBREVIATION AND ACRONYMS

AAU: Addis Ababa University

GBD: Global Burden of Diseases

HMIS: Health Management Information System

JUSH: Jimma University Specialized hospital

LIC: Low Income Country

MIC: Middle Income Country

MRN: Medical Record Number

PI: Principal Investigator

RTI: Road Traffic Injury

SPSS: Statistical package for social sciences

TASH: Tikur Anbessa Specialized Hospital

WHO: World Health Organization

WSUTRH: Wolaita Sodo University Teaching and Referral Hospital

Table of Contents

IDENTIFICATION.....	I
ACKNOWLEDGEMENT	II
ABBREVIATION AND ACRONYMS	III
Table of Contents.....	IV
LIST OF FIGURES	VI
LIST OF TABLES	VII
Abstract	VIII
1. INTRODUCTION	1
1.1 Background	1
1.2 Statement of the problem	3
1.3 Significance of the study	5
2. Literature review	6
2.1 Bone Fracture	6
2.1 Types of Fracture	6
2.3 Magnitude of extremity Fracture.....	7
3. OBJECTIVE	13
3.1. General Objective.....	13
3.2. Specific Objectives.....	13
4. MATERIALS AND METHODS.....	14
4.1 Study Area.....	14
4.2 Study period	14
4.3 Study Design	14
4.4 Population.....	14
4.4.1 Source Population.....	14
4.4.2 Study Population.....	14
4.5 Inclusion and exclusion criteria.....	15
4.5.1 Inclusion criteria	15
4.5.2 Exclusion criteria.....	15
4.6 Sample Size determination and Sampling Technique.....	15

4.6.1 Sample size determination.....	15
4.6. 2 Sampling Procedure.....	16
4.7 Study variables	17
4.7.1 Dependent variable	17
4.7.2 Independent variables	17
4.8 Definitions of terms and operational definitions.....	18
4.9 Data Collection Tool and Procedures.....	18
4.10 Data quality control.....	18
4.11 Data analysis and Interpretation.....	19
4.12 Ethical consideration.....	19
4.13. Dissemination of the study.....	19
5. RESULT	20
5.1 Socio- demographic characteristics.....	20
5.2 Fracture of extremity.....	21
5.3 Causes of extremity fracture	30
6. DISCUSSION.....	37
7. CONCLUSION.....	41
8. LIMITATION OF THE STUDY	42
9. RECOMMENDATIONS.....	43
REFERENCES	44
Annex I.....	48

LIST OF FIGURES

Figure 1: Schematic representation of sampling procedure in Tikur Anbessa specialized hospital (TASH).	17
Figure 2: Anatomical site of fracture and the side of extremity fractures in victims who visited orthopedics department of TASH.	21
Figure 3: Fracture distribution based on length of bones in victims who visited TASH orthopedics department.	23
Figure 4 : Clinical profile of extremity fractures for male victims who visited TASH orthopedics department.....	24
Figure 5: Clinical profile of extremity fracture in the age group greater than or equal to fifteen years old victims in TASH orthopedics department.	25
Figure 6 : Nature of fracture on extremity in victims who visited orthopedics department in TASH.	27
Figure 7: Types of fracture based on number of fractured bones in skeleton of extremity in victims who visited orthopedics department in TASH.	27
Figure 8: Specific patterns of extremity fractures among victims who visited orthopedics department in TASH.	28
Figure 9: Causes of fractures by age groups among victims in TASH orthopedics department. .	31
Figure 10: Victim groups by RTI in TASH orthopedics department.	33
Figure 11: Types of vehicles that involve in road traffic injury in victims who visited TASH orthopedics department.	35
Figure 12: Types of motor vehicles injury while they cause injury among victims who visited TASH orthopedics department.	36

LIST OF TABLES

Table 1: Socio-demographic characteristics of extremity fracture in victims who visited orthopedics department in Tikur Anbessa specialized hospital (TASH).	20
Table 2 : Pattern and frequency of upper extremity fractures in victims who visited orthopedics department in TASH.	22
Table 3: Pattern and frequency of lower extremity fractures in victims who visited orthopedics department in TASH.	22
Table 4: Clinical profile of extremity fractures in the age less than fifteen years old victims who visited TASH orthopedics department.	26
Table 5: Specific patterns of fracture in the age group greater or equal to 15 years old victims in TASH orthopedics department.	28
Table 6: Specific patterns of fracture in the age group less than 15 years old victims in TASH orthopedics department.	29
Table 7: Comparison of the number of fractured bones by gender in victims who visited orthopedics department in TASH.	29
Table 8: Comparisons of number of fractured bone by age group among victims who visited orthopedics department in TASH.	30
Table 9: The prevalence of causes of fracture among victims who visited orthopedics department in TASH.	30
Table 10: Causes of fracture in the age group greater or equal to 15 years old victim groups in TASH orthopedics department.	32
Table 11: Causes of fracture in the age group less than 15 years old victim groups in TASH orthopedics department.	32
Table 12: Age groups by causes of fracture in victims who visited TASH orthopedics department.	34
Table 13: Causes of fracture by gender in TASH orthopedics department.	34

Abstract

Background: Fracture is a loss in the structural continuity of bone which results from injury, repetitive stress, or abnormal weakening of the bone (a 'pathological' fracture). Globally, injury continues to be an important cause of morbidity, disability and mortality both in the developed and developing countries. Around the world, 5.8 million people die every year, and about 16000 people die from injuries every day.

Objective: The aim of this study was to assess the clinical profile and patterns of extremity fractures among patients visiting orthopedics department in TASH, Ethiopia.

Material and Method: Institutional based retrospective cross-sectional study was carried out in TASH from April, 2018- June 2018. The sample size was 354. The study participants were extremity fracture patients who visited orthopedic department of TASH. The data was entered into Epi-Data 4.2 and then exported to SPSS 21 for analysis. Categorical data was presented in frequency table, percentage and graphs. Chi-square (χ^2) test was applied to see if there was any association between the different variables.

Results: The study participant comprised of 251(73.6%) male and 90 (26.4%) female resulting in a male to female ratio of 2.8: 1. Most of the victims, 111 (32.6%), were in between the age of 15 and 29 years. Lower extremity fracture (65.6%) was more common than upper extremity (34.7%). The femur (23.7 %) was the commonest fractured bone in the extremity across all age group. The common patterns of fractures were transverse type which accounted for (35.5 %). The leading causes of fractures were road traffic injuries (RTIs) (42.2%) followed by falling down accidents (29.6%). The Cause of fracture and number of bone fracture were found to be statistically significant association with age group at $p < 0.05$.

Conclusion: The most common fractured bone in the extremities was femur followed by tibia and fibula together. Transverse fractures followed by comminuted type of fractures were the commonest patterns of fracture. The leading cause of fracture was road traffic injury followed by falling down accidents.

Keywords: Extremity, fracture, Patterns, Tikur Anbessa specialized hospital, Ethiopia

1. INTRODUCTION

1.1 Background

Fracture is a loss in the structural continuity of bone. It results from injury, repetitive stress, or abnormal weakening of the bone (a 'pathological' fracture). Most fractures are caused by sudden and excessive force, which may be direct or indirect (1). Fracture prevalence differs in different parts of the world and that the spectrum of fractures presenting to different hospitals may vary considerably (2). It is the most common pattern of orthopedic injuries, which affects all age group; and also frequently associated with other injuries (3).

Globally, injury continues to be an important cause of morbidity, disability and mortality both in the developed and developing countries. Around the world, 5.8 million people die every year, and about 16,000 people die from injuries every day (4). It is affecting all populations, regardless of age, sex, income, or geographic region. For every person who dies of injuries, several thousand injured persons survive, but many of them are left with permanent disability (5).

Injury is a major cause of morbidity and mortality in both developed and developing countries including Ethiopia (4). It results death in all age groups and for both sexes. Among persons aged 15 through 44 years, injuries account for 6 of the 15 leading causes of death. Road traffic injuries (17.5%), falls (12.2%), interpersonal violence (10.1%), and self-inflicted injuries (9.7%) are the main injury-related cause. Road traffic accidents are the 10th leading cause of death and the 9th leading cause of the burden of disease (5).

The Global Burden of Disease (GBD) estimated that combined rates of extremity injury from falls and road traffic crashes ranged from 1,000 to 2,600/100,000 per year in most low-and middle-income countries (LMICs) compared with 500/100,000 per year in high income countries (HICs) (two to five times higher in LMICs). Injury mortality rates also significantly higher in LMICs as compared to HIC (6, 7). Every year over 5,000,000 people die from injuries, with 95% of these deaths in LMICs (8).

In developing countries some data indicates a huge burden of disability from musculoskeletal injuries. Some of these data come from individual country studies, such as a population-based survey showed that 0.83% of Ghanaians had an injury-related disability. The vast majority (78%) of such disabilities were due to extremity injuries. Hence; extremity injury related disability is alerting issue in developing countries (9).

Injuries are more common and on increasing in most developing countries, including sub-Saharan Africa (10). The rate of injury mortality in African nations in 2004 was highest in Nigeria and lowest in Egypt. South Africa and Ethiopia were second and third, respectively (11).

Road traffic accident related bone fractures contribute to an increase in morbidity, death, disability, and health expenditures across the age span. The incidence of bone fracture is impacted by many factors including age, race, gender, biology, physiology, body habitus, and environmental exposure to fracture-producing injury mechanisms and access to prevention programs (12).

1.2 Statement of the problem

Injuries are among the leading causes of death and disability in the world. Injuries account for a significant health burden in all populations, regardless of age, sex, income, or geographic region (5).

According to the 1996 World Health Organization report (WHO) injury ranks fifth among all causes of death, accounting for 5.2% of all mortality worldwide (13). It is also anticipated that, if current trends continue, road traffic injuries, interpersonal violence and self –inflicted injuries will be among the leading 15 causes of disability adjusted life years lost by the year 2020 (14).

Injuries accounted for 10.1% of the global burden of disease in 2013. Of the people who sustained injuries that warranted some type of healthcare, 5.8% (56.2 million) warranted inpatient care, of whom 38.5% (21.7 million) sustained fractures (1).

The burden of injury on musculoskeletal system is a leading cause of death and disability for people under 45 years in the industrialized world. These rates are declining in developed countries but it is a significant and a largely neglected health problem in developing countries (15).

Hospital based studies continue to show the effect of injury on the continuity of bone, and that it is a major cause of morbidity and mortality in Africa. For instance, in Nigeria out of patients treated for fracture and dislocation, lower limb and upper limb fractures occurred in over 70% and 20% of cases respectively (16).

In Ethiopia, a study which was conducted in Tikur Anbessa specialized hospital (TASH) , among patients who came to the emergency department , nearly half (49.7%) of the cases were presented with musculoskeletal injuries (17). A similar study conducted in Jimma university specialized hospital (JUSH), on patients who visited surgical outpatient department, (8.2%) were injury cases. Fracture was the leading outcome of injury in (41.2%) of patients (18). This two studies indicated that extremity fractures were the most affected anatomical region (17, 18). Another study conducted on Magnitude and outcomes of road traffic accidents at Hospitals in Wolaita Zone reported that the principal outcome of injury was more commonly injury of the extremities (80.2%) (19).

Despite the increasing trend suggested by available data, bone injuries especially extremity injuries have not received the attention they deserve in most developing countries including Ethiopia (20). Therefore, the aim of this study was to investigate patterns of extremity fractures and to identify its mechanism of injury in TASH, Addis Ababa, Ethiopia.

1.3 Significance of the study

In Ethiopia, there is limited published research on distribution of extremity fracture, in all age groups, following any of the various causes of fracture. Data regarding the distribution of extremity fractures in all age groups will help us to focus better on orthopedic management of patients, and eventually minimize the associated morbidity/ disability and mortality of the victims.

This study was aimed at determining the prevalence of fractured bones in the skeletons of extremities, identifying the pattern of extremity fractures and the common causes of fractures in all age groups. This could use as a reference data for policy makers to make evidence based decision to focus, especially, on prevention aspect, to allocate resource and budget for hospital equipment in order to facilitate the management of extremity fractures. The result of the current study may also enable health care professionals to predict fractures and site of injury.

Finally, this study will also provide a base line information to other researchers in conducting further detailed investigations on related issues.

2. Literature review

2.1 Bone Fracture

Bone is the main constituent of the adult skeleton. Bone tissue provides solid support for the body, protects vital organs such as those in the cranial and thoracic cavities, and harbors cavities containing bone marrow where blood cells are formed. Atypical bone ailment is the fracture, which occurs when the bone is not able to withstand outside force like direct blows, twisting, injuries and falls. Fractures are cracks in bones and are defined as a medical condition in which there is a break in the continuity of the bone (21). This could be the result of excessive force, stress, or trivial injury as occurs in pathologic fractures. Fractures can happen in a variety of ways, but there are three common causes: Trauma fractures (Accidents), Osteoporosis and Stress or overuse (22)

2.1 Types of Fracture

Fractures can be broadly described as closed or open. Simple fractures (more recently called "closed") are not obvious as the skin has not been ruptured and remains intact. Compound fractures (now commonly called "open") break the skin, exposing bone and causing additional soft tissue injury and possible infection. A single fracture means that one fracture only has occurred and multiple fractures refer to more than one fracture occurring in the same bone. Fractures are termed complete if the break is completely through the bone and described as incomplete or "greenstick" if the fracture occurs partly across a bone shaft. This latter type of fracture is often the result of bending or crushing forces applied to a bone. A complicated fracture is a fracture of the bone combined with a lesion of an organ, artery, nerve bundle, or joint (22).

Fractures involving the long bones in adults should be described using certain universally accepted descriptive conventions. 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 inciting 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 (23).

2.3 Magnitude of extremity Fracture

A retrospective study over one year by Huda, et al; which was conducted in India, revealed that orthopedic injury was the commonest in the emergency department. There were 71.09% males and 28.9% females' patients with a ratio of 2.5:1. The most affected age groups were 11- 44 years (81.89%). RTA (59.72 %) was the most common cause of injury. Other causes were fall from height (22.25 %), fall from bed (0.27 %), fall from stairs (0.72 %), fall on ground (0.63 %), occupational injuries (8.28%), assault (5.67%), sports related (1.62%) and firearm injuries (0.8%). This study revealed that the commonest injury was fracture (68.64 %) and the most common site of injury was lower limbs (48.16%) with tibia/fibula (32.97%) being the most common bones to be fractured followed by upper limbs (28.08%) and pelvic fractures (10.01%). There were 71.65 % simple fractures and 28.34% compound fractures (24).

A similar study conducted by Jindal R et al; in India on prevalence of lower limb fractures revealed there were 61.9% males and (38.1%) females. The most common fractured bone was femur (33.2%) followed by fibula (29.7%). Pelvic fracture (4.4%) was the least affected bone. In contrary to the above study; maximum fractures occurred due to osteoporotic bone disease (51.6%) followed by RTA (30%). Other causes were Fall (5%), work place injury (4.5%) and sport injury (7.6%) (25).

A retrospective study conducted in India on patterns of fracture and dislocation due to RTI revealed that males (82.56%) were the most affected compared to females (17.42%). In this study, lower limb (60%) was the most affected anatomical region as compared to upper limb (30.66%). The commonest fractured bone in this study was femur (22.17%) followed by only tibia (13.21%). In the upper limb, humerus (8.01%) was the common site of injury (26).

Another study conducted on pattern of fractures and dislocations in a tertiary hospital in north – east India, revealed that Fractures of radius and/ulna (16.1%) were common site of fracture followed by tibia and fibula (14.3%). The common causes of fracture were RTA (62%) followed by fall from height (27).

A prospective descriptive hospital based study conducted by Awasthi, et al; in India revealed that; the common fracture in upper extremities was distal end of radius (17.2%) followed by both bones of forearm (6.7%) and the common site of fracture in lower extremities were both bones of leg (7.8%) followed by fracture of metatarsals (5.9%). The cause of injury was fall down (74.6%) followed by roadside accidents (14.6%) (28).

A similar study design to the above paragraph conducted in this country in Manipur also revealed that upper extremity injuries (58.16%) were more common than lower extremity (41.83%). Males (73.5%) were the most affected than females (26.75%) resulting a male to female ratio 2.7:1. The commonest fractured bone in the upper extremity was distal radius (20%) followed by both bones of forearm (7.3%). In the lower extremity, tibia and fibula together (7.58%) followed by metatarsals (5.8%) were the common site of fracture. Fracture was more common in the ages of between 31 to 40 years (24.5%) followed by 21 to 30 years old (23.8 %). The most common cause of injury was fall (68.75%) followed by that of road RTI (18.92%) (29).

A retrospective study conducted in kashan, Iran, on extremity Fractures and Dislocations due to RTI revealed that most frequent extremity fracture rate was observed in 15-29 year age group (43.2%) followed by 30-44 age group (23.4%). The most commonly fractured bones were tibia and fibula (37.6%) followed by radius and ulna (19.3%). Regarding the mechanism of limb injuries, the highest percentage of upper extremity injuries was found in bicyclists (64.7% $P=0.03$), followed by car accident (45.6%), motorcycle (39.3%), and pedestrian (33.8%). The highest percentage of lower extremity fracture was found in pedestrians (67.7%), followed by motorcyclists (62.2% $P=0.04$), car accident (56.1%) and bicyclists (35.3%) (30).

In Pakistan by Yousaf, et al; a cross-sectional institution based prospective study conducted on pattern of adult limb fracture revealed that males were the most affected (77.88%) than Female (22.11%). Male to female ratio was 3.52:1. Most of the injured patients were between the ages of 16-25 years. Lower limb (68.51%) was the common site of injury compared to upper limb (29.74%). The highest frequency of fracture occurred in the Femur (33.76%) followed by Tibio-fibular fracture (23.85%) and Humerus (16.33%), respectively. Most of fractures were closed type (84.95%) followed by open type (15.04%). The common of patterns of fracture were

Transverse (57.98%) followed by oblique (19.08%). RTIs were the common cause fracture which constituted (59.23%) (31).

Another prospective study done in Pakistan on Non-Fatal Limb Injuries in Motorbike Accidents revealed that, in the lower limb, tibia (39%) was the most injured bone followed by tibia and fibula (26%). In the upper limb, radius (9.2%) was the common site. Driver was the most affected groups (68%) followed by passengers (32%). Male to female ratio of the injured victims was 9:1. The most affected age group were in between the ages of 16 and 30 years (41%) followed by 30-45 years old (27%) (32).

A prospective study done in India on fracture due to RTA revealed that multiple fractures were found in majority (21.39%) of the cases followed by fractures of the tibia and fibula (12.69%). Maximum case were fall from the motorcycle (58.8%) followed by Bicycle accident which were (16.3%), pedestrian (9.62), car accident (9.62%) and heavy motor vehicle(4%) (33).

A crosssectional study conducted in Malaysia on Pattern of Childhood Fractures in a Developing Country revealed that there were (72.3%) boys and (27.3%) girls; giving a male to female ratio of 2.7:1. Mean age was 8.0 years old. The most common bones diagnosed for fracture were the radius and ulnar (41.9%) followed by the humerus (27.7%) and tibia/fibula (7.7%). Sport related activities was the main cause of injury which account (10%) Followed by Road Traffic Accident (9.2%) of all the fractures (34).

A crosssectional study done in Kenya on pattern of long bone fractures in a paediatric population revealed that the males formed a majority at (59%) giving a male: female ratio of 1.4:1. Most of the fractures occurred in the 2 - 6 years age groups (45%). In the age between 6 - 8 years old had the least number of patients at (28%). The predominant mechanism of injury was falls (56%) followed by RTA (21%). A majority of the patients (84%) sustained single fractures. The rests were multiple fractures (16%). Closed fracture (96%) was the predominant type followed by open fracture (4%). The upper limb (53%) was a common site of fracture compared to lower limb (47%). In this study, the commonest fractured bone in the lower limb was the femur (33%), where as in the upper extremity, radius (23%) followed by humerus (19%) (35).

Another cross-sectional study in Kenya on patterns of injuries due to RTI revealed that males (81%) were most affected than females (19%). Lower limb injuries contributed (57 %) whereas upper limb injuries constituted (35%). It also revealed that the most vulnerable groups were Pedestrians (62%) followed by passengers (24%) and drivers (9%). The common type vehicle that involve in RTIs were minibuses (40%) followed by saloon cars (17%) (36).

A retrospective study conducted in Nigeria, on Road Traffic Accidents and Bone Fractures revealed that RTI was observed to be the leading cause of bone fractures (57.87%) followed by domestic/sport related (27.31%). Fractures were occurred more in Males (57.41%) than in Females (42.59%). Fractures were observed to occur more in the lower extremity with the femur (22.69%) being the most fractured bone followed by the tibia/fibula (17.13%). The most fractured bone in the upper extremity was the humerus (12.96%) followed by the clavicle (9.26%). Patella (0.46%) was the least affected bone of the all skeletal fracture study. Simple fractures (56.59%) were more common compared to compound (43.41%). In this study, the common patterns of fractures were transverse type (36.21%) followed by comminuted (31.03%) (37).

A similar study design in this country (Nigeria), on anatomic pattern of fracture revealed that fracture was more common on male than female and the most affected groups were in the age between 20-39 years old (57%). In this study, upper and lower extremity was the most affected anatomical region. In the adults of upper extremity, the Femur (21.6%) was the most the common site of fracture followed by tibia and fibula (15.7%) whereas in the upper extremity, the radius and ulna (5.9%) followed Humerus were a common site of fracture (5.7%). This study also concluded that lower limb fractures were more common than upper limb fractures even in children. RTI (72%) was the most common cause followed by fall from heights (11%) (16).

Another prospective study on fracture patterns revealed that there were (80.2%) males and (19.8%) female's fractured cases resulting a ratio of 4:1. The lower limbs were affected in (41.5%) patients followed by upper limbs in (24.6%) compared to other skeletal fractured cases. The main causes were motor vehicular accidents (73.2%) followed by domestic accidents (3.4%) (38).

A descriptive cross-sectional study done in Egypt on pattern of extremity trauma on children revealed that males (66.67%) were at a higher risk of extremities trauma than females (33.33%). The highest incidence of extremities injuries in children occurred in school age group. Forearms and wrist accounted for (56.3%) of an all injured sites. The common cause of fracture was falling down (64%) followed by road traffic accidents (18.89%) (39).

A prospective crosssectional study conducted on adult in AAU, TASH showed that the main cause of adult musculoskeletal injury was RTA. Most of the study subjects involved in RTA was males (74.8%). Among patients with RTA, the highest age group which mostly affected was between the ages of 15-25 years (35.1%). Fractures were more occurred on lower limb (57.4%) compared to the upper limb (41.1%). Both upper and lower extremities were involved in (1.5%).The highest frequency of fractures occurred in the femur (15.8%) followed by tibio-fibular (14.4%) and humerus (12.9%). The majority of fractures were closed fractures (82.2%) whereas open fracture responsible for (17.8%). The common patterns of fractures were transverse followed by oblique(18.8%) (17).

A similar study done at TASH on adult limb fracture revealed that the highest age group mostly affected was between 21-30y (36.5%). The main causes of fracture were Road traffic accidents (47.9%) followed by fall down accident (29.9 %). The highest frequency of fracture occurred on the femur (15%) followed by tibio- fibular bones 14%) and the humerus (13.5%). It was evident that upper limbs or lower limbs were included solely or simultaneously. Fracture on the upper limb alone accounted for 50.53% whereas the proportion of injury for the lower limbs was 49.42%. The majority of fractures were closed fractures accounting (78.68%) compared to compound fractures (21.3%). The common patterns of fractures were transverse type (54.9%) followed by oblique (19.4%). The right side (52.1%) was slightly more affected as compared to the left side (47.2%) and both sides affection accounted for (0.6%) (40).

A retrospective cross sectional study conducted on 280 sampled fractured cases in Wolaita Sodo University Teaching and Referral Hospital (WSUTRH), Wolaita Sodo, Southern Ethiopia revealed that traumatic bone fracture was more Common among males (69.3%) than females (30.7%) resulting a male to female ratio of 2.3:1. The most affected groups were in between the ages of 15-25 years followed by 26-35 years, which accounted for (27.9%) and (25.7%),

respectively. The common causes of fractures were RTA (35.4%) followed by fall down accident (28.6%). In RTA, the most vulnerable groups were drivers (35.4%) followed by pedestrians and passengers; they accounted for (33.3%) and (31.3 %), respectively. Upper limb and lower limb are the commonly anatomic sites of fracture accounting (46.4%) and (37.5%), respectively. Radial and / or ulnar followed by tibia and / or fibula fractures were the most fractured bones and accounted for (48.9 %), (23.0 %), respectively. Regarding the nature of fracture, closed fracture (61.4%) was more common compared to compound (38.6%). With respect to the pattern of fracture, Transvers was the commonest patterns which was responsible for (47.8%) followed by Oblique (22.8%) (41).

3. OBJECTIVE

3.1. General Objective

- To assess the clinical profile and patterns of extremity fractures among patients visiting orthopedics department in TASH over a period of one year retrospectively, from December, 2016 to December, 2017.

3.2. Specific Objectives

- To determine the prevalence of most commonly fractured bones in the skeleton of extremity.
- To identify the common causes of fracture on extremity.
- To identify the common patterns of extremity fracture.

4. MATERIALS AND METHODS

4.1 Study Area

The study was conducted in TASH, Addis Ababa, Ethiopia. Black Lion Hospital (Tikur Anbessa hospital in Amharic), located in Addis Ababa, is Ethiopia's largest general public hospital and one of the University Hospitals in the country. It was established in 1964. In 1998 Black Lion Hospital, which is also the largest and oldest referral teaching hospital in the country, was given to AAU by the Ministry of health as a main teaching hospital. The faculty is the oldest and the largest among the health training institutions in the country, staffed with the most senior specialists. The hospital provides a tertiary level health care service and it is administered by Addis Ababa University. It offers medical services approximately for 370,000-400,000 patients per year in all wards. The hospital has 800 beds, with 130 specialists and 50 non-teaching doctors (42).

4.2 Study period

The study was conducted by reviewing records of patients with extremity fractures and the duration of the study was from April, 2018 – June, 2018.

4.3 Study Design

Institutional based retrospective cross sectional study design was employed.

4.4 Population

4.4.1 Source Population

The source population was all fracture patients who visited orthopedics department in TASH from December, 2016 to December, 2017.

4.4.2 Study Population

The study population was all extremity fracture patients who presented to orthopedics department in TASH, and that fulfill the inclusion criteria.

4.5 Inclusion and exclusion criteria

4.5.1 Inclusion criteria

- All patients with fracture of extremities, who visited orthopedics department in TASH from December, 2016 to December, 2017 were included in the study.

4.5.2 Exclusion criteria

- Extremity fracture patients' chart that had incomplete data greater than 20% of the variables of was excluded.
- Extremity fracture patients' chart which was lost from record office at the time of data collection was excluded.
- Extremity fracture records in children resulting from birth trauma were excluded.

4.6 Sample Size determination and Sampling Technique

4.6.1 Sample size determination

There was no data on the prevalence of extremity fractures in all age groups in Ethiopia. Therefore, the estimated prevalence of extremity fracture is 50%.

The minimum number of sample required for this study was determined by using single population proportion formula.

$$n = \frac{(z_{\alpha/2})^2 \cdot pq}{d^2}, p=q=0.5$$

Where: n= minimum sample size required for the study

Z= standard normal distribution (Z=1.96), CI of 95% = 0.05

P= prevalence of extremity fractures is unknown; Hence; p=50 % (0.5) is used.

d=Absolute precision or tolerable margin of error= 5 % (0.05)

$$n = \frac{(1.96)^2(0.5)(0.5)}{(0.05)^2} = \underline{\underline{384}}$$

Since the total source population during the study period was less than 10,000, which was 2002, correction formula was applied.

$$nf = \frac{n}{1+n/N} = \frac{384}{(1+\frac{384}{2002})} = \underline{\underline{322}}$$

10% was added for incomplete data

Thus, the final sample size was **354**

4.6. 2 Sampling Procedure

The medical record number (MRN) of all patients with a diagnosis of fracture was collected from emergency and regular fracture clinic health management information system (HMIS) registration book of the hospital within study period. The inpatient registration book and daily morning sheets also checked to avoid missing of some unregistered charts in HMIS of emergency and fractured clinic. While collection of MRNs of all fractured patients, extremity fracture patients were selected and then assigned by a consecutive number according to registration date in HMIS.

According to the number of cases distribution in pediatrics and adult age group, the sample size was proportionally allocated for each age group. Systematic random sampling method (every 5th MRN) was used to take sample MRNs in each age group. The initial starting MRN was identified by a simple random sampling method (lottery method) to take sample systematically in each group. After taking sample MRNs by systematic random sampling method, the card was searched from patients chart room by card room workers. All the data were collected by a team of data collectors (Figure1).

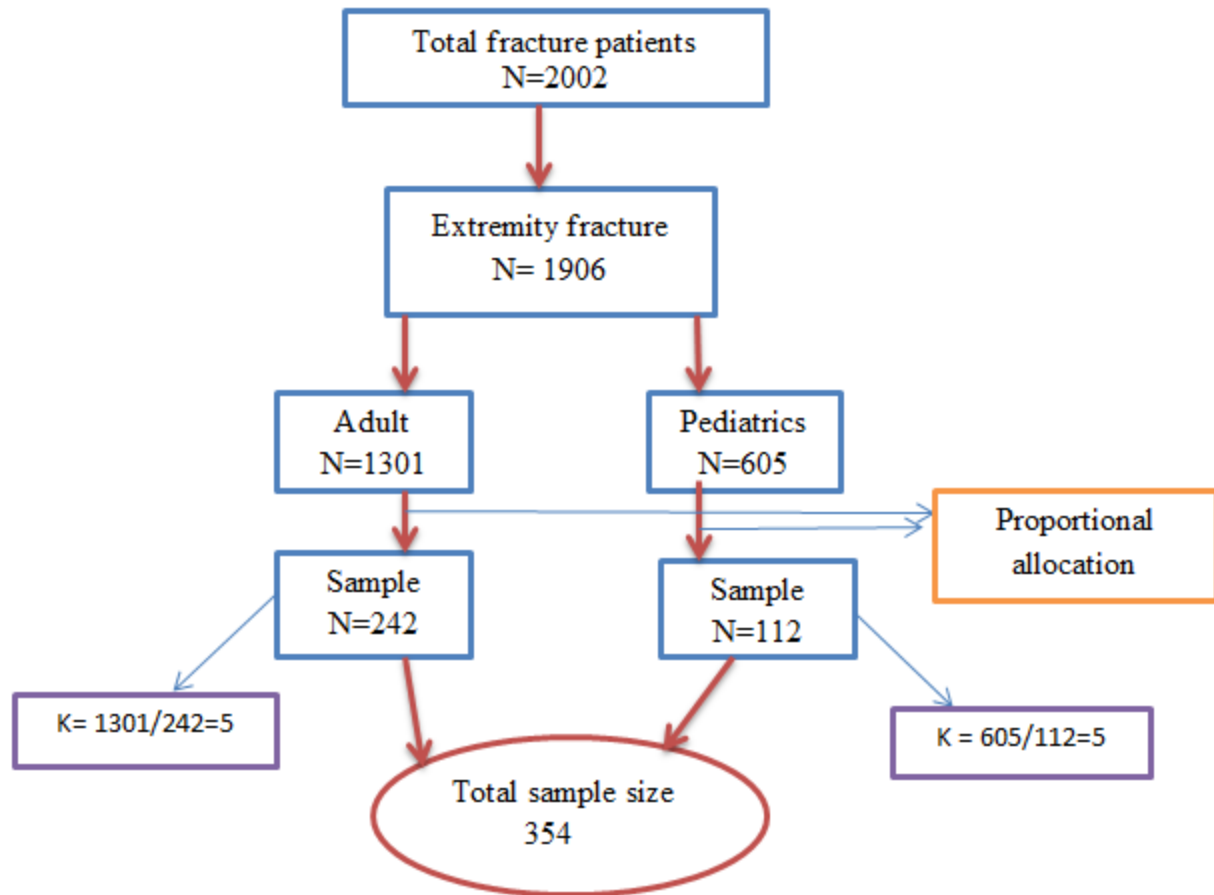


Figure 1: Schematic representation of sampling procedure in Tikur Anbessa specialized hospital (TASH).

4.7 Study variables

4.7.1 Dependent variable

- Extremity fracture

4.7.2 Independent variables

- Age
- Sex
- Causes of fracture

4.8 Definitions of terms and operational definitions

Injury: The physical damage that results when the human body is suddenly or briefly subjected to intolerable levels of energy.

Single fracture: Refers to one fracture only which occurred in the same bone

Multiple fractures: Refers to more than one fracture occurring in the bones.

Simple (closed) fractures: Fracture of bone which is not obvious as the skin has not been ruptured and remains intact.

Compound (open) fracture: A fractured bone breaks the skin, exposing bone and causing additional soft tissue injury and possible infection.

Road traffic injury: Refers to a collision between vehicles, between vehicles and pedestrians, between vehicles and animals, or between vehicles and fixed obstacles.

Clinical profile: Is profile of fractured bones in male, female, under fifteen and greater than fifteen years old.

Pedestrian: A person walking on road rather than travelling in a vehicle.

4.9 Data Collection Tool and Procedures

Data was collected using structured checklist which was adapted from previous literature. First MRNs were obtained from HMIS registration book through systematic random sampling method to get the main file of the patient from patients chart room. Next in the patients' charts room; from the main card the necessary details were sought in terms of age, sex, anatomical site, nature of fracture, affected side, number of fracture bone, pattern and causes of fracture. Finally, based on the inclusion and exclusion criteria of the study, a card which had variables for the study was used. Then; all variables were collected from the main card information.

Four nurses with a BSc degree were assigned to collect the data from medical cards and two BSc degree nurses were supervising data collectors in the process of data collections. Timely supervision was under taken by the principal investigator (PI) during the data collection period.

4.10 Data quality control

Training was given to the data collectors and supervisors for 2 days on techniques of data collection, data collection material and purpose of research. Properly designed data collection material, which was checked by professional experts, was used. The inpatient registration book

and daily morning sheets was checked to avoid missing of some unregistered charts in HMIS of emergency and fractured clinic. Supervision was carried out on daily based to check completeness and consistency by both the supervisor and the PI to assure the quality of data. Pretest was performed in 5% of total sample size of patients' card prior to the actual data collection time and correction was carried out on data collection material if necessary.

4.11 Data analysis and Interpretation

The data was checked after each data collection for its completeness. The data was entered into Epi-Data version 4.2 and then exported to SPSS Version 21 for analysis. For categorical data, descriptive statistics like frequency and percentage were computed and presented by the use of tables, bar graphs and pie chart. Continuous variables were summarized using means, median, mode and standard deviation. Chi-square (χ^2) test was applied to see if there was any association between the different categorical variables related to fracture. Statically significant association was declared at p-values <0.05.

4.12 Ethical consideration

Ethical clearance was obtained from Department of Research Ethics Review Committee (DRERC) of Addis Ababa University in Anatomy department. Then this ethical clearance and cooperation letter was sent for TASH outpatient department director to obtain consent to perform data collection. Confidentiality of patient information was maintained through taking the data anonymously. After data collection, the raw data was secured and was not accessed by anyone except the principal investigator and personal identifiers to keep confidentially.

4.13. Dissemination of the study

The finding of the study will be presented and submitted to Addis Ababa University, College of health science, school of medicine, department of anatomy. The finding of study will also be shared to orthopedic department and other concerned body. For broader dissemination, the manuscript will be submitted to one of peer-reviewed journals for publication.

5. RESULT

5.1 Socio- demographic characteristics

In the present study, out of 2002 fracture cases who visited orthopedic department in TASH (December, 2016 to December, 2017), 354 extremity fracture cases were sampled. Out of 354 sampled cases, 341 patient charts had complete data and this sample was analyzed in this study. The study participants comprised of 251 (73.6%) males and 90 (26.4%) females resulting in a male to female ratio of 2. 8: 1. The patients' ages ranged from 0 to 95 years with the mean and standard deviations of 29.3 and ± 21.8 years, respectively. The median and the mode of participants' age were 24 and 35 years, respectively. Most of the victims 111 (32.6%) were between the ages of 15 and 29 years. Nearly half of study participant came from Addis Ababa 161 (47.2%) followed by Oromiya, Amhara and SNNPR regions which accounted for 100 (29.3%), 46 (13.5%), and 22 (6.5%) respectively. The other study participants, 12 (3.5%) came from elsewhere or other regions of Ethiopia (Table 1).

Table 1: Socio-demographic characteristics of extremity fracture in victims who visited orthopedics department in Tikur Anbessa specialized hospital (TASH).

Characteristics		Frequency	Percent
Gender:	Male	251	73.6%
	Female	90	26.4%
Age:	0 – 14	103	30.2%
	15 – 29	111	32.6%
	30 – 44	55	16.1%
	45 – 59	27	7.9%
	60 – 74	27	7.9%
	>_ 75	18	5.3%
	Addis Ababa	161	47.2%
	Oromiya	100	29.3%
Region:	SNNPR	22	6.5%
	Amhara	46	13.5%
	Tigray	2	0.6%
	Harar	3	0.9%
	Benishangul Gumz	3	0.9%
	Afar	4	1.2%

5.2 Fracture of extremity

In this study, 216 (63.3%) participants had lower extremity fractures followed by 108(31.7%) upper extremity fractures. The rest of the participants 17(5.0%) had both upper and lower extremity fracture. Regarding fracture side of the body: the right side 159 (46.6%) was almost equally affected as the left side 156 (45.7%). Those patients who had both right and left side extremity fractures were about 26 (7.6%) (Figure 2).

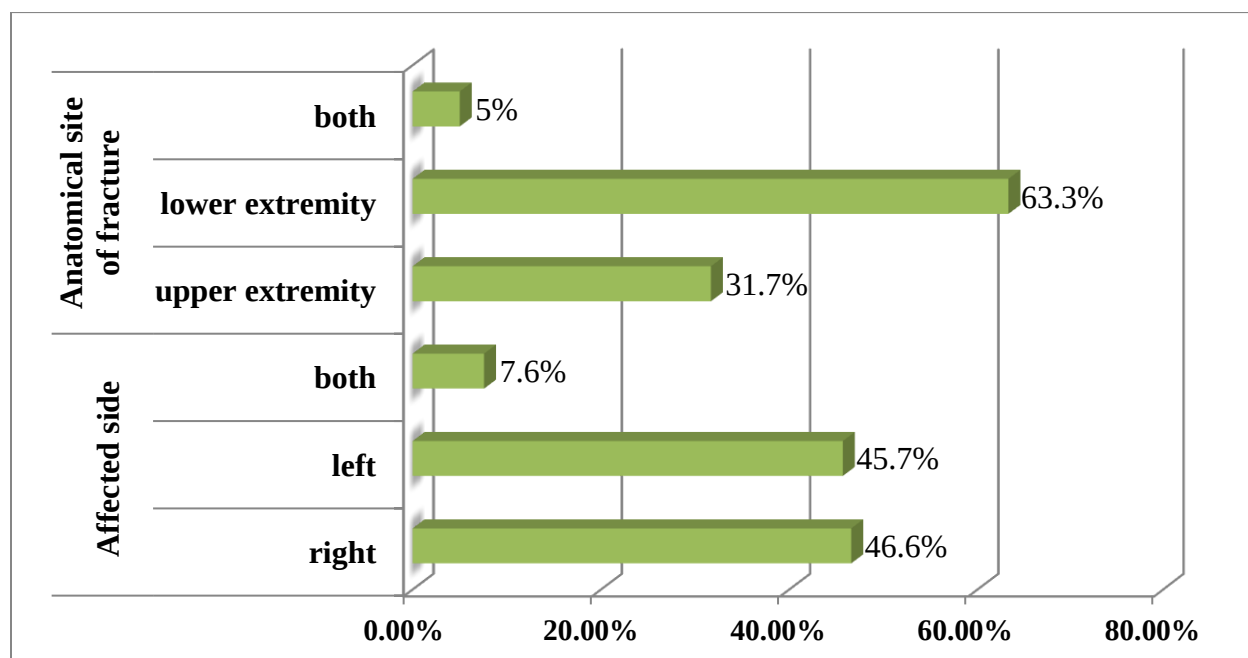


Figure 2: Anatomical site of fracture and the side of extremity fractures in victims who visited orthopedics department of TASH.

In this study, lower extremity (65.6%) was the most common site of fracture compared to upper extremity (34.7 %). The most commonly fractured bone in the lower extremity was the femur 89 (23.7%), followed by tibia and fibula together 49 (13.0%). The least fractured bone was phalangeal bone and accounted for 1(0.3%). It was also observed that the femur was the commonly affected bone in the skeleton of extremity. In the upper extremity, the most commonly fractured bone was the humerus 36 (9.6%) followed by radius and ulna together 30 (8.0%) while the scapula was the least affected bone and accounted for only 2 (0.5%) (Table 2 and Table 3).

Table 2 : Pattern and frequency of upper extremity fractures in victims who visited orthopedics department in TASH.

Fractured bones	Frequency	Percent
Scapula	2	0.5%
Clavicle	7	1.9%
Humerus	36	9.6%
Radius and Ulna	30	8.0%
Only Radius	22	5.9%
Only Ulna	23	6.1%
Carpal	3	0.8%
Metacarpal	4	1.1%
Phalangeal	3	0.8%
Total	130*	34.7%

Table 3: Pattern and frequency of lower extremity fractures in victims who visited orthopedics department in TASH.

Fractured bones	Frequency	Percent
Pelvic bones	48	12.8%
Femur	89	23.7%
Patella	7	1.9%
Only Tibia	39	10.4%
Only Fibula	4	1.1%
Tibia and Fibula	49	13%
Tarsal	3	0.8%
Metatarsal	6	1.6%
Phalangeal	1	0.3%
Total	246*	65.6 %

("*" In table 2 and table 3 represents, some patients had multiple site fracture on lower and upper extremity).

This study also revealed that the majority of fracture were occurred on long bone (humerus, radius and ulna, only radius, only ulna, femur, only tibia, only fibula, both tibia and fibula), it comprised for 292 (77.8%). The other fractures were occurred on pelvic bones followed by hand (carpal metacarpal, phalangeal), foot (tarsal, metatarsal, phalangeal) and others (scapula, clavicle and patella) which accounted for 48(12.8%), 10(2.7%), 10(2.7%) and 16(4.3%), respectively (Figure 3).

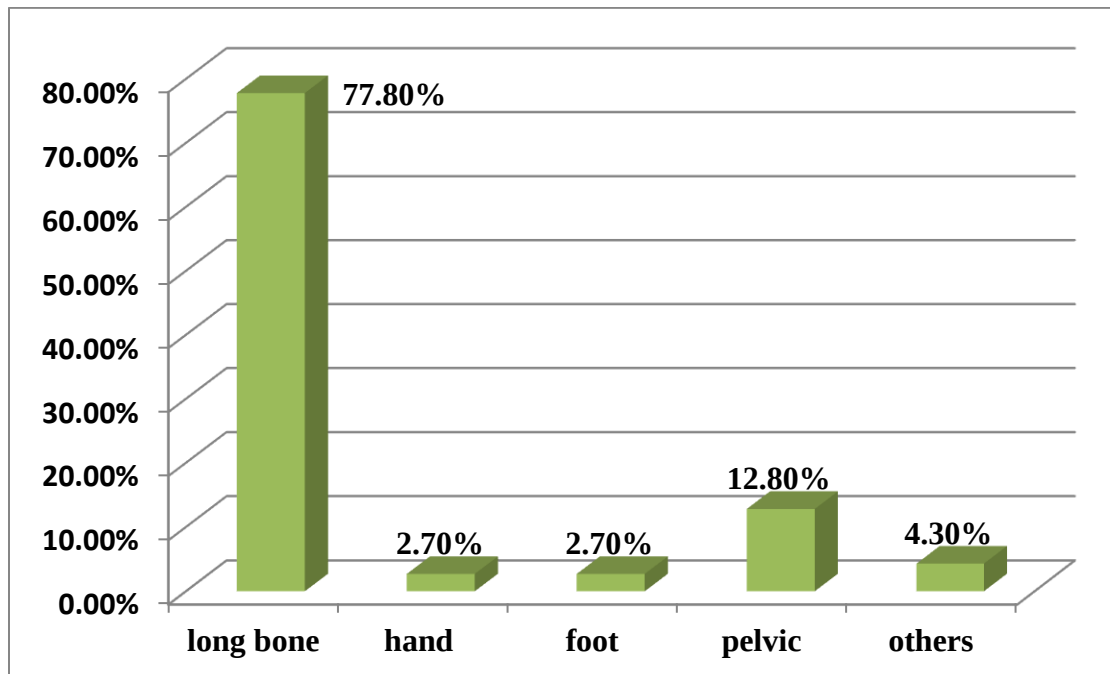


Figure 3: Fracture distribution based on length of bones in victims who visited TASH orthopedics department.

In males, the most commonly fractured bone in the skeleton of extremity was the femur (24.1%), followed by tibia and fibula together (15.1%) while the least fractured bones were hand phalangeal bones and scapula and each accounted for (0.4%) and (0.4%), respectively. In females, it was observed that the femur (22.4%), followed the humerus (17.3%) were the most affected bones in the skeleton of extremity while the least affected bones were the scapula, carpal, patella, tarsal, and foot phalangeal and each accounted for (1%) (Figure 4 and Figure 5).

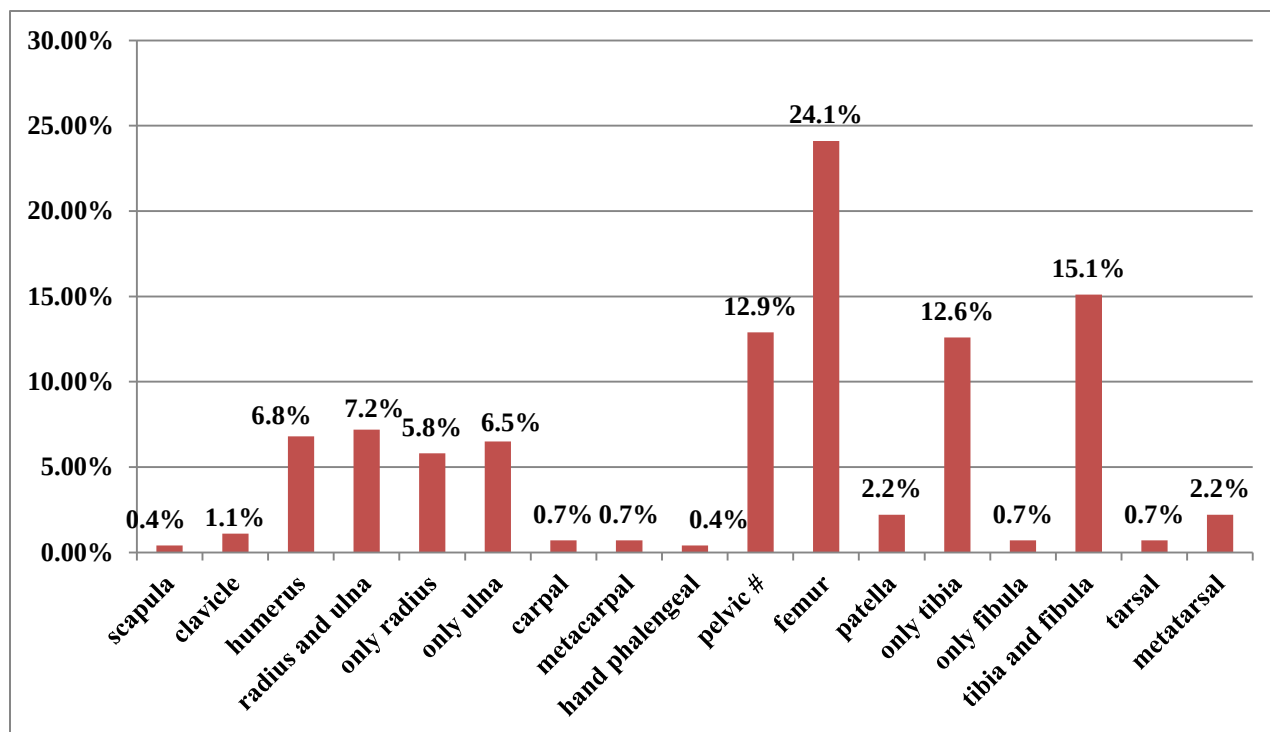


Figure 4 : Clinical profile of extremity fractures for male victims who visited TASH orthopedics department.

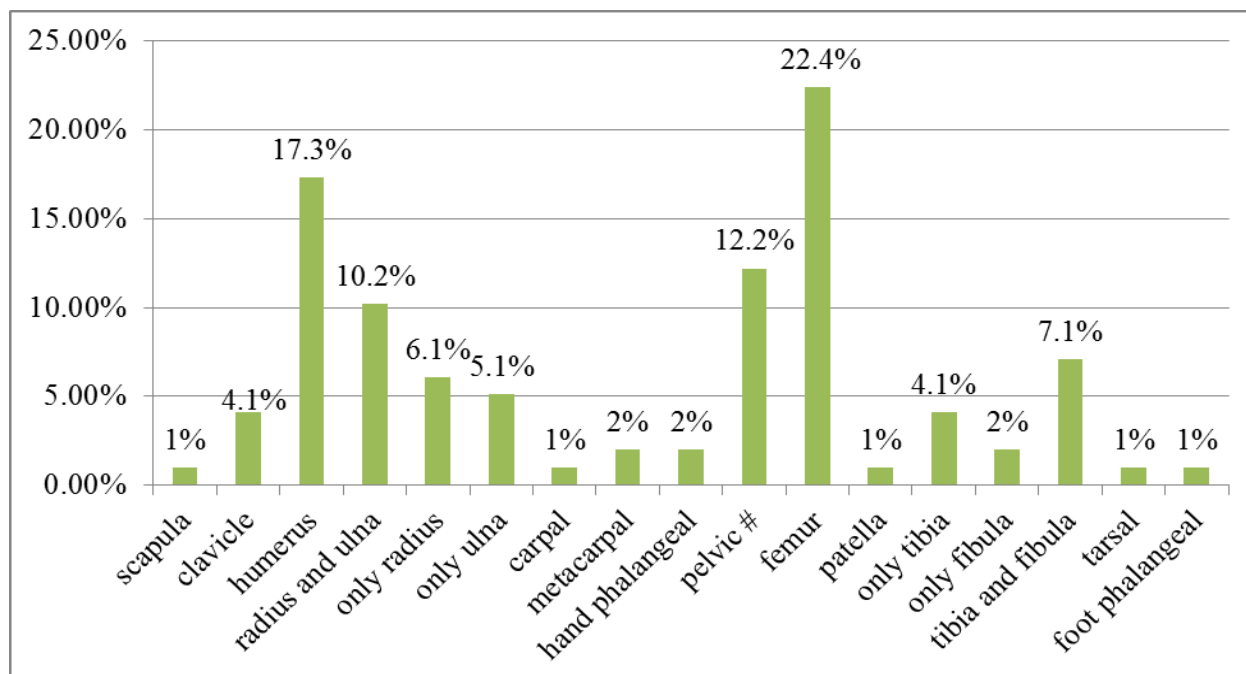


Figure 5: Clinical profile of extremity fractures for female victims who visited TASH orthopedics department.

In the age group greater or equal to fifteen years old, Femur (23.6%) was the commonly fractured bone, followed by pelvic bones (16.6%) and tibia and fibula together (16.6%). The least fractured bone was foot phalangeal bones and accounted for only (0.4%) (Figure 6).

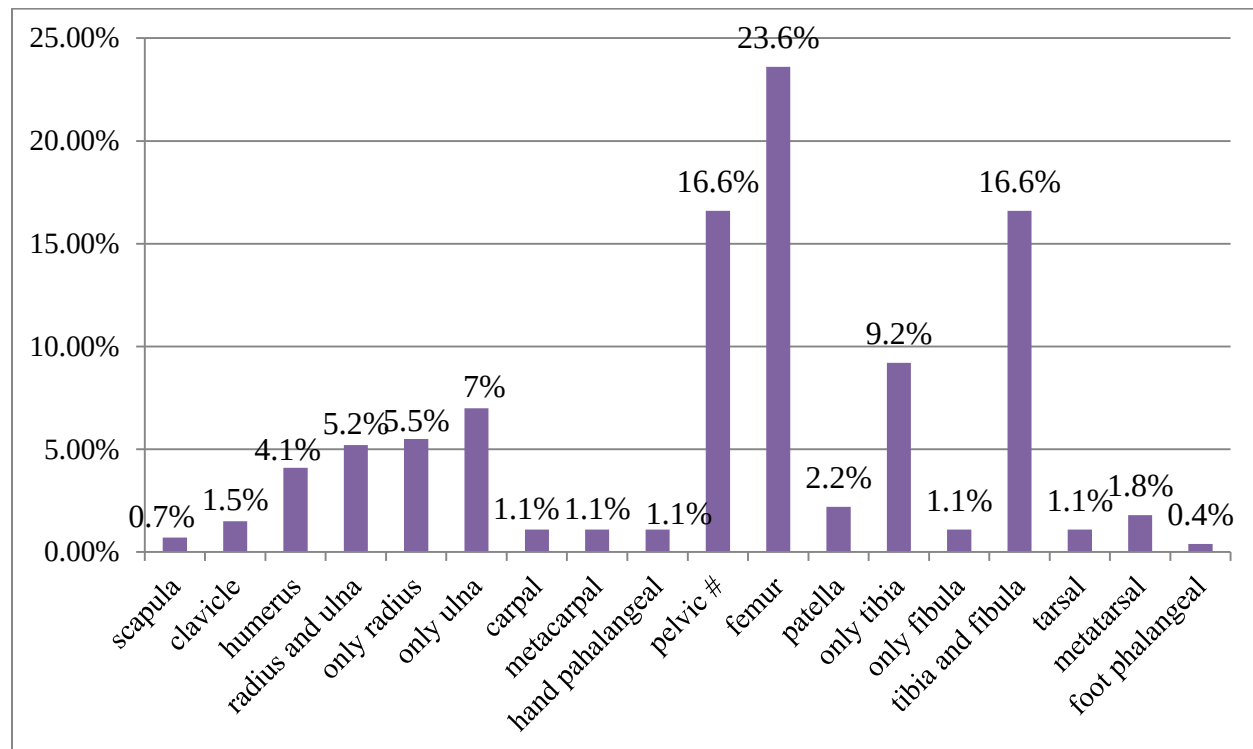


Figure 5: Clinical profile of extremity fracture in the age group greater than or equal to fifteen years old victims in TASH orthopedics department.

In the age group less than fifteen years old, there were one hundred three victims. Out of these study participants, upper extremity fractures 56 (53.4 %) were more common compared to lower extremity fractures 49 (46.8 %). In the upper extremity, the humerus was the commonly fractured bone and accounted for 25 (23.8 %), followed by radius and ulna together which accounted for 16 (15.2 %). In the lower extremity, the femur was the commonly fractured bone and accounted for 25 (23.8 %), followed by only tibia which constituted 14 (13.3%) of the fractured cases (Table 4).

Table 4: Clinical profile of extremity fractures in the age less than fifteen years old victims who visited TASH orthopedics department.

Bones	Frequency	Percent
Clavicle	3	2.9%
Humerus	25	23.8%
Radius And Ulna	16	15.2%
Only Radius	7	6.7%
Only Ulna	4	3.8%
Metacarpal	1	1.0%
Pelvic #	3	2.9%
Femur	25	23.8%
Patella	1	1.0%
Only Tibia	14	13.3%
Only Fibula	1	1.0%
Tibia And Fibula	4	3.8%
Metatarsal	1	1.0%
Total	105*	100.0%

*- multiple site fracture was present.

Regarding the nature of fracture, the majority of fractures were simple (closed) type 282(82.7%) followed by compound (open) type 55(16.1%). Two hundred thirty three (68.3%) fracture cases had single fracture followed by multiple fracture108 (31.7%). The present study also revealed that on specific pattern of fracture, the common type of patterns of fracture were Transverse 121 (35.5%) followed by Comminuted, oblique, mixed, spiral, and Greenstick which comprised for 79 (23.2%), 67 (19.6%), 39 (11.4%), 22(6.5%), and 13 (3.8%), respectively (Illustrated in figure 7, 8, and 9).

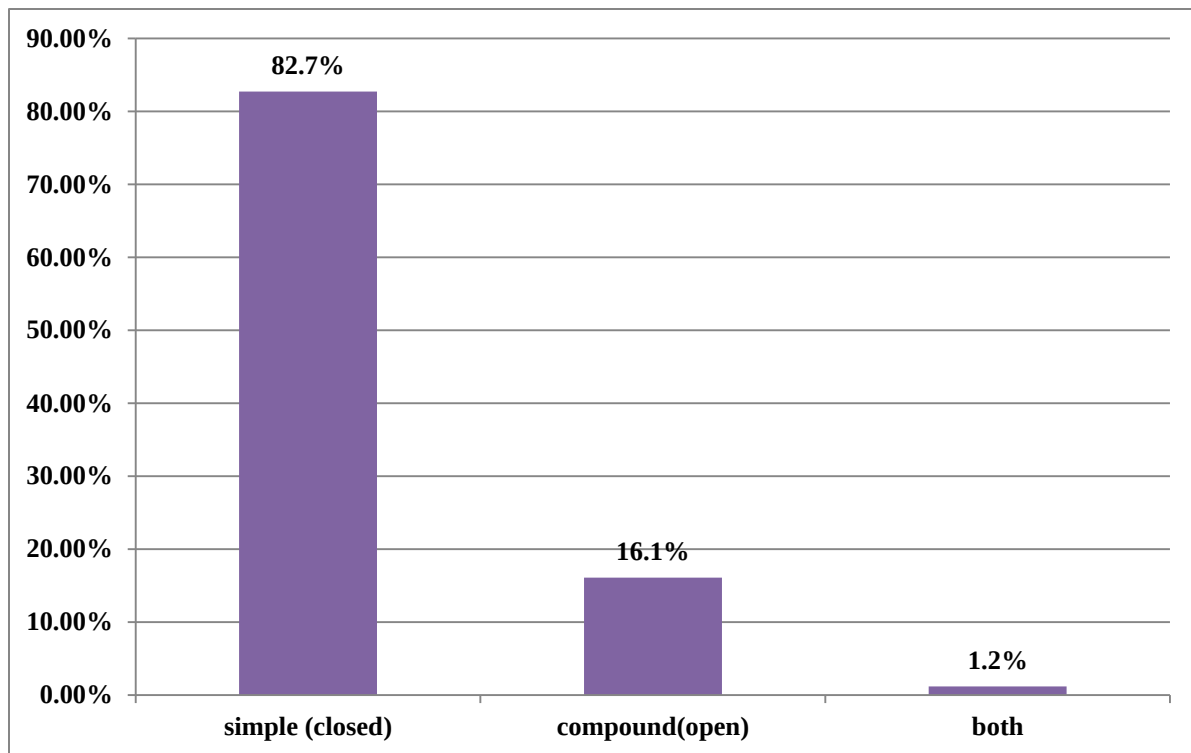


Figure 6 : Nature of fracture on extremity in victims who visited orthopedics department in TASH.

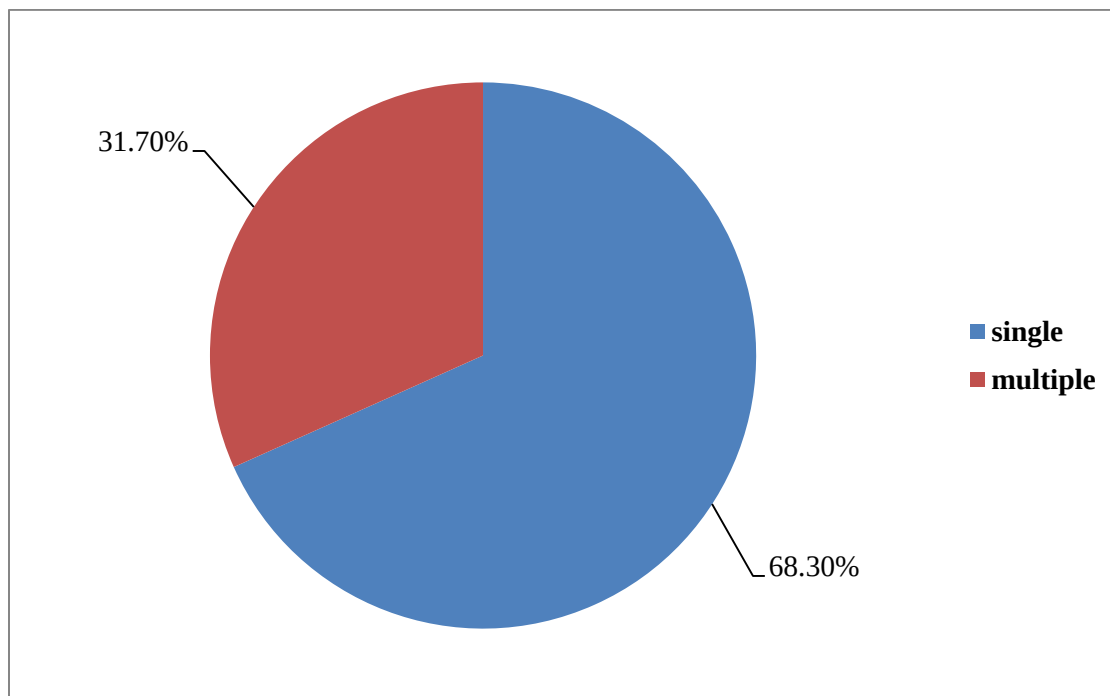
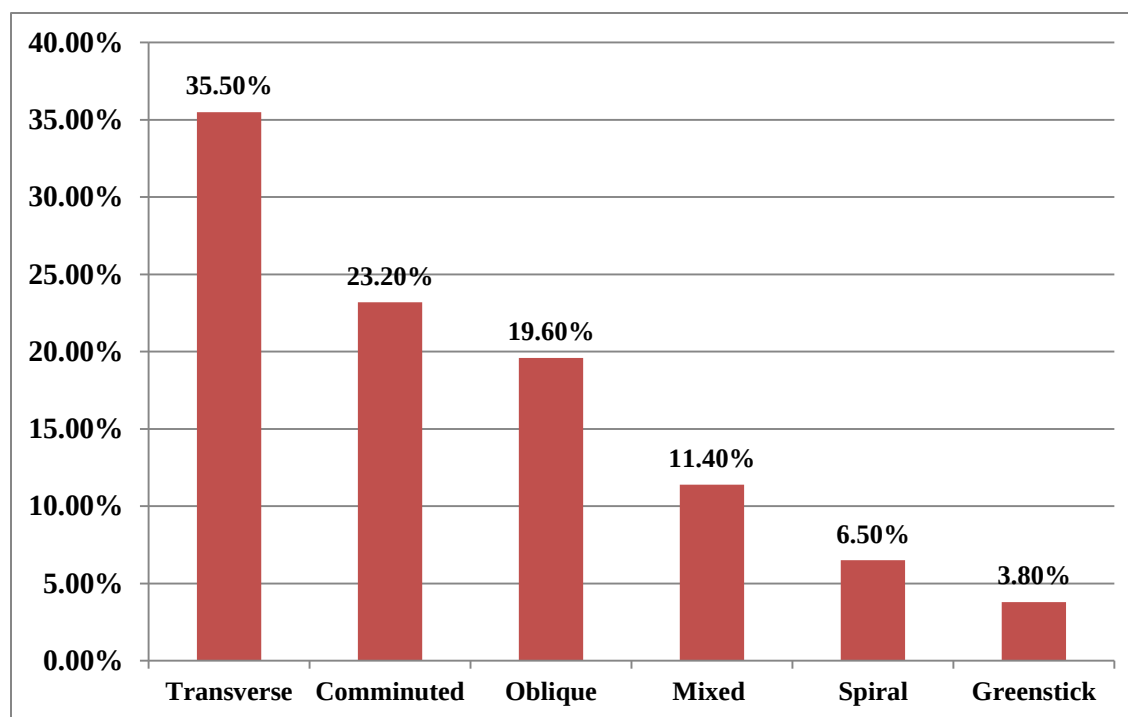


Figure 7: Types of fracture based on number of fractured bones in skeleton of extremity in victims who visited orthopedics department in TASH.



(Mixed= for those victims who had multiple site fracture with different fracture pattern)

Figure 8: Specific patterns of extremity fractures among victims who visited orthopedics department in TASH.

In the age group greater or equal to 15 years old, the common patterns of fractures were transverse type 88 (37%) followed by comminuted and oblique which comprised for 64 (26.9%) and 38 (16%), respectively (Table 5).

Table 5: Specific patterns of fracture in the age group greater or equal to 15 years old victims in TASH orthopedics department.

Pattern	Frequency	Percent
Transverse	88	37%
Oblique	38	16%
Comminuted	64	26.9%
Greenstick	3	1.3%
Spiral	15	6.3%
Mixed	30	12.6%
Total	238	100%

In the age group less than 15 years old, the common patterns of fracture were transverse type 33 (32%) followed by oblique and comminuted which comprised for 29 (28.2%) and 15(14.6%), respectively (Table 6).

Table 6: Specific patterns of fracture in the age group less than 15 years old victims in TASH orthopedics department.

Pattern	Frequency	Percent
Transverse	33	32.0%
Oblique	29	28.2%
Comminuted	15	14.6%
Greenstick	10	9.7%
Spiral	7	6.8%
Mixed	9	8.7%
Total	103	100%

Table 7: Comparison of the number of fractured bones by gender in victims who visited orthopedics department in TASH.

Gender	Number of bone fracture		Total	P-value
	Single	Multiple		
Male	168(66.9%)	83(33.1%)	251(100%)	0.427
Female	65(72.2%)	25(27.8%)	90(100%)	
Total	233(68.3%)	108(31.7%)	341(100%)	

Table 7 shows comparison of the number of fractured bones by gender. There was statistically no significant difference ($P=0.427$) between the number of fractured bones among the two sex groups regardless of whether it is single or multiple fractures.

Table 8: Comparisons of number of fractured bone by age group among victims who visited orthopedics department in TASH.

Age group	Number of fracture		Total	P- value
	single	Multiple		
0 - 14	82(79.6%)	21(20.4%)	103(100%)	0.001
15 - 29	75(67.6%)	36(32.4%)	111(100%)	
30 - 44	28(50.9%)	27(49.1%)	55(100%)	
45 - 59	18(66.7%)	9(33.3%)	27(100%)	
60 - 74	14(51.9%)	13(48.1%)	27(100%)	
>_ 75	16(88.9%)	2(11.1%)	18(100%)	
Total	233(68.3%)	108(31.7%)	341(100%)	

Table 8 shows there was statistically significant difference (P= 0.001) between the age group and number of bone fracture.

5.3 Causes of extremity fracture

Regarding the causes of fracture, RTI was the leading cause of extremity fracture and accounted for 144 (42.2%) followed by falling down accidents 101 (29%). The other cause of fracture were assault/ direct blow 40 (11.7%), sport related injury 19 (5.6%), pathological 15 (4.4%), Gunshot 10 (2.9%), occupational related injury 10 (2.9%) and other causes 2 (0.6%) (Table 9).

Table 9: The prevalence of causes of fracture among victims who visited orthopedics department in TASH.

Causes	Frequency	Percent
Road traffic injury	144	42.2%
Falling down accident	101	29.6%
Gunshot injury	10	2.9%
Occupational related injury	10	2.9%
Sport related injury	19	5.6%
Assault / direct blow	40	11.7%
Pathological	15	4.4%
Others	2	0.6%
Total	341	100%

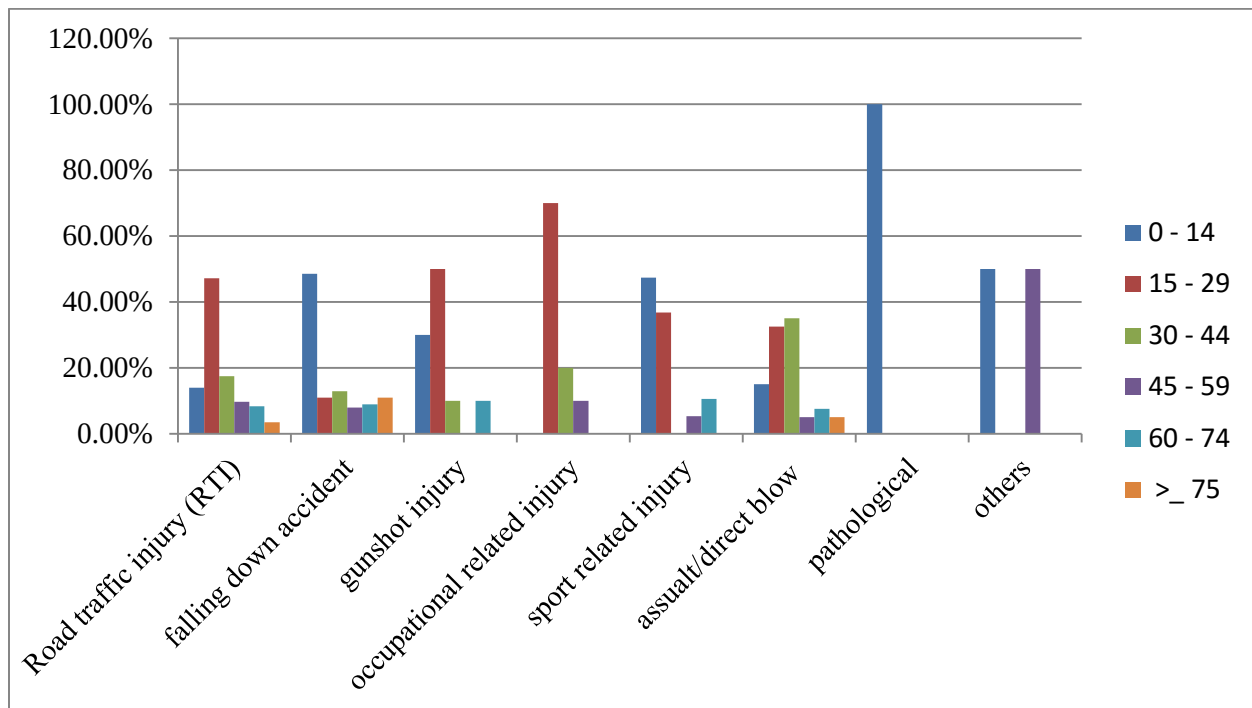


Figure 9: Causes of fractures by age groups among victims in TASH orthopedics department.

The above figure 9 shows RTI was the common cause of injury to all age group but it was the most prominent cause in the age between 15- 29 years old. Falling down accidents also common in all age group but it was the most common cause of injury in the age less than 15 years old. It also showed that pathological fracture was occurred exclusively in age less than 15 years old.

Out of 238 victim groups in the age group greater than or equal to 15, the common cause of fracture was RTI 124 (52.1% followed by falling down accident 52 (21.8 %). There were no pathological causes of fracture in this age group (Table 10).

Table 10: Causes of fracture in the age group greater or equal to 15 years old victim groups in TASH orthopedics department.

Causes of fracture	Frequency	Percent
Road Traffic Injury	124	52.1%
Falling Down Accident	52	21.8%
Gunshot Injury	7	2.9%
Occupational Related Injury	10	4.2%
Sport Related Injury	10	4.2%
Assault / Direct Blow	34	14.3%
Others	1	0.4%
Total	238	100

Out of 103 victim groups in the age group less than 15 years old , the common cause of fracture was falling down accidents 49 (47.6 %) followed by road traffic injury and pathological which accounted for 20 (19.4%) and 15 (14.6%), respectively (Table 11).

Table 11: Causes of fracture in the age group less than 15 years old victim groups in TASH orthopedics department.

Causes of Fracture	Frequency	Percent
Road Traffic Injury (RTI)	20	19.4%
Falling Down Accident	49	47.6%
Gunshot Injury	3	2.9%
Occupational Related Injury	0	0.0%
Sport Related Injury	9	8.7%
Assault / Direct Blow	6	5.8%
Pathological	15	14.6%
Others	1	1.0%
Total	103	100%

Out of 144 (42.2%) road traffic injury exposed groups, pedestrians were the most vulnerable groups and accounted for 62 (43.1%) followed by passenger and driver which comprised for 52 (36.1% and 30 (20.8%), respectively.

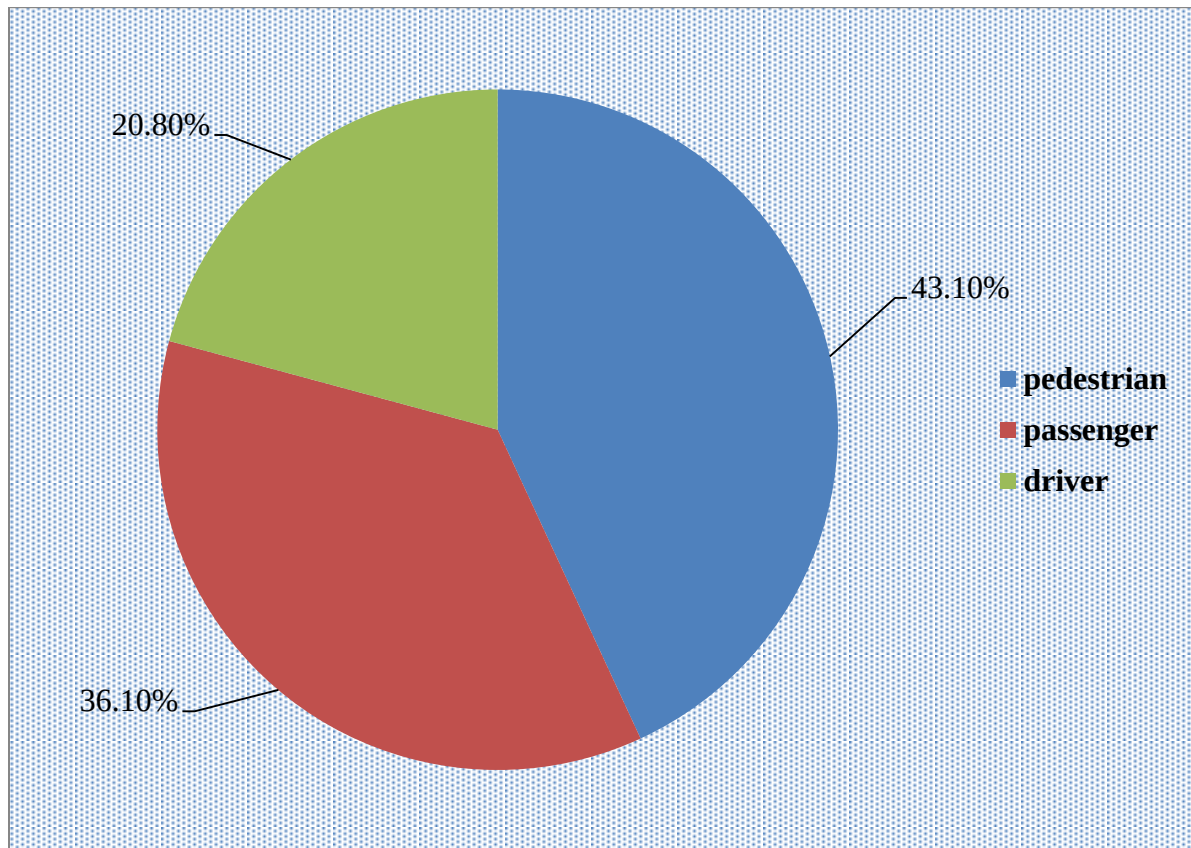


Figure 10: Victim groups by RTI in TASH orthopedics department.

Table 12: Age groups by causes of fracture in victims who visited TASH orthopedics department.

Age group	Causes of fracture									P- Value
	RTI	FD A	gun shot injury	occupational related injury	sport related injury	assault / direct blow	pathological	others	Total	
0 - 14	20	49	3	0	9	6	15	1	103	0.000
15 - 29	68	11	5	7	7	13	0	0	111	
30 - 44	25	13	1	2	0	14	0	0	55	
45 - 59	14	8	0	1	1	2	0	1	27	
60 - 74	12	9	1	0	2	3	0	0	27	
>_ 75	5	11	0	0	0	2	0	0	18	
Total	144	101	10	10	19	40	15	2	341	

FDA- falling down accident

Table 12 revealed that there was statistically significant difference between the causes of fracture in the various age-groups.

Table 13: Causes of fracture by gender in TASH orthopedics department.

Causes of fracture	Gender		Total	p-value
	Male	Female		
Road traffic injury	112	32	144	0.06
Falling down accident	66	35	101	
Gunshot injury	9	1	10	
Occupational related injury	8	2	10	
Sport related injury	13	6	19	
Assault / direct blow	33	7	40	
Pathological	10	5	15	
Others	0	2	2	
Total	251	90	341	

Table 13 shows the relation between causes of fracture and gender .There appeared to be difference in the causes of fracture between the two genders. However the difference was not statistically significant (p=0.06).

Out of 144 road traffic injury cases , the most common types of vehicle that involve in road traffic injury was minibus 34 (23.6 %) followed by Bajaji/ tricycle 22(15.3 %). The others were motorcycle 20 (13.9%), bus 17 (11.8%), automobile (private and others) 15 (10.4%), Isuzu14 (9.7%), other heavy good vehicle 13 (9.0%), bicycle 6 (4.2%), Lada 2 (1.4%) and others 1(0.7%), respectively result injury to bone (Figure 12).

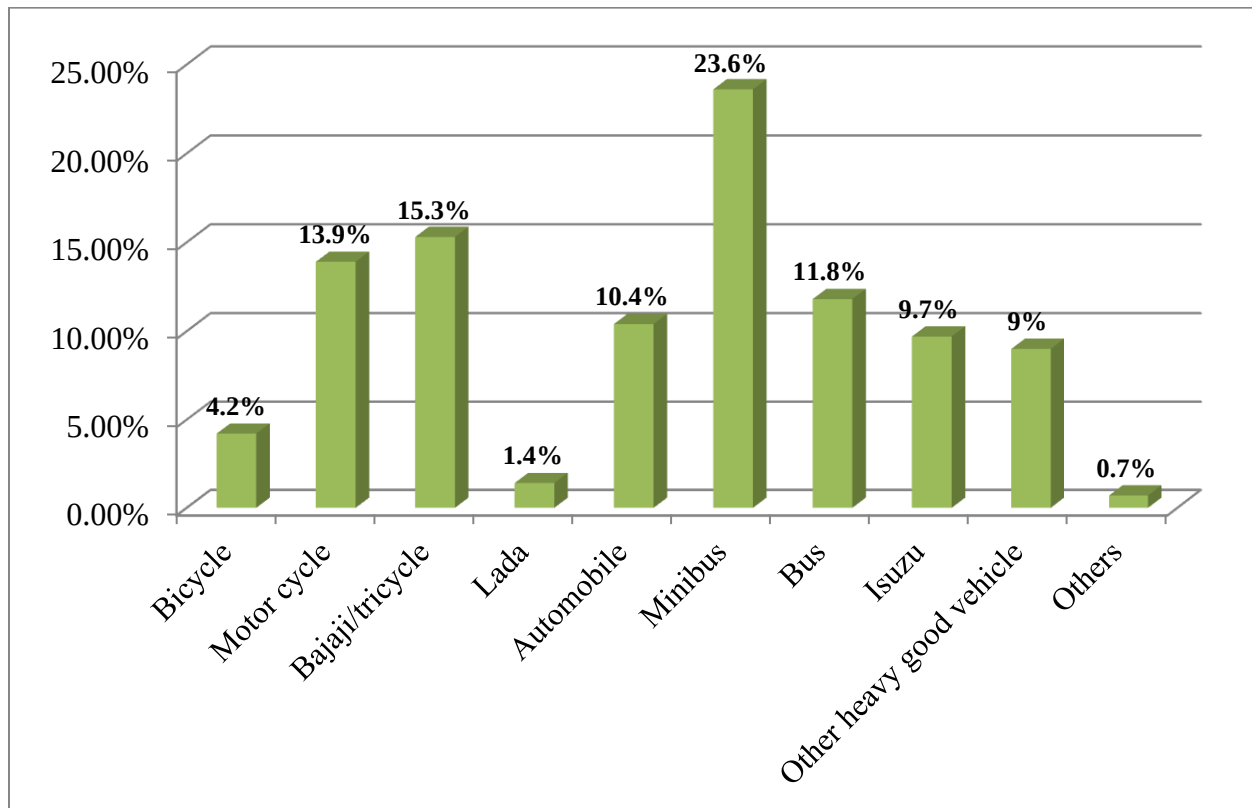


Figure 11: Types of vehicles that involve in road traffic injury in victims who visited TASH orthopedics department.

When we see the type of motor vehicle injury while they cause injury, pedestrian injury was the common type and accounted for 62 (43.1 %) followed by roll over car accident 32 (22.2%), head on collision 29 (20.1%), rear end accident 10 (6.9%), other type 10 (6.9%) and angled car accident 1 (0.7%), respectively (Figure 13).

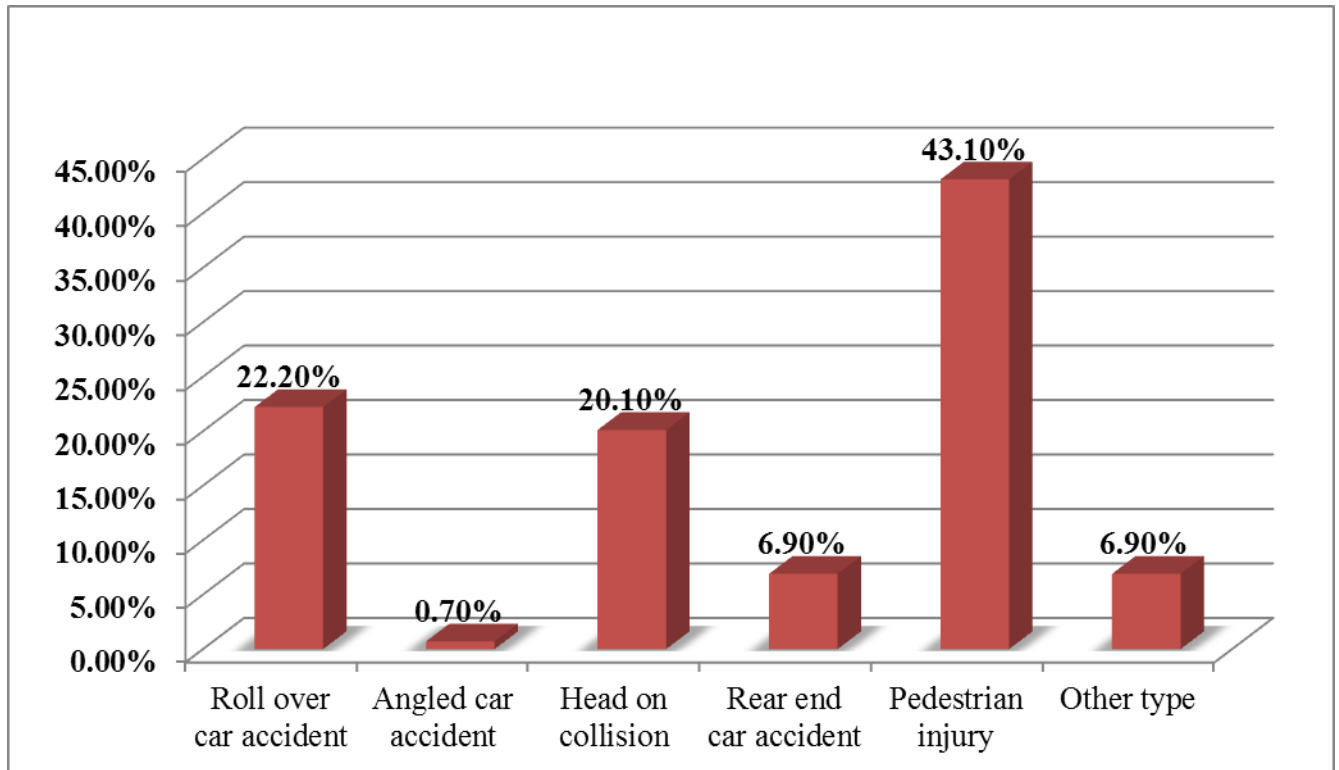


Figure 12: Types of motor vehicles injury while they cause injury among victims who visited TASH orthopedics department.

6. DISCUSSION

This study was conducted one year retrospectively on three hundred forty one fracture cases in TASH. It was observed that lower extremity fractures (65.6%) were significantly higher compared to upper extremity (34.7%). This observation is in agreement with a study conducted in Karnataka, India, where lower extremity fractures (60%) were more common compared to upper extremity (31%) (26). However, the funding of the current study were inconsistent with a study carried out in Munipar, India, where upper extremity fractures (58.6%) were more common compared to lower extremity (41.83%) (29). The reason for the difference observation may be due to the fact that the common cause of fracture in the current study was RTIs in contrast to a study conducted in India, where the common causes were falling down. This may be due to the fact that the upper limb may be used as a defense mechanism while they fall down and/or it may be due to the involvement of fast moving vehicles in RTIs in the current study.

Moreover, the present study also contradicts the reported data of the investigation conducted in WSUTRH, Southern Ethiopia, where the upper limb fracture (46.4%) was more common than lower limb fracture (37.5%) (41). In the study in Wolaita, RTIs were also the common cause of fracture. However, the difference with this finding may be due to fact that the use of small sample size which was 280 in Wolaita compared to the present study and due to the difference in study area.

In the present study, the most commonly fractured bone in the extremity was the femur (23.7%) followed by tibia and fibula together (13%). In the upper extremity, the humerus (9.6%) was the most commonly fractured bone. This finding is supported with a study conducted in Nigeria, where the femur (22.69%) was the commonly fractured bone in the extremity followed by tibia and fibula together (17.13%) and the humerus (12.69%) was the commonly fractured bone in the upper extremity (37). It was also supported by study carried out in Karnataka, India, where femur fracture accounted (22.17%) in the extremity and humerus fracture accounted (8.01%) in the upper extremity (26). Moreover, the present study also showed in agreement with a reported data of the investigation conducted in TASH, Ethiopia, where femur fracture (15.8%), (15%) was the commonest (17, 40). However, the prevalence of femur fracture in the current study was higher as compared to previous study conducted in this study area. The reason for the difference

observation may be due to the duration of study conducted in this area was earlier/time gap between studies and increment of patient referred to this hospital.

Furthermore, in this study the fracture side was analyzed, the right side (46.6%) was almost equally affected to the left side (45.7%). Both side fractures were (7.6%). This finding is inconsistent with a study carried out in Ethiopia, TASH, where the right side was the most affected (52.1%) as compared to left side (47.2%) (40). The possible reason for this discrepancy may be due to the fact that the involvements of both side fractures were relatively higher in current study as compared to previous study conducted in this study area.

Regarding the nature of fracture, in the present study most of the fractures were simple (82.7%) followed by compound type (16.1%). This finding is supported with a study conducted in TASH, Ethiopia and in Lahore, Pakistan. In TASH, simple fracture and compound fracture accounted for (82.2%), (17.8%), respectively (17) whereas in Lahore they comprised for (84.95%), (15.04%), respectively (31). The common patterns of fracture in this study were transverse type (35.5%) followed by comminuted (23.2%). This finding is in agreement with a study carried out in Ughelli, Nigeria, where transverse fracture constituted for (36.2%) followed by comminuted (31.03%) (37).

Furthermore, fractures were observed to occur more in males (73.65%) compared to females (26.4%) resulting a ratio of 2.8:1. This ratio was comparable with a study conducted in Munipar, India, where male to female ratio was 2.7: 1 (29). The possible reason for the high prevalence of fracture in males may be attributed to their high activity levels and linkage in high-risk activities. Most of the victims were between the ages of 15-29 (32.6%). This finding is consistent with a study carried out in kashan, Iran, where the most affected groups were in between the ages of 15-29 (43.2%) (30). The possible reason for this finding may be due to the fact these age groups represent the most productive and reproductive age group and therefore economically and socially active, participating in higher levels of economic and high-risk activities. However, the prevalence of the current study for this age group was relatively small compared to study conducted in Iran. The reason for the difference observation may be due to the use of relatively small sample size of the current study as compared to a study conducted in Iran.

In the present study, the common causes of extremity fractures in all age group was RTI (42.2%) followed by falling down accidents (29.6%). This finding is in agreement with a reported data of investigation carried out in Nigeria, where RTI was a common cause and contributed (72%), (73.2%) (16, 38) and in India, where RTI constituted (59.72%), (62%) (24, 27) (16, 24, 27, 38). However, the prevalence of RTI in the current study was smaller as compared to a study conducted in Nigeria and India. The possible reason for this discrepancy may be due to the use of small sample size in the present study. On the other hand, the prevalence of RTIs in the present study was higher as compared to a study carried out in WSUTRH, Southern Ethiopia, where RTIs were the main cause and accounted (35.4 %) (41). The reason for the different observation may be due to the difference in study area in which the current study was conducted in TASH, where it is found in the capital city of Ethiopia, and it is a tertiary hospital for the country and sample size difference. Moreover, regarding the common cause of fracture, the current study contradicts a study carried out in munipar, India, where the common cause of fractures were falling down accidents (68.75%) followed by RTI(18.92%) (29). The possible reason for the different observation may be due to the difference in geographical location and/or the traffic rule and regulation of the country of India.

Furthermore, out of the study groups, the common cause of fracture in adult was road RTI (52.1%) followed by falling down accidents (21.8%). This magnitude of RTI was slightly higher than the previous study conducted on adult limb fracture in TASH, where RTI contributed (47.9%) (40). The reason for the difference observation may be due to the tremendous increment of the number of vehicles from time to time in the city and/or due to increment of patients getting referred to TASH. Moreover, in children the upper extremity fracture (53.4%) was the commonly affected anatomical region as compared to lower extremity (46.8%). The common cause of fracture was falling down accidents (47.6 %) followed by RTI (19.1%). This finding is in agreement with a study conducted in Kenya, where upper extremity fracture (53%) followed by lower extremity(47%) and the common cause of fractures were falling down accidents (56%) followed by RTI (21%) (35). The possible reason may be due to the upper limb used as a defensive mechanism while they fall down.

Regarding the victim groups, the most victim groups in RTI were pedestrians (43.1%), followed by passenger (36.1%). This finding is consistent with a reported data of investigation conducted in Kenyatta national hospital, Kenya (36). However, the finding of the current study were contradicts a study carried out in Pakistan, where drivers (68%) followed by passengers (32%) were the most victim groups (32). The high prevalence of RTIs observed in pedestrians, in the present study, may reflect the low level of community awareness on road traffic safety and road use. In addition, the absence of pedestrian walkways in most of the roads in Addis Ababa, Ethiopia, may have contributed to the higher vulnerability of pedestrians to motorized vehicles. Therefore, educating the public on RTIs and safe use of the roads is critical.

Moreover, the types of vehicle that majorly involves in road traffic injury in the present study were minibuses (23.6%) followed by Bajaji/tricycle/ (15.3%). This finding is in agreement with a study carried out in Kenyatta national hospital, Kenya, where the minibuses were the main type of vehicle that involves in RTIs (36). The possible reason for this may be due to the majority of people use these types of vehicles as a main transportation.

7. CONCLUSION

This study concludes that a lower extremity fracture was a major public health problem and it was more common compared to upper extremity fracture. The most commonly fractured bone in the extremity was the femur followed by both tibia and fibula together. Among the upper extremity fractures, humerus was the commonly fractured bone followed by both radius and ulna together. The common patterns of fractures were transverse type followed by comminuted. Fractures were observed to occur more in males compared to females resulting a ratio of 2.8:1. It was also revealed that most of the victims were between the ages of 15-29 years old.

The leading causes of fracture across all age group were road traffic injuries followed by falling down accidents. In pediatrics, the leading causes of fracture were falling down accidents followed by road traffic injuries. In RTI, most of the victims were pedestrians followed by passengers. The common type of vehicle that involves in road traffic injury was minibus followed by Bajaji/tricycle.

8. LIMITATION OF THE STUDY

- Since it was a retrospective study, there were other variables that were not studied that might have an influence for the causes of fracture.
- Due to poor documentation of patient information and data management system in the study area, it was difficult to increase the scope of this study.
- This study was done in one hospital and data were collected over one year retrospectively, so the findings may fail to reflect the true picture of extremity fractures.

9. RECOMMENDATIONS

Based on this study, the following are recommended:

- Policy makers and higher authorities should make better law and traffic reform for the safety of public on roads.
- Public awareness on traffic rule and regulation should be enhanced in the school as well as in media to minimize this problem.
- Intervention should be made on specific vehicles that involve in RTI with concerned bodies.
- National, multicenter, prospective and randomized study with large sample size should be conducted to assess and compare the magnitude of fracture burden.
- Furthermore, research should be done on specific fractured bones in skeleton of extremity in adults and pediatrics age group as well.
- Health professionals working in the hospitals should properly collect and register Patient's medical information.

REFERENCES

1. Louise s. David W. Selvandurai N. Apley's system of orthopedics and fracture.9th ed. Hodder Arnold aioHEL, 2010
2. Bucholz RWH, James D.; Court-Brown, Charles M. Rockwood & Green's Fractures in Adults, 6th Edition. 2006 Lippincott Williams & Wilkins.
3. Shiva Prakash S, Amardeep G, Manjappa C. Pattern of Orthopaedic injuries among patients attending the emergency Department in a medical college hospital. International Journal of Orthopaedics Sci. 2017;3(1):93-6.
4. Haagsma JA, Graetz N, Bolliger I, Naghavi M, Higashi H, Mullany EC, et al. The global burden of injury: incidence, mortality, disability-adjusted life years and time trends from the Global Burden of Disease study 2013. Injury prevention. 2016;22(1):3-18.
5. Krug EG, Sharma GK, Lozano R. The global burden of injuries. American journal of public health. 2000;90(4):523.
6. World Health Organization. The Burden of Musculoskeletal Conditions at the Start of the New Millennium RoaWG, WHO Technical Report Series 919. Geneva, Switzerland: WHO; 2003.
7. World Health Organization. Global burden of disease project 2002. Available at: <http://www.who.int/healthinfo/bodproject/en/index.html>. Accessed July 28.
8. Krug EG SG, Lozano R. The global burden of injuries. Am J Public Health. 2000;90:523–526.
9. Mock C, Boland E, Acheampong F, Adjei S. Long-term injury related disability in Ghana. Disability and rehabilitation. 2003;25(13):732-41.
10. Nordberg E. Injuries as a public health problem in sub-Saharan Africa: epidemiology and prospects for control. East African medical journal. 2000;77(12 Suppl):S1-43.
11. Word health organization (WHO). Measurement and health information data sheet. Geneva SW.
12. Ezenew AO. Trends and characteristics of road traffic accidents iNJRSH.
13. Maciaux M RC. Accidents in children adolescent and young adults. Major public health problem. Wld Hlth Stat Quar. 1986;39:227-31

14. Allebeck P, Detels R, Beaglehole R, Lansang MA, Gulliford M. Oxford Textbook of Public Health, three volumes. Oxford University Press; 2010.
15. Zwi A. The public health burden of injury in developing countries. Trop Dis Bull. 1993;9:R5-R45.
16. Okoro I, Ohadugha C. The anatomic pattern of fractures and dislocations among accident victims in Owerri, Nigeria. Nigerian Journal of Surgical Research. 2006;8(1).
17. Admassie D, Yirga T, Wamisho BL. Brief communication: Adult limb fractures in Tikur Anbessa Hospital caused by road traffic injuries: Half year plain radiographic pattern. Ethiopian Journal of Health Development. 2010;24(1).
18. Woldemichael K, Berhanu N. Magnitude and pattern of injury in jimma university specialized hospital, South West Ethiopia. Ethiopian journal of health sciences. 2011;21(3).
19. Hailemichael F, Suleiman M, Pauolos W. Magnitude and outcomes of road traffic accidents at Hospitals in Wolaita Zone, SNNPR, Ethiopia. BMC research notes. 2015;8(1):135.
20. LM M. Injuries in Africa and the need to develop preventive strategies. East Central Afri J Surg. 1999;5(1):51-5.
21. Frey RJ. UXL Encyclopedia of diseases and disorders. 2009.
22. Tamisiea D. Radiologic aspects of orthopedic diseases, Mercier LR, ed. Practical Orthopedics, 6th ed Philadelphia, Pa: Mosby Elsevier. 2008.
23. D.J AHSLRStGRGA. . Diagnostic Radiology a text book of Medical imaging Third Edition. Sheffield and London. 1997:1573-625. .
24. Huda N, Gupta P, Pant A, Iqbal A, Julfiqar M, Khan MZ, et al. Pattern of Orthopaedic injuries among patients attending the emergency department in a tertiary care hospital–An analytical study. Acta medica international. 2014;1(1):10.
25. Jindal R, Jindal N, Dass A. A RETROSPECTIVE STUDY OF PREVALENCE OF LOWER LIMB FRACTURES. Journal of Advanced Medical and Dental Sciences Research. 2016;4(6):23.
26. Bhaskara K PTS, Nandini T, Sindhu. PATTERN OF FRACTURES AND DISLOCATIONS IN A TERTIARY CARE HOSPITAL, NORTH EAST KARNATAKA. International Journal of Medical Research & HEALTH SCIENCES AND DISEASES. 2014;3(4):847-50.

27. Meena R, Singh A, Singh C, Chishti S, Kumar A, Langshong R. Pattern of fractures and dislocations in a tertiary hospital in North-East India. *Internet Journal of Epidemiology*. 2013;11.
28. Awasthi B, Raina SK, Kumar N, Sharma V, Kalia S, Thakur L. Pattern of extremity fractures among patients with musculoskeletal injuries: A hospital based study from North India. *Journal of Medical Society*. 2016;30(1):35.
29. Singh OG, Singh HS, Singh ST. A hospital based study on pattern of extremity fractures following trauma in Manipur. *JOURNAL OF EVOLUTION OF MEDICAL AND DENTAL SCIENCES-JEMDS*. 2016;5(82):6097-100.
30. Mahdian M, Fazel MR, Sehat M, Khosravi G, Mohammadzadeh M. Epidemiological profile of extremity fractures and dislocations in road traffic accidents in Kashan, Iran: a glance at the related disabilities. *Archives of bone and joint surgery*. 2017;5(3):186.
31. Yousaf M, Shah SWA, Hayat RK, Iqbal P, Shafaq SA. Pattern of Adult Limbs Fractures at Shaikh Zayed Hospital, Lahore. *Proceeding SZPGMI Vol*. 2013;27(1):7-10.
32. Aslam M, Taj TM, Ali SA, Mirza WA, Badar N. Non-Fatal limb injuries in motorbike accidents. *Journal of the College of Physicians and Surgeons Pakistan*. 2008;18(10):635.
33. Kumar N. Pattern of Fractures and Dislocations in Road Traffic Accident Victims in a Tertiary Care Institute of Central India. *Age*. 2016;15(160):21.3.
34. Saw A, Fadzilah N, Nawar M, Chua Y. Pattern of childhood fractures in a developing country. *Malaysian Orthopaedic Journal*. 2011;5(1):13-6.
35. Mutiso V, Mwangi J. Pattern of long bone fractures in a paediatric population at Kenyatta National Hospital. *East African Orthopaedic Journal*. 2017;11(2):54-60.
36. Okemwa M. Patterns of injuries in road traffic accident fatalities seen at the Kenyatta National Hospital 2004.
37. Igbo OE, Isaac OA, Eronimeh OO. Road Traffic Accidents and Bone Fractures in Ughelli, Nigeria. *SPINE*. 2015;2:0.93.
38. Dabkana T. FRACTURE PATTERNS AS SEEN AT THE ACCIDENT AND EMERGENCY DEPARTMENT OF THE UNIVERSITY OF MAIDUGURI TEACHING HOSPITAL NIGERIA:-A FIVE YEAR PROSPECTIVE STUDY.
39. Elbaih AH, Taha M, Saker A, Aziz S, Shahate A. Patterns of extremities trauma in children and their management in emergency department in Suez Canal University Hospital, Ismailia, Egypt. *International Surgery Journal*. 2016;3(2):887-92.

40. Admasie D, Tekle Y, Wamisho B. Radiological and clinical details of major adult limb fractures in a teaching hospital, AAU, Ethiopia. East and Central African Journal of Surgery. 2009;14(1):88-97.
41. Bayisa JGETH. Factors Associated with Fracture and Its Outcome at Wolaita Sodo University Teaching and Referral Hospital, Wolaita Sodo, Southern Ethiopia. Journal of Biology, Agriculture and Healthcare 2017;7(5):77-89.
42. Accssed TASH,
http://www.missbdesign.com/clients/TAAAC/about_BlackLionHospital.html). 2011.

Annex I

Checklist

Check list to collect data on clinical profile and pattern of extremity fracture.

Part 1- Socio-Demographic Characteristics

1. Gender :
 - A. Male
 - B. Female
2. Age: -----
3. Region:
 - A. Oromo
 - B. SNNP
 - C. Amhara
 - D. Tigray
 - E. Addis ababa
 - F. Others (Specify)

Part-2 Fracture of Extremity

1. Where was the anatomical site of fracture?
 - A. upper extremity
 - B. lower extremity
 - C. both
2. What was the nature of fracture?
 - A. Simple (closed)
 - B. Compound (open)
 - C. both
3. What was the affected side?
 - A. right
 - B. left
 - C. both
4. Is/are the fracture (s)?
 - A. single
 - B. multiple

5. What was the specific pattern of fracture?

- A. Transverse
- B. Oblique
- C. Comminuted

- D. Greenstick
- E. Spiral
- F. Mixed type

I. Fractured bones in the Upper extremity

Name of bone	Yes	No
Scapula		
Clavicle		
Humerus		
Both Radius and ulna		
Only radius		
Only ulna		
Carpal bone		
Metacarpal bone		
Phalangeal bone		

II. Fractured bones in the lower extremity

Name of bone	Yes	No
Pelvic bone		
Femur		
Patella		
Only Tibia		
Only Fibula		
Tibia and fibula		

Tarsal(specify)		
Metatarsal		
Phalangeal		

Part 3- causes of fracture

1. What was the cause of fracture?

- A. road traffic injury
- B. Fall
- C. Gunshots
- D. Occupational related
- E. Sport related activities
- F. Assault/ direct blow
- G. Pathological
- H. Others/specify
- I. /...../.....

1. If there was road traffic injury;

I. what was the Vehicle type?

- A. Bicycle
- B. Motor Cycle
- C. Bajaj /tricycle /
- D. Lada
- E. Automobiles
- F. Minibus
- G. Bus
- H. Isuzu
- I. Heavy good vehicles
- J. Other vehicle types/ specify/...../.....

II. What was the type of motor vehicle injury?

- A. Roll over car accident
- B. Angled car accident
- C. Head on collisions
- D. Rear end accident
- E. Pedestrian injury
- F. Hit by car
- G. Others/ specify/

III. Victim groups?

- A. Passenger
- B. Driver
- C. Pedestrian
- D. Others

