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DEPARTMENT OF EMERGENCY MEDICINE

Road Traffic Accident related Fatalities in Addis Ababa City, Ethiopia:

An Analysis of Police Report 2013/14

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List of Acronyms

AATPD	Addis Ababa Traffic Police Department
DALYs	Disability – Adjusted Life - Years
EDHS	Ethiopian Demographic and Health Survey
EMCCN	Emergency Medicine and Critical Care Nursing
EMTC	Emergency Medicine Training Center
HIC	High Income Countries
LMIC	Low and Middle Income Countries
RTA	Road Traffic Accident
SPSS	Statistical Package for Social Sciences
WHO	World Health Organization

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Road Traffic Accident related Fatalities in Addis Ababa City, Addis Ababa, Ethiopia: An Analysis of Police Report 2013/14

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Abstract

Introductions *Road transportation provides benefits both to nations and to individuals by facilitating the movement of goods and people. It enables increased access for daily living and programs on the country at large. But these increased in access and number of transportation pose a great challenge in the individuals daily activity ranging from minor injury to death and the nation also suffers from lose of productive citizens and economic shift to preventable health activities*

Objectives *The general objective of the study is to assess the magnitude of and factors contributing to the Mortality related to Road Traffic Accidents in `Addis Ababa, Ethiopia from September 2013 to August 2014*.

Methodology *Data from the Addis Ababa Police Commission; Traffic Police Department was collected from the checklist used to collect information by the police officer at the scene and the logbook and entered to SPSS version 16.00 and description was performed. Finally the result was generated from the SPSS and will be presented to the department of emergency medicine and on the professional association's conference. Dissemination of the result will be made available to concerned bodies (Addis Ababa Traffic Police Department, Federal Ministry of Health Ethiopia and Federal Ministry of Transport and respected Addis Ababa Offices (Transport, Health, Traffic Police).*

Result *Overall, there were 2372 recorded road traffic accidents (excluding accidents with only property damage) in addis ababa during 2006(2013/14). Of these, 382(16.1%) were fatal. Among all fatalities majority were male 279(73.03%), Male/Female- 3:1 and pedestrians 321(84.0%). Fatal accidents were more prevalent on isled roads 262(60.7%) and involved especially commercial cars. More than half of fatalities 205(53.8%) occurred due to failure to give a way for pedestrians.*

Conclusion *Majority of affected were vulnerable road users among which pedestrians were predominant and affected while crossing the road outside the zebra cross and responsible parties were driving commercial cars and vast majority of victims died at the scene instantaneously which needs policy on pedestrian safety and education on behavioral change. These findings can serve as a basis for health care professionals and policymakers to create preventive measures for traffic accidents.*

Key words: *Road traffic Accident, Mortality, Addis Ababa, Ethiopia*

1. INTRODUCTION

1.1. Background

Road transportation provides benefits both to nations and to individuals by facilitating the movement of goods and people. It enables increased access to jobs, economic markets, education, recreation and health, which in turn has direct and indirect positive impacts on the health of populations However, the increase in road transportation, has also placed a considerable burden on people's health – in the form of road traffic injuries, and the health consequences that ensue from a reduction in physical activity. There are additional negative economic, social and environmental consequences that arise from the movement of people goods on the roads – such as air pollution, greenhouse gas emissions, consumption of finite resources, community severance, and noise.

Road traffic accidents (RTA) are a major public health problem worldwide, accounting for almost 1.24 million deaths per year and it is a number one cause for the death among those aged 15-29 years. Men are more affected more than females (M: F - 3:1) according to the WHO report on 2013, Although middle income countries only have half of the world's vehicles, they have 80% of RTA related deaths, unlike the high income countries which have RTA related death rates of 8.7 per 100,000 population middle and low income countries have a higher rates 20.1 and 18.3 respectively. Among these all deaths fifty percent of all RTA related deaths are among pedestrians (22%), cyclists (5%) and motorcyclists (23%)(1). WHO calculated the risk of dying in a road traffic crash by continent and Africa is the leading with the chance of 24.1 followed by eastern Mediterranean (21.3) residing in Europe is being the safest (10.3).
Even though the numbers shows the large prevalence rate in RTA in developing countries specifically in Africa (Including Ethiopia) (2, 3) the issue is still under reported and neglected area to be studied and interventions are needed urgently.

With economic growth, especially in low and middle-income countries, more vehicles are on the roads making daily transportation more complex and dangerous. Road Traffic Injuries (RTIs) constitute a major public health challenge killing thousands of people prematurely every day, representing the leading cause of death for young people.

Additionally, it is expected that these numbers will increase by about 65% over the next 20 years. Road traffic injuries have been the leading cause of permanent disability and mortality among those aged 10 to 50 year in developed countries, the same picture is unfolding in developing countries as they undergo what has been termed the "epidemiology of transition". In many developing countries, not only is the incidence of various injuries increasing but also the causative factors are changing from the historical patterns such as falling from trees to injuries due to occupational hazards, interpersonal violence and road traffic injuries, which appear to be the leading cause of traumatic injuries. Young age, high speed, and alcohol are predictors of fatal road traffic accidents.

1.2. Statement of the Problem

Addis Ababa is the capital city of Ethiopia with an area of 527 km^2 and a total population of more than 3 Million. It has 10 sub- cities, among these kolfe keranio (546,219) being most populated followed by Nefas Silik Lafto (335,740) and Bole (328,900). The health service coverage of Addis Ababa is 71%. There are 5 hospital, 24 health centers, 32 health posts & more than 500 private health institutions providing health services. Addis Ababa has the status of both a city and a state. It is where the African Union and its predecessor the OAU are based. It also hosts the headquarters of the United Nations Economic Commission for Africa (UNECA) and numerous other continental and international organizations. Addis Ababa is therefore often referred to as "The Political Capital of Africa" due to its historical, diplomatic and political significance for the continent(4, 5).

Road traffic accidents which are generally unintended and preventable are a common risk every day to life that can happen to almost every one(1), anywhere. Data from WHO shows the risk of dying from RTA is high in Africa 24.1 per 100,000 (6) making it challenging in line with struggling to overcome the burden of infectious diseases and increasing number of non – communicable diseases. The alarming increase in morbidity and mortality owing to road traffic accidents over the past few decades is a matter of great concern globally(1).

The issue of road safety has already become critical in Ethiopia- a country with low rate of motorization. The number of people killed and injured as a result of traffic accidents has

been steadily increasing and the country is experiencing a tremendous loss of life and property each year as one of the leading countries of the world with worst accident record. Recent studies (Abegaz et al...) reported an average of 1.2 deaths per every fatal crashes on Addis Ababa – Adama/Hawassa main road(7)

Even though The WHO and the Traffic Police Department of Addis Ababa has been working since 2002 to strengthen its road traffic injury data management capacity, the reports indicate that The trend of accident is not in a state of declining; but rather has continued to rise enormously(1). And In addition in 2006, WHO started working with the National Road Safety Coordination Office of Ethiopia, a key partner, by the development of an easy-to-use data collection form; a computer-based data analysis system; training the traffic police officers on data management; developing a resource centre; and promoting collaboration among key stakeholders in road traffic safety. In September 2007 the country has revised it is traffic road safety (enforcement law) and updated. This improved road safety policy include the new road safety laws (prohibition of cell phone conversation while behind the wheel, driving without using a seat belt and not using motorcycle helmet) and the amendment of the existing road safety laws (excessive speeding, impaired driving with alcohol and Khat and unsafe loading/unloading) by introducing higher penalty rate including suspension of the drivers' license. Seat belt wearing, helmet use and phoning while driving were enforced by using a roadside random check up on a regular bases; however speed and alcohol were not well enforced due to lack of radar and breath analyzer.(7)
As a whole the country has started to cover the emergency medical system specially the program is being implemented since 2010 with Federal Fire and Emergency Authority and Addis Ababa University.

1.3. Significance of the Study

Road transportation and roads are the main veins of the nations and its people by providing access to their need in day to day life, however, these expansions of roads and availability of many vehicles makes the traffic movement more dangerous with the congested pedestrians. Specially in addis ababa since the it is the fastest growing city, and most heavily motorized urban area in the country (main economic center for the country) and

political center for the continent with the growing up of the population it is worthwhile to consider this research to develop the policy and strategies in line with the city's development Even though WHO and the traffic police department of Addis Ababa has implemented the new data collection tool to be used at the scene it is of importance to the purpose of medico legal purpose and the Emergency medical system has been established under the Fire and Emergency Department as well as the city has updated the existing road safety measures and added new variables it is not yet known the city's road traffic accident; thus, it is important to conduct this research to evaluate the prevalence, trend and the different level of injuries and deaths thereby to standardize our transport policy as well as emergency medical system in Addis Ababa and in the country at large. However, to the best of the investigator's knowledge, in spite of the fact that the vehicle density of Ethiopia is still below the standard, reports showed alarming number of accidents. Moreover, there is no single evidence in the study area in particular.

Therefore, the current study is immensely important to highlight important predictors of mortality in the roads of Addis Ababa as well as to recommend possible road safety mechanisms congruent to the context of the study area. Moreover, it will contribute its own share for policy development as needed, and accordingly, other researchers can use it as a baseline evidence for further studies.

2. Literature Review

Road Traffic Injury is of significant importance to deal with. Globally WHO reported on 2013 Road traffic accidents (RTA) are a major public health problem worldwide, accounting for almost 1.24 million deaths per year and it is a number one cause for the death among those aged 15-29 years. Men are more affected more than females, although low and middle income countries (LMIC) only have half of the world's vehicles, they have 80% of RTA related deaths, unlike the high income countries which have RTA related death rates of 8.7 per 100,000 population middle and low income countries have higher rates 20.1 and 18.3 respectively. Among these all deaths fifty percent of all RTA related deaths are among pedestrians (22%), cyclists (5%) and motorcyclists (23%). WHO calculated the risk of dying in a road traffic crash by continent and Africa is the leading a chance of 24.1 followed by eastern Mediterranean (21.3) residing in Europe is being the safest with the chance of 10.3).(6) The road traffic accident has significant impact on the global population being the 9th leading cause of death in 2004 and WHO projected it would be the fifth leading cause of death in 2030. Data found from WHO report 2009 indicates the road traffic accident is the leading cause of death among people aged 5 – 44 which has a greater impact on the global economy and health of the population.(1)

Ampanozi G, Benos A et al analyzed fatal motor vehicle collisions in Macedonia, Greece, the country ranked seventh highest position in road crash fatalities among 38 countries in Europe, and found that 266(85.26%) of the total were males and almost 60% of fatalities were among drivers followed by 22.76% Passengers and 18.59% pedestrians, 49% of the pedestrian victims were aged over 65 years, followed by people under the category of 35-44 years. Consumption of alcohol was responsible cause for 87(28%) fatality cases(8).this finding is the same with the data found in the study conducted in New York City, by (L Nicaj et al, 2006) in which pedestrians aged above 65 years (48%) and female were victims in the largest developed countries and most fatalities occur in day time and weekdays.(9). Lankarani et al showed the same result in Shiraz Iran(10), another study in Iran the trend shows increasing and male to female ratio is 4:1(11) WHO reported in 2009 in USA Majority of road traffic crash victims were Drivers 62%, then passengers (26%) and the least were pedestrians which account 12% of the total RTDs(12) in the contrary most

fatalities in the road happened in the LMIC are during night time; weekend and holidays.(13-15) Unlike USA the one among high income countries, China, which also is the leading populated country, has high mortality of pedestrians16683 (24.6%) and passengers 24.1%, the rest were motorcyclists (22.0%) may be attributed to the number of highly populated pedestrians, large proportion public transport users and high number of motorcyclists in the country.(16)

In Vietnam, Ngo et al, demonstrated that Death rate attributed to RTA was 20.3 per 100,000 population; among 73% of 467 were age ranging from 15 to 49 economically productive population with the median age of 33.0,similar to the Brazilian study published in 2014.(14) significant number of fatalities (79%) were males, as per their occupation more than half 597(56.27%) were non-farmers, 323 farmers and the rest were students/children, motorcyclists (including drivers and passengers) were largest victims accounting 58% and pedestrians were 11% the majority of victims were students of primary and secondary school 22.14% and 32.23% respectively.

In this study 42% of deaths occur at the scene (25%) or en route (17%) to the health care facility. The main reasons for those accidents were reported to have alcohol (70.7%) and reckless driving and the peak incident was seen in June and December ± January(17) .

Brazilian study RTI hotspot analysis study showed that the high way double lane to single lane ratio is 2:1; males are more affected than females due to the proposed reasons like risk taking behaviors and reckless driving; complex traffic patterns; high density of pedestrians. Majority of accidents happened in the night time (14)

Even though death rates have been decreasing over the last four to five decades in many high income countries for instance in china being 6.00 per 100,000 population in 2007(18), road traffic injuries remain an important cause of death, injury and disability.(1)

Globally, the number of motorized vehicles is rapidly increasing with effect of national and international development data in Thailand showed the number of motorized vehicles almost doubled from 6.3 million to 11.5 million between the year 1991 and 2001 increasing the burden of road traffic fatalities and injuries despite the national development(1)

A study it is more important to consider in low and middle income countries who are striving to overcome the economic independence and to reside with the high income countries, especially in there is already a burden of communicable diseases. And the other face of

disease burden non communicable diseases including road traffic associated fatalities and injuries with the lower rate of motorization and rapid growth rate in the last decade consistently showed the following risk factors: male, urban, older, ever been drunk, and ever ridden motorcycle after drinking. Specifically, regarding lifetime experience of RTI, youths in the two older age groups (18□21 and 22□25) were found, respectively, at 1.6 and 1.9 times higher risk for RTIs than those in the 14□17 age group. Men were a 1.3 times higher risk than women.(19)

In middle income countries like india majority of the road traffic accident victims are age ranging between 15- 65 years resulting from the drivers fault (65%) including Excessive speeding , drunk driving, not wearing seat belt and cell phone use and others; 13% of causes are attributed to defective roads and the rest were bad weather (5.9%) and motor defect . in this hilly region 40 – 50% of deaths were at the scene and 10 – 15 5 were died en route to the hospital and more than half of cause of death were due to neurologic problems(20)

A national survey in India representing 1.1 million people conducted by Hsiao M, Malhotra A, ThakurJ S, *et al.* reveled that two third of RTA victims were vulnerable road users the most affected being pedestrians (37%), followed by motorcycle riders (20%) and the remaining were bicycle users. Of all deaths, 58% were happened at the scene and the vast majority (82.8%) were men and younger aged victims found to be 64.8%.(21)

Current trends from African countries and other low and middle income countries (LMIC) indicates that the situation is expected even to get worse, unless there is a coordinated response in these countries by the year 2030, RTI will be the fifth leading cause of death due to increase in motorization and developmental efforts as well as public health issues

The mortality rate due to MTI's in LMIC including SSA is about 20 per 100,000 populations while in High Income Countries (HIC's) it is about 10.3 per 100,000 populations. MTI's also represent the ninth leading cause of Disability Adjusted Life Years (DALY's) lost and are forecasted by WHO to be the third leading cause of DALY's lost by 2020. Total number of reported accidents in Kilimanjaro region in 2008 was 906 while in 2009 it was 1,125 accounting for an increase by 24%. The total mortality reported in 2008 was 147 and 202 in 2009 with an increase of 37%. The total morbidity was 622 in 2008 and 933 in 2009

accounting for a 50% increase(12). In 2004, injuries from road-traffic incidents were the sixth leading cause of death and the fourth leading cause of DALYs in middle-income countries. The highest death rates, however, occurred in low- and middle-income countries in Africa and in the Eastern Mediterranean and Western Pacific regions.(22) Whereas injuries accounted for 6% of deaths in high-income countries, they caused 12% of deaths in low-income countries in the Americas and 11% of deaths in low-income countries in Southeast Asia. The burden of injury is even greater in some individual countries, such as South Africa, where injuries are the second leading cause of both death and disability-adjusted life-years (DALYs).

As recently advocated by Khayesi and Peden, road safety in Africa is “part of the broader development process”. The situation is particularly worrying in this continent because of the combination of incompatible road users, poor vehicle condition, under-developed infrastructure, lack of risk awareness, and ineffective enforcement jeopardized by corruption or bribery. The road transport system is the dominant form of inland transportation and carries more than 95% of passenger traffic. (23) in most developing countries those road traffic crash related deaths and injuries occur on highways, and holidays; a study done in Thika district Kenya (with population of 650,000) shows in three months period there were 300 RTA victims among these crashes 80% happened on the highway and 73% were male unlike other developing countries majority of victims were car occupants , which might be attributed to small density of pedestrians on the high way and pedestrian victims were 45(15%) on the type of accidents more than sixty percent have been found o be head on collisions (24) unlike these findings in the above report another Hospital based study in Kenya showed the majority of affected due to the crash were car occupants (drivers and passengers) of which morbidity was 23.7% and mortality 38.5% followed by motor bike 15.9% morbidity and 34.62 % were bus(drivers and passengers) mortality and majority (87%) of crashes involved were commercial cars .(25)

Bawah et al has studied in kasena-Nankana Northern rural District in Ghana, more than three fourth of casaulities were among economically productive groups, and those secondary school and above victims were at high risk; those residing in the urban are at risk too. majority of accidents occur in December (Christmas time) and March/April (Easter), with respect to gender male and female ratio is approximating to be equal due to

increasing number of females riding motorbikes in the country, (13) but in other developing countries in Africa for example in Kenya it is almost 3:1(24); in Kazakhstan 2.8:1(26) .

With these all evidences in low income countries in sub-Saharan Africa region including Ethiopia the mortality and morbidity due to road traffic crashes is higher and even expected to become more worse in the future due to increasing number of vehicles and national development.(1) and the factors contributing to these accidents are classified in to three; one is human factor (reckless driving, excessive speeding, over taking errors, alcohol use negligent pedestrians, passengers, cyclists and cart pushers)(27); the second factor is external factor (poor road conditions, bad surface, and lack of road signs and marking and the third one is vehicle condition (poor mechanical condition like non-durable tyres, poor body work, defective breaks and lose wheel nuts)(12)

In Ethiopia Dessie T and Larson CP. studied the occurrence and characteristics associated with motor vehicles in Ethiopia in 1991 and found that over 91% of MTI involved pedestrians and the incidence rate per 100,000 population was 179.4; the mortality rate was 17.6/100,000 population and per 10,000 vehicles the mortality rate was 59.5, attributed risk factor in these finding were less experienced, and younger age drivers as well as government owned and mass transit vehicles were more at risk .(28) the (interrupted time series) study (Abegaz et al...2014) conducted Addis Ababa – Hawassa main road to evaluate the improved road safety applied by the Oromiya national regional state showed 4053 crashes were registered and among these 1193 (29.4%) were fatal and 24.2% injury crashes and almost half (1880 (46.4%)) were property damage, resulted in 1.2 deaths and 1.8 injuries per crash, of all deaths more than half 800(57.5%) were pedestrians, 32% vehicle occupants and the rest147(10.5%) were drivers ; vehicle occupants were more vulnerable for injury crash 55.% (965) followed by pedestrians 614 (35.1%) and the rest drivers are equally at risk for injury like deadly crash accounting 9.7% (170). Regarding the type of crashes reported in the study area, 40.6% (1,645) were crashing with other vehicles, followed by pedestrian collision 32.9% (1,335), rollover crashes accounted 16% (651) and the rest 6% (238), 4.5% (184) crash with fixed object and others including animal vehicle crash respectively. Day time collision accounted 69% (2,795) of total crashes; in

this study the authors find that the improved road safety has reduced the mortality by 12% and morbidity by 19%(7). Even though this study clarified the effect of reduction in mortality and morbidity by the implementation of road safety measures it doesn't indicate the risk factors and their association to the outcomes (morbidity and mortality).

A study conducted in Mekele City, Northern Ethiopia; revealed behavioral factors which are distractive and leading to more serious accidents. Majority of the study subjects 233 (66.6%) had risky driving behaviors which is Significant number. More than a quarter 100 (28.6%) had less knowledge about basic traffic signs. Significant percent of them 148 (42.3%) had a habit of using mobile phone while driving vehicle and 28 (9.7%) had experience of driving after drinking alcohol. 97(62.6%) house car and 58(37.4%) taxi unfasten their seat belt while driving. Majority 303 (86.6%) followed the recommended speed limit of driving. About 66 (18.9%) of them had experience of punishment or warning by traffic polices in the previous 1 year and 77 (22%) ever had car accident while driving. Drivers of secondary education and with high average monthly income were more likely to have risky driving behavior(27)

3. OBJECTIVES

3.1. GENERAL OBJECTIVE

The general objective of the study is to assess the magnitude of mortality related to Road Traffic Accidents in Addis Ababa, Ethiopia from September 2013 to August 2014.

3.2. SPECIFIC OBJECTIVES

1. To determine the magnitude of Fatalities related to Road Traffic Accidents in Addis Ababa between September 2013 and August 2014.
2. To determine what factors affect the outcome and mortality related to road traffic accident in Addis Ababa in the study period.
3. Based on the study findings to forward practicable recommendations for policy makers, service providers and the community.

4. METHODS

4.1. Ethical clearance

Ethical clearance was obtained from Institutional Review Board of Department of Emergency Medicine, Addis Ababa University and was produced for Addis Ababa Police Commission and their official permission was obtained. Letters was prepared to the local authority of all sub city police departments.

4.2. Study Design

This is a descriptive, cross-sectional study of data obtained from the Addis Ababa Police Commission, Police register on all road traffic crashes with fatalities that occurred in Addis Ababa City Administration between September11, 2013 to September10, 2014. Variables related to fatal crashes events such as crash location, crash type, time of day, day of week, month and weather conditions. Crashes types included: pedestrian injuries, vehicular tipping or rollover, vehicular collision with bicycle, collision with fixed or mobile object, vehicular head-on/ side impact, rear ended collisions, transverse collision (T-Bone), shedding of load, fall from a motorcycle/bicycle, or loss of control of the vehicle extracted.

Environment variables were evaluated which are described in the results section of this manuscript such as whether condition, geographical location and junction of the road as well as place where the accident happened.

4.3. DATA COLLECTION METHODS

Data was obtained from the Addis Ababa Traffic Police Department (AATPD). Variables related to fatal crashes events such as Socio demographic variables, type of road users involved in accident whether pedestrians, driver or passengers, the type vehicles which cause the injury, crash location, crash type, time of day, day of week, month and weather conditions extracted. Crashes types will also be included such as: pedestrian injuries, vehicular tipping or rollover, vehicular collision with bicycle, collision with fixed or mobile object, vehicular head-on/ side impact, rear ended collisions, transverse collision (T-Bone), shedding of load, fall from a motorcycle/bicycle, or loss of control of the vehicle.

4.4. INSTRUMENT

The standardized data collection checklist/from which on work by the Addis Ababa Police Commission, Traffic Police Department and the log book was used as a sole instrument of data collection

4.5. OPERATIONAL DEFINITIONS

Road traffic fatality - any person killed as a result of a road traffic injury accident

Road traffic Accident – An accident occurred in which it involves one or more motor vehicle or bicycle

Road traffic injury – an injury occurred on the road with an involvement of at least one motor vehicle or bicycle

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

Non- vulnerable road users – are those vehicle occupants including drivers and passengers who are protected by the body of the vehicle

4.6. VARIABLES

4.6.1. DEPENDENT VARIABLE (OUTCOME)

- Death (instant/after medical intervention)

4.6.2. INDEPENDENT VARIABLES

- Socio demographic variables
- The victim's role (Pedestrian, passenger, driver)
- Environmental factors(seasonal variability)
- Time of accident
- Type of vehicle
- Situation of the victim during RTA
- Whether condition
- Drivers experience in year
- Road category (double (high way) Vs. single lane)

4.7. DATA QUALITY CONTROL

To assure the quality of data, data collection tool which is the checklist used by the police officer during assessment at the scene was used as a sole source of information. During the data collection procedures, all the collected data was reviewed and checked for its completeness.

4.8. DATA ANALYSIS AND INTERPRETATION

The data obtained was checked and edited manually, then coded and entered into the computer using the Statistical Package for the Social Sciences (SPSS) version 16.00. Frequencies were generated. And presented by graphs and pie charts.

4.9. DISSEMINATION OF THE RESULT

The study result will be presented to Addis Ababa University, Faculty of Medicine, Emergency Medicine Department and Professional Associations. Documents will be disseminated to all responsible bodies in the study area, including Ethiopian Roads Authority, Ethiopian Traffic Police Department, FMOH and Addis Ababa University Department of emergency Medicine.

5. RESULTS

5.1. Drivers' profile

Between September11, 2013 to September10, 2014 there were a total of 382 fatal road traffic crashes in addis ababa city. Some crashes had more than one fatality; therefore the total number of victims was 662 among these 411 were dead. Fatalities were predominantly male (351 deaths, 91.3%), with an average of 34 deaths/month. The two age groups of frivers perpetrate were from 18 to 30 years with (155, 44.7%), and from 31 - 50 years (144, 41.5%).

Among the total fatal crashes occurred comprising more than 382 The study showed among the drivers 19(5%) died while from the occupants victims of 158 25 (15.8) died.

The educational status of the drivers was analyzed and among all most of attended senior secondary school and post senior secondary school 45% and 20% respectively. lastly followed by junior secondary school comprising 55(14.4%).

Drivers involved in those fatal accidents were totally 382 of which 351 were male; 27 or 7.1% unknown because they left the scene after the accident and neither report to the police nor bring the victim to the hospital. The relationship of drivers with the vehicle they were driving is 58.4% of those drivers were recruited mostly being commercial cars; others (either borrowed from a friend or family accounts for 78(20.4%) and owners involved were 47(12.3%) the remaining 9% unknown. Of those drivers involved majority of the drivers killed during the crash (42.1% were educated to senior secondary school level; 15 out of 19 drivers had driving license and 7 (36.8%) of them were driving automobile, one public transport with above 45 seats were responsible for the 113 victims and 12 fatalities alone.

99 (25.9%) of drivers held responsible for the fatal crash were well experienced who have been driving for more than ten years; followed by those having 5-10 and 2-5 years accounting 22.5% and 22.0% respectively; there were also 12 people who had no driving experience.

Large number of fatal accidents happened by commercial cars262 (68.53%) like12 seat capacity taxi, trucks Midi buses including city HIGER buses; the second group 19.1%of drivers were having automobile. Of these fatal crashes 7 automobile, a single public bus, 3 minibuses and 4 other vehicles (e.g roller compacter, excavators).

Regarding vehicular defects 78.3% of vehicles had no vehicular defects detected and 21.2% of cars' status was unknown; there were only one tyre and brake defect each.

	frequency	percent
Age category of drivers (years)		
<18	4	1..2
18-30	155	44.7
30-50	144	41.5
>50	44	12.7
Gender		
Male	351	91.9
Female	4	1.0
unknown	27	27
Educational status of the driver		
Illiterate	3	.8
Primary education	37	9.7
Junior secondary education	55	14.4
Senior secondary education	170	44.5
Post senior secondary school	76	19.9
unknown	41	10.7
Relationship of the driver with the vehicle		
Owner	47	12.3
Recruited	223	58.4
Other	78	20.4
unknown	34	8.9
Driving license		
Yes	322	84.3
No	20	5.2
Unknown	37	9.7
Not Applicable	3	.8
Driving experience in years		
Less than one year	31	8.1
1-2	23	6.0
2-5	84	22.0
5-10	86	22.5
Above ten years	99	25.9
Unknown	56	14.7
Not Applicable	3	.8

Table 1: - socio - demographic characteristics of drivers involved in the accident, Addis Ababa, Ethiopia, 2013/14

Drivers status	Alive		Dead	
Types of vehicle	Frequency	Percent	Frequency	Percent
Bicycle/Motor bike	7	1.8	0	0
Automobile	73	19.1	7	41.3
Taxi	5	1.3	0	0
Taxi 12 seat capacity	80	20.9	3	17.6
Lorry with various capacity	177	46.33	3	17.6
other	21	4.5	4	23.5
unknown	18	4.7	0	0
Vehicular defect				
Vehicular defect	Frequency	Percent		
Brake/tyre defect	2	.6		
no defect detected	299	78.3		
unknown	81	21.2		

Table 2: - vehicular type and defect involved in the accident. Addis Ababa, Ethiopia, 2013/14.

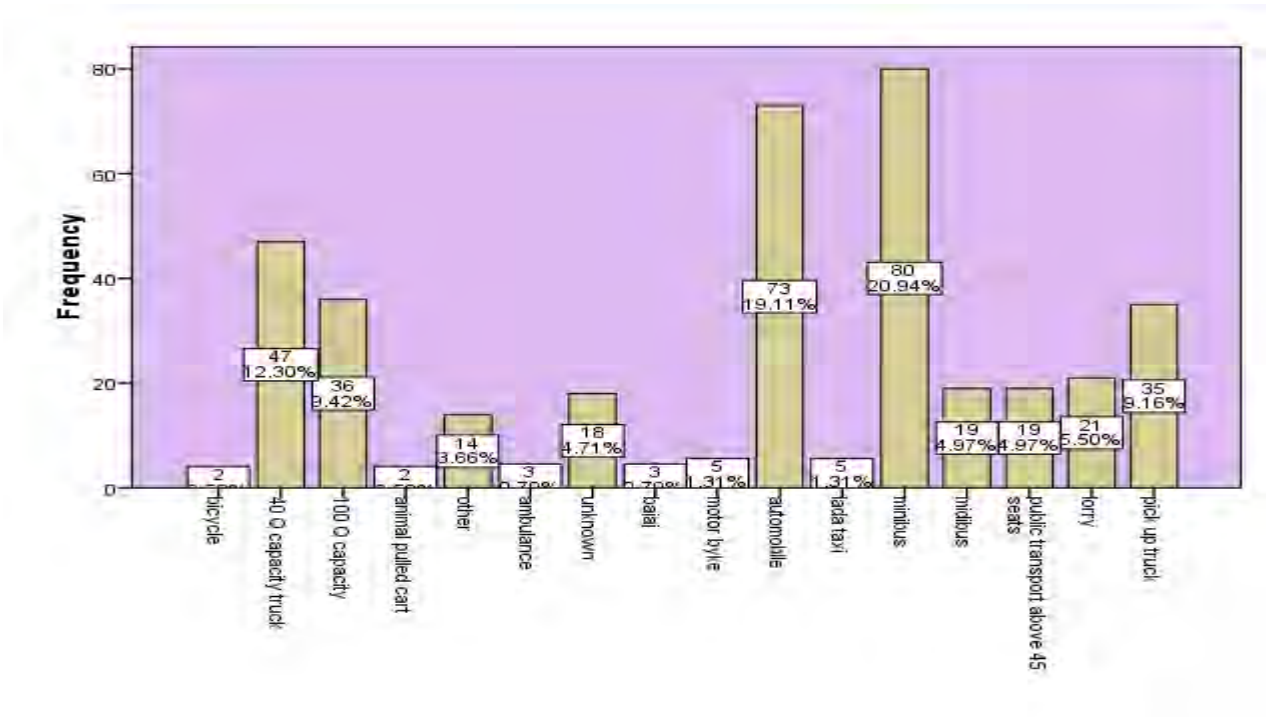

Figure1: - Vehicular type involved in the accident, Addis Ababa, Ethiopia, 2013/14

Variable	Frequency	Percent
Whether condition		
good whether/ clear sky	306	80.1
foggy/cloudy	4	1.0
rainy	9	2.4
hot	1	.3
cold	62	16.2
lighting		
day time	203	53.1
sunset	21	5.5
sun rise	6	1.6
night with road side light	113	29.6
night without road side light	39	10.2
Time the Accident occurred		
00:00 – 00:60	42	11.0
00:60 – 12:00	106	27.7
12:00 – 18:00	105	27.5
18:00 – 24:00	129	33.8
Roads condition in relation with whether condition		
dry	362	94.8
wet	20	5.2
Road type by lane		
single lane	31	8.1
double lane	113	29.6
isled	232	60.7
continuous line	6	1.6
Roads junction where the accident happened		
Y two lines coming to join	13	3.4
T single road joining transverse	63	16.5
O Isled	29	7.6
+ cross over	20	5.2
others	257	67.3

Table3: - Environmental, Seasonal and Geographical factors, Addis Ababa, Ethiopia, 2013/14.

The average number of fatalities per year on the road type by lane was 232 (60.7%) fatality crashes followed by 113 (29.6%) accidents on the double lane roads.

5.2. CIRCUMSTANCE OF THE ACCIEDNT

Kolfe keranyo and yeka sub city had 53 (13.9%) fatal accidents each followed by nefas slik lafto with 52 (13.6%) fatal crashes.

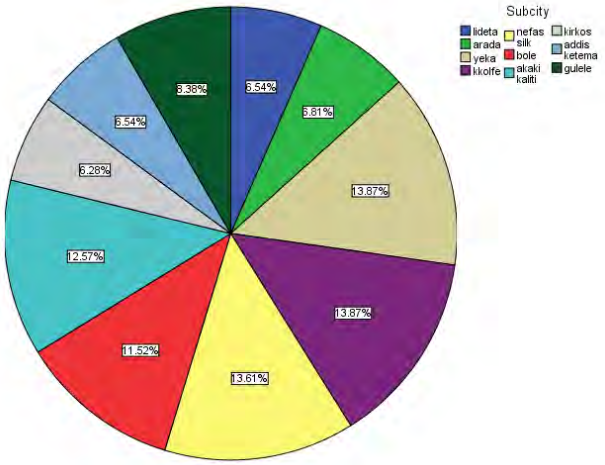

Figure2: - Percentage of fatal accidents by sub city, Addis Ababa, Ethiopia, 2013/14

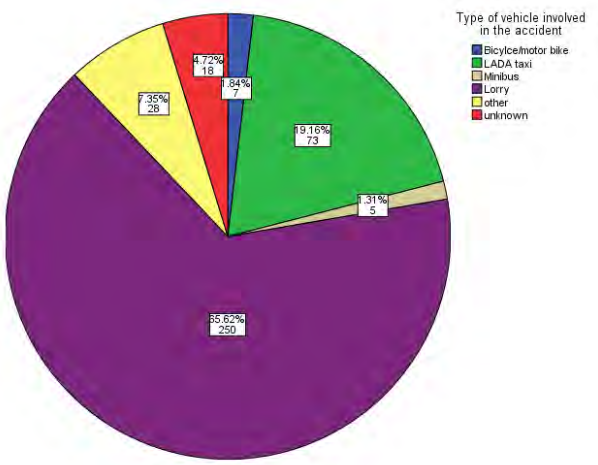

Figure3: - type of vehicle involved in the accident, Addis Ababa, Ethiopia, 2013/14

Regarding the vehicle movement prior to the accident Almost eighty percent of the accident happened while the vehicle responsible for the happening was heading straight and 39(10.2%) crashed while entering or leaving the junction from/to auxiliary roads

321(84.0%) of deaths were among victims due to car versus pedestrians and 19 (4.9%) fatalities were due to vehicular collisions between two or more cars like rear, head on, and/or T- bone side collisions and rollover accounting for 3.9% (15) each; followed by 8 fatal crashes were due to vehicle collision with fixed object like concrete fences, tree, electric pole, etc.

Majority of fatal accidents happened near to work place and residential provinces 130 (34.0%) and 107(28.0%) respectively. The reason for those fatal accidents are attributed to 205(53.8%) failure to give way for pedestrians and 102(26.8%) reckless driving behavior.

On weekends there were more fatalities than on weekdays with Saturday having the highest incidence (72 fatalities, 18.8%), followed by Sunday (70 fatalities, 18.4%). The month with the highest incidence of crashes was July with 42 fatalities (11.0%).

Most fatal crashes occurred between 18:00 and midnight (129, 33.8%), followed by 06:00 until midday (106, 27.7%) and midday to 18:00. Among the five climate modalities mentioned (good whether/clear skies), rainy, foggy/cloudy, hot and cold), good whether/clear skies were present for most of the fatal crashes (306, 80.1%), followed by cold weather (62, 16.2%).

Sub city		
Place where the accident happened		
Around school	25	6.5
Around factory	8	2.1
Near religious institutions	28	7.3
Market place	40	10.5
Recreational areas	37	9.7
Around hospitals	7	1.8
Residential province	107	28.0
Around work place	130	34.0
Types of collision		
Vehicular collision	19	4.9
Rollover	15	3.9
Auto pedestrian	321	84.0
Fall from vehicle	15	3.9
Collision with non moving/parked car or fixed object	11	2.9
Unknown	1	.3
Movement of the vehicle just before the accident		
Entering to/leaving the junction	39	10.2
Turning to the right/left/U shape	21	5.5
Running fast to pass another vehicle	9	2.4
Heading straight	305	79.8
Other	8	2.1
Reason for the accident		
Drink/drugged driving	2	.6
Excessive speed	28	7.3
Bypassing traffic police order/light	3	.9
Mechanical defect	1	.3
Failure to give way for pedestrians	205	53.8
Unknown	9	2.4
Reckless driving behavior	102	26.8
Driving out of his/her lane	31	8.1

Table4: - Place and characteristics of the accident, Addis Ababa, Ethiopia, 2013/14.

5.3. VICTIMS' PROFILE

A total of 321 pedestrian fatalities occurred likely due to lack of knowledge of road use by pedestrians and drivers; population growth and urban development. Those aged between 18 and 30 were more affected 126 (33.2%) then next being those between 30 and 50 years age third are those above 50 years but those of under 18 years old are list affected (9%)

The Mean and Median age of pedestrians dead during the accident were 38.78 and 35 respectively. Near three quarter 279 (73.0%) of pedestrians involved in the accident were male and pedestrians accounting 94.5% 361 in number were healthy in their gross physical evaluation.

Civil servants were more vulnerable for fatal accidents of total 382 fatal crashes comprising 92 (24.1%) but significant number of victims 89 (23.3%) occupational status was not known; pedestrians with occupations other than the above mentioned (those working on the road side selling stuffs, ...) account for 18.6% 30 (7.9%) were daily laborers and students.

The majority of this these pedestrians doesn't use pedestrian crossings illustrated by 186 (48.7%)of pedestrian fatalities happened while those pedestrians were crossing the road other than the zebra cross allowed for pedestrians including jumping over the isle or the road having metallic or concrete barrier. Only 4.7% of pedestrians involved used zebra cross while crossing the road 18 (4.7%) vulnerable pedestrians were killed while they were outside of the main road or pedestrian's sidewalk.

The most common type of crash was auto-pedestrian collision accounting 321 (85%) collisions, likely due to the population density, lack of awareness and negligence of both drivers and pedestrians and unavailability of pedestrians walking side for pedestrian followed by rollover and fall from vehicle each accounting fifteen(3.9%).

91.1% of total vulnerable specifically pedestrians died instantaneously ; the rest 8.9% died after some sort of medical intervention from day one up to six months.

Variable	frequency	percent
Age category (years)		
<18	34	9.0
18-30	126	33.2
30-50	114	30.1
>50	105	27.7
Gender		
Male	*279*	75.2
Female	92	24.8
Victims occupation		
student	30	8.0
Government employee/servant	92	24.5
farmer	4	1.1
unknown	89	23.7
jobless	30	8.0
Daily laborer	41	10.9
private	16	4.3
others	71	18.9
drivers	2	.5
Victims previous gross physical/health status		
Healthy	361	96.3
Disabled	1	.3
Deaf/mute	13	3.5
Victims movement just prior to the accident		
Crossing the road other than zebra cross	186	49.33
Crossing the road on zebra cross	18	4.7
Walking on the side/walk of pedestrians	78	20.7
Outside the sidewalk and/or the main road	18	4.7
Occupant	50	13.1
Unknown	27	7.0
Time of death		
Instant /at the scene or en route to hospital	346	91.1
Later/Died after medical intervention	34	8.9

Table 5: - Victims' socio – demographic characteristics, Addis Ababa, Ethiopia, 2013/14

6. DISCUSSION

This study emphasized on mortalities related to road traffic accidents and contributing factors in Addis Ababa, Ethiopia. A total of 382 fatal crashes occurred in Addis Ababa in the year 2006(2013/14) among those 382 perpetrators majority 91.9% were men and aged 18 – 30 and 30 – 50 years old 44.7% and 41.5% respectively. Even though studies shows under reporting in sub-Saharan Africa including Ethiopia.(3, 29)

In agreement with this study a study from china most of victims were among vulnerable road users predominantly pedestrians.(6, 16) and inversely in developed countries like USA, majority of fatalities are among drivers 62%.(1). Some crashes had more than one fatality; therefore the total number of victims was 662 and 411 were deceased. Fatalities were predominantly male (279, 73.03%), which is the same with Greece- 85.26%, relatively higher than those in India – 64.8%, Brazil - 75.9% (8, 14, 21) with an average of 34 deaths/month. But a study by Qirjako, et al found the reverse female were more responsible(30). Abegaz et al showed more than half of victims were among occupants, in the contrary, the crash type was vehicular collision attributed to 40.6% which might be explained by the study setting was on one of the busiest highway in Ethiopia with relatively low density of pedestrians.(7)

Fatalities by age group were distributed nearly similar;18 to 30 years 126 (30.1%), 31 to 50 years 114 (29.8%).and those above 50 years old accounted for 105 (27.7%) but those of under 18 years old are least affected (9%). In the contrary, a mortality survey studied in India revealed younger aged victims found to be 64.8% (21) The Mean and Median age of victims were 38.78 and 35 respectively. 361(94.5%) were healthy in their gross physical evaluation. Government employees were more vulnerable for fatal accidents comprising 92 (24.5%) but seid et al showed daily laborers 95(41.3%) and students28(12.2%) were more involved.(31)

The educational status of the drivers was analyzed and among all most of attended senior secondary school and post senior secondary school account 45% and 20% respectively. The relationship of drivers with the vehicle is 58.4% of those drivers were recruited; others (either

borrowed from a friend or family) 78(20.4%) and owners 47(12.3%). 99 (25.9%) of drivers held responsible for the fatal crash drove for more than ten years; 5-10years and 2-5 years accounting 22.5% and 22.0% respectively. Which is in the contrary to a study conducted earlier in Addis Ababa.(28) Similar to a study in Benin City, Nigeria, Large number of fatal accidents happened by commercial cars 262 (68.53%) like12 seat capacity taxi, trucks Midi buses; the second group 19.1%of drivers were having automobile..(25)

Regarding vehicular defects 78.3% of vehicles had no vehicular defects detected and 21.2% of cars' status was unknown. Similarly, Issam Barrimah et al reported almost ninety percent of vehicles involved were in a good condition.(15)

On weekends there were more fatalities than on weekdays with Saturday having the highest incidence (72, 18.8%), and Sunday (70, 18.4%). The month with the highest incidence of crashes was July (42, 11.0%). This study revealed that most fatal crashes occurred between evening/18:00 and midnight (129, 33.8%), followed by 06:00 until midday (106, 27.7%) and midday to 18:00.which is similar to a study conducted in hospital based analysis and on the field (7, 31) With respect to weather conditions, among the five climate modalities mentioned (good whether/clear skies), rainy, foggy/cloudy, hot and cold), good whether/clear skies were present for most of the fatal crashes (306, 80.1%), followed by cold weather (62, 16.2%).

232 (60.7%) fatality crashes happened on isled roads which is the road is divided by concrete isle followed by 113 (29.6%) on double lane roads. The same is true in one of brazil's high way Thika district of Kenya (14), (24)

Kolfe – keranyo, yeka and nefas – silk – lafto sub city were the places 158 (41.4%) of fatal accidents occurred similar to a study result by seid et al (31). Almost 80%(305) of the accident happened while the vehicle responsible was heading straight on the straight and flat road surface; 39(10.2%) accidents ocurred while the vehicle was entering to/leaving the junction.

84.0% of deaths were among pedestrians due to auto pedestrians; 91.1% of total vulnerable specifically pedestrians died instantaneously; the rest 8.9% died after some sort of medical intervention. And among those 186 (48.7%) fatalities occured while those pedestrians were crossing the road other than the zebra cross. Only 4.7% of pedestrians involved used zebra cross likely due to pedestrians' carelessness and/ or knowledge deficit regarding road safety the population density, lack of awareness and negligence of both drivers and pedestrians and limited availability of pedestrians walking side for pedestrian.

The reasons for those fatal accidents in Addis Ababa are generally attributed to human error specifically failure to give way for pedestrians and reckless driving behaviors of drivers 205(53.8%) and 102(26.8%) respectively. A study conducted in Mekele strengthens this finding. (27)

7. Strength and Limitation of the Study

6.1. Strength – most of earlier studies concentrate on hospital based finding and this research tries to find out the magnitude and associated factors of fatalities in Addis Ababa city which is done outside the clinical area

- Considering multiple factors for the assessment of outcome is also strength of this study

6.2. Limitation – since the data collected was secondary data there were difficulties in collection and interpretation of the data and results.

- Lack of community based and/or similar studies locally and most of literatures were hospital based which makes the comparison difficult

8. Conclusion

Majority of affected were vulnerable road users among which pedestrians were predominant and affected while crossing the road outside the zebra cross and responsible parties were driving commercial cars and vast majority of victims died at the scene instantaneously which needs policy on pedestrian safety and education on behavioral change. These findings can serve as a basis for health care professionals and policymakers to create preventive measures for traffic accidents.

9. Recommendation

MOH – resource allocation and strengthen prevention oriented policies on road traffic accidents

Media – Advocacy and awareness creation for occupants and pedestrians

Fire and Emergency Department – rapid deployment of pre hospital service at the scene and possible integration with traffic police department

Police Commission – further law enforcement for pedestrians in line with education on safety measures and advocacy

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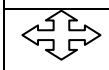
Annex 1: Data Collection Sheet

No.	Question	Choices	
	1. Socio demographic data of the drivers participated in the accident		
1.1	Age	<18 years	
		18-30 years	
		31-50 years	
		>51 years	
		Unknown	
1.2	Gender	Male	
		Female	
		Unknown	
1.3	Relationship of the driver with the vehicle	Owner	
		Recruited	
		Others	
		Unknown	
1.4	Educational status of the driver	Illiterate	
		Basic education	
		Primary School	
		Junior secondary School	
		Senior Secondary School-12 grade	
		Above Senior Secondary School	
1.5	Driving Experience in years	Below one year	
		1-2 years	
		2-5 years	
		5-10 years	
		Above 10 years	
		Unknown	
1.6	Had the driver had Driving license?	Yes	
		No	
1.7	If the answer is yes for the above		

	question. Level of driving license (1,2,3,4,5,Special)		
1.8	Type of vehicle involved in the accident	Bicycle	1
		Motor bike	2
		Automobile	3
		LADA Taxi	4
		Minibus (12 seat capacity)	5
		Midi bus (45 seat capacity)	6
		Public transport above 45 seats	7
		Lorry (both for dry and liquid transport	8
		Pick up 10 quintals capacity	9
		40 quintals capacity	10
		100 quintals capacity	11
		Animal pulled cart	12
		other	13
		ambulance	14
		Unknown	15
		bajaj	16
1.9	Vehicular defect	Brake defect	
		Steering Wheel defect	
		Tyre defect	
		Light defect	
		Other mechanical defect	
		No defect detected	
		Unknown	
2. Questions regarding the road safety			
2.1	Type of road the accident happened	Road connecting to neighboring region	
		Road connecting to neighboring	

		district	
		Rural road	
		Urban road	
2.2	Place where the accident happened	Rural province	
		Outside rural province	
		Around school	
		Around factory	
		Near religious institutions	
		Market place	
		Recreational areas	
		Around hospitals	
		Residential province	
		Around work place	
		others	
2.3	The Roads geographical location	Straight and broad	
		Straight and sloppy or slant	
		Straight with up and downs	
		Zigzag	
		Up Hill	
		Down hill	
		Other	
2.4	The road surface type	Asphalt with good condition	
		Asphalt with bad condition	
		Course sandy	
		Rural road	
2.5	Road type by lane	Single lane	
		Double lane	
		Isled (desset)	
		Divided by a continuous line	
		Divided by A dotted line	

2.6	Road junction Types	 two lines coming to join	
		 single rod joining transverse	
		 Isled	
		 Cross over	
		 Five roads coming to one direction	
		Rail way crossing	
		Other	

3. Day and time of the accident

Time		Day		Month	

4. Whether condition at the scene

4.1	Light	Day time	
		Sun set	
		Sun rise	
		Night with road side lights	
		Night with poor or no road side light	
		Other	
4.2	Road condition related to whether condition	Dry	
		Wet	
		Muddy	
4.3	Whether condition	Good whether	
		Fogy /cloudy	
		Rainy	
		Hot	
		Cold	
		Heavy wind	

		Other Dusty	
4.4	Type of collision	Face to face collision	1
		Rear collision	2
		Side or T-bone collision	3
		Side by side shearing	4
		Roll over	5
		Collision with pedestrian	6
		Fall from vehicle	7
		Collision with non moving vehicle	8
		Collision with fixed object	9
		Other	10
4.5	Movement of the vehicle before the accident	Entering to the junction	1
		Leaving the junction	2
		Turning to the right	3
		Turning to the left	4
		Turning U shape	5
		Running fast to pass another vehicle	6
		Heading straight	7
		Entering to the main road from either home other places	8
		Moving back	9
		Entering to the square junction	10
		While stopping	11
		Other	12
		Unknown	13
5. Data on pedestrians involved in the accident			
5.1	Age	<18 years	
		18-30 years	

		31-50 years	
		>51 years	
		Unknown	
		Male	
5.2	Gender	Female	
		Unknown	
5.3	Occupation	Student	1
		Civil servant	2
		Farmer	3
		Jobless	4
		unknown	5
		Daily laborers	6
		private	7
		others	8
		driver	9
5.4	Previous gross physical and health status	Deaf-mute	5
		Blind	2
		Disabled	3
		Healthy	1
		Drunk	4
		Unknown	6
5.5	Pedestrians movement during the accident	Crossing the road other than zebra cross	1
		Crossing the road on zebra cross	2
		Loading/unloading	3
		Walking on the side walk of pedestrians	4
		Walking/standing on the right of the road	5
		Walking/standing on the left of the	6

		road	
		Outside the side walkand/or the main road	7
		occupant	8
		unknown	9
5.6	Reason for the accident	Drunk driving	1
		Drugged and driving	2
		Excessive speed	3
		Bypassing traffic light	4
		Bypassing traffic police order	5
		By passing stop sign	6
		Mechanical defect	7
		Driving on pedestrians	8
		Sleepy driving	9
		Unknown	10
		Fall from vehicle	11
		Occupant	12
		Reckless driving	13
		Driving out of his/her lane	14

Annex 2: Declaration

I the undersigned, EMCCN student declare that this thesis is my original work in partial fulfillment of the requirement for the degree of Master of Science in EMCCN.

Name: Anteneh Kebede Sebsbie

Signature: _____

Place of submission: *Department of Emergency Medicine*, School of Medicine, College of Medicine and Health Sciences, Addis Ababa University.

Date of Submission: _____

This thesis work has been submitted for examination with my/ our approval as university advisor(s).

Advisors

Name	***Signature***
_____	_____
_____	_____