



**ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH**

Title: Magnitude, outcomes, and associated factors of road traffic injuries among trauma victims that visited AaBET Hospital from 2020 to 2022

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APPROVED BY THE BOARD OF EXAMINERS

This is to certify that the thesis prepared by Golgotha Behailu (MD) entitled “Magnitude, outcomes, and associated factors of road traffic injuries among trauma victims that visited AaBET Hospital from 2020 to 2022” and submitted in partial fulfillment of the requirements for the Degree of Masters in General Public Health complies with regulations of the University and meets the accepted standards with respect to originality and quality.

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ACRONYMS

AaBET -	Addis Ababa Burn Emergency and Trauma
WHO -	World Health Organization
SPHMMC -	Saint Paul's Millennium Medical College
MOH -	Ministry of Health
EMCC -	Emergency Medicine and Critical Care
ALERT -	All Africa Leprosy, Tuberculosis and Rehabilitation Training Center
GCS -	Glasgow Coma Scale
ICU -	Intensive Care Unit
KTS II -	Kampala Severity Score II
OPD -	Out Patient Department
SNNP -	Southern Nations, Nationalities, and People
RTAs -	Road Traffic Accidents

Abstract

Background: Worldwide, approximately 1.3 million people die each year due to road traffic accidents and more than 90% of road traffic deaths occur in low and middle-income countries. Currently in Ethiopia, it is posing a major public health threat with significant morbidity and mortality in road traffic victims with a pooled prevalence of 31.5% in road traffic accident victims among trauma patients.

Objective: The main objective of the study is to determine the magnitude of road traffic accident victims among trauma patients, associated factors, and their outcomes at ABET Hospital from January 2020 to January 2022.

Methods: A quantitative retrospective institution-based study design was applied at AaBET Hospital using an adopted Kampala and tailored pre-tested data collection checklist with a systematic random sampling technique. The sample size was 667, and collected data was entered into Epi-Data and transferred to SPSS for analysis. Binary and multivariate analysis was used to determine associated factors with outcomes of road traffic injury victims.

Results: The magnitude of road traffic accidents among admitted trauma patients at AaBET Hospital was 44.8%, with males accounting for 78% of the victims. The age groups between 30 to 44 years had the highest prevalence with 38.4% among the road traffic accident victims. 39.6% of victims arrived with private vehicles with the commonest time of injury during the day time. 44.3% of road traffic accident victims were pedestrians accounting. Only 50.8% received pre-hospital care/treatment before their referral. Severe injury outcomes accounted for 58.6% (190) and outcomes with non-severe injury were 41.4% (133). Factors with a significant association for outcomes were type of victims who are drivers, moderate Glasgow Coma Scale, and duration of hospitalization greater than 24 hours.

Conclusion: Type of victims who are drivers , moderate Glasgow Coma Scale, and duration of hospitalization greater than 24 hours have a statistically significant association with severe injury outcome. With almost half of the trauma patients arriving at AaBET Hospital being road traffic accident victims, urgent multi-sector intervention is needed to prevent the injury as well as decrease complications.

Keywords: road traffic accident, trauma, associated factors, injury severity scale, severe injury

1. Introduction

1.1 Background

A road traffic accident is defined as an event occurring on a way or road that is open to public traffic which can ensue in one or more persons being injured or killed in a situation where at minimum one moving vehicle is involved (1).

According to World Health Organization (WHO) reports on road safety in June 2022, worldwide approximately 1.3 million people die and 50 million get injured each year due to road traffic accidents. Notably, 93% of these deaths occurred in low- and middle-income countries that contribute only 60% of the world's vehicles. Road traffic accidents are the leading cause of death for children and young adults aged 5 to 29 and cost countries 3% of their gross domestic product. The long-term impacts include significant physical, financial, psychological, and social devastation (2).

In October 2021, In response to this public health threat, the United Nations General Assembly declared a Decade of Action for Road Safety 2021-2030 with five major pillars, aiming to reduce road traffic deaths and injuries by 50% (3).

Among the recommended areas of action, the fifth pillar; post- crash care response seeks to set in place the capacity for immediate attention and stabilization of victims on crash sites, access to the emergency medical systems, equipped emergency rescue systems, pre-hospital medical care, medical trauma care capacity at the hospital. It also included rehabilitation services, as well as data and information systems as necessary and possible to ensure road traffic accident victims' gain of optimal function into an active life (3).

Although the grave outcomes of road traffic accidents are witnessed regularly, efforts made to tackle the issue have not brought satisfactory results, especially in developing countries including Ethiopia. The problem is exacerbated by a lack of effective interventions and inadequate research. In Ethiopia, the majority of deaths caused by road traffic accidents highlight a significant gap in consistent and comprehensive research that can guide the production of effective interventions. (4).

This study attempts to address this gap by evaluating the outcomes and associated factors of road traffic accident victims at AaBET Hospital from January 2021 to January 2022, aiming to provide data-driven insights to inform policy and intervention strategies.

1.2 Statement of the problem

Road traffic accidents (RTAs) are a major public health issue globally, ranking as the eighth-leading cause of mortality according to the World Health Organization (WHO). By 2030, RTAs are projected to become the fifth-leading cause of mortality worldwide. The global fatality rate is alarmingly high at 16.4 per 100,000 population, with an estimated 50 million people suffering non-fatal injuries annually(5).

In Ethiopia, the burden of RTAs is significant, yet the research on their prevalence and impact is limited and highly variable. Hospital-based studies reported prevalence rates ranged from 1.3% to 62.5% with time-trend analysis revealing an increment in burden of RTAs in health-care settings of Ethiopia with Addis Ababa accounting for 33% . Without adequate research generation it is difficult to uncover the detrimental effect road traffic accidents have on the public on daily(6). This variability highlights the need for more comprehensive and consistent research to accurately understand the public health impact of RTAs.

The outcomes of RTA victims concerning their socio-demographic characteristics and clinical profiles have not been thoroughly investigated in Ethiopian health institutions. This study aims to address this gap by assessing these outcomes using expanded variables and standardized tools.

In a study done in Gedeo Zone, Dilla on the patterns and outcomes of injuries among trauma patients, death was the investigated outcome of the study with an assessed mortality prevalence of 6% (5). In a study done at Tikur Anbessa Specialized Hospital on injury characteristics and and outcome of road traffic accident among victims at adult emergency department outcome was assessed based on the anatomic site of injury.

Therefore this study was conducted at AaBET Hospital, an affiliate of St. Paul's Hospital Millennium Medical College (SPHMMC), which is the only institution in Ethiopia solely dedicated to emergency and trauma care. This study will provide crucial insights into the burden of RTAs by helping identify the factors contributing to

severe outcomes for RTA victims. This knowledge is essential for designing effective mitigation strategies and interventions to reduce the incidence and severity of RTAs in Ethiopia.

1.3 Rationale of the study

Assessing what causes injuries in citizens of a country is crucial in public health discipline, especially for developing countries like Ethiopia. Road traffic accidents being the leading cause of death among children and young adults, pose a significant threat to public health. And the monetary and human resource mobilized to care for the victims of road traffic accident can be paramount at health institutions where they visit.

The magnitude of road traffic accident victims visiting hospitals, the severity of their injury, and the outcome of their injuries, socio-demographic, accident information, as well as clinical profiles of the victims can lead to assess the burden of road traffic accidents. It also helps analyze the issue in terms of injury severity, determine predictors predisposing to severe injuries which can help to design tailored interventions to prevent as well as decrease injury severity of road traffic accidents.

Hence, continuous research is essential for sustainably resolving these issues. This study, conducted at AaBET Hospital, the sole trauma and emergency center in the country will provide valuable input for future studies by uncovering critical factors hindering optimal outcomes for road traffic accident victims in health institutions.

In alignment with the declared decade of action for road safety 2021-2030 in regards to the expectation of countries in monitoring road crashes and casualties this study will enhance the record-keeping system of victims arriving at the trauma center to put forth better evidence based strategies. Furthermore, it will serve as a significant foundation for policymakers to consider broad and comprehensive multi-sectoral measures to effectively manage the issue of RTAs.

2. Literature review

2.1 Magnitude of road traffic accident

Globally, the number of injuries and fatalities caused by road traffic accidents continues to be overwhelmingly high. It is anticipated in 20230, to become the fifth leading cause of death with the annual death toll reaching 2.4 million owing to the increased motor vehicle ownership and use. With more than 90% of road traffic deaths occurring in low and middle-income countries, Africa takes the lead in the highest death rates whereas Europe has the lowest death rates (5).

According to WHO's 2016 estimated road fatalities report on country profiles; Ethiopia is one of the worst performing countries worldwide with almost double and tenfold increment in fatality rate in contrast to the best-performing countries in the region (Mauritius) and in the world (Switzerland). With an estimated country population of 102, 403, 200, the estimated fatality due to road traffic accidents was 27,326 and the estimated serious injury was 409,000 in Ethiopia. The cost of fatalities and serious injuries was 6, 516 million USD, costing the country a GDP of 8.8% that year.

In assessing the distribution of road traffic injuries and fatalities across the country, a road safety performance review of Ethiopia in 2020 by the United Nations reveals that 85% of the road traffic fatalities are accounted for by Oromia Regional State (1,478), Amhara Regional State (1104), South Nations Nationality People (712) and Addis Ababa City Administration (528) in the year from 2016 to 2018. These statistics indicate the need for urgent consolidated efforts to curb the grave consequences of road traffic accidents nationally (3).

Among the factors that contribute to the high incidence of road traffic accidents in regards to Ethiopia, rampant reckless driving behaviors, poor road network, road conditions not meeting standards, failure to implement road traffic laws, and poor vehicle conditions are the major ones (4).

In regards to the burden of road traffic accident in trauma care departments of health institution: a descriptive cross-sectional study conducted in Nepal India on the magnitude of road traffic accidents among patients visiting the department of emergency of a tertiary care center revealed that among 29, 735 patients in 2023, road traffic accident prevalence was 4.5% (1338) (7).

In a retrospective cross-sectional study conducted in Juba Teaching Hospital and Directorate of Traffic Police in South Sudan in 2018, out of 7862 patients visiting the Out Patient Department (OPD), 7.3% accounted for injuries caused by road traffic accidents(8).

Despite differences in the frequency of road traffic accidents among trauma patients in Ethiopia's various hospitals, all of them point to the issue's importance as a serious threat to public health. In a systematic review and meta-analysis done in 2018, the pooled prevalence of road traffic injury among trauma patients in Ethiopia was 31.5%, while the regional sub-group analysis was 58.3% in SNNP and 33.3% in Addis Ababa (6).

These comparable figures of road traffic accident victims that visited health care settings in Ethiopia as well as neighboring low-income countries strongly support the need for a collaborative strategy to reduce the devastating consequences.

2.2 Injury outcomes

Data about road traffic accident victims and their clinical outcomes is essential to address the burden of injury in low- and middle-income countries. In this regard, health institution medical record registries are key in collecting epidemiological data on the injury. Studies as such can greatly aid the process of identifying opportunities for prevention, systems strengthening, and further research (9).

Nevertheless, in many developing countries there is a lack of abundance in research on road traffic injuries, fatalities, and outcomes. The same is true for Ethiopia, which further hinders multiple progresses from being made in tackling the problem which requires evidence-based statistics production (4).

In a cross-sectional hospital-based on road traffic accident victims attending the emergency department of Tirunesh Beijing Hospital in Addis Ababa in 2019, prevalence of severe injuries accounted for 36.6% of the victims. (tirunesh)

In a hospital-based prospective study done in Western Ethiopia in 2021 at four hospitals from 4 different zones, out of the total 327 road traffic accident victims 181 (66.1%) had sustained multiple injuries and 65 (24%) of them had sustained severe injuries. (10)

Concerning the outcomes of road traffic accident victims that reach health care settings, a cross-sectional study done at Tikur Anbessa Specialized Teaching Hospital revealed that out of all road traffic injuries, 7.45% have resulted in death (1).

Whereas, an institution-based cross-sectional study conducted at emergency departments of public and private hospitals in Adama in 2021 for one year revealed the magnitude of death among road traffic injury victims to be 12.9%, reflecting how a significant proportion of road traffic injuries resulted in fatal outcomes (11).

2.3 Factors predicting injury outcomes

2.3.1 Socio- demographic factors

According to the 2016, WHO estimated road fatalities report on country profiles; in Ethiopia, the percentage of road traffic accident fatalities and injuries in the economically productive age group (15-64 years) was 60%, with a 2:1 ratio of male to female fatalities, and 550 life years affected due to disability from road traffic accident per 100,000 people. These figures reflect an alarming issue severely affecting the productive age group of the country essential for the country's development (1).

In a descriptive cross-sectional study conducted in Nepal India on the magnitude of road traffic accidents among patients visiting the department of emergency of a tertiary care center in 2023, most of the victims attending 77.4% were males. This

figure was attributed to the high number of male drivers and reckless driving among male drivers (7).

Similarly, in a study conducted in 2019 to assess injury severity levels and associated factors among road traffic collision victims among selected public health hospitals in Addis Ababa, from a total of victims 363, 76.6% accounted were males (12).

Likely, a study conducted in 2015 at hospitals in Wolaita zone in SNNP on the magnitude and outcomes of road traffic accidents revealed that 77.6% of victims involved were males, accounted for due to their nature of work exposure and increased level of participation in high- risk activities compared to females (13).

Globally, road traffic accident is found to be more prevalent in productive age groups. (1) In a study conducted in Nepal India road traffic accidents among patients visiting the department of emergency of a tertiary care center in 2023, the highest number of victims were found in the age group of 16- 30 years accounting for 50.82% followed by the age group of 31- 45 years accounting for 26.87% (7).

Among studies conducted in Ethiopia, in a study conducted in the emergency department of the University of Gondar Comprehensive Teaching and Referral Hospital in 2020, age was found to be a significant factor in road traffic accidents. Similarly, in a study conducted in 2019 in selected public health hospitals in Addis Ababa, the age group mainly affected by road traffic accidents was from 21 to 30 years followed by the age group 12 to 20 years, accounting for 38.8% and 20.4 % respectively (14) (12).

Among the socio-demographic factors contributing to road traffic accident deaths, age was one of the significant factors. In an institution-based study conducted in Adama in 2021 at the emergency outpatient department of private and public hospitals, the age group significantly associated with death related to road traffic accidents was from 25 - 44 years. This is comparable to the WHO report estimate with age groups between 15 - 44 accounting for nearly the global road traffic death (1).

In a study conducted at Western Uganda multi-center cohort study conducted in 2023 across 6 emergency units of hospitals among admitted road traffic accident victims, the majority of victims were motorcyclists which accounted for 48.8%. In contrast, in a study conducted in the emergency department of the University of Gondar Comprehensive Teaching and Referral Hospital in 2020, it was revealed the majority of road traffic accident victims were passengers accounting for 50.28% followed by pedestrians with 34.95%.

Another study conducted in 2015 at Tikur Anbessa Specialized Hospital revealed pedestrians accounted for 62.5% of road traffic accident victims. A study conducted at Jimma University Medical Center in 2023 on road traffic accident clinical patterns and management outcomes at the emergency department also showed among the victims affected, 49.6% were pedestrians followed by passengers accounting for 26.1% (15)(14)(11).

2.3.2 Health care related factors

In a hospital-based prospective follow-up study done in 2021 in Northwest Ethiopia, interval of victims' arrival to the hospital for greater than 1 hour and lower GCS Scales were found to be significantly associated with unfavorable outcomes (16).

In a multicenter cohort study conducted in Uganda in 2023 across 6 emergency units of hospitals among admitted road traffic accident victims, it was revealed that the injury severity scale is a significant predictor of unfavorable outcomes for victims(17).

Similarly, a study conducted in 2020 at Wolaita Soddo Christian Hospital in South Ethiopia revealed that the presence of co-morbid conditions and injury severity were found to be significantly associated with the outcomes of road traffic accident victims(18).

In a study conducted in 2023 at Kisumu County in Kenya while assessing the epidemiological characteristics of crashes and patterns admitted at hospitals, it was revealed a Glasgow Coma Scale and Injury Severity Scale were among the factors with significant association to severe outcomes of road traffic accident victims (19).

Similarly, in a hospital-based prospective cohort study conducted in 2021 in North West Ethiopia, among predictors of unfavorable patient outcomes in admitted road traffic accident victims, systolic blood pressure less than 90mmHg and Glasgow Coma Scale less than 8 were found to be significantly associated factors (20).

In a likely manner, a study conducted in Gedeo Zone, Dilla in 2020, it was revealed more deaths associated with road traffic accidents were observed in patients with a head injury with lower Glasgow Coma Scales and polytrauma (5).

In a study done in the emergency department of the Instituto Central on factors contributing to road traffic accidents in hospitalized patients in Latin America in 2023, patients experiencing longer stays in hospitals were among the factors that led to severe injuries to the victims (20).

In a study done in Saudi Arabia in 2018 on assessing the pattern of injuries in trauma patients, admission to the intensive care unit, moderate and severe injuries were found to be significant associated factors in predicting unfavorable in-hospital outcomes (21).

Comparably, a study done in 2024 in Hawassa on the incidence and predictors of mortality among road traffic accident victims admitted to hospitals revealed that moderate Glasgow Coma Scale and admission to the intensive care unit were among significantly associated factors in predicting unfavorable outcomes (22).

In a study conducted at the adult emergency department of Tikur Anbessa Specialized Hospital assessing injury characteristics and outcomes of road traffic accident victims in 2015, the length of hospital stay has been reported to be an important measure of morbidity among trauma patients (23).

2.3.4 Post-crash care in Ethiopia

Although prevention of road traffic accidents is primarily desirable, a comprehensive road safety strategy wouldn't be complete without a focus on improving post-crash care for road traffic accident victims to reduce fatalities and improve outcomes.

Nevertheless, many low- and middle-income countries lack appropriate and adequate post-crash care for injured persons to reduce fatalities and improve outcomes, contributing to the high burden of deaths and disability resulting from road traffic accidents (14).

A study conducted at Jimma University Medical Center in 2023 on road traffic accident clinical patterns and management outcomes at the emergency department revealed that 42% of road traffic accident victims who visited the emergency department at Jimma University Medical Center victims didn't get any type of treatment before arriving to the hospital (15).

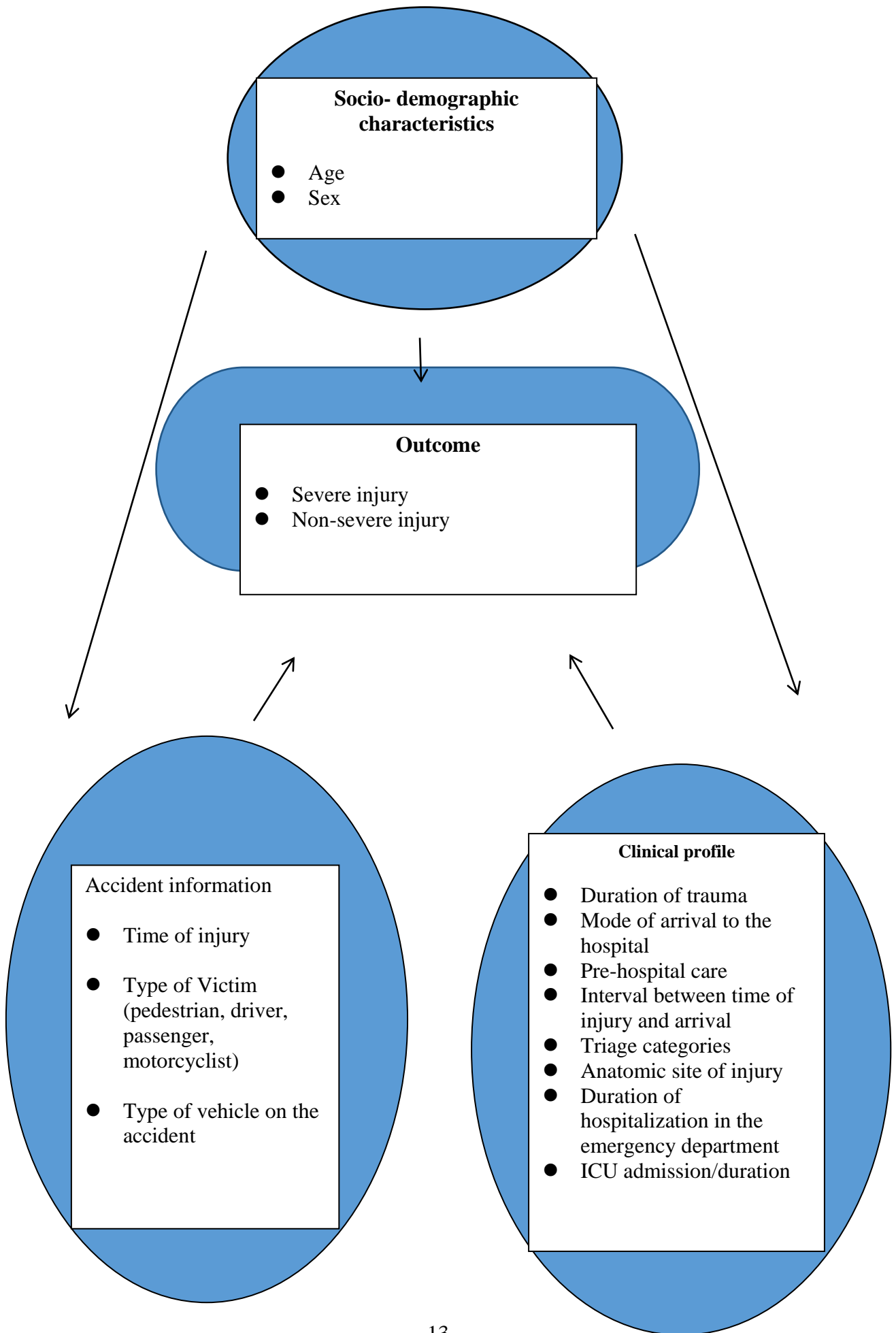
In a hospital-based prospective study done in Western Ethiopia in 2021 at four hospitals from 4 different zones, nearly two-third, 112 (74%) of victims did not receive the required pre-hospital emergency care (10).

A study conducted in ALERT hospital in Addis Ababa in 2022 on the clinical profile and outcomes of trauma patients visiting the emergency department revealed that among the severely injured patients, only 50% were transported and arrived at the hospital with an ambulance. This supports the nation's poor, unplanned, and fragmented pre-hospital care similar to other low-income countries (11).

3. Conceptual framework

As presented in the diagram of the conceptual framework, the outcome of road traffic accident victims graded to non-severe and severe injury is the dependent variable. Whereas, socio-demographic characteristics of patients, accident information, and the clinical profile of the victims were the independent variables affecting the outcomes of the patients.

According to the literature reviewed in this study, among the independent variables considered, the type of victims, the moderate Glasgow Coma Scale, duration of hospitalization were found to be statistically significant factors associated with severe outcomes in admitted road traffic accident victims across multiple demographics.



4. Objectives

4.1 General Objective

To assess the magnitude of road traffic accidents, their associated factors, and outcomes among trauma victims at AaBET Hospital, Addis Ababa, Ethiopia from January 2020 to January 2022.

4.2 Specific Objectives

- To determine the magnitude of road traffic injuries among trauma victims at AaBET Hospital, Addis Ababa, Ethiopia from January 2020 to January 2022.
- To assess the outcome of road traffic injury victims at AaBET Hospital, Addis Ababa, Ethiopia from January 2020 to January 2022.
- To assess the associated factors predisposing to injury outcomes of road traffic injury victims at AaBET Hospital, Addis Ababa, Ethiopia from January 2020 to January 2022.

5. Methods

5.1 Study Setting

The study was conducted in Addis Ababa Burn, Emergency, and Trauma (AaBET) Hospital, which is located in the nation's capital, Addis Ababa, Ethiopia.

Addis Ababa is located at an elevation of 2,440 meters above sea level and has an estimated density of 5,535.8 people per square kilometer. According to the health and health-related indicators published by the Ministry of Health (MOH), there are 13 public hospitals and more than 40 private hospitals in the city.

Addis Ababa Burn, Emergency, and Trauma (AaBET) Hospital was inaugurated in 2015 as a public hospital under SPHMMC as a result of the fruitful quality improvement project of SPHMMC to address the gap in the area of burn, trauma, and neurosurgery. It is one of the first health sectors with an entire trauma and burns unit with more than 200 beds and around 800 staff comprising departments in EMCC, neurosurgery, orthopedics, and traumatology, as well as an academic program in plastic and reconstructive surgery (26).

5.2 Study Design

A quantitative retrospective institution-based cross-sectional study design was applied to assess the magnitude, outcome, and associated factors of road traffic injuries among trauma victims who visited AaBET Hospital from January 2020 to January 2022.

5.3 Source population

The source population was all trauma patients who visited AaBET Hospital from January 2020 to January 2022.

5.4 Study population

The study population was all road traffic accident victims who fulfilled the inclusion criteria at AaBET Hospital from January 2020 to January 2022.

Inclusion Criteria

- All trauma patients who visited AaBET Hospital from January 2020 to January 2022

Exclusion Criteria

- Patients who were deceased on arrival
- Patients with incomplete chart documentation not including all the variables in the checklist

5.5 Sample size determination

A single population proportion formula is used to estimate the minimum required sample size for the first objective. Based on a previous study in Addis Ababa on the clinical profile and outcome of trauma patients visiting the emergency department of ALERT Hospital the prevalence of road traffic injury was 30.7% of all trauma and we will consider this as P.

Applying the formula

$$n = \frac{(Z\alpha / 2) p q}{d}$$

Where n is the determined sample size

Z is the value from the standard normal distribution reflecting the confidence level that will be used for this study. A 95% confidence level will be used making the z value 1.96

P is the proportion of successes in the population or the prevalence of the desired outcome in the population.

E is the desired margin of error/Absolute error or precision has to be decided by the researcher for this study 0.05 will be used.

Therefore, using the formula the determined sample size for the first objective will be:

$$n = \frac{(1.96)^2 \cdot 0.318 \cdot 0.682}{(0.05)^2} = 333.26$$

A double population proportion formula is used to estimate the minimum required sample size for the third objective. An institution-based cross-sectional study conducted at emergency departments of public and private hospitals in Adama in 2021 for a duration of one year revealed the magnitude of death among road traffic injury victims to be 12.9% and we will consider this as P1. Whereas, a study in Addis Ababa on the clinical profile and outcome of trauma patients visiting the emergency department of ALERT Hospital the magnitude of death among road traffic injury victims was 3.6% and we will consider this as P2.

Applying the formula:

This calculator uses the following formula for the sample size n:

$$n = \frac{(Z_{\alpha/2} + Z_{\beta})^2 \cdot (p_1(1-p_1) + p_2(1-p_2))}{(p_1 - p_2)^2},$$

where $Z_{\alpha/2}$ is the critical value of the Normal distribution at $\alpha/2$

Z_{β} is the critical value of the Normal distribution at β

p_1 and p_2 are the expected sample proportions of the two groups.

$$n = \frac{(1.96 + 1.96)^2 \cdot (0.036(1 - 0.036) + 0.129(1 - 0.129))}{(0.036 - 0.129)^2}$$

$$n = 15.3664 \cdot ((0.034704) + (0.112359)) = 15.3664 \cdot 0.147063 = 2.258$$

From the two calculated sample sizes, the larger of the two was utilized for the study. The calculated sample size was doubled to ensure robustness of the data.

Hence, making the sample size of the study $333.26 \cdot 2 \text{ years} = 667$

5.6 Sampling procedure

After having identified the total number of trauma patients between January 2020 and January 2022 from AaBET hospital registry, the required sample was identified by dividing the total number to the number of trauma patients admitted during the time frame to the sample size determined utilizing systematic random sampling technique. After assigning a numerical label to every unit in the sampling frame, random digits were used to select labels at random (K=38).

$$25,554 = 38 = K$$

667

5.7 Data collection procedures

Data was collected by a retrospective chart review using a pre-formed data collection check-list adopted from the WHO injury surveillance guideline and Kampala trauma severity score II after necessary modification from patient medical records at AeBET Hospital who visited the health institution from January 2020 to January 2022.

Data collectors were 4 emergency and critical care specialized nurse practitioners at AeBET Hospital.

The check-list form will include four major categories:

1. Socio-demographic profile

It included: the age and sex of the patient

2. Accident information

It included: the time of injury, type of individuals (pedestrian, driver, passenger, motorcyclist), type of vehicles involved in the accident (public transport, private vehicle, heavy truck, bajaj, motorcycle)

3. Clinical Profile

It included: time of injury, region of referral, mode of arrival to the hospital, pre-hospital care (treatment given at health facilities before referral), interval between

time of injury and arrival, triage categories, type of injury, mechanism of injury, GCS, anatomic site of injury, duration of hospitalization in the emergency department, and ICU admission.

To assess the initial clinical condition of the victims on admission, triage categories in to green, yellow, orange, and red was used which assesses the severity of the medical condition of patients. It includes: the vital signs of the patient (Airway, Breathing, Circulation, Disability, and Exposure), questionnaire assessing for (haematemesis, rectal bleeding, hernia, pain, alimentary vomiting, diarrhea, and ECG abnormalities)

To objectively assess the extent of impaired consciousness in trauma patients, Glasgow Coma Score was used which is graded out of 15. It is composed of three parameters, which are: best eye response, best verbal response, and best motor response. The scores have ranges of mild (13-15), moderate (9-12), severe (<8), interpreted to mild, moderate, and severe traumatic brain injuries.

The parameters are graded as:

Best eye response

1. No eye opening
2. Eye opening to pain
3. Eye opening to sound
4. Spontaneous eye opening

Best verbal response

1. No verbal response
2. Incomprehensible sounds
3. Inappropriate words
4. Confused
5. Oriented

Best motor response

1. No motor response
2. Abnormal extension to pain
3. Abnormal flexion to pain

4. Withdrawal from pain
5. Localizing pain
6. Obeys commands

4. Injury grading score

5. Outcomes at the emergency department

- Severe injury
- Non-severe injury

Data collectors traced and collected data from randomly selected charts of trauma patients who visited AaBET Hospital from January 2020 to January 2022.

5.8 Operational definitions

Injury - the presence of physical or mental damage to a person's body caused by accidents, falls, hits, weapons, and more.

Kampala trauma severity score II was used to grade the severity of the injury and as an outcome of road traffic accident victims. It utilizes the age of the patient, systolic blood pressure on admission, the respiratory rate on admission, and the neurological status of the patient (22).

Mild injury - KTS II = 9-10

Moderate injury- KTS II = 7-8

Severe injury- KTS II < 6

Non-severe injury - According to Kampala trauma severity score II; KTS II of 9 to 10 are designated as mild injury. For this study, mild injuries are considered as non-severe injury.

Severe injury - According to Kampala trauma severity score II; KTS II of 7 to 8 are designated as moderate injury and KTS II of less than 6 as severe injury. For this study, moderate and severe KTS II scores as considered as severe injury.

5.9 Data management and analysis

The study relied on secondary data extracted /collected using a pre-formed data collection checklist. Collected data was first manually checked for completeness. Then it was entered into Epi-Data and transferred to SPSS for analysis.

Descriptive statistics was used for the socio-demographic aspect of the data, accident information, the clinical profiles, and outcome of injury utilizing frequency, and percentage which were then presented in tables and graphs.

To determine the socio-demographic, accident information, and clinical profiles of road traffic accident victims' outcomes, cross-tabulation of each was carried out. Then, to assess the association between the socio-demographic aspect of the data and associated factors; accident information and the clinical profiles to the outcome of road traffic accident victims were analyzed using a binary logistic regression model.

A multivariate logistic regression model was used to determine the association of combined risk factors for road traffic accident victims' outcomes on discharge. All independent variables having p -value < 0.25 were included in a multivariate regression model. A p -value less than 0.05 and an Adjusted Odds Ratio (AOR) with a 95% Confidence Interval (CI) not inclusive of one were considered statically significant and were used to determine outcome predictors of road traffic accidents.

5.10 Data Quality Assurances

The pre-formed data collection checklist adopted from the WHO injury surveillance guideline and Kampala trauma severity score II was prepared in English and translated into Amharic.

The quality of the data collected for this study was ascertained by cleaning for duplicated data, incomplete data, irrelevant data, unreliable, as well as inconsistent data in comparison with the variables included in the performed data collection checklist.

Data collectors were trained for 2 days according to the training manual to collect data in alignment with the pre-formed data collection checklist with the priority to the objectives of the study in place.

Pre-formed data collection checklist was applied to 5% of the sample size to observe for needed correction of the checklist or data collection technique. After this, collected data completeness and consistency were checked daily.

5.11 Ethical consideration

Ethical clearance and approval was obtained from the Research Ethics Committee of Addis Ababa University School of Public Health. Since research data is secondary, the patient chart/medical record was retrieved after a support letter from the medical director's office for submission to the record office of the AaBET Hospital. All gathered information was kept confidential and no individual identifiers were used.

Data collectors were informed and given a 2-day training on the aim of the research and its specific objectives with appropriate data collection techniques keeping the anonymity of patients.

6. Results

6.1 Socio-demographic background

Table 1.1 Socio-demographic background of trauma patients admitted at AaBET Hospital, 2020-2022 (n=667)

Socio-demography	Frequency	Percent
Sex		
Male	499	74.8%
Female	168	25.2%
Age group		
< 15 years	89	13.3 %
15 -29 years	261	39.1%
30 - 44 years	220	33.0%
45 - 59 years	61	9.1%
60 - 74 years	24	3.6%
> 75 years	12	1.8%
Region of referral		
Addis Ababa	373	55.9%
Oromia	249	37.3%
Amhara	25	3.7%
SNNP	14	2.1%
Tigray	3	0.4%
Afar	3	0.4%

In comparison to table 1.1 on the socio-demographic background of the total trauma patients; in case of road traffic accident victims, males accounted for 78% and 38.4% are attributed to age groups between 30 to 44 years, and 36.2% of road traffic accidents are attributed to age groups between 15-29 years.

6.2 Mechanism of injury

Among admitted trauma patients 48.4% (323) of them sustained injury secondary to road traffic accidents.

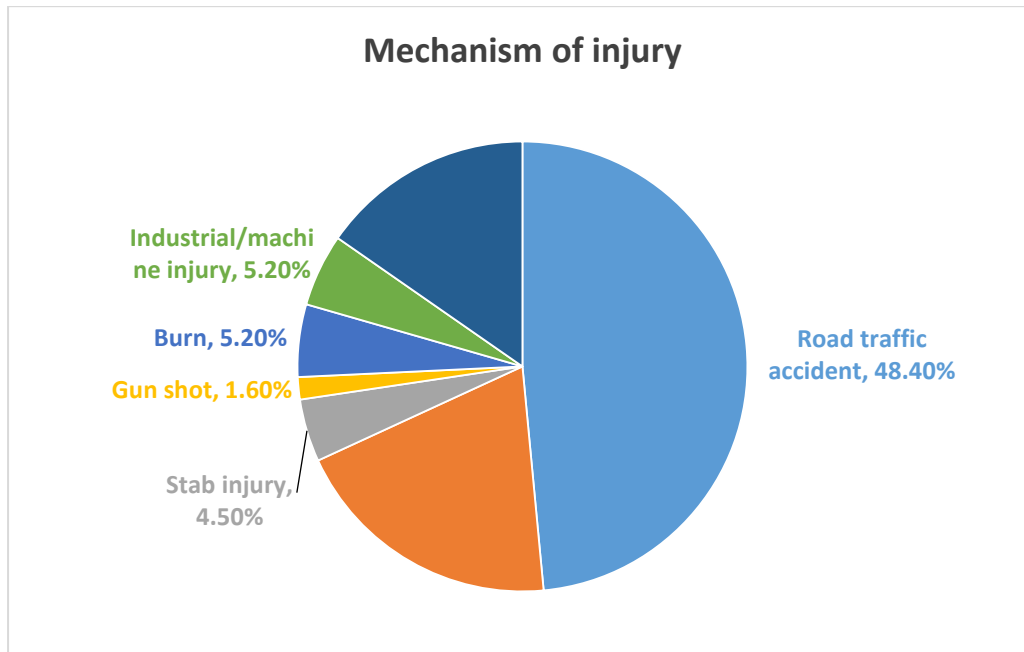


Figure 1.1 Mechanism of injury of admitted trauma patients

6.3 Accident information

6.3.1 Time of injury

The commonest time of injury for trauma patients admitted was 12 PM to 6 PM, followed by 6 AM to 12 PM and 6 PM TO 12 AM with equal frequencies of injury accounting for 40.3%, 27.7%, and 26.7% respectively. Similarly, among road traffic accident victims admitted to the hospital, the commonest time of injury was from 12 PM to 6 PM followed by 6 AM to 12 PM.

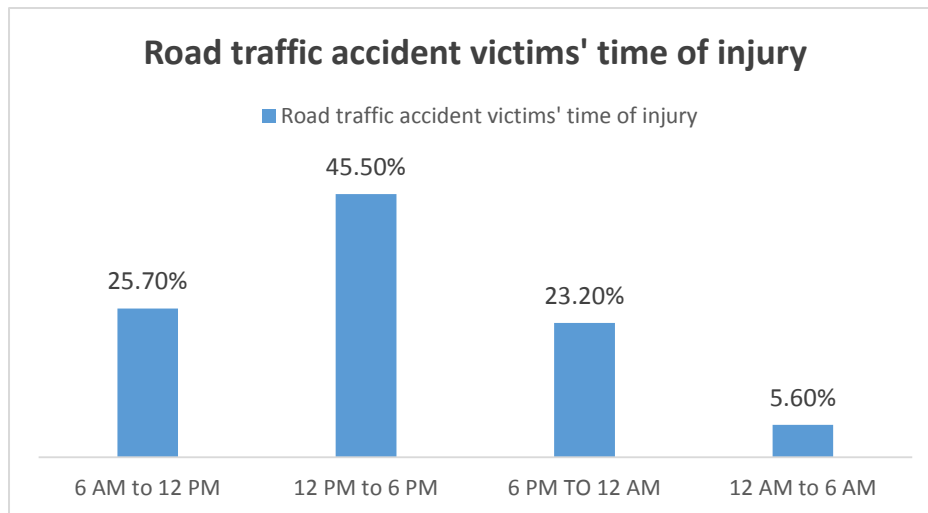


Figure 1.2 Road traffic accident victims' time of injury

6.3.2 Individuals sustaining road traffic accident

Among admitted trauma patients who sustained injury secondary to road traffic accidents, pedestrians and passengers accounting for 44.3% (144) and 30.9% (100), 15.47% (50) driver, 9.28% (30) motorcyclist respectively.

Among the types of vehicles involved in road traffic accidents in admitted victims, more than one-third of victims 43.65% (141) accounted for public transportation, 27.86% (90) private vehicle, 9.28% (30) heavy vehicle, 7.12% (23) bajaj, 12.38% (40) motorcycle.

6.4 Clinical profile

6.4.1 Mode of arrival

Among road traffic accident victims, only 31.6% of them arrived at the hospital by ambulance, 39.6% arrived by private car, 8.7% by walking, and 13.6% by taxi.

6.4.2 Source of referral

46.3% of trauma patients had no referral and arrived at the hospital by themselves without a referral from health care settings. Similarly, among road traffic accident

victims admitted to the hospital, almost half had a source of referral by themselves without obtaining a formal referral from any health care setting.

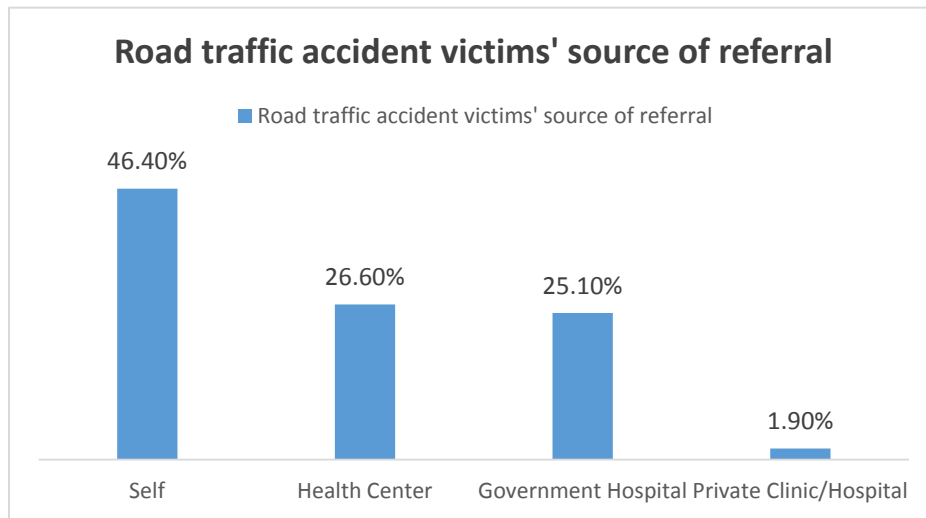


Figure 1.3 Road traffic accident victims' source of referral

6.4.3 Pre-hospital care/treatment given at the health facilities prior to referral

Only 51.3% of admitted trauma patients had received pre-hospital care/treatment from health facilities before their referral. Among road traffic accident victims admitted to the hospital, only 50.8% received pre-hospital care/treatment at the health facilities before their referral.

6.4.4 Interval between the time of injury and arrival

56.4% of admitted trauma patients had an interval between the time of injury and arrival to the hospital between 1 hour and 24 hours. Only 27.6% of admitted trauma patients had an immediate arrival to the hospital in less than 1 hour. Whereas, 16% of them had arrival intervals within days.

6.4.5 Triage categories

48.9% of admitted trauma patients were categorized as yellow, 25.6% were categorized as green, 18.4 % were categorized as orange, and only 6.9% were categorized as red.

Among total trauma patients admitted to the hospital, the highest number of patients were admitted to the yellow category accounting for (326) 48.9%.

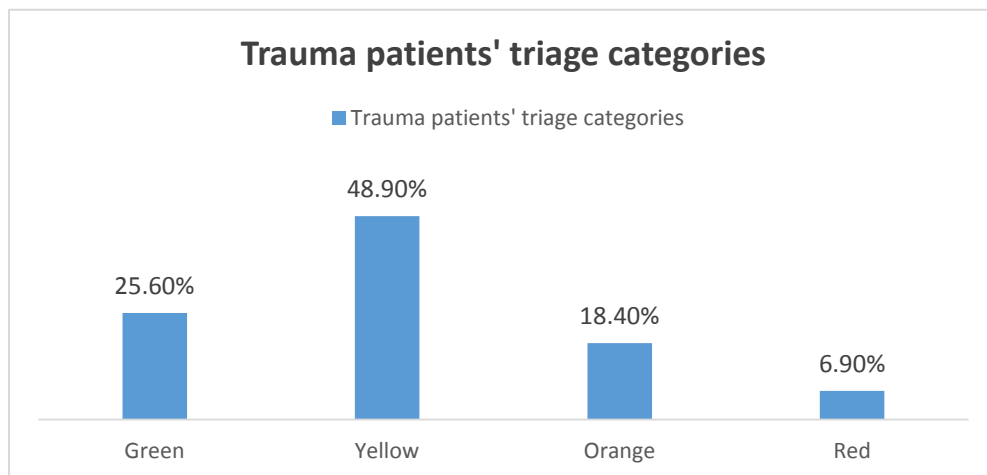


Figure 1.4 Road traffic accident victim's triage categories

6.4.6 Glasgow coma scale (GCS)

Among admitted road traffic accident victims, two-third (217) sustained mild head injuries with a GCS of 13 to 15.

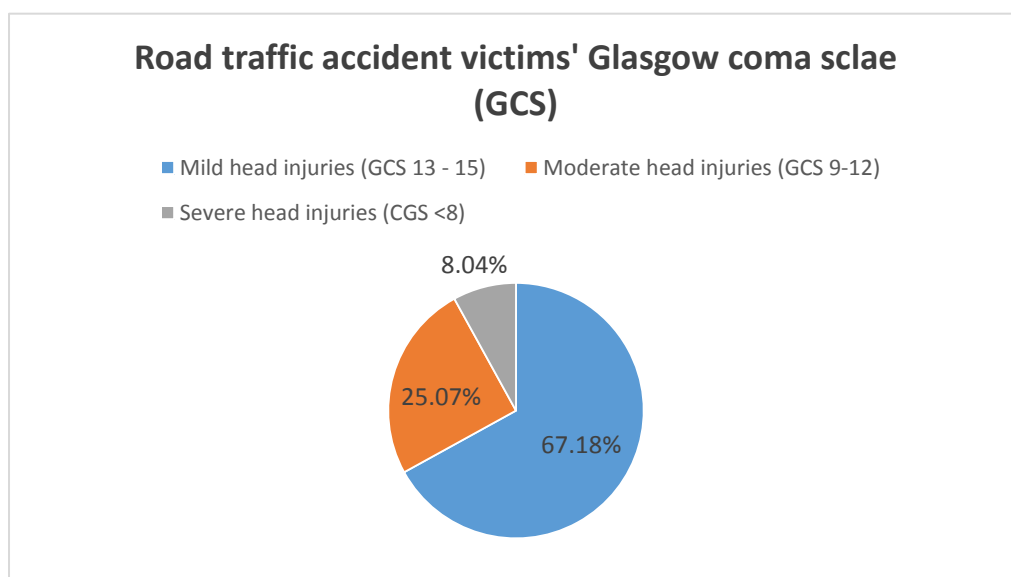


Figure 1.5 Road traffic accident victims' GCS

6.4.7 Anatomic site of injury

Among admitted road traffic accident victims, the highest injury site anatomically was head injury, polytrauma, and lower extremity injuries.

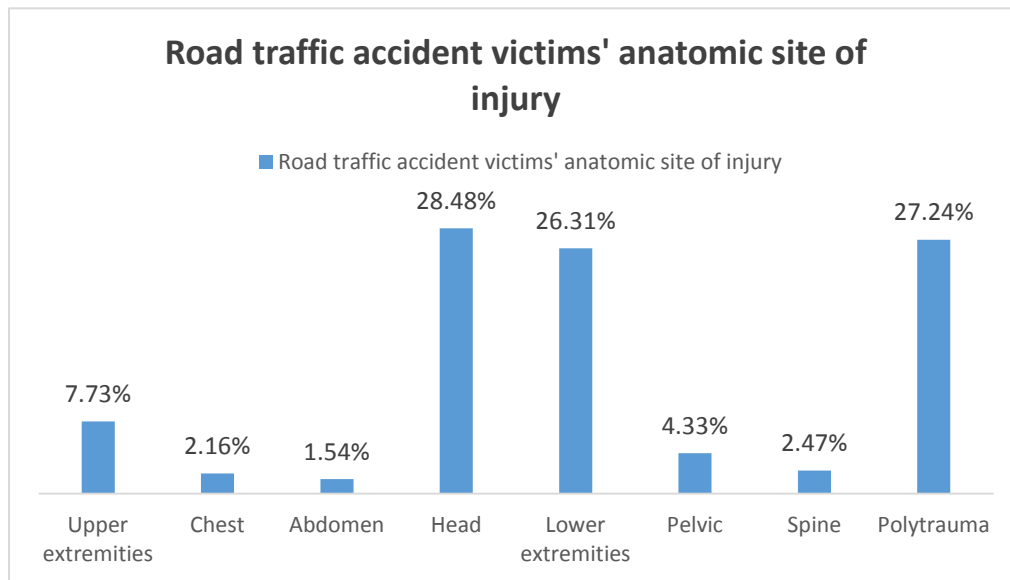


Figure 1.6 Anatomic site of injury of road traffic accident victims

6.4.8 Intensive Care Unit (ICU) Admission

Among admitted road traffic accident victims, 87.61% had no Intensive Care Unit (ICU) admission, whereas only 12.38% had admission to the Intensive Care Unit (ICU). At AaBET Hospital areas dedicated to trauma patients admitted at triage categories orange and red have critical care machinery similar to an ICU setting, which can reflect the small percentage of ICU admission among the road traffic accident victims.

6.4.9 Duration of hospitalization in the hospital

Among road traffic accident victims, 59.75% were admitted to the hospital for more than 24 hours, whereas 39.93% of the victims were admitted to the hospital for less than 24 hours.

7. Outcome of road traffic accident victims

Among road traffic accident victims admitted to the hospital from January 2020 to January 2022, 58.6% (190) of them sustained severe injury, whereas 41.4% (133) of them sustained non-severe injury.

Table 1.2 Binary logistic regression of socio-demographic predictors of outcome

Variables		Injury outcome		COR 95% CI
		Severe	Non-severe	
Sex	Male	154	99	1.512(0.891-2.568)
	Female	36	35	1
Age group	15-29 years	77	43	1.109(0.505-2.433)
	30-44 years	69	53	0.806(0.370-1.756)
	45-59 years	16	16	0.619(0.233-1.648)
	60-75 years	6	7	0.531(0.146-1.930)
	>75 years	1	2	0.310(0.025-3.764)
	<15 years	21	13	1
Region of referral	Oromia	81	47	1.393(0.871-2.229)
	Amhara	8	4	1.617(0.469-5.575)
	SNNP	4	5	0.647(0.168-2.493)
	Tigray	1	1	0.809(0.050-13.14)
	Afar	2	1	1.617(0.144-18.174)
	Addis Ababa	94	76	1

(*P<0.25, **P<0.05, ***P<0.01)

Table 1.3 Binary logistic regression of accident details of outcome

Variables		Injury outcome		COR 95% CI
		Severe	Non-severe	
Type of individuals involved in the RTA	Passenger	52	48	0.631(0.376-1.059)*
	Driver	22	28	0.458(0.238-0.879)**
	Motorcyclist	25	5	2.912(1.052-8.061)**
	Pedestrian	91	53	1
Type of vehicle involved in the RTA	Private vehicle	54	36	1.657(0.970-2.831)*
	Heavy truck	24	6	4.418(0.591-3.490)**
	Bajaj	13	10	1.436(0.591-3.490)
	Motorcycle	32	8	4.418(1.903-10.257)**
	Public transportation	67	74	1
Time of injury	12:00 PM - 6:00 PM	88	60	1.239(0.720-2.130)
	6:00 PM - 12:00 AM	47	28	1.417(0.750-2.679)
	12:00 AM - 6:00 AM	10	8	1.056(0.379-2.942)
	6:00 AM - 12:00 PM	45	38	1

1.4 Binary logistic regression of clinical profiles of outcome

Variables		Injury outcome		COR 95% CI
		Severe	Non-severe	
Mode of arrival	Private vehicle	73	55	0.755(0.439-1.299)
	Taxi	26	19	0.967(0.458-2.040)
	Lada/Ride	13	8	1.250(0.445-3.510)
	Walking	11	17	0.433(0.185-1.013)
	Ambulance	67	35	1
Source of referral	Health center	49	37	1.204(0.705-2.057)
	Government hospital	59	23	2.332(1.305-4.167)**
	Private clinic/hospital	5	4	1.136(0.293-4.401)
	Self	77	70	1
Pre-hospital care	Not given	91	68	0.892(0.573-1.389)
	Given	99	66	1
Arrival time	Within 24 hour	120	74	1.415(0.873-2.295)*
	Within >24 hours	15	12	1.091(0.465-2.558)
	Immediate < 1 hour	55	48	1
Triage categories	Yellow	70	66	1.536(0.860-2.745)*
	Orange	64	18	5.149(2.544-10.424)***
	Red	27	8	4.888(1.948-12.265)**
	Green	29	42	1
Glasgow Coma Scale (GSC)	Moderate (9- 12)	66	15	4.608(2.477-8.570)***
	Severe (3-8)	18	8	2.356(0.983-5.648)*
	Mild (13 - 15)	106	111	1
Anatomic site of injury	Chest	2	5	0.509(0.082-3.142)
	Abdomen	1	4	0.318(0.031-3.268)
	Head	43	49	1.117(0.459-2.719)
	Lower extremities	49	36	1.732(0.705-4.258)*
	Pelvic	7	7	1.273(0.343-4.726)
	Spine	3	5	0.764(0.149-3.916)
	Polytrauma	74	14	6.727(2.538-17.829)***
	Upper extremities	11	14	1
Hospitalization	Greater than 24 hours	159	36	13.962(8.119-24.012)***
	Less than 24 hour	31	98	1
ICU admission	Admitted	37	4	7.859(2.729-22.634)***
	Not admitted	153	130	1

(*P<0.25, **P<0.05, ***P<0.01)

After selecting factors that have a statistically significant association of p -value < 0.25 with binary logistic regression model (source of referral from government hospital, interval from accident and hospital arrival between 1 and 24 hours, triage yellow, triage orange, triage red, passengers, drivers, private vehicle, heavy truck, motorcycle, moderate GCS, severe GCS injury to lower extremities, poly-trauma, duration of hospitalization greater than 24 hours, ICU admission), a multivariate logistic regression model was used to determine the association of combined risk factors for road traffic accident victims' injury outcomes.

Results disclosed that interval from accident and hospital arrival between 1 and 24 hours, moderate GCS, duration of hospitalization greater than 24 hours, and moderate injury- KTS II = 7-8 were found to have a statistically significant association with an outcome of severe injury (p -value=0.02, 0.03, 0.000, 0.000) respectively.

Table 1.5 Multivariate logistic regression of predictors of severe injury outcome

Variables		Injury outcome		COR 95% CI	AOR (95%CI)
		Severe	Non-severe		
Source of referral	Health center	49	37	1.204(0.705-2.057)	1.504(0.475-2.339)
	Government hospital	59	23	2.332(1.305-4.167)**	2.197(0.913-5.287)
	Private clinic/hospital	5	4	1.136(0.293-4.401)	1.987(0.286-13.822)
	Self	77	70	1	1
Arrival time	Within 24 hour	120	74	1.415(0.873-2.295)*	0.877(0.404-1.907)
	Within >24 hours	15	12	1.091(0.465-2.558)	0.240(0.062-0.929)*
	Immediate < 1 hour	55	48	1	1

Triage categories	Yellow	70	66	1.536(0.860-2.745)*	1.158(0.505-2.655)
	Orange	64	18	5.149(2.544-10.424)***	2.635(0.908-7.643)
	Red	27	8	4.888(1.948-12.265)**	1.280(0.333-4.915)
	Green	29	42	1	1
Type of individual s involved in the RTA	Passenger	52	48	0.631(0.376-1.059)*	0.840(0.389-1.815)
	Driver	22	28	0.458(0.238-0.879)**	0.268(0.101-0.715)**
	Motorcyclist	25	5	2.912(1.052-8.061)**	0.413(0.040-4.250)
	Pedestrian	91	53	1	1
Type of vehicle involved in the RTA	Private vehicle	54	36	1.657(0.970-2.831)*	2.093(0.909-4.815)
	Heavy truck	24	6	4.418(0.591-3.490)**	1.726(0.479-6.217)
	Bajaj	13	10	1.436(0.591-3.490)	1.164(0.307-4.406)
	Motorcycle	32	8	4.418(1.903-10.257)**	9.860(1.334-72.875)
	Public transportation	67	74	1	1
Glasgow Coma Scale (GSC)	Moderate (9- 12)	66	15	4.608(2.477-8.570)***	3.006(1.270-7.118)*
	Severe (3-8)	18	8	2.356(0.983-5.648)*	0.889(0.219-3.597)
	Mild (13 - 15)	106	111	1	1
Anatomic site of injury	Chest	2	5	0.509(0.082-3.142)	0.477(0.036-6.275)
	Abdomen	1	4	0.318(0.031-3.268)	0.296(0.019-4.672)
	Head	43	49	1.117(0.459-2.719)	0.742(0.224-2.460)
	Lower extremities	49	36	1.732(0.705-4.258)*	1.209(0.375-

					3.896)
	Pelvic	7	7	1.273(0.343-4.726)	2.262(0.405-12.641)
	Spine	3	5	0.764(0.149-3.916)	0.476(0.060-3.784)
	Polytrauma	74	14	6.727(2.538-17.829)***	1.845(0.515-6.613)
	Upper extremities	11	14	1	1
Hospitalization	Greater than 24 hours	159	36	13.962(8.119-24.012)***	8.838(4.490-17.399)***
	Less than 24 hour	31	98	1	1
ICU admission	Admitted	37	4	7.859(2.729-22.634)***	2.418(0.565-10.341)
	Not admitted	153	130	1	1
(*P<0.05, **P<0.01, ***P<0.001)					

The multivariate logistic regression analysis provides insights into the independent predictors of severe injury outcomes among road traffic accident (RTA) victims.

Factors affecting the outcome of road traffic accident victims

Source of referral: Referral from government hospitals was strongly associated with severe injuries, as evidenced by the bivariate analysis (COR 2.332, 95% CI: 1.305-4.167, $p<0.05$). In the multivariate model, this association was reduced and became non-significant (AOR 0.8, 95% CI: 0.164-3.899). This indicates that the source of referral for RTA victims alone does not independently predict severe injury outcomes in the context of other factors.

Interval between the time of injury and arrival: The interval between the time of injury and arrival between 1 hour and 24 hours was found to be a very strong predictor of severe injuries in the bivariate analysis (COR 1.415, 95% CI: 0.873-2.295) $p<0.25$, whereas, in the multivariate analyses association was reduced to be insignificant (AOR 0.877, 95% CI: 0.404-1.907). This underscores that although there is a critical importance of the interval between

the time of injury and arrival, but it did not independently predict severe injuries in consideration with other variables.

Triage Categories: The initial analysis showed that patients categorized as yellow (COR 1.536, 95% CI: 0.860-2.745, $p < 0.25$), (COR 5.149, 95% CI: 2.544-10.424, $p < 0.001$), and red (COR 4.888, 95% CI: 1.948-12.265, $p < 0.05$) were significantly more likely to have severe injuries. However, after adjusting for other factors, the associations were not statistically significant for yellow (AOR 1.158, 95% CI: 0.505-2.655), orange (AOR 2.635, 95% CI: 0.908-7.643), and red (AOR 1.280, 95% CI: 0.333-4.915) categories. This suggests that while triage categories indicate initial severity, they do not independently predict severe injuries when other variables are considered.

Type of individuals involved in the RTA: Passengers (COR 0.631, 95% CI: 0.376-1.059, $p < 0.25$) and drivers (COR 0.458, 95% CI: 0.238-0.879, $p < 0.05$) were strongly associated with non-severe injuries in the univariate analysis. However, in the multivariate model, the association with passengers (AOR 0.840, 95% CI: 0.389-1.815) was reduced and became non-significant. While the association with drivers was increased (AOR 0.268, 95% CI: 0.101-0.715, $p < 0.01$). This indicates that drivers among the type of individuals involved in RTA alone can predict severe injury outcomes in the context of other factors having a protective association towards severe injury.

Type of Vehicle Involved in RTA: In the univariate analysis private vehicles (COR 1.657, 95% CI: 0.970-2.831, $p < 0.25$), heavy trucks (COR 4.418, 95% CI: 0.591-3.490, $p < 0.05$), and motorcycle (COR 4.418, 95% CI: 1.903-10.257, $p < 0.05$) were associated with a moderate, though not statistically significant, risk of severe injuries. In the multivariate model, this association was further reduced and remained non-significant for private vehicles (AOR 2.093, 95% CI: 0.909-4.815), heavy trucks (AOR 1.726, 95% CI: 0.479-6.217), and motorcycle (AOR 9.860, 95% CI: 1.334-72.875). This indicates that the type of vehicle alone does not independently predict severe injury outcomes in the context of other factors.

Glasgow Coma Scale (GCS): Moderate GCS scores (COR 4.608, 95% CI: 2.477-8.570, $p < 0.001$) and severe GCS scores (COR 2.356, 95% CI: 0.983-5.648, $p < 0.25$) were found to be a very strong predictor of severe injuries in bivariate analysis. In the multivariate analyses, only moderate GCS scores was

found to be statistically significant (AOR 3.006, 95% CI: 1.270-7.118, $p < 0.05$) where as association with severe GCS scores was reduced and became non-significant. This underscores the critical importance of GCS as an independent predictor of injury severity, with moderate scores significantly increasing the likelihood of severe outcomes.

Anatomic site of injury: Injury to the lower extremities (COR 1.7327, 95% CI: 0.705-4.258, $p < 0.25$) was associated with a moderate, though not statistically significant risk of severe injuries and polytrauma (COR 6.727, 95% CI: 2.538-17.829) was found to be significantly associated risk of severe injuries and statistically significant in the bivariate analysis. In the multivariate model, these associations were non-significant in predicting severe injuries for lower extremities (AOR 1.209, 95% CI: 0.375-3.896) and polytrauma (AOR 1.845, 95% CI: 0.515-6.613).

ICU Admission: The need for ICU admission was initially associated with severe injuries (COR 7.859, 95% CI: 2.729-22.634, $p < 0.001$), but this association did not hold in the multivariate analysis (AOR 2.418, 95% CI: 0.565-10.341). This suggests that while ICU admission is related to the severity of the injury, it is not an independent predictor when other factors are considered.

Duration of Hospitalization: A duration of hospitalization exceeding 24 hours was a strong predictor of severe injuries in both the bivariate (COR 13.962, 95% CI :8.119-24.012, $p < 0.01$) and multivariate analyses (AOR 8.838, 95% CI: 4.490-17.399, $p < 0.001$). This finding indicates that extended hospital stays are a significant independent indicator of severe injury, reflecting the need for prolonged medical care in more severe cases.

8. Discussion

The study found that 44.8% of the trauma patients admitted to AaBET Hospital were victims of road traffic accidents (RTAs). This prevalence is notably higher than the pooled prevalence of 31.5% reported in a 2018 systematic review and meta-analysis of trauma patients in Ethiopia.

The regional subgroup analysis from the same study showed even higher prevalence rates in the Southern Nations, Nationalities, and Peoples' (SNNP) region (58.3%) and Addis Ababa (33.3%) (5). The increased prevalence observed at AaBET Hospital may be attributed to its unique role as the sole government hospital dedicated solely to trauma care, likely resulting in a higher concentration of severe cases.

The study revealed that the majority of road traffic accident victims were male (78%), which aligns with other studies. A study done in Nepal on the magnitude of road traffic accidents among patients visiting the department of emergency of a tertiary care center in 2023 reported a similar figure of 77.4% for males and a 2019 study in Addis Ababa reported 76.6% (7)(12).

This gender disparity can be attributed to the nature of work predominantly undertaken by males, which often involves greater exposure to road environments and higher risk-taking behaviors.

Regarding age distribution, this study showed that among admitted road traffic victims, 38.4% of them belong to age groups between 30 to 44 years, and 36.2% of road traffic accidents are attributed to age groups between 15-29 years, implying 74.6% of road traffic accident victims belong to the productive part of the society which can severely impact the short- and long-term endeavors of the country in economic growth.

This result from the study is consistent with studies done globally as well as in Ethiopia, where a study in Nepal showed the highest number of victims were found in the age group of 16-30 years (50.82% followed by the age group of 31-

45 years (26.87%). And a study conducted in 2019 in selected public health hospitals in Addis Ababa, the age group mainly affected by road traffic accidents was from 21 to 30 years followed by the age group 12 to 20 years, accounting for 38.8% and 20.4 % respectively (1) (7).

Among road traffic accident victims admitted to AaBET hospital, the commonest time of injury was from 12 PM to 6 PM followed by 6 AM to 12 PM, accounting for 45.5% and 25,7% respectively. This pattern is consistent with findings from a study done at Jimma in 2023, the majority of road traffic accidents occurred during the daytime (63.9%) which is also consistent with a study done in Addis Ababa at Alert Hospital, where 27.1% of road traffic injuries occurred during the day time between 8 AM and 11:59 AM.

A study conducted at Gondar also revealed most road traffic accidents occurred during rush hour with 53.9% occurring in the afternoon and 25.24% occurring in the morning. (1,15,25). This reflects the injuries prevailing during the day time mostly the rush hours. This suggests that poor road traffic management during peak hours significantly contributes to the high incidence of RTAs

Among admitted road traffic victims, the majority were pedestrians and passengers accounting for 44.3% and 31% respectively, which might reflect poor road consciousness among pedestrians or unsatisfactory pedestrian facilities in the road designs. This result is congruent with studies done at Tikur Anbessa Specialized Hospital in 2015 which revealed pedestrians accounted for 62.5% of road traffic accident victims as well as a study conducted at Jimma University Medical Center in 2023 which showed among the victims affected, 49.6% were pedestrians followed by passengers accounting for 26.1%.

In contrast, a study conducted in the emergency department of the University of Gondar Comprehensive Teaching and Referral Hospital in 2020 revealed that the majority of road traffic accident victims were passengers accounting for 50.28% followed by pedestrians with 34.95% (14)(11)(15).

This study found that among the total road traffic accident victims who sustained severe disability which was 62.5%, only 31.6% of them had arrived at the hospital with an ambulance. Whereas, 39.6% arrived with a private vehicle.

This result shows a slightly better ambulance transportation than a study done in Jimma in 2023 where only 26.1% of patients arrived at the hospital with an ambulance similar to a study done in Addis Ababa in 2022 at Alert Hospital Trauma and Emergency Department that showed only 24.9% ambulance use by road traffic accident victims. This shows the poor and fragmented pre-hospital care system in Ethiopia (15,25).

In this study, only 51.3% of admitted trauma patients had received pre-hospital care/treatment from health facilities before their referral. Among those who sustained injury secondary to road traffic accidents, 49.2% did not receive any pre-hospital care/treatment from health facilities before their arrival to the hospital.

This reflects the high number of patients arriving at the hospital by themselves without receiving a proper referral from a healthcare setting where they would have received pre-hospital treatment. This result is higher than studies done in Addis Ababa at Alert Hospital in 2022, where 32.8% of victims did not receive pre-hospital treatment. Similarly, in a study done at Jimma in 2023, 42.% of patients never got any type of treatment before they arrived at the hospital (15,25).

In this study, only 31.9% of road traffic accident victims arrived at the hospital within 1 hour of the injury reflecting on how the first golden hour for medical intervention after a trauma had already passed before the victims arrived at the hospital. This is slightly higher than a study done in Addis Ababa at Alert Hospital where only 15.4% of road traffic accident victims arrived at the hospital within the first golden hour (25).

As a result of multivariate regression, the study revealed that the interval between the time of injury and arrival to the hospital between 1 hour and 24

hours moderate traumatic brain injury with a Glasgow Coma Scale (GCS) of 9-11, moderate Kampala trauma severity score II, and duration of hospitalization greater than 24 hours had a statistically significant association with severe injury outcomes (p-value<0.05, 0.05, 0.001, 0.001) respectively.

Results of the combined risk factors are in alignment with a study done with Jimma in 2023 where patients with lower Glasgow Coma Scale (GCS) are liable for a bad outcome from the emergency department and a study done in Addis Ababa Tikur Anbessa Specialized Hospital where lower GCS was one of the predictors with statistically significant prediction to severe outcomes of road traffic accident victims (11,15).

In a hospital-based prospective study done in 2021 in North-West Ethiopia, hospital arrival times greater than 1 hour and lower GCS Scales were found to be among the significant predictors of bad outcomes among road traffic accident victims (16).

Similar to this study, a study conducted in Uganda in 6 emergency units of hospitals among admitted road traffic accident victims showed an injury severity scale as a significant predictor of unfavorable outcomes. which is similar to a study done in Wolaita SNNP, which showed injury severity was significantly associated with outcomes of road traffic accident patients. In a study conducted in Gedeo Zone, Dilla in 2020, head injuries causing lower Glasgow Coma Scales were found to be among the significant predictors of unfavorable outcomes for road traffic accident victims (5,17,18).

Similarly, a study conducted in Hawassa in 2024 revealed moderate Glasgow Coma Scale and admission to the intensive care unit were among the significantly associated factors in predicting unfavorable outcomes (22).

Longer hospital stays in the hospital were found to be among the factors significantly associated with severe injury outcomes in this study. Similarly, a study done in Latin America in 2023 in the emergency department of the Instituto Central revealed that patients experiencing longer stays in hospitals

were among the factors that led to severe injuries. A study conducted at the adult emergency department of Tikur Anbessa Specialized Hospital assessing injury characteristics and outcomes of road traffic accident victims also showed longer duration of hospitalization to be a significantly associated factor for morbidity outcomes of patients (11,25).

9. Strength and limitation

9.1 Strength

The study illustrated the magnitude of road traffic accidents at AaBET Hospital which is the only tertiary hospital in Ethiopia dedicated solely for trauma patients. This helps reveal the burden the hospital is bearing as well as the outcomes it is producing after caring for these patients.

This study has shown the magnitude and predictors of severe injury outcomes for road traffic accident victims, which will contribute as a significant input in endeavors taken to strategically prevent injuries and decrease complications sustainably to halt the alarmingly high road traffic accidents in the nation.

9.2 Limitation

Because of the sample size used for the study, the confidence interval of the statistically significant factors for severe injury outcome is wide, decreasing the validity of the study.

Since the source of data was secondary, data collection from patient card information with the full information needed from the questionnaire was time-consuming.

10. Conclusion

Among admitted trauma patients, almost half (48.4%) of them sustained injury due to road traffic accidents. This is an overwhelming figure considering the very few numbers of vehicles Ethiopia has in contrast to the population. The majority of victims were males (78%) who are in the productive age group from 30-44 years and 15-29 years which is detrimental to the economy of the families they sustain as breadwinners and the nation at large.

Only 39.6% of victims arrived with private vehicles with just 50.8% having received pre-hospital treatment before their arrival, reflecting the dire need for organized trauma care from scene of injury to health care institutions.

The majority of road traffic accident victims (62.5%) admitted to the hospital had severe injury outcomes, whereas, only 37.5% of the victims had non-severe injury outcomes. The factors significantly associated with severe injury outcomes are the interval between the time of injury and arrival to hospital between 1 hour and 24 hours, Glasgow Coma Scale (GCS) of 9-11, moderate Kampala trauma severity score II, and duration of hospitalization greater than 24 hours.

This study implies that a significant number of trauma patients arriving at AaBET Hospital are road traffic accident victims with almost two-thirds of them with severe injury outcomes. This is an alarming result that depicts the grave consequences citizens bear that in turn overwhelms the already fragile health care system of the country.

11. Recommendation

Early and Accurate Assessment: The significant predictive value of GCS and KTS scores underscores the importance of standardized protocols for initial trauma assessment to identify high-risk patients and ensure timely interventions. This expansion would improve the quality of care delivered and optimize patient outcomes.

Resource Allocation: The strong association between longer hospital stays and severe injuries highlights the need to ensure the availability of necessary medical supplies, specialized staff, and rehabilitation facilities that is essential to improve patient recovery and outcomes.

Strengthening Pre-hospital Care Systems: Integrating and implementing a formal referral system is crucial to accurately track victims' journeys from the injury site to healthcare facilities. This system would also bolster ambulance transport efficiency and the provision of pre-hospital care.

Traffic Management: Improving traffic management during peak hours and enhancing road safety measures can reduce the incidence and severity of RTA. Implementing stricter traffic regulations, better road designs, and public awareness campaigns on road safety can contribute to safer road environments.

Future Research Recommendations: Conducting studies with larger sample sizes and longer follow-up duration is necessary to identify the long-term functionality of trauma victims in terms of physical, mental, and social health. These studies would provide more comprehensive data to inform healthcare practices and policy-making.

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13. Annex

13.1 English Check-list

A. Socio-demography	
Age	
Sex	
A. Clinical	
Mode of arrival to the hospital	<ol style="list-style-type: none">1. Ambulance2. Private Vehicle3. Taxi4. Lada/Ride5. Walking
Region of referral	<ol style="list-style-type: none">1. Addis Ababa2. Oromia3. Amhara4. SNNP5. Diredawa6. Tigray7. Afar8. Somalia9. Benshangul10. Gambela11. harari
Referral source	<ol style="list-style-type: none">1. Self2. Health center3. Government hospital4. Private clinic/hospital

Time of injury	<ol style="list-style-type: none"> 1. 6 :00 AM - 12:00 PM 2. 12 :00 PM - 6 : 00 PM 3. 6 :00 PM - 12 AM 4. 12:00 AM - 6:00 AM
Pre-hospital care (treatment given at health facilities prior to referral)	<ol style="list-style-type: none"> 1. Yes 2. No
Interval between time of injury and arrival	<ol style="list-style-type: none"> 1. Immediate < 1 hour 2. Within 1-24 hour 3. With in days >24 hours
Triage categories	<ol style="list-style-type: none"> 1. Green 2. Yellow 3. Orange 4. Red
Mechanism of injury	<ol style="list-style-type: none"> 1. RTA 2. Falling down 3. Stab injury 4. Gun shot 5. Burn 6. Industrial (Machine injury) 7. Fighting
Type of individuals involved in RTA	<ol style="list-style-type: none"> 1. Pedestrian 2. Passenger 3. Driver 4. Motorcyclist
Type of vehicle involved in the RTA	<ol style="list-style-type: none"> 1. Public transportation (Bus, Taxi, lada/uber)

	<ol style="list-style-type: none"> 2. Private vehicle 3. Heavy truck 4. Bajaj 5. Motorcycle
Glasgow coma scale (GCS)	Mild (GCS 13 - 15) Moderate (GCS 9- 12) Severe (GCS 3-8)
Anatomic site of injury	<ol style="list-style-type: none"> 1. Head 2. Chest 3. Abdomen 4. Upper extremities 5. Lower extremities 6. Pelvic 7. Spine 8. Poly-trauma
Duration of hospitalization in the emergency department	<ol style="list-style-type: none"> 1. Less than 24 hours 2. Greater than 24 hours
ICU admission	<ol style="list-style-type: none"> 1. Admitted 2. Not admitted
B. Injury grading score	
Mild injury- KTS II = 9-10	
Moderate injury- KTS II = 7-8	
Severe injury- KTS II < 6	
C. Outcome of road traffic accident	
Severe injury	
Non-severe injury	

13.2 Amharic translated check- list

ሀ. ማህበራዊ ጉዳዮችን የሚመለከቱ ጥያቄዎች	
ዕድሜ	
ፆታ	
ለ. የህክምና ጉዳዮችን የሚመለከቱ ጥያቄዎች	
ወደ ሆስፒታል የመጠበቅ ሁኔታ	አምቡላንስ የግል መኪና ታክሲ ላዳ/ራይድ በእግር ሌላ (ይግለጹ)
የአደላውቆይታ	ከ1ሰዓት በታች ከ1ሰዓት በላይ ከ1ቀን በላይ ሌላ (ይግለጹ)
ሪፈራል የተጻፈበት ቦታ	አዲስ አበባ አሮምያ አማራ ደቡብ ሌላ (ይግለጹ)
ሪፈራል የፃፈው ድርጅት	በግል ጤና ጣብያ የመንግስት ሆስፒታል የግል ሆስፒታል

አደጋው የደረሰበት ሰዓት	5. 6 :00 AM - 12:00 PM 6. 12 :00 PM - 6 : 00 PM 7. 6 :00 PM - 12 AM 8. 12:00 AM - 6:00 AM
ከሪፈራል በፊት የተደረገ ህክምና /አርዳታ	1. አለ 2. የለም
አደጋው የደረሰበት እና ወደ ህክምና ቦታ የደረሱበት ሰዓት	ወዲያውከ 1 ሰዓት በታች ከ 1-24 ሰዓት ከ 24 ሰዓት በላይ
ትራያጅ ምድብ	አረንጓዴ ቢጫ ብርቱካን ቀይ
የአደጋው መንስኤ	የመኪና አደገ መውደቅ በስለት መውጋት በጥይት መመታት እሳት አደጋ የፋብሪካ (ማሽን አደጋ) በድብድብ
አደጋው የደረሰው በመኪና አደጋ ከሆነ	እግረኛ ተሳፋሪ አሽከርካሪ ሞተር ሳይክል ነጂ

አደጋው የደረሰው በመኪና አደጋ ከሆነ፡ አደጋውን ያደረሰው ተሸከርካሪ	የህዝብ ማመላለሻ (ባስ, ታክሲ) የግል መኪና ባጃጅ ሞተር ሳይክል
ግላስኮኮማስኬል	መለስተኛ - 13 - 15 መካከለኛ - GCS 9- 12 ከፍተኛ - GCS 3-8
አደጋው የደረሰበት የሰውነት ክፍል	ጭንቅላት ደረት ሆድ እጅ እና ከንድ እግር እና ታፋ ዳሌ አከርካሪ ፕሊትራማ
በሆስፒታሉ ድንገተኛ ክፍል የቆየበት ሰዓት	ከ 24 ሰዓት በታች ከ 24 ሰዓት በላይ
የጽኑ ህመማን ክፍል	ገብተዋል አልገቡም
ሐ.የጉዳት መለኪያ መጠን	
መጠነኛ ጉዳት - KTS II = 9-10	
መካከለኛ ጉዳት - KTS II = 7-8	
ከፍተኛ ጉዳት - KTS II < 6	
መ.የመኪና አደጋው ወጠኑ	
ከፍተኛ ጉዳት	
ከፍተኛ ያልሆነ ጉዳት	

13.3 Kampala trauma score II

	Description	Score
A	Age in years	
	5-55 years	1
	<5 or > 55 years	0
B	Systolic blood pressure on admission (mmHG)	
	>89	2
	89-50	1
	>49	0
C	Respiratory rate	2
	9-29 minutes	1
	> 30 minutes	0
	</= 9minutes	
D	Neurological status	
	Alert	3
	Responds to verbal stimuli	2
	Responds to painful stimuli	1
	unresponsive	0
E	Score for serious injury	
	None	2
	One injury	1
	More than one injury	0

Kampala trauma score II

Interpretation

KTS II < 6 - Severe injury

KTS II 7-8 - Moderate injury

KTS II 9-10 - Severe injury

13.4 Triage color category

Color Code	Red	Orange	Yellow	Green
Questionnaire				
Haematemesis	Continuously	Frequently	Few	None
Rectal bleeding	-	Continuously	Blood mixed in the stool	None
Hernia	-	Irreducible/strangulated	-	None
Pain		Very severe	Severe	Few or none
Alimentary vomiting	-	-	Yes	No
Diarrhea	-	-	Yes	No
ECG abnormalities	Life-threatening	Dangerous	Not dangerous	Not acute
Vital signs				
Airway	Obstructed airway	Threatened airway	-	Free airway
Breathing	SPO2<80 without O2 supply RR>35 or <8	SPO2<90 without O2 supply RR>30	SPO2<95 without O2 supply RR>25	SPO2>95 without O2 supply RR 8-25
Circulation	PR>150	PR>120 OR <40	PR>110 OR < 50	PR 50-110
Disability	Unresponsive Ongoing seizure	Respond to pain Very agitated	Respond to speech Moderately agitated	Alert Slightly agitated
Exposure	-	Temperature >40 or <32	Temperature >39 or <35	Temperature 35-39