Addis Ababa University
School of Graduates Studies, collage of Health Sciences School of Public Health

Master of Public Health in Epidemiology

Magnitude and Trends of Road Traffic Accident and Associated Factors: from Akaki to Adama, July 2007-June 2012, Oromia, Ethiopia

By

Fekede Asefa (BSc.)

June 2013

Ethiopia

Addis Ababa University
School of Graduates Studies
Collage of health Science School of Public Health

Master of public Health in Epidemiology

Magnitude and trends of road traffic accident and associated factors: from Akaki to Adama, July 2007-june 2012, Ethiopia

A Thesis Submitted to the School of Graduate Studies of Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Master of public health in Epidemiology

By

Fekede Asefa (BSc.)

June 2013

Addis Ababa

ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

Magnitude and trends of road traffic accident and associated factors: from Akaki to Adama, July 2007-june 2012, Ethiopia

By: Fekede Asefa (B.Sc.)

_____	_____	_____
Chairman, SPH	**Signature**	**Date**
Demeke Assefa **(MD, MA)**	_____	_____
Advisor:	**Signature**	**Date**
_____	_____	_____
External examiner	**Signature**	**Date**
_____	_____	_____
Internal examiner	**Signature**	**Date**

Acknowledgements

Apart from the efforts of myself, the success of this thesis depends largely on the encouragement and guidance of many others. I take this opportunity to express my gratitude to the people who have been instrumental in the successful completion of this thesis. I would like to thank all those who have put something towards the accomplishment of this thesis.

First, I gratefully thank almighty God from the depth of my heart for his support to reach this spot, without his guidance and support surely I wouldn't be here today. Secondly, I would like to thank Addis Ababa University School of Public Health for providing me with the fund needed for the thesis. Next, I would like to extend my deepest thanks to my advisor Dr. Demeke Assefa for his guidance and help throughout the work. Thirdly, I have very special thanks to Dr Alemayehu Worku for his encouragement and good advice starting from topic selection to the analysis, in spite of having practically no spare time, still managed to find time to provide help and advice.

In addition, I thank Mr. Gezahegn Tesfaye, and Mr. Abyot Asres for their feedbacks and comments to enrich the work I have done. The guidance and support received from my classmates, School of Public Health secretaries and librarians and all others who contributed was vital for the success of the thesis.

At last, but not least my thanks go to the Oromia Police Commission, Police Station of Gelan, Dukem, Bishoftu, Mojo and Adama for provision of letter of support to concerned bodies and all police officers of each station who helped me in the data collection.

Contents

List of tables

List of figure

List of Acronyms

AAU	Addis Ababa University
AOR	Adjusted Odd Ratio
ASMR	Age Specific Mortality Rate
CI	Confidence Interval
CSA	Central Statistical Agency
DALY	Disability Adjusted Life Year
GC	Gregorian Calendar
MTI	Motor Vehicle Injury
OR	Odd Ratio
RTA	Road Traffic Accident
RTC	Road Traffic Crash
RTI	Road Traffic Injury
SPSS	Statistical Package for Social Science
TWMV	Two wheel motor vehicle
DPSEEA	Driving force, Pressure, State, Exposure, Event and Effect, Action

Abstract

Background: Road traffic accident is now becoming a public health problem in the world and resulting in human tragedy. Globally, about 1.2 million people are killed in road traffic accident every year and 20 to 50 million more are injured and/or disabled. These injuries account for 2.1% of global mortality. Low- and middle-income countries account for about 85% of the deaths and 90% of the DALYs lost annually due to road traffic accident. Without appropriate action, by 2020, road traffic injuries are predicted to be the third leading contributor to the global burden of disease. Despite having low road network density and vehicle ownership, Ethiopia has a relatively high accident records. Road accidents are concentrated in few of the regions in the country. The capital City of Addis Ababa and Oromia Region account for 58 per cent of all fatal accidents and two thirds of all injuries

Objective: To assess magnitude, trends and associated factors of road traffic accident from Akaki to Adama.

Method: Retrospective study was conducted from police reports between July 2007 and June 2012 retrieved from the 8 police stations in the study area.

Result: A total of 2335 accidents have been registered in the study area from July 2007 to June 2012. Of those 389 (16.7%) resulted in death (fatal accident), 316 (13.5%) resulted in severe injuries, 290 (12.4%) resulted in slight injuries. The rest 1316 (56.4%) accidents resulted in property damage. During the study period, 1745 individuals were affected as a result of the accident. Of those 515 (29.5%) victims died, while 549 (31.5%) sustained severe injury and the rest slight injury. The major reason for the accidents were over speeding accounting for 836 (36.1%) followed by careless driving 573 (24.8%) and failure to give priority 507 (21.9%) for other vehicles and pedestrians. Being Female driver, accident occurring at mid night, accident caused by over speeding, failure to give priority and vehicles having technical problem are strong determinants of fatality.

Conclusions and recommendations

Trend of road traffic accident was steadily increased in magnitude from July 2007-June 2012 in the study area which calls for urgent interventions. Enforcing drivers to obey traffic rules and strong enforcement of speed limit appear to be the most critical parts of interventions.

1. Introduction

1.1. Background

Land transportation systems have become a crucial component of modernity. By speeding up communications and the transport of goods and people, they have generated a revolution in contemporary economic and social relations. Of all the systems that people have to deal with on a daily basis, road transport is the most complex and the most dangerous which highly associated with the rise in road traffic accidents[1]

Road traffic accidents (RTA) *can be defined as "An accident that occurred 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. Thus, RTA is collisions between vehicles; between vehicles and pedestrians; between vehicles and animals; or between vehicles and geographical or architectural obstacles"[2]*

According to the 2004 WHO report on RTA prevention, globally, more than 1.23 million people die as a result of road traffic accident each year, while the number injured could be as high as 50 million. If this trend continuous without increased efforts and new initiatives to prevent it, the total number of road traffic deaths worldwide and an injury is forecast to rise by some 65% by 2020. This problem will affect highly those low and middle income countries where 80% of the predicted death occurs. Millions of others sustain injuries, with some suffering permanent disabilities [1, 3]. Africa has the world's highest death rate per population (28.3 per 100,000 of the population) and Ethiopia which has the lowest vehicles to population ratio even in Africa stands as one of the worst countries with respect to road safety performance in terms of traffic accident fatalities. (95deaths per 10000 vehicles as reported 2007/8).[4]

1.2. **Statement of the problem**

Ethiopia is currently being labeled as one of the most unsafe places to drive. It has become one of the concerns of the government to make safe road for everybody and cognizant to the worsening situation in road death, injuries and property loss to take appropriate action. So, well conducted, scientifically rigorous research on the burden and impact of road traffic accident, associated risk factors and effectiveness of intervention are crucial elements need to be focused on in order to prevent and control of road traffic accident[5].

Currently, there is scarcity (gap) of published research regarding RTA in Ethiopia. Therefore, this study will provide important input about the magnitude and severity of road traffic accident and the analyzing trends which are very important in order to reach at measurable and actionable recommendations to help decision makers in strategic planning and decision-making. Moreover, the identification of major determinants of road traffic accident and severity as well as fatality of the injury will help save lives and improve the quality of life at large

2. Literature review

According to WHO report on RTA prevention in 2004, globally, more than 1.23 million die as a result of road traffic accident each year, while the number injured could be as high as 50 million. Around 85% of all global road deaths, 90% of the disability-adjusted life years lost due to road traffic accident, and 96% of all children killed worldwide as a result of road traffic injuries occur. The magnitude of the problem can be compared using its rate in low and middle-income countries and developed country which is 21.5, 19.5, and 10.3 per 100,000 persons, respectively. This high rate occurred in those low and middle income countries, with about 48% of the global registered vehicles contributes 90% of the deaths of RTA[6]. Unfortunately, over 50% of all these deaths occur among those who are aged 15 to 44 years that are economically active segment(young adult in age) of the population magnifying its effect [7] and In 2000 literature reported that road traffic accident was the second cause of death for the group between 5-29yrs and the third for those between 30-44yrs age group[8].

2.1. Magnitude and trends of RTA and road traffic fatality

An exploratory time-series study about mortality of RTA in Brazil reported that, there were 7,345 deaths of RTA victims in federal district, of these 580 being motorcyclists (7.9%) the same study showed that the number of deaths of motorcyclists increased from 25 in 1996 to 139 in 2007. [9]

Time trends study from Lithuania analyzed road traffic accident incidence and age specific mortality rate (ASMR) between 1998 and 2007 reported the increase in the occurrence of crashes while mortality rates remain unchanged. The overall road traffic injury incidence was 10.7% higher in 2007 (270/100 000) compared to 1998 (244/100 000). While the RTI-related ASMR decreased from 28 to 25 deaths per 100 000 population per year between 1998 and 2007, the road traffic crash rate was 7.7% higher in 2007 when compared with 1998[10].

Study from Turkey on the group from 0-17yrs reported that a total of 22,518 persons died due to road traffic injuries during the period of this study (2003-2007). The age group of 0-17 years represents 15,914 (10.9%) of the total deaths (range: 10.1%-12.2% over the 5-year period). Of all the injuries suffered, the age group of 0-17 accounted for 20% of the total number (16.2%-17.1%). Among the 0-17 age group, 53.5% of deaths and 70.7% of injuries related to road traffic occurred in residential areas. 63.8% of the children who were killed due to road traffic accidents in residential areas were pedestrians, 24.6% were passengers and 11.6% were reported to have been the driver. Most deaths among drivers occurred in 2006 (20.7%), among passengers in 2007 (30.9%) and among pedestrians in 2003 (70.1%), in residential areas. Although there are similar rates in terms of death in uninhabited areas in accordance with years, the numbers in 2007 were slightly higher.[11]

Cross-sectional study in Dubai from the period of 2002 to 2008, reported steadily increasing numbers of road traffic injuries from 2203 in the year 2002 to 3043 in the year 2008, representing a 38% increase. The associated mortality showed the same trend with an overall increase rate of 54% between 2002 and 2008. There was a noted drop (-11.4%) in fatalities between 2007 and 2008. During 2008, there were 3433 road traffic injuries and 294 deaths (8.5% fatality rate).[12]

Study from 2004–2007 periods in Cameroon reported that total of 935 police reports, including 279 non-injury, 428 injury, and 228 fatal crashes. Among the 1868 injured persons, 768 (41%) were not seriously injured, 726 (39%) seriously injured, and 278 (15%) killed immediately. More men than women were injured (73.8%) and killed (74.9%).[13]

2.2. Factors associated with road traffic accident

There is marked variation across the world in the way that roads are used and injuries are caused, which have important implications for road safety policy and practice. For example, road traffic injuries in highly-motorized countries mostly involve car drivers, whereas in certain countries of Asia it is motorcycle riders and in many low-income countries it is occupants of multiple passenger vehicles (such as buses) and pedestrians. There is also appreciable variation in the breakdown of these injuries by underlying cause (road infrastructure versus vehicle design versus exposure to risk factors such as speeding or not wearing a seatbelt)[14]

The World Report on Road Traffic Injury Prevention categorizes risk factors for road traffic accident into four groups. These are: first, factors influencing exposure to risk, such as economic and demographic factors, the level of motorization, modes of travel, the volume of unnecessary trips and land-use plans practices. Second, factors influencing crash involvement, such as excessive speed, drinking and driving, unsafe vehicles, unsafe road design and the related lack of effective law enforcement and safety regulations. Third, factors influencing crash severity, such as the nonuse of seat belts, child restraints or crash helmets, insufficient vehicle crash protection both inside and outside the vehicle, unforgiving roadside objects and human tolerance factors. Fourth, factors that influence the severity of post-crash injuries, including delays in detecting a crash and providing life-saving measures and psychological assistance, delayed or poor emergency care on the spot or transport to a health facility, and inadequate trauma care and rehabilitation following the collision.[15]

Age of the drivers is an important factor which is highly associated with the occurrence of road traffic accident and it severity. Many literatures noted that young age driver especially from 19-30yrs are frequently involved in the crash [12, 16-19] and the study in Qatar shows the highest percentage of the RTCs occurred in the age group 25-34 years (31.2%), followed by 35-44 years (22.9%)[16], while above 30yrs drivers are frequently involved in the crash as reported in some literatures[20, 21] but there is completely different finding that shows the age below 15yrs and above 74yrs are frequently involved in the crash. AOR were obtained for age groups at the ends of the range (AOR=1.50) for drivers younger than 15 years, and 2.43 for drivers more than 74 years old)[22].

Sex of the driver is another important factor which determines the occurrence of the crash as well as its outcome. The study in Qatar shows that crashes were more common among male drivers (69.4%), with females accounting for 30.6% of the crashes[16] and also being a female driver is associated with lower risk of accident in another study [22].

Study in Spain shows driving above and below speed limit has strong association with accident. the above speed limit (AOR=6.35) and slow speed (AOR=4.20) also showed a strong association[22] which is also supported by study in Qatar that more than half of the studied drivers

with a history of crashes had traffic violations (57.2%) especially in exceeding the speed limit (25.7%) is highly significant(<0.001)[16] and also excessive speed is also the main cause of fatal crash (20%) on study in Cameron[13]. A large increase in the risk of accident was observed for driving under the influence of alcohol, especially when a positive test result was recorded (AOR=8.71). Driving without a valid license, Excess of passengers or load were associated with slight increases in the risk of accident[22]

Study from Cameroon reported crashes involving vehicles travelling in opposite directions, single vehicles running off the road Crashes with still or maneuvering vehicles and at intersections were responsible for a very small proportion of fatalities (3.7% of the 374 fatalities). The main causes of fatal crashes were hazardous overtaking (23%) and mechanical failures (28%), two thirds of the latter being Tyre problems. Other important causes were loss of control and other human factors [13]

Study in Qatar reported drivers with more driving experience (>5 years) were more frequently involved in RTCs (38.2%), followed by 1-3 years (30.6%) and 3-5 years (21.4%) of driving experience[16] but a protective effect was reported on drivers who have number of years driving license and also Helmet use and female sex were associated with a lower risk of collision. [22]. RTCs were more common among drivers who were owners of vehicles (66.7). A significant difference was observed between drivers who did and did not have crashes in terms of ownership of vehicle (<0.001) and type of vehicle (p=0.02). The highest frequency of crashes occurred in drivers with university degree (32.7%)[16].

Victim's injury can be classified as mild (slight), severe and death. According to study in Dubai majority of injuries are mild injuries, comprising around 60% of total injuries. Moderate to severe injuries fluctuate from 32.3% in 2002 to 31.3% during 2008. The age distribution of RTIs shows that the majority of injuries are in the middle-age groups, between 18 and 35 years, Females were involved in around 20% of total injuries. The fatality rate per 1000 injuries is higher in the middle-age group[12]. The study in India also reported most of the victims were in the 3rd decade of life (28.5%, n =98). Maximum number of males (n =94, 30.6%) were aged between 20 and 29 years. While the male fatality pattern varied during the different age groups, the distribution of female

cases was fairly uniform throughout each decade of life[23]. The study from Brazil also reported that most victims were male (94.3), aged between 20 and 39 years (73.8%)[9].

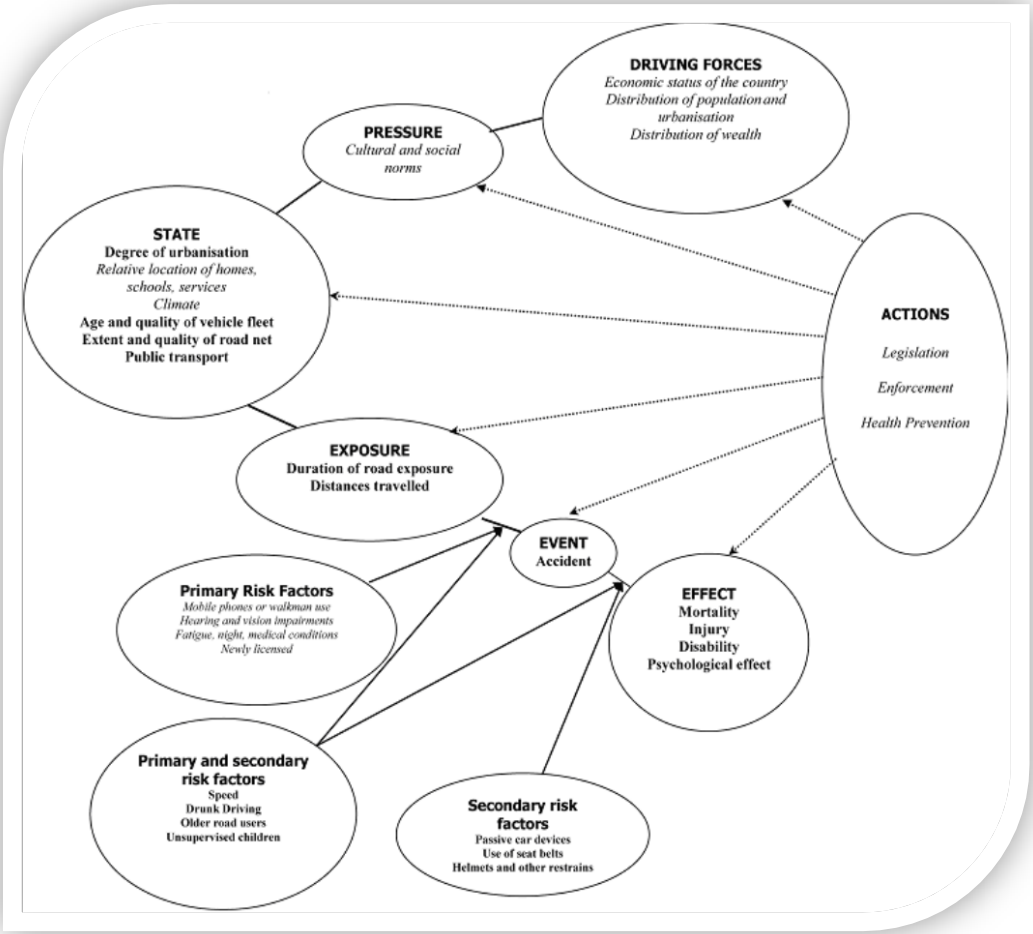
2.3. Road traffic accident in Ethiopian situation

Ethiopia stands as one of the worst countries with respect to road safety performance in terms of traffic accident fatalities per 10,000 which were between 165 and 233 per 10,000 vehicles from 1968/9- 1994/5G.C. The fatality risks were, however, between 2.2 and 4.0 per 100,000 populations. In 2007/8 trend of traffic accidents fatality was 95 per 10,000 vehicles. Pedestrians were the most vulnerable road users and buses and trucks as the vehicle types most frequently involved in traffic accidents. [24]

A comprehensive analysis of the road safety problem in Ethiopia and a detailed study in the City of Addis Ababa was showed that traffic accident fatalities progressively increase with the growth in population and the number of vehicles. About 56 % of the fatalities during 1987/8-1996/7 were pedestrians,[25].

Out of all accidents registered in Ethiopia, Addis Ababa holds about 60% on average. This is partly because the City has great contact through its gates with different regions every day. Addis Ababa to Adama is one of the main gets of Addis Ababa which connects the City to the southern and eastern part of the country. Therefore, having a great deal of concentration of vehicles and traffic, takes the lion's share in car accidents. The costs of such injuries and fatalities due to traffic accidents have a great impact on various aspects of the society[26]

Figure 1 Conceptual framework for road traffic accident (DPSEEA model)



Source: Farchi, S., et al and European Road Accident Indicator Working Group[27]

3. Objectives

3.1. General objective

To assess magnitude, trends and associated factors of road traffic accident from Akaki to Adama, between July 2007 and June 2012.

3.2. Specific objectives

To assess magnitudes of Road traffic accident from Akaki to Adama

To see trends of Road traffic accident from Akaki to Adama

To identify factors associated with road traffic accident from Akaki to Adama

4. Methodology

4.1. Study area and Period

The study was conducted in Oromia Regional State which has the highest area coverage and high traffic movement next to Addis Ababa in the country. The highest accident fatality occurs in this Region. Addis Ababa and Oromia Region account for 58 per cent of all fatal accidents and two thirds of all injuries [28]. Addis Ababa to Adama covers about 100km long towards the east and connects the City to southern and eastern parts of the country even neighboring country like Djibouti. This road is one of the busiest routs out and to Addis Ababa. Therefore, high numbers of vehicles are moving through this way and the occurrence of the RTA is very high compared to other parts of the Country. Mini buses, buses, heavy duty vehicles (truck) are the most frequent vehicles moving on the high way. The study area includes Gelan, Dukem, Bishoftu, Mojo and Adama towns.

4.2. Study design

Mixed-method approach was used by combining a Record based retrospective study from police reports of the July 2007– June 2012 period with qualitative interviews. All reported road traffic accidents during the period from July 2007 to June2012 were reviewed from the 8 police stations of Akaki to Adama. Qualitative study (in depth interview) was conducted with drivers and traffic police officers.

4.3. Population

4.3.1. Source population

All registered road traffic accidents during the period from July 2007 to June2012 on registry of 8 police stations located in the area.

4.3.2. Study population

All registered road traffic accidents during the period from July 2007 to June2012 on registry of police stations of Akaki to Adama.

4.4. Inclusion and exclusion criteria

All registered road traffic accidents during the period from July 2007 to June2012 on registry of police stations of Akaki to Adama were included.

4.5. Study variable

4.5.1. Dependent variable

Magnitude of road traffic accident

Trends of road traffic accident

Severity of road traffic accident

4.5.2. Independent variables

Age of drivers

Sex drivers

Educational status

Driving experience

Type of vehicle

Type of injury

Driver car relationship (vehicle ownership)

Levels of driving license

Cause of accident

Light condition

Weather condition

4.6. Sample size calculation & Sampling technique

All registered road traffic accidents during the period from July 2007 to June2012 on registry of police stations of Akaki to Adama were taken.

4.7. Data collection

Data was collected from 8 police RTA registry using check list which was prepared based on road traffic accident registration format. Qualitative study (in depth interview) was conducted with drivers and traffic police officers, by the investigator. Eight in depth interview (four with drivers and four with traffic police officers) at Gelan and Dukem towns.

4.8. Data quality Control

Check list for data collection was prepared in English and translated to Afan Oromo and checked before actual data collection started. Data collection procedures were supervised by supervisors and principal investigator and checked for completeness and coherence. Data cleaning and editing take place by removing the missing values by using Epi-info version 3.5.1 statistical packages.

4.9. Data processing and analysis

The data was entered, cleaned using Epi-info version 3.5.1 and analyzed by SPSS version 16. First descriptive statistics of percentages and frequency distribution, ratio using tables and figures were carried out to explore the socio-demographic characteristics of drivers and occurrence of RTA. Binary logistic regression was used to assess the association of road traffic accidents with socio-demographic characteristics of drivers (age and sex), year of the accident, reason of accident, time of the event, location of the event, and type of vehicle involved. Adjusted odds ratios (OR) with 95% confidence intervals (CI) and *P* values were calculated. $P < 0.05$ was considered statistically significant. Factors for which significant ($P \leq 0.2$) bivariate association observed were retained for subsequent multivariate analyses using logistic regressions. A trend of road traffic accident was seen using chi-square for liner trend.

The qualitative data from the interviews with traffic police officers and drivers were analyzed using content analysis. Analysis was started by importing the transcribed text into the Open Code programme to facilitate the coding process. Units of relevant meaning were examined line-by-line and coded. As part of the analysis, four categories were developed that illustrated the manifest meaning of the findings, while the single theme represents our overall joint interpretation of the qualitative data

4.10. Operational definitions

Fatal injury: At least one person (driver, passenger or pedestrian) killed within 30 days by injuries sustained in the RTA

Severe injury: At least one person injured and admitted crash to hospital but no fatalities

Slight injury: At least one person requiring medical crash care, but no fatalities or injuries requiring hospitalization

Property damage: All reported accidents not involving injuries or deaths are classified as property damages.

4.11. Ethical consideration

The study protocols were approved by Institutional Ethical Review Committee of the Addis Ababa University College of Health Sciences. An official letter of co-operation was written to Oromia Police Commission. Oromia Police Commission wrote letter of support to each police station of the study area. Information on the studies was given to police officials working on RTA, including purposes and procedures, potential risk and benefits and the consent were given from the police official.

4.12. Dissemination of Results

The final report is presented as partial fulfillment of the Degree of Master of Public Health to the School of Public Health, Addis Ababa University. Copies of the final report will be provided to Oromia Police Commission. Furthermore; it will be disseminated through Publication in local and international journals and presented on scientific conferences.

5. Result

Magnitude of RTA and Factors related with drivers characteristics

From July 2007-June 2012, 2335 RTAs registered in the eight police stations from Akaki to Adama. Of those 389(16.7%) were fatal, 316(13.5%) severe injuries, 290(12.4%) slight injuries and the rest 1316(56.4%) were property damage while the outcome of 24(1%) accidents were not registered.

As shown in the table below (Table 1), majorities of the drivers involved on the crash were male 2303(98.6%), while 15(.6%) were female drivers. Seven hundred twelve (34.4%) drivers reported to have completed grade 5-8 while 577(27.8%) drivers completed grade 9-10. Almost half of the accidents 1175(51.1%) were caused by 19-30 years aged drivers followed by 916(40.1%) 31-50years old drivers. The mean age of drivers was 32.9(SD±9.8). 1009(46.7%) of the drivers were those who had had grade three driving license followed by 436(20.2%) drivers those who had had grade 4 driving license. Having driving experience from 3-5 years were more frequently involved in RTAs 479(32.5%), followed by 1-3 years 401(27.2%) and 5-10 years 345(23.4%) of driving experience.

The qualitative finding also reported that young age drivers are most frequently involved in RTAs. As qualitative informants young drivers are driving irresponsibly and carelessly because they have nothing to worry about and less experienced as well as most of them have 3rd level driving license. Older drivers have family responsibility and most of them drive their own vehicles. Therefore older drivers carefully drive which decreases the risk of accident.

One respondent reported as "*Currently drivers who cause RTAs are those young aged once. Now if you see drivers of mini bus and Isuzu they are very young even you suspect them that they have driving license. Those who have 3rd level driving license are frequently involved in crashes. They don't care, they don't feel responsibility. They drive in high speed by new force.*"

RTAs were more common among drivers who were hired 1923(83.6%) while it was low among drivers who were owners of the car 344(15%). Thirty nine (1.7%) accidents were occurred in rainy weather condition. In regards to the light condition during the accidents, there were a total of 348(16.7%) accidents during night time. Of those, 142 (6.1%) accidents were at around (midnight) while 206(8.8%) dark (early night/early morning) which is during rush hour and 1946(83.3%) were at day light.

Table 1 Frequency distribution of driver's related characteristics involved in RTA from Akaki to Adama, June 2007 to June 2012, Ethiopia

	Frequency	percent
Age of driver **(2274)**		
≤18	25	1.1
19-30	1175	51.7
31-50	916	40.3
51+	158	6.9
Sex of driver (2307)		
Female	15	0.6
Male	2303	99.4
Vehicle owner ship (2299)		
Owner	344	15
Hired	1923	83.6
Others*	32	1.4
Educational status (2063)		
0-4	74	3.6
5-8	712	34.4
9-10	577	27.8
11-12	497	24
12+	212	10.2
Driving experience (1473)		
<1year	129	8.7
1-3years	401	27.2
3-5 years	479	32.6
5-10years	345	23.4
10+years	119	8.1
Driving license (2162)		
No driving license	26	1.2
1st level	39	1.8
2nd level	205	9.5
3rd level	1009	46.7
4th level	436	20.2
5th level	432	20
Special license	15	0.7
Vehicle has deficiency (2190)		
Yes	2171	99.1
No	19	0.9
Weather condition (2318)		
Rainy	39	1.7
Dry	2261	97.5
Others**	18	0.8
Light condition (2294)		
Dark mid night	142	6.2
Dark early night/morning	206	9
Day light	1946	84.8

*** Friend, relatives of the owners, ranted**

**** Cloudy, windy**

From July 2007-June2012 about 1745 individuals were affected by the accident in the study area. Of these 183 (10.5%) were drivers, 812(46.5%) were pedestrian and the rest were 750(43%) injured passenger. About 1333(76.4%) of the victims were male while 412 (23.6%) were females. From the total victims 515(29.5%) were died while 549(31.5%) were severely injured and 681(39%) were injured slightly. Out of died 63(12.2%) were drivers while 307(59.9%) were pedestrians and 145(28.2%) were passengers.

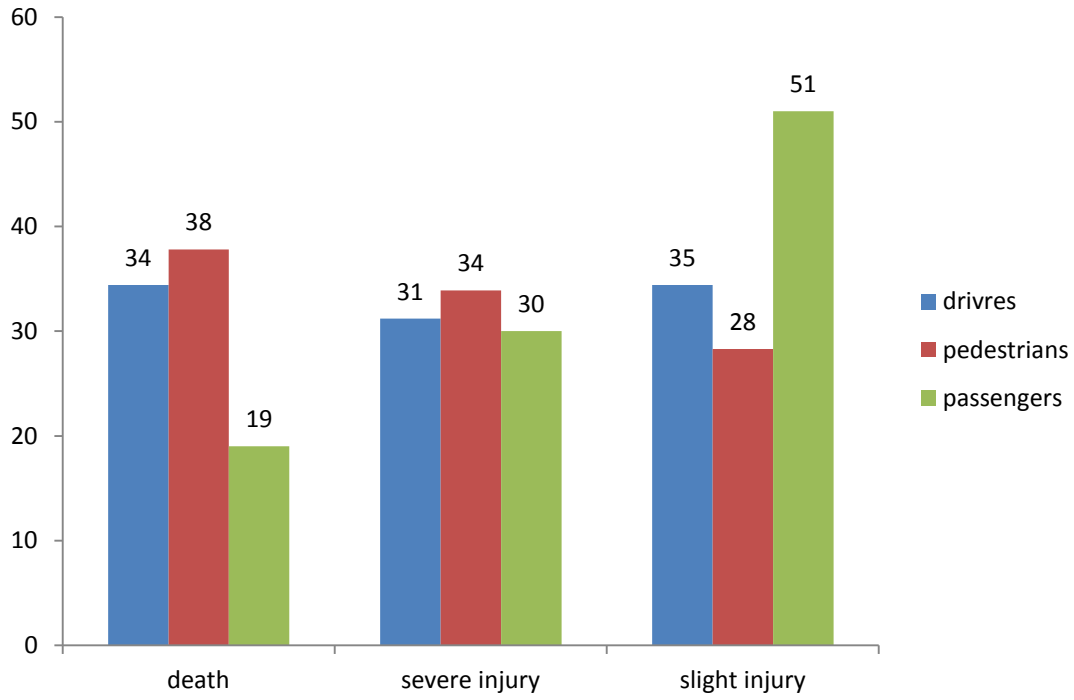


Figure 2 Distribution of type of victim's accident from Akaki to adama, July 2007 to June 2012

As shown the table below, the numbers of victims increased from 261(15%) to 494(28.3%) in the five year period.

Table 2 frequency distributions of RTA victims from Akaki to Adama, June 2007 to June 2012, Ethiopia.

Year	frequency of victims'	percent
July 2007-June 2008	261	15
July 2008-June 2009	312	17.8
July 2009-June 2010	282	16.2
July 2010-June 2011	396	22.7
July 2011-June 2012	494	28.3

As shown below in the pie chart 967(55.5%) were in the age group 18-30 years followed by 31-50years 360(20.5%) while less than seven year age group was the lowest 33(2%).

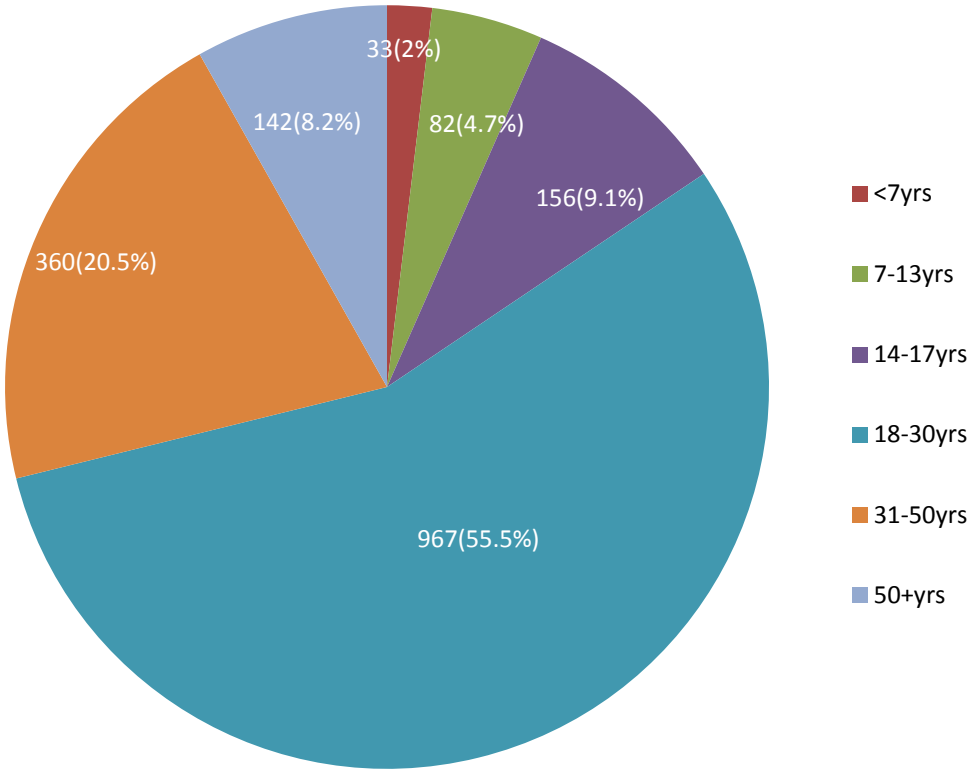


Figure 3 Age distribution RTA victims from Akaki to adama July 2007 to June 2012.

The occurrence of accident in line with the Day, 399(17.3%) accident occurred on Monday followed by 368(15.91%) on Thursday and lowest at Wednesday 201(8.7%).

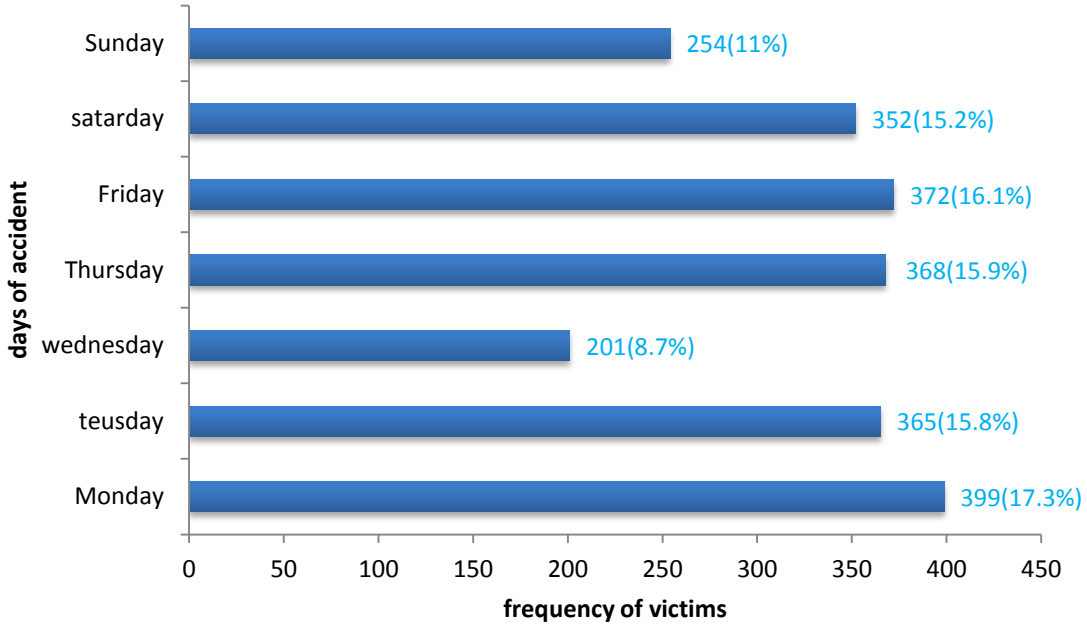


Figure 4 Distribution of RTAs by day from Akaki to adama, July 2007 to June 2012

5.1. Trends of road traffic accident

As shown in figure-5 out of the total (2335) accidents, there were 389(16.7%) accidents that resulted into death followed by 316(13.5%) were resulted in severe injury and 290(12.4%) were resulted in slight injury and the rest 1316(56.4%) were property damage. Two hundred fifty seven (11.1%) occurred from July2007-June 2008, and it was nearly doubled 492(21.3%) between July 2008-June 2009 while it shows slight decrement in July 2009-June 2010 which is 443 (19.2%) accident compared to July 2008-June 2009. In July 2010- June 2011 483(20.9%) accidents still decreased compared to July 2008-June 2009 while there is slight increment compared to July 2009-June 2010. In July 2011-June 2012, 637(27.5%) accidents were occurred which shows high increment compared to all other years.

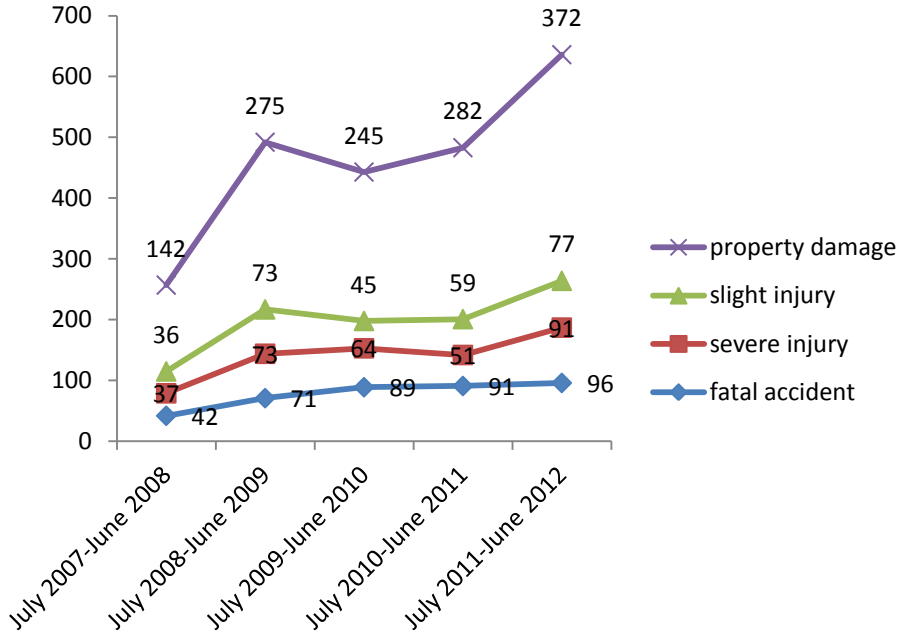


Figure 5 trends of road traffic accident from Akaki to Adama, July 2007 - June 2012.

In the figure below (figure 6), the magnitude of RTA increased from 259(11.2%) in July 2007-June 2008 to 637(27.5%) in July 2011-June 2012. Fatal RTA doubled from 42(10.8%) to 96(24.7%) and non fatal RTA increased as well from 217(11.2%) to 541(28%). Although the magnitude RTA shows increment, it is not statistically significant. (Chi square 0.00353 p-value 0.95)

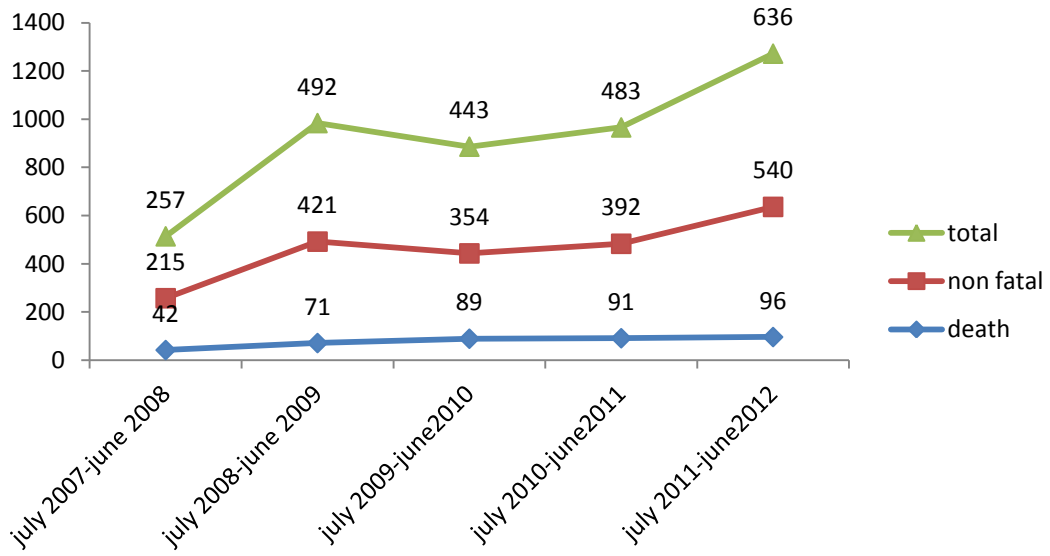


Figure 6 trends of fatal and non fatal RTA from Akaki to adama July 2007 to June 2012.

Fatality rate per 1000 injury is lowest in July 2008-June 2009 and highest in July 2009-June 2010 but shows some tendency of decreasing from July 2010-June 2012.

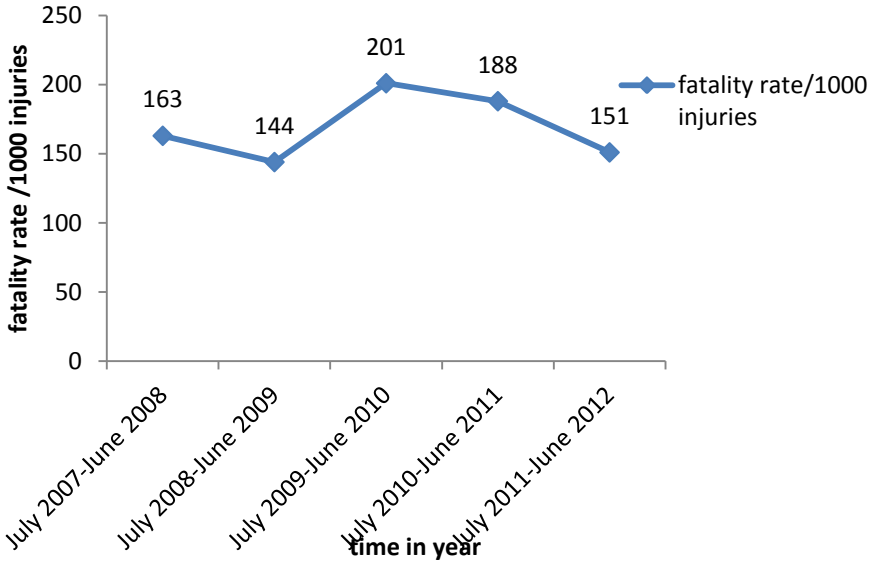


Figure 7 trends of fatality rate per 1000 accidents from Akaki to adama July 2007 to June 2012.

5.2. Factors associated with road traffic accident

As shown in the table 3 below age of the drivers, sex of the driver, vehicle ownership, and educational status of the drivers, years driving experience and levels of driving license are not significantly associated with fatal accident in bivariate analysis. Female drivers accounted for 5(1.3%) of the fatal and 10(0.5%) of non fatal accident and vehicle owners caused 49(12.9%) of the fatal accident 293 (15.3%) of non fatal accident.

Table 3 Driver's related factors associated with road traffic accident from Akaki to Adama, July 2007 to June 2012, Ethiopia

Variables	Outcomes		
	Fatal no.(%)	No fatal no.(%)	p-value
Age of driver (2263)			
Less or equal to18	5(1.4)	20(1.1)	0.592
19-30	193(52.1)	974(51.5)	
31-50	152(41.1)	761(40.2)	
51+	20(5.4)	138(7.3)	
Sex of driver (2307)			
Female	5(1.3)	10(0.5)	0.089
Male	379(98.7)	1913 (99.5)	
Vehicle owner ship (2290)			
Owner	49(12.9)	293 (15.3)	0.366
Hired	323 (85.2)	1593(83.4)	
Others*	7(1.8)	25(1.3)	
Educational status (2063)			
0-4	13(3.8)	61(3.5)	0.326
5-8	127(37.1)	583(33.9)	
9-10	102(29.8)	470 (27.3)	
11-12	71(20.8)	425(24.7)	
12+	29(8.5)	182 (10.6)	
Driving experience (1473)			
<1yr	21(8)	108(8.9)	0.873
1-3yr	79(30)	322(26.6)	
3-5 yr	77(29.3)	402(33.2)	
5-10 yr	66(25.1)	279(23.1)	
10+ yr	20(7.6)	99(8.2)	
Grade of driving license (2153)			
No driving license	4(1.1)	22(1.2)	0.843
1st level	6(1.7)	33 (1.8)	
2nd level	30(8.4)	175 (9.7)	
3rd level	174(48.9)	830(46.2)	
4th level	77(21.6)	357(19.9)	
5th level	63(17.7)	368(20.5)	
Special license	2(0.6)	12(0.7)	

*** Friend, relatives of the owners, ranted**

As show below on the table 4 the highest accidents were registered at Adama 975(42.1%) while the lowest at Gelan 149(6.4%). Adama accounted 128(32.9%) of the fatal accidents and 847(44%) of non fatal accident. From July 2007-June 2008 about 259(11.2%) accident happened, where as about 637(27.5%) accidents from July 2011-June 2012. Place of accident and light condition during accident are statistically significant with fatality in bivriate analysis. Dark night is responsible for (12% vs 5%) for fatal and non fatal accident respectively

Table 4 Characteristics of RTAs according to time, place and weather condition from Akaki to Adama, June 2007 to June 2012, Ethiopia

Variables	Outcomes		
	Fatal no.(%)	No fatal no. (%)	p-value
Place of accident (2318)			
Adama	128(32.9)	847(44)	0.001
Mojo	87 (22.3)	307(15.9)	
Bishoftu	84(21.6)	375 (19.8)	
Dukem	64(16.5)	269(13.9)	
Gelan	26(6.7)	123(6.4)	
Year at accident (2335)			
July 2007-June 2008	42 (10.8)	217 (11.2)	0.085
July 2008-June 2009	71 (18.3)	422 (21.9)	
July 2009-June 2010	89 (22.9)	354(18.4)	
July 2010-June 2011	91(23.4)	395(20.5)	
July 2011-June 2012	96(24.7)	541(28)	
Vehicle has deficiency (2183)			
Yes	3(0.8)	15(0.8)	0.646
No	362(99.2)	1803(99.2)	
Weather condition at the time of accident (2312)			
Rainy	5(1.3)	34(1.8)	0.804
Dry	379(97.9)	1876(97.5)	
Others*	3 (0.8)	15 (0.8)	
Light condition at the time of accident (2286)			
Dark mid night	46(12)	96(5)	<0.001
Dark early night/morning	50 (13.1)	156(8.2)	
Day light	287(74.9)	1651(86.8)	

*cloudy, windy

As shown in table.4 below trucks were leading by 607(27.7%) followed by Isuzu (loading) 403(18.4%) and min bus 321(14.6%) while Isuzu (people) 91(4.1%), land cruiser 55(2.5%) and others 23(1%) were the least three by involving in the crash. The major reason of RTAs is over speeding 836(36.1%) followed by careless driving (irresponsible driving) 573(24.8%) and failure to give priority 507(21.9%) which shows statistical significance in bivariate analysis. Careless driving is responsible for 51(13.1%) vs 522(27.1%) fatal and on fatal accident respectively.

According to in depth interview majorities of RTA were caused by drivers' errors which were carelessness of the drivers; driving by high speed, following too closely, turning improperly, by failing to give priority for vehicles are the major one. The reason of exercising such activities are more of economical than lack of knowledge. Most of drivers are hired and tried to do more than expected from them and taking the extra money for their own selves. Even they are driving for more than 24hr. In order to avoid sleep, they uses different substance like Khat, shisha which makes them over stimulated and leads them to reckless driving which is the main causes of accident.

One driver responded as "*Now day's minibus and Isuzu drivers are frequently causing accident. Simply they think about the money. They don't care about anything else. They are moving at night. So if drivers are drive without sleeping, they use khat and shisha to avoid sleep. The reason for over speeding is about the benefit. If you ordered him to do something, he rushes to have extra money for himself. He rushes to drop the first, to be the first in the next turn."*

From the quantitative study only about 7(0.3%) of accident were caused by pedestrian error but the contribution of pedestrians for the occurrence of accident is very high according to drivers. High proportions victims of road traffic accidents are pedestrian. Especially in the town pedestrians are not respecting the traffic rule and they are not moving on their appropriate direction. Because, few of them have low knowledge about traffic rule but majority of them are ignorant to obey traffic rule and to taker of themselves.

One driver said "*In the town pedestrians do not feel responsibility to taker, they fear ox than vehicles. They stand and greet each other while crossing the road. They think even they have the right to sleep on zebra road, really they are ignorant*."

Table 5 Causes of RTA and types of car involved in road traffic accident from Akaki to Adama June 2007-june 2012

Variables	fatal Frequency (%)	non fatal frequency (%)	p-value
Causes of accident (2315)			
Careless driving	51(13.1)	522(27.1)	< 0.001
Over speeding	185(47.8)	651(33.8)	
Failure to give priority	101(26)	406(21.1)	
Vehicle defect	10(2.6)	10(0.5)	
Road error	1(0.3)	4(0.2)	
Pedestrian error	1(0.3)	6(0.3)	
Follow too closely	13(3.3)	249 (12.9)	
Unknown causes	22(5.7)	45(2.7)	
Others*	5(1.3)	33(1.7)	
Type of vehicle (2185)			
Cycle/motor cycle/ Bajaj	24(6.6)	146(8)	0.201
Minibus	55(15)	264(14.5)	
Bus	19(5.2)	87(4.8)	
Isuzu (people)	19(5.2)	72(4)	
Automobiles	36(9.8)	181(10)	
Heavy vehicles	89(24.3)	516 (28.4)	
Isuzu (loading)	85(23.2)	315 (17.3)	
Pick up and Toyota	27(7.4)	172(9.5)	
Land cruiser	7(1.9)	48 (2.6)	
Others**	5(1.3)	18(1)	

*cattle's, horses running and failing under vehicles

**like: coaster, cart,

A logistic regression model taking in to account: place of accident, time in year of accident, sex of drivers, light condition during accident and causes of accident. High speed (AOR 5.3 95% CI, 2.9-9.6), and failing to give priority (AOR 5, 95%CI: 2.3-9.3) were strongly and significantly associated with fatal crashes (Table 6). Furthermore, fatal road accidents were much more prevalent on the vehicles that have defect (AOR 19.12, CI: 6.42-56.8) and unknown cause of accident (AOR: 8.3, 95%CI: 3.7-18.9). Careless driving (Irresponsible driving) (AOR, 1.78: 95% CI, 0.94-3.37) and Pedestrian errors are also escalating fatal accident although statistically not significant (AOR 3.87 95% CI: 0.43-35.26).

Surprisingly, women were more likely to perpetrate fatal road traffic accidents than men, (AOR, 4.74; 95% CI, 1.5-15). Accident occurred at night is 2.5 times more likely to be fatal than accident occurred at day (AOR 2.5 95% CI: 1.7-3.7)

Table 6 Association of fatal road traffic accidents (n = 2335) with selected risk factors; multivariable-adjusted odds ratios (OR) from binary logistic regression

Variables	Outcome		Crude OR	adjusted OR
	Fatal no.(%)	non fatal no.(%)		
Place				
Adama	128(32.9)	849(44)	1(reference)	1(reference)
Mojo	87(22.4)	307(15.9)	**1.9[1.4-2.5]****	1.36[0.97, 1.9]
Bishoftu	84(21.6)	301(19.8)	**1.5[1.03-1.9] ***	1.26[0.9, 1.77]
Dukem	64(16.5)	269(13.9)	**1.6[1.1-2.2] ***	**1.64[1.1, 2.3]***
Gelan	26(6.7)	123(6.4)	1.4 [0.9-2.2]	1.6 [0.97-2.6]
Year				
July 2007-June 2008	42(10.8)	217(11.2)	1(reference)	1 (reference)
July 2008-June 2009	71(18.3)	422(21.9)	0.8[0.6-1.3]	1.08[0.7-1.7]
July 2008-June 2010	89(22.9)	304(18.4)	1.3[0.9-1.9]	**1.75[1.1-2.7]***
July 2010-June 2011	91(23.4)	395(20.5)	1.2[0.8-1.8]	1.5[0.98-2.3]
July 2011-June 2012	96(24.7)	541(28)	0.91[0.6-1.4]	1.27[0.9-1.9]
Light condition				
Dark (midnight)	46(12)	96(5)	**2.8[1.9-4]****	**2.5[1.7-3.7]****
Dark (early nt/morg)	50(13.1)	158(8.2)	**1.8[1.3-2.6]****	**1.67[1.2-2.4]***
Day light	278(74.9)	1651(86.8)	1 (reference)	1(reference)
Sex				
Female	5(1.3)	10(0.5)	2.5[0.9-7.4]	**4.74[1.5-15]***
Male	379(98.7)	1913(99.5)	1(reference)	1(reference)
Cause of accident				
Careless driving	51(13.1)	522(27.1)	1.87[0.99-3.5]	1.78[0.9-3.4]
Over speeding	185(47.6)	651(33.8)	**5.4[3-9.7]****	**5.3[2.9-9.6]****
Fail to give priority	101(26)	406(21.1)	**4.76[2.6-8.6]****	**5.03[2.3-9.3]****
Vehicle defect	10(2.6)	10(0.5)	**19.2[6.8-54]****	**19[6.4-56]****
Road defect	1(0.3)	4(0.2)	4.78[0.5-46]	2.9[0.3-29]
Pedestrian error	1(0.3)	6(0.3)	3.19[0.36-28.5]	3.9[0.4-35]
Unknown cause	22 (5.7)	45(2.3)	**`9.36[4.4-20]****	**8.3[3.6-18.8]****
Others***	5(1.3)	33(1.7)	2.9[0.97-8.7]	2.3[0.8-7.2]
Following too closely	13(3.3)	249(12.9)	1(reference)	1(reference)

Overall *P* value * p <0.05 ** p ≤ 0.001 *** cattle's, horses running and failing under vehicles

6. Discussion

RTAs are becoming a major public health and economic problem everywhere in the world and it is getting worse in developing country including Ethiopia. From July 2007 to June 2012 a large number RTAs occurred on a distance of less than 100 kms which resulted in high morbidity and mortality from Akaki to Adama. This by itself alarms and signifies the magnitude of the problem in the area. This study demonstrated a strong positive association between fatal road traffic accidents and place of accident, sex of drivers, light condition during accident, high speed, and failure to give priority and vehicle technical problem.

From July 2007 to June 2012 about 2335 accidents were listed in the main registries of the eight main police stations from Akaki to Adama. Of those 389(16.7%) were fatal accidents which is similar with study in Tirana 272(17%)[17].

From July 2007-June 2008, 257(11.1%) occurred and it was nearly tripled within five years in July 2011-June 2012, 637(27.5%) accidents. Similarly, cross-sectional study in Dubai from the period of 2002 to 2008, reported steadily increasing numbers of road traffic injuries[12] and time trends study from Lithuania between 1998 and 2007 also reported the increase in the occurrence of RTAs [10]. Therefore, the trend of RTAs in our study was showing the tendency of increment while it is not statistically significant. The reason for increasing trend of RTA might be due to increasing vehicle fleet of the country which is incompatible with the existing road. Furthermore, drivers and pedestrian related factors, poor vehicle technical inspection and poor enforcement of traffic safety rules were escalating the problem.

One traffic police responded as "*although the numbers of road traffic accident increased, it is decreasing in relative to the number of vehicle flow which increased every year and not compatible with existing road."*

Higher accidents were registered at Adama 977(42%) followed by Bishoftu 465(20.4%), Mojo 394(16.9%), Dukem 333(14.3%) and Gelan 149(6.4%). This might be because Adama is most populated and high vehicle fleets are there. Bishoftu is second populated followed by Mojo,

Dukem and Gelan respectively. Dukem is 64% more likely than Adama to cause fatal accident while Mojo and Bishoftu are turned to insignificant when adjusted for others variables. This is probably because at Dukem government is upgrading the existing road and this might make the road inconvenient for drivers and exacerbate the fatality.

Overwhelmingly, high proportion of younger drivers involved in traffic accidents has become a serious concern. Almost half of the accidents 1167(51.6%) were caused by young drivers whose age is ranging between 19-30yrs followed by 913(40.3%) age between 31-50yrs old drivers. This finding is consistent with the different studies [12, 16-19] whereas age group between31-40 were highly involved in the crash as noted in some literatures[20, 21] and older age group commits more fatal accident than younger one [18]. But age is not statistically significant with fatality in our study unlike study in Tirana[17]. The probable reason that this age group dominating is most of them have just finished primary school or secondary education and they have not succeeded for further studies and they are jobless, so become a driver. Most drivers of these ages are not well experienced and express risk taking behaviors.

Male drivers were involved in more than 99% of the accident which is slightly more than the study conducted at Mekele about 96%[29] this difference might be due to Mekele is the town therefore, females are more involved in driving activity than ours which is high way road but this finding is highly exaggerated than other[16, 30]. The preponderance of males might be due to driving is considered as mare work of males and also due to their greater exposure to traffic and other associated factors.

Surprisingly, female drivers were five times more likely to perpetrate fatal road traffic accidents than men which is consistent with study conducted in Tirana [17] and USA[17, 31] This might be Women are more likely to have been ignorant of the correct speed limit or to be travelling too fast for the conditions rather than deliberately speeding [32] while other literature fail to report significant difference between male and female[29]

In regards to the physical environment, weather condition does not have significant association with fatality in our study which is quiet different form another study that indicates accident occurs in rainy season is highly associated with fatality[33]. Regarding driver car relationship 1916(83.7%) drivers were hired which is in contrary with study in Qatar that RTCs were more common among drivers who were owners of vehicles (66.7%)[16] This discrepancy is probably because high socioeconomic difference between population of Ethiopia and Qatar which determines car ownership.

The police data showed more than 93% of the accident were caused by drivers error such as; driving carelessly, failing to give priority for others and pedestrians, driving above the speed limit and following too closely (failing to have enough distance between vehicles while moving) whereas in Kenya about 85% of the accidents were caused by human factors (drivers and pedestrians error) [16]. High speed and failing to give way were causing five times fatal accident than following too closely which supplement existing literatures [1, 8, 21, 31, 34]. Furthermore, fatal road accidents were much more prevalent on vehicle reported having some defect, unknown causes of accident and Careless driving.

According to qualitative study both traffic police and even drivers believe that almost all RTAs take place due to problems of drivers like over speeding, improper turning, following too closely, careless driving and failure to give priority are the major problem raised by informants. Even though the input of others like the road, pedestrians and vehicles technical problem is not minimal, they believe the occurrence of the accident is more or less depending on drivers**.**

One traffic police said" *the drivers are responsible for the occurrence of the accident because they can prevent accident by adjusting themselves to the existing situation, if the road is inconvenient, they should drive slowly and accordingly. They should limit the speed while follow other car."*

High speed is highly determinant factors for the occurrences of the accident and even determines the outcome of the accident. Driving in high speed was seen frequently on young drivers and has low experience but the reason of driving above speed limit is more of economical problem than lack of driving experience and lack of knowledge on the driving rule.

One driver responded as "*Now day's minibus and Isuzu drivers are frequently causing accident. Simply they think about the money. They don't care about anything else. The reason for over speeding is about the benefit. If you ordered him to do something, he rushes to have extra money for himself. He rushes to drop the first and to be the first in the next turn.*"

Pedestrian errors were also escalating fatal accident although it is not statistically significant even after adjusted for other variables. which is consistent with another study[21]. Surprisingly, alcohol is never reported as cause of RTAs that many literatures claimed as major cause of crash and fatality[17].

Although many individuals agreed that RTA is caused by driver's error, the contribution of pedestrians for the occurrence of accident is high. Most victims of road traffic accidents were pedestrian. Especially in the town pedestrians are not respecting the traffic rule and they not move on their proper direction. This is because few of them have no knowledge of traffic rule but majority of them are ignorant to obey traffic rule and to taker of themselves.

One driver said "*In the town pedestrians do not feel responsibility to taker, they fear ox than vehicles, and they stand and greet each other while crossing the road. They think even they have the right to sleep on zebra road, really they are ignorant*."

Victims of RTAs were more likely to die from the accidents occurring at night than those at day-time. This is consistent with the study in Tanzania [30]. The possible explanation of increased risk of dying during the night following motor traffic accidents is; at night drivers drive for a long time, therefore, to avoid sleep while driving use different substance like "shisha" and "khat". Driving under influence of those substances makes them over stimulated which lead to risky driving like reckless driving, over speeding. Furthermore, since traffic police do not worke after 8pm and other issue like visibility problems, it may take time to locate all injured victims in time and delayed rescue and first aid.

One driver responded as "……..*many drivers are moving at night. So if drivers drive without sleeping, they use khat and shisha to avoid sleep."*

Trucks, Isuzu (loading) and min bus were most frequently involved in the crash which is inconsistent with some studies in Kenya and Qatar cars, pick up and vans are most frequently involved in crash[16, 35]. This might be the study area is the part of the high way which connects southern and eastern part of the country even neighboring country like Djibouti and Somalia to Addis Ababa. Heavy duty vehicles (trucks) and Isuzu more frequently move on this way and exposed to accident.

In this study driving experience is not determinant factor for fatal accident. However, drivers who drove for 3-5 yr were frequently involved in the crash and accountable for 479(32.5%) of the accident followed by driving for 1-3yr who caused about 401(27.2%) of the accident but study in Qatar noted that drivers who drove for more than five years are more frequently involved in the crash[16]. Although driving experience is statistically not significant in this study, literatures noted that fatality is highly associated with risky driving behaviors. There are controversial finding that having more driving experience were found to exercise more risky behaviors which is determinant of fatality[36]. In contrary, a study in Tanzania showed that drivers who were not having driving experience found to be with high risky driving behaviors[30]. Unlike to the above studies, driving experience was not found as a predictor variable for risky driving behavior[29]. `

Levels of driving license and educational status of the drivers are not predictors of road traffic mortality in our study (p-value 0.84 and 0.87) respectively, but drivers who followed elementary education(5-8 grade) causes higher number of accidents 712(34.4%). whereas study in Addis Ababa noted more severe accidents were caused by those drivers[19] and following secondary/above educational level increases risk of RTA in some studies[19, 30] which is also supported by study in Qatar that the highest frequency of crashes occurred in drivers with university degree (32.7%)[16]. Having valid driving license and more driving year experience were protective for the occurrence of the accident[22]

Victims' injury classified as fatal, severe and slight. Five hundred fifty (29.5%) died, while 549(31.5%) were severely injured and 681(39%) were injured slightly which is quite different from study in Kenya only 10% died[35]. In our study around 88% of road traffic fatalities were

pedestrian and passengers that are similar with study conducted on the way of Addis Ababa to Shashamane revealed that about 91% RTA fatality[37]. It is true that urban environment here in Ethiopia does not have proper pedestrian facilities. Furthermore, road users are not well aware of traffic rules and regulation in the country. Our finding is a little bit more than study in Kenya that pedestrian and passengers accounted for 80% of fatality[35] and also according to study in Cameroon pedestrians accounted for 57% of all crashes, 74% of all fatalities which is more or less similar to our study [13] but study in Brazil noted that drivers accounted for 67.8% of deaths[9]. This discrepancy might be due to road traffic injuries in highly-motorized countries mostly victims were car drivers, whereas in many low-income countries it is occupants of multiple passenger vehicles (such as buses) and pedestrians[14, 38].

In our study about 76.4% of the victims were males which is similar with other literature that noted 77.3% of the victims were males and the highest numbers of victims were in 18-30 age group which is supported by the same study [39]. The dominance of males and young age groups might be due to their traveling more because they are economically active segment of population which increases their risk of exposure to accidents.

7. Strengths and limitations of the study

7.1. Strengths

Mixed-method approach was used by combining quantitative with qualitative to identify the major causes of the accident.

All registered accidents have been taken. It is less likely to be subjected to selection bias

Since the source of data is secondary data it is less likely to be influenced by recall and social desirability biases.

7.2. Limitations

This study has several limitations. Records of road traffic accidents from the Traffic Police Department in the country provide a single reason for the accidents mainly focusing on drivers but the causes of road traffic accidents are multi-factorial.

Furthermore, records from the Traffic Police do not include important information on the use of seat-belt/ helmets, alcohol consumption, level of the speed which would enable the assessment of impact of these measures on the prevention of fatal accidents.

In addition, I did not get valid information about population at risk, numbers registered vehicles and vehicle fleet of study area during the period in order to calculate different rates which are more power full to see the trend and compare with other findings.

8. Conclusion

Several practical lessons can be drawn from this study. First of all, a large number of accidents which are the causes of high mortality and morbidity in the study area need more emphasis to address road safety issues of the country.

The trend of road traffic accident from July 2007 to June 2012 appeared to show the tendency of increment for both fatal and non fatal accident. Nevertheless, the increment was not statistically significant.

Young age, males and hired drivers were largely involved in road traffic crash. This study demonstrated a strong positive association between fatal road traffic accidents and place of accident, sex of drivers, and light condition during accident, accidents caused by high speed, failure to give priority and vehicle having technical problem.

9. Recommendation

More efforts should be made to enforcing young drivers to obey traffic rules and a need for stronger enforcement of the speed limit appears to be the most critical which needs urgent interventions.

Driving at night need to be avoided and important controlling mechanism should be arranged to prevent the use of Khat and shisha while driving.

Large prospective study is needed to identify possible cause of RTA.

Awareness campaigns concerning safety rules targeted pedestrian and strengthening the major taken on pedestrians not obeying road safety rule will also be of help in reducing the occurrence of road traffic accident as well as improvement of the road use.

10. Reference

1. WHO., *World Report On Road Traffic Injury Prevention.* *http://whqlibdoc.who.int/publications/2004/9241562609*. 2004.
2. SafeCarGuide, *International Injury & Fatality Statistics.* http://www.safecarguide.com/exp/statistics/statistics.htm, , 2004.
3. Esiyok B, K.İ., et al., *Road traffic accidents and disability: A crosssection study from Turkey. Disability and Rehabilitation. .* 2005. **27**: p. 1333-8.

.

4. ScienceDaily:, *"Road Traffic Injury Is An Escalating Burden In Africa"* (June 27,2007;http://www.sciencedaily.com /releases/2007/06/070626151407.htm, 2007.
5. road traffic injury research nework, *Capacity Development for Road Traffic Injury Research in low and middle income countries, supporting junier researchers, .* April 2010.
6. WHO *Global status report on road safety.* *http://whqlibdoc.who.int/publications/2009/9789241563840_eng*. 2009.
7. Litman T, *If health matters: integrating public health objectives in transportation planning. .* Victoria, BC, Victoria Transport Policy Institute,. (http://www.vtpi.org/health.pdf), , 2003.
8. peden M, M.G.K., Krug E (eds), injury , , *A leading cause of the global burden of disease, 2000.* Geneva,world health organization, 2002.
9. Silva, M.d.M., et al., , *Mortality of motorcyclists in traffi c accidents in the Brazilian Federal District from 1996 to 2007.* Rev Saúde Pública 2011. **45**(3).
10. Lunevicius, R., H.K. Herbert, and A.A. Hyder, , *The epidemiology of road traffic injuries in the Republic of Lithuania, 1998-2007.* European Journal of Public Health, 2010. **20**(6): p. 702-7.
11. YAVUZ, C.I.a. and O. HAMZAOĞLU, *Road traffic-related injury among the 0-17 age group in Turkey. .* Turkish Journal of Trauma & Emergency Surgery, 2011. **17**(4): p. 318-322, doi: 10.5505/tjtes.2011.34022.
12. Marzooqi, A.H.A., M. Badi, and A.E. Jack, , *Road Traffic Accidents in Dubai, 2002-2008 . .* Asia-Pacific Journal of Public Health Supplement, 2010. **22** (3): p. 31-39.
13. J. Sobngwi-Tambekoua, e.a., *Road traffic crashes on the Yaoundé-Douala road section, Cameroon.. .* Accident Analysis and Prevention, 2010. **42**: p. 422-426.
14. Chisholm. D and H. Nac, *Road traffic injury prevention: an assessment of risk exposure and intervention cost-effectiveness in different world regions world health organization Final version (December 2008), .* 2008.
15. Margie Peden, *Global collaboration on road traffic injury prevention. .* International Journal of Injury Control and Safety Promotion, 2005. **12**(2): p. 85-91.
16. BENER, A., et al., , *Risk factors contributing to road traffic crashes in a fast-developing country: the neglected health problem. .* Turkish Journal of Trauma & Emergency Surgery,, 2010. **16** (6).
17. Qirjako, G., et al., *Factors Associated with Fatal Traffic Accidents in Tirana, Albania: Crosssectional Study.* Croat Med J 2008. **49**: p. 734-740.
18. Heather Ward, et al., *Road Safety Research Report No. 76 Trends in Fatal Car-occupant Accidents*. 2007, Department for Transport: London.
19. mekonnon, t., *EMPIRICAL ANALYSIS ON TRAFFIC ACCIDENTS INVOLVING HUMAN INJURIES (THE CASE OF ADDIS ABABA)(thesis report, unpublished)*. 2007.
20. Ivan Cheung and Anne T. McCartt, *Declines in fatal crashes of older drivers: Changes in crash risk and survivability.* Accident Analysis and Prevention 2011 **43**: p. 666-674.
21. Wang, Y.g. and Shen-sen Huang, *Multipattern Road Traffic Crashes and Injuries: A Case Study of Xi'an City.* Acta Polytechnica Hungarica, 2011. **8** (4).

22. Lardelli-Claret, J.n.-M.n., and de Dios Luna-del-Castillo et al., , *Driver dependent factors and the risk of causing a collision for two wheeled motor vehicles. .* Injury Prevention 2005. **11**: p. 225-231. doi: 10.1136/ip.2004.006957.
23. Kanchan T et al., *Analysis of fatal road traffic accidents in a coastal township of South India. .* Journal of Forensic and Legal Medicine, 2012. **doi:10.1016/j.jflm..02.031**.
24. UNITED NATIONS ECONOMIC COMMISSION FOR AFRICA, *Case Study: Road Safety in Ethiopia.* 2009.
25. Berhanu, G., *Effects of Road Safety and Traffic factors in Ethiopia.* Dr.Ing. thesis. Norwegian University of Science and Technology, Trondheim, 2000.
26. T.B.TESEMA et al, *DATA MINING USING ADAPTIVE REGRESSION TREES. I. J. of SIMULATION .* 2005. **6** (10 and 11).
27. Farchi, S., et al., , *Defining a common set of indicators to monitor road accidents in the European Union.* BMC Public Health, 2006. **6**(183).
28. TRL and Ross Silcock Partnership, *Study for Sectoral Road Safety Program in Ethiopia, Transport Research Laboratory, Addis Ababa .* 2001.
29. Hassen et al, *Risky driving behaviors for road traffic accident among drivers in Mekele city, Northern Ethiopia. .* BMC Research Notes, 2011. **4**: p. 535.
30. Deus Damian Komba, *Risk Factors and Road Traffic Accidents in Tanzania: A Case Study of Kibaha District(Master Thesis)*. 2006.
31. Bedard M, G.G., Stones MJ, Hirdes JP,, *The independent contribution of driver, crash, and vehicle characteristics to driver fatalities. .* Accid Anal Prev 2002. **34**: p. 717-27.Medline:12371777 doi:10.1016/S0001- 4575(01)00072-0
32. Clarke, D., Ward, P., Truman, W. and Bartle, C, , *Fatal Vehicle-occupant Collisions: An In-depth Study. Road Safety Research Report* 2007 Department for Transport: london.
33. Moen, B.E.a.T.R., *Worrying about Transport Risks;. Risk Judgement and Safety in Transport. Rotunde Publication Number 87*. 2005 Trondheim.
34. Laflamme L and Vaez M, *Car crash and injury among young drivers: contribution of social, circumstantial and car attributes. .* Int J Inj Contr Saf Promot. , 2007. **14**: p. 5-10. Medline:17624005 doi:10.1080/17457300601119031.
35. Odero W, Meleckidzedeck K, and Heda PM, *Road traffic injuries in Kenya: magnitude, causes and status of intervention.* In Control Saf Promot, 2003. **10**(2): p. 53-61.
36. Mike M, *Traffic crash victimizations of California children and teenagers by drinking over21 drivers* Californian J Health Promotion 2009. **7**: p. 92-101.
37. Getu Segni and Girma Berhanu, *CAUSES OF ROAD TRAFFIC ACCIDENTS AND POSSIBLE COUNTER MEASURES ON ADDIS ABABA-SHASHEMENE ROADS, Addis Ababa*. April 2007.
38. Vinand M Nantulya and Michael R Reich, *The neglected epidemic: road traffic injuries in developing countries.* BMJ 2002. **324**: p. 1139-1141.
39. Deepak Sharma, Uday Shankar Singh, and Sidhyartha Mukherjee, *A study on road traffic accidents in Anand-Gujarat* h e a l t h l i n e 2011. **2**(2).

Table 7 Theme: Road traffic accident is caused by road user problem and aggravated by different factors

categories	Causes of accident	Drivers problem	Pedestrian problem	Aggravating factors
codes	Carelessness High speed Road problem Improper inspection Sleep disturbance Irresponsible Fail to give priority Releasing strong light	High speed Improper turning Substance abuse Sleep disturbance Working illegally Fail to give priority Carelessness greediness	Carelessness Law awareness Ignorance Irresponsible Doing forbidden	Economical problem High vehicle fleet Miss match Licensing issue Light condition Weather condition Substance abuse Driving at night

Annex II: Information sheet and Consent Form

1. Information sheet and consent

Statement of the Study

Magnitude and trends of road traffic accident and associated factors from 2006-2011 in Addis Ababa, Ethiopia

Purpose of the Study

The study participant in a study on Magnitude and trends of road traffic accident and associated factors from 2006-2011 G.C in Addis Ababa, Ethiopia. I went to collect information about the age, sex, educational status of drivers, characteristics of RTA and condition of the accident

Procedures

Specifically I am going to collect information age, sex, educational status drivers; driving experience, vehicle service year, driver vehicle r/n ship, condition of pedestrian, place of accident, cause of accident, type of injury including severity from the registration. The completion time is about 15 to 20 minutes. I do not want write the name. The information that was taken during the study will be kept confidential. Only data collectors and researchers will have access to the questionnaires and the information that provided.

Risks and Benefits of the Study

By participating in this study, and providing information, will not receive any direct benefit. However, it will help us to increase our understanding of the problems associated with RTA. I hope that the results of the study will help to improve the efforts going on to improve road traffic condition and make more acceptable the services currently available for road users.

Questioners

1. Age of the drive
   ----------in years
2. Sex of the driver
   1. Male
   2. Female
3. Educational status of the drive
   ----------grade completed

4. Driver car relation ship
   1. Owner 3. Others
   2. hired

5. Level of driver license

   1. $1^{s.t}$ 3. $3^{rd.}$ 5. 5^{th}
   2. 2^{nd} 4. $4^{th.}$ 6. Special

6. Drivers driving experience ----------in year

7. Types of vehicle

Cycle/motor cycle/ Bajaj
Minibus

Bus

Isuzu (people)

Automobile

Heavy vehicles

Isuzu (loading)

Pick up and Toyota

Land cruiser
Others**

11. Type of injury

1. Death 2. Sever injury 3. Slight injury. 4. Property damage

13 health status of pedestrian

1. Deaf 2. Blind 3. Handicap 4. Healthy 5. 6. Unknown

15. Causes of accident

1. Careless driving
2. Over speeding
3. Fail to give priority
4. Vehicle defect
5. Road defect
6. Pedestrian error
7. Following too closely
8. Unknown cause
9. Others

16. injured (affected) individuals

Total----------

1. driver---------- age----------sex----------type of injury----------health cond--------

2. Pedestrian age----------sex----------type of injury----------health cond--------

3. Passenger ------age----------sex----------type of injury----------health cond--------

18. No. of vehicle affected ----------

19. Amount of money wasted ----------

Unka galmee afaan oromoo

1. Lakkofsa galmee----------
2. Guyyaa balaan ga'e----------guyyyaa/ji'a/bara
3. Sa'aati balaan itti ga'----------
4. Umurii konkolachisaa----------(waggaa)
5. Saala konkolachisaa----------
6. Sadarkaa barnoota konkolaachisaa----------
7. Walitti dhufeenya konkolaatafi konkolaachisaa----------
8. Shakala konkolachisuu----------
9. Gosa konkolaata----------
10. Hir'ina konkolaata----------
11. Haala qillensaa----------
12. Haala ifaa----------
13. Gosa baalaa----------
14. Qabeenya barbadaa'ee----------(qarshiin)
15. Lakkofsa konkolaatota balaa keessatti hirmaatani----------
16. Sababaa balaa----------
17. Namoota midhamani

17.1. Konkolaachisaa----------umurii----------gosa balaa----------haala balaa-------

17.2. Lafoo ----------umurii----------gosa balaa----------haala balaa-------

17.3. imaalaa----------umurii----------gosa balaa----------haala balaa-------

Declaration

I, the under signed, declared that this is my original work, has never been presented in this or any other University, and that all the resources and materials used for the thesis, have been fully acknowledged.

Name: **Fekede Asefa**

Signature: _____

Date: _____

Place: *Addis Ababa University, Ethiopia*

Date of submission: June, 2013

This thesis has been submitted for examination with my approval as University advisor.

Name: **Demeke Assefa (MD, MA)**

Signature: _____

Date: _____