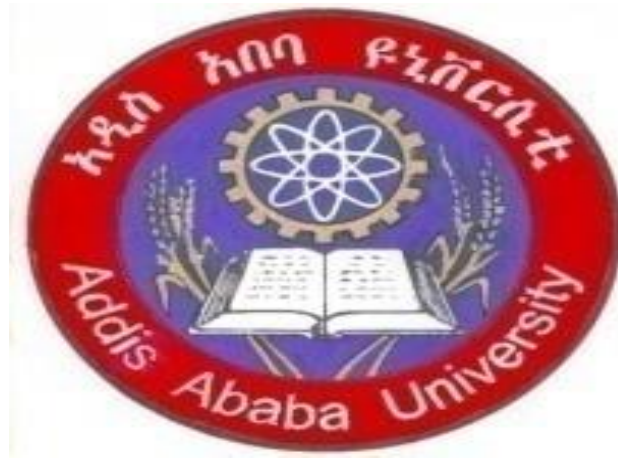


ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH
SCIENCES SCHOOL OF PUBLIC HEALTH



PREVALENCE OF ROAD TRAFFIC INJURY CRASHES AND
ASSOCIATED FACTORS ON ADDIS ABABA-ADAMA EXPRESSWAY

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ATHESIS SUBMITTED TO ADDIS ABABA UNIVERSITY, SCHOOL OF PUBLIC HEALTH IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS IN
ENVIRONMENTAL AND OCCUPATIONAL HEATH.

June, 2021

ADDIS ABABA, ETHIOPIA

ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH

MASTER OF PUBLIC HEALTH
RESEARCH PROJECT SUBMISSION FORM

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Full title of the research project	Prevalence Road Traffic Injury Crash and Associated Factors On Addis Ababa-Adama Expressway: A Cross-Sectional Study, 2019/2020.
Duration of project	01 Sep 2019-30 June 2020
Study Area	Addis Ababa-Adama Expressway , Ethiopia
Total Cost of the project	25,000.00 ETB
Sources of budget	Addis Ababa University
Address of investigator	Tel: - +251913434133/923089016 Mail:- negesaadugna2018@gmail.com

Acknowledgments

I would like to thank Addis Ababa University College of Health Science, school of public health that gave me the opportunity to carried out this research.

My deepest gratitude also goes to Dr. Teferi Abegaz and Mrs. Meaza Gezu who assist and comment throughout the journey of this research work.

My sincere acknowledgement also goes to administrative bodies/managers, Traffic Safety and Security Department workers of Ethiopian Toll Road Enterprises, in which they were open to give me different information's important for my works.

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Abbreviations

BSc Bachelor Science

COR Crude Odds Ratio

GDP Growth Domestic Plan

ETB Ethiopian Birr

ERC Ethics Review Committee

KM/HR Kilometer per hours

MSc Master Science

PhD Doctor of Philosophy

RTC Road Traffic Crash

RTIC Road Traffic Injury Crash

RTA Road Traffic Accident

SPSS Statistical Package for Social Sciences

USA United States of America

WHO World Health Organizations

Summary

Background: - Road traffic accidents are one of the main public health problem results pre-mature death and injuries in the world. Ethiopia is among the leading countries in road traffic accident in the world. Addis Ababa – Adama Expressway is one of the newly introduced modern toll road with a traffic accident are occurred increasingly. This study describes prevalence, trend and associated factor of road traffic injury crashes.

Objectives: To assess the prevalence and trend of road traffic injury crash and associated factors on Addis Ababa-Adama Expressway.

Methods: - The study is based on the secondary data collected from Ethiopian Toll Road Enterprises from September 2014 to August 2018. The collected data contained information about the cause of accident, types of accidents, human causality and injury and other relevant information on the environmental condition and vehicle characteristics. Electronic data received in excel sheet was transferred to SPSS statistical software for analysis. Bivariate and multivariate Logistic regression analysis was employed to determine the possible predictors.

Results: - The overall prevalence of RTIC was (30%). In bivariate logistic regression: age of driver, season, types of vehicle, and types of collision and cause of road traffic crashes were significant association with RTC. Socio-demographic status, being 50 and above(AOR=2.03, 95% CI: 1.13, 2.58), types of vehicle status, being minibus and bus (AOR- 2.75, 95% CI: 1.88, 4.02), pick up and medium truck (AOR= 1.88, 95% CI: 1.30, 2.71), automobile(AOR= 1.50, 95% CI: 1.07,2.10), car overthrow (AOR= 2.00, 95% CI: 1.49, 2.67), sleeping/fatigue (AOR= 2.76, 95% CI: 1.15, 4.62), over speeding (AOR= 1.53, 95% CI: 1.10, 1.12) and unethical driving (AOR= 1.43 95% CI: 1.08, 1.90).

Conclusion: Road traffic injury crash on Addis Ababa-Adama Expressway become increasing. This trend showed that the issue need urgent attention and consider as a priority public health agenda.

1. INTRODUCTION

1.1 Background

Road Traffic Accidents (RTAs) which is defined as “An accident which occurred or originated on a way or street open to public traffic; resulted in one or more persons being killed or injured, and at least one moving vehicle was involved. These accidents therefore include collisions between vehicles, between vehicles and pedestrians and between vehicles and animals or fixed obstacles”(1). Road traffic injuries are a global health problem. The number of road traffic deaths raise steadily, to 1.35 million in 2018. The problem became the eighth cause of global death and 20-50 million others are injured (2, 3). Recent trend shows that the total number of people killed in road crashes in developing world continues to increases (3-5,33). Within these facts, many researchers have come out with the causes to traffic accidents. According to the result of the studies indicated alcoholic drink, technical failures, over speeding, unethical driving, fatigue and others are identified as some of the major causes of traffic accidents (1, 6, 7).

According to the Global Burden of Disease report, deaths from non-communicable diseases are expected to rises from 28.1 million a year in 1990 to 49.7 million by 2020 (an increase in absolute numbers of 77%). Road traffic crashes will contribute significantly to this rise (8). The report show that road traffic injuries are expected to move from ninth level in 1990 to take third place in the rank order of disease burden by 2020(9, 10). RTA is the second leading cause of death in economically active population group of 15–44 years of age and more than 75% of RTA casualties occur in this age group(4). In many countries the estimate economic loss due to RTAs is as high as 3% of their gross domestic products(3). According to WHO report, 90% of the world’s fatalities on the roads occur in low-income and middle-income countries, which have only 48% of the world’s registered vehicles (5).

Africa has one of the highest road traffic death rates in the world, with little difference in rates between those countries categorized as low-income (32.3 deaths per 100,000 populations per year). Ethiopia is one of developing country facing road traffic crisis. Traffic accident costing the country around 0.8% - 0.9% of the GDP for the past consecutive years (25) and Each year thousands of road users are killed and the majority of them are economically active population(1, 4).

1.2 Statement of the Problem

Road traffic accident level of the country is one of the high in the world; according to the Ethiopian Federal Police report more than 41,000 people were killed in eleven years. Moreover, the report stated that majority of road accidents were concentrated in Addis Ababa, which is the capital city of Ethiopia, and Oromia region, accounting 58 percent of all fatalities and two-third of all injuries (24). A study in Addis Ababa shows that passengers were frequently affected by RTA 89(54.6%) followed by pedestrians 42(25.8%)(1).

Addis Ababa-Adama Expressway is the only first-class roads currently giving services in Ethiopia. This express way was constructed to improve country's transport network and facilitate the import export process of the country. The old Addis Ababa Adama road way was one of the busiest routes in the country. The heavily congested road was the main road segment results frequent traffic accidents. The new Addis Ababa Adama express-way resolves traffic congestion issues in a significant extent. However, road traffic accident is not declining as expected. According to data from the Ethiopian Toll Road Enterprises there has been around 1,429 road crashes during the past five years, since the road start giving services (31)

It is known that, road traffic crash is the result of a complex interaction between several inter-dependent factors representing human related (drivers and other road users); environmental related (road design, road layout, pedestrian facilities, road side protection, weather and light conditions); and vehicle related (technical defects and in-vehicle crash protection) (11, 28). The human factor becomes the most common determinants of road traffic crashes. Socio-demographic characteristics: driver age, gender and driving experience pre-dispose the traffic crashes. Similarly, personality characteristics have a strong relationship with risky, aggressive and competitive driving behaviors and crash involvement (6, 14). These can be aggravated by poor road geometry or poor vehicle condition (17, 19). As a matter of fact, the Addis- Adama express -way is the road network that encourages drivers to travel in a higher speed, hence the traffic accidents frequently result human causality crashes. In recent time, the magnitude of the problem increases and drivers frustrated to use the express way as a result significant number of drivers use the older route even though it is poorly constructed and maintained.

Traffic accidents on Addis Ababa-Adama expressway become increasing from time to time. This alarming that need for undertaking coordinated effort to control the problem. However, there have been only few researches undertaken on the level of accident and the causes of these traffic accidents on the study area. This research is therefore motivated by the research gap on the area and focuses on identifying the causes of traffic injury, prevalence of injury crash, trends and proposes possible solution that helps to minimize the level of traffic accident on Addis Ababa - Adama Expressway.

1.3 Rationale of Study

Road traffic accidents became critical issue in Ethiopia, takes human life and people are getting worry while they travel to other places using public transportation. Because of drivers fault many parents lost their children, children are forced to live without their parents, and many people became disabled and stay at home without work. If stakeholders and concerned body informed the risky of these problem, they prepare them self to contribute to controls the problem. And accidents will be reduced. This motivates us to conduct this project.

1.4. Significance of the Study

The study was help to create awareness for road user about severity of traffic problems. The study was supplementing the existing literature of road traffic injury that was work to assess the situation of road traffic injury in Ethiopia. It assesses existing situation and communicate readers how to act while using express roads and save their life and property through notifying the severity of road accidents. And it helps policymakers, transport authorities, road engineers, and other concerned stakeholders to minimize road safety problems. The research also gives information to those who are interested in conducting research on traffic injury.

1.5 Structure of the Thesis

The Study is comprised of seven Chapters. The first chapter consists of a background of the study, statement of the problem, the significance of the Study, rationale of study and organization of the Study. The second chapter comprises a review of related literature to support this study which provides prevalence of study, factor associated to road traffic accident like human factor, environmental/infrastructure factor and vehicle factor. Chapter three is objectives of the Research, Chapter four is on research methodology which describes research design, study area and period, source of population, sample size determination, sampling approach, study variable, data collection procedure, data quality management, data analysis procedure. Chapter five result of study consists of socio-demographic, prevalence of RTIC, characteristics of injury, trends of RTIC, and associated factor of road traffic injury crash. Chapter six consist discussion. Chapter seven consists of conclusions and recommendations which proposes future research areas.

2 Literature Review

2.1 Prevalence of Road Traffic Injury

Road traffic injury crashes are a global problem affecting all parts of society. However, road safety has received insufficient attention at national and regional levels. As a result, traffic accident has been increasing dramatically from time to time. Road traffic killed more than 1.35 million people additional 20-50 million injuries (8). Road traffic accidents are the eighth leading cause of death globally, and the leading cause of death for young people aged 15–29(10, 12). Almost 60 % of road traffic deaths are among 15–44 year old worldwide and for every road traffic fatality, at least 20 people sustain non-fatal injuries(10). The overall global road traffic fatality rate is 18 per 100, 000 populations among which middle income countries have the highest annual road traffic fatality rates, at 20.1 per 100, 000. More than half of the world's road traffic deaths occur among vulnerable road users which includes, motorcyclists (23 %), pedestrians (22 %) and cyclists (5 %) with 31 % of deaths among car occupants and the remaining 19 % among unspecified road users (3).

Surprisingly more than 85%of road traffic deaths occur in low and middle income countries, which account for only 52% of the world's vehicle population. The risk of dying as a result of a road traffic injury is highest in Africa (24.1 per 100 000 population) and 38 % of all African road traffic deaths occur among pedestrians(3). The injury characteristics for road traffic accident in developing countries differ from developed countries. Pedestrians are most vulnerable to injury and death (3). In Ethiopia, according to National Road Traffic Office data reported, 18,309 road traffic injuries occurred from 2015-2016 which 4,352 were fatal (36). Also other study conducted on Hawassa University comprehensive specialized hospital reports that the prevalence of road traffic accident was 40.9% (13). Study conducted on road Addis Ababa to Hawassa by Kasu shows accidents on these roads reported high death rate 32.48%, followed by 18.46% serious injuries, 13.48% slight injuries and 35.58% property damages (17)

2.2 Risk factors for Road Traffic Injury Crashes

Road traffic injury crashes can results from a combination of factors. Some factors contribute to the occurrence of accident other factors aggravate the effects of the accident. Most studies have

described that the major contributing risk factors for traffic crashes are human factors, vehicle factor and roadway/environment (26, 30).

2.2.1 Human factor

Dr. William Haddon had developed a Matrix using three major risk factors. Human factors were subdivided into six categories (Driver, Passenger, Pedestrian, Motorcyclist, Bicyclist and Other (27). The human contributes to the cause of 90% of all RTA's (5). In developing countries, it is estimated that human error account for between 64 and 95% of all causes of traffic crashes (10). The behaviors of drivers who are particularly prone to over-speeding, lack of attention, improper stopping and turning, violation of traffic laws, etc. have a significant role in many accidents (20). Among the five key risk factors for RTA determined by the WHO, four are related to human factor. These include speeding, drinking and driving, non-use of motorcycle helmet and non-use of seat belts (5). Among dominant driver error occurred speeding was 37.9% in Ghana (44). Study conducted in Mekele city showed that 9.7% drivers had the habit of driving after drinking alcohol and behavior of drivers and pedestrians are important factors to comprehend the causes of traffic accident (6). Head injuries are the leading cause of death and major trauma for two and three wheeled motor vehicle users (45). Correct helmet use can lead to 42% reduction in the risk fatal injuries and a 69% reduction of in risk of head injuries (46). Seat belt use prevents and reduces the severity of injuries during motor vehicle crashes. (47). Seat belts dramatically reduce risk of death and serious injury. Among drivers and front seat passengers seat belts reduce the of death by 45%, and cut the risk of serious injury by 50 % (48)

2.2.2 Road Infrastructure and other environmental factor

Road traffic injury crash can be caused by defects on the road infrastructure. Construction of roads that are of low standard and improper design can increase the exposure of the accidents and associated severity. In relation to road design, in the period between a road being planned and a road being built, a number of circumstances can change, such as the volume of vehicles, the type of road users and the weather conditions (15).

The prevailing weather conditions on the roads can also contribute to crashes; for example, a wet road reduces friction, and flowing or standing water can cause slippage to the moving vehicle.

Many severe crashes have occurred during conditions of smoke or fog, which significantly in reduce visibility. There are debates on whether infrastructural factors can be considered as one of significant causes for road traffic injury. This is because as seen in developing and low income countries even after the construction of better quality roads the number of accidents still on the rise (21). According to Fanuel study, RTA from road infrastructure and environment takes only 2% of the overall number of accidents. However low the significance may be it is undeniable that infrastructure and weather condition play a role. And that they substantially affect both the performance of drivers and vehicles (22)

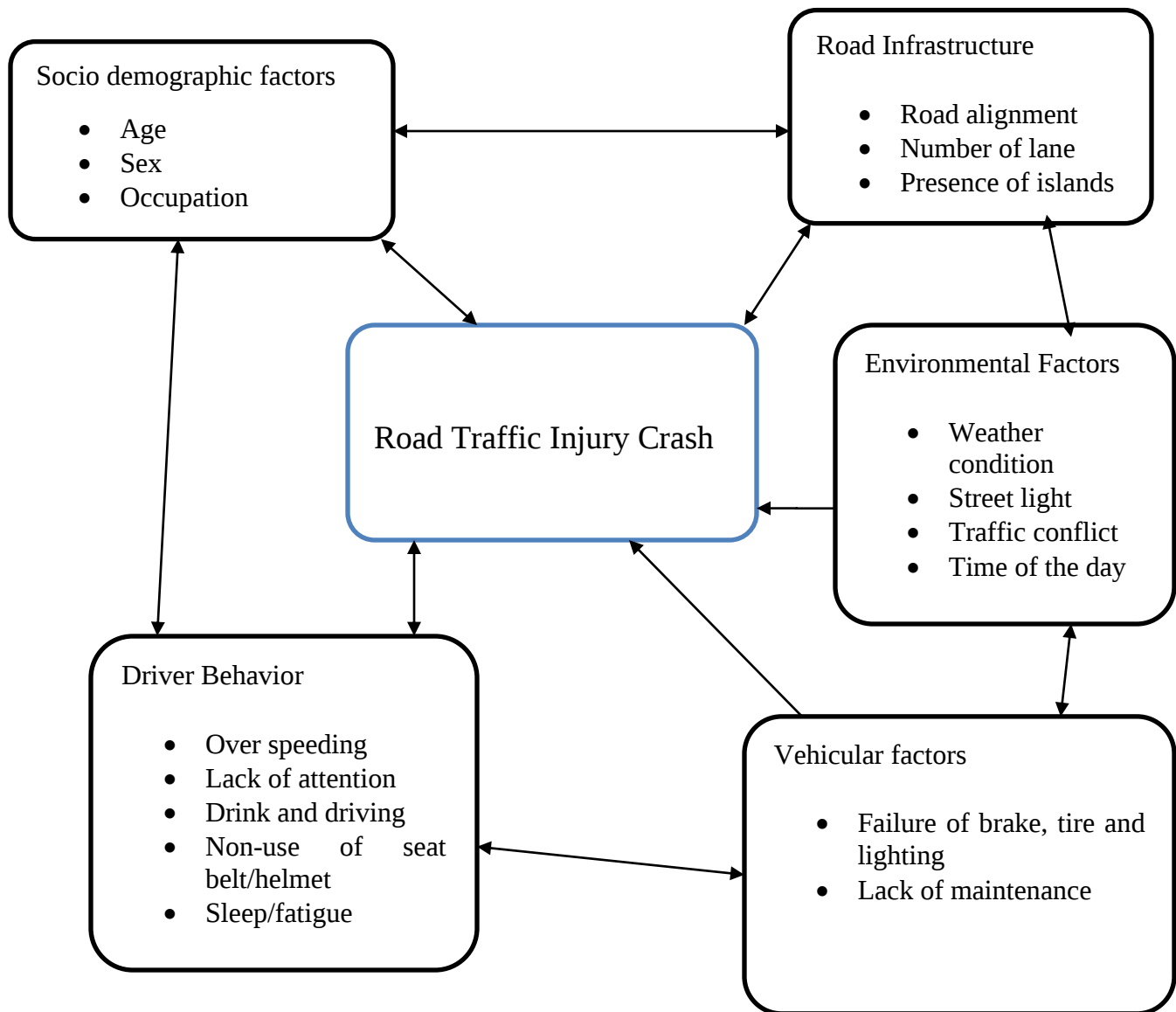
2.2.3 Vehicular factor

This is due to inherent design limitations or defects to lack of maintenance, failure of components like brakes, tires and lighting. Visibility, speed and vehicle lighting are also important. Vehicle also the major factors of RTA. In the road traffic system, the reliability of a vehicle is directly related to its liability for causing accidents. Road safety, however, goes beyond periodic check or prompt repair of vehicles. It should be a daily routine of care and check of all components of a vehicle. The main vehicle factors are defects in tires, brakes and inputs all rising from poor maintenance of the vehicle (23).

Moreover, accidents can be caused by not having crash protection system. If all cars were fitted with crash protection systems half the number of injuries and fatalities could be avoided (24). In high income countries, all vehicles are required to have standard regulations for safety, such as seat belts, airbags etc. However, low income countries lack standard regulations for safety, which means that many pedestrians, motorcyclists and cyclists experience higher RTAs (18).

An error in driver-vehicle-roadway system and it must be recognized that different types of accidents are caused due to different at any given location namely, rear-end, side-swipes, head-on, night-time, bad-weather, etc. Bad weather accidents can result due to a road pavement which becomes dangerously slippery when wet or it may be due to inadequate signs for inclement weather (24).

Conceptual Frame work



Source: Based on Literature Review

Figure 1: Conceptual Framework

3 Objectives of the Study

3.1. General Objective

To assess the prevalence and trend of traffic injury crash and factors associated for Addis Ababa-Adama Expressway;

3.2. Specific Objectives

1. To assess prevalence of road traffic injury crash on Addis Ababa-Adama Expressway
2. To show the trends of RTC
3. To identify the major factors contribute to traffic injury crashes on Addis Ababa-Adama Expressway

4 Methods

4.1 Study Design

A cross-sectional study design was employed based on the data retrieved from Addis Ababa-Adama expressway crash investigation database.

4.2. The Study Area and Period

This study was conducted on Addis Ababa-Adama expressway that starts from Tulu Dimtu Customs checking point and ends on the east side of Adama that connects Adama Awash road. It has a total length of 76.3 kilometers. It has 19 entrances and 29 exits. It is a two-way road separated by a protected island, there were three lanes on each side of the road that serve for those vehicles traveling with 60-80 km/hr, 80-100 km/hr and above 100 km/hr driving speed. The expressway can also serve for those nearby towns as an entrance and exit, Tulu Dimtu custom check points 16km Dukem, 33km Bishoftu, 52km Modjo, 60A and 60B Adama and 64km Welenchity. The road section incorporates road lay-by with an interval of 3km that serve the road user during emergency cases and to take rest. The routes pass through fertile lands that were suitable for agriculture. Products like large scale flower farmers, crops and other plants were produced along the sides of the road. The road was also a link between the capital cities with neighboring country and facilitates transactions of sea ports and support movement to recreation centers. The overall data covers a period of five years (September 2014 to June 2018) (31).

4.3. Sources of population

All road traffic crash recorded by the traffic patrol assigned by Ethiopian Toll Road Enterprises between 2014 and 2018 was sources of population

4.4 Study population

All road traffic crash happened on Addis Ababa- Adama highway with complete information was considered as study population during the study period (September 2014-August 2018)

4.5 Sample size determination

As the study was conducted based on readily available data, our sample size was five year road traffic crashes. Studies made in Bangladesh and Czech Republic indicated that one year and above data can be used for accident related analysis(16). From the above studies it was advisable

to use data of three years and above to undertake such research; in case where there is sufficient data on the area it possible to use five years' data. Accordingly, the research used all the data available since the expressway started operation. To draw the trend of injury crash five years were broken into monthly that contains enough points to show the trends.

4.6 Sampling Approach

According to the research design proposed above, secondary sources of data were consulted in this research to obtain the required data for conducting the research. Information collected was contains five years' data recorded by Ethiopian Toll Road Enterprises. Quantitative research technique was used to systematically investigate the facts behind traffic injury crash and to discover and analyze Driver Behavior, Road/Environmental factors, Vehicular factors to draw logical conclusion that help to draft applicable rules, laws and theories for the area.

4.7 Eligibility

- **Inclusion criteria**

All registered RTAs from September 2014 to August 2018 that were documented in Ethiopian Toll Road Enterprises Addis Ababa-Adama was included in the sample

- **Exclusion criteria**

Data that missed some very important information were excluded from analysis.

4.8 Study Variable

4.8.1 Dependent Variable

- Road Traffic Injury crash: human injury crash and non injury/property damages

4.8.2 Independent Variable

- Driver Behavior; over speeding, unethical driving and sleeping
- Vehicular factors; Technical problem, Tire problem, brakes, vehicle types and collision types
- Road/Environmental factors, Years, months, days of week, and time of days(light condition)

4.9 Data collection procedure

Traffic accident data on expressway have been collected and recorded by the traffic patrol assigned by Ethiopian Toll Road Enterprises. The raw data used for this research was obtained

from the Traffic Safety and Security Department of Ethiopia Toll Road Enterprises. The overall data covers a period of five years (September 2014 to August 2018). Accordingly, the research had used all the data that eligible and available since the expressway started operation. The road traffic accident data collected from Traffic Safety and Security Office incorporated relevant information including their cause, locations, weather condition and types of accident in addition to number of fatalities, injuries and property damage in detail for the study period five years. Data taken from traffic safety and security office was within different language and within different year it had different format, we organized it in excel and data cleared were entered to SPSS.

4.10 Data quality Management

To maintain data quality, training had given for data collectors and supervisors for one day. Supervision had been carried out to check completeness and consistency both by the supervisors and by principal investigator. Correctly completed data were collected from data collectors. Those crashes miss some of the relevant information needed were excluded. The collected data were entered to excel and check it as contains full information. After the data entry completed, we run the frequency and print out the output. Consistency was checked by comparing the frequency and the difference were corrected accordingly by using the original data retrieving form. The confounding effect of the explanatory variables was checked using forward and backward elimination techniques and any variable above 20% change of coefficient was considered as a confounder. Multicollinearity was checked using variance inflation factor (VIF) at cut-off value of 10. Variables with greater than 10 VIF value were handled by removing the most intercorrelated variables from the model and substitute their cross product as an interaction term. Final model fitness was checked using Hosmer-Lemeshow method.

4.11 Data analysis procedure

Data were cleaned, checked for completeness and accuracy manually. Data coded and exported to IBM SPSS/ Statistical Package for the Social Science for statistical analysis. Descriptive statistics were used to summarize the data using tables and figures. For trends of the RTC we used line graph. Binary logistic regression has been used to check independent variables associated with road traffic injury crash. Those variables found to have P values of ≤ 0.2 were fitted to multivariate logistic regression to control the effects of confounders. Odds ratios with

95% CI were computed and variables having P values ≤ 0.05 in the multivariate logistic regression model were considered significantly associated with the dependent variable.

4.12 Ethical consideration

Letter of ethical approval was obtained from Ethics Review Committee (ERC) of the School of Public Health. Before starting the data collection, permission from the Ethiopian Toll Road Enterprises managers and written and verbal consent was obtained after briefing about the purpose of the study. Confidentiality of information extracted was maintained by coding and information saved in a password protected storage system.

4.13 Operational definition

Fatal crash- is one where at least one person is killed with death occurring within 30 days of the accident.

Injury crashes- road crashes resulting at least one injury it can be either severe or minor injury

Trend: the consecutive five-year prevalence of road traffic injury crash

Accident casualty - refers to road crash victims, which include injuries and fatalities

Severe injury: At least one person was injured and admitted in hospital, but no deaths occurred.

Slight Injury - It is an accident where slight injuries to the persons involved like a cut, sprain or bruise.

4.14 Dissemination

The findings of this study had disseminated to the Ethiopian Toll Road Enterprises. The paper were also be submitted to Addis Ababa university school of public health both with soft and hard copy with the plan of presenting findings at appropriate seminars, workshops and conferences. Besides publication of the study findings on the local /international journal were be considered.

5. RESULTS

5.1 Socio-demographic characteristics of driver

A total of 1429 road traffic crashes occurred on Addis-Adama express-way in five years period.

The age category of drivers, most of them 804(56.3%) were between 30-49 years old, followed by 506 (35.4%) were between 18-29 years old. Regarding to gender majority 1395 (97.6%) of drivers were males.

Table 1: Socio-demographic of drivers that in involved in road traffic crashes on Addis Ababa-Adama Expressway (2014-2018)

Variable	Category	Frequency(n=1429)	Percentage (%)
Age of Driver	18-29	506	35.4
	30-49	804	56.3
	50 and Above	119	8.3
	Total	1429	100.0
Gender of Driver	Male	1395	97.6
	Female	34	2.4
	Total	1429	100

5.2 Prevalence of Road Traffic injury crashes on Addis Ababa-Adama

Expressway

From total 1429 road traffic crashes reported during the stated period, 430 (30.1%) of road traffic crashes were results human injuries and fatalities. Of those 430 causality crashes more than 1077 road victims were reported. But 50 human injuries had missing very important information needed for analysis and hence we exclude them accordingly. So 1027 human injuries included in this analysis.

This study found that prevalence of road traffic injury crashes on Addis Ababa-Adama Expressway, in past five years were 430(30.1%.) with 95% CL 27.6% to 32.4% were reported.

5.2.1 Characteristics of road traffic injury crash on Addis Ababa-Adama Expressway

Traffic injury in the past five years had shown slight variation. The cumulative five years distribution showed that, 119(11.58%) fatal, 285(27.75%) serious injuries and 623(60.66%) slight injury.

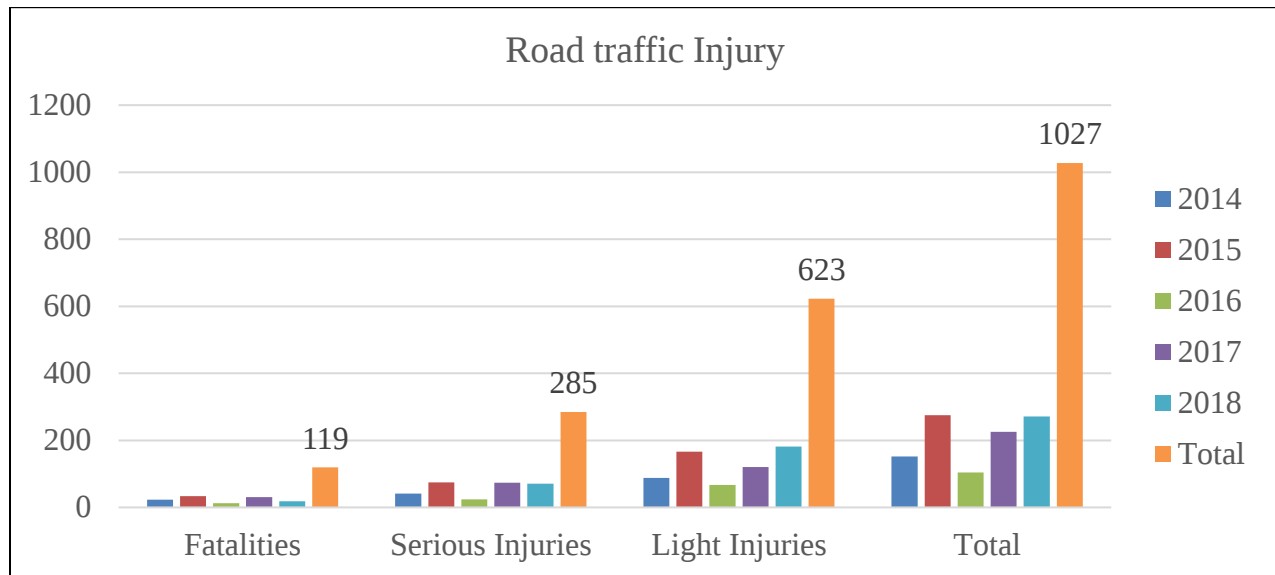
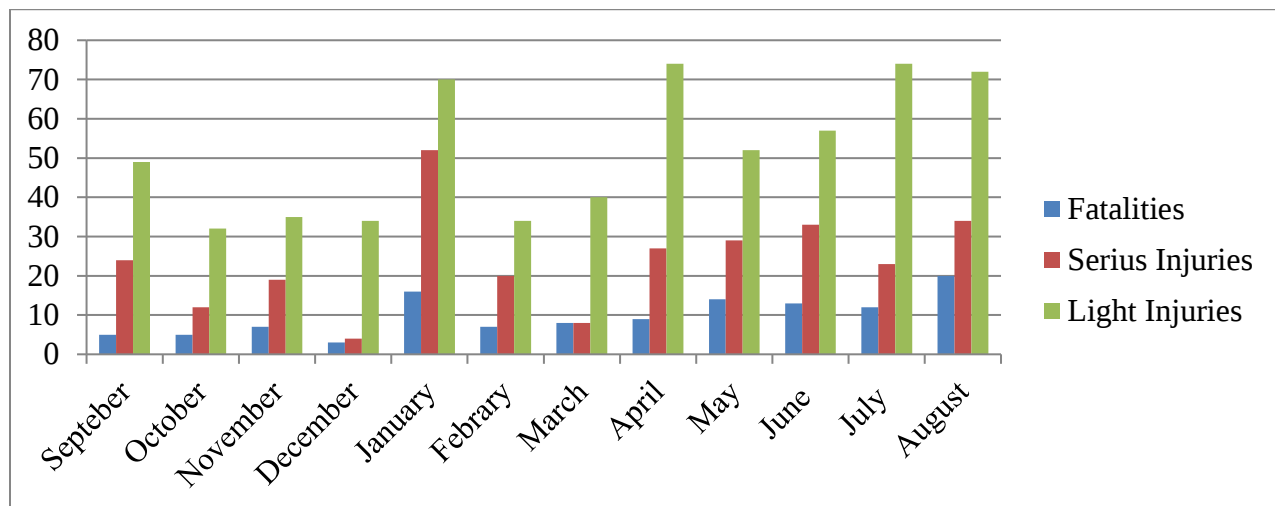


Figure 2: Distribution of Road Traffic Injury crash yearly on Addis Ababa-Adama Expressway (2014-2018)



Regarding the monthly distribution of crash injuries there was slightly higher incidence in January 138(13.44%), followed by August 126(12.27%), April 110 (10.71%), July 109 (10.61%) and June 103 (10.03%).

Figure 3: Monthly Distribution of injury crash on Addis Ababa-Adama Expressway (2014-2018)

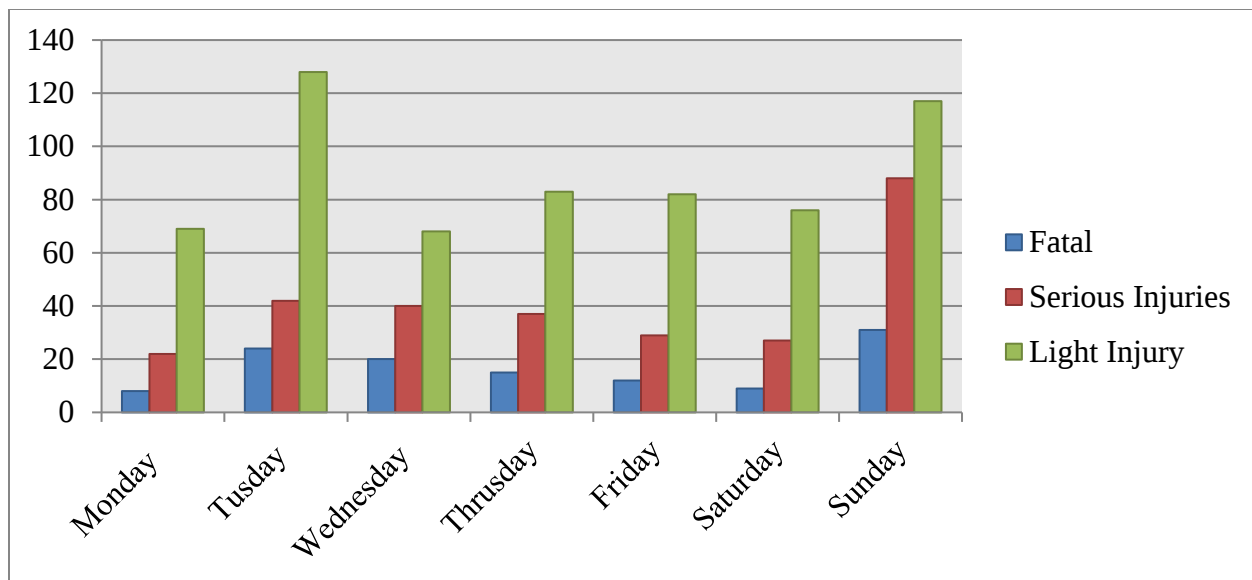


Figure 4: Distribution of days of the week of injury crash on Addis Ababa-Adama Expressway (2014-2018)

In the days of the week more injury was occurred on Sunday 236(22.98%), Tuesday 194(18.89%), Thursday 135(13.15%), Wednesday 128(12.46%), Friday 123(11.98%), Saturday 112(10.91%) and Monday 99(9.64%).

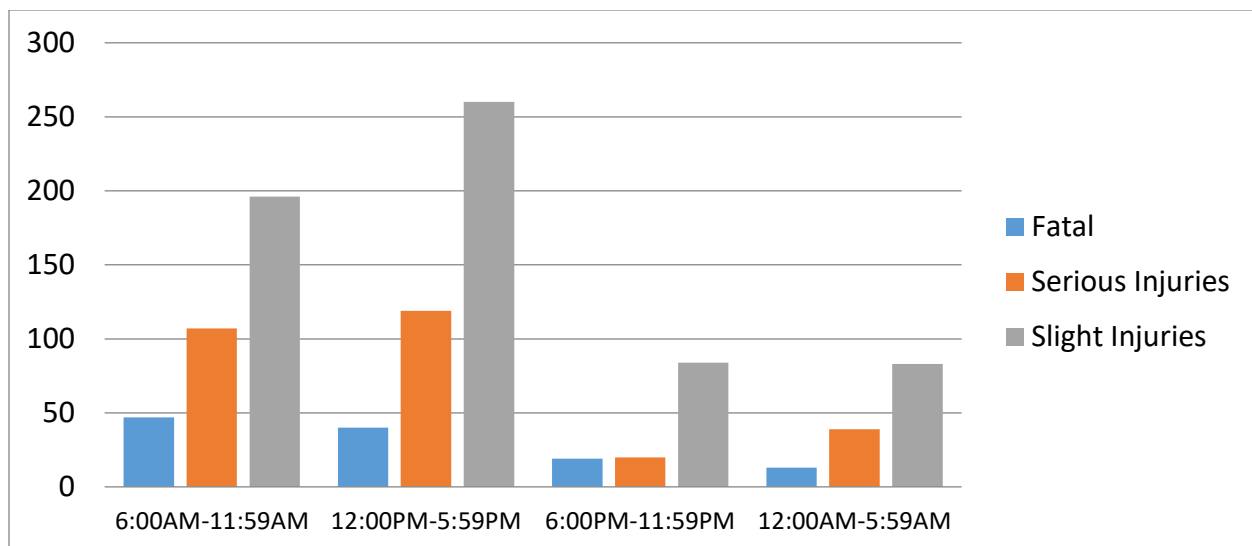


Figure 5: Distribution of hourly injury crash on Addis Ababa-Adama Expressway (2014-2018)

Similarly, the accident time varies in some extent, more injuries were occurred on 12:00PM-5:59PM 419(40.80%) in mid day, 6:00AM-11:59AM 350(34.08%) in morning, 12:00AM-5:59AM 135(13.15%) and 123(11.98%) on 6:00PM-11:59PM.

Among vehicles that were involved in the injury, Minibus and bus were more frequency 311(30.28%), followed by automobile 305(29.70%), Pickup and medium truck 221(21.52%) and Truck and above were 190(18.50%).

Table 2: Car type involved in injury crashes on Addis Ababa-Adama Expressway (2014-2018)

No.	Types of vehicle	Frequency	Percent
1	Automobile	305	29.70%
2	Pickup and Medium truck	221	21.52%
3	Minibus and Bus	311	30.28%
4	Truck and Above	190	18.50%
	Total	1027	100.00%

In relation to collision types more injury occurred by car overthrow 559 (54.43%), crash vehicle to vehicle 237(23.08%), crash vehicle to other objects 216(21.03%) and unknown was 15(1.46%).

Table 3: Collision types i in injury crashes on Addis Ababa-Adama Expressway (2014-2018)

No.	Collision types	Frequency	Percentages
1	Car overthrow	559	54.43%
2	Vehicle to vehicle	237	23.08%
3	Vehicle to static object	216	21.03%
4	Unknown	15	1.46%
	Total	1027	100.00%

5.3 Trends of Road Traffic Injury Crashes on Addis Ababa-Adama Expressway 2014-2018

From year to year, the occurrence of road traffic injury crashes (RTICs) has variation on Addis Ababa-Adama expressway. As shown in figure 9, 224 (15.68%) RTC was occurred during the period of September 2014 to end of August 2014. It was rise to 321(22.46%) during the period of September 2015 to August 2015. However, by the year 2016 there was slight decline compare to the previous year2015 and it was 318(22.25%). Among the period of September 2017 to August it was increased to 325(22.74%) RTC. But, on the fifth year 2018 it showed decreased to 241 (16.86%) when compared to others years, except 2014.

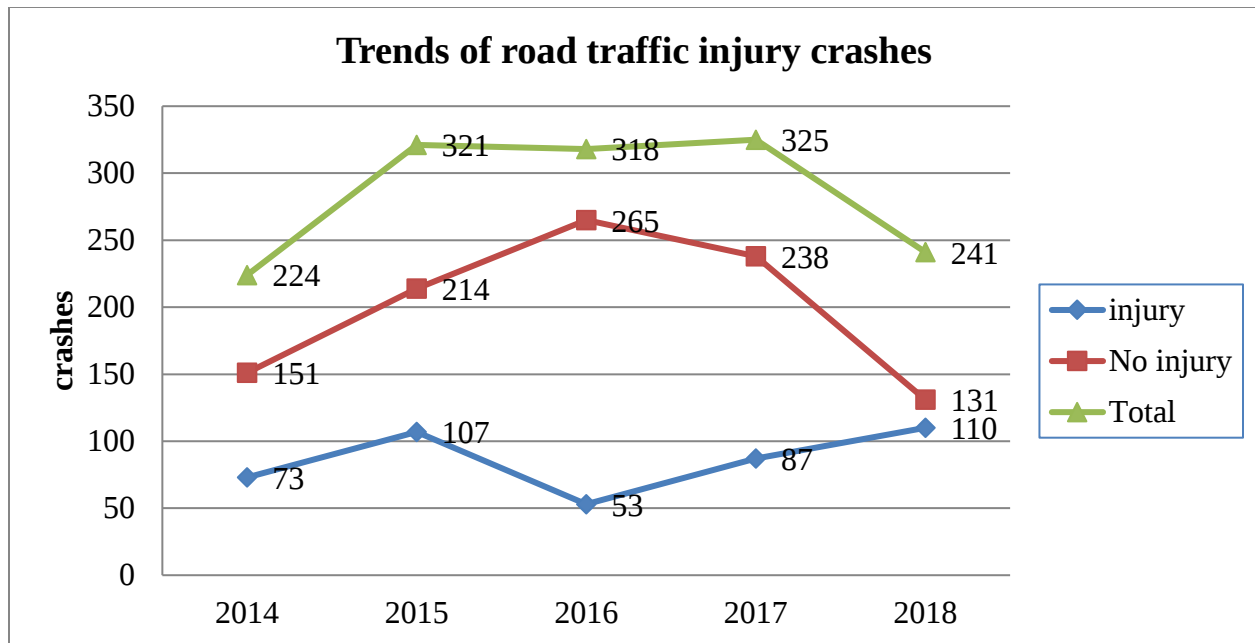


Figure 6: Trends of Yearly Road Traffic Injury Crashes on Addis Ababa-Adama expressway (2014-2018)

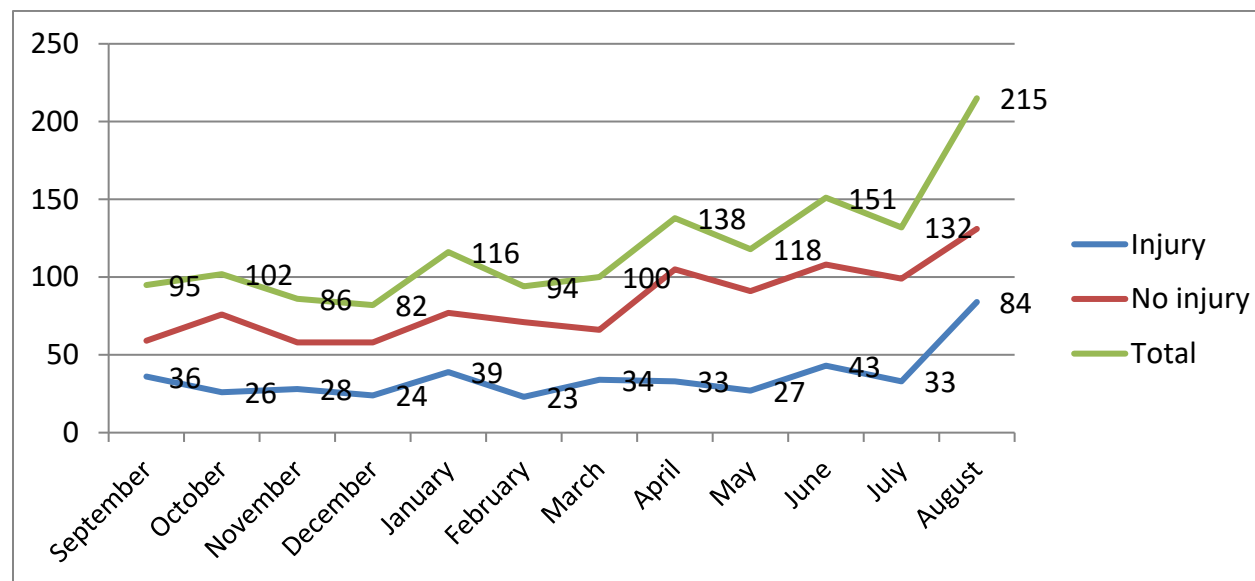


Figure 7: Trends of Monthly injury on Addis Ababa-Adama Expressway (2014-2018)

Concerning monthly trends, figure 10 showed that, it had a sort of minor fluctuation. The month of August had more cases 215 (15.05%), followed by the month of June 151(10.57%), April 138(9.66%), July 132(9.24%), January 116(8.12%) and the other months had likely similar variation.

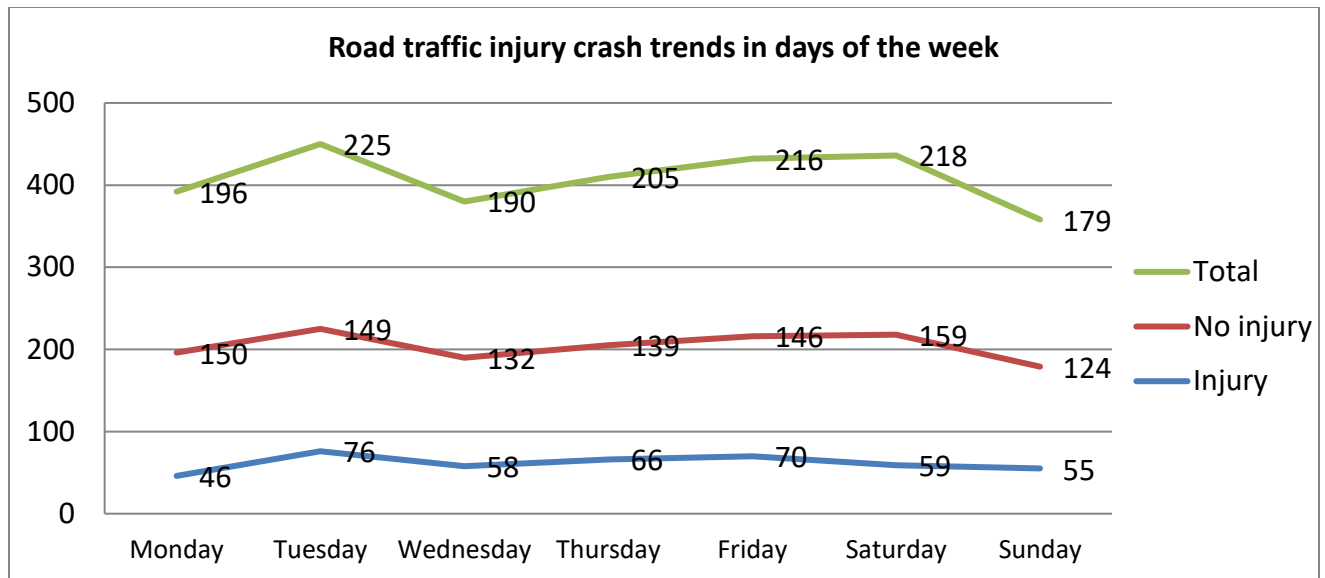


Figure 8: Trends of days of the week injury on Addis Ababa-Adama Expressway

In the days of the week more injury crashes occurred on Tuesday 225(15.75%), followed by Saturday 218(15.26%), Friday 216 (15.12%), Thursday 205(14.35%), Monday 196(13.72%), Wednesday 190(13.30%), and Sunday 179(12.53%).

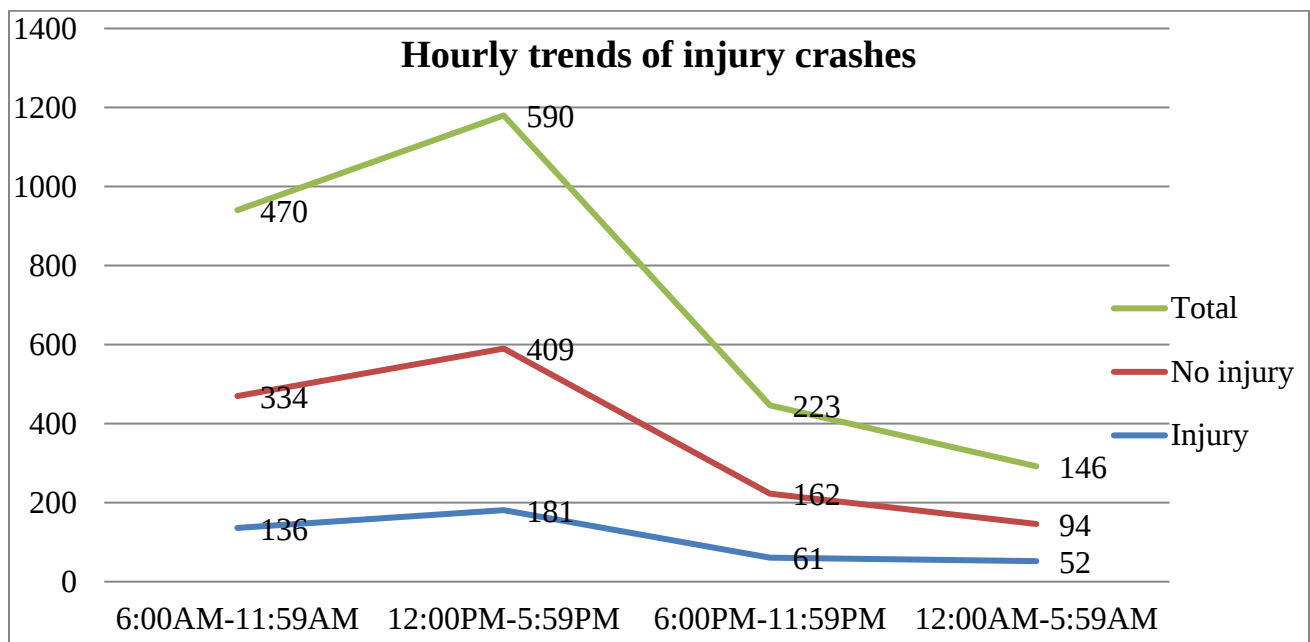


Figure 9: Trends of hourly variation of injury on Addis Ababa-Adama Expressway (2014-2018)

Hourly variation afternoon time were more injury crashes occurred 590(41.29%), and the morning time were the second one 470(32.89%). But night time was less than the day time.

5.4 Factors Associated to road traffic injury crash on Addis Ababa-Adama Expressway

5.4.1 Bivariate logistic regression

The bivariate logistic regression was used to see the association between each independent variable and the dependent variable. The degree of association between independent and dependent variables was assessed using crude odds ratio with 95% confidence interval and a P-value ≤ 0.05 was considered as statistically significant. In the bivariate logistic regression the major factors associated with road traffic injury crashes were: age of drivers 50 and above (COR= 1.62, 95% CI: 1.09,2.40) 18-29 (COR=0.96, 95% CI: 0.75, 1.23), minibuses and bus (COR=2.40, 95% CI: 1.68, 3.45), pickup and medium truck (COR= 1.87, 95% CI: 1.31,2.66), automobile (COR= 1.38, 95% CI: 1.00, 1.89), car overthrow (COR= 1.95, 95% CI: 1.48,2.59), sleeping/fatigue (COR= 2.76, 95% CI: 0.82,1.58). Over speeding (COR= 1.59, 95% CI: 1.16, 2.18). Unethical driving (COR= 1.31, 95% CL: 1.00, 1.71) and sleeping was (COR= 2.64, 95% CL: 1.63, 4.28).

Factors that did not have any relation with road traffic injury in bivariate analysis include, days of the week, hours, seasonal.

Table 4: The association of RTCs with independent variables; Crude odd ratio (COR) from the bivariate logistic regression

Variable	Category	<u>Cross-tabulation</u>		<u>Bivariate logistic</u> <u>Regression</u>
		Injury crash	Non-Injury	COR(95%CI)
Age	18-29	145	361	0.96[0.75,1.23]*
	30-49	237	567	Ref.
	50 and above	48	71	1.62[1.01,2.40]*
Days	Weekday	316	716	Ref.
	Weekend	114	283	0.91[0.71,1.18]
Hourly	6:00AM-11:59AM	136	334	Ref.
	12:00PM-5:59PM	181	409	1.09[0.83,1.42]
	6:00PM-11:59PM	61	162	0.93[0.65,1.32]
	12:00AM-5:59AM	52	94	1.36[0.92,2.01]
Seasonal	Rainy season	263	568	0.84[0.66,1.05]
	Dry season	167	431	Ref.
Types of Vehicle	Automobile	155	398	1.38[1.00,1.89]*
	Minibus and Bus	100	147	2.40 [1.68,3.45]***
	Pickup and Medium truck	100	189	1.87[1.31,2.66]***
	Truck and above	75	265	Ref.
Collision Types	Crash vehicle to vehicle	93	263	1.23[0.82,1.56]
	Car overthrow	231	379	1.95[1.48,2.59]***

	vehicle to static objects	97	311	Ref.
	Unknown	9	46	0.63[0.30,1.33]
Cause of crash	Over speeding	95	179	1.59[1.16,2.18]**
	Unethical driving	163	373	1.31[1.00,1.71]*
	Sleeping/fatigue	37	42	2.64[1.63,4.28]***
	Technical problem	135	405	Ref.

$p \leq 0.05^*$, $p \leq 0.01^{**}$, $p \leq 0.001^{***}$, COR= crude odd ratio, CI= confidential interval

5.3.2 Multivariable logistic regression

The variables with P-value ≤ 0.2 in the bivariate analysis were entered into the final multivariate logistic regression analysis to control potential confounding factors and to get estimates of the association between factors and dependent variables. The multivariate binary logistic regression analysis identified that; age of drivers, vehicle types, collision types and cause of road traffic injury crashes were significantly associated with road traffic injury crashes.

In multivariate analysis the odd of drivers age 50 and above were 1.70 times more likely (AOR= 1.70, 95% CI: **1.13, 2.58**) to had RTC in five years period, than those drivers age 30-49 years. The odd minibus and bus car 2.75 times more likely (AOR= 2.75, 95% CI: **1.88, 4.02**) to had RTC among when compared to truck and above car, pickup and medium truck was 1.88 times more likely (AOR=1.88, 95% CI: **1.30, 2.71**) to had RTC than truck and above car, automobiles were 1.50 times more likely (AOR= 1.50 95%CI: 1.07, 2.10) to occur when compared to truck and above. The odds of car overthrow was 2.00 times more likely (AOR=2.00, 95% CL: **1.49, 2.67**) to had RTC in five years period, than crash of vehicle to static objects.

The odd of sleeping/fatigue was 2.76 times more likely (AOR= 2.76, 95% CI: **1.65, 4.62**) to had RTC than technical problem. Odd of over speeding was 1.53 times more likely (AOR= 1.53, 95%, CL: **1.10, 2.12**) to had RTC than technical problem and the odd of unethical driving was 1.43 times more likely (AOR= 1.43, 95% CL: **1.08, 1.90**) to had RTC than technical problem.

Among data entered to multivariate logistic regression days of week, hours and seasonal (rainy and dry) variable was not significant.

Table 5: The association of RTICs with independent variables; Adjusted Odd Ratio (COR) from the Multivariate logistic regression

Variable	Category	<u>Cross-tabulation</u>		<u>Multivariate logistic regression result</u>
		Injury crash	Non-Injury	AOR(95%CI)
Drivers Age	18-29	145	361	0.89[0.69,1.15]
	30-49	237	567	Ref
	50 and above	48	71	1.70[1.13,2.58]**
Days	Weekday	316	716	Ref.
	Weekend	114	283	0.94[0.73, 1.23]
Hourly	6:00AM-11:59AM	136	334	Ref.
	12:00PM-5:59PM	181	409	1.12[0.85, 1.48]
	6:00PM-11:59PM	61	162	0.99[0.69, 1.43]
	12:00AM-5:59AM	52	94	1.31[0.86, 2.00]
Seasonal	Rainy season	263	568	Ref.
	Dry season	167	431	0.82[0.64,1.04]
Types of Vehicle	Automobile	155	398	1.50[1.07, 2.10]*
	Minibus and Bus	100	147	2.75[1.88, 4.02]***
	Pickup and Medium truck	100	189	1.88[1.30, 2.71]***
	Truck and above	75	265	Ref
Collision	Crash vehicle to vehicle	93	263	1.08[0.77, 1.53]

Types	Car overthrow	231	379	2.00[1.49, 2.67]***
	Vehicle to static objects	97	311	Ref
	Unknown	9	46	0.67 [0.31, 1.44]
Cause of crash	Over speeding	95	179	1.53[1.10, 2.12]*
	Unethical driving	163	373	1.43[1.08, 1.90]*
	Sleeping/fatigue	37	42	2.76[1.65, 4.62]***
	Technical problem	135	405	Ref.

$p \leq 0.05^*$, $p \leq 0.01^{**}$, $p \leq 0.001^{***}$, COR= crude odd ratio, CI= confidential interval

6. DISCUSSION

In this study the prevalence of road traffic injury crashes was 30% (95% CI 27.6%, 32.4%). In bivariate logistic regression: age of driver, season, types of vehicles, and types of collision and cause of road traffic crashes were significant association with injury crashes.

In this study the prevalence of injury crashes was 30% which was consistent with the studies conducted in Addis Ababa city among motorcycle drivers 33.8% (35). The study conducted in Vietnam reported, the prevalence of road traffic crashes was 22.7%, study conducted in Northern Ethiopia 23.17% which were lower than our study. This difference may due to sample setting, duration of sample taken with differences years (32, 36). Study conducted in Ghana reported that, prevalence and pattern of road traffic accident was 64% which higher than our current study (37).

In this study the monthly trends revealed that there were increments on June and August. This study consistent with study conducted in Ethiopia Sululta road side (39). This might be both months were rainy months when more rain were raining in Ethiopia, the rain cause flood that could affect the potential to control the car.

The odd of injury crashes among drivers with the age of 50 and above years were 1.70 times more likely higher than age group 30-49 years. But study conducted in Mekele city, Northern Ethiopia on risky driving behaviors for road traffic accident among drivers showed that, younger driver were frequently involved high proportion than other age groups(6). This difference may be due to the nature of the road network as the previous study conducted in urban setup.

This study identified that types of car were the main predictor of road traffic crash injury. Minibus and bus were 2.75 times more likely to had injury crashes when compared to truck and heavy truck.. This might be due to minibus and bus drivers were more competitive in order to arrive earlier to increase the number of trips. Automobile car was 1.50 times more likely to have road traffic injury crashes when compared to truck and heavy truck. This study consistent with study conducted on Addis Ababa-Adama traffic accident cause and countermeasures, Ethiopia (38). This might be due to the fact that automobile car drivers use the road network for vacation purpose as most of the recreational areas were found at the middle of the express way (Bishoftu/Debrezeit).

This study revealed that types of collision were found to be an aggregating factor for injury crashes. The odd of car overthrow was 2.00 times more likely to had road traffic injury crashes when compared with crashes to static objects. This study also consistent to study conducted on Addis Ababa-Adama traffic accident cause and countermeasures, Ethiopia (38). This might be due to competition between drivers within high speed to reach timely in expectation of the way safe.

This study also identified the odd of sleeping was 2.76 times more likely to had RTC than technical problem. This might be due to the nature of the express-way it is more comfortable road and with very few curves make the driving task very easy and exposed drivers to sleep or drowsy. The odd of over speeding was 1.53 times more likely to had injury crashes than technical problem. As speed increases the human tolerance for physical force increase and the human level of control became declining.

The typical strength of the study is the fact that used all available data that recorded for five years, which give all feature of problem on this expressway. The study assessed the trends of the accident which not undertaking in previous study. On the other hand, one of the limitations of the study might be lack of sufficient data related to several important predictors which may affect the severity of RTIC, such as socio-demographic; like, educational level, marital status, driving experience and population flow were not recorded by the toll road enterprise and hence could not be assessed in the study. Other limitation was since data secondary data, all needed variable not included in the study. As a result, the number of records in the study wasn't adequate. This may affect the conclusion of the study.

7. CONCLUSION AND RECCOMENDARION

7.1 Conclusion

This study was carried out to describe the prevalence of road traffic injury crashes, characteristic of injury, trends of injury crash and factors associated to road traffic injury crashes. The prevalence of injury crash was unexpectedly high. However the trends of injury crash had nearly similar various it was started within high percentage. The major factors of road traffic injury were driver behavioral, vehicle factor and environmental factor. The types of cars and collision type were the other types of causative for the occurrence of road traffic injury crashes.

7.2 Recommendation

Based on the above findings, the following recommendations are recommended. This recommendation will help the Ethiopia Toll Road Enterprises, policy makers and road user to alarming the problem and give attention working on to minimize this severity of road traffic injury crashes on Addis Ababa-Adama Expressway.

- ✓ The finding of the study reveals that the prevalence of injury crashes were high, even if the road look like safe way, road authority should be take attention
- ✓ Driver behavior (over speeding, unethical driving and sleeping/fatigue) and Vehicle factor were the worst accident cause on Addis Ababa – Adama Expressway. Therefore, it is important to advocate training for drivers and ensure ethical behavior among those using the road, which may include enhancing personal driving capacity through participating different government and non-governmental initiatives towards the transport sectors. In addition, concerned body may ensure the maintenance of car regularly.
- ✓ Most of the collision was registered as a result of car overthrow. The main cause for the occurrences of this crash is particularly unethical driving behaviors of driver in respect to over speed and tire problem. As a result, it is important to reconsider the speed limit of the Expressway in relation to the advanced vehicular performance checking technology.

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Annex

Annex I

Participant information sheet in English

Addis Ababa University Faculty of preventive Medicine School of Public Health

You have been chosen the participant in this study which is, Assessment of Prevalence Traffic Accident and Associated Factors On Addis Ababa-Adama Expressway. Please read the following statements and ask any unclear questions before you agree to participate.

1. Topic: Assessment of Prevalence Road Traffic Injury Crash and Associated Factors On Addis Ababa-Adama Expressway, Ethiopia.

2. Objective of the study: The objective of this study is to assess Prevalence Road Traffic Injury Crash and associated factors on Addis Ababa-Adama Expressway. And this information collected from you serve as a base line information for the country to take a corrective action and to identify the magnitude of the problem in the country as well as to Proper implementation of occupational health law and standards in countries has also shown to bring about a significant reduction of road traffic accidents.

3. Participation procedure and Guidelines:

The information you provide will be kept completely anonymous. Your information will completely confidential.

4. Participant Benefit and risk:

Your participation in the study does not involve risks. You also may experience some benefits from participating in this study. You can get the information about the prevalence of road traffic accident in our country and the cause of this problem.

5. Study design:

Cross sectional study will be conducted from February – March, 2020

6. Right as a participant

You have a right to ask any question(s). If you need clarification on the study, please contact:
Negesa Adugna

Cell Phone: 0931323014

E-mail negesaadugna2018@gmail.com

Thank you

አባሪ II

በተሳታፊ የመረጃ ወረቀት በአማሪኛ

የአዲስ አበባ ዩኒቨርሲቲ የመከላከያ ጤና ትምህርት ቤት የህዝብ ጤና ትምህርት ቤት

በዚህ የጥናት ተሳታፊ ሆነው የተመረጡት እርስዎ የቅድመ አደጋ የትራፊክ አደጋ ማግኘትና ተጓዳኝ ምክንያቶች በአዲስ አበባ-አዳማ ኤክስፕራይት ላይ የተመረጠዎልዎትል:: እባክዎ ከሚከተሉትን መግለጫዎች ያንብቡ እና ለመሳተፍ ከመስማማትዎ በፊት ማንኛውም ግልፅ ጥያቄዎችን ይጠይቁ::

1. ርዕስ-የቅድመ አደጋ የትራፊክ አደጋ እና ተጓዳኝ ምክንያቶች ማግኘት በአዲስ አበባ-አዳማ ኤክስፕራይት ላይ:: ኢትዮጵያ::

የጥናት ዓላማ-የዚህ ጥናት ዓላማ የአዲስ አበባ

አዳማ ኤክስፕራይት ላይ የትራፊክ አደጋ እና ተጓዳኝ ሁኔታዎችን መገምገም ነው:: እናም ከእርስዎ የተሰበሰበው መረጃ በአገሪቱ ውስጥ የማስተካከያ እርምጃ ለመውሰድ እና በአገሪቱ ውስጥ ያለውን የችግር ንስፋት ለመለየት እንዲሁም በተገቢው የሙያ ጤና ሕግ እና ደረጃዎች ውስጥ በትክክል መተግበር እንደመነሻ መስመር መረጃ ሆኖ ያገለግላል:: ስለዚህም ንገድ ትራፊክ አደጋዎችን ጥያቄዎቻችን::

3. የተሳታፊ አሰራር ሂደት እና መመሪያዎች

የሰጡት መረጃ ሙሉ በሙሉ ማንነቱ ሳይታወቅ ይቀመጣል:: ስም ህልውና ጾታ:: መረጃዎ ሙሉ በሙሉ ምስጢራዊ ነው:: ደቂቃ ህልውና ይወስዳል::

4. የተሳታፊ ጥቅም አደጋ;

በጥናቱ ውስጥ ያለዎት ተሳታፊ አደጋ ነዳግ ካትትም:: በተጨማሪም በዚህ ጥናት ውስጥ በመሳተፍ ከንዳንድ ጥቅሞችን ሊያገኙ ይችላሉ:: በአገራችን ስላለው የመንገድ ትራፊክ አደጋ መስፋፋት እና የዚህ ችግር መንስኤ መረጃ ማግኘት ይችላሉ::

5. የጥናት ንድፍ-

የክፍል ተከላከያ ጥናት ከየካቲት - ማርች 2020 ድረስ ይካሄዳል

6. እንደተሳታፊ መብት

ማንኛውንም ጥያቄ (ቶች) የመጠየቅ መብት አልዎት:: በጥናቱ ላይ ማብራሪያ ከፈለጉ እባክዎ ከዎንያን ጋር Negesa Adugna

ስልክ ቁጥር 0931323014 ኢሜል: negesadugna2018@gmail.com ማድረግ ይችላል አመሰግናለሁ

Annex III: Consent form before conducting interview

Name of enterprise_____ Name of the department _____

Name of the working section_____

Greeting

Hello, I am_____. I am working in the research team of Addis Ababa University, school of public health, Department of preventive medicine. I would like to ask you a few questions about road traffic accident. This will help us to give attention to road traffic accident and enforce to concerned body more working on it based on your answer to our questions. Your name will not be written in this form and will never be used in connection with any information you tell us. All information given by you will be kept strictly confidential. Your participation is voluntary and you are not obliged to answer any question you do not wish to answer. If you feel discomfort with the interview, please feel free to drop it any time you want. This interview will take about 20 minutes. Do I have your permission to continue?

1. If yes, continue to the next page

2. If no, skip to the next participant by writing reasons for his/ her refusal

Informed consent Certified by

Interviewer: Code_____ Name_____ signature_____

Date of interview_____ Time started_____ Time completed_____

Result of interview: 1. Completed 2. Respondent not available 3. Refused 4. Partially completed

Checked by Supervisor: Name_____ signature_____ Date_____

For any inconvenience and problem, you can contact the principal investigator.

Negesa Adugna

Phone -0931323014 E-mails- negesaadugna2018@gmail.com

Annex IV: Amharic version consent form

የድርጅትስም _____ የመምሪያውስም _____

የስራክፍሉስም _____

ሰላምታ

ጤናይስጥልኝ፣እኔ _____ ነኝ።እኔበአዲስአበባዩኒቨርሲቲየምርምርቡድንውስጥ፣በሕዝብጤናት /
ቤት፣የመከላከያህክምናመምሪያውስጥእሠራለሁ።ስለመንገድትራፊክአደጋጥቂትጥያቄዎችንልጠይቅዎትእፈልጋለሁ።
፡ይህለመንገድትራፊክአደጋትኩረትእንድንሰጥእናለጥያቄዎቻችንበሚሰጡትመልስላይበመመርኮዝለሚመለከተውአ
ካልየበለጠለመስራትእንድንችልይረዳናል።ስምዎበዚህቅጽአይጻፍምእንዲሁምእርስዎከምትነግሩንማንኛውምመረጃ
ጋርበተያያዘጥቅምላይአይውልም።በእርስዎሚሰጡትሁሉምመረጃዎችበጥብቅበሚስጢርይያዘሉ።የእርስዎተሳትፎ
በፈቃደኝነትነውስለሆነምመመለስየማይፈልጉትንማንኛውንምጥያቄየመመለስግዴታየለብዎትም።በቃለመጠይቁወ
ቅትየተሰማዎትንጭንቀትከሞሉእባክዎንበፈለጉትጊዜለመጣልነፃይሙሉ።ይህቃለመጠይቅ 20
ደቂቃዎችንይወስዳል።ለመቀጠልየአንተፈቃድአለኝ?

1. አዎነኝ፣ወደሚቀጥለውገጽእቀጥላለሁ
2. የለምከሆነ፣ለሚፈጽመውተሳታፊ / እሱውድቅያደረገበትንምክንያቶችበመጻፍይዝለሉ

በመረጃየተረጋገጠስምምነትበ

ቃለ-መጠይቅ-ኮድ _____ ስም _____ ፊርማ _____

የቃለመጠይቅቀን _____ ሰዓትየተጀመረው _____ ሰዓትተጠናቀቀ

የቃለመጠይቅውጤት 1. 1. ተሞልቷል 2. መልስሰጬአይገኝም 3. ተቀባይነትአላገኘም 4. በከፊልተጠናቋል

በአለቃተቆጣጣሪተረጋግ ፡ል-ስም _____ ፊርማ _____ ቀን _____

ለማንኛውምችግርእናችግርለዋናመርማሪባለሙያውማነጋገርይችላሉ።

ኒሳሳአዲጉሳ

ስልክ -0931323014 ኢ-ሜይሎች- negesaadugna2018@gmail.com

Annex v

Data Collection Checklists

Socio-demographic	Number	
Age		
Gender		
Cause of Traffic Accident		
Driver behavior		
Vehicle factor		
Environmental factor		
Types of Vehicle		
Automobile		
Minibus and bus		
Pickup and medium truck		
Truck and above		
Daly Traffic Accident		
Monday –Friday		
Weekend		
Monthly		

Annex IV Assurance of principal investigator

The undersigned agrees to accept responsibility for the scientific ethical and technical conduct of the research project and for provision of required progress reports as per terms and conditions of the Research Publications Office in effect at the time of grant is forwarded as the result of this application.

Name of the student: Negesa Adugna

Date. _____ Signature _____

Approval of the primary Advisor

Name of the primary advisor: Teferi Abegaz (PhD)

Date. _____ Signature _____