



Center for Innovative Drug Development and Therapeutic Trials for Africa

The impact of mode of transport and adequacy of pre-hospital care
among severely injured road traffic accident patients in Addis
Ababa, Ethiopia: A retrospective cohort study

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THE IMPACT OF MODE OF TRANSPORT AND ADEQUACY OF
PRE-HOSPITAL CARE AMONG SEVERELY INJURED ROAD
TRAFFIC ACCIDENT PATIENTS IN ADDIS ABABA, ETHIOPIA: A
RETROSPECTIVE COHORT STUDY

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Letter of Certificate

This is to confirm that Aklile Habtemariam’s final project work, “The *impact of mode of transport and adequacy of prehospital care among severely injured road traffic accident patients in Addis Ababa Ethiopia: A retrospective cohort study*” has been completed and presented to in partial fulfillment of Master of Science in Clinical Trial degree requirement in conformity with university requirement and fulfills acceptable criteria in terms of originality and quality.

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Letter of Declaration

I, Aklile Habtemariam Kassa, certify that this thesis is my original work under the supervision of Professor Charlotte Hanlon and Dr Agumasie Semahegn. All sources of information utilized in the thesis have been properly credited. I further affirm that the thesis has not been submitted to any other higher learning institution in part or in whole to acquire a master degree.

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Table of Contents

Letter of Certificate.....	iii
Letter of Declaration	v
Acknowledgements.....	vi
List of Tables.....	ix
List of Figures	ix
Acronyms	x
Abstract.....	xi
1. Introduction.....	1
1.1 Background	1
1.2 Statement of the problem	3
1.3 Significance of the study.....	4
2. Literature Review	5
3. Objectives of the study.....	8
3.1 General objective	8
3.2 Specific objectives	8
3.3. Conceptual Framework	8
4. Methods	10
4.1 Study setting.....	10
4.2 Study design and period	10
4.3 Population	10
4.4 Eligibility criteria.....	11
4.5 Sample Size	11
4.6 Sampling Procedure	12
4.7 Selection of the Exposed Group	12
4.8 Selection of Non- Exposed Group.....	12
4.9 Study Variables.....	13
4.10. Operational Definitions	13
4.11 Data sources and data collection methods.....	16
4.12 Data processing and analysis.....	16
4.13 Ethical considerations	17
4.14 Dissemination.....	17
5. Results	18
5.1 Demographic and Clinical Characteristics.....	19
5.2 Factors associated with RTI outcomes	22
5.2.2 Predictors of Death.....	22
5.2.3 Predictors of disability in survivors (n=375).....	24
6. Discussion	26
6.5 Limitations of study	29

6.6 Implication of the study.....	29
6.7 Future Areas of study	30
7. Conclusions and recommendations	31
7.1 Conclusions	31
7.2 Recommendations	31
References	33
Annexes	38
Annex 1. Data extraction format.....	38
Annex 2. Sample size determination	41
2.1. Sample size calculations for the variable adequacy of prehospital care.....	41
2.1.1. Calculation for magnitude of difference.....	41
2.1.2. Sample size determination.....	41
2.2. Sample size determination for the variable mode of transport used.....	42
2.2.1. Calculation for magnitude of difference.....	42
2.2.2. Sample size determination.....	42
Annex 3. Modified early warning score	44
Black -Dead	44
Annex 4. Descriptive statistics for age, vital signs, arrival time and hospital stay of sample patients	52
Annex 5 – Multicollinearity Test	53
Annex 6 - Cross Tabulation Results	54
6.1. Chi square t test results for Mode of transport and Clinical Outcome	54
6.2 Chi Square t test results for Mode of transport and Adequacy of care	55
6.3 Chi Square Test for Adequacy of Care with Clinical Outcome	56
6.4 Chi Square t test for Type of healthcare provider with Adequacy of care.....	57
Annex 7. Regression Models	58
7.1 Bivariate logit regression table - Mode of Transports with Clinical Outcome (Dead or Alive)	58
7.2 Adjusted bivariate regression model for models with variables age, sex, arrival time, systolic blood pressure and morbidity	60
7.3 Bivariate regression for Mode of transport with Disability.....	63
7.4 Adjusted bivariate regression for Mode of transport with Disability	65

List of Tables

Table 1- Site of injury and the respective care patients are expected to receive 15
Table 2- Descriptive characteristics (N=449) 20
Table 3 Chi Square result for assessing association between mode of transport and adequacy of care 22
Table 4- Regression result summary for predictor death 23
Table 5 Regression result summary - Disability 25

List of Figures

Figure 1. Conceptual framework for examining the mode of transport used and adequacy of prehospital care received with clinical outcomes of severely injured patients from road traffic accidents (Self-constructed). 9
Figure 2 - Sample flow chart..... 18
Figure 3- Type of care provided (n=219)..... 21

Acronyms

ALERT Hospital	All Africa Leprosy, Tuberculosis and Rehabilitation Training Hospital
CDT-Africa	Centre for Innovative Drug Development and Therapeutic Trials for Africa
DALYs	Disability-adjusted life years
EDHS	Ethiopian Demographic Health Survey
EMS	Emergency Medical Services
GCS	Glasgow Coma Scale
HIC	High Income Countries
HMIS	Hospital Management Information System
ICU	Intensive Care Unit
LIC	Low Income Countries
LMICs	Low- and Middle-Income countries
MEWS	Modified Early Warning Score
MIC	Middle-income countries
ODK	Open data kit
OOP	Out of Pocket
RTI	Road Traffic Injuries
RTA	Road Traffic Accidents
SDG	Sustainable Development Goals
WHO	World Health Organization

Abstract

Background: Road traffic injuries (RTIs) are a major global health concern, particularly in low- and middle-income countries (LMICs) where over 90% of RTI deaths occur. Ethiopia has one of the highest RTI fatality rates in sub-Saharan Africa, with up to 37 deaths per 100,000 people. Contributing factors include poor road infrastructure, limited emergency medical services (EMS) and inadequate prehospital care. Despite EMS being crucial to reducing trauma mortality, Ethiopia lacks a formal prehospital care system, and most RTI victims are transported by informal means without emergency care. The impact of prehospital care and transport mode patient outcomes remains under-researched.

Objective: This study investigated the impact of mode of transportation and adequacy of prehospital care on clinical outcomes—mortality, discharged with disability, and discharged without disability—among severely injured RTI patients admitted to Alert Hospital Trauma Center in Addis Ababa.

Methods: A hospital-based observational study reviewed clinical records of RTI patients presenting to Alert Hospital Trauma center (2020-2023). The study included severely injured 449 adults (triaged red or orange by modified early warning score, MEWS) with recorded outcomes. Patients transported by ambulance were compared to those using non-ambulance means, and those receiving adequate pre-hospital care were compared to those with inadequate or no care. Data on demographics, clinical parameters, transport mode, provider type and outcomes were analyzed for association with RTI mortality and disability. Logistic regression was carried out to further examine significant associations to identify risk factors.

Results: Out of 18,408 trauma cases seen at the institution during study period 2,946 (16%) were RTI. Of these, 449 records of severely injured patients were identified. Out of 449 patients, males made 70.8% with median age of 35 years and pedestrians accounted for 56.1%. Prehospital care was documented in half of the patients, though only 20% received adequate care. Prehospital care was mainly given health professional (95.5%). Mortality was 16.5%, with 39.4% discharged with disability and 44.1% without disability.

Compared with private/public patients, patients arriving walking had twelve times more odds of death (AOR = 12.26, 95% CI: 2.47-60.89). Other predictors of death were age (AOR= 1.05, 95% CI: 1.03 – 1.07), female (AOR = 0.20 95% CI: 0.08-0.52) and higher systolic blood pressure (AOR

= 0.98%, 95% CI: 0.97-0.99). Mode of transport and higher systolic blood pressure were found to be significant predictors of disability. Compared with private/public transport, patient transported by ambulance has twice odds of being disabled (AOR = 2.36, 95% CI: 1.41-3.94).

Conclusions: The study highlights a high rate of RTI in Ethiopia. Patients' clinical outcome is significantly associated with mode of transport. Arrival on foot or carried was associated with higher mortality while arrival by ambulance increased the likelihood of disability. Although most prehospital care was provided by health professionals, only a small fraction was adequate. Strengthening EMS systems, improving timely quality prehospital care could substantially reduce death and disability among this population. Other key predictors of outcomes were age, sex and systolic blood pressure.

Keywords: clinical outcomes, emergency medical services, mode of transport, prehospital care, road traffic accidents

1. Introduction

1.1 Background

Efforts continue to be made to improve emergency care services worldwide. In 2019, the 72nd World Health Assembly unanimously considered emergency treatment as necessary for Universal Health Coverage (Delaney et al., 2021). This act acknowledged the important role that emergencies such as injuries play in the overall burden of diseases. Each year, injuries result in an estimated 5.8 million fatalities (Delaney et al., 2021; Morris et al., 2015), which is higher than the combined number of deaths from HIV, tuberculosis, and malaria, and by 2030 mortality from injuries is projected to increase by 30–40% (Delaney et al., 2021). The distribution of injury-related deaths reveals a significant disparity between high-income countries and low- and middle-income countries (LMICs). About 90% of the injury- related deaths occur in LMICs (Morris et al., 2015). The impact of globalization is believed to have contributed to significant changes in the occurrence and burden contributed by accidents and environmental dangers, with high fatalities (Ebi et al., 2017).

Globally, road traffic accident is one of the main causes of injuries worldwide (RTIs), which accounted for 26% of the burden of injuries in 2017 (Dhufera et al., 2022). RTIs cause up to 50 million injuries and up to 1.3 million fatalities per year, with 17 documented road fatalities for every 100,000 people worldwide each year (Abegaz & Gebremedhin, 2019). This makes RTIs one of the top 10 causes of death worldwide (Ebi et al., 2017). Even though RTIs frequently result in mortality, non-fatal effects account for a sizable share of total disability-adjusted life years (DALYs). RTIs continue to be the major contributors to DALYs and place a heavy economic and societal burden (Ebi et al., 2017). RTIs have been estimated to cause up to 3% of a country's gross domestic product in economic losses (Abegaz & Gebremedhin, 2019). According to a report by the World Health Organization (WHO) 85% of all RTI fatalities worldwide in 2018, are seen in LMICs, indicating that RTI disproportionately affects these nations (Dhufera et al., 2022). The world had taken steps to address the challenge by including RTIs in its agreed-upon Sustainable Development Goals (SDGs). SDG-3 aimed to reduce the number of RTI-related deaths and injuries worldwide by half by 2030 (Abegaz & Gebremedhin, 2019).

With 27 deaths per 100,000 people, Ethiopia has the highest rate of RTI-related deaths in sub-Saharan Africa (Dhufera et al., 2022). Available evidence indicates that the rate could even be as high as 37 per 100,000 population (Abegaz & Gebremedhin, 2019). More than one-third of the time, these injuries affect vulnerable road users, including motorcyclists, pedestrians, and cyclists (Abegaz & Gebremedhin, 2019). An analysis of secondary data from the Ethiopian Demographic and Health Survey (EDHS) showed that 22% of those who had RTIs were drivers, and 35% were passengers. Men made up two-thirds of those sustaining RTIs, with approximately two times the likelihood of RTI compared to women (Abegaz & Gebremedhin, 2019). The high prevalence of RTI in Ethiopia has been linked to a number of causes, including widespread irresponsible driving practices, an inadequate road network, poor road conditions, inadequate enforcement of traffic laws, and poor vehicle condition (Abegaz & Gebremedhin, 2019; Ebi et al., 2017). Though close to two-thirds of the nation's vehicles and 75% of RTIs happen to be in Addis Ababa, the capital city, and its vicinity, only 3 public and 4 private hospitals have specialized trauma wings (Dhufera et al., 2022).

Available evidence has revealed that the percentage of deaths that happen outside of hospitals is higher in LMICs compared to High Income Countries (HIC) (Morris et al., 2015). According to Reilly et al. (2019), 30% of prehospital deaths could be avoided. Kironji et al. (2018) estimated that creating effective emergency care systems in LMICs could reduce avoidable deaths by 45% and DALYs by 35%. Emergency Medical Service (EMS), a system of responding to emergencies with highly skilled prehospital clinicians, is one of the primary components of trauma care in high-income nations. The existence of EMS might reduce the annual mortality rate in LMICs by 54% (Ebi et al., 2017). In sub-Saharan Africa, injuries constitute the major share of the cases seen in prehospital care. But about 91% of the population lacks access to EMS (Delaney et al., 2021). Less than 1% of the population in LMICs has access to official emergency medical transportation services, such as ambulances (Kironji et al., 2018). The lack of a clear path to follow in establishing formal EMS, the lack of data on which components of such EMS can be designed to be cost effective, and the scarcity of studies on alternatives to formal EMS such as extensive first aid training for first responders are all factors that hinder efforts to improve prehospital care in LMICs (Kironji et al., 2018). A large number of sick and injured people are brought to healthcare facilities in LMICs using available commercial transportation methods, such as taxis, private cars, or even non-motorized means that often result in severe delays (Morris et al., 2015).

1.2 Statement of the problem

RTIs has projected fifth leading cause of death by the year 2030 globally (Debenham et al., 2017). The WHO estimates that 1.19 million deaths are caused by road traffic accidents annually, with more than 92% of road traffic related deaths from LMICs and the highest number from Africa¹. RTIs cause 17 documented road fatalities per 100,000 people worldwide (Abegaz & Gebremedhin, 2019). In LMICs, road traffic deaths are 27.5 per 100,000 population compared to 8.3 deaths per 100,000 population in HICs (Factors et al., 2021). WHO estimates that RTI related deaths are leading causes of death in children and young adults (5-29 years), three quarters of which occur in males under 25². Speeding, driving under the influence of alcohol or other psychoactive substances, failure to use motorcycle helmets, seat belts or child restraints, unsafe road infrastructure, unsafe vehicles, inadequate post-crash care and inadequate enforcement of traffic laws have been identified as risk factors by WHO. Evidence shows that Ethiopia's road fatality rates could be as high as 37 per 100,000 people (Dhufera et al., 2022; Abegaz & Gebremedhin, 2019). The Ethiopian Federal Police Commission reported that between July 8, 2020 and July 7, 2021, the country experienced 15,034 road accidents leaving 4,161 dead and 5763 serious injuries³. The federal police report stated incompetence among drivers, speeding, technical inefficiency of vehicles, and inappropriate use of the road by pedestrians as reasons for the significant number of accidents. Other reports show that in terms of financial burden of RTIs up to 30% of all health care costs for road traffic injuries come from direct out of pocket payment (OOP) in Ethiopia (Dhufera et al., 2022). The average OOP expenditure was \$256 for out-patient care and \$690 for inpatient care. The study evidenced that such figures imply that 24% of the households could be pushed below the international poverty line.

¹ <https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries>, accessed on 5 June 2025

² <https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries>, accessed on 5 June 2025.

³ <https://ethiopianmonitor.com/2021/08/03/over-4160-killed-in-traffic-accidents-last-fiscal-year/>
Accessed on 5 June 2025.

Only a small number of studies have been done in Ethiopia to look into different elements of injuries, their effects, and the services that go along with them. A study from Wolaita Sodo (Asrat et al, 2021), showed that the overall death rate of RTIs was 9.5% and that lack of first aid was significantly associated with patient outcome, and that RTA patients who had not received first aid were found to be 3 times more likely to die than those who had received it. But information on the impact of adequacy of prehospital care received by RTI patients on mortality in Ethiopia is lacking.

Time from injury to hospital arrival has been found to be a significant predictor of time to death (Denu et al., 2021). The study reported that 68.5% of the patients were transferred by commercial vehicle and only 20.5% by ambulance. Denu et al (2021) found that prehospital care was not provided by ambulance crews. Yet, information linking mode of transport used and mortality of RTI victims in Ethiopia is still lacking.

Ethiopia, which lacks a prehospital care system, needs to get such information to make informed decisions to put in place a system that would reduce mortality due to RTIs. This research attempted to analyze the role prehospital care adequacy, as assessed by the researcher, and mode of transportation used play in determining clinical outcomes of patients from RTAs.

1.3 Significance of the study

The findings of the study will contribute to filling at least partially the knowledge gap regarding the association between the adequacy of prehospital care delivered to road traffic victims, and the mode of transportation used in the in-hospital patient outcomes from road traffic accidents. Information so generated will inform policymakers on steps to be taken for better in-hospital patient outcomes and generates topics that researchers would further investigate.

2. Literature Review

Trauma mortality in LMICs can be as high as 40-50%, the bigger portion occurring in prehospital settings. With the projected rise in RTIs, improving prehospital care is a crucial public health priority. Evidence shows that having organized and adequate prehospital trauma care reduces morbidity and mortality associated with trauma (Care, 2018). Morris et al. (2015) assessed the status of prehospital care in 13 LMICs by looking at the mode of transport, training, organization, access, and funding. The authors reported that EMS systems in these countries were organized at many different levels, including national, sub-national and local levels. National level organization included setting of national policy on EMS, as in Vietnam and Colombia, or an actual nationally organized ambulance service seen in Ghana. Many of the LIC countries do not have standards. Basic life support capabilities were available to more than half of the people only in South Africa and in some states of India. Pakistan and India made substantial use of EMS with care provided by attendants with on-the-job experience. In Delhi, India, substantial use is made of police and fire department personnel for transport. In most LMICs, it is expected that a substantial number of emergencies are transported by commercial and private vehicles. A systematic review of prevalence and training interventions of bystander assistance for trauma victims in LIMCs also found similar results (Care, 2018). Family members, police and bus/taxi drivers commonly transported patients; and a majority of patients, as high as 94%, received aid from bystanders (Care, 2018).

Impacts of culture, infrastructure, communication and coordination have also been suggested as important elements. Lack of transportation and trained prehospital care providers as well as equipment were identified as barriers for outpatient hospital emergency care in LMICs (Kironji et al., 2018); Tran et al. (2019) identified that cultural aspects are important components of prehospital care within LMICs. The authors outlined that there are three critical time points in delays in seeking emergency care. These points are seeking care, reaching care, and receiving care. Seeking care was found to be determined by the involvement of family members in the decision, perceived quality of care that will be received at the hospital, and the availability of medicine. For example, large proportion of Ghanaians prefer to see traditional bone setters to fix fractures. Reaching care is determined by the presence of well-organized and efficient EMS.

As EMS is not well developed in LMICs, patients are forced to rely on bystanders during emergency cases like RTIs. The review by Tran et al (2019) found that the bystanders' lack of experience and knowledge of emergency care made their actions detrimental rather than helpful. The authors reported that laypersons think that removing victims from the crash scene and taking them to hospital as soon as possible would be better for the patient, and that they do not know that this could worsen the situation if injuries are involving the spinal cord. The review also found that most patients reached hospitals by using private transportation rather than by ambulances. A study included in a systematic review featured a case where in rural Ghana less than 10% of RTIs were brought to the hospital by an ambulance. Broccoli et al (cited in Tans et al., 2019) highlighted the need for considering some cultural aspects regarding use of ambulances where bystanders might be prohibited from contacting ambulances or responsible authorities in fear of being blamed as the perpetrator. The other basic reason affecting ambulance usage in LMICs is its limited availability.

The last point of delay in pathway to emergency care is receiving care. It is a delay in access to definitive treatment, namely hospital admission and transfer. Taking patients to treatment centers within an hour of traumatic injury has been identified as a key concept of timely prehospital trauma care and rapid transport has been a mainstay in prehospital teaching (Bedard et al., 2020). Prehospital time is crudely defined as time from EMS notification to hospital arrival time (Bedard et al., 2020). Review of studies that evaluated the effects of prehospital time on trauma outcomes found that association between mortality with shorter prehospital times were rather mixed. A study assessing prehospital care for road traffic injury in Lagos, Nigeria, found that 24% presented to the emergency room within an hour following injury, and about a third of them reached the emergency room between one and six hours. From the studied patients, three-quarter of the patients had not visited any hospital before presenting to study hospital. 45% of patients were brought by police while the rest were brought by bystanders and state ambulances (Ibrahim et al., 2017).

Ethiopia introduced emergency medicine only in the past two decades (Adera et al., 2019). A study that examined EMS in Ethiopia through the perspectives of EMS case team members at both the federal and regional governments identified five thematic areas of concern following the introduction of EMS to the country. These are lack of resources, inadequate training, sub-optimal use of EMS monitoring and evaluation systems that led to inadequate supervision, lack of

continuity, and complexity of coordination. Shortage of ambulance services was mentioned as a subset of thematic area under lack of resources. One of the respondents reported “EMS in our region consists of ambulance services, triage, and follow up and screening during first step at hospitals” (Adera et al., 2019).

Another study conducted at Gonder Comprehensive Hospital, Northern Ethiopia, found that none of RTI study patients received prehospital care at the scene of injury by trained personnel. Of the total injured, 62% were directly transferred from the scene while 37% were referred from primary hospitals. None of the victims transferred from primary hospitals got surgical intervention at the primary hospitals except wound dressing, immobilization with local materials and tetanus prophylaxis (Denu et al., 2021). From the total deaths, 16.25% occurred within the first hour of injury, 13.75% of the total deaths occurred between the first and four hours of injury, and 40 % of the deaths occurred between and the first and seventh days (Denu et al., 2021). The study identified several predictors of mortality, notably location of the accident (in rural areas or not), time from injury to hospital arrival, and distance to hospital.

A hospital-based study conducted by Habte et al (2021) looked at the patterns of road traffic accidents, nature of related injuries and post-crash outcome determinants in western Ethiopia. His findings in regard to mode of transportation show that a higher proportion of casualties were those presented to the hospital by other vehicles other than ambulances. From all of the injured patients included in the study, 38% and 24% died on the scene, and during treatment, respectively. And nearly two third of the injured people did not receive the required minimum emergency care at the scene or during transportation. The author also reported that better survival rate was recorded in those patients that were taken to the hospital by police officers than medical technicians and by those transported by other vehicles than ambulances. As these findings contradict expectations, the study suggested the need for further studies regarding mode of transport used on mortality rate of road traffic accidents. Similarly, statistically significant and negative association was observed between lack of immobilization before transportation and longer time elapsed until help arrives (Habte et al., 2021).

3. Objectives of the study

3.1 General objective

The overall objective of this study was to assess the impact of adequacy of pre-hospital care received and the mode of transportation used on mortality rate of severely injured RTA victims arriving at the Trauma Center of Alert Hospital in the year 2020-2023, Addis Ababa, Ethiopia.

3.2 Specific objectives

- To assesses the association between mode of transport used (ambulances, police services, public/private transportation, or other means) and patient outcomes till discharge,
- To assesses the adequacy of prehospital care received by patients and investigate the association with the category of pre-hospital service providers (bystanders, police, health centers) and patient outcomes (including mortality).

3.3. Conceptual Framework

As depicted in the chart below, the study assessed the adequacy of pre-hospital care that people with severe injuries due to an RTA received, the mode of pre-hospital transport used to get to the trauma center of Alert hospital and the association with clinical outcomes. The study also explored whether selected socio-demographic characteristics influenced clinical outcomes defined as death, discharge with disability, and discharge without disability.

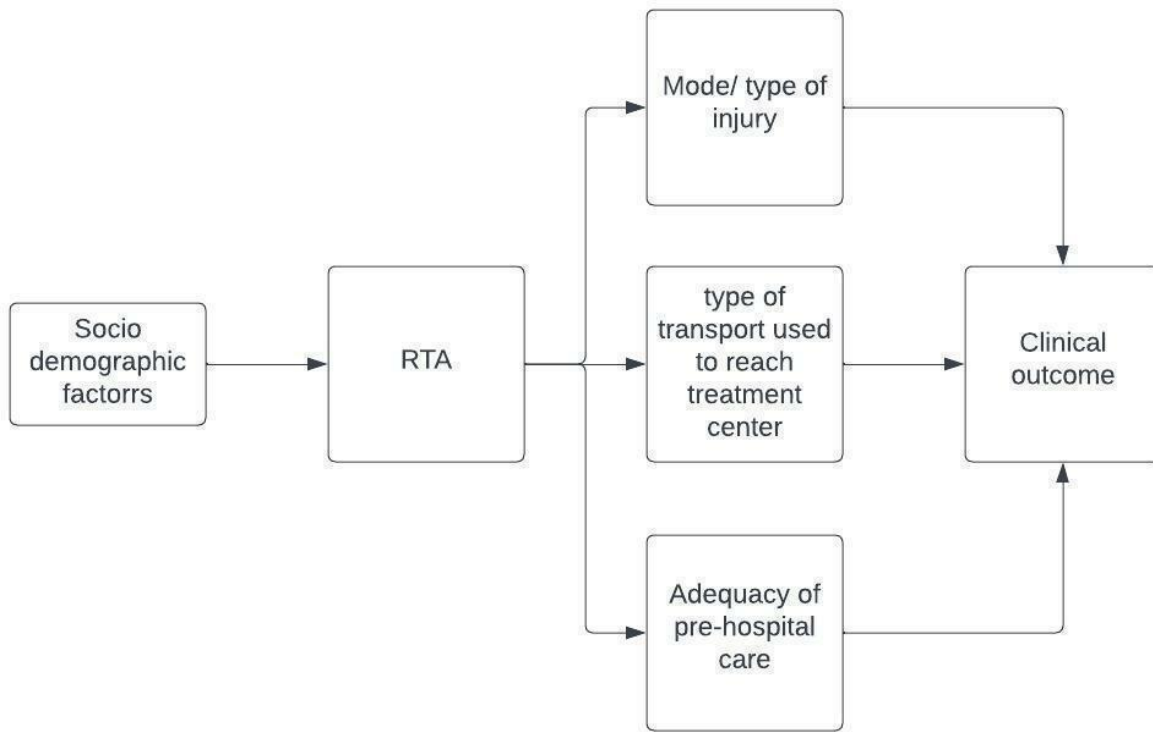


Figure 1. Conceptual framework for examining the mode of transport used and adequacy of prehospital care received with clinical outcomes of severely injured patients from road traffic accidents (Self-constructed).

4. Methods

4.1 Study setting

The study was conducted at Alert Hospital Trauma center. Alert Hospital trauma center is one of the two public trauma centers in Addis Ababa, with close to nine years of service. It serves as a referral center for trauma cases occurring in four sub-city administrations of Addis Ababa, in the vicinities of Oromia Region surrounding the capital, and for those coming from all over the country for specialty services such as plastic surgery and spinal related cases. The trauma center is staffed by 6 General surgeons, 7 Neurosurgeons, 9 Plastic Surgeons, 7 Orthopedic Surgeons and 5 Emergency and Critical Care specialists that work along with general practitioners and nurses. The trauma ward has around 45 beds and has access to 12 ICU beds. In cases of mass casualties, the trauma department has access to the rest of the 100 plus beds present in other departments of the hospital.

4.2 Study design and period

A retrospective cohort study design was used, through retrieval of records of emergency patients who experienced an RTA and by tracking their clinical outcomes up to the point of death or discharge during their in-patient hospital stay between 2020 and 2023.

4.3 Population

Source population- All trauma patients aged 18 years or above brought to Alert trauma center for medical care between 2020 and 2023.

Study population-Sampled RTA trauma patients aged 18 years or above brought to Alert trauma center for medical care between 2020 and 2023 and identified as critically ill patients (triaged as red or orange).

Exposed group (adequacy of prehospital care) –critically ill RTA trauma patients who received adequate prehospital-care before arriving at Alert hospital trauma center. See operational definition for Adequacy.

Non-exposed group (adequacy of prehospital care) - critically ill RTA trauma patients who received none or inadequate prehospital-care before arriving at Alert hospital trauma center.

Exposed group (Mode of transport) - Sampled critically ill RTA trauma patients who arrived at Alert hospital trauma center by ambulance.

Non exposed group (Mode of transport)- Sampled critically ill RTA trauma patients who arrived at Alert hospital trauma center by mode of transport other than ambulance.

4.4 Eligibility criteria

Inclusion criteria- All RTA patients presenting to Alert trauma center who were triaged to be treated in orange or red zones (indicating that they were critically ill) during the study period. Patients who died on arrival with hospital records were also included. The hospital uses Modified Early Warning Score (MEWS) triage to classify incoming patients into categories of red, orange, yellow, green, and black. Orange categories are patients with MEWS of 5-6, seizures (past) and who are aggressive. Red patients are those with MEWS of 7 and above, chest pain, seizures (current), hypoglycemia and who are aggressive. See Annex for further information on the categories.

Exclusion criteria- Those patients who were referred to other treatment centers were excluded as their clinical outcomes could not be identified from the medical records.

4.5 Sample Size

For this retrospective, cohort study a sample size determination was done for the variables of adequacy of prehospital care and mode of transport (Details are shown in the annex). When sample size estimates were done for the two variables, the mode of transport variable produced the highest required sample size, which the study adopted to use. The sample size was determined by the formula below considering the following assumptions inferred from a related study (Asrat et al, 2021). **Mortality outcome 9.5%, $\alpha = 5\%$, $\beta = 80\%$, $RR = 2.5$ $r = 0.67$ (for prevalence arrival by ambulance)** and missing information allowance rate 10%. The

final sample size was calculated to be 449 (exposed 245 and non-exposed 164, and 40 for 10% incomplete rate for each group (exposed =24 and non-exposed 16). See annex for detailed calculations.

$$n_{exposed} = \frac{(Z_{\alpha} + Z_{\beta})^2 p (1 - p)(r + 1)}{(d)^2 r}$$

Where,

$Z_{\alpha} = 1.96$ for 95% confidence interval

$Z_{\beta} = 0.84$ for power of 80%

P = prevalence of outcome

$r = \text{number of } \frac{\text{unexposed}}{\text{exposed}}$

d = magnitude of difference

RR = 2.5

4.6 Sampling Procedure

All trauma patients who were triaged to be treated in orange or red zones were included in the study, starting from the most recent backwards until the required sample size was reached.

4.7 Selection of the Exposed Group

Trauma patients with a history of RTA triaged to be treated in orange or red zones and arrived at the center with ambulance were included until the required sample size as exposed group until the required sample size was reached.

4.8 Selection of Non- Exposed Group

Trauma patients with history of RTA triaged to be treated in orange or red zones and arrived at the center by other means than ambulance was included till the required sample size for the non- exposed group was reached.

4.9 Study Variables

Dependent variable: In-hospital clinical outcome of RTA was expressed as died, discharged with disability, or discharged without disability.

Independent variables: Mode of transport used, and adequacy of prehospital care given were the two independent variables. The study also extracted data on other variables: age and sex of the patient, time lapse from time injury to arrival at the trauma center, severe head injury score on arrival (Glasgow Coma Scale, GCS, 3-8), admission systolic blood pressure < 90 mmHg, presence of comorbid conditions, and first aid service received.

4.10. Operational Definitions

The study adopted the following definitions of key technical terms.

- **Adequate prehospital care:** In this study the term adequacy was used to classify prehospital care received by patients before coming to Alert hospital by the researcher into none, little, provided but largely inadequate, and adequate after examining the prehospital care services provided to each patient based on the type of injury and expected prehospital care to be provided to the patient. The following summarized table was prepared as a guide to determine adequacy of prehospital care rendered to each patient. The decision was determined by also considering the site of injury (Asrat et al, 2021; NHTSA, 2019; US Department of Transportation NHTSA, 2009; NA, 2000). Application of half of the listed care services was considered as adequate and application of less than one fourth of the listed will be taken as little to none.
- **Clinical Outcomes:** For this study, clinical outcomes were defined as death, discharge with disability, or discharge without disability.
- **Disability** – In this study, disability was defined as the presence of long-term physical, mental, intellectual or sensory impairment, documented in medical record that substantially restricts one or more major life activities and required repeated medical care (WHO,2001).
- **Exposure** –Trauma patients with history of RTA triaged as orange or red upon presentation and arrived by ambulance.
- **Mode of Transport:** It was the type of transport used to reach Alert Trauma Centre. It is

categorized as public/taxi transportation, police vehicles, or ambulance.

- **Prehospital time:** This was crudely defined as time from EMS notification to arrival at a hospital (Bedard et al., 2020). Due to lack of a notification system, the study used time taken to arrive to the treatment center as prehospital time.
- **Prehospital Care:** This was medical care rendered to injured patients starting from the place where the accident took place to the place of definitive care. The organization and operation of prehospital care systems vary by country and should be linked to the local hospitals and facilities to which patients are transported (Antao & Irish, 2017).
- **Severely Injured:** The term severely injured patient in this study is used to refer to patients who have been categorized into red and orange by medical officers when triage is done following their arrival to the trauma center using early modified warning scale.

Table 1- Site of injury and the respective care patients are expected to receive

<i>Site of injury</i>	<i>Prehospital care/ procedures the patient is expected to receive depending on the patient's initial presentation</i>
<i>Head Injury</i>	<ul style="list-style-type: none"> ● <i>Application of neck collar</i> ● <i>Bleeding control</i> ● <i>IV cannula with administration of fluids (crystalloids, Blood, Mannitol)</i> ● <i>Oral Airway Protection</i> ● <i>Oxygen administration</i>
<i>Upper Extremity</i>	<ul style="list-style-type: none"> ● <i>Bleeding control</i> ● <i>IV cannula with administration of fluids (crystalloids, blood)</i> ● <i>Splinting and stabilization and reduction of fracture site</i> ● <i>Wound cleaning and dressing</i> ● <i>Analgesics</i>
<i>Chest Injury</i>	<ul style="list-style-type: none"> ● <i>Bleeding control</i> ● <i>IV cannula with administration of fluids (crystalloids, blood)</i> ● <i>Analgesics</i> ● <i>Oxygen administration</i> ● <i>three sided would dressing</i> ● <i>Airway protection</i>
<i>Abdominal Injury</i>	<ul style="list-style-type: none"> ● <i>Bleeding control</i> ● <i>IV cannula with administration of fluids (crystalloids, blood)</i> ● <i>Wound cleaning and dressing</i> ● <i>Air wary support</i>
<i>Pelvic Injury</i>	<ul style="list-style-type: none"> ● <i>Bleeding control</i> ● <i>IV cannula with administration of fluids (crystalloids, blood)</i> ● <i>Wound cleaning and dressing</i> ● <i>Pelvic stabilization</i>
<i>Lower Extremity</i>	<ul style="list-style-type: none"> ● <i>Bleeding control</i> ● <i>IV cannula with administration of fluids (crystalloids, blood)</i> ● <i>Splinting and stabilization and reduction of fracture site</i> ● <i>Wound cleaning and dressing</i> ● <i>Analgesics</i>
<i>Spinal Injury</i>	<ul style="list-style-type: none"> ● <i>Bleeding control</i> ● <i>IV cannula with administration of fluids (crystalloids, blood)</i> ● <i>Spinal stabilization</i> ● <i>Wound cleaning and dressing</i> ● <i>Analgesics</i>

4.11 Data sources and data collection methods

The study extracted data from secondary data sources of hospital records. Two sets of data collection formats were used. The first format looked at health management information system (HMIS) records and screened out those presenting with RTI and fulfilling triage categories. Identified medical records were given unique identifying number that corresponded to individual medical record numbers. This list was password protected and only accessible to the investigator. Individual patient folders of medical records meeting criteria were retrieved, and data were extracted by also employing assistants using data extraction format attached in Annex I. All data collection work was conducted under close supervision of the investigator.

4.12 Data processing and analysis

The data was collected using open data kit (ODK) data collection tool. Collected data were imported into IBM SPSS version 23.0 for cleaning and analysis. Descriptive analysis was applied to compute frequencies, percentage, mean and standard deviations. Inferential analysis was done in two levels. First chi square test was conducted to test association between categorical variables of interest and clinical outcomes. Followed by bivariate logistic regression and computation of crude and adjusted odds ratio.

During the initial inferential analysis, ordinal logistic regression model was considered due to the ordinal nature of outcome variable. However, the test of parallel lines indicated that the proportional odds assumption was found to be violated. To address this, multinomial logistic regression was considered but this model was also found to be unstable. For this reason, outcome variables were collapsed into dead or alive and bivariate logit analyses was conducted. The models were checked for Omnibus test of model coefficient and Hosmer and Lemeshow test. Two step analysis was done to test predictors – (i) with dead or alive category followed by (ii) disabled and without disability.

Multicollinearity among predictors was tested using Variance Inflation factor (see annex 5). Predictors with high collinearity were removed. Additionally in line with the widely cited rule of at least 10 outcome event per predictor variable (Peduzzi et al 1996) the number of predictors included in the multivariable logistic regression model were limited. Thus, the variables age, sex, arrival times, SBP and comorbidly were included for the final adjusted model.

4.13 Ethical considerations

The study was conducted after obtaining ethical clearance from the research and ethics review committee from CDT-Africa and from the College of Health Sciences, Addis Ababa University as well as from Alert- AHRI research ethical committee. The study involved retrospective review of medical records without direct patient contact. As a result, the need for informed consent was waived. All data were handled confidentially and anonymized to protect patient privacy. The study was conducted in accordance with ethical principles of the *Declaration of Helsinki (World Medical Association, 2013)*

4.14 Dissemination

Finally, the result of the study will be disseminated through defense and presentations at seminars. It will be submitted to Addis Ababa University, Centre for Innovative Drug Development and Therapeutic Trials for Africa (CDT-Africa), ALERT Hospital, Ethiopian Medical Association, and Ethiopian Federal Ministry of Health. Further efforts will be made to publish the findings in national and international journals.

5. Results

A total of 18,408 records of trauma cases were screened. From the total records examined during the study period 2946 (16%) were RTIs. Triage prevalence showed that green, yellow, orange, and red triaged patients accounted for 9.7%, 77.8%, 6.6% and 3.6%, respectively. Looking at the mode of transport used to arrive at the center, 65.9% used either private or public transportation vehicle, 23.6% of patients used ambulance, and 7% arrived walking or being supported or carried by others. Meanwhile 0.3% of were brought by police vehicles. Out of the total RTI patient records 449 severely injured patients were identified and included in the study.

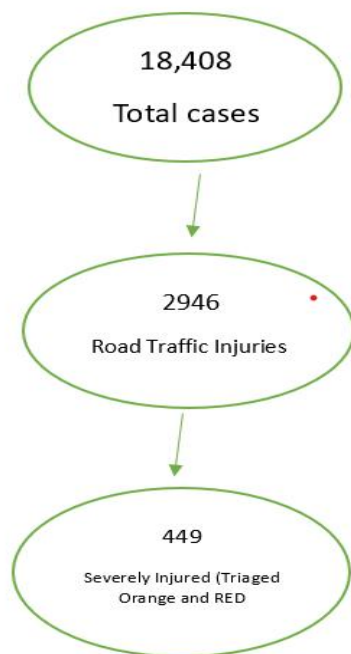


Figure 2 - Sample flow chart

5.1 Demographic and Clinical Characteristics

Out of 449 study participants, the majority were male (70.8%) (Table 2). The median age at presentation was 35 years (Annex 4). Time taken to arrive at the treatment area varied from 20 minutes to 6 days. The largest proportion of RTA patients was pedestrians (56.1%), followed by passengers (24.9%), drivers (12.9%), and the rest were cyclists (4 %). Most patients presented with a GCS score between 13 and 15 (74.4%), indicating mild to no impairment of consciousness. A smaller portion had severe impairment (GCS 3 to 8, 10.5%) or moderate impairment GCS 9 to 12, (13.1%). 9.4% of study participants were reported to have co-morbidity. Half of participants had received prehospital care, mostly from health professionals (95.5% of those receiving prehospital care) with some provided by bystanders (4.5%). Despite receiving care from a health professional, only 20.5% received adequate care. The majority had inadequate (34.2%) or little (45.2%) prehospital care. Among all study participants, 16.5% died, while 39.4% were discharged with disability, and 44.1% were discharged without disability (see table 2).

Table 2- Descriptive characteristics (N=449)

Variable	Category	Frequency (n)	Percent (%)
Sex	Female	131	29.2
	Male	318	70.8
Glasgow Coma Scale (GCS)	Missing	4	0.9
	3–8	47	10.5
	9–12	59	13.1
	13–15	334	74.4
	Not applicable (Dead on arrival)	5	1.1
Comorbidity	Missing	57	12.7
	No	350	78.0
	Yes	42	9.4
Patient Role	Missing	9	2.0
	Cyclist	18	4.0
	Driver	58	12.9
	Passenger	112	24.9
	Pedestrian	252	56.1
Mode of Transport	Ambulance	269	59.9
	Others (Self-walking, carried)	15	3.3
	Police Vehicle	30	6.7
	Private/Transport Vehicle	135	30.1
Pre-Hospital Care	Missing	3	0.7
	No	222	49.4
	Yes	224	49.9
Provider of Pre-Hospital Care	Missing+ No prehospital care	225	50.1
	Health Professional	213	47.4
	Bystander	10	2.2
	No Information	1	0.2
Adequacy of Care	No prehospital care	230	50.1
	Adequate	45	10.0
	Inadequate	75	16.7
	Little	99	22.0
	No Information	5	1.1
Clinical Outcome	Death	74	16.5
	Discharge with disability	177	39.4
	Discharge without disability	198	44.1

Half (n=219; 49.9%) of patients were documented to have received prehospital interventions. Among these patients, 47.9% (n=105) had IV-line securement and fluids administered, 24.2% (n=53) received wound cleaning and dressing, 10.5% (n=23) had bleeding control, 18.3% (n=40) fracture splinting and immobilization, and analgesics were administered for 58.9% (n=129) indicating moderate use of pain management. Less common interventions included spinal administration (7.3%, n=16), oxygen administration (7.3%, n = 16) and pelvic stabilization (0.9%) (See figure 3).

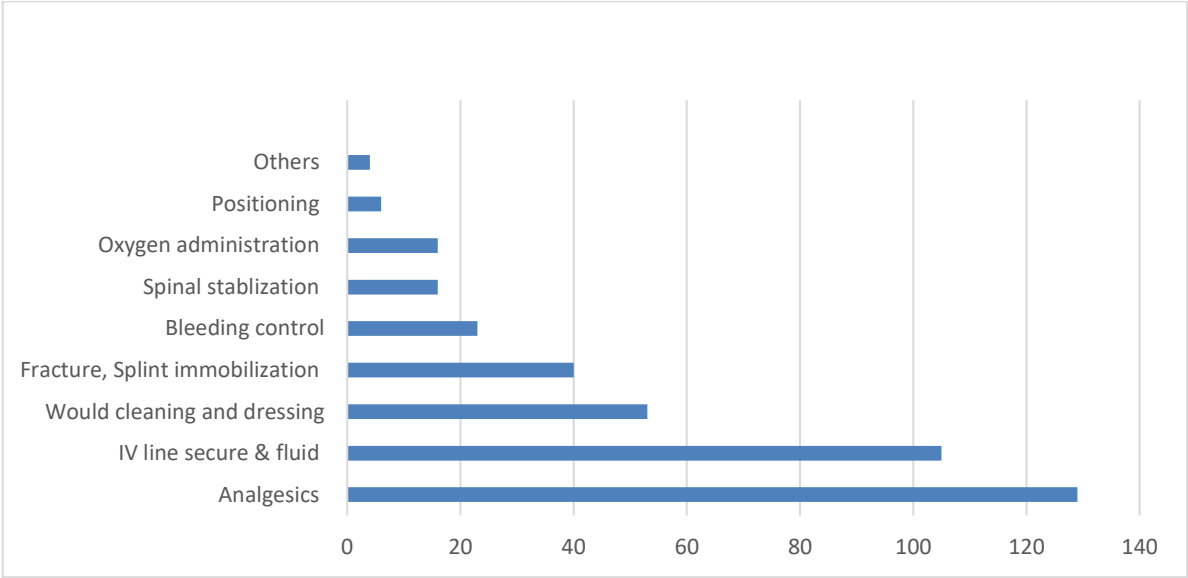


Figure 3- Type of care provided (n=219)

5.2 Factors associated with RTI outcomes

While executing Chi square test for mode of transport, cells with less than 5 observations were identified. Hence, for this stage of analysis mode of transport was recoded as exposed and non-exposed, i.e., exposed observations for those arriving with ambulance and non-exposed for those arriving to the hospital using other modes of transport. The test showed statistical significance between mode of transport and clinical outcome ($p < 0.002$). However, neither adequacy of care ($p = 0.323$) nor the type of prehospital care provider ($p = 0.259$) were associated with clinical outcome (See annex 6).

Table 3 Chi Square result for assessing association between mode of transport and adequacy of care

Variable	Tested variable	Pearsons's square	df	P-value (2 sided)
Mode of Transport (exposed/Non exposed)	Clinical Outcome	12.582	2	0.002
Adequacy of care	Clinical Outcome	6.973	6	0.323
	Prehospital Provider	431.010	2	0.259

5.2.2 Predictors of Death

Bivariate logistic regression analysis showed that mode of transport was significantly associated with the odds of death ($X^2(3) = 13.13, p = 0.004$). Compared with private/public transport, patients transported by other means (self-walking, carried) had seven times higher odds of death (COR= 7.00, 95% CI: 2.22-22.06, $p = 0.001$), while those transported by police had almost three times higher odds of death (COR = 2.91, 95% CI: 1.10 – 7.68, $p = 0.031$). Although patients transported by ambulance had increased odds of death relative to private/public transport, this difference was not statically significant (COR = 1.56, 95% CI: 0.84 – 2.93, $p = 0.161$). (For result summary see table 4, and for all results the regression analysis, see annex 7.1).

Multivariable logistic regression results revealed that predictors of clinical outcomes were age, sex, arrival time, comorbidly and systolic blood pressure. In the adjusted model, mode of transport was found to be significantly associated with the odds of death. Compared to those using private/public transport, patients transported by other means (self-walking, carried) had more than twelve times the odds of death (AOR = 12.26, 95% CI: 2.47-60.89, p = 0.002), while using ambulance or police transport were not significantly different. Increasing age was strongly associated with mortality, with each additional year increasing the odds of death by (AOR = 1.05, 95% CI: 1.03-1.07, p<0.001). Being female was associated with about 0.2 times the odds of death compared to males (AOR = 0.20 95% CI: 0.08 – 0.52, p = 0.001). Higher systolic blood pressure was protective with each unit increase reducing the odds of death by 2% (AOR = 0.98, 95% CI: 0.97- 0.99, p=0.001). Morbidity status and arrival time were not significant associated with mortality. (For result summary see table 4, and for all results of the regression analysis see annex 7.2).

Table 4- Regression result summary for predictor death

	Predictor	Crude Odds ratio for outcome of death (95% CI)	Adjusted Odds Ratio for outcome of death	95% CI		References
				Lower Limit	Upper Limit	
Mode of transport	Self - walking, carried)	COR= 7.00 (2.22, 22.06)	AOR =12.26	2.47	60.89	Private/public transport
	Police	COR= 2.91 (2.47,60.89)	AOR = 0.847	0.156	4.597	Private/public transport
Age (in years)			AOR= 1.05	1.03	1.07	
Female			AOR=0.20	0.08	0.52	Male
Systolic blood pressure on arrival			AOR = 0.98	0.97	0.99	

5.2.3 Predictors of disability in survivors (n=375)

Bivariate logistic regression analysis showed that mode of transport was significantly associated with disability status ($X^2(3) = 12.26, p = 0.007$). Compared with private/public transport users, patients transported by ambulance had more than twice of odds of disability (COR = 2.24, 95% CI: 1.42-3.54, $p=0.001$). Those transported by police also had increased odds of disability (COR=2.23, 95% CI: 0.89-5.59), although this association was not statistically significant ($p=0.088$). The model could not reliably estimate the effect of the other category due to data separation. These findings suggest that ambulance transport is significantly associated with disability among survivors. (For result summary see table 6, for all results of the regression analysis see annex 7.3).

In the adjusted logistic regression model, SBP and mode of transport were significant predictors of disability. Higher SBP was associated with lower odds of disability (OR=0.99, 95% CI: 0.98-1.00, $p = 0.006$). Patients with comorbidities showed nearly twice the odds of disability (OR= 2.30, 95% CI: 0.98-5.38), although this association was marginal ($p= 0.055$). Mode of transport was also significantly associated with disability ($X^2(3) = 11.45, p = 0.010$). In particular, ambulance transport was linked to more than two-fold odds of disability compared with private transport (AOR= 2.36, 95% CI: 1.41-3.94, $p = 0.001$). Transport by police showed a similar trend (AOR=2.68, 95% CI: 0.95-7.55) but did not reach statistical significance. The effect for the other category (self-walking, carried) could not be reliably estimated due to sparse data. Age, sex and arrival time were not significantly associated with disability. (For result summary see table 6, for all results of the regression analysis see annex 7.4).

Table 5 Regression result summary - Disability

	Predictor	Crude Odds ratio for outcome of death (95% CI)	Adjusted Odds Ratio for outcome of death	95% CI		References
				Lower Limit	Upper Limit	
Mode of transport	Self-walking, carried)	COR = 2.24 (1.42, 3.54)	AOR = 2.68	0.95	7.55	Private/public transport
	Police	COR= 2.23 (0.89, 5.59)	AOR = 2.68	1.41	3.94	Private/public transport
SBP			AOR = 0.99	0.98	1.00	
Comorbidity			AOR =2.30	0.98	5.38	No comorbidity

6. Discussion

The percentage of emergency room presentations with RTA during the study period was found to 16%, highlighting the significant burden on the healthcare system in line with other reports from LMICs (WHO, 2018). Young males were the most affected group (70.8%) and median age was 35 years. These findings are consistent with global trends showing young economically active males are vulnerable and are disproportionately affected by RTA (Ambade et al., 2021, WHO,2023). Contributing factors include behavioral risks, hazardous occupation, and high exposure to traffic environments (Nantulya & Reich 2002; Chandran et el.,2010, WHO,2023; Ambade et al., 2021). Pedestrians (56.1%) were the most affected group, followed by passenger (24.9%) and drivers (12.9%). These trends are common in LMICs where pedestrian infrastructure is poor and traffic regulations are inadequately enforced (Peden et al., 2004). This study found wide variation in time to hospital presentation (from 20 min to 6 days) underscoring systematic issues in transport awareness and emergency access, all of which add to poor clinical outcomes (Calvello et al.,2015). Outcomes revealed 16.5% death, 39.4% discharge with disability and 44.1% discharge without disability. These rates are consistent with other trauma center reports and underline the need for timely and effective emergency care (Mock et al., 2004).

Mode of transport emerged as a significant predictor of mortality. Patients arriving with non-conventional, self-walking or being carried, had substantially higher odds of death compared to those transported by private/public vehicle (AOR=12.26, 95% CI: 2.47-60.89, p=0.002). This finding underscores the critical nature of timely and appropriate transport for trauma patients. Delays and absence of basic lifesaving interventions during transport in such cases increases the risk of death, a finding that corroborates previous studies reporting that unorganized transport contributes strongly to adverse outcomes in victims of trauma. (Kobusingye et al., 2005, Mock et al., 2004, Mock et al 2012).

Lack of a well-developed EMS in Ethiopia forces patients to rely severely on bystanders or private transport lacking in emergency training and equipment. As shown in other LMICs, such alternatives often result in delays and inadequate care (Morries et al., 2015; Tran et al., 2019). For instance, Habte et al. (2021) reported high proportion of casualties in Western Ethiopia arriving by means other than ambulances. Societal and cultural barriers, such as fear of blame also hinder timely EMS activation

(Broccoli et al., cited in Trans et al., 2019). This emphasizes the critical need for structured, well-resourced EMS system to reduce mortality and improve outcomes in trauma settings (Kim et al., 2024; Ogebeumida et al., 2024; Sasser et al., 2005).

Ambulance transport was associated with higher odds of mortality in both adjusted and unadjusted analysis though the relationship was not statistically significant. This finding is similar with studies from Ethiopia where arriving using alternative vehicle other than ambulance was found to be linked with better survival (Woyessa et al., 2021). This pattern likely reflects the confounding by injury severity, where more critically injured patients tend to preferentially be transported by ambulance. Other unmeasured confounder could be average time for transporting vehicles, due to limited resources ambulance waiting could be longer. Availability of equipment could also be confounder. Ambulances being equipped with trained personnel and appropriate emergency medical equipment offer organized care during transport which improves stabilization and outcomes (Calvello et al., 2015; Razzak & Kellerman 2002).

Similarly, police transport showed increased unadjusted mortality risk, but the association was diminished in multivariable model. However, the use of police vehicles, which often lack medical staff or equipment, highlights the need for equipping and training all emergency transport providers, including police to function not just as transport services providers but also as care givers during transport (Kobusingye et al., 2005; Morries et al., 2015; Ibrahim et al., 2017).

Levels of disability amongst survivors were high, especially given the young age and lack of medical co-morbidity, highlighting the need for targeted rehabilitation services to address disability among survivors. Among survivors, ambulance transport was associated with increased odds of disability (AOR= 2.36, 95% CI: 1.41-3.94, p= 0.001). Arriving by police vehicle followed similar trend, although statistical significance was not reached, This likely reflects the higher baseline injury severity in this group and is consistent with literature that patients using formal emergency medical services as a result of having sustained more severe injuries (World Bank,2023). It emphasizes the need for strengthened prehospital protocols, including advanced trauma life support and rapid stabilization during ambulance transport to reduce secondary injury and improve long-term outcomes.

Only half of the patients received any form prehospital care reflecting a considerable gap in EMS responsiveness and coverage in Ethiopia – an issue similarly reported across LMICs (Razzak & Kellermann, 2002; Kobusingye et al., 2005). The majority of care was provided by health professionals (95.5%), with minimal involvement from bystanders (4.5%). Though majority of care is being rendered by professionals, only 20% of care was rated as adequate, while 34.2% was considered inadequate and 45.2% were categorized as little or no care. Overall, only 10% received adequate prehospital care. This mirrors challenges reported in other LMICs where professional providers lack adequate training and face resource constraints and protocol gaps that reduce the quality of trauma care during transport (Habte et al., 2021; Khan et al., 2024; Scotland Trauma Network, 2020). Common intervention reported were IV line and fluid administration (47%), analgesics (58.9%) and wound dressing (24.2%). These are core components of trauma resuscitation, indicating that even basic interventions if provided early can enhance patient stabilization.

Low prevalence of adequate prehospital care reflects systemic gaps in EMS in Addis Ababa. While the association between prehospital care adequacy and clinical outcomes were not statistically significant, the finding indicates an urgent need for strengthening prehospital systems including the need for standardization of EMS personnel and community first aid programs. This is consistent with prior studies that demonstrated the life-saving impact of timely prehospital interventions (Peden et al., 2004; Haagsma et al., 2012).

Significant predictors of mortality were age, sex and SBP. Each additional year of age increased the odds of death by 5% (AOR=1.05). Higher SBP, with each unit increase reducing the odds of death by 2% (AOR=0.98). The findings are in line with existing literature, which consistently demonstrates the prognostic importance of physiological status and demographic factors in trauma outcomes (Chalya et al., 2012, Covino et al., 2020; Rothschild et al., 2016; Lee et al., 2014, Kim et al., 2023; Chen et al., 2024).

Females had approximately 80% lower odds of death compared to males (AOR = 0.20). This finding is consistent with trauma literature suggesting physiological and hormonal differences may confer some protection against mortality in females, though further research is required to elucidate these mechanisms fully (Sethuraman et al., Mair et al., 2022, Ambade et al., 2021).

Comorbidity is marginally associated with increased odds of disability (AOR=2.30, p=0.055), suggesting that pre-existing health conditions may influence post trauma functional outcomes. Arrival time and injury severity did not show a statistically significant association with mortality or disability. Mode of transport and initial physiological parameters related to the severity of the injury may have a stronger impact on outcome in this study (Glynn & Edwards, 2025).

6.5 Limitations of study

The study had a number of limitations. Due to retrospective design, the data relied on existing patients records which at times are incomplete or inconsistently documented. Also due to design and reliance on records, important variables such as distance from scene to hospital, equipment availability and death occurring prior to reaching hospital could not be captured. In addition, adequacy of prehospital care was measured from available documentation instead of direct observation of quality of care delivered. As the study was a single facility-based, wider or national generalizability could be restricted.

6.6 Implication of the study

Findings of this study have important implication for trauma care system planning in Ethiopia. This study provides important evidence on the critical role of mode of transport in determining patient outcomes among severely injured RTA patients in Addis Ababa. The finding that patients transported by other means than by private/transport vehicles had significantly higher chance of mortality highlights the urgent need to strengthen formal ambulance services and ensuring timely, properly equipped transport for definitive care. Additionally, the low adequacy of prehospital care delivered though being given by health professionals points to substantial gaps in training, resource availability, and standardized protocols for prehospital care providers, including police and bystanders. Strengthening prehospital emergency systems accordingly has the potential to significantly reduce death and disabilities from RTI. Moreover, the results underscore the need for better documentation and standardized data collection in trauma registries to guide evidence- based decision making. Policy makers should give priorities to investment in emergency transport infrastructure and prehospital care training, particularly in urban centers like Addis Ababa where RTI burden is high.

6.7 Future Areas of study

Future studies need to examine provider and system level factors influencing prehospital care, and assess the training, competencies, and resource availability (health professionals, police, bystanders), ambulance availability, coordination between prehospital providers and receiving facilities and community awareness about emergency transport options.

7. Conclusions and recommendations

7.1 Conclusions

This study examined the impact of prehospital care adequacy and mode of transport on clinical outcomes among severely injured RTA patients presenting to Alert Hospital, Addis Ababa, Ethiopia between 2020 and 2023. Prevalence of RTA was found to 16% of all trauma center presentation. Predominantly affected are young, economically active males. Pedestrians make the most vulnerable group. Half of study patients did not receive prehospital care. Among those who did, only 20% received care rated as adequate even when 95% of prehospital care was provided by health professionals. This highlights the critical gaps in EMS quality and coverage, and may point to gaps in training, resources and standardized protocols which limit the effectiveness of prehospital care.

The findings demonstrated that patients who arrived walking or carried had significantly higher odds of death compared to those arriving by private/public transport showing the critical importance of organized timely and medically supported transport. Ambulance and police transport were associated with higher rates of disability, underscoring the need for both capacity strengthening and improved prehospital protocol to prevent secondary complications. Age, sex and blood pressure came out as other predictors of clinical outcomes.

Overall, the study underscored the urgent need for strengthening Ethiopia's EMS through investments in improving and expanding the ambulance system, workforce training and community engagement. Enhancing both transport and quality of prehospital care have the potential to significantly reduce mortality and disability among severely injured RTA victims.

7.2 Recommendations

Based on the findings of the study, the following recommendations have been made:

For Policymakers (Ministry of Health and other relevant government agencies):

- Develop and implement a national EMS policy that standardizes prehospital protocols and integrates ambulance, police and health services

- Expand well equipped ambulances coverage staffed by trained emergency personnel thereby reducing reliance on informal transport.
- Establish community-based training programs in basic life support and first aid to empower bystanders as effective responders
- Strengthen trauma data systems and routine audits and monitor outcomes and guide evidence-based improvement.

For health professionals and EMS providers

- Prioritize early, basic interventions such as bleeding control, positioning and immobilization to improve adequacy of prehospital care and thereby survival of patients.
- Engage in continuous training, simulations, and adherence to standardized trauma care protocols.
- Collaborate with police, associations or community of drivers, and non-traditional primary care providers to improve coordination and continuity of care
- Ensure systematic documentation of prehospital interventions to strengthen accountability and inform future planning

For researchers

- Investigate barriers to ambulance use and associated factors in relation to prehospital care provision
- Explore system level strategies to improve coordination between prehospital providers and receiving facilities
- Evaluate targeted training and resource interventions for professionals and lay responders.

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Annexes

Annex 1. Data extraction format

This research is being conducted as part of the requirement for MSc Clinical Trials, from CDT- Africa, Addis Ababa University. Titled “*The impact of mode of transport and adequacy of pre- hospital care among Severely injured road traffic accident patients: A study from Alert Hospital Trauma Center, Addis Ababa, Ethiopia*” the study will try to assess relationship clinical outcome of RTA patients with mode of transport, adequacy of prehospital care.

Procedure: The questionnaire contains 18 questions to be filled using medical records. The questions focus on the presentation of the patient, mode of transport used to arrive at the center and type of treatment rendered before arrival.

Benefit: Even Though the study might not have direct benefit to the participants the information gathered might be helpful for policy makers and will aid other researchers to draw baseline information might lead them to direct further investigation on the area. Moreover, it will help me to write up my thesis for the partial fulfillment of a postgraduate degree in Clinical Trials.

Harm: There will not be no direct harm to patients

Confidentiality: Data extracted will be fully confidential as each questionnaire are given an Identification Code that is computer generated and corresponding medical record numbers will be password protected that is only accessible to the investigator.

If you have any questions please contact,

Dr Aklile Habtemariam, Aklilehzt@gmail.com

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Addis Ababa University, CDT-Africa			
Identification Code-			
Code	Questions	Answers	Remark
01	Date and Year of Presentation	-----	
02	Time of Presentation	-----	
03	Source of Referral	A) Health Centre B) Red Cross/Firefighter/ Police C) Self	If health center please specify name and Sub city
04	Age		
05	Sex	A) Male B) Female	
06	Vital Sign at Presentation	A) Pulse _____ B) BP _____	
07	Glasgow Coma Scale (GCS) at presentation	A) 3-8 B) 9-12 C) 13-15 D) Not applicable (dead on arrival)	
08	Does the patient have co-morbidity	A) Yes B) NO	
09	What was the role of the patient?	A) Passenger B) Pedestrian C) Driver D) Cyclist E) Other	if other, please specify here
10	Which part of the body sustained the most severe injury?	A) Head Injury B) Chest Injury C) Abdomen Injury D) Upper Extremity Injury E) Lower Extremity Injury F) Pelvic Injury G) Spinal Injury	

11	Time taken to arrive to trauma center from Scene /referral center, (In minutes/hours)	_____	
12	Mode of transport used to get to trauma center	A) Ambulance (health service) B) Police Vehicle C) Private/ transport Vehicle D) Others (self-walking, carried by bystanders)	
13	Was Prehospital Care Provided?	A) Yes B) NO	if NO, please pass to code 17
14	Who provided the prehospital care?	A) Health Professional B) Police C) Bystander	
15	Please choose the type of care provided	A) IV line secure, administration of fluids/blood/Mannitol B) Wound cleaning and dressing C) Bleeding control D) Fracture splint and immobilization E) Spinal stabilization F) oxygen administration G) Pelvic stabilization H) Three -sided wound dressing I) Airway protection J) Positioning K) Analgesics L) Other,	if Other, please specify here
16	Rate the adequacy of the prehospital care given in relation to the injury sustained	A) Little to none B) Inadequate C) Adequate	
17	What was the clinical outcome of the patient at time of discharge or death	A) Discharge without disability B) Discharge with disability C) Death	
18	Overall time of stay in the hospital for the clinical outcome	-----	

Annex 2. Sample size determination

2.1. Sample size calculations for the variable adequacy of prehospital care

Sample size was determined using the following formula

$$n_{exposed} = \frac{(Z_{\alpha} + Z_{\beta})^2 p (1 - p)(r + 1)}{(d)^2 r}$$

Where: $Z_{\frac{\alpha}{2}} = 1.96$, for 95% confidence interval, $Z_{\beta} = 0.84$ for power of 80%, P = prevalence of outcome, $r = \frac{\text{number of unexposed}}{\text{number exposed}}$, d = magnitude of difference, $RR = 2.5$

Based on reports of Asrat et al (2021), RTA mortality outcome was 9.5% and first aid prevalence was 40%. Thus, r is calculated to be 1.5.

2.1.1. Calculation for magnitude of difference

Since P is weighted average, $p = \frac{P_1 + r(P_o)}{1 + r}$ $d = P_1 - P_o$

Using $RR = \frac{P_1}{P_o}$ we find that $P_1 = (RR)(P_o)$, $P_1 = 2.5P_o$. Substituting this value in the above formula. We obtain

$$0.095 = \frac{2.5P_o + 1.5(P_o)}{1 + 1.5}$$

$$P_o = 0.059375$$

$$P_1 = 0.148438$$

Hence, $d = P_1 - P_o$, $d = 0.089063$

2.1.2. Sample size determination

By using $Z_{\frac{\alpha}{2}} = 1.96$, for 95% confidence interval, $Z_{\beta} = 0.84$ for power of 80%, P = prevalence of outcome, $r = 1.5$, $d = 0.089063$ values. The sample size is determined as such.

$$n_{exposed} = \frac{(Z_{\alpha} + Z_{\beta})^2 p (1 - p)(r + 1)}{(d)^2 r}$$

$$n_{exposed} = \frac{(1.96 + 0.84)^2 0.095(1 - 0.095)(1 + 1.5)}{(0.089063)^2 r}$$

$$r = \frac{\text{number of unexposed}}{\text{number exposed}}, 1.5 = \frac{n_{exposed} = 142}{n_{unexposed} = 213}$$

$$\text{Sample size} = \text{unexposed} + \text{exposed}$$

$$\text{Sample size} = 355$$

Considering 10% incomplete rate each (exposed, non-exposed) groups calculated and added will give us final sample size to be 391

2.2. Sample size determination for the variable mode of transport used

Sample size was determined using the following formula

$$n_{\text{exposed}} = \frac{(Z_{\alpha} + Z_{\beta})^2 p (1 - p)(r + 1)}{(d)^2 r}$$

Where: $Z_{\alpha} = 1.96$, for 95% confidence interval, $Z_{\beta} = 0.84$ for power of 80%, P = prevalence of outcome, $r = \frac{\text{number of unexposed}}{\text{number exposed}}$, d= magnitude of difference, RR = 2.5

Based on reports of Asrat et al (2021), RTA mortality outcome was 9.5% and those arriving by ambulance was 60%. Thus, r is calculated to be 0.67.

2.2.1. Calculation for magnitude of difference

Since P is weighted average, $p = \frac{P_1 + r(P_0)}{1+r}$
 Using $RR = \frac{P_1}{P_0}$ we find that $P_1 = (RR)(P_0)$, $P_1 = 2.5P_0$. Substituting this value in the above formula. We obtain

$$\begin{aligned} 0.095 &= \frac{2.5P_0 + 0.67(P_0)}{1 + 0.67} \\ P_0 &= 0.080015 \\ P_1 &= 0.200025 \end{aligned}$$

Hence, $d = P_1 - P_0$, $d = 0.120015$

2.2.2. Sample size determination

By using $Z_{\alpha} = 1.96$, for 95% confidence interval, $Z_{\beta} = 0.84$ for power of 80%, P = prevalence of outcome, $r = 0.67$, d= 0.089063 values. The sample size is determined as such.

$$n_{\text{exposed}} = \frac{(Z_{\alpha} + Z_{\beta})^2 p (1 - p)(r + 1)}{(d)^2 r}$$

$$n_{\text{exposed}} = \frac{(1.96 + 0.84)^2 0.095(1 - 0.095)(1 + 1.5)}{(0.120015)^2 r}$$

$$n_{\text{exposed}} = 245$$

$$r = \frac{\text{number of unexposed}}{\text{number exposed}}, \quad 0.67 = \frac{\text{number of unexposed}}{245}$$

$$n_{\text{unexposed}} = 164$$

$$\text{Sample size} = \text{unexposed} + \text{exposed}$$

$$\text{Sample size} = 409$$

Considering 10% incomplete rate each (exposed, non-exposed) groups calculated and added will give us the final sample size to be 449.

Annex 3. Modified early warning score

<i>Score</i>	3	2	1	0	1	2	3
<i>Mobility</i>				Walking	With help	with stretcher	
<i>Pulse Rate</i>		≤ 40	41-50	51-100	101-110	111-129	≥130
<i>Respiratory Rate</i>		≤ 8		9-14	15-20	21-29	≥30
<i>SaO2</i>				≥94%	90-94%	≤ 90 (not for CO poisoning)	
<i>Temperature</i>		≤ 35.0		35.2-37.9	≥38		
<i>CNS/AVPU</i>		Confused		Alert	Responds to voice	Responds to Pain	Unresponsi ve
<i>Trauma</i>				NO	Yes		
<i>Pain Score</i>				No pain	1-3/10	4-7/10	≥7/10

RED	ORANGE	YELLOW	GREEN
MEWS ≥ 7 or	MEWS 5-6	MEWS 3-4 or	MEWS 3-4 or
Chest pain		HB-8 or	HB <10
Seizure - current or	Seizure post	Pv Bleeding or	
Hypoglycemia ≤ 2.5mmol (45mg) or		Hematemesis or	
Aggressive patient	Aggressive patient	Hemoptysis	

Black -Dead

Annex 4. Descriptive statistics for age, vital signs, arrival time and hospital stay of sample patients

Variable	N	Minimum	Maximum	Mean	Standard Deviation
Age (years)	448	18	83	35.54	15.67
Pulse Rate (bpm)	446	0	162	90.05	26.28
Systolic Blood Pressure (mmHg)	443	0	230	118.68	31.71
Diastolic Blood Pressure (mmHg)	443	0	168	72.40	21.04
Arrival Time (minutes)	426	20	8640	367.70	869.31
Hospital Stay (in Days)	443	0.02	90.00	6.44	9.53
Valid N (listwise)	404				

Annex 5 – Multicollinearity Test

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13066.440	19	687.707	3.088	<.001 ^b
	Residual	75503.732	339	222.725		
	Total	88570.173	358			

a. Dependent Variable: Age

b. Predictors: (Constant), PHCBystander, PatientRoleDriver, SevereGCS, MOT_PoliceVehicle, Dia BP, PatientRoleCyclist, Arrival Time (in Minutes), PR, MorbidityR, MOTOthers, ModerateGCS, Overall stay in days, PatientRolePassenger, RecodeSex, PHChealthprovider, MOT_Private_transport_vehicle, Sys BP, PatientPedestrian, MildGCS

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	40.736	9.716		4.192	<.001		
	PR	-.048	.035	-.072	-1.380	.168	.935	1.070
	Sys BP	.114	.054	.193	2.114	.035	.303	3.303
	Dia BP	-.057	.079	-.065	-.718	.473	.303	3.302
	RecodeSex	1.490	1.866	.043	.798	.425	.881	1.135
	MildGCS	-.952	7.688	-.026	-.124	.902	.058	17.354
	ModerateGCS	1.184	7.932	.026	.149	.881	.082	12.156
	SevereGCS	-1.634	8.078	-.030	-.202	.840	.117	8.540
	MorbidityR	10.217	2.702	.198	3.781	<.001	.919	1.088
	PatientRolePassenger	-12.460	5.641	-.345	-2.209	.028	.103	9.706
	PatientPedestrian	-7.842	5.521	-.249	-1.420	.156	.082	12.178
	PatientRoleDriver	-14.456	5.834	-.316	-2.478	.014	.155	6.465
	PatientRoleCyclist	-16.121	6.681	-.205	-2.413	.016	.347	2.881
	MOT_Private_transport_vehicle	-.410	1.952	-.012	-.210	.834	.770	1.299
	MOT_PoliceVehicle	-2.067	3.807	-.029	-.543	.588	.854	1.171
	MOTOthers	1.498	4.634	.017	.323	.747	.894	1.119
	Arrival Time (in Minutes)	.000	.001	-.029	-.560	.576	.956	1.046
	Overall stay in days	.207	.087	.126	2.376	.018	.901	1.110
	PHChealthprovider	-3.620	1.761	-.115	-2.055	.041	.801	1.249
	PHCBystander	-2.824	5.572	-.027	-.507	.613	.917	1.090

a. Dependent Variable: Age

Annex 6 - Cross Tabulation Results

6.1. Chi square t test results for Mode of transport and Clinical Outcome.

Crosstab

Count

		Clinica Outcome			Total
		Death	Discharge with disability	Discharge without disability	
Mode of Transport (Exposed/Non-exposed)	Non-exposed	30	54	96	180
	Exposed	44	123	102	269
Total		74	177	198	449

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	12.582 ^a	2	.002
Likelihood Ratio	12.712	2	.002
Linear-by-Linear Association	4.636	1	.031
N of Valid Cases	449		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 29.67.

6.2 Chi Square t test results for Mode of transport and Adequacy of care

Crosstab

Count

		Adequacy2__1234				Total
		Not recieving	Little	Inadequate	Adequate	
Mode of Transport (Exposed /Non- exposed)	Non exposed	129	31	19	1	180
	Exposed	101	68	56	44	269
Total		230	99	75	45	449

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	61.348 ^a	3	<.001
Likelihood Ratio	71.697	3	<.001
Linear-by-Linear Association	58.652	1	<.001
N of Valid Cases	449		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 18.04.

6.3 Chi Square Test for Adequacy of Care with Clinical Outcome

Adequacy of Care with Clinical Outcome

Count

		Clinical Outcome			Total
		Death	Discharge with disability	Discharge without disability	
Adequacy2__1234	None	47	84	99	230
	Little	14	41	44	99
	Inadequate	9	30	36	75
	Adequate	4	22	19	45
Total		74	177	198	449

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.973 ^a	6	.323
Likelihood Ratio	7.181	6	.304
Linear-by-Linear Association	2.087	1	.149
N of Valid Cases	449		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.42.

6.4 Chi Square t test for Type of healthcare provider with Adequacy of care

**Adequacy of care * Type of healthcare provider
Crosstabulation**

Count

		Type of provider		Total
		1.00	2.00	
AdequacyReduced	Little	6	93	99
	Inadequate	4	71	75
	Adequate	0	44	44
Total		10	208	218

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.702 ^a	2	.259
Likelihood Ratio	4.671	2	.097
Linear-by-Linear Association	2.129	1	.144
N of Valid Cases	218		

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is 2.02.

Annex 7. Regression Models

7.1 Bivariate logit regression table - Mode of Transports with Clinical Outcome (Dead or Alive)

Classification Table^{a,b}

Observed	ClinicalBI__by__Death		Predicted		Percentage Correct
			ClinicalBI__by__Death .00	1.00	
Step 0	ClinicalBI__by__Death	.00	375	0	100.0
		1.00	74	0	.0
Overall Percentage					83.5

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)
Step 0 Constant	-1.623	.127	162.772	1	<.001	.197

Variables not in the Equation

	Score	df	Sig.
Step 0 Variables			
Mode of transport	15.022	3	.002
Mode of transport (1)	.008	1	.931
Mode of transport (2)	10.273	1	.001
Mode of transport (3)	2.423	1	.120
Overall Statistics	15.022	3	.002

Omnibus Tests of Model Coefficients

	Chi-square	df	Sig.
Step 1 Step	12.502	3	.006
Block	12.502	3	.006
Model	12.502	3	.006

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	389.408 ^a	.027	.046

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	1	1.000

Contingency Table for Hosmer and Lemeshow Test

		ClinicalBI__by__Death = .00		ClinicalBI__by__Death = 1.00		Total
		Observed	Expected	Observed	Expected	
Step 1	1	120	120.000	15	15.000	135
	2	225	225.000	44	44.000	269
	3	30	30.000	15	15.000	45

Classification Table^a

		Predicted		Percentage Correct
		ClinicalBI__by__Death		
Observed		.00	1.00	
Step 1	ClinicalBI__by__Death .00	375	0	100.0
	1.00	74	0	.0
Overall Percentage				83.5

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	Mode of transport			13.131	3	.004			
	Ambulance (1)	.448	.320	1.960	1	.161	1.564	.836	2.927
	Others (2)	1.946	.586	11.044	1	<.001	7.000	2.222	22.055
	Police (3)	1.068	.495	4.646	1	.031	2.909	1.102	7.682
	Constant	-2.079	.274	57.654	1	<.001	.125		

a. Variable(s) entered on step 1: Mode of transport .

7.2 Adjusted bivariate regression model for models with variables age, sex, arrival time, systolic blood pressure and morbidity

Classification Table^{a,b}

Observed		Predicted		Percentage Correct
		ClinicalBI__by__Death .00	1.00	
Step 0	ClinicalBI__by__Death .00	317	0	100.0
	1.00	52	0	.0
Overall Percentage				85.9

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-1.808	.150	145.972	1	<.001	.164

Variables not in the Equation

		Score	df	Sig.	
Step 0	Variables	Mode of transport	10.952	3	.012
		Mode of transport (1)	1.196	1	.274
		Mode of transport (2)	7.790	1	.005
		Mode of transport (3)	.292	1	.589
		Age	20.640	1	<.001
		SexBi	8.509	1	.004
		MorbidityBi	2.908	1	.088
		Sys BP	5.150	1	.023
		Arrival Time (in Minutes)	.951	1	.329
Overall Statistics		53.818	8	<.001	

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	53.364	8	<.001
	Block	53.364	8	<.001
	Model	53.364	8	<.001

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	246.731 ^a	.135	.242

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	3.832	8	.872

Contingency Table for Hosmer and Lemeshow Test

		ClinicalBI__by__Death = .00		ClinicalBI__by__Death = 1.00		Total
		Observed	Expected	Observed	Expected	
Step 1	1	37	36.489	0	.511	37
	2	36	36.004	1	.996	37
	3	35	35.141	2	1.859	37
	4	35	34.437	2	2.563	37
	5	31	33.745	6	3.255	37
	6	33	32.926	4	4.074	37
	7	33	32.077	4	4.923	37
	8	32	30.588	5	6.412	37
	9	27	27.616	10	9.384	37
	10	18	17.977	18	18.023	36

Classification Table^a

	Observed	ClinicalBI__by__Death	Predicted		Percentage Correct
			.00	1.00	
Step 1	ClinicalBI__by__Death	.00	310	7	97.8
		1.00	43	9	17.3
Overall Percentage					86.4

a. The cut value is .500

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Step 1 ^a			10.290	3	.016			
Mode of transport								
Ambulance (1)	.584	.400	2.128	1	.145	1.793	.818	3.931
Others (2)	2.506	.818	9.397	1	.002	12.261	2.469	60.886
Mode of transport (3)	-.166	.863	.037	1	.847	.847	.156	4.597
Age	.045	.010	19.622	1	<.001	1.046	1.025	1.067
SexBi	-1.623	.492	10.893	1	<.001	.197	.075	.517
MorbidityBi	.803	.481	2.786	1	.095	2.231	.869	5.727
Sys BP	-.018	.005	10.571	1	.001	.982	.972	.993
Arrival Time (in Minutes)	.000	.000	.740	1	.390	1.000	.999	1.000
Constant	-1.668	.764	4.769	1	.029	.189		

a. Variable(s) entered on step 1: Mode of transport , Age , SexBi, MorbidityBi, Sys BP, Arrival Time (in Minutes).

7.3 Bivariate regression for Mode of transport with Disability

Classification Table^{a,b}

Observed		Predicted		Percentage Correct
		ClinicalBI__Disability .00	1.00	
Step 0	ClinicalBI__Disability .00	198	0	100.0
	1.00	177	0	.0
Overall Percentage				52.8

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.112	.103	1.175	1	.278	.894

Variables not in the Equation

		Score	df	Sig.
Step 0	Variables			
	Mode of transport	19.828	3	<.001
	Mode of transport (1)	12.583	1	<.001
	Mode of transport (2)	7.307	1	.007
	Mode of transport (3)	.506	1	.477
Overall Statistics		19.828	3	<.001

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	23.027	3	<.001
	Block	23.027	3	<.001
	Model	23.027	3	<.001

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	495.657 ^a	.060	.079

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	2	1.000

Contingency Table for Hosmer and Lemeshow Test

		ClinicalBI__Disability = .00		ClinicalBI__Disability = 1.00		Total
		Observed	Expected	Observed	Expected	
Step 1	1	8	8.000	0	.000	8
	2	78	78.000	42	42.000	120
	3	10	10.000	12	12.000	22
	4	102	102.000	123	123.000	225

Classification Table^a

	Observed	ClinicalBI__Disability	Predicted		Percentage Correct
			.00	1.00	
Step 1	ClinicalBI__Disability	.00	86	112	43.4
		1.00	42	135	76.3
	Overall Percentage				58.9

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	Mode of transport			12.260	3	.007			
	Ambulance (1)	.806	.234	11.913	1	<.001	2.239	1.417	3.540
	Others (2)	-20.584	14210.361	.000	1	.999	.000	.000	.
	Mode of transport (3)	.801	.469	2.919	1	.088	2.229	.889	5.588
	Constant	-.619	.191	10.462	1	.001	.538		

a. Variable(s) entered on step 1: Mode of transport .

7.4 Adjusted bivariate regression for Mode of transport with Disability

Classification Table^{a,b}

Observed		Predicted		Percentage Correct
		ClinicalBI__Disability .00	1.00	
Step 0	ClinicalBI__Disability .00	167	0	100.0
	1.00	150	0	.0
Overall Percentage				52.7

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.107	.112	.911	1	.340	.898

Variables not in the Equation

		Score	df	Sig.
Step 0	Variables			
	Age	.864	1	.353
	Sys BP	4.645	1	.031
	SexBi	1.383	1	.240
	MorbidityBi	3.409	1	.065
	Arrival Time (in Minutes)	2.717	1	.099
	Mode of transport	18.337	3	<.001
	Mode of transport (1)	11.863	1	<.001
	Mode of transport (2)	6.429	1	.011
Mode of transport (3)	.519	1	.471	
Overall Statistics		31.948	8	<.001

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	35.832	8	<.001
	Block	35.832	8	<.001
	Model	35.832	8	<.001

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	402.711 ^a	.107	.143

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	9.746	8	.283

Contingency Table for Hosmer and Lemeshow Test

		ClinicalBI_Disability = .00		ClinicalBI_Disability = 1.00		Total
		Observed	Expected	Observed	Expected	
Step 1	1	29	26.154	3	5.846	32
	2	23	22.572	9	9.428	32
	3	16	20.044	16	11.956	32
	4	17	18.327	15	13.673	32
	5	13	17.040	19	14.960	32
	6	17	15.637	15	16.363	32
	7	15	14.592	17	17.408	32
	8	18	13.484	14	18.516	32
	9	13	11.598	19	20.402	32
	10	6	7.552	23	21.448	29

Classification Table^a

		Predicted		Percentage Correct
		ClinicalBI_Disability .00	ClinicalBI_Disability 1.00	
Step 1	ClinicalBI_Disability .00	100	67	59.9
	ClinicalBI_Disability 1.00	67	83	55.3
Overall Percentage				57.7

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	Age	.010	.008	1.521	1	.218	1.010	.994	1.027
	Sys BP	-.015	.005	7.554	1	.006	.985	.975	.996
	SexBi	-.281	.261	1.167	1	.280	.755	.453	1.258
	MorbidityBi	.833	.433	3.697	1	.055	2.300	.984	5.378
	Arrival Time (in Minutes)	.000	.000	1.533	1	.216	1.000	1.000	1.000
	Mode of transport			11.450	3	.010			
	Ambulance (1)	.858	.262	10.752	1	.001	2.359	1.412	3.940
	Otheers (2)	-20.507	14981.191	.000	1	.999	.000	.000	.
	Mode of transport (3)	.985	.529	3.473	1	.062	2.678	.950	7.547
	Constant	.733	.676	1.179	1	.278	2.082		

a. Variable(s) entered on step 1: Age , Sys BP, SexBi, MorbidityBi, Arrival Time (in Minutes), Mode of transport .