



**ANATOMICAL PATTERNS AND ASSOCIATED INJURIES OF
ROAD TRAFFIC ACCIDENT-RELATED FRACTURES
AMONG PATIENTS ADMITTED TO ADDIS ABABA BURN,
EMERGENCY AND TRAUMA HOSPITAL, ADDIS ABABA,
ETHIOPIA**

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MARCH 2026

ADDIS ABABA, ETHIOPIA

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ETHIOPIA**

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ABSTRACT

Background: Road traffic accidents (RTAs) are a major global public health crisis, with fractures being the most common associated injury. In Ethiopia, the burden is disproportionately high, yet localized data from major trauma centers like Addis Ababa Burn, Emergency and Trauma (AaBET) Hospital remains limited.

Objective: The primary objective of this study is to assess anatomical patterns and associated factors of road traffic accident-related fractures among patients admitted to Addis Ababa Burn, Emergency and Trauma Hospital, Ethiopia.

Methods: A retrospective study was conducted using 349 patient medical records. Descriptive statistics were used to summarize fracture patterns, demographics, injury mechanisms, associated factors, and clinical outcomes using frequencies, percentages, and means

Results: The study population (n=349) had a median age of 28 years with interquartile range of 18, with a strong male predominance (71.3%). The most common mechanism of injury was being hit by a vehicle (54.4%). A total of 500 fractures were recorded, with lower limb fractures (59.8%) more prevalent than upper limb fractures (24.4%). The most frequent specific fracture sites were the tibiofibular region (22.8%), followed by the femoral (17.6%) and pelvis (9.8%). Most fractures were closed (64.4%) and treated surgically (75.1%).

Conclusion: RTAs at AaBET Hospital primarily affect young males, with lower limb fractures being the dominant anatomical pattern. These findings underscore the need for targeted injury prevention and optimized orthopedic resource allocation.

Keywords: Road traffic accident, patterns of fracture, AaBET hospital

ACRONYMS AND ABBREVIATIONS

- **AaBET:** Addis Ababa Burn, Emergency and Trauma
- **LHS:** Length of Hospital Stay
- **LMIC:** Low- and Middle-Income Countries
- **RTA:** Road Traffic Accident
- **RTI:** Road Traffic Injuries
- **SD:** Standard Deviation
- **SPHMMC:** St. Paul's Hospital Millennium Medical College
- **TASH:** Tikur Anbessa Specialized Hospital

LIST OF TABLES

Table 1 sociodemographic characteristics.....	13
Table 2 Axial Skeleton Fractures.....	15
Table 3 Upper Body Fractures.....	15
Table 4 Lower Body Fractures	16
Table 5 Discharge outcome of fracture patients	19

LIST OF FIGURES

Figure 1 mechanism of injury..... 14

Figure 2 Fracture distribution by body region..... 16

Figure 3 Frequency of fracture by specific anatomical location 17

Figure 4 Nature of Fracture 18

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	iii
ABSTRACT.....	iv
ACRONYMS AND ABBREVIATIONS	v
LIST OF TABLES	vi
LIST OF FIGURES	vii
1. INTRODUCTION	2
1.1 Background	2
1.2 Statement of the Problem	3
1.3 Significance of the Study.....	4
2. LITERATURE REVIEW	5
2.1 Global and Regional Burden of RTAs and Fractures	5
2.2 Relationship Between RTAs and Fractures.....	5
2.3 Anatomical Patterns of RTA-Related Fractures.....	5
2.4 Associated Factors of RTA-Related Fractures	6
3. RESEARCH OBJECTIVES	7
3.1 General Objective	7
3.2 Specific Objectives	7
4. METHODOLOGY.....	8
4.1 Study Design and Period	8
4.2 Study Setting	8
4.3 Population.....	8
4.4 Eligibility Criteria	8
4.5 Sample Size Determination and Sampling Technique	9
4.6 Study Variables.....	10
4.7 Operational Definitions.....	10
4.8 Data Collection Tool, Method, and Procedures	11
4.9 Data Quality Control, Data Processing and Analysis	11
4.10 Ethical Considerations	11
4.11 Dissemination of Results	12
5. RESULTS	13
5.1. Demographic Characteristics.....	13
5.2. Mechanism of Injury	14
5.3. Anatomical Patterns of Fractures	14
5.4. Fracture Patterns and Associated Injuries	18
5.5. Treatment and Outcomes	18
6. DISCUSSION	20
6.1. Demographic Profile and Mechanisms of Injury	20
6.2. Anatomical Patterns and Fracture Types	20
6.3. Treatment and Outcomes	21
6.4. Comparison with Previous AaBET Study (Dengela, 2022)	21
6.5. Limitations of the Study	22
7. CONCLUSION.....	23
8. RECOMMENDATIONS.....	24
9. REFERENCES.....	25
10 ANNEXES.....	27
10.1 Questioner	27

Declaration

1. INTRODUCTION

1.1 Background

An RTA refers to an incident on a public road or street that injures or kills one or more people and involves at least one vehicle in motion [1]. It represents a major and increasing global public health emergency, causing significant morbidity, mortality, and permanent disability worldwide [2]. Globally, it is estimated that 3,000 people die and 30,000 are seriously injured on the world's roads every day [2]. Road Traffic Injuries (RTIs) are the leading cause of death for young people aged 15 to 29 and are acknowledged as the eighth leading cause of death worldwide. Approximately 16% of the 20 to 50 million non-fatal injuries that occur each year result in lifelong disabilities [3].

In low- and middle-income countries (LMICs), the burden of RTIs is disproportionately high [2]. These nations are responsible for 90% of disability-adjusted life years (DALYs) and over 85% of global motor vehicle fatalities, despite owning a small fraction of the world's registered automobiles [4]. With global costs estimated to reach US\$1.8 trillion between 2015 and 2030—an annual tax of 0.12% on the world's gross domestic product—the economic impact is significant [5]. Despite having the highest health burden, LMICs contribute significantly less to the global economic burden (46.4%) than high-income nations, in part because of lower productivity and treatment costs [5].

Road traffic injuries are a major public health challenge in Africa, which records the highest global mortality rate at 24.1 deaths per 100,000 population [3] [6]. Like many other developing countries, Ethiopia is experiencing an increase in RTIs. Addis Ababa, as the capital city, is particularly affected, with 60-62% of Ethiopia's total vehicles concentrated there [7] [8]. The economic toll in Ethiopia alone amounted to approximately 36.3 billion birrs (US\$1.3 billion) over an eleven-year period, signifying an average annual loss of 0.9% of the national budget due to traffic accidents [7].

Among the various types of injuries resulting from RTIs, orthopedic fractures are consistently identified as one of the most common and significant consequences, often leading to substantial disability [7]. Studies in Ethiopian hospitals, including Tikur Anbessa Specialized Hospital (TASH), have repeatedly highlighted this pattern. For instance, a 2007 study in TASH found

that RTIs were responsible for almost half of musculoskeletal injuries, with the highest frequency of fractures in the femur, followed by tibio-fibular and humerus [2]. A 2013 study at the same hospital reported that fractures were sustained by 78.0% of RTI victims, with lower limb fractures being the most common (36.2%) [7]. A more recent 2021 study in Black Lion Hospital reaffirmed that fractures accounted for 71.1% of all injury types, specifically lower limb fractures (42.1%) [7].

1.2 Statement of the Problem

Despite the alarmingly increasing incidence of RTIs and their profound consequences, particularly orthopedic fractures, there remains a critical gap in comprehensive, up-to-date, and localized empirical data from major trauma centers in Ethiopia like AaBET hospital [7]. The absence of detailed information on the anatomical patterns and associated injuries of RTI-related fractures among patients admitted to AaBET Hospital hinders the ability of healthcare providers and policymakers to plan targeted interventions and optimize patient care.

Knowing the anatomical patterns of fractures associated with RTA and the associated injuries will help to accurately assess the magnitude and evolving nature of this health problem, identify specific high-risk groups, common injury mechanisms, and prevalent fracture patterns that may necessitate tailored preventive interventions, optimize resource allocation and infrastructure planning within the hospital's emergency department and orthopedic services to effectively manage the specific types and complexities of fractures presenting from RTAs.

The Ethiopian traffic management has been working to reduce the burden of RTI in various ways. For instance, in Addis Ababa alone, over 250 speed humps have been installed at high-risk locations, over 60 kilometers of pedestrian walkways, have been constructed or upgraded, and more than 40 intersections have been signalized, with 30 receiving redesigned safety treatments to address traffic density and improve pedestrian protection.[9]. The city administration is making major investments in new infrastructure for pedestrians in walking and cycling. They have also been organizing "Car-Free Day" events since 2019, closing 16 major road sections once a month to promote walking and reduce accidents [10]. These efforts, along with mass media campaigns and enhanced enforcement, led to a decrease in the overall speeding rate from 49% to 39% between June 2015 and August 2018 [11]. Despite all these efforts, road traffic accident is still one of the major reasons for trauma-related admission in Ethiopian hospitals and other healthcare setups [12].

Therefore, a retrospective cross-sectional study detailing the anatomical patterns and associated factors of road traffic accident-related fractures among patients admitted to AaBET Hospital for the period of 2023-2025 is essential. Such a study will provide crucial, current data to fill this knowledge gap, informing targeted prevention efforts, guiding evidence-based clinical practices, and supporting strategic healthcare planning to alleviate the burden of RTI-related orthopedic injuries in Addis Ababa.

1.3 Significance of the Study

The findings of this study can inform healthcare providers, policymakers, and researchers about the healthcare needs of individuals who sustained fracture due to RTAs, facilitating the development of targeted interventions, resource allocation, and patient counseling strategies. Additionally, this study contributes to the body of knowledge on RTA fracture patterns in AaBET hospital, which is the city's major trauma center. A deeper understanding of this complex problem has the potential to improve clinical outcomes and enhance quality of life for those affected.

2. LITERATURE REVIEW

2.1 Global and Regional Burden of RTAs and Fractures

Road traffic injuries are consistently ranked among the top ten leading causes of death globally, with an estimated 1.24 million deaths per year [5]. The World Health Organization (WHO) reports that RTAs are the leading cause of death among young adults aged 15–29 years [13]. While high-income countries have observed a downward trend in RTA-related deaths, many LMICs continue to experience a rising incidence [14]. Poor road infrastructure, weak enforcement of traffic regulations, and limited access to emergency medical services primarily drives this disparity.

In Sub-Saharan Africa (SSA), the burden of RTIs is particularly severe, with the highest death rates globally. Studies from various Sub-Saharan Africa (SSA) countries consistently highlight RTIs as a major public health challenge, placing immense strain on healthcare systems and contributing to significant economic losses [15]. Ethiopia, as an LMIC, faces a similar predicament, with a high fatality rate and a substantial number of road accidents annually [16].

2.2 Relationship Between RTAs and Fractures

Fractures are among the most common and debilitating injuries resulting from RTAs. The kinetic energy involved in vehicular collisions often leads to direct impact or indirect forces that exceed the bone's structural integrity, resulting in fractures [17]. The severity and type of fracture are influenced by factors such as the speed of impact, the type of vehicle involved, the position of the victim (e.g., pedestrian, cyclist, occupant), and the point of impact on the body [18].

Orthopedic fractures, particularly those affecting the long bones of the limbs, frequently require surgical intervention, prolonged hospitalization, and extensive rehabilitation, leading to significant morbidity and long-term disability [19]. The economic consequences of RTIs include direct medical costs, lost productivity, and the burden on caregivers [5].

2.3 Anatomical Patterns of RTA-Related Fractures

Studies across different regions consistently report specific anatomical patterns of fractures in RTA victims. Lower limb fractures, particularly those involving the tibia, fibula, and femur, are

frequently observed, especially among pedestrians and motorcyclists [20]. This is often due to direct impact with vehicles or falls from moving vehicles. Upper limb fractures, including those of the humerus, radius, and ulna, are also common, often resulting from attempts to brace for impact or direct trauma [21].

In Ethiopia, several studies have documented these patterns. For instance, research at TASH reported high frequencies of femur, tibio-fibular, and humerus fractures [2]. Similarly, a different study at the same institution reported lower limb fractures as the most common injury type among RTA patients with orthopedic injuries [7]. These findings underscore the need for targeted prevention strategies focusing on vulnerable road users and the optimization of orthopedic services for managing these prevalent injuries.

2.4 Associated Factors of RTA-Related Fractures

Various factors are associated with the occurrence and severity of RTA-related fractures. Demographic factors such as age and sex are consistently identified. Young males are disproportionately affected, often attributed to higher exposure to road traffic, risk-taking behaviors, and occupational activities [4] [6].

Mechanism of injury plays a crucial role. Being hit by a vehicle (pedestrian involvement), collisions, and overturning incidents are common mechanisms leading to fractures [22]. Vehicle type, road conditions, and time of day also influence injury patterns. For example, pedestrian injuries are often associated with severe lower limb fractures, while occupants may sustain a wider range of injuries depending on crash dynamics [23].

Pre-hospital care and timely access to definitive medical treatment are critical factors influencing patients outcomes. Delays in transport and inadequate initial management can exacerbate injuries and lead to poorer prognoses [12]. Furthermore, socioeconomic factors, such as urban versus rural residence, can influence exposure to RTAs and access to healthcare facilities [24].

3. RESEARCH OBJECTIVES

3.1 General Objective

To assess the anatomical patterns and associated injuries of road traffic accident-related fractures among patients admitted to Addis Ababa Burn, Emergency and Trauma Hospital, Ethiopia.

3.2 Specific Objectives

- 1) To determine the socio-demographic characteristics of patients with RTA-related fractures admitted to AaBET Hospital.
- 2) To describe the anatomical patterns of RTA-related fractures among patients admitted to AaBET Hospital.
- 3) To identify the types of RTA-related fractures (open/closed, transverse, oblique, comminuted) among patients admitted to AaBET Hospital.
- 4) To determine the mechanisms of injury leading to RTA-related fractures among patients admitted to AaBET Hospital.
- 5) To assess the clinical outcomes (length of hospital stay, type of treatment, discharge status) of patients with RTA-related fractures admitted to AaBET Hospital.
- 6) To assess associated injuries with fractures in RTA patients (Soft tissue injure, other organ damages)

4. METHODOLOGY

4.1 Study Design and Period

A retrospective cross-sectional study design was employed to assess the anatomical patterns and associated injuries of RTA-related fractures. The study reviewed patient medical records from January 1, 2023, to December 30, 2025.

4.2 Study Setting

The study was conducted at AaBET Hospital, located in Addis Ababa, Ethiopia. AaBET Hospital is a leading trauma center in Ethiopia, affiliated with SPHMMC, providing 24/7 specialized services in emergency medicine, critical care, trauma and acute care surgery, and orthopedics.

4.3 Population

4.3.1 Source Population

The source population included all patients admitted to AaBET Hospital with RTA-related injuries during the specified study period.

4.3.2 Study Population

The study population consisted of all RTA patients admitted to AaBET Hospital with documented fractures during the period of January 1, 2023, to December 30, 2025.

4.4 Eligibility Criteria

4.4.1 Inclusion Criteria

- All RTA patients admitted to AaBET Hospital with documented fractures during the study period.
- Patients with complete medical records containing relevant information for the study variables.

4.4.2 Exclusion Criteria

- Patients with incomplete medical records or missing crucial information.
- Patients whose injuries are not directly related to road traffic accidents.

4.5 Sample Size Determination and Sampling Technique

4.5.1 Sample Size Determination

The sample size was determined by using single population proportion formula considering the following assumptions: 95% level of confidence, 5% margin of error (d), which is 0.05 and 67% proportion (p) from previously conducted study in TASH. The sample size for the study was computed from the following formula:

$$n = \frac{(Z_{\alpha/2})^2 P(1 - P)}{d^2}$$

Where;

D = Margin of error (5%)

P = Prevalence of fracture in RTA patients at TASH

95% confidence level and 1- Confidence level = $1 - 0.95 = 0.05$

$Z_{\alpha/2}$ with 95% confidence interval equals to 1.96

n = sample size

$$n = \frac{1.96^2 \cdot 0.67 \cdot (1 - 0.67)}{0.05^2}$$

$$n = \frac{0.7909}{0.0025}$$

$$n = 316.39$$

So, n = 317

non-respondents = 10% (317) = 31.7

Final sample size = 349

4.5.2 Sampling Technique

A stratified sampling technique was employed, where all eligible patient records meeting the inclusion criteria within the defined study period were selected for data extraction.

4.6 Study Variables

- **Anatomical Patterns of Fractures** (e.g., upper limb, lower limb, axial skeleton, specific bone involvement)
- **Types of Fractures** (e.g., open/closed, transverse, oblique, comminuted)
- **Socio-demographic Characteristics:** Age, Sex, Residence.
- **Mechanism of Injury:** Type of road user (pedestrian, passenger, driver), type of vehicle involved, nature of impact (e.g., hit by vehicle, collision, overturning).
- **Associated Factors:** Presence of associated injuries (e.g., soft tissue injury, head injury, visceral injury), pre-hospital care received, time to hospital arrival.
- **Clinical Outcomes:** Length of hospital stay, type of treatment (surgical/conservative), discharge status (e.g., recovered, partial recovery, disability, death).

4.7 Operational Definitions

- **RTA:** An incident on a public road or street that injures or kills one or more people and involves at least one vehicle in motion.
- **Fracture:** A break in the continuity of a bone, diagnosed radiologically or clinically.
- **Open Fracture:** A fracture where the skin and soft tissues overlying the fracture are breached, exposing the bone to the external environment.
- **Closed Fracture:** A fracture where the skin and soft tissues overlying the fracture remain intact.
- **Anatomical Pattern:** The specific location of the fracture on the body (e.g., femur, tibia, humerus, pelvis).
- **Associated Factors:** Variables identified in patients with different anatomical patterns or types of RTA-related fractures.
- **Length of Hospital Stay (LHS):** The total number of days a patient remains admitted in the hospital from admission to discharge.
- **Partial Recovery:** Improvement in the patient's condition allowing discharge, but with some residual functional limitation or requiring ongoing rehabilitation.
- **Disability:** Any restriction or lack of ability (resulting from an impairment) to perform an activity in the manner or within the range considered normal for a human being.

4.8 Data Collection Tool, Method, and Procedures

4.8.1 Data Collection Tool

A structured data extraction checklist was developed based on the study variables. The checklist was pre-tested at a similar trauma center to ensure clarity, completeness, and consistency.

4.8.2 Data Collection Method and Procedures

Data was collected retrospectively from patient medical records available at the AaBET Hospital. Trained data collectors (medical students and medical interns) reviewed the medical charts, admission forms, surgical notes, imaging reports, and discharge summaries to extract relevant information using the standardized checklist. Each record was assigned a unique identification number to maintain anonymity and confidentiality.

4.9 Data Quality Control, Data Processing and Analysis

4.9.1 Data Quality Control

To ensure data quality, data collectors received comprehensive training on the data extraction tool and procedures. A supervisor oversaw the data collection process, conducting daily checks for completeness, accuracy, and consistency of the extracted data. Any discrepancies or missing information was addressed immediately by referring back to the original medical records.

4.9.2 Data Processing and Analysis

Collected data was entered into a statistical software package (SPSS). Descriptive statistics, including frequencies, percentages, means, and standard deviations, was used to summarize the socio-demographic characteristics, anatomical patterns, fracture types, mechanisms of injury, and outcomes. Results are presented using tables, graphs, and charts.

4.10 Ethical Considerations

This study was conducted in accordance with ethical principles for medical research involving human subjects. Ethical approval was obtained from the Institutional Review Board (IRB) of SPHMMC before the commencement of data collection. A formal letter of cooperation was secured from the relevant authorities at AaBET Hospital.

Patient confidentiality was maintained throughout the study. Data was extracted from medical records using unique identification numbers, and no personal identifiers were recorded. Access to the collected data was restricted to the research team. The retrospective nature of the study, utilizing existing de-identified medical records, minimized direct patient contact and associated risks. The study findings were disseminated in a manner that protects the privacy and anonymity of all individuals involved.

4.11 Dissemination of Results

The findings of this study will be disseminated through various channels to reach relevant stakeholders, including healthcare providers, policymakers, and the academic community. The primary mode of dissemination will be the submission of this thesis report to the School of Public Health, SPHMMC, as a partial fulfillment of the requirements for the Doctor of Medicine degree.

Further dissemination efforts will include:

- **Presentation at Scientific Conferences:** The results will be presented at local and national scientific conferences related to emergency medicine, orthopedics, and public health.
- **Publication in Peer-Reviewed Journals:** A manuscript based on the study findings will be prepared and submitted to a reputable peer-reviewed medical or public health journal for publication.
- **Briefing to Hospital Management and Policymakers:** Key findings and recommendations will be shared with the management of AaBET Hospital and relevant health policymakers in Addis Ababa to inform evidence-based decision-making and intervention strategies for RTA prevention and trauma care improvement.

5. RESULTS

This chapter presents the descriptive analysis of the anatomical patterns and associated injuries of RTA-related fractures among patients admitted to AaBET Hospital from 2023 to 2025. The analysis is based on a dataset of 349 patient records, which includes demographic information, injury mechanisms, fracture details, associated injuries, treatment methods, and patient outcomes.

5.1. Demographic Characteristics

Table 1 sociodemographic characteristics

Variable		Frequency	Percent
Age category	less than 12	29	8.3
	13 to18	35	10.0
	19 to 25	76	21.8
	26 to 30	59	16.9
	31 to 35	43	12.3
	36 to 45	54	15.5
	46 to 60	34	9.7
	above 60	19	5.4
	Total	349	100.0
Sex	Female	100	28.7
	Male	249	71.3
	Total	349	100.0
Residence Location	Addis Ababa	139	39.8
	Afar	1	.3
	Amhara	21	6.0
	Dire Dawa	1	.3
	Oromia	184	52.7
	SNNP	2	.6
	Tigray	1	.3
	Total	349	100.0

The study population comprised 349 patients with a median age of 28 years(Interquartile Range of 18). The age distribution revealed that the highest number of fractures occurred in the 13-24 years age group (31.8%), closely followed by the 25-36 years age group (31.5%). A strong male predominance was observed, with 249 (71.3%) of the patients being male and 100 (28.7%) being female. Geographically, the majority of patients were from the Oromia region (52.7%), while 47.3% were from Addis Ababa.

5.2. Mechanism of Injury

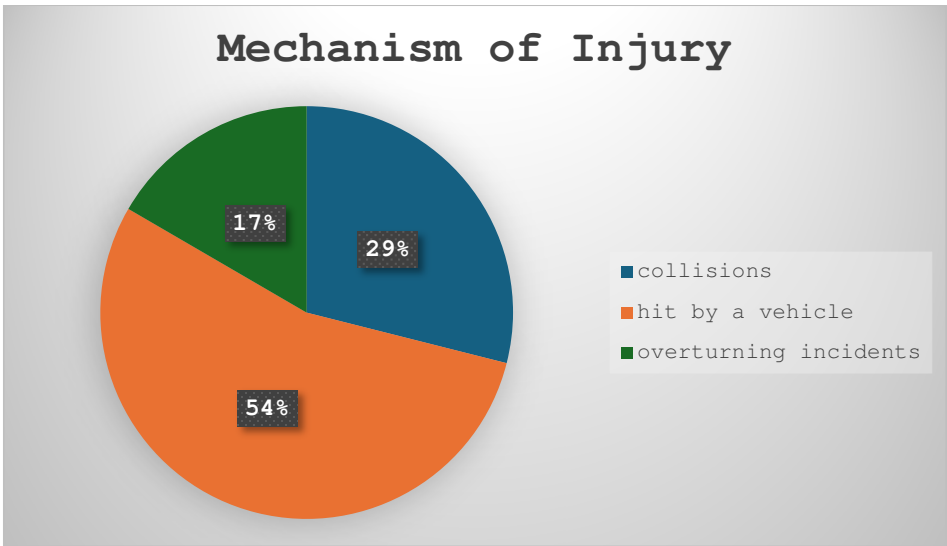


Figure 1 mechanism of injury

The primary mechanism of injury was identified as being hit by a vehicle (54.4%), indicating a significant burden on pedestrians. This was followed by collisions (28.9%) and overturning incidents (16.6%). Information regarding alcohol status was largely unknown for 97.1% of the records, with a small percentage (0.6%) indicating a history of alcohol use.

5.3. Anatomical Patterns of Fractures

A total of 500 fractures were recorded among the 349 patients, with many patients sustaining multiple fractures. Fractures were significantly more common in the lower body (59.8%) compared to the upper body (24.4%).

The most common specific fracture locations were:

- Tibiofibular region: 22.8% (Right Tibiofibular: 11.2%, Left Tibiofibular: 10.6%)
- Femoral region: 17.6% (Right Femoral: 9.0%, Left Femoral: 8.6%)
- Pelvis: 9.8%
- Humerus: 8.0% (Right Humerus: 3.4%, Left Humerus: 4.6%)

Table 2 Axial Skeleton Fractures

Anatomical Location	Total (N)	Percentage (%)
Head / Skull	21	4.2%
Cervical Spine	2	0.4%
Thoracic Spine	2	0.4%
Lumbar Spine	5	1.0%
Pelvis Fracture	49	9.8%

Table 3 Upper Body Fractures

Anatomical Location	Right (N)	Left (N)	Total (N)	Percentage (%)
Humerus	17	23	40	8.0%
Radial	10	11	21	4.2%
Ulnar	2	5	7	1.4%
Radioulnar	13	4	17	3.4%
Clavicular	11	15	26	5.2%
Scapular	4	2	6	1.2%
Palmar	3	2	5	1.0%

Anatomical Location	Right (N)	Left (N)	Total (N)	Percentage (%)
Category Total	-	-	122	24.4%

Table 4 Lower Body Fractures

Anatomical Location	Right (N)	Left (N)	Total (N)	Percentage (%)
Femoral	45	43	88	17.6%
Tibial	12	17	29	5.8%
Fibular	7	6	13	2.6%
Tibiofibular	58	51	109	21.8%
Patellar	7	6	13	2.6%
Malleoli	20	12	32	6.4%
Metatarsal and Digits	8	7	15	3.0%
Category Total	-	-	299	59.8%

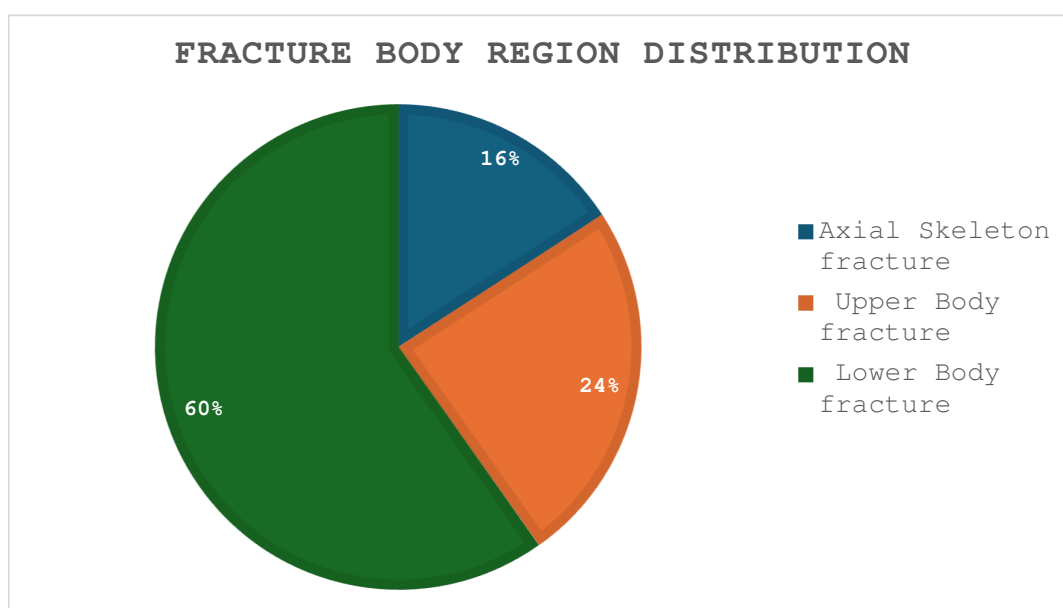


Figure 2 Fracture distribution by body region

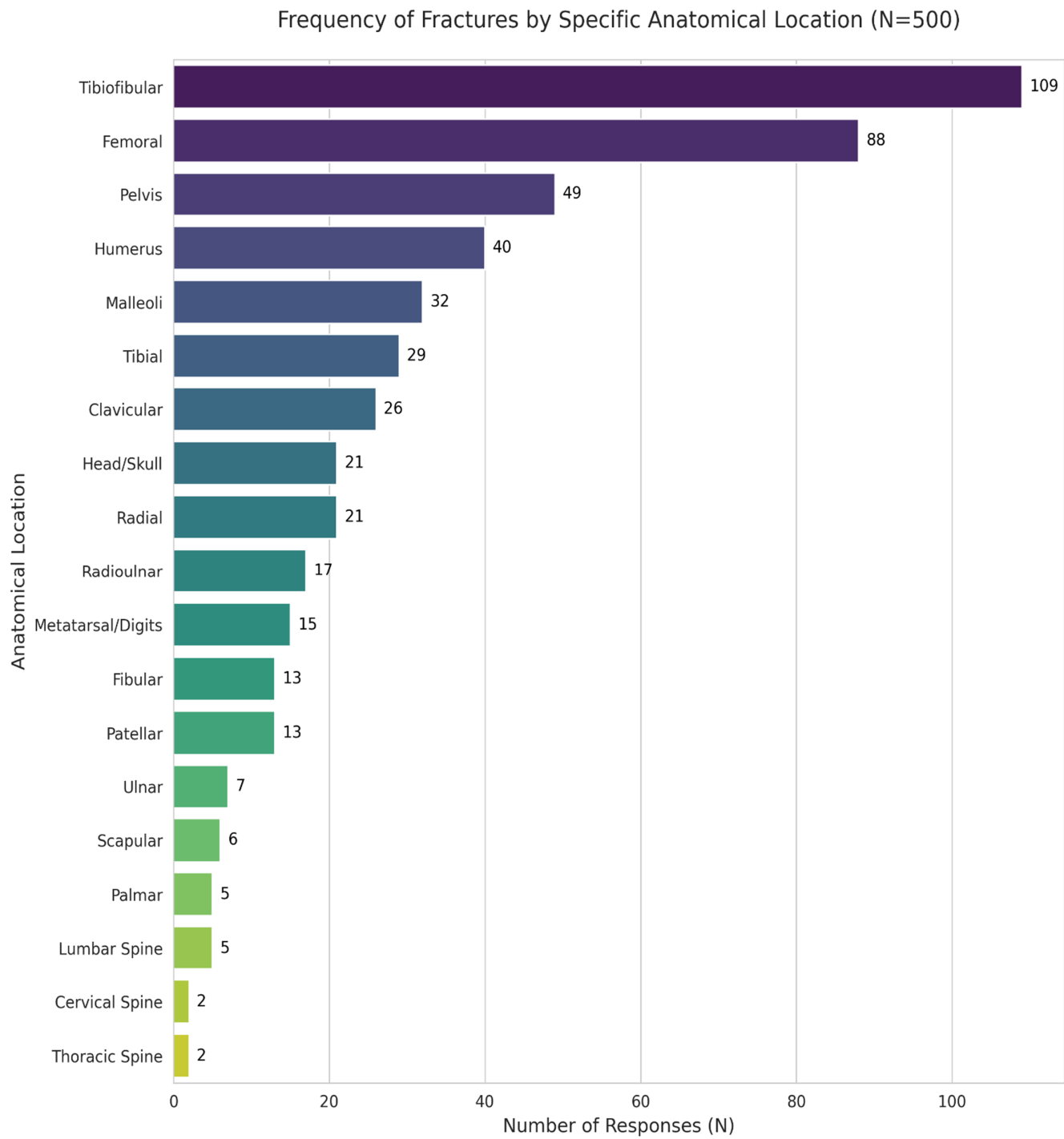


Figure 3 Frequency of fracture by specific anatomical location

5.4. Fracture Patterns and Associated Injuries

The majority of fractures were closed (64.4%), while 35.6% were open. Regarding the fracture line, the most common types observed were transverse (34.3%), oblique (27.3%), and comminuted (21.4%). Soft tissue injuries (STI) were the most frequently associated injury, present in 48.1% of cases.

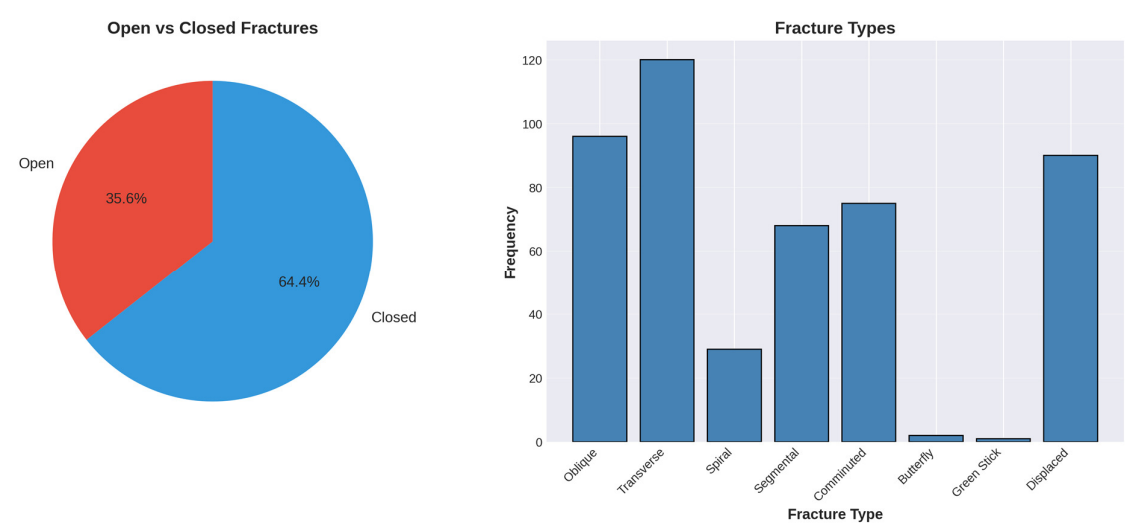


Figure 4 Nature of Fracture

5.5. Treatment and Outcomes

Surgical intervention was the primary treatment modality, required by 75.1% of patients. The mean LHS was 21.7 days (SD = 23.3). The most common discharge outcome was partial recovery (91.2%), with 4.0% resulting in disability, 2.6% referred out, and 2.0% left against medical advice with similar presentation.

Table 5 Discharge outcome of fracture patients

	Frequency	Percent
Disability	14	4.0
Partial Recovery	319	91.4
Referred	9	2.6
Same	7	2.0
Total	349	100.0

6. DISCUSSION

This study provides a comprehensive analysis of anatomical patterns and associated injuries of RTA-related fractures at AaBET Hospital, offering valuable insights into the burden of orthopedic trauma in Ethiopia. The findings are largely consistent with, and in some aspects, further elaborate on, existing literature from Ethiopia and other LMICs.

6.1. Demographic Profile and Mechanisms of Injury

The demographic profile of patients in this study, characterized by a median age of 28 years (Interquartile Range of 18) and a strong male predominance (71.3%), aligns closely with previous research in Ethiopia. Studies at TASH [4, 6] reported similar male proportions (71.7%), and a previous study at AaBET by Dengela (2022) found 69.9% male patients [13]. This consistent pattern reaffirms the heightened vulnerability of young, economically active males to RTAs, likely due to increased exposure to road traffic, occupational risks, and potentially higher engagement in risk-taking behaviors. The concentration of injuries in the 13-24 and 25-36 age groups further emphasizes the significant socioeconomic impact of RTAs on this working segment of the population.

The leading mechanism of injury, being hit by a vehicle (54.4%), is also consistent with findings from other Ethiopian studies, including Dengela (45.0%) [13] and Laytin et al. [7], who noted that over half of RTI victims in Addis Ababa were pedestrians. This highlights the critical need for enhanced pedestrian safety measures and stricter enforcement of traffic laws to protect vulnerable road users.

6.2. Anatomical Patterns and Fracture Types

A total of 500 fractures were identified among 349 patients, indicating a high incidence of multiple fractures per patient. The predominance of lower body fractures (64.0%), particularly in the tibiofibular (22.8%) and femoral (17.6%) regions, is a consistent finding across Ethiopian trauma centers [1] [6]. This pattern is often attributed to the direct impact experienced by pedestrians and motorcyclists during RTAs. While the proportion of lower limb injuries in this study is higher than some previous reports (e.g., Dengela reported 32.7% lower limb injuries [13]), this difference might be due to the current study's specific focus on admitted fracture patients, who typically present with more severe and localized injuries.

The high percentage of open fractures (35.6%) in this study, although slightly lower than the 39.0% reported by Dengela [13], remains a significant clinical challenge. Open fractures are associated with a higher risk of infection, delayed union, and non-union, leading to prolonged hospital stays and potentially poorer functional outcomes. The prevalence of transverse, oblique, and comminuted fracture types further indicates the high-energy nature of RTA-related trauma.

6.3. Treatment and Outcomes

The high rate of surgical intervention (75.1%) observed in this study underscores the severity and complexity of RTA-related fractures managed at AaBET Hospital. This figure is comparable to the 87% surgical treatment rate reported by Dengela for admitted patients at the same hospital [13], and consistent with findings from other regional studies [25]. The demand for surgical services places a substantial burden on the hospital's orthopedic and surgical resources, highlighting the need for adequate infrastructure and skilled personnel.

The mean LHS of 21.7 days in the current study is a critical finding. This prolonged hospitalization period, while reflecting the severity of injuries, also has significant implications for healthcare costs, bed occupancy rates, and patient recovery. While direct comparisons of LHS are varied across studies due to differences in patient populations and healthcare systems, the current finding suggests that patients with RTA-related fractures at AaBET require

extensive inpatient care. The high rate of partial recovery (90.8%) as a discharge outcome is encouraging, but the 4.0% disability rate emphasizes the long-term consequences of these injuries and the need for robust rehabilitation services.

6.4. Comparison with Previous AaBET Study (Dengela, 2022)

Comparing the current study (2023-2025) with the previous study by Dengela (2022) at AaBET Hospital provides valuable insights into trends over time. While the male predominance remains consistent (71.3% vs. 69.9%), the current study shows a higher proportion of lower body fractures (59.8% vs. 32.7% for lower limb injuries in Dengela's study). This could indicate a shift towards more severe lower limb trauma. The surgical intervention rates remain high and comparable (75.1% vs. 87%), reinforcing AaBET's role as a major trauma center handling complex orthopedic cases. The consistent findings across these studies from the same institution

reinforce the persistent public health challenge posed by RTAs in Addis Ababa and the ongoing demand for specialized trauma care.

6.5. Limitations of the Study

This study, while providing valuable insights, is subject to certain limitations. Firstly, its retrospective cross-sectional design, relying solely on existing medical records, inherently limits the ability to establish causal relationships and is susceptible to the quality and completeness of recorded data. Secondly, as a single-center study conducted at AaBET Hospital, the generalizability of its findings to other trauma centers or the broader Ethiopian population may be limited. Lastly, a significant portion of data regarding crucial associated factors, such as alcohol status (97.1% unknown), was unavailable, which restricted a comprehensive analysis of all potential contributing factors to RTA-related fractures.

7. CONCLUSION

This study provides a detailed characterization of anatomical patterns and associated injuries of road traffic accident-related fractures among patients admitted to AaBET Hospital from 2023 to 2025. The findings reveal that RTAs disproportionately affect young, economically active males, with lower body fractures, particularly of the tibiofibular and femoral regions, being the most prevalent anatomical pattern. A significant proportion of these injuries are open fractures, necessitating complex surgical interventions and resulting in prolonged hospital stays. The high volume of fractures per patient and the intensive treatment required emphasize the substantial burden placed on the healthcare system at AaBET Hospital.

8. RECOMMENDATIONS

Based on the findings of this study, the following recommendations are put forth:

For AaBET Hospital Management and Healthcare Providers:

- **Optimize Orthopedic Resource Allocation:** Given the high prevalence of lower limb fractures and the demand for surgical intervention, ensure adequate allocation of resources, including specialized orthopedic surgeons, operating room capacity, and post-operative rehabilitation facilities.
- **Enhance Trauma Care Protocols:** Continuously review and update trauma care protocols, particularly for the management of open fractures, to minimize complications and improve patient outcomes.
- **Data-Driven Interventions:** Utilize the detailed data on fracture patterns and associated factors to inform clinical practice, guide training programs for healthcare professionals, and prioritize areas for quality improvement initiatives.

For Future Researchers:

- **Prospective Studies:** Conduct prospective studies to evaluate long-term functional outcomes, quality of life, and the economic impact of RTA-related fractures on patients and their families.
- **Risk Factor Analysis:** Further investigate specific risk factors, such as alcohol use, vehicle type, and road conditions, through more detailed data collection to inform targeted prevention strategies.

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10 ANNEXES

10.1 Questioner

Section A: Demographic Information

- Age (in years): ____
- Sex: ☐ Male ☐ Female
- Occupation: ____
- Residence (urban/rural): ____
- Mode of transport at time of RTA: ☐ Pedestrian ☐ Motorcycle ☐ Car ☐ Bus ☐ Bicycle ☐ Other: ____

Section B: Accident Details

- Location of accident (on the body):
 - Lower body
 - Upper body
- Mechanism of injury: ☐ Collision ☐ Overturning ☐ Hit by vehicle ☐ Other: ____
- Alcohol or drug use before incident (if known): ☐ Yes ☐ No ☐ Unknown

Section C: Fracture Pattern

- Body region affected (you can select multiple):
 - Head/Skull
 - Cervical spine
 - Thoracic spine
 - Lumbar spine
 - Pelvis
 - Upper limb (specify bone):
 - Humerus
 - Right
 - Left
 - Radial
 - Right
 - Left
 - Ulnar
 - Right
 - Left

- Radioulnar

- Right
- Left

- Clavicular

- Right
- Left

- Scapular

- Right
- Left

- Palmar

- Right
- Left

- Other ____

☐ Lower limb (specify bone)

- Femoral

- Right
- Left

- Tibial

- Right
- Left

- Fibular

- Right
- Left

○ Tibiofibular

- Right
- Left

○ Patellar

- Right
- Left

○ Dorsalis pedis

- Right
- Left

○ Other: _____

- Nature of fracture: ☐ Closed ☐ Open
- Fracture type: ☐ Simple ☐ Comminuted ☐ Greenstick ☐ Spiral ☐ Others: _____
- Associated injuries: ☐ Internal bleeding ☐ Organ damage ☐ Neurovascular injury ☐ Other: _____

Section D: Clinical Outcomes

- Treatment given: ☐ Conservative ☐ Surgical ☐ Other: _____
- Hospital length of stay: _____ days
- Discharge outcome: ☐ Full recovery ☐ Partial recovery ☐ Disability ☐ Against Medical advise (same)

Declaration

I, the undersigned student, declare that this research project is my original work in partial fulfillment of the requirement for the **Degree of Doctor in Medicine, MD**. I also declare that it has never been presented in this or any other higher institution and that all resources and materials used in the research work have been duly acknowledged.

Name of the student: Tesodros Desalegn Tolera
Signature: [Signature]
Date: March 25 / 2026

Approval of Advisors

This research work has been submitted for examination with my approval.

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