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PREVALENCE, ASSOCIATED FACTORS AND MANAGEMENT MODALITIES OF EXTREMITY FRACTURES IN TIKUR ANBESSA SPECIALIZED HOSPITAL AND ADDIS ABABA BURN, EMERGENCY AND TRAUMA HOSPITAL.

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ACRONYMS AND ABBREVIATIONS

AAU - Addis Ababa University

BSc. - Bachelor of Science

EMRN-Electronic medical record number

FRI - Fracture-Related Infection

ICU - Intensive Care Unit

LMICs - Low- and Middle-Income Countries

MRN - Medical Record Number

ORIF - Open Reduction and Internal Fixation

POP - Plaster of Paris

RTI - Road Traffic Injury

SPSS - Statistical Package for the Social Sciences

AaBETH-Addis Ababa burn and emergency trauma hospital

TASH -Tikur Anbessa specialized hospital

TBS - Traditional Bone Setting

WHO - World Health Organization

YLD - Years Lived with Disability

MENA-middle east north Africa

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Abstract

Introduction: Extremity fractures are a significant public health concern globally due to rising road traffic accidents, falls, and occupational injuries. In Africa, the burden is increasing with rapid urbanization, poor road safety regulation, and limited trauma care systems. In Ethiopia, extremity fractures represent a major proportion of orthopedic admissions, contributing to prolonged disability, loss of productivity, and economic burden for patients and families. Effective management of these fractures is crucial for improving patient outcomes and reducing complications such as nonunion, malunion, and infections**.** This study will provide crucial insights for healthcare providers, policymakers, and researchers to improve extremity fracture management in Ethiopia. This research will provide valuable data for orthopedic surgeons and hospital administrators to improve clinical decision-making and resource allocation for extremity fracture care.

Objectives: To assess the prevalence, associated factors, and management outcomes of extremity fractures among trauma patients presenting to TASH and AaBETH in Addis Ababa, Ethiopia.

Methodology: A retrospective cross-sectional study was conducted by reviewing medical records of patients admitted with extremity fractures. Participants were all patients who have visited a hospital for treatment of extremity fractures over the past 4 year (2020-2024). Data Collection was carried out through Structured checklist from hospital records, including demographic data, fracture characteristics, causes of fractures, and treatment outcomes. Data Analysis will be carried out by SPSS Version 27.

Result: total sample size was 381 and only 378 MRN has full data that is fit for analysis. The prevalence of extremity fractures among trauma patients was 50.1%**.** Lower limb fractures were more common (68.5%) than upper limb fractures (31.5%), with the femur being the most frequently affected bone (33.6%). Males (72.5%) and individuals aged 20–39 years were the most affected groups. Road traffic injury were the leading causes of fractures. urban residence**,** construction work**,** and involvement in car or motorcycle accidents were significantly associated with upper limb fractures.

Conclusion: In the two major tertiary referral hospitals assessed in Addis Ababa, extremity fractures represented a substantial proportion of trauma admissions, accounting for almost half of all trauma cases**.** The most affected are young adult males. Road traffic accidents remain the principal causes.

Recommendation: Strengthen road safety measures to reduce accident-related fractures and further prospective studies are needed to explore long-term disability and quality of life after extremity fractures.

Keywords: Extremity fractures; Prevalence; Associated factors; Management outcomes; Road traffic injury; Ethiopia

1. Introduction

1.1. Background

Extremity fracture is an important component of musculoskeletal injury worldwide. The distributions of etiological factors and types of extremity fractures vary from and within subregions and have implications in preventive and treatment strategies (1). *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 (2). These fractures are broadly classified based on their type (open or closed) and pattern (simple or comminuted). Open fractures involve a break in the skin, exposing the bone to the external environment and increasing the risk of infection, while closed fractures remain contained within the soft tissue envelope (3).

The prevalence of extremity fractures varies based on environmental, socioeconomic, demographic factors and comorbidities. Older adults' females, particularly postmenopausal women, are more vulnerable due to osteoporosis and age-related bone fragility, whereas young adult males are frequently affected due to high-risk activities such as driving and manual labor (5, 7). Studies suggest that high-energy trauma, such as road traffic accidents and falls from height, are leading causes of open and comminuted fractures, whereas low-energy mechanisms, including falls from standing height, are associated with simple fractures (5). The management of these fractures depends on their classification and associated complications. While closed fractures can often be treated conservatively with immobilization, open and comminuted fractures frequently require surgical intervention, such as external or internal fixation, to achieve stability and promote healing (6).

In Ethiopia, trauma-related fractures are becoming more prevalent due to poor road infrastructure, increasing transportation options, and inadequate enforcement of traffic safety regulations. A comprehensive understanding of trauma's impact on different body regions is crucial for improving treatment planning (8). Extremity injuries, including those affecting the upper and lower limbs, are a major public health issue in Ethiopia, particularly in Addis Ababa, where their high prevalence significantly impacts both individuals and the healthcare system. A study conducted at Tikur Anbessa Specialized Hospital in Addis Ababa reported that among 407 orthopedic trauma patients, 32.7% sustained upper extremity injuries, while 72.2% had lower extremity injuries, with some patients experiencing injuries in both regions (9).

The challenges associated with managing extremity fractures in Ethiopia stem from limited access to healthcare services, delays in seeking care, and shortages of specialized orthopedic professionals. Research on large-scale metal manufacturing factories in Addis Ababa has revealed a 49.9% annual prevalence of occupational injuries among workers. Similarly, a study of small-scale woodworking industry workers in the city's Kirkos sub-city reported a 41.6% prevalence of work-related injuries over a 12-month period (4,5).

Effective management of extremity fractures is essential for preventing complications such as nonunion, malunion, deep infections, and long-term disability. Treatment options range from conservative approaches (e.g., casting, splinting, traction) to surgical interventions (e.g., open reduction and internal fixation, external fixation), depending on fracture type, severity, and available resources (12). However, in resource-limited settings like Ethiopia, challenges such as delayed hospital presentation, inadequate surgical capacity, and limited rehabilitation services often hinder optimal patient outcome (13).

The standard of care for fracture management includes both non-operative and operative techniques, with surgical intervention often preferred for fractures requiring anatomical alignment and early mobilization. Despite these recommendations, disparities in timely and appropriate surgical treatment persist, particularly in rural areas with limited healthcare resources (14). The initial management of extremity fractures involves stabilizing the patient, controlling life threatening hemorrhages, and ensuring proper wound care. Internal and external fixation are two primary surgical techniques for fracture treatment. Internal fixation involves the placement of plates, screws, or intramedullary nails for precise anatomical realignment. Studies at Tibebe Ghion Specialized Hospital and Addis Ababa Burn, Emergency, and Trauma Hospital show that most patients undergo surgery within the first week of admission and receive postoperative antibiotics for over seven days (13-15).

External fixation is a cost-effective method for stabilizing fractures using percutaneously inserted pins or wires connected to an external frame. It is particularly useful for managing open fractures, as it minimizes soft tissue damage and facilitates wound care. However, the upper extremity presents unique challenges due to the smaller soft-tissue envelope and proximity of neurovascular structures. External fixation is often preferred for significant open fractures, but rigid internal fixation combined with K-wire support may be suitable for injuries involving the humerus, radius, ulna, and fingers or metacarpals (17-19). Traditional bone-setting practices pose additional challenges to modern fracture management in Ethiopia. While

culturally significant, these practices often result in complications such as nonunion, malunion, and infections, underscoring the need for public education and the integration of traditional methods with modern medical care (20).

Despite the clinical significance of extremity fractures, no comprehensive data on extremity fracture prevalence in Addis Ababa's tertiary hospitals 'there is Limited evidence on how socioeconomic factors (occupation,) affect fracture prevalence, there is the Lack of holistic data on adult fractures across anatomical sites and Surgical feasibility in resource-limited settings. Therefore, this study aims to bridge this gap by assessing the prevalence of extremity fractures, identifying key risk factors, and evaluating management strategies.

1.2. Statement of the Problem

Extremity fractures are a significant public health concern, contributing to morbidity, disability, and economic burden worldwide. In 2019 alone, there were 178 million new fractures globally, marking a 33.4% increase in absolute numbers since 1990. The same year, 455 million individuals suffered from acute or long-term symptoms related to fractures, reflecting a 70.1% rise in prevalence. These statistics underscore the growing burden of extremity fractures on healthcare systems and society at large (21 23).

The burden and distribution of traumatic fractures in low- and middle-income countries (LMICs), including Ethiopia, are still poorly understood. Fractures of the extremities are not only major public health concern worldwide, but also are in Ethiopia by contributing to increased morbidity, disability, and financial burden. If untreated, these fractures can result in severe complications that lead to long-term impairment and even mortality (7).

Despite global attention on fracture management, limited data exist on the epidemiology and treatment outcomes of extremity fractures in Ethiopian tertiary hospitals, Studies from Debre Markos Referral Hospital and Dessie City indicate that extremities are the most affected body regions in trauma cases, accounting for 34.12% and 30.4% of trauma patients, respectively. Road traffic accidents (RTAs) and gunshot injuries are leading causes of these fractures, with substantial implications for patient recovery and healthcare resource allocation (24 ,25).

In Ethiopia, the management of extremity fractures faces several challenges, including high complication rates and a preference for traditional bone setting (TBS) over modern medical interventions. At Wolaita Sodo University Teaching and Referral Hospital, 22.5% of fracture patients developed complications, while 11.1% were discharged with long-term disabilities, highlighting gaps in effective treatment approaches. Research at Black Lion Hospital further revealed that 29.9% of fracture patients opted for TBS due to past hospital experiences, initial consultations with traditional healers, and patient perceptions of treatment efficacy. This reliance on alternative treatments raises concerns about delayed recovery, improper fracture healing, and long-term disability risks (26 ,27).

Several factors contribute to the high prevalence of extremity injuries in Addis Ababa. Road traffic accidents are the leading cause, accounting for 42.8% of cases at Tikur Anbessa Specialized Hospital. Falls and occupational hazards contribute to 27.0% of injuries, highlighting risks associated with daily activities and workplace environments (7). Moreover, studies have identified associations between injury prevalence and factors such as male gender, age (20-44 years), low income (<34.2 USD per month), employment as a daily laborer or farmer, and substance use. Extremity fractures account for the majority of skeletal injuries requiring surgical intervention, with factors such as severity, location, and medical resource availability influencing treatment approaches. Poor patient outcomes often result from inadequate diagnostic tools, limited surgical capacity, and delayed medical attention in resource-limited settings (7-10).

Additionally, there is a deficiency of comparative research evaluating the success rates of open reduction and internal fixation (ORIF) versus conservative treatment in Ethiopian tertiary hospitals, especially in light of implant shortages. While prior studies have investigated fracture types and treatment approaches, there is still a lack of comprehensive data from Addis Ababa. This absence of evidence complicates informed decision-making, resource distribution, and focused healthcare initiatives. To address these gaps, the present study seeks to offer updated epidemiological data regarding extremity fractures and assess the effectiveness of both surgical and non-surgical treatment options in tertiary hospitals in Addis Ababa. By pinpointing major challenges and treatment outcomes.

1.3 Significance of the study

Understanding the severity of extremities fractures that frequently come to an institution aid in both resource allocation (physiotherapy and implants) and treatment planning (conservative and surgical). The findings may help develop strategies to reduce the prevalence of extremity fractures by identifying potential risk factors for limb fractures and those who are more vulnerable to them.

The study's findings will benefit hospitals management, regional, and national policy makers to comprehend the scope of the issue and the contributing reasons. Hospital administrators at Tikur Anbessa and AaBET will use data on surgical success rates to advocate for increased operating theater capacity. Information on the prevalence of extremities fractures across all age groups would enable us to better manage patients' orthopedic needs, ultimately reduce the related morbidity, disability, and death of the victims, and used as baseline for the planning of its management.

The study's findings can assist policymakers and healthcare providers in optimizing trauma care, improving resource allocation, and enhancing patient outcomes in Addis Ababa Additionally, the study will assess current approaches to treating extremity fractures, including both nonsurgical and surgical techniques. Clinical procedures can be enhanced, resource use maximized, and treatment delays, gaps in healthcare delivery, and surgical results identified. This study will set the foundation for future research into fracture prevention, treatment innovation, and long-term rehabilitation strategies because there is a dearth of data on fractures of the extremities in Ethiopia. In general, this study will produce evidence-based suggestions that can strengthen Ethiopia's trauma.

2. literature review

2.1 Extremity Fracture

Bone is the main component of the adult skeleton. Bone tissue provides strong support for the body, contains cavities that house bone marrow, the source of blood cells, and protects vital organs like those in the thoracic and cranial cavities. Bone fractures and other musculoskeletal injuries c continue to be major causes of illness, disability, and mortality in both developed and developing countries. Around the world, extremity injuries kill 5.8 million people annually, or 1,600 every day (23).

2.2 Prevalence of Extremity Fractures

A comprehensive study analyzing data from over 87 million individuals in the United States reported an annual incidence of 67.6 upper extremity fractures per 10,000 persons. The distribution of specific fracture types was 16.2 per 10,000 persons, Phalangeal ,12.5 per 10,000 persons Metacarpal 8.4 per 10,000 persons Proximal Humerus Fractures 6.0 per 10,000 persons, Clavicle Fractures 5.8 per 10,000 persons and distal radius fractures were predominant across most age groups (24).
An analysis of U.S. data revealed that lower extremity fractures increased by 4.5% over a 15-year period, from 305,764 cases in 2002 to 319,422 in 2017. Women consistently represented the majority of these fractures, accounting for 61.1% in 2002 and 62.3% in 2017 and Hip and femur fractures increased by 23.5% from 150,565 in 2002 to 185,979 in 2017 (25).

Between 2003 and 2017, there was a significant decrease in extremity fracture hospitalizations among older adults in the U.S., primarily due to a decrease in low energy femur fractures, which accounted for 65% of all fracture hospitalizations. Mortality among older adults with an extremity fracture hospitalization declined from 5.1% in 2003 to 3.3% in 2017 in men and 2.6% to 1.9% in women. High-energy fractures were attributed to falls, motor vehicle accidents, and other injuries, with increases observed among men aged 65-74 and 75-84 (26).

Lower Extremity Fractures (LEFs) have increased significantly, accounting for over 30% of global skeletal injuries. The age-standardized incidence rate (ASIR) of LEFs in the MENA region increased by 4.57% from 1990 to 2019, with the highest ASIR among fractures occurring among those 20-24 years old. The highest ASIR was found in Saudi Arabia, while the lowest was in Sudan. The YLD rate of LEFs also increased to 277.65 per 100,000 in 2019, from 235.55 per 100,000 in 1990 (27).

Upper extremity fractures have been increasing in the Middle East and North Africa (MENA), with an age-standardized incidence rate of 1,086.39 per 100,000 people from 1990 to 2019. The YLD rate increased 15.69%, with the highest ASIR of radius and/or ulna fractures (505.32 per 100,000). Saudi Arabia had the highest ASIR of UEFs (2,296.93 per 100,000), while Afghanistan had the highest age-standardized YLD rate (19.6 per 100,000). Falling was the leading cause of UEFs, accounting for 45.05% of incidence and 41.19% of YLD overall (28).

A study in South-East Nigeria found that 67% of motorcycle injuries patients sustained extremity injuries, with motorcycle collisions being the most common. The most common injuries were fractures, abrasions, and lacerations. Traumatic brain injury (23.7%) was the most common associated injury, with delayed hospital arrivals correlated with extremity fractures (29). Osteoporosis increases fracture risk globally, with 1 in 3 women and 1 in 5 men over 50 experiencing fractures. The prevalence is rising due to aging, lifestyle changes, and aging populations. By 2050, the incidence of extremity fractures will increase by 310% and 240%, with high fracture risk increasing due to demographic shifts (30).

A study at Tikur Anbessa Specialized Hospital reported that lower extremity fractures were more common (65.6%) compared to upper extremity fractures (34.7%). The femur was the most commonly fractured bone, accounting for 23.7% of cases. Road traffic incidents are a leading cause of fractures 41% of injuries, while falls were the predominant mechanism (51.3%) for patients from Addis Ababa (31).

2.3 Associated Factors

Study conducted in Chinese shows Approximately 80% of fractures occurred at home and on the common road (other than high way). In men, alcohol consumption (OR, 2.12; 95%CI, 1.11–4.06), residence at ≥2nd floor without an elevator (OR, 2.86; 95%CI, 1.16–7.06), sleep duration<7 h/day (OR, 2.77; 95%CI, 1.42–5.37), and history of past fractures (OR, 3.10; 95%CI, 1.21–7.93) were identified as significant risk factors. In women, obesity (BMI ≥ 28.0) (OR, 1.86; 95%CI, 1.31–
2.66), living in the central region in China (OR, 1.53; 95%CI, 1.01–2.31), living at a higher latitude (40°–49.9°N) (OR, 1.79; 95%CI, 1.02–3.14), alcohol consumption (OR, 2.40; 95%CI, 1.58–3.63), more births (OR, 1.45; 95%CI, 1.15–1.83), sleep duration <7 h/day (OR, 2.21; 95%CI, 1.53–3.20), and history of past fracture (OR, 2.70; 95%CI, 1.52–4.80) were identified as significant risk factors (32).

The study conducted in Cameroon shows the most vulnerable road users were pedestrians (26.52%) and passengers on motor bikes (38.44%) and the commonest mechanism by which crash victims sustained injuries were: bike-car collisions (22.84%), and bike-pedestrian collisions (19.29%). Commercial motor bikes (62.77%) and taxis (22.38%) were the road users most involved in road traffic collisions. The leg 98(49.75%), thigh 23(11.68%), and knee 20(10.15%) were the most injured anatomical parts of the lower extremity. Fractures 68 (34.52%), lacerations 53(26.90%), and bruises 49(24.87%) were the most recurrent pattern of lower extremity injuries and the prevalence of lower extremity injuries from Road Traffic Crashes in this study was 47.93% (33).

Study conducted to assess characteristics of limb fractures among adult patients and their management at Vihara County and Referral Hospital in Kenya from September 2019 to September 2020 shows that majority (83%) of the fracture patients were male. the commonest mechanism of injury was RTA (54.2%) followed by falls (31.9%). Motorcycle accidents accounted for 84% of the RTAs. Fractures of the femur were the most common (48.9%) followed by tibio-fibula fractures (29.8%). Majority (47.87%) of the fracture patients received non-operative treatment and the main factors associated with prolonged length of stay included smoking, lack of health insurance and operative treatment. Smoking and lack of health insurance are associated with longer hospital stay for patients with limb fractures (34)

Hospital based cross-sectional study conducted from April to June 2018 at Debre Markos referral hospital show Residency, sex, age, behavioral factors such as using alcohol and fighting, vehicle type, types of occupation and medical illness were identified as the key risk factors of extremities fracture (2). Study carried out in Adama shows out of 556 trauma victims, 304 (54.7%) were due to road traffic accidents followed by personal violence (24%) and falling accident (10.3%). The majorities (74.8%) of patients were male and urban residents (55%). Soft tissue injury was the most frequent type of injury (51%) followed by extremity fracture and dislocation (26%). Delay to come to hospital (over 24 hours), severity of injuries and management types were factors influencing management outcome of injuries related to traffic accidents (35).

2.4 Management Strategies

Initial management of injuries includes safely gaining control of the animal and assessing and treating systemic shock. If hemorrhage is life threatening, it must be controlled. If the limb is nonfunctional, it should be stabilized. Any open orthopedic injury should be treated by cleaning the tissues, protecting the exposed tissues, and administering systemic antibiotics. A commercial splint is available that can immobilize and relieve weightbearing for cases of phalangeal fracture, flexor tendon rupture, fetlock breakdown, and lower joint luxation's/subluxations. Hock and carpal luxation and radius fracture in foals can be stabilized by wooden or metal splint incorporation in a bandage. The appropriate emergency treatment of these injuries is often the determining factor in whether the injury remains in a condition that can be successfully repaired (15).

A retrospective case series study conducted in south Africa indicates Twenty-five male patients, with mean age of 32-years-old, sustained gunshot injuries to the distal humerus. Eleven patients had multiple gunshots. Forty-four percent of patients underwent Computed Tomography Angiography (CTA), 20% had confirmed brachial artery injury. Limbs with vascular injury were salvaged with arterial repair and external fixation. Fractures were extra-articular in 20 cases (80%). Nineteen fractures were classified as highly comminuted. Nerve injuries occurred in 52% and were all managed expectantly. Only 32% of patients attended follow-up beyond 3 months (36).

Study conducted in Nigerian Hospital on Clinical Outcomes after Open Locked Intramedullary Nailing of Closed Femoral Shaft Fractures for Adult Patients shows the rate of union in the study was 95.3%. The average time to radiological union was 14.0 ± 1.2 weeks while the mean time to painless full weight bearing was 14.2 ± 1.2 weeks. Among the complications encountered were broken nails (4.7%), infection, loosening of the distal screw, and limb length discrepancy (2.3% each). Using Thoreson's criteria, excellent results were obtained in 93% and poor results in 4.7% of patients and Open locked intramedullary nailing gives excellent clinical outcomes with high union and low complication rates in the management of closed femoral shaft fractures in adult patients (37,70).

The bone transport nail (BTN), an all-internal, magnet-driven implant, has emerged as a promising treatment for segmental tibial bone defects, addressing complications associated with external fixation and hybrid constructs. In our series, four patients (average age 27 years) with defects ranging from 50 to 128 mm were treated using the BTN, with an average follow-up of 18.07 months. Three patients

successfully completed treatment with a mean bone healing index of 41.4 days/cm, while one required additional surgery for docking site nonunion. Complications included symptomatic implants, malalignment, nonunion, and technical malfunctions, along with injury related issues such as infection, wound dehiscence, peroneal tendonitis, and joint rigidity. This study outlines our clinical experience with BTN, detailing surgical technique, treatment protocol, and patient outcome (38,).

Surgical management of extremity fractures in Ethiopia primarily involves internal fixation techniques such as intramedullary nailing (IMN) and open reduction internal fixation (ORIF). A study conducted at Ayder Comprehensive Specialized Hospital reported that 55% of patients with lower limb fractures underwent IMN, while ORIF was the preferred approach for upper limb fractures (39).

A multiphase priority setting exercise conducted in partnership with the James Lind Alliance over 21 months (October 2019 to June 2021) A total of 532 uncertainties, submitted by 158 respondents (including 33 patients/careers) were received during the initial survey. These were refined into 58 unique indicative questions, of which all 58 were judged to be true uncertainties after review of the existing evidence (40). A descriptive retrospective study conducted in Kenya from September 2019 to September 2020 Majority (47.87%) of the fracture patients received non-operative treatment (34).

Sixty-four patients with scaphoid fracture who attended the hand clinic at King Hussein Medical City from January 2022 to December 2022 were included and reviewed regarding the anatomical fracture site revealed Most patients were males (62 patients, 96.9%), and most (47, 73.4%) fell within 25 to 40 years. Scaphoid waist fracture was the most common location (40, 52.5%). Most patients (47, 73.4%) received conservative treatment and 17 (26.6%) were fixed acutely. However, nonunion complicated 53 fractures (82.8%). Notably, there were no differences in the union rate or time between cases of scaphoid nonunion treated with vascularized or non-vascularized grafts. Furthermore, there were no variations in union rates among genders, extremities, age, fracture locations, or among smokers. However, a higher union rate was noted in office workers and those who received conservative treatment (41).

A scoping review published in the European Journal of Orthopedic Surgery & Traumatology identified 12 national clinical practice guidelines from countries including the UK, USA, the Netherlands, Finland, and Malawi revealed that five randomized controlled trials were included, with a total of 335 patients and no statistically significant difference in overall mortality or improvement in ICU admission between early (< 24 h) and late fracture stabilization. Comparing femoral nailing and external fixation, findings showed

that femoral nailing reduce ICU length of stay and duration of invasive mechanical ventilation and the results indicate that immediate surgical treatment by nailing is superior to delayed treatment or a staged surgical approach in stable polytrauma patients with long-bone fractures (42 ,72).

Generally, management of extremity fractures continues to evolve, incorporating evidence-based timing of surgery, advanced fixation techniques, standardized treatment guidelines**,** and optimized care for open fractures. The important conclusions from current research are early fracture stabilization (<24 hours) with intramedullary nailing reduces ICU stays and ventilation time, particularly in femoral fractures, Minimally invasive and hybrid fixation techniques improve functional outcomes while minimizing complications, Global standardization of fracture care protocols is necessary, Early antibiotic administration (within 1 hour) significantly reduces infection risk in open fractures, while the timing of surgical debridement is less critical

2.5 conceptual framework

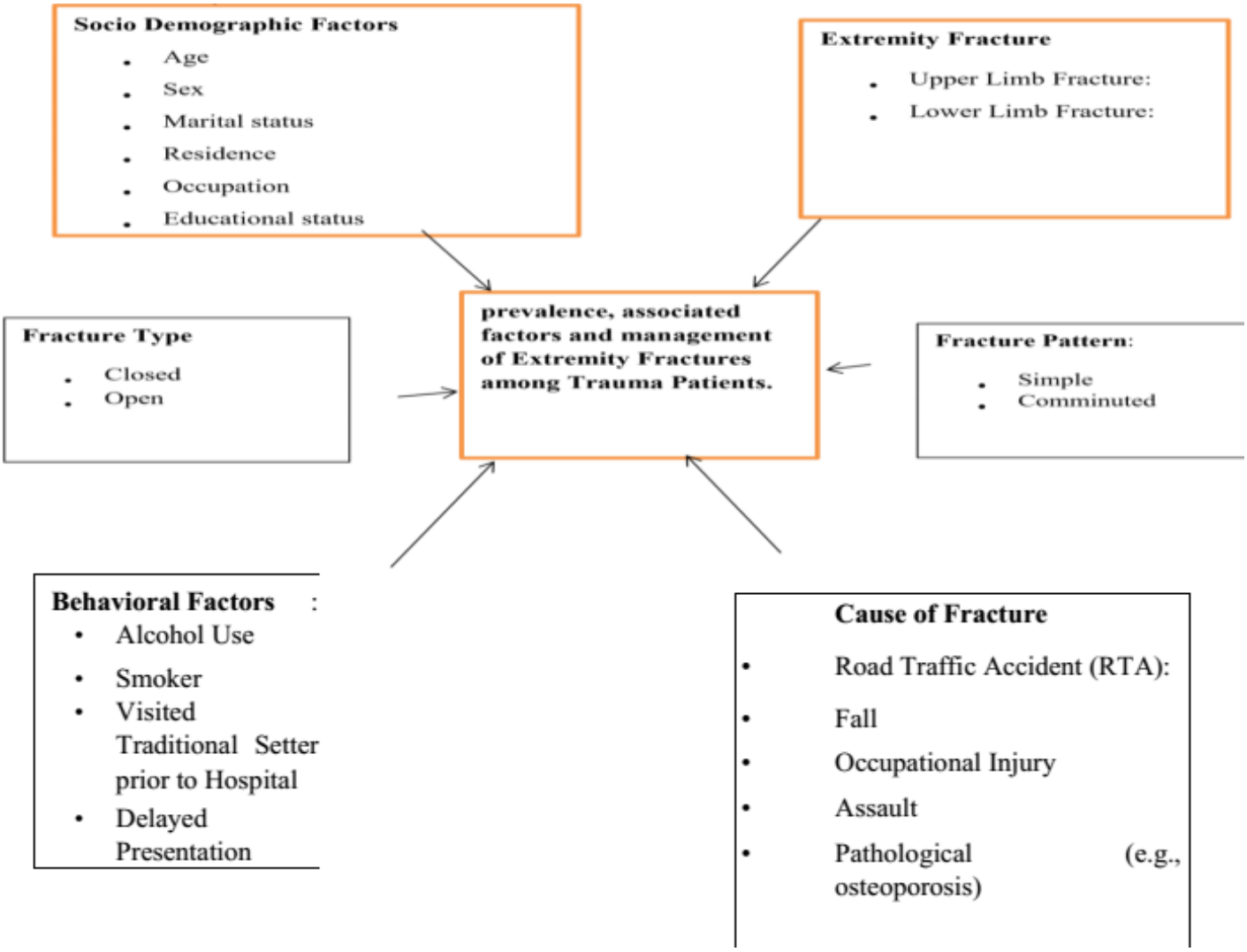

Figure 1. Conceptual framework of the study

3. Objectives

3.1. General Objective

- To determine the prevalence, Associated factors, and Management modalities of extremity fractures among orthopedic patients at Tikur- Anbessa Specialized Hospital (TASH) and Addis Ababa Burn Emergency and Trauma hospital in Addis Ababa, Ethiopia (2020–2024)

3.2. Specific Objectives

- To determine prevalence and anatomical distribution of extremity fractures among orthopedic patients.
- To identify sociodemographic, behavioral and environmental factors associated with extremity fractures
- To analyze the mechanisms that lead to extremity fractures.
- To assess the common complications of surgical and conservative management

4. Methods

4.1 Study Area

This study was conducted in Addis Ababa, Ethiopia, at two tertiary hospitals. Tikur Anbessa Specialized Hospital (Black Lion Hospital) and AaBET Hospital. Tikur Anbessa Specialized Hospital, established in 1964, is the largest and oldest referral and teaching hospital in the country. In 1998, it was transferred to Addis Ababa University by the Ministry of Health to serve as the university's main teaching hospital. The hospital provides tertiary-level health care services and functions as one of Ethiopia's leading centers for medical education and research.

Tikur Anbessa Specialized Hospital of Addis Ababa University (TASH) is the highest/ last referral tertiary Hospital of the Nation with all sub and super specialty Departments. It has over 800 beds, with around 2,500 Total staff, of which around 700 are Academic staff. In addition, there are close to 1,000 Specializing residents and Fellows. The Department of Orthopedics has 25 staff members and 75 residents and Fellows with 125 dedicated beds.

Addis Ababa Burn Emergency and Trauma (AaBET)hospital is a branch of the St. Paul Millennium Medical College's Hospital in Addis Ababa which is the first largest hospital in Ethiopia. Paul's Hospital was first established in July 1947. The purpose behind it was to provide care to those who couldn't afford medical expenses. The hospital has over 700 beds, provides both outpatient and inpatient services, including an intensive care unit and the hospital has a catchment population of more than 5 million. Both hospitals were selected due to their high caseload of extremity fractures, surgical capacity, and representation of Ethiopia's urban trauma care challenges.

4.2 Study period

Case inclusion period was retrospective review of medical records from January 2020 to December 2024 (4 years) and data collection period was performed from April 2025 to June 2025 (3 months).

4.3 Study Design

Hospital based retrospective cross-sectional study design was employed.

4.4 Population

4.4.1 Source Population

All patients who were admitted to Tikur Anbessa Specialized Hospital and Addis Ababa Burn Emergency and Trauma Hospital for musculoskeletal trauma between December 2020– December 2024.

4.4.2 Study Population

All patients diagnosed with extremity fractures at Tikur Anbessa Specialized hospital and Addis Ababa Burn Emergency and Trauma Hospital between 2020–2024 and who meet the inclusion criteria for this study.

4. 5. Inclusion and exclusion criteria

4.5.1 Inclusion criteria

- Patients who received operative or nonoperative treatment for extremity fracture
- Patients whose fractures occurred within a study period
- Patients with accessible and complete medical records for retrospective review

4.5.2 Exclusion criteria

- Severe comorbidities (e.g., metastatic cancer, sepsis) affecting outcomes.
- Non-extremity fractures
- Inadequate or Missing Data

4.6 Sample size and Sampling Procedure

4.6.1 Sample size determination

There was data on the prevalence of extremity fractures in Ethiopia that was conducted in Debre Markos Referral Hospital report prevalence of extremity fracture was 34.12%. Therefore, the estimated prevalence of extremity fracture in 2020 is 34.12% and also another study had 29.9% in black lion hospital. I used 34.12% assuming the sample size calculation yields relative larger than 29.9% (2, 7).

The minimum number of samples required for this study will be determined by using single population proportion formula

$$n = \frac{\left(Z\,\alpha/_2\right)^2 \cdot pq}{d^2}$$

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 known p=34.12 % (0.3412) and q is 1-p (1-0.3412) =0.6588 is used.

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

$$n = \frac{(1.96)^2(0.3412)(0.6588)}{0.05^2} = 346$$

10 % was added for incomplete data. Thus, the final sample size was **381.**

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 two hospitals within study period. The inpatient registration book and daily morning sheets were checked to avoid missing of some unregistered charts in HMIS of emergency and fractured clinic.

Patients with extremities fractures were chosen during the collection of MRNs for all broken patients, and their numbers were assigned sequentially based on their HMIS registration date. According to the number of cases distribution in both hospitals and final sample size (381) sample was proportionally allocated for both hospitals and Systematic random sampling method (every 25th MRN) were 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 both hospitals.

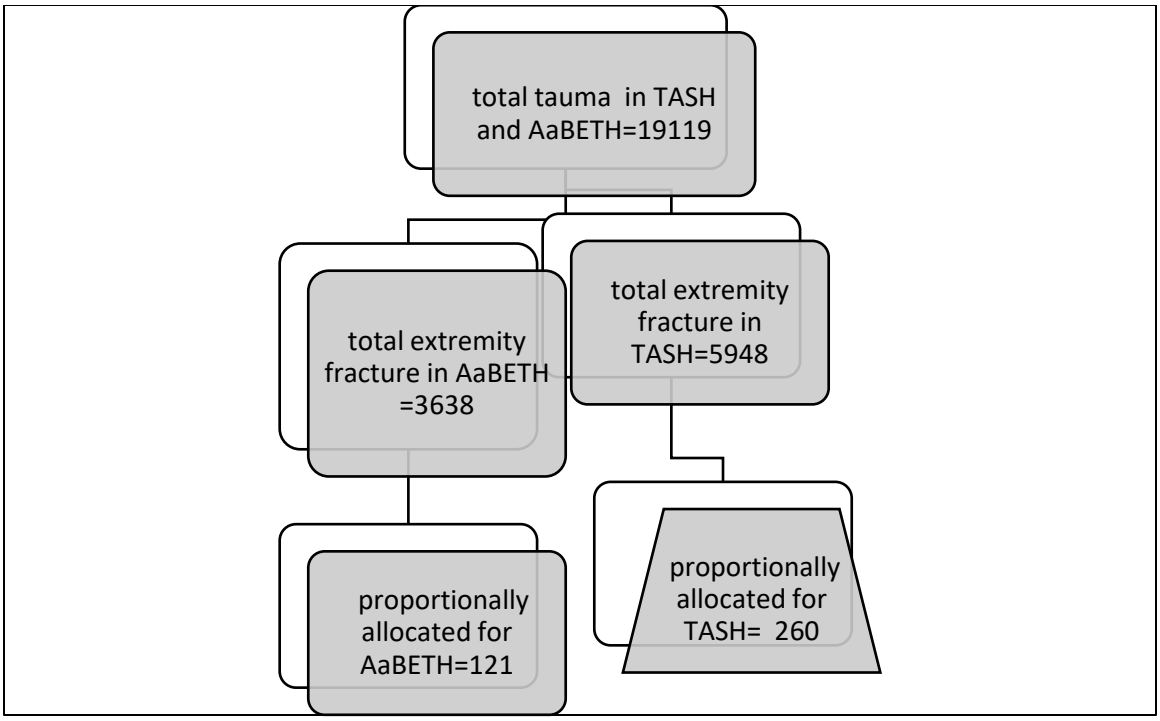

Figure 2. Schematic representation of sampling procedure in TASH and AaBETH

4.7 Study variables

4.7.1 Dependent variable

- ❖ Extremity fracture
- ❖ Fracture characteristics
  - ✓ Anatomic site (upper/lower limb)
  - ✓ Types (open/closed)
- ❖ Outcomes

4.7.2 Independent variables

- ✓ Demographic: Age, sex, occupation, residence.
- ✓ Behavioral: Alcohol use, smoking, visit to traditional bone-setter before coming to hospital.
- ✓ Mechanism: RTA, fall, industrial injuries,

4.8 Operational definitions

Extremity Fracture: A break in the continuity of a bone occurring in the upper or lower limbs, (that means, doesn't include pelvis, acetabulum, shoulder girdle, spine ribs, face and skull bones)

Prevalence: Proportion of extremity fractures among trauma patients and distribution of each bone fracture within body.

Open Fracture (Compound Fracture): A fracture in which the bone is exposed to the external environment due to a break in the skin.

Closed Fracture (Simple Fracture): A fracture in which the skin remains intact, and the bone does not communicate with the external environment.

Comminuted Fracture: A fracture that results in more than two separate bone fragments.

Extremity Injury: Any trauma affecting the upper or lower limbs, which may involve fractures, dislocations, soft tissue injuries, or vascular and nerve damage.

Management Outcomes: The results of different treatment approaches, including surgical and non-surgical interventions, in terms of recovery, complications, and functional mobility.

Fracture-Related Infection (FRI): An infection occurring at the site of a fracture, which may require multiple operations or amputation.

Internal Fixation: The surgical process of physically joining fractured bones using screws, plates, wires, or nails.

External Fixation: The use of percutaneous pins or wires connected by an external scaffold to stabilize the fracture.

Reduction and Immobilization: A method of fracture treatment involving aligning the bones and restricting movement to allow healing.

Complete Fracture: A fracture where the break extends across the entire width of the bone, involving both cortices.

Incomplete Fracture: A fracture that does not extend completely across the bone

Healing Status: Radiological evidence of bone union

Malunion: Healing of a fracture in a misaligned position, as documented in patient records.

Nonunion: Absence of bone healing (radiological union) within the expected period, noted as a complication

4.9 Data Collection Tool and Procedures

Data was collected using structured checklist which is 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 patient's 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, causes of fracture and management of fracture. Finally, based on the inclusion and exclusion criteria of the study, a card which has variables for the study were used. Then, all variables were collected from the main card information.

4.10 Data quality control

Training was given to the data collectors and supervisors on techniques of data collection, data collection material and purpose of research and a pilot test of the data collection tool on a small sample was conducted before full data extraction. Data Validation and Cross-Checking was conducted by Comparing extracted data with hospital logbooks, HMIS (Health Management Information System), and patient records to ensure completeness and Data Cleaning was performed by Identifying and correcting duplicate records, missing values, and outliers before analysis. Supervision was carried out on daily based to check completeness and consistency by both the supervisor and the principal Investigator (PI) to assure the quality of data.

4.11 Data analysis and Interpretation

The data was checked after each data collection for its completeness and the data was entered into Epi-Data version 4.7 and then it was exported to SPSS Version 27 for analysis. For categorical data, descriptive statistics like frequency and percentage were computed and presented by the use of tables and bar graphs. Continuous variables were summarized using means, median, mode and standard deviation. Chi-square ($\chi 2$) test was applied to see if there is any association between the different categorical variables related to extremity fracture and management outcome. Multivariate Analysis (logistic regression) were applied to identify independent predictors of fractures.

Management outcomes Analysis was conducted through treatment Approaches such as Conservative vs. Surgical treatment, Common surgical procedures (e.g., Open Reduction Internal Fixation [ORIF], external

fixation) and Treatment Outcomes including Healing time and complication rates by using Comparison of complication rates (e.g., infections, non-union).

4.12 Ethical consideration

Ethical clearance was obtained from Department of Research Ethics Review Committee (DRERC) of Addis Ababa University in Anatomy department (DRERC/13/20). Then this ethical clearance and cooperation letter (547/2017) were sent for Tikur Anbesa specialized Hospital and AaBET Hospital 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 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 of both Tikur Anbesa Specialized Hospital and AaBET Hospital and other concerned body.

5. Result

5.1 Socio- demographic characteristics

In this study, out of 19119 trauma cases who visited orthopedic department in TASH and AaBET (December, 2020 to December, 2024), 381 extremity fracture patients were sampled. Out of 381 sampled cases, 378 patient charts had complete data and this sample was analyzed in this study. The sample was taken from 9586 patients MRN and prevalence of extremity fracture in TASH and AaBET hospital was (50.1%).

The study participants comprised of 274 (72.5%) males and 104 (27.5%) females resulting in a male to female ratio of 2. 3: 1. From 378 study participants 251 (66.4%) came from urban area specially from Addis Ababa and 127(33.6%) came from rural areas of different part of our country.

The most participants occupation is agriculture 80(21.2%), second highest was unemployed 70(18.5%) and 24 participants age were less than 5. The highest proportion of victims falls within the 20–34 age group, accounting for 133 cases, followed by the 35–49 age group with 99 patients. Children under 14 years represent 47 patients, while older adults aged 50–64 and 65–100 each account for 41 cases. The lowest frequency is observed among adolescents aged 15–19 years, with only 17 patients. Overall, the chart indicates that young adults (20–34 years) are the most affected age group, whereas teenagers are the least affected. The patient ages ranged from 1 to 98 years with the mean and standard deviations of 36.32 and ± 19.8 years, respectively (**Table 1).**

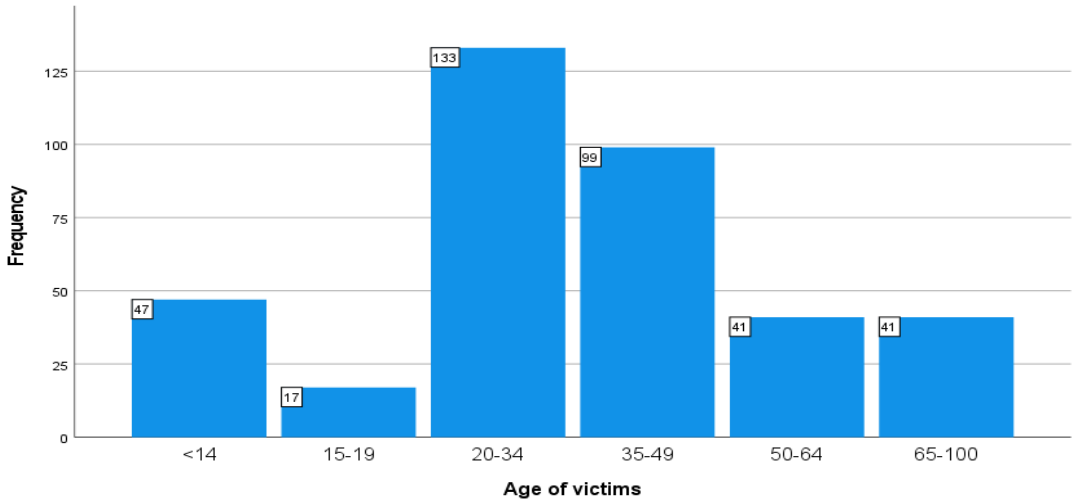

Figure 3. Prevalence of extremity fractures by age in TASH and AaBETH

Table 1.Socio-demographic characteristics of extremitsy fracture in victims who visited orthopedics department in TASH and AaBETH

Characteristics		Frequency	Percent
Gender	Male	274	72.5%
	Female	104	27.5 %
Occupation	Construction	47	12.4%
	Agriculture	80	21.2%
	Driver	33	8.7%
	Merchant	22	5.8%
	Student	45	11.9%
	Government employe	57	15.1%
	Unemployed	70	18.5%

5.2 Fracture of extremity

In this study, 200 (52.9%) participants had lower extremity fractures followed by 121(32%) upper extremity fractures. The rest of the participants 57(15.1%) had both upper and lower extremity fracture. Regarding fracture side(laterality) of the body of upper limb: the right side 111 (29 .4%), the left side 41 (10.8%). Those patients who had both right and left side of upper extremity fractures were about 29 (7.7%). Regarding fracture side(laterality) of the body of lower limb: the right side 141(37.3%), the left side 87(23%). Those patients who had both right and left side of lower extremity fractures were about 27 (7.1%). Regarding to fracture types from all victims 268 (70.9%) had closed fracture and 110 (29.1%) had open fracture (Figure 4 and Table 2)

Table 2.Anatomical site of extremity fractures in victims who visited orthopedics department of TASH and AaBETH.

	Site of fracture	Frequency	Percent
Extremity fracture	Upper limb	121	32%
	Lower limb	200	52.9%
	Both	57	15.1%
	Total	378	100%

5.2.1 Prevalence and frequency of upper extremity fractures

Among the 378 patients included in the study, the specific anatomical site of upper limb fractures were 184 patients (48.7%) and the most frequently affected site was the humerus, accounting for 98 patients (25.9%), followed by the radius with 63 patients (16.7%). Fractures of the metacarpal bones occurred in 15 patients (4.0% overall,), whereas carpal bone and phalangeal fractures were (1.1%,) and (0.8%) respectively. Ulna fractures were the least common, identified in only one patient **(Table 3)**.

Table 3. Prevalence and frequency of upper extremity fractures in victims who visited orthopedics departments in TASH and AaBETH

Fractured bone	Frequency	Percent
Humerus	98	25.8%
Radius	63	16.7%
Ulna	1	0.3%
Carbal bone	4	1.1%
Metacarpal bone	15	4%
Phalanges	3	.8%
Total	184	48.7%

5.2.2 Prevalence and frequency of lower extremity fractures

From a total of 378 patients included in the study, lower limb fracture site extremity fractures were 254 patients (68.5%). Femur fractures were the most frequent, occurring in 127 patients (33.6%), followed by tibia fractures in 72 patients (19.0%). Tibiofibular fractures were 21 cases (5.6%) and Metatarsal bone fractures were 16(4.2%) Less common fracture sites included the tarsal bone (2.1%), fibula (1.3%), ankle (1.1%), and phalanges (0.3%) **(Table 3).**

Table 4. Prevalence and frequency of lower extremity fractures in victims who visited orthopedics departments in TASH and AaBETH

Fractured bone	Frequency	Percent
Femur	127	33.6%
Tibia	71	19%
Fibula	5	1.3%
Tarsal bone	8	2.1%
Metatarsal bone	16	4.2%
Phalanges	2	0.3%
Ankle	4	1.1%
Tibiofibular	21	5.6%
Total	254	68.5%

5.2.3 Pattern and types of extremity fractures

Fracture characteristics showed that simple fractures were the most common pattern, accounting for 231 cases (61.1%), while comminuted fractures comprised 147 patients (38.9%). With respect to fracture type, closed fractures predominated, occurring in 268 patients (70.9%), whereas open fractures were observed in 110 patients (29.1%) (Table 5).

Table 5. Prevalence of Extremity by Patter and types victims who visited orthopedics department in TASH and AaBETH

Variable	Categories	Frequency	Percent
	Simple	231	61.1%
Fracture pattern	Comminuted	147	38.9%
	Total	378	100%
Fracture types	Categories	Frequency	Percent
	Closed	268	70.9%
	Open	110	29.1%
	Total	378	100%

5.2.4 Prevalence of extremity fractures by gender

Among the study population, both male and female patients were more likely to sustain lower limb fractures**.** However, male patients had a higher overall number of fractures across all categories. Specifically, lower limb fractures were the most common type among males (144 patients) and females (56 patients), followed by upper limb and both-limb injuries. This suggests that lower extremity fractures are the dominant type across sexes, with a higher burden observed in males (Figure 5).

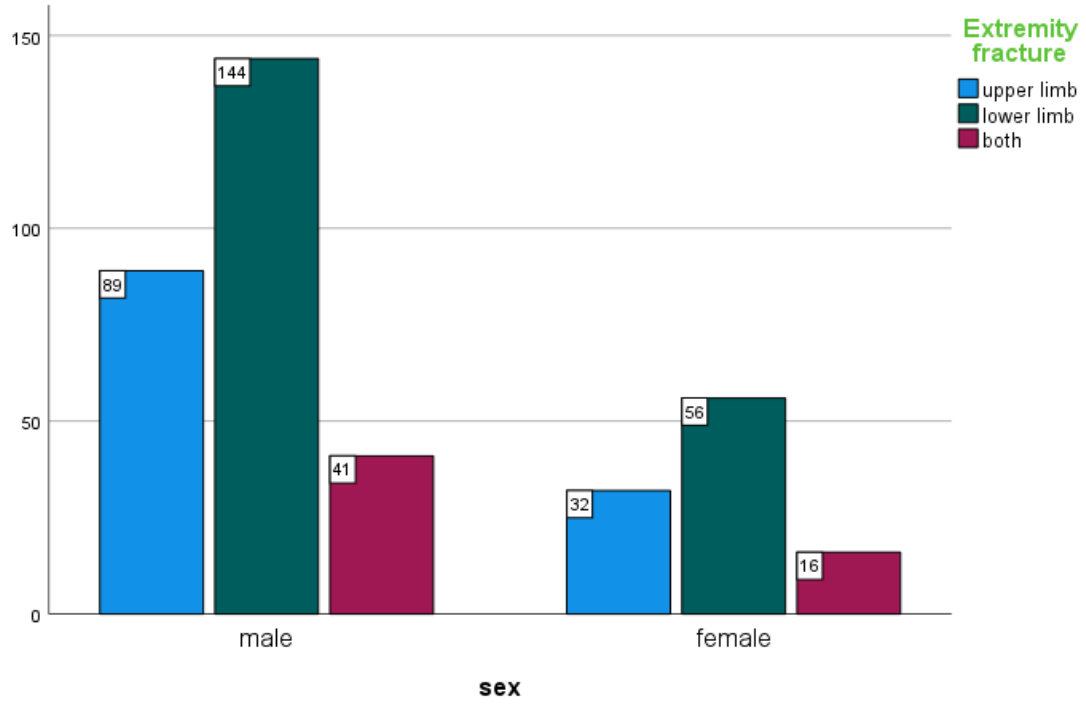

Figure 4. Prevalence of extremity fractures by age victims who visited orthopedics department in TASH and AaBETH

5.3 Causes of extremity fracture

Regarding to cause of fracture road traffic injury were the most common cause, accounting for **43.1%** (163 patients) and Falls caused **29.9%** of fractures (113 patients), making it the second most frequent cause. Occupational injuries were responsible for **8.7%** (33 patients). Assault-related fractures made up **12.7%** (48 patients). Pathological fractures (those due to underlying medical conditions) were the least common, at **5.6%** (21 patients) **(Table 6).**

Table 6. The prevalence of causes of fracture among victims who visited orthopedics department in TASH and AaBETH

Causes of fracture	Frequency	Percent
Road traffic injury	163	43.1%
Fall	113	29.9%
Occupational injury	33	8.7%
Assault	48	12.7%
Pathological	21	5.6%
Total	378	100%

5.3.1 Types of vehicles that cause Road traffic accidents

Cars are the leading vehicle type involved in fracture-related accidents, followed closely by motorcycles and Bajaj vehicles account for a small portion of injuries **(Table 7).**

Table 7. Types of vehicles that causes Road traffic accidents in in TASH and AaBETH

Types of vehicles	Frequency	Percent
Motor cycles	70	18.6%
Car	83	22.3%
Bajaj	10	2.9%
Total	163	43.1%

5.3.2 Types of equipment that Causes assault in TASH and AaBETH

In this study, bullet injuries were identified as the leading cause of assault, accounting for 36 patients, representing the majority of the reported incidents. Assaults involving sticks were the second most frequent, with 8 patients followed by stone-related assaults (3 patients) and glass-related assaults (2 patients). Overall, firearm-related injuries markedly outnumbered other forms of assault, indicating that bullet-related trauma constitutes a major burden in the study population, whereas assaults involving blunt or sharp objects such as sticks, stones, and glass were relatively uncommon **(Table 8).**

Table 8. Causes of common assault in TASH and AaBETH

Cause of assault	Frequency	Percent
Bullet	36	9.5%
Stick	8	2.1%
Stone	3	0.8%
Glass	2	0.5%
Total	49	13%

5.3.3 Behavioral factors of extremity fracture

Alcohol use was the most common behavioral factor, reported by **41** patients. Delayed presentation to the hospital occurred in **36** patients, indicating a significant number of patients did not seek immediate medical care. Visiting Traditional Bone Setters (TBS**)** before coming to the hospital was reported in **32** patients, suggesting a reliance on traditional healing methods and Smoking was reported by **30** patients **(Table 9).**

Table 9. Behavioral factors of extremity fracture in TASH and AaBETH

Behavioral factors	Frequency	Percent
Alcohol user	41	10.8%
Smoker	30	7.9%
Visited to TBS prior to hospital	32	8.5%
Delayed presentation to hospital	36	9.5%
Total	139	36.8%

5.3.4 Fracture Prevalence by Fracture causes and residence

RTIs were the leading cause of fractures in both urban and rural areas, but more common in urban settings, likely due to higher traffic density. Occupational injury was More reported in urban areas, possibly due to higher rates of industrial jobs. Assault-related fractures are more frequent in rural areas than urban, which may suggest due to political cases such war because most of them were by bullet **(Figure 6).**

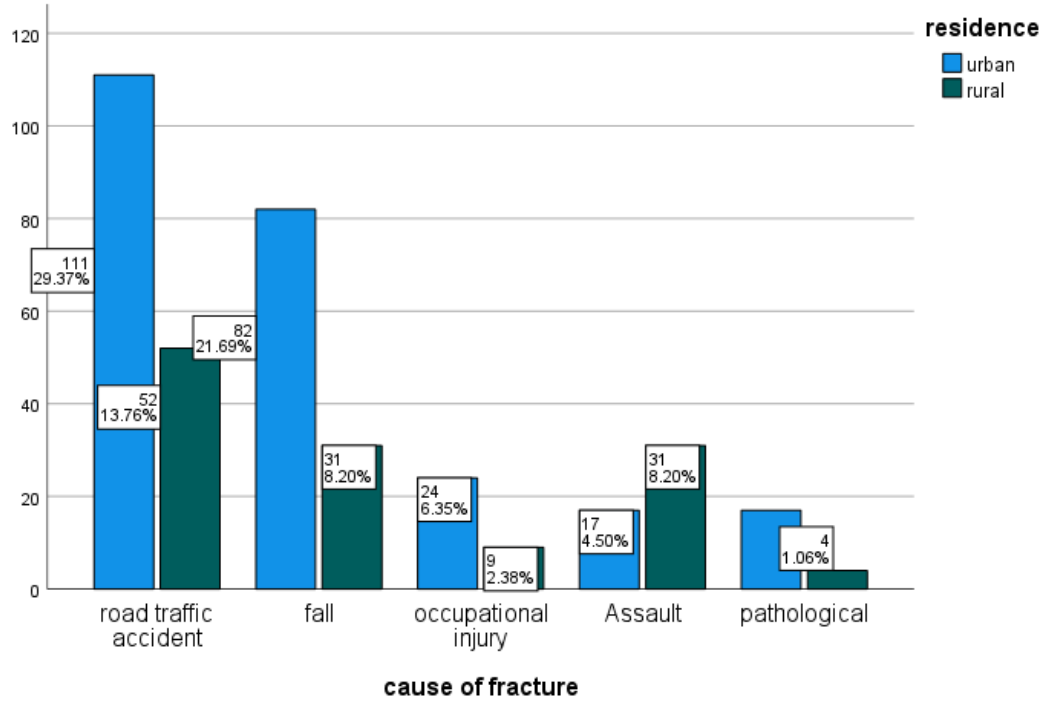

Figure 5. Fracture Prevalence by Fracture causes and residence in TASH and AaBETH

5.3.5 Gender-specific prevalence of fracture cause

Overall, males are more affected by fractures across all identified causes compared to females. The most common cause of fractures is road traffic injury (RTI)with 117 patients among males and 46 among females. This significant disparity suggests that males may be more involved in high-risk road activities such as driving or motorbike riding. Falls are the second leading cause, accounting for 76 patients in males and 37 in females. Unlike RTIs, the gender gap for falls is smaller, possibly indicating that such injuries may occur in domestic or less gender-specific settings. Occupational injuries are the third most frequent cause of fractures, reported in 24 males and 9 females. This difference likely reflects the predominance of males in physically demanding or hazardous occupations. Assault-related fractures show a stark gender difference, with 44 patients among males compared to only 4 among females. This may reflect higher exposure of males to interpersonal violence or aggressive environments. Lastly, fractures due to pathological causes those arising from underlying medical conditions are less frequent but still notable, affecting 13 males and 8 females. The relatively small gender gap in this category suggests that these types of fractures may be more closely linked to age or disease rather than external risk factors (Figure 7).

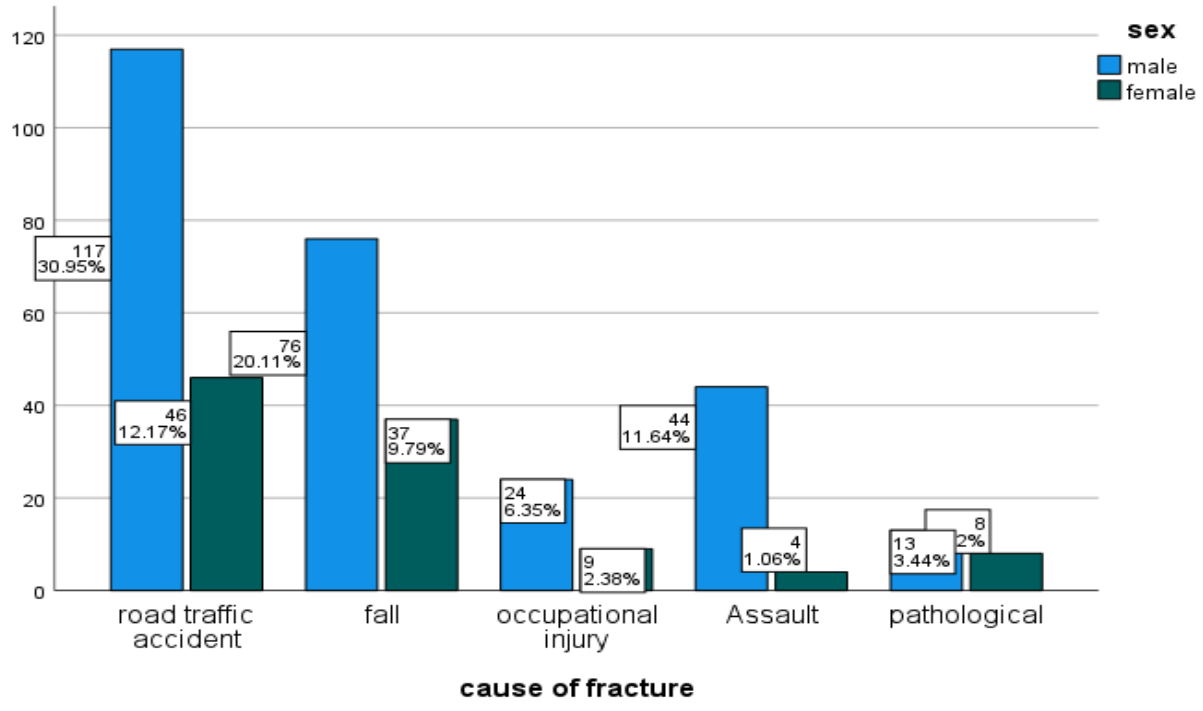

Figure 6. Prevalence of cause of Fracture by gender in TASH and AaBETH

5.4 Associated Factors of Extremity Fractures

5.4.1 Extremity fracture and occupation

The Chi-Square test indicated a statistically significant association between extremity fracture and occupation, δ^2 (12, N = 355) = 30.061, p = 0.003. Since the p-value is 0.003, which is less than 0.05, the association between occupation and extremity fracture distribution is statistically significant (Table 10).

Table 10. Association between extremity fracture and occupation

	Extremity Fracture			Total	p-value
	Upper limb	Lower limb	Both		
Occupation	26	18	3	47	
Agriculture	21	40	19	80	
Driver	8	17	8	33	=.003
Merchant	6	11	5	22	
Student	17	23	5	45	
Government employee	17	36	4	57	
Unemployed	14	45	11	70	
Total	109	191	55	355	

5.4.2 Association between cause of extremity fracture and age

The Chi-Square test indicated a statistically significant association between cause of extremity fracture and age group, δ^2 (12, N = 378) = 30.061, p = 0.0001. This indicates there is a statistically significant association between cause of extremity fracture and age group **(Table 11).**

Table 11. Association between cause of fracture and age

Age	RTI	FDA	Occupational injury	Assault	Pathological	Total	p-value
<14	6	31	1	6	3	47	
15-19	9	3	2	3	2	19	0.0001
20-34	68	27	21	17		133	
35-49	53	20	2	19	3	97	
50-64	13	9	1	2		25	
65-100	14	23	6	1	13	57	
Total	163	113	33	47	21	378	

5.4.3 Association between Extremity fracture and healing time

There was statistically no significant difference (P=0.322) between the number of extremities fractured bones among the group of healing times

Table 12. Comparison of the number of extremity fracture by healing time

	Healing Time				Total	p-value
	4-8 week	9-22 week	13-24 week	>24 week		
Upper limb	7	9	5	100	121	
Lower limb	12	14	18	156	200	0.322(>0.05)
Both	1	2	9	45	57	
Total	20	25	31	301	378	

5.4.4 Association between Independent Variables and Extremity Fracture for the selection to multinomial regression

There is no statistically significant association between the extremity fracture and gender, cause of assault, behavioral factor, (0.546, df = 1, p = .460) (6.861, df = 6, p = .334.) and the other independent variables (age group, residence, occupation, complication types of vehicles that causes RTA, have statistically significant association within extremity fracture**.** so, the independent variable its p-value less than 0.25 are selected or fit for multinomial regression and the rest are not fit for multinomial regression **(Table 13).**

Table 13. δ^2 Value result for selection of independent variables for multinomial regression

Variable	δ^2 Value	Df	p-value	Selection for multivariate	Reason
Sex	0.102	2	0.95	No	P>0.25
Age group	18.46	10	0.048	Yes	P<.25
Residence	3.75	2	0.1	Yes	P<.25
fracture Cause	17	8	0.034	Yes	P<0.25
Cause of assault	7.8	6	0.315	No	P>0.25
Types of vehicles that causes RTI	9	6	0.16	Yes	P<0.25
Behavioral factor	6.7	6	0.315	No	p>0.25
Occupation	30	12	0.003	Yes	P<0.25
Complication	15	6	0.02	Yes	P<0.25

5.4.5 Factors associated with extremity fractures in multivariable logistic regression of Upper limb (both extremity fracture as reference)

Multivariable logistic regression showed that Compared to both extremities, upper limb fractures were substantially more common in urban residences, construction employees, and patients hurt in auto or motorcycle accidents. whereas age, and complications were not significant predictors

Urban patients had significantly higher odds of upper limb fractures compared to rural (AOR = 1.9, CI: 1.6–4.4, p = 0.007). This means **urban residents were about 1.9 times more likely** to present with upper limb fractures than both-limb fractures. Complications such as infection, nonunion, and malunion did not show significant associations. (example, Infection had AOR = **0.439 (0.4–4.64)**, p > 0.05. and so, Complications were not strong predictors of whether patients had upper limb fractures vs both.

Construction workers had higher odds of upper limb fractures (AOR = 2.8, 95% CI: 1.3–5.4, p = 0.028) compared to government employees. Road traffic accidents also played an important role. Patients injured by **motorcycles (AOR = 2.4, p < 0.001)** and **cars (AOR = 3.1, p < 0.001)** were significantly more likely to sustain upper limb fractures relative to both-limb involvement. In contrast, other factors such as age group, fracture pattern, complications (infection, malunion, nonunion), and causes of fracture (fall, assault, occupational injury) were not statistically significant predictors (p > 0.05). generally Urban residence, construction occupation, and RTA-related injuries (motorcycle and car accidents) were independent predictors of upper limb fractures, whereas age, and complications, did not significantly influence the likelihood of isolated upper limb fractures **(Table 14).**

Table 14. Multivariable logistic regression result of upper limb

Variable	Categories	B	Standard error	Wald	Df	p-value	AOR 95% CI
Age	0-14	1.6	0.70	3.85	1	0.9	0.15(089, 2.6) *
	15-19	1.3	1.5	0.001	2	0.93	5.65(0.2, 12)*
	20-34	1.2	1.030	0.00	1	0.004	**1.114(0.147,8.16)** **
	35-49	-0.74	1	0.52	1	0.4	0.5(0.065,3.5)*
	50-64	-0.54	1.14	0.14	1	0.7	0.6(0.35,5.6)*
	>65 ref						
Residence	Urban	1.799	0.669	7.824	1	0.007	**1.9046(1.637, 4.4)** **
	Rural						
	Infection	-3.23	1.134	0.257	1	0.468	0.439(0.4,4.64)*
Complication	Nonunion	-0.264	1.37	0.04	1	0.847	0.768(0.05-1.1)*
	Malunion	-1.369	1.144	1.143	1	0.213	0.254(0.27,2.24)*
	Compartment syndrome						
Fracture causes	RTA	-1.18	0.77	0.000	1	0.98	1.83(0.56, 3.89)*
	FDA	-2.1	0.79	0.0001	1	0.998	0.69(0.125, 3.2)*
	Occupational injury	0.664	0.51	0.02	1	0.7	0.515(0.34, 8.90)*

Occupation	Construction	2.9	1.325	4.79	1	0.028	**2.8(1.3-6.44) ****
	Agriculture	-0.009	0.8	4,5	1	0.89	0.9(0.2,4.3)*
	Driver	0.757	0.05	5,3	1	0.42	0.46(0.72,2.072)*
	Merchant	1.385	1.18	1.138	1	0.24	3.97(0.396,4.32)*
	Student	1.339	1.47	3.92	1	0.34	3.8(0.247,8.96)*
	Unemployed	1.009	1.903	4.63	1	0.434	3.01(0.192,4.92)*
	Government employee						
	Motor cycle	2.6	1.193	3.63	1	**<0.001**	**2.4(0.29, 3.24) ****
Types of vehicles	Car	2.8	1.146	3.43	1	**<0.001**	**3.1(2.54, 8.14) ****
	Bajaj	2.8	0.00	0.89	1	0.28	3.09(0.87,6.96) *

5.4.6 Factors associated with extremity fractures in multivariable logistic regression of Lower limb

Multivariable logistic regression was also conducted to identify predictors of lower limb fractures, again using both extremities as the reference group. Age was a significant predictor: individuals aged 20–34 years were nearly 2.44 more likely to present with lower limb fractures compared to elderly patients (AOR = 2.44, 95% CI: 1.5–5.7, $p < 0.01$).

Similar to upper limb results, road traffic accidents were important predictors. Patients injured in motorcycle crashes (AOR =2.4, $p < 0.001$) and car accidents (AOR = 3.1, $p < 0.001$) were significantly more likely to sustain lower limb fractures compared to both extremities. However, residence, occupation, and most other causes of fracture (fall, assault, occupational injury) were not significant predictors ($p > 0.05$).

in summary Lower limb fractures were significantly associated with young adult age (20–34 years), and RTAs involving motorcycles and cars, whereas other sociodemographic and occupational variables were not independently predictive **(Table 15).**

Table 15.Multivariable logistic regression result of Lower limb

Variables	Categories	B	Standard error	Wald	Df	P-value	AOR95%CI
Age	0-14	1.66	1.73	0.00	1	0.99	4.66(0.045, 1.35) *
	15-19	1.16	1.56	0.00	1	0.992	10.44(0.001, 2.46) *
	20-34	1.634	0.96	3.094	1	0.008	**2.44(1.51,3.356)** **
	35-49	0.901	0.869	1.076	1	0.3	2.462(0.45, 1.5) *
	50-64	2.092	1.203	2.965	1	0.085	0.938(0.7, 3.1) *
Residence	Urban	0.288	0.554	0.271	1	0.603	1.334(0.45,3.952) *
	Rural						
fracture causes	RTI	0.123	91.26	0.001	1	0.1	1.13(1.8, 8.908) *
	FDA	-0.984	91.13	0.0001	1	0.92	0.395(0.005, 12.9) *
	Occupational injury	-0,987	12.9	0.0001	1	0.373	0.734(0.04, 2.46) *
Occupation	Construction	0.539	1.271	0.180	1	0.671	1.72(0.142,2.7) *
	Agriculture	-0.648	0.678	0.914	1	0.34	0.53(0.14, 1.796) *
	Driver	-0.71	0.812	0.765	1	0.3	0.492(0.1, 2.43) *
	Merchant	-0.791	1.178	0.451	1	0.5	0.453(0.045,3.67) *
	Student	-0.114	1.348	0.007	1	0.092	0.892(0.004,12.51) *
	Unemployed	2.071	1.118	2.883	1	0.09	7.51(0.73, 3.34) *
	Government employee (ref)						
Types of vehicles that cause fracture	Motor cycle	2.674	1.196	2.1	1	<0.0001	**2.5(1.96, 3.45)** **
	Car	2.23	1.178	2.25	1	<0.001	**0.9(0.806, 1.237)** **
	Bajaj	1.83	1.79	2.05	1	0.85	3.64(0.51, 7.82) *

Abbreviations: A0R.Adjusted Odd Ratio; CI, Confidence Interval. Not Significant *, P-value >0.05, statically significant **; P-value < 0.05 df: degree of freedom

5.5 Initial management and management outcome of extremity fracture

Initial management was documented for 365 patients (96.6%). Splinting was the most common intervention, applied in 187 cases (49.5%), followed by plaster of Paris in 107 cases (28.3%) and external fixation in 71 cases (18.8% overall) **(Table 16).**

Table 16. Initial management performed in TASH and AaBETH

Initial management	Frequency	Percent
Splinting	187	61.5%
Plaster of Paris	107	35.7%
External fixation	8	2.6%
Total	302	100%

5.5.1 Definitive treatment of extremity fracture

Among all participant 327(86.5%) were treated surgically and 50(13.2%) were treated non operatively. Only 1 person was treated both surgically and conservatively. From non-operatively treated 48 participants were treated by casting and the 2 were by traction. Regarding to surgical procedure conducted greater than half 313(89.8 %) were ORIF and the 11(3.3%) patients were treated with external fixation and 3(1%) patients were treated with both external fixation and ORIF. Surgical procedure is conducted for 210 victims after 72 hrs. and for 17 victims 72 hrs. from injury.

5.5.2 Implants inserted during surgical treatments during surgical procedure in TASH and AaBETH

In this study, plates were the most frequently used orthopedic implants, with a total of 151 patients, accounting for the largest proportion of implant utilization., while nails were used in 66 patients (**Table 17).**

Table 17. Implants inserted during surgical procedure in TASH and AaBETH

Types of implants inserted	Frequency	Percent
Plates and screw	151	46.2%
Nails (IMN)	66	14.1%

Table 18. Common complication during extremity fracture treatment in TASH and AaBETH

Types of complications	Frequency	Percent
Nonunion	26	6.5%
Deep implant related infection	14	3.73%

6. Discussion

This study assessed the prevalence, associated factors, and management outcomes of extremity fractures at Tikur Anbessa Specialized Hospital (TASH) and AaBETH in Addis Ababa.
In the present study, agricultural workers represented the largest occupational group (21.2%), followed by the unemployed (18.5%). This aligns with evidence from rural and agrarian settings in Ethiopia, where physical labor and poor transport infrastructure contribute to a heightened risk of extremity fractures (28).

In this study, the 20–34 age group accounted for the largest proportion of cases (35.2%), followed by the 35–49 age group (26.2%). This pattern is supported by findings from Nigeria, Kenya, and Cameron where young adults were also reported as the most affected age group (14, 52, 53). The higher prevalence in this age category may be attributed to their active engagement in outdoor activities, occupations involving physical labor, and increased exposure to road traffic accidents, which are the leading causes of extremity fractures in low- and middle-income countries. On the other hand, the lowest frequency was observed among adolescents aged 15–19 years, which is similar to a study conducted at Alert Hospital in Addis Ababa that also showed relatively fewer fractures among teenagers compared to young adults and middle-aged groups (54). This may be explained by lower involvement of adolescents in high-risk occupations and mobility compared to young adults.

In the present study, males were disproportionately affected, accounting for 72.5% of participants, yielding a male-to-female ratio of 2.3:1. This male predominance is consistent with reports from other Ethiopian hospitals and several sub-Saharan African studies, where men are more frequently involved in trauma cases (46,48) The prevalence of extremity fracture was calculated by proportion of extremity fracture to total trauma patients appeared at TASH and AaBET hospitals. The prevalence of extremity fractures among trauma patients was 50.1%. This prevalence is lower than that reported in a study conducted in Germany, where 58.6% of patients had significant extremity fractures. In that study, patients with relevant extremity injuries sustained an average of 2.1 fractures per case, and 4.9% of patients experienced five or more extremity injuries (43). These differences may be explained by the fact that the German and European data mainly focused on severely injured patients**,** who are more likely to sustain multiple extremity fractures, whereas our study included all trauma patients, regardless of injury severity

This prevalence is also lower compared to that reported by a study conducted in Kenya which is 63.9% (44). The discrepancy could be explained by variations in the study population and the mechanism of injury. While the current study included all age groups and a higher percentage of road traffic injuries, which are frequently linked to multi-system trauma, the Kenyan study concentrated on older adults, who frequently fall and usually sustain fractures to their extremities. Compared to a study conducted in India, where the prevalence of extremities fractures was 18.9%, this prevalence is higher. This inconsistency may be the result of differences in the study site, sample size and case mix. Furthermore, variations in trauma mechanisms could possibly account for the greater prevalence seen, with falls and traffic accidents being major causes of extremities fractures in Addis Ababa.

In the current study, long bone fractures constituted the majority of extremity injuries, a finding that aligns with a prospective study conducted in Nigeria where 88% of fractures involved the long bones (1). This similarity may be explained by shared injury mechanisms, particularly road traffic accidents and falls, which exert high-energy forces on weight-bearing bones. Furthermore, both TASH and AaBETH, like Nigerian tertiary hospitals, serve as referral centers for orthopedic trauma, there by receiving a disproportionate number of patients with long bone fractures.

Other hospital-based studies in Ethiopia have reported levels of prevalence of extremity fracture ranging between 29.9% at Black Lion Hospital and 34.1% at Debre Markos Referral Hospital (2,7).
This discrepancy may be explained by differences in study setting, where TASH and AaBETH, being national referral centers, manage a larger proportion of severe trauma cases. Additionally, the increasing burden of road traffic accidents in Addis Ababa, broader inclusion criteria, and improved diagnostic capacity may have contributed to the higher prevalence observed. Additionally, A retrospective cross-sectional chart review of 362 patients admitted from January 2019 to December 2019 at Alert Hospital (in Addis Ababa) trauma and emergency found that 24% prevalence of extremity fracture (45). While ALERT Hospital admits a wider range of trauma patients, including burns and soft tissue injuries, TASH and AaBETH are major national referral centers for orthopedic trauma and thus manage a larger share of fracture cases.
These differences in study setting and inclusion criteria may account for this discrepancy. Additionally, the ALERT study's retrospective design might have resulted in underreporting, whereas the current study's higher prevalence was probably influenced by both the growing burden of traffic accidents in Addis Ababa and enhanced diagnostic capabilities.

A retrospective cross-sectional chart review involving 415 trauma patients at Dessie City Government Hospitals found that extremity fractures accounted for 34.7% of all traumas (46).

This lower prevalence likely reflects differences in hospital type and case-mix. Dessie hospitals provide general trauma care with a broad spectrum of injury types, whereas TASH and AaBETH are referral institutions with a high intake of orthopedic trauma. Additionally, the retrospective nature of the Dessie study may have under-reported fractures due to documentation limitations, whereas our prospective methodology and strong diagnostic infrastructure likely enhanced fracture detection. Lastly, the higher urban road-traffic accidents in Addis Ababa contribute to a fracture-heavy cohort, further explaining the elevated prevalence observed.

From this study It was observed that lower extremity fractures 200(52.9%) were significantly higher compared to upper extremity 121 (32%) and the number of participants who had both upper and lower extremity fractures was 57 (15.1%). This finding is consistent with reports from Dessie Referral Hospital, Ethiopia, where lower limb fractures were also more common than upper limb injuries, largely attributed to high-energy trauma from road traffic collisions and falls from height (46). Similarly, studies from Nigeria and other sub-Saharan African countries have documented a predominance of long bone fractures, particularly femoral and tibial (48,49).

However, the finding of the current study was inconsistent with a study carried out in Munipar, India, where upper extremity fractures (58.6%) were more common compared to lower extremity (41.83%) (50). This contrast likely reflects differences in the mechanisms of trauma and regional exposure patterns. In Muni par, a higher incidence of falls from height, domestic accidents, and low-energy injuries may predispose to upper limb fractures, particularly distal radius and wrist injuries. Conversely, in Ethiopia and many sub-Saharan African settings, road traffic accidents remain the leading cause of extremity fractures, especially among pedestrians and motorcyclists, resulting in a predominance of lower limb involvement such as femur and tibia fractures.

In the present study, upper limb fractures were more frequent on the right side (29.4**%)** compared to the left (10.8%), while 7.7% of patients sustained bilateral upper limb fractures. Similarly, lower limb fractures were more common on the right side (37.3%) compared to the left (23.0%), with 7.1% being bilateral. This predominance of right-sided injuries is consistent with findings from other settings such as Nigeria and the United Kingdom have reported a higher frequency of right-sided limb fractures, which

has been attributed to hand and leg dominance, as well as protective reflexes whereby individuals instinctively use the dominant side of the body to absorb the impact during falls (7,8 ,51).

With regard to fracture type, the majority of cases this study was closed fractures (70.9%), while 29.1% were open fractures. This distribution is in line with reports from other regions, where closed fractures account for the majority of extremity injuries. However, the proportion of open fractures in our series is higher than some studies in Sub-Saharan Africa and Asia, which reported open fracture rates ranging between 15% and 25% (10). The relatively high proportion of open fractures this study area may reflect the dominance of high-energy trauma mechanisms such as road traffic accidents, which frequently result in direct impact injuries associated with severe soft-tissue damage.

From upper limb the humerus was the most frequently affected bone (25.9%), followed by the radius (16.7%) and metacarpals (4.0%). Similar findings were reported in a study from Nigeria, where the humerus was the most commonly fractured bone of the upper limb, followed by the radius and ulna (20). Another study from Dessie Referral Hospital, Ethiopia, also identified humeral fractures as the leading upper-extremity injury, particularly among young adult males (46). This predominance of humeral fractures may be explained by the vulnerability of the bone to direct trauma and falls onto the outstretched arm, mechanisms frequently encountered in both road traffic accidents and domestic falls

In this study, lower limb fractures were more common than upper limb fractures, accounting for 68.5% of all extremity injuries. The femur was the most frequently fractured bone (33.6%), followed by the tibia (19.0%), tibiofibular fractures (5.6%), and metatarsal fractures (4.2%). This result is consistent with other studies in Sub-Saharan Africa and globally. A prospective study from Nigeria reported that the femur was the most common long bone fractured among trauma patients, attributed largely to high-energy mechanisms such as road traffic accidents and, a study from Addis Ababa found that femoral fractures were the leading lower extremity injury, especially among young male adult (20,22, 70). The vulnerability of the femur to injury in high-energy trauma is well established, given its central anatomical position and the magnitude of force required to cause fracture.

In the present study, the majority of fractures were of the simple type (61.1%), while comminuted fractures accounted for 38.9%. This finding is consistent with reports from Ethiopia and other low- and middle-income countries, where simple fracture patterns predominate due to mechanisms such as low-energy falls

and direct trauma. However, the proportion of comminuted fractures in our study is also notable and higher than in some regional studies. in Gondar reported simple fractures as the leading type, while comminuted fractures were relatively less frequent and similarly, a Nigerian study found that simple fractures were more common, often linked to less severe mechanisms of injury, whereas comminuted fractures were frequently associated with high-energy trauma such as road traffic crashes (1, 28). This high proportion of comminuted fractures in our study may reflect the increasing burden of high-velocity injuries in Addis Ababa, particularly road traffic accidents, which are a leading cause of trauma in urban centers.

In this study, road traffic accidents (RTIs) were the leading cause of fractures, accounting for 43.1% of cases, followed by falls (29.9%). Occupational injuries and assaults contributed 8.7% and 12.7% of fractures. This finding is consistent with several studies across sub-Saharan Africa, which have reported RTAs as the predominant cause of extremity fractures. In Nigeria, found that road traffic crashes were the most frequent mechanism of injury, particularly affecting young adults and a study from Cameroon reported that RTAs were responsible for nearly half of all open fractures (1, 14, 55).

These findings are notably consistent with local Ethiopian data. For instance, at Wolaita Sodo University Teaching and Referral Hospital, RTAs were also the predominant cause of fractures (35.4%), followed by falls (28.6%) and interpersonal violence (21.8%) .(,57 21) Similarly, a wider study in Wolaita Zone revealed that RTAs accounted for 62.5% of all trauma cases, with falls and personal violence trailing at 20.8% and 9.6%, respectively.(56).Together, these findings paint a clear picture that RTAs remain a leading driver of fracture burden across both rural and urban healthcare settings in Ethiopia. Urban centers like Addis Ababa may experience higher RTA-related fracture rates, likely due to denser population, increased vehicle traffic, and pedestrian exposure. Meanwhile, rural and peri-urban areas to bear a high RTA burden, (motor cycles) reflecting broader road safety shortcomings.

In the present study, alcohol use was the most common behavioral factor associated with fracture patients, reported by 41 participants. Alcohol consumption has been consistently identified as a major risk factor for trauma, particularly road traffic accidents and interpersonal violence, in both Ethiopian and global contexts (58,59). A study from Addis Ababa similarly demonstrated that alcohol intake was significantly associated with an increased risk of injury, particularly among young adults (60). This reflects how risk-taking behaviors under the influence of alcohol contribute to the high burden of trauma in low- and middle-income settings.

Delayed presentation to hospital care (36 cases) and prior visits to Traditional Bone Setters (32 patients) highlight significant barriers to timely fracture management. Similar delays have been reported at Wolaita Sodo University Hospital, often linked to poor referral systems, limited prehospital care, transport challenges, and financial constraints (21). The use of TBS, common in Ethiopia and Nigeria due to cultural acceptance and accessibility, is associated with poor healing, malunion, and higher disability rates (61,62). These findings underscore the need for community education, improved emergency referral systems, and integration of safe practices into modern trauma care.

In this study, cars were the leading vehicle type involved in fracture-related accidents, followed by motorcycles the high burden of motorcycle injuries likely relates to limited rider protection, poor helmet use, and unsafe driving practices, which have been observed in other Ethiopian and East African studies (63).

In the present study, several factors were found to be associated with extremity fractures. Male sex was more strongly associated with fractures than female sex, which is consistent with reports from Gondar, Wolaita Sodo, and Addis Ababa, as well as studies from Nigeria and Tanzania (21, 28, 63). The predominance among men is likely due to their higher engagement in outdoor work, occupational hazards, driving, and risk-taking behaviors.

Residence also played a role, with rural dwellers more frequently affected. This finding agrees with studies in southern Ethiopia and other African countries, where rural residents face increased vulnerability due to poor road infrastructure, unsafe working conditions, and limited access to timely trauma care(21,61).This study analysis identified three independent predictors of upper limb fractures (versus both-limb involvement) urban residence, construction-related occupation, and road traffic accident (RTA) mechanisms, specifically, motorcycle and car-related injuries.

Urban residents were nearly four times more likely to sustain upper limb fractures compared to both-limb fractures (AOR = 1.9, 95% CI: 1.6–2.4, p = 0.007). Construction workers had significantly increased odds of upper limb fractures (AOR = 2.8, 95% CI: 1.3–4.4, p = 0.028) relative to government employees. This finding is consistent with research from Nigeria and India, which has shown that construction-related occupations expose workers to falls, machinery accidents, and heavy object injuries that commonly affect the upper extremities (29). Patients involved in motorcycle (AOR = 2.4) or car accidents (AOR = 3.1; both $p < 0.001$) had significantly higher odds of sustaining upper limb fractures. This aligns with reports

from Kenya and Ghana, where upper limb fractures accounted for 30–40% of all injuries sustained in RTAs, especially among motorcycle crash victims (63,21). This reflects broader evidence that RTAs are a common mechanism of upper extremity injury. For example, studies have documented diverse upper limb fracture rates among RTA victims.

In this study, younger adults (20–34 years) were significantly more likely to sustain lower limb fractures compared to elderly patients. Similar results from Nigeria and Ethiopia have reported that the peak incidence of femoral and tibial fractures occurs in this age group, reflecting their higher involvement in road traffic and occupational hazards. (46, 48, 64). Fracture pattern was another important predictor, with comminuted fractures strongly associated with lower limb involvement. Studies from Kenya and India also confirm that comminuted fractures are more common in lower extremities following RTAs compared to upper extremities (63,65). These results align with reports from Nigeria and Kenya, where motorcycles and cars are leading mechanisms of femoral and tibial shaft fractures. (32 65). In contrast, sociodemographic variables such as residence, occupation, and non-RTA causes (falls, assaults, occupational injuries) were not significant predictors in this study. Similar non-significant findings have been noted in hospital-based studies in Ethiopia and Tanzania, suggesting that fracture site and pattern are more closely determined by mechanism and energy of trauma rather than occupation or residence (47,63.

In this study, the vast majority of patients (86.5%) were managed surgically, while only 13.2% received conservative treatment, highlighting a strong preference for operative fixation in tertiary hospitals and ORIF was the most frequently performed procedure. this result is consistent with other Ethiopian studies where internal fixation is the predominant approach due to better outcomes in terms of stability and early mobilization. (64,66). In this study, radiological healing time ranged from 4 weeks to 155 weeks, with a mean of 41.3 ± 19.84 weeks. Similar findings have been reported in other African trauma studies, where extended healing times are often linked to delayed hospital presentation, reliance on conservative care, and resource constraints limiting access to early internal fixation

7. Conclusion and recommendation

7.1 Conclusion

This study demonstrated that extremity fractures account for about half of all trauma admissions at TASH and AaBETH is, with lower limb injuries being most common. The leading causes of fracture across all age group were road traffic injuries followed by falling down accidents and bullet injuries were the most common mechanism of assault-related fractures. These findings indicate that the majority of extremity fractures are associated with preventable causes, particularly traffic accidents and falls, which pose a substantial public health burden. the most common affected bone overall body is femur. Young adult males were the most affected group. Independent predictors of upper limb fractures included urban residence, construction-related occupations, and RTIs involving motorcycles and cars. Lower limb fractures were significantly associated with young adult age (20–34 years) and RTIs. Surgical treatment was the mainstay of management, predominantly ORIF and intramedullary nailing and however, delayed presentation to hospital care and reliance on traditional bone setters, were noted as barriers to optimal management. Healing time was markedly prolonged, averaging 41 weeks, and more than three-quarters of patients had very delayed healing. Infection, malunion, and nonunion were common complications. bullet injuries represent the leading cause of assault-related trauma, accounting for the majority of reported cases. Alcohol use was identified as the most common behavioral factor among patients with extremity fractures, followed by smoking. Overall, extremity fractures remain a major public health concern in Addis Ababa's tertiary hospitals, driven primarily by preventable causes such as RTIs.

7.2 Recommendations

Based on this finding, the following are recommended**:**

- Collaborate with transport authorities and police to enforce helmet and seatbelt use, improve road safety in urban corridors, and reduce the burden of motorcycle- and car-related fractures.
- Implement workplace safety measures in the construction sector, including training and provision of personal protective equipment (PPE), to lower occupational fracture risks.
- Healthy professionals should Establish a hospital-based fracture registry to track mechanisms, treatments, healing times, and outcomes, enabling ongoing monitoring of quality.
- Researcher also have to Undertake multicenter studies(prospective) to validate predictors of fracture patterns and healing outcomes.
- Provide targeted community education on injury prevention, especially for high-risk groups such as motorcyclists, construction workers, and urban youth.
- Public health initiatives targeting fall prevention should be implemented, particularly among children, the elderly, and individuals with mobility limitations, through awareness creation and environmental safety improvements.
- Community-based interventions aimed at reducing interpersonal violence and assault should be promoted in collaboration with social organizations, local authorities, and law enforcement agencies.
- Stricter firearm regulation, enforcement, and awareness-based violence-prevention programs are needed to reduce bullet-related assaults and promote non-violent conflict resolution.
- Implement community awareness campaigns highlighting the risks of alcohol consumption and smoking.
- Develop collaborative strategies with traditional bone setters to ensure early referral of fracture patients to formal healthcare facilities

8. Limitation and strength of the study

8.1 limitation of 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**.**
- poor documentation of patient information and data management system in the study area,
- Hospital-based study: the findings may not be fully generalizable to the wider Ethiopian population, especially rural areas or lower-level facilities

8.2 Strength of the study

- Dual-hospital setting: Conducting the study at both Tikur Anbessa Specialized Hospital (TASH) and AaBET Hospital improved representativeness of trauma
- Comprehensive variables: The study assessed not only prevalence but also associated factors, treatment modalities, healing patterns, and complications
- This study is one of the few multi-hospital analyses in Addis Ababa with a large sample size
- Clinical relevance: The findings provide practical insights for orthopedic surgeons, emergency physicians, and policymakers by highlighting key risk factors (e.g., RTAs, young age, occupation) and outcomes (delayed healing, infection)

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Annex

Questionnaires and Checklists

Part I: Socio-Demographic Data

1. Patient ID: _____ (anonymized)
2. Age: _____ (Years)
3. Sex: ☐ Male ☐ Female
4. Occupation: ☐ Manual laborer (e.g., construction, agriculture) ☐ Driver (motorcycle/taxi/truck) ☐ Merchant ☐ Student ☐ Governmental employee ☐ Unemployed ☐ Other: _____
5. Residence: ☐ Urban ☐ Rural

Part II: Fracture Characteristic Extremity

☐ **Upper Limb:**

Bone: ☐ Humerus ☐ Radius/Ulna ☐ Hand (carpal/metacarpal/phalanges**)**

Laterality: ☐ Right ☐ Left ☐ Bilateral

☐ **Lower Limb:**

Bone: ☐ Femur ☐ Tibia/Fibula ☐ Foot (tarsal/metatarsal/phalanges)

Laterality: ☐ Right ☐ Left ☐ Bilateral

Fracture Type: ☐ Closed ☐ Open

Fracture Pattern: ☐ Simple ☐ Comminuted

Part III: Associated Factors Causes of Fracture:

☐ Road Traffic Accident (RTA):

Vehicle Type: ☐ Motorcycle ☐ Car ☐ Bajaj ☐ Pedestrian

☐ Fall

☐ Occupational Injury (specify: _____

☐ Assault

☐ Pathological (e.g., osteoporosis) ☐ Other: _____

Behavioral Factors:

☐ Alcohol Use ☐ Smoker ☐ Visited Traditional Bone-Setter prior to Hospital ☐ Delayed Presentation (>72 hours from injury)

Part IV: Clinical and Management Data

Initial Management:

☐ Splinting ☐ Plaster of Paris (POP) ☐ External Fixation

Definitive Treatment:

☐ **Surgical**:

Procedure: ☐ ORIF ☐ Intramedullary Nailing ☐ External Fixation

Implant: ☐ Plate/Screws ☐ Nail ☐ Other: _____

Time to Surgery: ≤72 hours ☐ >72 hours ☐

☐ **Conservative**:

☐Casting

☐Traction

Part V: Outcomes

1. **Healing Time**: _____ weeks (radiological union).
2. **Complications**:

☐ Infection ☐ Nonunion ☐ Malunion ☐ Compartment Syndrome ☐ Other: _____