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COLLEGE OF HEALTH SCIENCES

DEPARTMENT OF EMERGENCY MEDICINE AND CRITICAL CARE

EMERGENCY ROOM MORTALITY PATTERNS AND ASSOCIATED FACTORS AMONG ROAD TRAFFIC CRASH VICTIMS AT ADULT EMERGENCY DEPARTMENT OF TERTIARY LEVEL TRAUMA CENTERS IN ADDIS ABABA ETHIOPIA FROM JANUARY 1st 2016 TO DECEMBER 31st 2017.

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Emergency Room Mortality Patterns and Associated Factors among Road Traffic Crash Victims at Adult Emergency Department of Tertiary Level Trauma Centers in Addis Ababa Ethiopia From January 1st 2016 To December 31st 2017.

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Declaration

First, I declare that this thesis is my genuine work and that all sources of materials used for this thesis have been duly acknowledged. This thesis is submitted in partial fulfillment of requirement for an advanced (MSc.) degree at Addis Ababa University, College of Medicine and Health Sciencesand it can then be deposited at the university, collage of medicine and Health Scienceslibrary for borrowing according to the rule of library. On the other hand, I solely declare that this thesis is not submitted to any other body anywhere for the award of any academic degree, diploma, or certificate at any University or college.

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Abbreviations and Acronyms

AA …… Addis Ababa

AAU…… Addis Ababa University

ANOVA……..… Analysis Of Variance

CHS…… College of Health Sciences

DALYs ……...…… Disability Adjusted Life Years

ED..……..…… Emergency Department

ER …...…….…… Emergency Room

EMS ……..……Emergency Medical Services

ETI ……..... Endo Tracheal Intubation/ted

MVA/C ……....Motor Vehicle Accidents/Collision/Crash

RTA/C…… Road Traffic Accident/Crash/Collision

RTI …… Road Traffic Incident/Injury

TASH …… Tikur Anbessa Specialized Hospital

WHO ……..... World Health Organization

ZMH ……. Zewditu Memorial Hospital

Abstract

Background: Road Traffic Accidents (RTAs) are ever increasing public health hazards worldwide, the most common cause of deaths among all trauma victims and leading cause of deaths in the Emergency room and projected to become the third most important health problem by 2020. Road traffic accidents were the leading cause of permanent disability and mortality among those in productive age in developed countries but currently the developing countries are also faced by a similar challenge as they undergo what has been termed as the "epidemiology of transition".

Objective: the objective of this study is to analyze mortality patterns and associated factors among road traffic crash victims at adult emergency departments of tertiary level trauma centers in Addis Ababa Ethiopia, 2017/8.

Methods: the study was conducted using Hospital based retrospective chart review study design. Data was collected from registration books, patients' charts, records and death certificates by including all traffic crash victims who died in adult ED of tertiary level trauma Centers in Addis Ababa, in the last two years from January 1, 2016 to December 31, 2017 G.C. Collected data was checked for completion and entered to SPSS version 20 then analyzed usingdescriptive statistics, and finallypresented using ratios, percentages, frequencies; tables, charts and graphs.

Results: there were 162 RTA deaths during the study period of which 76 (46.91%) were being treated at ER of Tikur Anbessa specialized hospital while 83(51.2%) victims were affected in the accidents happed out of Addis among which the majority (58, 69.9%) were from Oromia. 79(48.8%) in Addis and The majority of victims, 135(83.33%) were males with a sex ratio of 5:1. The age range of victims was 14 to 76 years with the mean value of 36.84(±16.1) years. The modal age group was 21–30 (61, 37.65%) of the total mortality figure. The majority of victims (97(59.9%)) were Referred from other health facilities while only 7(4.3%) and 25(15.4%) victims were brought by Ambulance& Police Car, respectively.However 80.0% of the victims had presented to ED within 24 hours, only25(15.4%) victims were arrived ED within golden hour. The time from Accident to ED Arrival ranges from 20 minutes to 9 days with the mean of 15.9(±37.4) hours.

Conclusion: Road traffic crash is a significant cause of death for young adults and adolescents in emergency room, affecting more males than females and most fatalities occurring in the young adult age group of 21-30 years. Pedestrians are the most affected road users' category. The first 24 hours after accident in ED is a quite crucial for survival of RTA victims. Early referral for severe RTA victims has a paramount importance. Coordinated pre-hospital and in hospital Emergency Medical Services can reduce RTA mortality figure in Emergency Room by reducing duration of accident before ED arrival and providing early & adequate resuscitation. Increased age, lack of pre-hospital care, delayed presentation,delayed resuscitation measures and multiple referrals are the major contributors to road traffic crash-related mortality in the emergency room.

***Key Words**: road traffic crash, mortality, emergency room, Addis Ababa, Ethiopia*

1. INTRODUCTION

1.1. Background

A Road Traffic Accident/Crash (RTA) can be defined as, an event that occurs on a way or street open to public traffic; resulting in one or more persons being injured or killed, where at least one moving vehicle is involved. Thus RTA is a collision between vehicles; between vehicles and pedestrians; between vehicles and animals; or between vehicles and geographical or architectural obstacles. RTAs are a human tragedy. They involve high human suffering and socioeconomic costs in terms of premature deaths, injuries, and loss of productivity [1-3].

RTA contribute significantly to the burden of disease and mortality throughout the world, particularly in developing countries[4, 5]. It has been predicted that by 2020, it will rank as high as third among causes of Disability Adjusted Life Years (DALYs) lost [6]. Worldwide, it is estimated that, 1.25 million lives lost and more than 50 million injured on the roads each year [7].

RTA is continuing to be an occurrence of epidemic proportions both in the developed and developing countries, statistically it is becoming one of the leading causes of mortality and morbidity with 90% of RTA deaths occurring in low and middle income countries[8, 9]. Formally RTAs were the leading cause of permanent disability and mortality among those in productive age in developed countries but currently the developing countries are also faced by a similar challenge as they undergo what has been termed as the "**epidemiology of transition**"[10].

In sub-Saharan Africa, RTA deaths have grown by 84% since 1990, almost twice the global increase and become the 8^{th} leading cause of deaths and the 10^{th} leading cause of healthy life years lost. The public health burden of RTA exceeds that from tuberculosis and maternal disorders. In contrast, road injuries are the 17^{th} leading cause of death in developed countries even though they have dramatically higher motorization rates [11].

The RTA death rate in sub-Saharan Africa is 27.0 per 100,000 people, which is 40% higher than the global road injury death rate. In Nigeria, RTAs are now the 5^{th} leading cause of death, up from 11^{th} in 1990. Nigeria has the highest RTA death rate (52.4 per 100,000 people) of any country globally. Mozambique has the third highest death rate (46.7 per 100,000). These rates are more than 15 times the death rates in Sweden, UK, and the Netherlands, which have among the lowest death rates globally. These countries have a death rate of approximately 3 per 100,000, 15 times smaller than that of Nigeria and Mozambique.Nigeria, Ethiopia, South Africa and Sudan, together account for half of all RTA fatalities in sub-Saharan Africa. Among top ten countries in the world by RTA death rates, six countries are from this region [11].

RTA is the major public health problem in Ethiopia. In 2010, RTA alone was the 9thcause of premature deaths in the country from 13th in 1990. It has been observed that Ethiopia has the highest rate of RTAs, due to the major transportation system in the country is based on road transport [12, 13].

Though access to pre-hospital services and quick evacuation and transport to hospital can save many lives; the availability and efficiency of an adequate pre-hospital care system in Ethiopia is very limited [14]. There is a phenomenon known as the 'Golden Hour' in trauma care, which is commonly used to characterize the urgent need for the care of trauma patients. This term implies that morbidity and mortality are affected if care is not instituted within the first hour which occurs immediately after injury. Aid during this period has been shown to reduce mortality rates dramatically [15].

The emergency department(ED) of a hospital is an important entry point of critically ill patients. It is often challenging to save valuable lives as it calls for prompt and appropriate initial management. Thus mortality in ED depends upon the infrastructure of the department and the manpower, in addition to certain pre- hospital factors. The quality of care in ED is considered to be an indirect indicator of the standard of healthcare delivery that is given in a health institution [16].

Pattern of death statistics is important scientific information that should be available for constant evaluation of available health services as an integral part of the managerial process in health care delivery to identify future area of improvement as well to reduce in hospital RTA related mortality[17].

However RTA related mortality in ED has certain patterns and associated factors, it is not well documented especially in Ethiopia which initiates to this study.

1.2.Statement of the Problem

Road Traffic deaths in every country are only the tip of the iceberg. For every death, several more are hospitalized and hundreds seek emergency care. Over 3400 people die on the world's roads every day, over 1.24 to 1.5 million dies and more than 50 million injured and need hospitalizations every year. The morbidity as measured by DALYs was estimated to 38 million for the year 2004. Currently, it is the eighth leading cause of death globally and almost 60% of road traffic deaths are among 15–44 years olds who are the reproductive age groups worldwide[3, 14, 18].

RTAs are widely recognized to be a leading health problem for young adults worldwide; among children aged 5-14 years the 3rd leading cause of death globally and the 4th in sub-Saharan Africa; for young adults 15-49 years the 2nd leading cause of death globally and the 5th in sub-Saharan Africa; The 7th leading cause of death for males and 13th for females (18th globally) in sub-Saharan Africa[11].

Worldwide, motor vehicle collisions lead to death and disability as well as financial costs to both society and the individuals involved. “The human suffering for victims and their families of road traffic–related injuries is incalculable. There are endless backlashes: families break up; high counseling costs for the bereaved relatives; no income for a family if a breadwinner is lost; and thousands of money to care for injured and paralyzed people” [3].

RTA is one of the contemporary leading human security threats because it causes the global socioeconomic crisis. As many studies indicated by 2020 it is expected to be the third major killer and largest leading cause of death and disabilities after HIV/AIDS and Tuberculosis (TB), which will replace the current third ranking perinatal disease [3, 14].

Rapid motorization become increasing than ever before in developing countries due to rapid population growth, industrialization and urbanization, and leads to high pressure on the transport network, particularly on road system. This has been resulted to growth rates of RTAs, which in turn, has contributed for the growing number of deaths and injuries negatively affect human lives. This makes deaths and injuries from road accidents are becoming high as compared to other causes of death in developing countries[14, 19].

RTA remains an important public health hazards worldwide[20]. In many low and middle income countries, the burden of traffic related injuries represent between 30% and 86% of all trauma admissions[14]. In Saudi Arabia, for instance, one person is died and four are injured every hour due to traumatic causes among which RTAs account for 80–85% whereas 20% of beds in hospitals under Ministry Of Health (MOH) were occupied by RTA victims, and 81% of deaths in the hospitals were due to RTAs [21, 22].

Furthermore, RTA cost low and middle income countries between 1% and 2% of their gross national product – more than the total development aid received by these countries. Death and injury on the roads in these countries exacerbates poverty by depriving households of the main income earner, and

imposing a heavy burden on health services. The global cost is estimated to be US$ 518 billion per year while Low and middle income countries account for US$ 65 billion, more than they receive in development assistance [18].

In Africa the severity of RTA is higher than rest of the world. According to WHO, Africa has shared the world's highest death rate per population even though data are not correctly reported. This is because many vulnerable road users are involved and the lack of pre-hospital and hospital emergency care after accidents makes the outcome of car accidents in Africa the worst [14, 23].

RTA is becoming a serious threat to the health and well-being of Ethiopians. Ethiopia, according to WHO report, is considered one of the worst countries in the world where road transportation claims and injures a large number of road users every year [24].The incidence of trauma caused by RTA is the highest cause of trauma (47%) in the country [25].

The magnitudes of RTA and case fatality rates were 946 and 80 per 10 000 registered vehicles respectively and account for over a third of all injuries in Ethiopia. In 2007/2008 nearly 19 000 RTA occurred in the country claiming over 2500 lives and property worth US$ 56 million [26]. Hospital based study revealed that, 38.3% of all injured patients presented to ED and almost half of the musculoskeletal injuries were due to RTAs [19, 27].
However preventing RTA related mortality is impossible, reducing mortality is possible by reducing RTA from happening, providing organized pre-hospital and hospital emergency medical services and conducting organized research. Therefore identifying Emergency Room mortality patterns and associated factors among RTA victims in ED is necessary step in reducing RTA related mortality.

There was a great need for organized research that is closely linked toEmergency Room mortality patterns and associated factors related to RTAs. Study on Emergency Room mortality patterns and associated factors among RTA victims at ED are almost non-exist in our local setting (study areas).

Although RTA is being recognized as one of ever increasing public health hazards, its mortality patterns and associated factors in Ethiopian health care setup has not been well documented.

Therefore, the objective of this study is to analyze Emergency Room mortality patterns and associated factors among RTA victims at adult ED of tertiary level trauma Centers in Addis Ababa, Ethiopia,from January 1st, 2016 to December 31st, 2017.

1.3. Significance of the study

There are many reports from different parts of the world, including Ethiopia, addressing different aspects of mortalities as a whole. But study of mortality patterns and associated factors among road traffic crash victims at Adult ED is limited, especially in our country. To the best of investigator's knowledge, there is no published study on pattern of mortalities and associated factors among RTA victims at emergency departments from this country.

The findings of this study will be useful in order to identify future areas of improvement regarding in hospital emergency services delivered to safe invaluable and irreplaceable human life following RTAs.

It is useful for epidemiological monitoring, health planning and monitoring of the ED of respective hospitals, for the city and for the country as well.
It provides important information for emergency professionals regarding time distribution of mortality among RTA victims at ED.

It will also helpful for health monitoring group, for policy makers, for other researchers as base line and for the respective hospitals as well.

Information on RTA and associated factors could help in tuning up the service delivery for RTA victims.

2. LITERATURE REVIEW

Many different studies within and outside Africa evidenced the majority of RTA victims are those at a productive and reproductive age with males being more involved. Both in developing and developed countries, the peak age for road traffic related injury is late teens to early 40s and males are more affected than females[28, 29].

Over 50% of the global mortality due to road traffic injury occurs among young adults aged between 15 and 44 years, and the rates for this age group are higher in low- and middle-income countries [30]. In 2002, males accounted for 73% of all road traffic deaths, with an overall rate almost three times that for females [31].

The findings of many studies well documented that adolescents and young adults are at high risk of traffic injury which has important economic impacts as these are people in their most economically productive years. It also has implications for the design and implementation of more targeted interventions [32]. This group represents the economically active age and portrays an economic lost both to the family and the nation [33].

Analysis of fatal road traffic accidents in a coastal township of South Indiahave revealed that 39% of medico-legal autopsies were due to RTAs and 89.8% of mortuaries due to RTAs were males while most of the male victims belonged to the age group of 20-29 years, the mean age of victims was 38.7 years. Occupants of motorized two wheelers (43%) and pedestrians (33%) were the most common victims of RTAs and the most common offending agents in road traffic accidents were heavy motor vehicles (35.2%) [20].

Similarly, retrospective study of medico-legal autopsies in Fiji showed that 7% of autopsies were due to RTAs while 70.5% of RTA victims were males with a sex ratio of 2.3:1 and 29.4% of the victims were in the age of 30 to 44 years; passengers (51.9%), pedestrians (31.2%) and drivers (15.6%) were affected road users while Head injuries (65.7%), multiple injuries (55.6%), thoracic injuries (54.9%), abdominal injuries (30.3%), vertebral injuries (20.5%) and major vessel injuries (11.7%) were reported injury patterns[34].

Babalola OR., et al., in their study of Pattern of emergency room mortality among road traffic crash victimsat Karlovac General Hospital, Croatia, has shown that Mangled lower extremity, bilateral long bone fractures of lower limbs, pelvic injuries, blunt injuries to the chest and abdomen, and cranial fossae fractures were the common injury pattern identified after RTA related deaths at ED. Meanwhile the mean time between injury and presentation to the first trauma facility was 112.1 (±55.4) minutes, and between ER presentation and death was 410 (±645) minutes. Severe injuries, delayed presentation, multiple referrals and delayed resuscitation were reported to be the major contributors to road traffic crash-related mortality in the emergency room[28].

In Saudi Arabia study done to assess Trauma patterns in patients attending the Emergency Department of Jazan General Hospital, Saudi Arabia, showed that 82.8% of the victims had no pre-hospital

intervention as they were not transported by ambulance while only 6.6% got intravenous fluids, however; the interval between the accident and hospitalization was 41.3(±79.8) minutes and most patients arrived hospital within 30–60 minutes after trauma [21].

Study from Alhabad City, India by Kual A, et al on Fatal Road Traffic Accidents, study of distribution, nature and type of injury has reported that M/F ratio of 3:1 and 33.68% of cases were in the age of 25-44 years. Pedestrians (35.79%) and occupants of motorized two wheelers (30.53%) were most affected road users while 58.52% of accidents were due to Heavy Vehicles and 83.05% of accidents occurred on highways. This study evidenced that the first 24 hours, after accident, as a quite crucial for RTA victims by noting that a great majority of victims had died within 24 hours after accidents [35].

Similarly, medico-legal autopsy study done to assess the pattern of injuries leading to deaths from RTAs in a tertiary care hospital in Puducherry, India, showed: 46.43% of the victims were due to motorcycles, 25.71% were due to Heavy vehicles, 21.43% were due to Light vehicles, 3.57% Self-fall from two-wheeler and 2.86% unknown vehicles whereas 46.43% pedestrians, 40% were motorcycle riders, 7.142% were Cyclists, 5.714% were Pillion riders and 0.714% was unknown victim of road user's category. Head was involved in 93.6% of the victims, Chest (thorax) in 17.85% of cases, abdomen in 7.1%, Lower Limbs in 7.14%, Upper Limb in 10.71% and Spinal injury in 2.85% of cases. Among associated injuries; Abrasion (44.28%), laceration (30.7%), Fractures (18.57%), Crush injury to Abdomen (7.14%), and Crush injury to head (5.71%) were reported injury types whereas 46.43% of the cases died due to cranio-cerebral injuries, 33.57% due to intracranial haemorrhages and 17.14% due to haemorrhage and shock secondary to multiple injuries and 2.86% of the cases died due to Cervical spine injury [36].

Study findings from Australia to identify Differences in risk factors between early and late trauma death after road traffic accidents revealed that 11.2% of the victims died within five days after accidents, and 88.8% subjects survived their first week after accidents however 2.4% of early survivors were involved in late deaths[37].

As it is observed from the study of differences in risk factors between early and late trauma death after RTAs in Australia; Age, GCS and SBP on admission were found to be common risk factors for both early and late trauma deaths [37].

Malaysian study of The Pattern of Death Related to Trauma Cases Presented to The Emergency Department of A Tertiary University Hospital, Malaysia revealed 97.3% of the deceased victims were presented initially with SBP >90 mmHg however 76% of the deceased victims were those presented with GCS <9. However 58.7% of deaths occurred within 48 hours after the admission, the mean time of hospital stay (from admission to death) was 119 (±221) hours. Less than 50% stayed alive beyond 45 hours post admission and less than 10% beyond 11 days[38].

According to a single hospital pilot study done to determine the differences in risk factors between early and late trauma death after RTA at Royal Perth Hospital, Australia: 80.4% of the deceased victims were 12-55 years old; 92.2% had no preexisting medical conditions and exhibited normal physiological parameters on admission; three quarters of victims sustained injuries with a NISS<41 while Major injury of Head (61.3%), Chest (58.0%), Abdomen (21.1%) and Extremity (36.3%) were reported injury patterns[39].

Although all types of road user are at risk of being injured or killed in a road traffic crash, there are notable differences in fatality rates between different road user groups. In particular, the "vulnerable" road users such as pedestrians and two-wheeler users are at greater risk than vehicle occupants and usually bear the greatest burden of injury. This is especially true in low- and middle-income countries, because of the greater variety and intensity of traffic mix and the lack of separation from other road users. Of particular concern is the mix between the slow-moving and vulnerable non-motorized road users, as well as motorcycles, and fast-moving, motorized vehicles [40]

A prospective injury surveillance study in the emergency room of Central Hospital of Yaounde´ Cameroon showed 75% of RTA victims were 15-45 years old with the mean age of 31(±13.6) years, and 73% were male; and 59% of males were 15-45 years-old. Pedestrians (34%), motorcyclists (29%) and automobile occupants (26%) were highly affected among road users; Pedestrians were more likely to be female ($p < 0.001$) and motorcyclists were more likely to be male ($p < 0.001$); 52% were Passengers and 35% were drivers among non-pedestrian victims; the bony pelvis and extremities (44%) and the head, neck and face (30%) were injured body regions whereas 84% of the victims arrived hospital via taxi or private automobile without receiving any pre-hospital care[41].

More recent study done to estimate the demographic, injury pattern and causes of death among RTA victims in Oweri metropolis, Nigeria, 2017, revealed the male to female ratio of 4:1 with mean age of 36.63(±16.07) years while 29.63% of the victims were in the age of 21-30 years, 19.26% were 31-40 years, 17.78% were 41-50 years and 12.6% were 51-60 years. Skull fractures (33.01%), Long bones of the extremities among which fractures of the femur (16.27%), tibia (14.36%), fibula (11.96%) and humerus (11.96%) were the commonest bone fractures recorded[42].

According to study at Kigali University Teaching Hospital, Rwanda, 50.7% of RTA victims were in the age of 16 to 30 years, 7.2% were aged 46 years and above with only 1.9% above 60 years; 78.7% were male with M/F ratio of 3.7:1 whereas 54.7% were wound and contusions, 41.9% were lower limb injuries and 29.4% were head injury however 16.7% of the victims were pedestrians while 30.5% of accidents were due to motorcycles and 40.7% were due to motor cars [29].

The regional distribution of road accident in Ethiopia is not uniform; that is, most of the accidents occur in the central portion of the country including the Oromia Regional State and Addis Ababa where most of the vehicles found and the road network are concentrated [43]**.**

Study conducted to assess magnitude of, trends in and associated factors of road traffic collusion in central Ethiopia, from Akaki to Adama highway, revealed 76.4% of the victims were males among those killed in RTCs while 59.9% were pedestrians, 28.2% were passengers and 12.2% were drivers [44].

According to study done to determine the pattern of injuries and associated variables among patients visiting Emergency Department (ED) due to injury at Tikur Anbessa Hospital, Ethiopia; RTA accounts 38.3% while among injured victims 27.1% presented to ED by taxis, 26.5% by Minibus, 18.4% by Ambulance and 9.3% by Private Cars; 28% of all victims received no treatment before arrival to ED, only 2.5% got first aid at the scene, 19% and 50.2% received medical assistance at health center and 50.2% received medical assistance at district hospitals [19].

Another study conducted to assess the incidence of RTI and associated factors at ED of Tikur Anbessa Hospital, Ethiopia, showed 78.7% of the victims were males with a sex ratio of 3:0.7 and 76% of the victims were in the age of 20-59 years. Pedestrians (71.7%), passengers (13%) and drivers (12.2%) were highly affected road user groups while 35.1% of the victims transported to hospital by minibus. Head, neck, and face (43.5%), lower extremity (25.9%), upper limbs (12.9%), pelvic (11.4%), chest (4.5%), and spinal cord (1.5%) injuries were reported patterns of injury; 74% of victims were urban dwellers[45].

Study done to assess injury characteristics and outcome of RTA victims at Tikur Anbessa Specialized Teaching Hospital, Addis Ababa, Ethiopia, witnessed Pedestrians (62.6%), passengers (24.3%) and drivers (6.5%) were the most affected road user category. However, 86.96 % of the victims arrived hospital within 24 hours of injury, only 27.0 % were arrived within the golden hour whereas none of the patients received pre-hospital care, 22.61% of the victims were transported to ED by ambulance and 3.9% by police car [13].

Further study conducted at Zewditu Memorial Hospital (ZMH) also reported that 69% of the victims were pedestrians while 78% of the accidents were due to an automobile and 88% of pedestrians were dwellers of Addis Ababa; 41% of the victims were referred from a private or public health facility while Lower limbs (36%), Head (20%) and Upper limb (15%) injuries were the major identified injury patterns. About 29% of the victims received pre-hospital care either in an ambulance or at another health care facility however only 14% of the victims arrived ED by ambulance[46].

Furthermore, more recent cross sectional study done to assess magnitude and associated factors of trauma at Arba Minch General Hospital indicated: 47% of trauma victims were due to RTAs while

93.75% of RTA victims were male, 55.36% were in the age of 20-29 years whereas 40% of RTA were due to motor cycle, 33% due to Bajaj related accident and 11.6% due to public bus while 41% of the victims were passengers, 30% were drivers and 25 % were pedestrians [25].

However RTA deaths are being recognized as a major public health problemEmergency Room mortality patterns and associated factors among RTA victims at ED are not studied well in developing countries like Ethiopia. Therefore this study will identify pattern of injury, diagnosis on presentationand main demographic pattern of death and associated factors following RTA in adult ED of tertiary level trauma centers in Addis Ababa, Ethiopiafrom January 1st 2016 to December 31st 2017.

3. OBJECTIVES

3.1. General Objectives

The main objective of this study is to analyze emergency room mortality patterns and associated factors among road traffic crash victims at adult emergency department of tertiary level trauma centers in Addis Ababa Ethiopia from January 1st 2016 to December 31st 2017.

3.2. Specific Objectives:

- ✓ To analyze the pattern of mortality among deceased RTA victims at adult ED,
- ✓ To analyze the pattern of injury among deceased RTAvictims atadult ED,
- ✓ To analyze the time distribution from injury to ED arrival among deceased RTA victims at adult ED,
- ✓ To determine the time distribution from ED arrival to death among deceased RTA victims at adult ED, and
- ✓ To identify common mortality associated factors among deceased RTA victims atadult ED

4. METHODOLOGY

4.1.Study Area and Period

4.1.1. Study Area

The study was conducted in Addis Ababa the capital city of Ethiopia and Africa, with an estimated population of 3.6 million in the city proper and a metro population of more than **4.6** million[47].It has an estimated area of 530 Km2, with altitudes ranging from 2200 to 3000 meter above sea level, average temperature of 22.8°C and average rainfall of 1,180.4 millimeters. Addis Ababa has 49 hospitals (13 public and 28 NGO and private), 29 health centers, 122 health stations, 37 health posts and 382 modern private clinics[48].

There are 13 governmental hospitals among which Amanuel Specialized Psychiatric Hospital and Mahatma Ghandi Memorial Hospital provide specific service that is Psychiatric and Obstetrics and Gynecology cases respectively. The rest eleven hospitals provide general emergency service in their emergency department however Tikur Anbessa Specialized Teaching Hospital(TASH), All African Leprosy Rehabilitation and Training Center (ALERT hospital and Addis Ababa Burn and Emergency Trauma (AaBET) Hospital provide general emergency services and in addition known to be Tertiary Level Trauma centers in the city as well as in the country. Thus they are providing Trauma services not only for Addis Ababa dwellers but also for the whole country by receiving referral cases from respective regions and city administrations.

Thus, study was conducted at three selected referral hospitals in Addis Ababa which serves the country as Tertiary care, provide higher education in different health and related fields including specialty and sub-specialty for many professionals of the country as well as neighborhood countriesand known to be Trauma Centers in the city and in the country as well. Namely: Tikur Anbessa,AaBET and ALERT Hospitals which selected for this study purposely.

4.1.2. Study period

The study was conducted from October 2017 to June 2018. Data was collected from March 19th to April 15th, 2018, retrospectively, from ED admission and discharge registration book, Nurses registration book, mortality records,patient charts and death certificates of RTA victims diedin Emergency Room from January 1st, 2016 to December 31st, 2017.

4.2.Study Design

Hospital based Retrospective chart review method was used to analyze Emergency Room mortality patterns and associated factors among deceased RTAvictims at adult ED of tertiary level trauma Centers in Addis Ababa, Ethiopia, from January 1st, 2016 to December 31st, 2017.

4.3.Source Population

All deaths in the emergency department of selected hospitalsfrom January 1st, 2016 to December 31st, 2017 were the source population for this study.

4.4.Study Population

All RTA deaths in the emergency department of selected hospitals from January 1st, 2016 to December 31st, 2017 were the study population.

4.5.Eligibility Criteria

4.5.1. Inclusion criteria

All patients presented alive to adult Emergency departments of selected hospitals as a result of road traffic accidents and started treatment at emergency department but dead during the course of treatment at the department before transferred to other wards or dischargedfrom January 1st, 2016 to December 31st, 2017.

4.5.2. Exclusion criteria

- ✓ Patients brought dead,
- ✓ Patients died on arrival to the hospital,
- ✓ Patient died due to non-road traffic accident causes,
- ✓ Patients died in different wards other than ED, even if they died due to RTAs and
- ✓ Patients, who had incomplete registration, will be excluded.

4.6.Sample Size determination and Sampling Technique

Initially three hospitals known as Tertiary Level Trauma Centers in Addis Ababa were selected purposely then Convenience sampling technique was used to include all cases of RTA deaths that fulfilled the inclusion criteria.

4.7.Study Variables

4.7.1. Dependent Variables

- ➢ Mortality
- ➢ Length of stay in the hospital ED

4.7.2. Independent variables

- ➢ Age
- ➢ Sex
- ➢ Type of road users
- ➢ Duration of time from accident to ED Arrival
- ➢ Mode of presentation to hospital
- ➢ PreexistingMedical Comorbidity
- ➢ Site of injuries/Body region affected
- ➢ Type of injury sustained
- ➢ Type of ED Intervention

4.8.Data collection procedure

Three teams containing nine data collectors and three supervisors were selected and recruited; one supervisor and three data collectors were formed as a separate group for each respective study areas/selected hospitals (Tikur Anbessa Specialized Teaching Hospital, AaBET Hospital and ALERT Hospital). One day training was given on the tools and techniques of data collections for supervisors and data collectors. Checklist and individual code were used for supervisorsat the end of each Questionnaire to know who filled it and to get clarification if there was any ambiguity during analysis.

4.9. Data collection instruments

Data was collected using structured Check Lists whichwas developed based on study objectives after literature review.

4.10. Data quality management

At the end of each day of data collection, data was checked for completeness, accuracy and consistency. Respective supervisors have conducted onsite close supervisions to clarify any ambiguity and misunderstanding regarding data collection procedures and had provided sound explanations with principal investigator, accordingly. All collected data were manually checked and cleaned before importing to computer for analysis.

4.11. Data Entry, Processing and Analysis

Collected data were enteredto Statistical Packages for Social Sciences [SPSS] version 20 software, coded; then analyzed using descriptive statistics and presented using ratio, percentages, frequencies, tables, charts and graphs. Further, correlation test were done by using Spearman's rho' correlation by setting the significance level

4.12. Ethical Consideration

Ethical clearance was obtained from Addis Ababa University, College of Health Sciences, School Medicine, department of Emergency Medicine Ethical board. An official support letter from the Addis Ababa University, College of Health Sciences School Medicine department of Emergency Medicine was presented to each Hospital's administration offices. Next, approval and authorization to conduct the study was obtained from the medico legal officers and administrative directors of each hospital.

Further approval and authorization was obtained from the emergency services directorates and the record keeping officers of the respective hospitals accordingly after fully explaining the nature and design of the study and confidentiality in this regard is strictly maintained. It was step by step by using official letters from Addis Ababa University, college of health sciences, school of medicine department of emergency medicine and critical care as initial letter.

4.13. Dissemination of the results

The study finding will be presented to Addis Ababa University, College of health sciences, Department of Emergency Medicine and critical care. It will also be disseminated to Addis Ababa University, College of health sciences Library, Addis Ababa City Administration Health Bureau,

respective hospitals where the study was conducted, federal ministry of education, federal ministry of health and to different Organizations that has a contribution in this study and will be submitted to national and international Scientific Journal for possible publication.

4.14. Operational definitions and definition of terms

Bicyclist – a person riding or being carried on any transport vehicle operated solely by pedals.

Co-morbidity – the presence of pre-existing medical conditions including, congestive cardiac failure, diabetes, hypertension, hypertensive heart disease, chronic obstructive pulmonary disease, previous cerebrovascular accident (stroke), chronic renal failure and liver disease.

Death – any patient admitted and started treatment at selected hospitals as a result of road traffic accidents but lost his/her life in the hospital emergency room during the course of treatment before transferred to wards or discharged from the hospital.

Death on arrival (DOA): patients who had no baseline vitals and as a result were excluded from the analysis.

ED deaths are those who arrived alive and had baseline assessment data then died

Exclusion of patients who were brought in dead leaves out a number of patients who may have hadsignificant injuries. However, we were forced to do this because of the difficulty we had with retrieving vital information regarding these patients.

Motorcyclist – a person operating or being carried in a two wheeled mechanically or electrically powered device having one or two riding saddles and sometimes having a third wheel for the support of a side car.

Occupant – a person operating or intending to operate (driver), or a person being carried (passenger) in any mechanically or electrically powered device designed primarily for or being used at the time primarily for conveying persons or goods from one place to another.

Passenger – A person other than the driver travelling in or on a car, truck or bus

Pedestrian – a person involved in an accident that was not at the time of the accident riding in or on any mechanically or electrically powered device.

Poly traumatized patient being defined as a patient sustainedmore than two injury types.

Tertiary Level Trauma Centers: The Ethiopian health system has three tiers of health care: primary, secondary and tertiary. The tertiary health centers are teaching hospitals and Federal Medical Centers; which are similar in function to a Level I trauma center, serve as referral centers for the remaining two tiers. Patients with moderate to severe traumatic injuries needing advanced care (for example, neurosurgical and cardiothoracic) are referred to tertiary healthcare facilities. In theory, only patients with moderate to severe injuries should be taken to such centers, but in reality, almost all trauma patients, the severity of injury notwithstanding; are taken to tertiary hospitals.

Vulnerable road users – are those who are not car occupants but includes pedestrians, cart pushers, motorbike and bicycle riders.

5. Results

Geographical location of the accident

There were a total of 162 cases of road traffic crash-related deaths in the emergency room of Tertiary level Trauma centers in Addis Ababa Ethiopia from January 1st, 2016 to December 31st, 2017 of which 76 (46.91%) were happened at Tikur Anbessa, 48(29.63%) at AaBET and the rest (38(23.46%)) were at ALERT Hospital. Regardingplace of accident 79(48.76%) of total cases were happened in Addis Ababa while 83(51.2%) were injured out of Addis or referred from other regions among which 58(69.9%) were from Oromia National Region. Out of 83 patients referred from other regions 56(67.5%) were presented to Tikur Anbessa Specialized Teaching Hospital this is shown on fig 1.

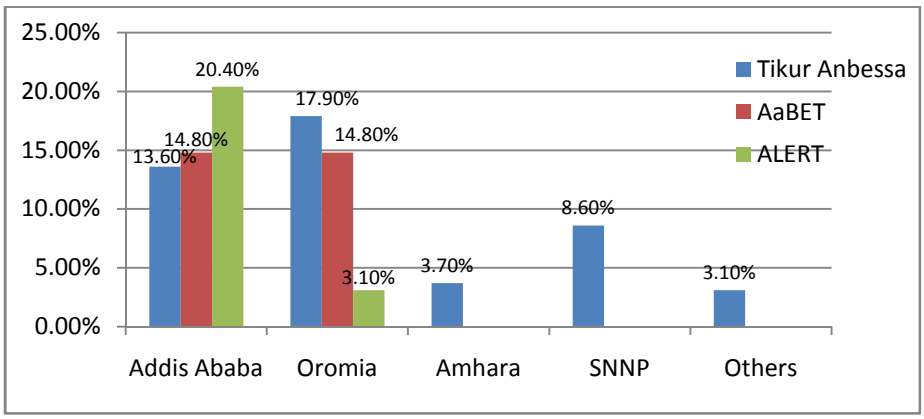

Figure 1Place of Accident with specific Hospitals/Place of Treatment among RTA victims at Tertiary Level Trauma Centers in Addis Ababa, Ethiopia,from January 1st, 2016 to December 31st, 2017.

Socio-demographic Characteristics

Among 162 road traffic-related mortality 135(83.33%) were males with a sex ratio of 5:1. The age range of victims was 14 to 76 years with the mean age of the 36.84±16.098. The age group with the highest rate of mortality was the 21–30 year age group, which constituted 61(37.65%) of the total mortality figure of which 45(27.78%) were males and 16(9.87%) were females constituting the majority of female victims (Table 1).

Table 1 Socio-demographic characters of RTA Victims at Tertiary Level Trauma Centers in Addis Ababa, Ethiopia, from January 1st, 2016 to December 31st, 2017.

		Sex of the Victims MaleFemale		Total
Victims Age	<=20	14 (8.6%)	0	14 (8.6%)
	21-30	45 (27.8%)	16 (9.9%)	61 (37.7%)
	31-40	32 (19.8%)	0	32 (19.8%)
	41-50	8 (4.9%)	2 (1.2%)	10 (6.2%)
	51-60	13 (8.0%)	2 (1.2%)	15 (9.3%)
	61-70	10 (6.2%)	2 (1.2%)	12 (7.4%)
	>70	3 (1.9%)	5 (3.1%)	8 (4.9%)
	Unknown	10 (6.2%)	0	10 (6.2%)
	Total	135 (83.3%)	27 (16.7%)	162 (100.0%)

Pre-hospital Transport/Mod of Arrival

The majority of victims (97, 59.9%) were Referred from other health facilities while only 7(4.3%) were brought by Ambulance, 25(15.4%) were by Police Car, 19(11.75) were by Private Automobile and 14(8.6%) by Taxi.The total duration of time from accident to ED arrival ranges from 20 minutes to 9 days however the average was15.9(±37.4) hours. Although about four fifth (129, 79.6%) of the victims were presented to EDwithin the first 24 hours, only 25(15.4%) were arrived within golden hour while 14(8.6%) were presented after twenty four hours of accidents (fig.2).

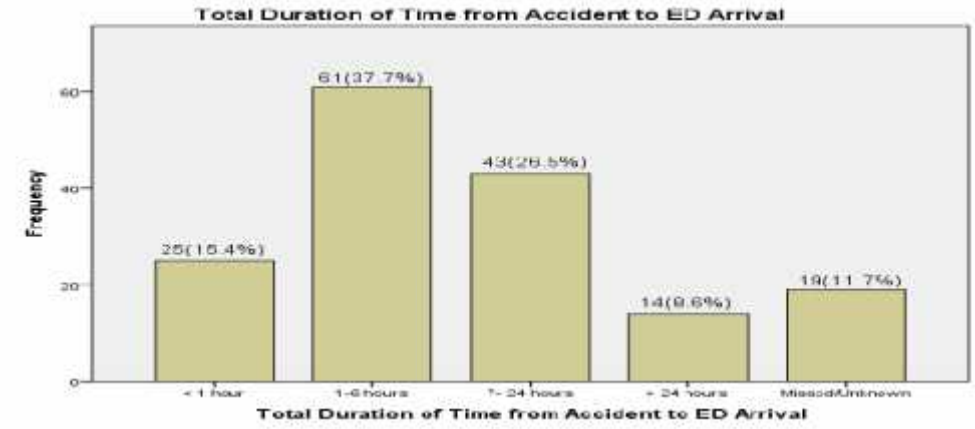

Figure 2 Total Duration of Time from Accident to ED Arrival among RTA victims at ED of Tertiary Level Trauma Centers in Addis Ababa, Ethiopia, from January 1st, 2016 to December 31st, 2017.

Road Users Group

Regarding road user categories more than half (82, 50.6%) of the victims were Pedestrians while 47(29.0%) were Passengers. More than half of femaleswere pedestrians constituting 51.9% and the rest 48.1% of the females were passengers of different vehicles (fig 3).

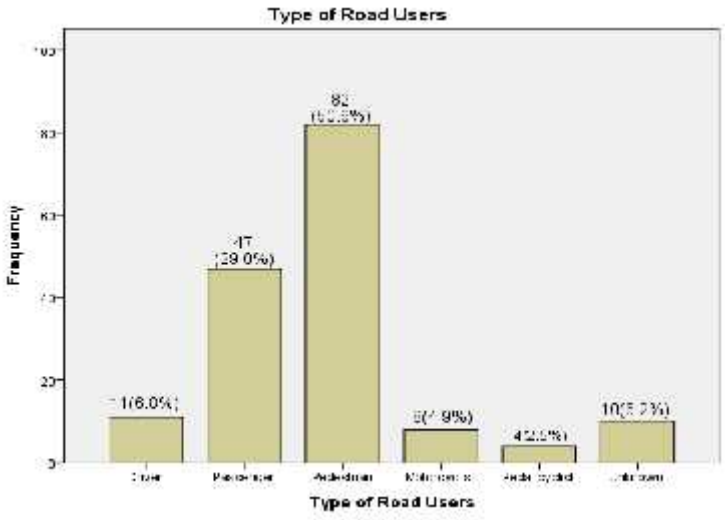

Figure 3 Type of Road Users among RTA victims at Adult ED of Tertiary Level Trauma Centers in Addis Ababa Ethiopia,from January 1st, 2016 to December 31st, 2017.

Physiological Parameters

Regarding Physiological Parameterson ED presentation the majority (93, 57.4%) victims were presented with 10-24 respirations per minute) while 34(21.0%) and 30(18.5%) with <10and>24 Rpm, respectively; and the majority(128,79.0%) of the victims were presented with GCS of less than nine while more than half of the victims, 91(56.2%), had Systolic BP of greater than 89 mmHg.

Vehicle Type

Among different types of vehicles involved in road traffic accident/caused the accident, the majority (66, 40.7%) were due to different types of vehicles including private automobiles, pickups,ambulances and others, nominated in this paper as cars for the analysis purpose only, followed by Minibus (21, 13.0%), Isuzu (19, 11.7%), Bajaj (17,10.5%), Heavy vehicle/Truck (12,7.4%), Bus (10, 6.2%), Motorcycle (5, 3.1%), and Taxi including Ladas and minibuses 2(1.2%))while vehicle type was unknown for 10(6.2%) victims.

Type of Collision or Mechanism of Injury

In review of type of collision or mechanism of injury more than half of the victims (82(50.6%)) were collisions of Motor Vehicles with Pedestrians followed by collisions of Motor Vehicles with each other (19, 11.7%) and Roll Over or Falling of the lone vehicle (29, 17.9%) (Table2).

Table 2Type of Collision/Mechanism of Injury among RTA victims Adult ED of Tertiary Level trauma Centers in Addis Ababa, Ethiopia, from January 1st, 2016 to December 31st, 2017.

Type of Collision/mechanism of injury	Frequency	Percent
Motor Vehicle with each other	19	11.7
Roll Over or Falling of lone vehicle	29	17.9
Motor Vehicle with Motorcycle	3	1.9
Motor Vehicle with Pedestrians	82	50.6
Lone motorcycle (falling from motorcycle)	5	3.1
Falling from vehicle	10	6.2
Motor vehicle with Bicycle	4	2.5
Unknown	10	6.2
Total	162	100.0

Injury Patterns

The common sites of injuries were the head and neck region 150(92.6%), which is followed by Extremities including pelvis 39(24.1%), Chest (thorax) with 31 cases (19.1%), Face with 28 cases (17.3%), Abdomen including pelvic organs with 22 cases (13.6%) and External and/or Spinal cord with 18 cases (11.1%). However a single patient can have more one type of injuries, Laceration was the most common type of injuries sustained (63, 38.9%) followed by Fractures of different body parts (55, 34.0 %), Contusions (53, 32.7%), Hematomas (31, 19.1%), Abrasion (29, 17.9%) and Crush injuries (4, 2.5%).

Table 3showing Type of injury by Body Regions Affected among deceased RTA victims at Tertiary Level trauma Centers in Addis Ababa, Ethiopia, from January 1st, 2016 to December 31st, 2017

Body Regions Affected	Frequency	Percent
Head and Neck	**150**	**92.6**
Face	**28**	**17.3**
Thorax or Chest	**31**	**19.1**
Abdomen including pelvic organs	**22**	**13.6**
Extremities including pelvis	**39**	**24.1**
External or Spinal cord	**18**	**11.1**

In this study the commonest bone fractures were recorded in the extremities accounting 37(22.84%)followed by Fractures of the skull accounted for 14(8.7%) with variable degrees of cerebral involvementand other regions involved in bone fractures were the thoracic region and pelvis. This is shown in Table 4.

Table 4 Type of associated Bone Fractures among RTA victims at Tertiary Level trauma Centers in Addis Ababa, Ethiopia,from January 1st, 2016 to December 31st, 2017.

Type of associated Bone Fractures	Frequency	Percent
Depressed skull Fracture	5	5.9
Basal Skull Fracture	9	10.6
Mandibular/Maxillofacial Fracture	5	5.9
Clavicle Fracture	6	7.1
Rib/s Fracture	11	12.9
Humeral Fracture	1	1.2
Radial/Radio-Ulnar Fracture	7	8.2
Pelvic Fracture	10	11.8
Femoral/femoral Shaft Fracture	13	15.3
Tibial/Tibio-fibular Fracture	6	7.1
Depressed skull Fracture + Basal skull Fracture + Tibio-fibular Fracture	7	8.2
Humeral Fracture + Pelvic Fracture	5	5.9
Total	85	100.0

The majority (69, 42.6%) of the victims were identified with primary diagnosis of isolated Head injury/Head, Neck and Face however 40 (24.7%) victims were primarily diagnosed as two diagnosis among which 18(11.1%) were diagnosed for Head injury + Extremity Fracture, 16(9.9%) for Head injury + Spinal cord injury and 6(3.7%) for Head injury + Chest injury; 38(23.5%) were diagnosed for Multiple Injury/Polly Trauma, 7(4.3%) were for Pelvic fracture while Long bone fractures and Crush injuries each recorded in 3(1.9%) victims and 2(1.2%) were diagnosed for Chest injury. Among 150 victims of Head injuries 116(77.3%) were recorded as Severe and 27(18.0%) were Moderate. Preexisting Medical Comorbidities were recorded in 12 cases (7.4%) all of which had only one (1) type of preexisting medical comorbidity.

The majorities (102, 63.0%) of the victims were treated Medically/generally or they got General/Non operative management only while among other types of ED intervention providedChest Tube Drainagewas the most common however intubation was performed for 88 victims (54.3%) before their death (Table 5).

Table 5 Type of ED intervention given among RTA victims at Tertiary Level trauma Centers in Addis Ababa, Ethiopia, from January 1st, 2016 to December 31st, 2017 (N= 162 but multiple response).

Type of intervention ED given	Frequency	Percent
General/Non operative medical management only	102	63.0
Chest Tube Drainage	29	17.9
Laceration repair	12	7.4
Splint/slab, fracture/dislocation reduction	19	11.7
Intubation	88	54.3
Needle Decompression	8	4.9

Length of stay

The majority of victims (138, 85.1%) died within the first 24 hours of their arrival in the emergency department while 24(14.8%) were survived the first day of their hospital admission among which only 7(4.3%) cases were stayed more than three days or died after 72 hours of their admission all of which happened at Tikur Anbessa Specialized Hospital. The average length of stay in ED before death was about 18.3(±29.06) hours (fig 4&5).

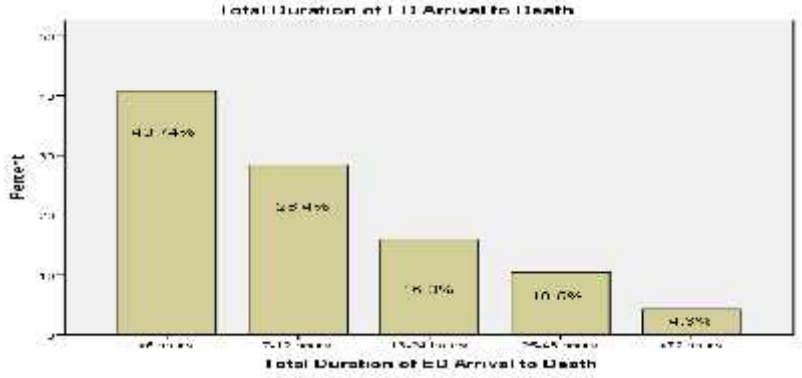

Figure 4 Total Duration of ED Arrival to Death/Length of stay in ED among deceased RTA victims at Tertiary Level Trauma Centers in Addis Ababa Ethiopia, from January 1st, 2016 to December 31st, 2017.

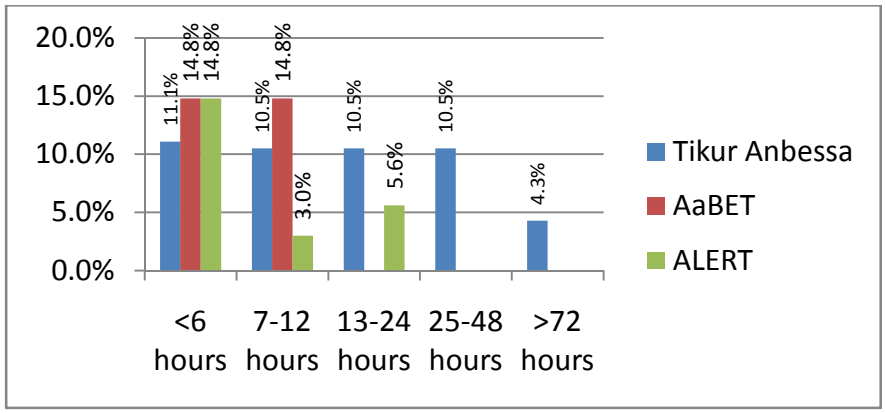

Figure 5 Showing Total Duration of ED Arrival to Death with respective hospitals among RTA victims at Tertiary Level Trauma Centers in Addis Ababa Ethiopia, from January 1st, 2016 to December 31st, 2017.

Correlation Test

Spearman's rho correlation was done to test for significant association/correlation between certain variables. Accordingly Age >55, Respiratory Rate of less than 10 or greater than 24 has significant correlation with Length of Stay ($p<0.01$), Systolic BP on ED admission has significant correlation with Respiratory Rate on ED admission, Primary Diagnosis, Length of Stay, ($p<0.01$), ($p<0.01$); Body Region Affected with Length of Stay ($p<0.05$); Primary Diagnosis with Length of Stayat $p<0.01$;Head Injury Severity with Systolic BP, Respiratory Rate and GCS on Presentation at $p<0.01$.

6. DISCUSION

This study analyzed Emergency Room Mortality Patterns and Associated Factors among Deceased Road Traffic Crash victims at Adult Emergency Department of Tertiary Level Trauma Centers in Addis Ababa Ethiopia from January 1st 2016 to December 31st 2017.

Geographical location of the accident

The finding of this study shows; out of 162 road traffic crash-related deaths in the ED of Tertiary Level Trauma Centers in Addis Ababa Ethiopia, namely Tikur Anbessa, AaBET and ALERT hospitals, during the study period;79(48.8%) victims were affected in the accident happened in Addis Ababa while 83(51.2%) were injured in the accident happened out of Addis among which 58(69.9%) were from Oromia National Regional State, 14 (16.9%) were from SNNP, 6 (7.2%) were from Amhara and 5(6.0%) were from other Regions which is in agreement with study done at Tikur Anbessa Specialized Teaching Hospital, Addis Ababa, Ethiopia, to assess Injury characteristics and outcome of RTAs among victims at Adult EDin which 139 (60.4 %) of accidents occurred in Addis Ababa city while 91 (39.6 %) occurred out of the city [13].

The fact that about 70% of referral cases were from Oromia National Region is that Addis Ababa is totally surrounded by, the center of and also part of Oromia Region which is slightly higher than Seid M. et al [13]. In their study about 39.6% of RTA victims were from out of Addis but in this study it is 51.2% which may be due to differences in method and time.

In current study among all deaths 76(46.9%) were at Tikur Anbessa, 48(29.6%) at AaBET and the rest (38, 23.5%) were at ALERT Hospital. Out of 83 patients referred from other regions 56(46.5%) were presented to Tikur Anbessa Specialized Teaching Hospital.This shows Patients were not equally distributed among those Trauma Centers in Addis Ababa which may lead to overcrowdings of emergency departments of some hospitals while others were not and decreases quality of care, increases work load on professionals.

This may be due to the fact thatTikur Anbessa is old hospital in the country used as referral hospital which currently serves as Tertiary Level Trauma Centers in Addis as well as in the country in line with AaBET and ALERT hospitals. However those hospitals, the latter two, were organized recently and/or transformed to referral hospitals and trauma Centers for the city and the country as well they are not well known at regional level or at district hospitals. That is why the majority of referral cases were sent or presented to Tikur Anbessa Specialized Teaching Hospital. There is no previous study which compares inter institutional RTA mortality among Trauma Centers with place of Accidents.

Socio-demographic Characteristics

In the present study significantly high proportion of males were died in a road traffic accident 135(83.3%) in comparison with female 27(16.7%) giving a male to female ratio of 5.1 ratio. The age range of victims was 14 to 76 years with the mean of 36.84(±16.1)years. Moreover, 119 (78.3%) of

the victim's age group in both sex were in range of 14-55 while only 21.7% were in age group of greater than 45 years.

This is in accordance with Autopsy Study in Nigeria which revealed 80% of the RTA mortuaries were male with a sex ratio of 4:1 with themean age of 36.63(±16.07) years and 29.63% of the victims were in the age of 21-30 years [42]. Study from Arbaminch General Hospital, 2017 also reported 93.75% of RTA victims were male, 55.36% were in the age of 20-29 years [25].

This age group is active, strong, reproductive and economically productive which participate in all types of activities all over the world, this why they are exposed to the accidents.It also has implications for the design and implementation of more targeted interventions.This group represents the economically active age and portrays an economic lost both to the family and the nation.

Pre-hospital transport/Mod of Arrival

In the current study majority 97(59.9%) of victims got Medical Assistances at different health centers and/or district hospitals as they were Referred from other health facilities however only 7(4.3%) were presented/transported to ED by Ambulances, 25(15.4%) were by Police Car, 19(11.75) were by Private Automobile and 14(8.6%) by Taxi, which is in accordance with, study in the emergency room of Central Hospital of Yaounde´ Cameroon in which 84% of the victims arrived hospital via taxi or private automobile without receiving any pre-hospital care[41].

This study revealsmajority of victims (148, 91.4%) were arrived ED within the first 24 hours of accident of which only 25(15.4%) were presented within golden hour; this is in agreement with the study done at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, in which 86.96 % of the victims arrived hospital within 24 hours of injury and only 27.0 % were arrived within the golden hour whereas none of the patients received pre-hospital care, 22.61% of the victims were transported to ED by ambulance and 3.9% by police car [13].

This finding is in line with study done to determine the pattern of injuries and associated variables among patients visiting ED of Tikur Anbessa Hospital, Ethiopia in which 27.1% of the victims presented to ED by taxis, 26.5% by Minibus, 18.4% by Ambulance and 9.3% by Private Cars; 28% of all victims received no treatment before arrival to ED, only 2.5% got first aid at the scene, 19% and 50.2% received medical assistance at Health Center and district Hospitals, respectively [19].

The numbers of victims transported to ED by Ambulance were slightly higher in the above study than in our study (7, 4.3% in our study).This may be attributed to the fact that the previous scholars (Tadesse B, Tekilu S et al. 2014,Seid M, et al. 2015 & Tadesse B, Assefa B et al. 2014) considered all patients' mod of arrival tohospital of their study whether they referred from other health facilities or not however inthis paper the investigator didn't consider the ambulances that used to transport referredpatients rather categorized them as 'Referred' based on the core idea of Pre-hospital Emergency Medical Services which includes Ambulances, Emergency professionals (pre-hospital

emergency service professionals i.e. EMT 1,2,3 …) and the services provided at the scene or on the route to hospital; not solely the vehicle alone.

Physiological parameters upon presentation in ED

In the current study more than half of the victims, 91(56.2%), had Systolic BP of greater than 89 mmHg up presentation to ED however the majority of victims (128, 79.0%) had presented initially with GCS of < 9 which is in line with Malaysian study of Pattern of Death Related to Trauma Cases Presented to ED of A Tertiary University Hospital revealed 97.3% of the deceased Trauma victims were presented to the hospital initially with SBP >90 mmHg however 76% of the deceased victims were those presented with GCS <9[38].

Road user group

Our study found that the majority (82, 50.6%) of victims died in the ED due to RTA were pedestrians followed by occupants of different vehicles (58, 35.8%) of which passengers constituted 47(29.0%) and drivers (11, 6.8%) which is consistent with study done in emergency room of Central Hospital of Yaounde´ Cameroon that revealed Pedestrians (34%), motorcyclists (29%) and automobile occupants (26%) were highly affected among road users [41].

More than half of the female victims were pedestrians in this study constituting 51.9% and the rest 48.1% of the females were passengers/occupant of different vehicles,however statistically not significant, which is in agreement with other studies [13, 45]. Females affected more while walking on road side or crossing the road and contributing to high proportions of pedestrians.

Vehicle type and Mechanism of injury/Type of Collision

Privately owned vehicles used for family transport or business oriented vehicles nominated as Car (in this paper) had important role as a cause of accident in this study. City taxi (including Ladas and minibuses), buses, Bajaj's, long distance travelling minibuses and buses, heavy good vehicles and Isuzu were the vehicle types mainly involved as accident causing vehicles however ambulances were also not free of causing the accidents.

According to the findings of the current study different types of vehicles involved in road traffic accidents among which the majority, 66(40.7%), were due to Cars of different types (including private Automobiles, Pickups and others) followed by Minibus 21(13.0%), Isuzu 19(11.7%), Bajaj 17(10.5%), Heavy vehicle/Truck 12(7.4%), Bus 10(6.2%), Motorcycle 5(3.1%) and city Taxis including Ladas 2(1.2%) however 10(6.2%) victims were injured by unknown type of vehicle which is in contrary with study of medico-legal autopsies of RTAs in south India in which heavy motor vehicles (35.2%) were most common offending agents in road traffic accidents[20].

This finding is in agreement with the study done at Tikur Anbessa Specialized Hospital, Ethiopia in which Long-distance travelling Minibuses (16.5%) were responsible for the majority of road traffic crashes, followed by Taxis, Heavy good vehicles, Long-distance travelling Bus, Isuzu and other means

of transportation (private Automobile, Pickup trucks, Motorcycle and others) in only 0.2% of cases[13].

In our study more than half of the victims (82, 50.6%) were affected in the collision of Motor Vehicles with Pedestrians while 19(11.7%) were in collisions of Vehicles with each other, 29(17.9%) were in Roll Over or Falling of the lone vehicle, 10(6.2%) victims were injured or affected by Falling from moving vehicle, 5(3.1%) falling from moving motorcycle, 4 (2.5%) victims were injured in vehicle collision with Bicycle and 3(1.9%) victims were due to Motor Vehicle with Motorcycle collision however 10(6.2%) victims were affected in unknown collision or mechanism of injury.
This is consistent with study done at Tikur Anbessa Specialized Hospital, Ethiopia which evidenced collision of vehicle with pedestrian (58.7%), rolled vehicle (10.4%), falling from a moving vehicle (18.7%), collisions with other vehicle (7.0%) and other types of collisions (5.2%)[13].

Pattern of injury by body regions and injury types

In current study the most common sites of injuries were the head and neck region 150(92.6%) which is followed by Extremities including pelvis 39(24.1%), Chest (thorax) with 31 cases (19.1%), Face with 28 cases (17.3%), Abdomen including pelvic organs with 22 cases (13.6%) and External and/or Spinal cord injury with 18 cases (11.1%). This is in line with medico-legal autopsy study done to assess the pattern of injuries leading to deaths from RTAs in a tertiary care hospital in Puducherry, India, showed Head was involved in 93.6% of the victims, Chest (thorax) in 17.85% of cases, abdomen in 7.1%, Lower Limbs in 7.14%, Upper Limb in 10.71% and Spinal injury in 2.85% of cases [36].

In the present study Laceration (63, 38.9%) was the most common type of injuries followed by Fractures of different body parts (55, 34.0%) and Contusion (53, 32.7%) while others include Hematoma 31(19.1%), Abrasion 29(17.9%) and Crush injuries to different body parts 4(2.5%) which is in accordance with medico-legal autopsy study done to assess the pattern of injuries leading to deaths from RTAs in a tertiary care hospital in Puducherry, India in which Abrasion (44.28%), laceration (30.7%), Fractures (18.57%), Crush injury to Abdomen (7.14%), and Crush injury to head (5.71%) were associated injury types among deceased RTA victims [36].

Skeletal injuries were a significant mode of mortality in this study as 55(34.0%) had had fractures of different body parts however a single patient can have two or more type of fractures accordingly 37 victims (22.84%) were presented with extremity fractures among which Femoral/femoral Shaft Fracture is accounted 13(8.0%), Radial/Radio-Ulnar Fracture 7(4.3%), Tibial/Tibio-fibular Fracture 6(3.7%) and Humeral Fracture 1(0.6%) were the main types; followed by Fractures of the skull 14(8.7%) with variable degrees of cerebral involvement among which Basal Skull Fracture accounted 9(5.6%) and Depressed skull Fracture accounted 5(3.1%) and other regions involved in bone fractures were the Pelvic bone Fracture 10(6.2%), thoracic region of which Rib/s Fracture accounted 11(6.8%) and Clavicle Fracture accounted 6(3.7%) while 5(3.1%)were Mandibular/Maxillofacial Fracture which is consistent with the study done to estimate the demographic, injury pattern and causes of death

among RTA victims in Oweri metropolis, Nigeria that revealed Skull fractures (33.01%), Long bones of the extremities among which fractures of the femur (16.27%), tibia (14.36%), fibula (11.96%) and humerus (11.96%) were the commonest bone fractures recorded [42].

The majority of the victims (69, 42.6%) were identified with primary diagnosis of isolated Head injuries/Head, Neck and Face however 40 (24.7%) victims were primarily diagnosed as two diagnosis(Head injury + other injury) among which 18(11.1%) were diagnosed for Head injury + Extremity Fracture, 16(9.9%) for Head injury + Spinal cord injury and 6(3.7%) for Head injury + Chest injury; 38(23.5%) were diagnosed for Multiple injuries, 7(4.3%) were for Pelvic fracture while Long bone fractures and Crush injuries each recorded in 3(1.9%) victims and 2(1.2%) were for Chest injury only. This in accordance with other studies [34, 41].

Preexisting Medical Comorbidities

In the current study only 12(7.4%) victims were presented with Preexisting Medical Comorbidities all of which had only one type of preexisting medical condition indicating about 92.6% of the victims had no Preexisting Medical Comorbidities/Chronic diseases and apparently health before the accident which is in accordance with Saudi Arabian study in which of are often as 90.6% of severe trauma victims , which is 92.6% in our study, had no history of chronic diseases [21]. Similarly, according to Australian single hospital pilot study 92.2% (similar finding with current study, 92.6%) of deceased trauma victims had no preexisting medical conditions and exhibited normal physiological parameters on admission [39].

This shows Road Traffic Accident is killing apparently health people making it different from other killer diseases worldwide.

ED Intervention

In the current study the majority (102, 63.0%) of the victims were treated generally or they got only General/Non operative management or Medical treatment only while 60 (37.7%) got general management and other types of treatment among which Chest Tube Drainage was inserted for 29(17.9%) victims, Splint/slab, fracture/dislocation reduction for 19(11.7%) victims, Laceration repair for 12(7.4%) victims and Needle Decompression for 8(4.9%) victims while Intubation was performed for 88(54.3%) victims before their deaths which is in line with study from Ahmedabad city, India in which among ED intervention required, dressing only/dressing & laceration repair (65.3%),Dressing only (38.0%), Laceration repair (27.3%), Splint/slab/fracture/dislocation reduction (24.0%), ICD insertion (2.7%) and crash intubation (10.0%) were performed in the ED[49].

Length of stay

Emergency Medical Services both Pre-hospital and in hospital with other factors can affect the patients' length of stay within the hospital or after the accidents. Thus it can be used as an indicator for quality of care which is greatly differing among different countries in the globe.

In current study Length of stay in ED ranges from couple of minutes to weeks. The majority of victims (112, 69.1%) were died within the first 24 hours of their ED admission, 50 victims (30.8%) were survived the first day of their admission among which only 24(14.8%) were survived the second day/beyond 48 hours in ED and only 7(4.3%) cases were stayed more than three days or died after 72 hours of their admission all of which happened at Tikur Anbessa Specialized Hospital.The average length of stay in ED before death was about 18.3(±29.06) hours.

This is in agreement with Malaysian study which revealed 58.7% of deaths occurred within 48 hours after the admission; the mean time of hospital stay (from admission to death) was 119 (±221) hours; andLess than 50% stayed alive beyond 45 hours post admission and less than 10% beyond 11 days [38].In Croatia, study done to analyze Emergency Room mortality patterns among RTA victims at Karlovac General Hospital, Croatia revealed the mean time between ER presentation and death was 410 (±645) min which is about 6.83(±10.75) hours[28].

The differences seen in length of stay were due to fact that other studies focus on over all RTA deaths in the hospital while result of current study analyzed only RTA deaths in the Emergency room.

7. CONCLUSION

Road traffic crash is a significant cause of ER mortality among adolescents and young adults affecting economically active age group of the population and males are five times greater than femalesin the study location. Though olds (>55) are least affected in number but the mortality is higher. Pedestrian and vehicle passengers are the most vulnerable social groups for road traffic accident and they were injured while crossing and waking on the road side showing the poor awareness of road traffic rules both by drivers and passengers. Private vehicles and/or business oriented vehicles were responsible for the majority of accidents however all types of vehicles were involved. Head and musculoskeletal system were the most commonly injured body parts and lower limb fracture were the leading types of fracture. Age>55, Glasgow coma scale of <9, systolic blood pressure at admission equal or below 89 mmHg, the presence of head were associated with mortality of the victim and these were statically significant at $p<0.01$. The first 24 hours of accident and/or after ED admission is very crucial for RTA victims' survival.Contributing factors to these deaths might include physiological severity, anatomical severity, decreased patient reserve, and lack of pre-hospital care in addition severe injuries, delayed presentation and multiple referrals contribute to this mortality.

8. RECOMMENDATION

Availability of land ambulance services to aid early arrival of victims, better communication between trauma centers and availability of trained and experienced trauma personnel in ED will help to reduce these mortality figures. In addition strong inter facility communication and inter facility transfer or sharing the patients may contribute in reducing Emergency Room mortality.

Nevertheless in hospitals with limited resources including equipment's, ICU beds and drugs, a rapid resuscitation and convenient assessment with early referral of the patient to a tertiary hospital would be of paramount importance.

Government should equip law enforcement agents involved in regulating and monitoring road users to ensure and enforce safe driving and safe crossing. Road networks in the state and country entirely should be repaired, properly maintained, widened and fully equipped with road signs to assist motorists. Driver's license should be issued only to qualified people. Citizens should change their attitudes positively, stop reckless driving, obey traffic codes, stop alcohol or drug intoxication.

Our health facilities should be modernized and fully equipped with emergency gadgets and drugs with adequate manpower to man them. Vehicles that are not road worthy should be stopped from plying the roads which should be cleared of broken down vehicles.

All road traffic accident deaths occurring within twenty four hours of admission in any health center is a coroner's case and all Emergency professionals should aware of this phenomena and should be prepare themselves, provide adequate resuscitative measures timely.

There should be provision of continuous on job training on Emergency Care of RTA victims for all Emergency Professionals.

The government should strength Emergency Departments with modern equipment's; decentralize Trauma Centers throughout the country.

Also a proper national traffic traumatic injury surveillance registry is seriously required to reveal the contributing factors, circumstances and sequence of events leading to the RTA. This will be profitable to strengthen traffic law enforcement, fortify policy making to reduce the road carnage and improve trauma management at the national level in Ethiopia.

9. STRENGTH AND LIMITATION OF THE STUDY

STRENGTH

- To the best of investigator's knowledge this is the first study in the area and gives future direction.

LIMITATION

- Thestudy method used in this paper wasretrospective chart review which cannot cover/provide all necessary information.
- Though all information was taken from the patients charts/records after the patient had died sometimes it was challenging to get full information.
- Lack of Trauma registration Book was another challenging event.
- In general the poor documentation, attachment and handling of the patients' chart were the other major challenge.

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ANNEXES

Annex I: Information Sheet

Name of the investigator Ame Mehadi (BSc, MSc candidate)

Research title Emergency Room Mortality Patterns and Associated Factors among Road Traffic Crash Victims Presented to Adult Emergency Departments of Tertiary Level Trauma Centers in Addis Ababa, Ethiopia

Research objective the aim of this study is to Analyze Pattern of Mortality and Associated Factors among Road Traffic Crash Victims admitted from January 1st, 2016 to December 31st, 2017 to Adult Emergency Department of Tertiary Level Trauma Centers in Addis Ababa, Ethiopia.

Study procedure to achieve the objective of the study, mode of presentation/transportation to the hospital, duration of accidents, time of presentation and patterns of vital signs on arrival will be collected from the triage sheet while socio demographic data, clinical history on presentation, type of injury sustained, length of hospital stay, type of management, time of death and immediate causes of death will be collected from patients' medical records.

Confidentiality the collected information will be used only for research purpose and kept confidential in all possible circumstances. The patients' personal information like name and/or others will not be collected. All records of the study will be secured.

Person to contact if there is any question or assumption or if data collectors, supervisors or other hospital administrative staffs have any question regarding the study they should be free to contact the principal investigator personally or through the following addresses;

Ame Mehadi

Phone: +251(0)92 092 1209 or+251(0)9 19118839

Email: mehadiame1554@gmail.com

Annex II: Hospital consent form English version

This is a study that will be conducted at selected public hospitals in Addis Ababa city which are known to be tertiary level trauma centers. They are Tikur Anbessa Specialized Teaching Hospital, Alert Hospital and AaBET Hospital. The main objective of this study is to Analyze Pattern of Mortality and Associated Factors among Road Traffic Crash Victims admitted from January 1, 2016 to December 31, 2017 to Adult Emergency Department of Tertiary Level Trauma Centers in Addis Ababa, Ethiopia. Studying emergency room mortality patterns and associated risk factors is useful to assess our regional and national improvement in emergency services as well as for the availability of information to help emergency department personnel on the proper management of road traffic accident cases.

Road traffic accidents are ever increasing public health problem and becoming the leading causes of death by claiming thousands of Ethiopians life and making the country high ranked in the world. However, pattern of mortality and associated risk factors at emergency department is not well documented in Ethiopia. Therefore the hospital's participation and collaboration is helpful in generating the required information and will be appreciated.

In this study the patients' medical records will be used to collect necessary data retrospectively. Any personal information of the patients like the name or others will not be collected and information generated will be disclosed in totality. In addition confidentiality of any personal information will be maintained throughout the study process and it will not be allowed for unauthorized access to the information.

Finally, the hospital has all the right to accept or reject the study at any time. If there is any question or further information/elaboration is needed regarding the planned study and to get clarification from the principal investigator or from the institution contact the principal investigator in person or use Telephone 0920921209 (Ame Mehadi, principal investigator). Therefore, if you would like to decide the study will be conducted at your hospital, please confirm it by signing.

The participant Hospital----------Principal Investigator ----------

Annex III: Amharic Version of Hospital Consent Form

የሆስፒታልስምምነትቅጽ

ይህጥናትሚካህደውበአዲስአበበከተማከፍተኛአደጋዚክሚናመዕከልየሆኑትሆስፕታሎችሲሆንየጥናቱዋናአ ለማበመኪናአደጋምክንያትበሆስፕታልየአወቂዲንገተኛናአደጋህክምናክፍልዉስጥየምሞቱትሁኔታናየተገ ናኙነገሮችንመዳሰስነውመጠን፡፡መኪናአደጋቀንበቀንኢየጨመራበመሆኑበቪሆችለምቆጠሩትኢትዮፕያኖች ሂዎትበመቆጨትአገርቱንበአለምላይከፍተኛመክናአደጋከምያስተናግዱሀገሮችመካከልአንዱንበመድረግላይ ይገኛል፡፡

ይጥናትበድነገተኛናአደጋክፍልለምሰሩየጤናባለሙያዎችምበመክናአደጋየምከሰተውሞትንየተመለከታዝር ዝርአይነቱናየተገናኙነገሮችንአስመልክቶመረጃበመስጠትለህክምናመሻልምሆናበአደጋህክምናያለንበትለመ ገመትምይጠቅማል፡፡ከሌሎችሀገሮችአንጻርስታይኢትዮፕያሀገራችንበመክናአደጋቡዙህወትቢታጣም፤የተገ ናኘሞትንአስመልክቶዝርዝርጥናትቡዙምአይገኝም፡፡

ስለሆነምሆስፕታሉየሚያስፈገውየዚህጥናትመረጃዎችንእንድንሰበስብመፍቀድለጥናቱመካናወንከፍትኛየ ሆነአሥተዋጾያበረክታል፡፡ለጥናቱየሚስፈልገውንመረጃየሚሰበስበውከበተኞችየህክምናቻረትላይሲሆንየበሽ ተኛውስምወይምለልችግላዊመረጃዎችአይወሰድም፡፡በተጨማሪምለጥናቱተብሎምሰበሰበውመረጃበሚስጥ ርየሚጠበቅናከጥናቱተመራማሪዎችውጪማንምስውልያግኘውአይችሌም፡፡ይህጥናትበፍቃደኝነትላይየተ መሰረተእንደመሆኑመጠንሆስፒታሉበማንኛውምወቅትጥናቱንመቀበልምሆናአለመቀበልምይችላል፡፡

ከጥናቱጋርበተያያዘጥያቄወይምተጨማሪመብራርያካስፈለገዋናተመራማሪዉንባከልወይምበሚከተለውአ ድራሻጥያቄዎንማቅረብናማብራሪያማግኘትይችላሉ፡፡አሜመሀዲ(ዋናተመራማሪ) ስልክ0920921209በዚህጥናትለመሳተፍሆስፒታሉፍቃደኛከሆነእባክዎበፊርማዎያረጋግጡልን፡፡እናመሰ ግናለን

ተሳታፊውሆስፒታል-.....ዋናተመራማሪ.....

Annex IV: Checklist for Data Collections

ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF MEDICINE

DEPARTMENT OF EMERGENCY MEDICINE

THIS CHECK LISTS ARE DESIGNED TO COLLECT NECESSARY INFORMATION FOR MORTALITY PATTERNS AND ASSOCIATED FACTORS AMONG ROAD TRAFFIC CRASH VICTIMS AT EMERGENGENCY DEPARTMENTS OF TERTIARY LEVEL TRAUMA CENTRES IN ADDIS ABABA, ETHIOPIA

ADDIS ABABA UNIVERSITY

1. Hospital: **1**. TASH 2. AaBET 3. ALERT
2. Age _____
3. **Sex:** 1. Male 2. Female
4. Place of Accident:
    1. Addis Ababa
    2. Oromia
    3. Amhara
    4. SNNP
    5. Others(specify) _____
    6. Unknown
5. Mod of arrival to ED/Pre hospital transport by;
    1. Ambulance
    2. Police Car
    3. Private Automobile
    4. Taxi
    5. Carried by people
    6. Walking
    7. Referred from other health facility (specify) _____
    8. Others (specify)_____
    9. Unknown
6. Duration of Accident/Total time before ED Arrival _____/minutes/hrs/days
7. Pattern of Vital Signs on Arrival in the ED:
    1. Syst BP _____
    2. PR/HR_____
    3. RR _____
    4. GCS _____
8. Type of road users/Role of the victim during the Accident
    1. Rider/Driver
    2. Passenger
    3. Pedestrian
    4. Motorcyclist
    5. Pedal Cyclists
    6. Pillion rider
    7. Other (Specify) _____
    8. Unknown
9. Type of vehicle involved/caused the accident:
    1. Car
    2. Isuzu
    3. Minibus
    4. Bus
    5. Taxi
    6. Bajaj
    7. Motorcycle
    8. Truck/Heavy Vehicle
    9. Private Automobile
    10. Other (specify) _____
    11. Unknown

10. Type of collision (Mechanism of injury)
    1. MV-MV
    2. MV-MC
    3. MC-MC
    4. MV–Bajaj
    5. MC–Pedestrian
    6. Single MC(falling from)
    7. Falling from MV
    8. MC-Bicycle
    9. MV-Bicycle
    10. Roll Over
    11. Falling of MV
    12. MV–Pedestrian
    13. Other(Specify) _____
    14. Unknown
11. Body region affected/involved:
    1. Head, Neck & Face
    2. Chest & Thorax
    3. Abdomen (including Pelvic organs)
    4. Extremities (including Pelvis)
    5. Back including Spinal Cord
    6. Other (Specify) _____
    7. Unknown
12. Injury description:
    1. Hematoma
    2. Laceration
    3. Contusion
    4. Abrasion
    5. Avulsion
    6. Crash
    7. Other(specify) _____
    8. Unknown
13. Primary Dx
    1. HI/Head, Neck & Face
    2. Pelvic #
    3. Abdominal injuries
    4. SCI
    5. Chest injury
    6. Hemopneumothorax
    7. Pneumothorax
    8. Crush injuries
    9. Polly Trauma/Multiple injuries
    10. Other(specify) _____
14. If a fracture what type?
    1. Depressed skull #
    2. Basal Skull #
    3. Mandibular/Maxillofacial #
    4. Clavicular #
    5. Rib #
    6. Humeral #
    7. Radial/Radio-Ulnar #
    8. Pelvic #
    9. Femoral/femoral Shaft #
    10. Tibial/Tibio-fibular #
    11. Other(specify) _____
15. If head injury state severity: 1. Severe 2. Moderate 3. Mild
16. Types of Treatment/ED intervention given:
    1. General non operative mgt only
    2. General+Laceration repair
    3. General+Splint/slab, #/dislocation reduction
    4. General+Tracheostomy
    5. General+Chest tube drainage
    6. General+Needle Decompression
    7. Other (Specify) _____

17. Endotracheal Tube/Intubation status: 1. Intubated 2. Not intubated 3. Unknown
18. Presence of PMC: 1. None (0) 2. One (1) 3. Two or more (≥2)
19. Length of stay _____Minutes/hours/days
20. Immediate cause of death:
    1. MOF
    2. Respiratory Arrest
    3. Cardiorespiratory Arrest
    4. Arrhythmias
    5. Fat Embolism
    6. DVT/PE
    7. Cardiac Arrest
    8. Hemorrhagic Shock
    9. Septic shock
    10. Severe TBI
    11. Crash injury
    12. Brain Herniation
    13. Other (specify)_____
    14. Unknown
21. ISS _____RTS _____TRISS _____

Data Collectors and supervisors Check List

1. Data collector's Name: _____

   Code: _____Signature: _____

2. Supervisor's Name: _____

   Code:_____ Signature:_____

Date: _____**Code: _____**

Annex V: ASSURANCE FORM

I, the undersigned, assert that this MSc. thesis is my original work, has not been presented for a degree in any other university and that all sources of materials used for the thesis have been cited and acknowledged accordingly.

MSc candidate: Ame Mehadi (BSc)

Signature: _____ Date_____

Advisors:

1. Sofia Kebede (MD, ER Physician)

   Signature: _____ Date _____

2. Achamyelesh Tadele (BSc, MSc)

   Signature: _____ Date _____