

**ADDISABABA UNIVERSITY**  
**COLLEGE OF HEALTH SCIENCES**  
**SCHOOL OF ALLIED HEALTH SCIENCES**  
**DEPARTMENT OF NURSING AND MIDWIFERY**

**ASSESSMENT OF ROAD TRAFFIC ACCIDENTS AMONG CHILDREN IN  
ADDISABABA CITY, ETHIOPIA**

**BY ALMAZ BERHE (BSC)**

**A THESIS SUBMITTED TO SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA  
UNIVERSITY, DEPARTMENT OF NURSING AND MIDWIFERY IN PARTIAL  
FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER'S IN  
CHILD HEALTH NURSING.**

**JUNE, 2014**  
**ADDIS ABABA, ETHIOPIA**

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**Email: almazbw1@gmail.com**

**ADVISOR: DR AMSALE CHERIE (PHD)**

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**APPROVAL BY THE BOARD OF EXAMINATION**

**THIS THESIS BY ALMAZ BERHE WELDEMICAL (BSC) IS ACCEPTED  
IN ITS PRESENT FORM BY THE BOARD OF EXAMINERS AS  
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IN CHILD HEALTH NURSING.**

**INTERNAL EXAMINER:**

_____	_____	_____	_____
<b>FULL NAME</b>	<b>RANK</b>	<b>SIGNATURE</b>	<b>DATE</b>

**RESEARCH ADVISOR /SUPERVISOR:**

_____	_____	_____	_____
<b>FULL NAME</b>	<b>RANK</b>	<b>SIGNATURE</b>	<b>DATE</b>

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## **LIST OF ACRONYMS**

AATA: Addis Ababa Transport Authority

AAU: Addis Ababa University

AATCID: Addis Ababa Traffic Control and Investigation Department

AOR: Adjusted Odd Ratio

CI: Confidence Interval

DALYs: Disability-Adjusted Life Years Lost

OR: Odds Ratio

RTI: Road Traffic Injuries

RTA: Road Traffic Accident

SPSS: Statistical Package for Social Science

WHO: World Health Organization

## **ABSTRACT**

**BACKGROUND:** Road traffic injuries are major causes of death and disability worldwide, with a disproportionate number of occurrences in developing countries particularly in school age children.

**OBJECTIVES:** To assess the magnitude and factors associated with road traffic accidents among Children in Addis Ababa, Ethiopia.

**METHOD:** **Four years** retrospective record review about road traffic accidents among children was conducted from records of all sub cities of Addis Ababa Traffic Control and Investigation Department (AATCID).Data were collected using structured checklist . Bivariate and multivariate analysis was done using SPSS version 20.

**RESULT:** A total of 1019 accidents among children have been registered in all police stations of sub cities of Addis Ababa from March 2010 to February 2014. Of these 125(12.3%) resulted in fatal accident, 510(50%) in severe injuries and 384(37.7%) in light injuries. Overall, 608 (59.6%) of the accidents occurred during rush hours. Children in the age group 4-6 years and children from 7-10 years were more likely to die from road traffic accidents compared to children in the age group 11-14 years **AOR 2.19, 95% C.I (1.29, 3.75)** and **AOR 2.15, 95% C.I (1.34, 3.46)** respectively. Drivers with less than one year driving experience were more likely to cause fatal accidents compared to their counterparts **AOR 2.77, 95% C.I (1.16, 6.66)**.

**CONCLUSION AND RECOMMENDATION:** The rise in road traffic accident in Addis Ababa among children is alarming. Therefore, Road safety laws, proper and adequate training of drivers and public education need to be in place to respond to the high morbidity and mortality associated with road traffic accidents.

**KEY WORDS:** Children, Fatality, Injuries, Road traffic accident.

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## CHAPTER 1: INTRODUCTION

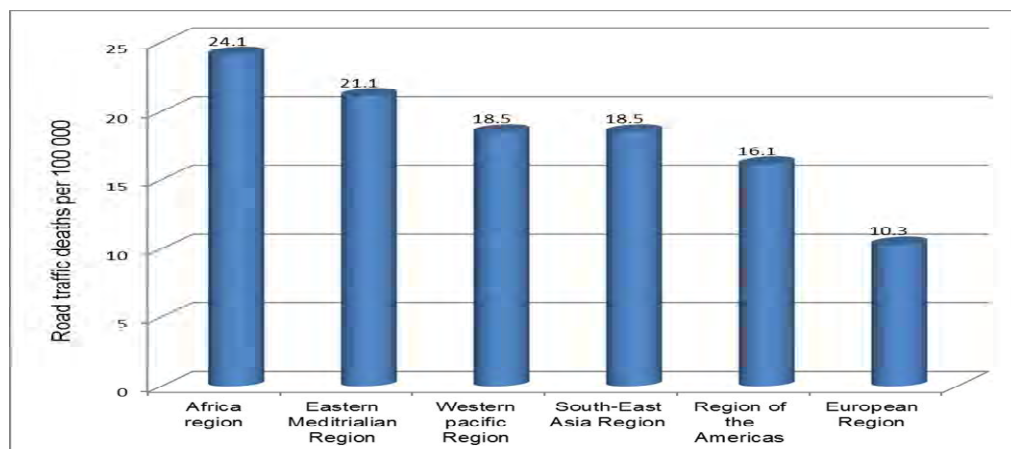
### 1.1 BACKGROUND

Road traffic accidents continue to be a growing problem. According to WHO/World Bank Report, deaths from non-communicable diseases are expected to grow to 49.7 million by 2020. Traffic accidents are the main causes of this rise. Road traffic injuries are expected to take a higher place in the rank order of disease burden in the near future (1).

In Ethiopia, the causes, temporal and spatial variations and consequences of road traffic accident have been studied and all reports showed that the problems of road accidents are growing from time to time (1-3). However, information on road traffic accidents and associated factors in children is missing.

### 1.2 STATEMENT OF THE PROBLEM

Globally, road crashes are the ninth single biggest cause of death; killing 1.2 million people annually with 50 million are injured. More than 85% of these casualties occur in low and middle-income countries. This could rise to 2.4 million by 2020. Africa has the world's highest death rate per population due to RTAs (28.3 per 100,000 of the population when corrected for under-reporting). A case study by UNECA in 2009 shows that road traffic deaths and injuries impose a huge economic burden on developing economies, amounting to 1-2% of GNP in most countries. The following figure (Fig. 1) shows that the highest burden of RTAs is on Africa region (4).



**Figure 1:** Road traffic deaths per 100 000 populations, by WHO region (source: WHO 2010)

In Ethiopia, pedestrians and passengers of commercial vehicles are the most vulnerable in Ethiopia, whereas in high-income countries crashes involve primarily privately owned vehicles with the driver being the main car occupant injured or killed. For example, In the United States of America, 60% of the fatalities account to be car drivers, compared with only 5% in Ethiopia. This implies that in one crash the number of people killed or injured in Ethiopia is about 30 times higher than in the United States (5).

According to the Federal Police Commission report, the death rate due to car accident is significantly increasing among pedestrians and passengers from time to time in Ethiopia. A total of 25,110 accidents and 3,415 fatalities were recorded in Addis Ababa during 2000-2009. The majority of fatalities were pedestrians 2970 (87%), followed by passengers 297 (9%) and drivers 148 (4%) (6).

### **1 .3 SIGNIFICANCE OF THE STUDY**

In Ethiopia, there are no studies conducted to assess the occurrence of road traffic accident in children. Therefore, this study will contribute important input regarding the magnitude and factors associated with road traffic accidents to the children of Addis Ababa city. This study will help assess and describe the factors related to RTA in Addis Ababa city. Moreover, this study will recommend the possible prevention and control options to decision makers and other stakeholders in order to decrease death and disability resulting from road traffic accidents in children. Finally, this study may also serve as a baseline data for further research on RTA in children in Addis Ababa city and reference for other cities in Ethiopia.

## **CHAPTER 2: LITERATURE REVIEW**

### **2.1 EPIDEMIOLOGY OF ROAD TRAFFIC INJURIES**

According to the WHO Global Burden of Disease project in 2004, nearly 1.3 million people of all ages were killed in road traffic crashes around the world and up to 50 million, more were injured or disabled. The South-East Asia and the Western Pacific Regions of WHO together accounted for two third of all road traffic deaths. However, the highest rates of road traffic death were in the African and Eastern Mediterranean Regions. Globally, 21% of road traffic deaths were among children (8).

Each year, over 20 million people are injured or disabled and 1.17 million are killed, due to road traffic crashes. According to the 2004 World Health Report, about 1.2 million people have been killed in road traffic accident worldwide, 85% of them were in the developing countries. Sub-Saharan Africa alone with only 4% of the global vehicle registered accounts for 10% of the total road fatalities. The economic, social and health consequences are very serious. Conversely, the high-income countries, with 60% of the total global vehicle fleet registered contribute only 14% of the annual road deaths, the African region road traffic death rate for children is nearly twice that of the world rate at 19.9 per 100 000 population(8). For all age groups, except for the 15–19-year age group, road traffic fatality rates are greater in low income and middle-income countries than they are in high-income countries(9). In Bangladesh, for instance, road traffic injuries were the second most common cause of injury deaths in children aged 1–9 years, whereas in children aged 10–14 years they were the leading cause, accounting for 38% of all child deaths. In those aged 15–17 years, road traffic injuries accounted for 14% of injury deaths (9).

Globally, the road traffic death rate among children is 10.7 per 100 000 population. In the African Region it is 19.9 per 100 000 population. Although the mortality rate is not as high in Europe, road traffic injuries still account for around a fifth of all childhood injury deaths across the European Union (10).

Early road casualty data analysis found children to account for a higher share of road casualties in developing countries. Donor agencies have supported the development of traffic safety materials for children as not only did they appear to be more vulnerable but they were also keen to instill good habits early in life to avoid the need to break bad habits later (11). There have been downward trends in the numbers of road traffic deaths and injuries over the last couple of decades in several developed countries. Globally, though, the outlook is disturbing. By the year 2030, road traffic injuries are predicted to be the fifth leading cause of death worldwide (8) and the seventh leading cause of disability adjusted life years lost (12). The South-East Asia, African and Western Pacific regions are expected to see the most significant increases in road traffic injuries (13).

Road traffic injuries are a leading cause of disability for children. The exact proportion of children disabled by road traffic injuries varies by age group and across countries. According to these surveys, the rate of permanent disability among children aged 1 to 17 years injured as a result of a road traffic accident was 20 per 100 000 children. In addition, significant numbers of children required hospitalization or missed school because of their injuries (14).

A study done in England between 1985 and 2003 in Children aged 0–14 years, To examine trends in road death rates for child Pedestrians, cyclists and car occupants /100 000 children. Showed that pedestrian death rates remained higher (0.55 deaths/100000; for all at 95% confidence interval 0.42 to 0.72 deaths than those for car occupants 0.34 deaths; 0.23 to 0.48 deaths and cyclists (0.16 deaths;0.09 to 0.27 deaths). By 2003, for every 10 million miles travelled, there were 0.55 child cyclist deaths (0.31 to 0.89 deaths), 0.27 child pedestrian deaths (0.20 to 0.35 deaths) and 0.01 child car occupant deaths (0.007 to 0.014 deaths). The child pedestrian death rate was 27 times (17 to 42) higher than the child car occupant death rate, and the child cyclist death rate was 55 times (30 to 100) higher (15). similarly a study done in India to assess Fatal Road Traffic Accidents among Young Children, indicated that, In one year study period 59 children aged less than 16 years died due to road accidents out of 450 cases (13.1%) out of which 83.1% were males and 16.9% were females. The commonest age group involved was 13-16 years followed by 9-12 years and 6-8 years respectively. The national and state highways accounted for 55.9% of all cases followed by village roads (23.8%). Pedestrians (61%) were the commonest group of road users killed followed by cyclists (13.6%), 54.2% of fatal

accidents occurred in winter season. Trucks and buses were responsible for 40% of fatal accident followed by cars and jeeps (30.5%) Hit & Run type of accidents occurred 59.3% cases followed by run over accidents in 18.6% cases. Children were themselves at fault in majority of cases like negligent road crossing (22%), playing on road, (16.9%) and cycling without helmet (13.6%) (16). In addition Cross sectional survey with a Sample of 2809 Age 5-14 in Urban India showed that Boys and girls has similar rates of injuries as pedestrians As cyclists, boys had three times higher injuries than girls, Lower income household groups had more injuries than higher income household(17).

Africa has the world's highest death rate per population (28.3 per 100,000 of the population) and Ethiopia which has the lowest vehicle to population ratio stands as one of the worst countries with respect to road safety performance in terms of traffic accident fatalities with 136 deaths per 10,000 vehicles. Pedestrians account for the highest proportion of road fatalities in nearly all African countries, ranging between 31% in Zimbabwe and 51% in Ethiopia. Involvement of pedestrians is much greater in urban environment than in rural areas. Studies in Addis Ababa and Abidjan reported extremely high proportion of pedestrian casualties of 90% and 75%, respectively. Passengers rank second, accounting for 32% to 46%. Pedestrians and passengers altogether represent over 80% of all road deaths.

In 2003 alone, above 1,800 people died while above 7,000 were disabled in Ethiopia. Moreover, Ethiopia is losing over 400 million birr yearly because of road traffic accidents. The share of Addis Ababa city in the total number of accidents was 60 percent in 1989 with annual average traffic accident growth rate of 31.4 % (15). Nowadays Addis Ababa is experiencing around 700 accidents per month, resulting in various levels of injury severity (18).

A study conducted in Oromia region from July-June 2012 showed that about 1745 individuals were affected by the accident from Akaki to Adama area. Of those, 10.5% were drivers, 46.5% were pedestrians' and the rest 43 % were injured passengers including children and the number of victims increased from 15% to 28.3% within the five-year period(7).

## **2.2. FACTORS AFFECTING ROAD TRAFFIC ACCIDENT**

Child pedestrian injury is highest in Africa and Asia, where it is usual for people to walk along roads (14). Despite significant reductions in child pedestrian injury in many high-income countries, the prevention of such injury remains a problem, particularly among 5–14-year-olds. Their ability to synthesize information, from their peripheral fields of vision and their auditory sense, is limited, which can lead to their missing critical cause of danger, thus increasing their risk of road traffic injury (19). However, they exhibit poor skills in recognizing dangerous places to cross the road, relying exclusively on the visible presence of cars in the vicinity. They are also unlikely to assess the presence of oncoming traffic with accuracy. “Blind” sections of the road, obstacles by the road that could obscure a child from a driver’s field of vision and complex road junctions are not perceived by young children as threatening situations (20).

Road traffic crashes involving young children include a large proportion of “dart and dash” cases. In such cases, a child pedestrian is injured through a “critical behavioral error”, where it has failed to stop or slow down before attempting to cross the road. This type of behavior is due to a child’s “centration” –the inability of the child to switch attention from one task to another (21).

However, there has been little research to date attempting to quantify the role that parental perception plays in a child’s risk for road traffic injury. Lack of adult supervision has often been cited as a risk factor among children for road traffic injury. However, it is just one of several interrelated risk factors. There are a number of characteristics associated with parents or caregivers with a limited ability to supervise children. These include being a single parent, being a working parent, and being a parent affected by illness or depression (22). Such characteristics are found in families across the world, and are independent of the economic status of a country.

Nonetheless, if there is adult supervision, the probability of a child incurring road traffic injury is significantly reduced.

Globally, pedestrians form the single largest category of children involved in road traffic crashes. In high-income countries between 5% and 10% of children suffering road traffic injuries are pedestrians, while in low-income and middle-income countries the proportion ranges from 30% to 40%(23).

A lack of safe, efficient public transportation systems; Children need access to safe spaces for play and physical exercise. If such spaces are not available, children will be tempted to play on the streets. Play spaces should be secure and well maintained, with features that children find interesting. Designing safe play areas should be incorporated into urban planning and the development of school facilities and residential complexes. In the Anonymous, UNICEF is working with local government authorities to develop safe play areas, under the “Child Friendly Cities” programmes. Working in consultation with children and adolescents, a team of architects has planned parks where children can play safely (24-25)

Much effort has been spent on designing ways of getting to school, particularly for children of primary-school age. The measures include the provision of buses to transport children to school and encouraging children to walk to school, using the concept of “walking buses”. In the latter, adult volunteers, accompany groups of children, who walk along safe routes, wearing conspicuous, possibly fluorescent, vests. Walking buses, teach children how to walk safely, as well as teaching the health benefits of walking. They also reduce traffic congestion and pollution, particularly near schools (24). Although this measure has been implemented in a number of developed and developing countries, with clear health and social benefits(26),its effectiveness in reducing the incidence of child traffic injuries has yet to be calculated.

Child restraint systems are very effective at preventing fatalities, and are the most important “in-vehicle” safety measure for children. In the event of a crash, if restraint systems are properly installed and used, they can: reduce deaths among infants by around 70%, reduce deaths among small children, aged 1–4 years, by 54%(25), reduce the chances of sustaining clinically significant injuries by 59% among children aged 4–7 years who are strapped in booster seats, as compared to the rate of injuries sustained using ordinary vehicle seat-belts. Despite the overwhelming evidence of their effectiveness, though, many children are not restrained in age-appropriate child or booster seats (27).

In many high-income countries, the use of child restraints is common, with usage rates as high as 90%. Elsewhere, though, child restraints are still rarely used. Choosing and installing the appropriate child restraint system is important. Even in countries where the use of child restraints is common – such as in Sweden, the United Kingdom and the United States – restraints are frequently used inappropriately. A child may, for instance, be restrained in a device that is wrong for its age or weight, or the straps or harnesses may be inadequately secured or may be left

entirely undone. In all these situations, the child is placed at increased risk of both fatal and non-fatal injuries (25, 27).

In many places, the use of child restraints may be limited by access or cost, or else may not be practical because of the many children in the family. In addition, parents need to be aware of what type of seat to choose where to place it and how to install it. Research in Greece found that 88.4% of parents placed their children unrestrained on the back seat, while 76.1% of those who used a restraint did not do so consistently (28). Such campaigns are most effective when backed up by enforcement.

Appropriate restraints can be subsidized or distributed free to families. Loan schemes have been used in some countries, thus increasing both the accessibility and affordability of appropriate restraint systems (29).

Recent research suggests that children whose restraints are placed in the center rear seating position incur fewer injuries than those placed on the outer seats, though this contradicts earlier studies that found that the center seat was a less safe position (30-31).

Recently a study done in Bulawayo city of Zimbabwe in 2013 showed developing countries are experiencing high rates of population growth and car ownership; hence, there is a greater need for people to be mobile. These increases have resulted in a number of people being killed and injured in road accidents. South Africa and Nigeria account for most of the reported deaths in Sub-Saharan Africa. Ethiopia, Kenya, Uganda, Tanzania and Ghana are the other countries that experience high numbers of road deaths (2). Traffic police reports from Ethiopia showed that the main causes of road injuries are human errors, poor road environment and vehicles with technical problems. Study in Bahir Dar showed that 100 (28.8%) accidents occurred between 7 a.m. - 9 a.m. 21 (6%) accidents occurred during 12 a.m. - 2 p.m. and 6 (1.7%) occurred between 7 a.m. - 9 a.m. (36)

A study done from Akaki to Adama, the busiest highway in Ethiopia coming from and outgoing to the main port; showed RTA occurred highest 399(17.3%) on Monday; 368 (15.9%) on Thursday, and lowest on Wednesday 201 (8.7%). (7)

A study conducted to identify the causes and consequences as well as the temporal and spatial variations of taxi traffic accidents in Addis Ababa, shows that taxi drivers who are young, employed, with less driving experience and less educational level are mainly responsible for the

many of traffic accidents in the city. Those taxi drivers with experience as being assistants to other taxi drivers, and those who are unmarried, working for longer hours without recess and weekly leave and with fixed terms of contract have a tendency of committing more traffic accidents than others commit (3). A similar study in California showed that having more driving experience were found to exercise more risky behaviors which is the main determinant of fatality (33).

Similarly, a study conducted in northern Ethiopia, Mekelle area, showed that people with secondary/high school education had more chance of having risky driving behavior than people with university/college educational status. People who have high income were found at higher risk of driving behavior than the low-income ones (32). As to the cause of road traffic accidents in Ethiopia, the Road Transport Authority (RTA) has identified four leading causes: not respecting speed limit, driver characteristics, not giving priority for pedestrian, and vehicle defects. As to the cause of the accidents, some reports showed that, denying pedestrian's priority, not keeping an appropriate distance while driving, driving on the left side and over speeding, ranks from first to fourth respectively(1).

The set of risk factors that increase a child's susceptibility in road traffic can be considered within the Haddon Matrix. RTAs occur due to defects or errors of environment, (road environment), pediatrician/passenger, vehicle). The table is adopted from Haddon Matrix to show the main factors associated with RTA (33). (Table 1)

Table 1 Haddon Matrix applied to the risk factors for road traffic crash injuries among children

	Child factors	Vehicle and safety equipment	Physical environment	Socioeconomic environment
Pre-event	Age; gender; lack of supervision; risk-taking; impulsive behavior; disobedience; lack Of police enforcement.	Lack of roadworthiness of vehicle; poor lighting; poor state of brakes; speeding; overloading	Poor road design; lack of public transport; no enforcement of speed limits; no safety barriers; lack of alcohol laws; poor infrastructure for pedestrian safety	Poverty; single-parent family; large family size; poor maternal education; lack of awareness of risks among caregivers, childcare Providers and educators.
Event	Size and physical development of child; lack of equipment to protect occupants,	Child restraints and seat-belts not fitted or incorrectly used; poor design of vehicle For protection in crashes;	Roadside objects such as trees and poles	Lack of safety culture in the car and on the road.
Post-event	Child's lack of resilience; child's general condition; lack of access to appropriate health care; post-injury care	Difficult access to victim; lack of trained health-care and rescue Workers.	Lack of availability of adequate pre-hospital care, acute care and rehabilitation	Lack of culture of supporting Injured people; no first aid given at scene.

## **CHAPTER 3: OBJECTIVES**

### **3.1. GENERAL OBJECTIVE**

To assess the magnitude and factors associated with road traffic accidents among children in Addis Ababa city, Ethiopia.

### **3.2. SPECIFIC OBJECTIVES:**

- ✓ To assess, the magnitude of road traffic accident in children between 4 -14 years old. .
- ✓ To asses factors associated with road traffic accident in children between 4 -14 years old.

## **CHAPTER 4: METHODOLOGY**

### **4.1. STUDY AREA AND PERIOD**

Addis Ababa lies at an altitude of 7,546 feet (2,300 meters) and is a grassland biome, located at 9°1'48"N 38°44'24" E Coordinates: 9°1'48"N 38°44'24"E. The city lies at the foot of Mount Entoto. From its lowest point, around Bole International Airport, at 2,326 meters (7,631 ft.) above sea level in the southern periphery, the city rises to over 3,000 meters (9,800 ft.) in the Entoto Mountains to the north (<http://www.addisababacity.gov.et/index.php/en/city-hall/city-profile>).

This study was conducted in Addis Ababa city from March 11 in April 10, 2014.

Addis Ababa has a population of 2,739,551 people with an age structure of 197,976 under-4 years of age, 209,971 people between 5-9 years of age, 250,190 people between 10-14 years of age and 385,713 people in the age range of 15-19 years (3). Ethiopia has relative to other countries a small number of cars and the length of its roads relative to its population size and area respectively is improving fast of recent. An upward trend in vehicle population is expected in its major cities. The number of vehicles inspected and registered increased from almost 59,000 in 1989/90 to 76,000 in 2000/01. The actual number of vehicles is by far greater than the estimated between 100-120 thousands according to the Addis Ababa Transport and Communication Bureau. 2001/02. Due to topography, unplanned expansion of the city and the financial limitation of the City administration, Addis Ababa did not have adequately developed road network. But compared to the other regions of the country the city has relatively developed and interconnected routes, particularly in the last 10 years there is huge improvement including city wide train routes are currently under construction. Addis Ababa has a radial pattern of roads that radiate outwards mostly directed to the regional capitals and other larger towns. In addition, the number of taxis in the city is estimated at about 10% of the vehicle population in the city, of which about 60% of them are 5-12 seaters (3). Addis Ababa had high numbers of vehicles compared to other parts of

the country. Minibuses, taxis and automobiles are the most frequent vehicles moving in Addis Ababa. This study area includes all sub cities in Addis Ababa.

#### **4.2. STUDY DESIGN**

Retrospective record review was employed from police reports of Addis Ababa Traffic Control and Investigation Department (AATCIDs) in sub cities of Addis Ababa from (March2010-February 2014).

#### **4.3. SOURCE POPULATION**

All motor vehicle accidents exposed to RTA and recorded in AATCIDs of all sub cities, during the period from March2010-February 2014 were included.

#### **4.4 STUDY POPULATION**

All children aged 4-14 years, who had had RTA and recorded at AATCIDs of all sub cities, from March2010- february2014.

#### **4.5 INCLUSION AND /EXCLUSION CRITERIA**

Complete register road traffic accidents in children aged 4-14 years recorded at AATCIDs of all sub cities, from March2010- february2014 were included.

#### **4.6. SAMPLE SIZE AND SAMPLING PROCEDURE**

All registered RTAs in children aged from 4-14 years covering the period from March 2010 to February 2014 police stations of all sub cites.

## **4.7. VARIABLES:**

### **4.7.1. DEPENDENT VARIABLE**

Outcome of road traffic accident (death vs. injury)

### **4.7.2. INDEPENDENT VARIABLE**

Socio demographic and other variables related to child pedestrian/passenger like

- Age
- Sex
- Health condition
- Movement of child pedestrian/passenger during the accident

Socio demographic and other variables related to the driver like

- Age
- Sex
- Educational background
- Driver vehicle relationship
- Driving experience
- Movement of driver during the accident

Vehicle related variables

- Vehicle type
- Vehicle years of service

Other

- Road condition
- Location

#### **4.8. DATA COLLECTION**

Data were collected using a structured checklist which was developed based on daily RTA registration book format and conducted by 10 police personnel and the investigator.

#### **4.9. DATA QUALITY CONTROL**

The checklist were prepared first in English, then translated to Amharic, and translated back to English by experts and checked before the actual data collection started. Data collectors were supervised by supervisor and principal investigator and checked for completeness and coherence. Data were checked and cleaned for completeness and consistency at the same time incomplete records were discarded. Data cleaning and editing was done by using SPSS version 20.

#### **4.10. DATA PROCESSING AND ANALYSIS**

Data were entered, cleaned and analyzed using SPSS version 20. First Descriptive statistics of percentages and frequency distribution using tables and figures were carried out to explore the socio demographic characteristics related to the driver, characteristics related to direct or in direct cause of the accident occurrence of RTA in children. Binary logistic regression was used to assess the association between the dependent and independent variables, outcome of RTA with socio demographic characteristics related to driver (age, sex, educational background, driving experience and driver vehicle relationship and characteristics related to direct(in direct) cause of the accident (year of accident, sub city of accident, movement of child during the accident, road user, road condition, vehicle service years, reason of accident, time of the accident, day of accident, location of accident, type of vehicle involved, vehicle years of service and reason of injury). Adjusted odds ratio (OR) with 95% confidence interval (CI) and P values were calculated.  $P < 0.05$  was considered statistically significant.

#### **4.11. OPERATIONAL DEFINITION**

**RTA:** A road traffic accident is defined as any motor vehicle accident occurring on a public highway. It includes collisions between vehicles and animals, vehicles and pedestrians, or vehicles and fixed obstacles. Single vehicle accidents, which involve a single vehicle that means without other road user, are also included (Safe car guide 2004).

**RTI:** Is the outcome of RTA and can be light and /severe.

**Slight injury:** an injury which requires medical care, but no injuries requiring hospitalization.

**Severe injury:** an injury, which results hospital admission.

**Children:** children aged between 4-14years.Pupil: (school children) boys and girls less than 14 years of age for the purpose of this study.

**Death:** a death that occurs immediately after traffic accident injury.

**Outcome of road traffic accident:** outcome/result of the accident whether it is injury or death.

**Movement of child pedestrian/passenger during the accident:** whether the pedestrian is crossing over a zebra line, walking alongside or other.

**Driver vehicle relationship:** Categorized as, owner, hired and other (this may be relative, friend, or one who rented the vehicle).

**Driving experience:** This is the number of years the driver drove since receiving a driving license. The information obtained from the driver is recorded under one of the following six categories: <1 year,1-2 years, 2-5 years ,5-10 years > 10years and unknown.

**Movement of driver during the accident:** to which direction where the driver moving at the time of the accident and categorized as one of the following: straight moving, inappropriate use guide (*meri*) to the left side of the road inappropriate use guide (*meri*) to the right side of the road whether the driver using his right side or left side way.

**Vehicle type:** type of the vehicle, which caused the accident.

**Vehicle years of service:** This is the number of years from date of manufacture.

The categories are:  $\leq$  1 year, 1-2 years, 2-5 years, 5-10 years,> 10 years and unknown.

**Road surface Type:** condition of the road asphalt or gravel "*pista*".

**Location:** This indicates the area where a traffic accident happened.

**Rush hour:** Rush hour for school children are in the morning (7a.m- 9 a.m.), break/ lunch time (12 a.m. -2 p.m.), the time of return from school (3p.m-6 p.m.).

#### **4.12. ETHICAL CONSIDERATION**

The study protocols were approved by Institutional Review Board (IRB), of Addis Ababa University, College of Health Sciences. An initial letter of cooperation was written to Addis Ababa police commission. Addis Ababa police commission, in turn, wrote a letter of support to each sub city of police station. Information of the study (purpose and producers, potential risk and benefits) were given to police officials working on RTA, confidentiality were assured for the information gathered; personal identifiers were not used on the checklist.

#### **4.14. DISSEMINATION OF THE RESULT**

The result of this study will be submitted to Addis Ababa University, Department of Nursing and Midwifery for partial fulfillment of the degree of Masters in child health nursing and be disseminated to the concerned bodies; AATCIDs of all sub cities. It will also be presented at different workshops and be published.

## **CHAPTER 5. RESULT**

A total of 1019 (11.4%) accidents occurred in children 4-14 years of age in sub cities of Addis Ababa during the year from March 2010 to February 2014.

### **5.1 SOCIO DEMOGRAPHIC CHARACTERISTICS OF VICTIMS OF RTA AND DRIVERS**

Six hundred fifty four (64.2%) of the victims were males and 365 (35.8%) were females. The mean age of the study subjects were 9.99(SD±3.002). Four hundred ninety (48%) of the children were in the age group between 11- 14 years and 373 (36%) of the children were 7-10 years of age and 156(15.3%) of the accidents occurred in 4-6 years of age.

The majority 946 (92.8%) of the drivers were males, while 39 (3.8%) were female drivers and 34(3.3%) drivers were with unknown sex status. Six hundred twenty (60.8%) drivers completed secondary school education and 262 (25.7%) of the drivers completed primary school education. Four hundred fifty three (44.5%) of the drivers were between 19-30 years of age, and 381(37.4%) of the drivers were 31-50 years of age. Two hundred sixty four 264 (25.9%) of the drivers had a driving experience of >10 years, 246(24.1%) of the drivers had 5-10 years' of experience and 35 (3.4%) of the drivers had no driving license. Regarding driver car relationship, seven hundred two (68.9%) of the drivers were hired and 249 (24.4%) drivers were vehicle owners. (Table 2)

**Table 2. Frequency distribution of drivers' related characteristics involved in RTA in sub cities of police traffic offices of Addis Ababa city from March 2010-February 2014. (n=1019)**

	Frequency	Percent (%)
<b>Age</b>		
<18 yrs. old	26	2.6
19-30 yrs. old	453	44.5
31-50 yrs. old	381	37.4
> 50 yrs. old	100	9.8
Unknown	59	5.8
<b>Educational background.</b>		
Illiterate	7	0.7
Religious education	4	0.4
Primary school	262	25.7
Secondary school	620	60.8
Higher education and plus	85	8.4
Unknown	41	4
<b>Driving experience</b>		
<1 year	69	6.8
1-2 year	106	10.4
2-5 year	217	21.3
5-10 year	246	24.1
> 10	264	25.9
Unknown	82	8.0
No license	35	3.4
<b>Driver vehicle relationship</b>		
Owner	249	24.4
Hired	702	68.9
Other*	9	0.9
Unknown	59	5.8

\* Friend, relative of the owners, rented.

## 5.2. MAGNITUDE OF RTA IN CHILDREN OF ADDIS ABABA

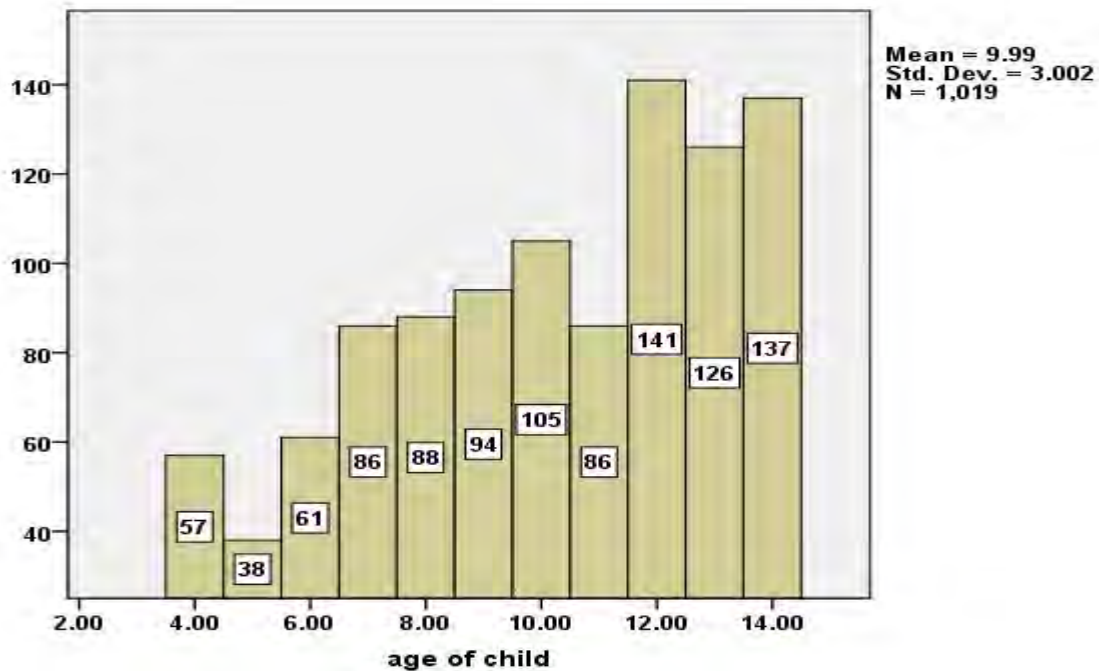
A total of 1019 (11.4%) of RTAs occurred in children between 4-14 years of age. Of those 125 (12.3%) were fatal, 510 (50%) severe injuries and 384 (37.7%) were slight injuries. Six hundred fifty four (64.2%) were males and 365 (35.8%) were females. Almost all children were healthy 1018 (99.9%) except one child who was physically disabled. Most of the children were pupils 912(89.5%) and almost 10% of Addis Ababa children aged from 4-14years was not pupils.

Higher death rate 58(46.4%) occurred in children with 7-10 years of age. however, a large number of severe injuries 239(46.9%) were occurred in the age group 11-12 years old. The accidents occurred in Male children were nearly two times higher compared two female children (table 3).

Table 3.Outcome of the road accident by age and sex of the victims in sub cities of police traffic offices of Addis Ababa city from March 2010- February 2014.

variables	Outcome of RTA		
	Death, number (%)	Severe injury, number (%)	Slight injury, number (%)
Age			
4-6 years old	26(20.8%)	81(17.9%)	49(12.8%)
7-10 years old	58(46.4%)	190(37.3%)	125(32.6%)
11-12 years old	41(32.8%)	239(46.9%)	210(54.7%)
Total	125(100%)	510(100%)	383(100%)
Sex			
Male	84(67.2%)	325(63.7%)	245(64.2%)
Female	41(32.8%)	185(36.3%)	139(35.8%)
Total	125(100%)	510(100%)	384(100%)

Figure 2 below shows a bar graph where 141(13.8%) of the accidents were in the age of 12 years followed by 137(12.4%) in 14 years old, while 38(3.7%) of the accidents occurred in 5 years old child. The mean age of the children were 9.99(SD±3.002) (Figure 2).

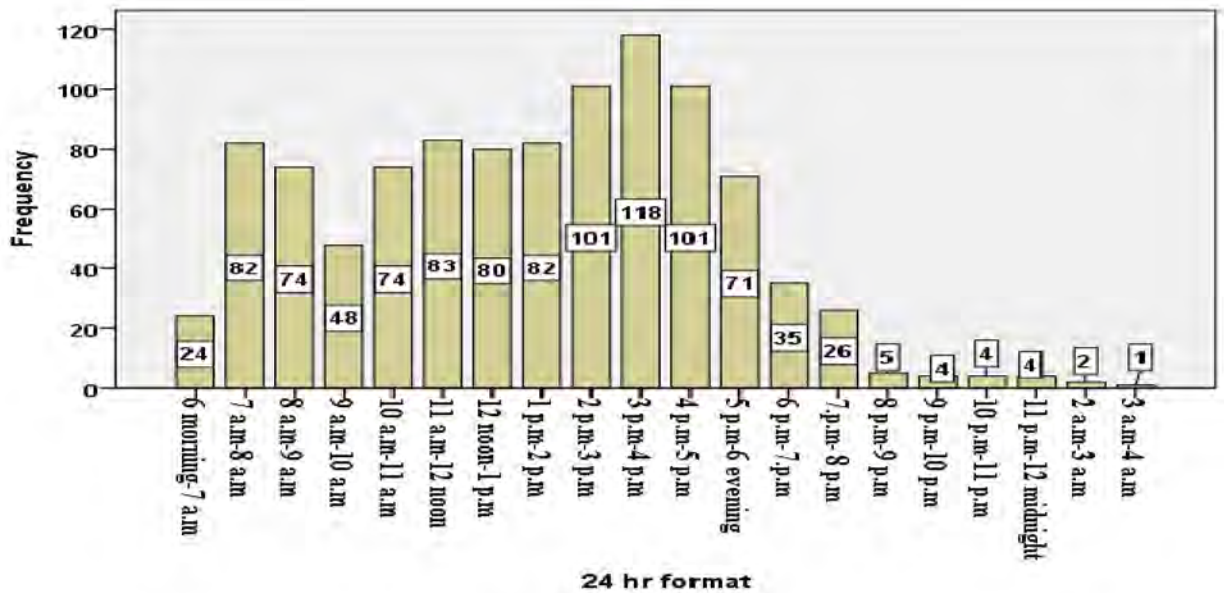


**Figure 2 :** Age distribution of RTA victims in sub cities of police traffic offices of Addis Ababa (March 2010-February 2014).

More than half of the road traffic accidents 608 (59.6%) occurred during rush hour. Of this 290 (47.7%) occurred afternoon from 3:00 -6:00 pm and 162(26.6%) during lunch time 12:00 am-2:00 pm and 156 (25.7%) morning from 7:00 am-9:00. (Table 4 and Figure 3)

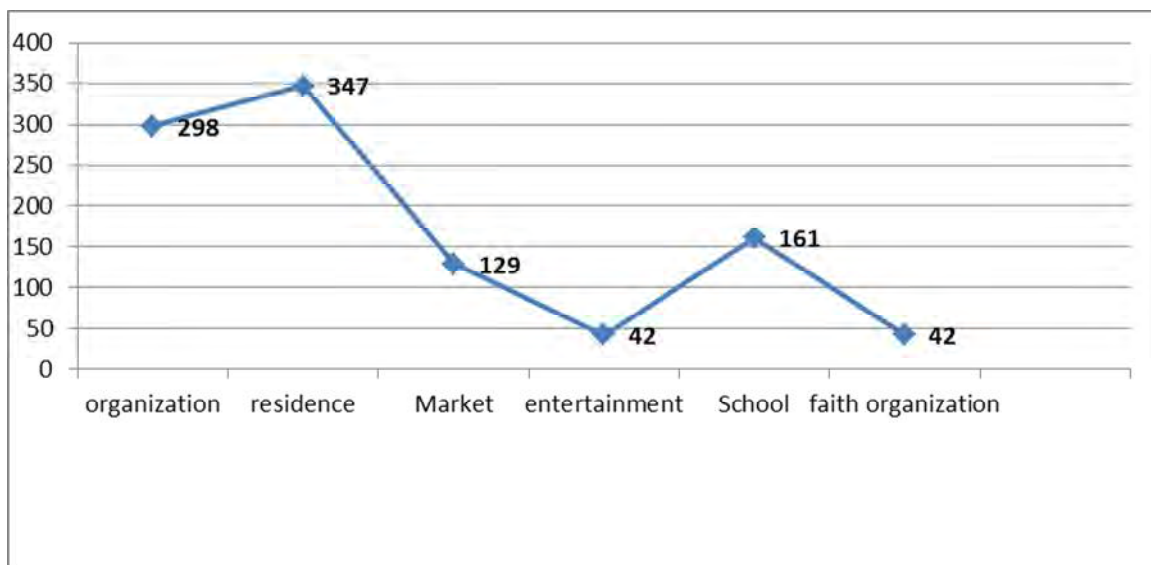
Table 4 Time of RTA in sub cities of Addis Ababa police traffic offices (March2010-February 2014).

Rush hours	Number	Percent (%)
Morning (7:00 a.m-9:00 a.m.)	156	25.7%
Break/lunch time (12:00 a.m-2:00 p.m.)	162	26.6%
Afternoon /return (3:00p.m-6:00 p.m.)	290	47.7%
Total	608	100%



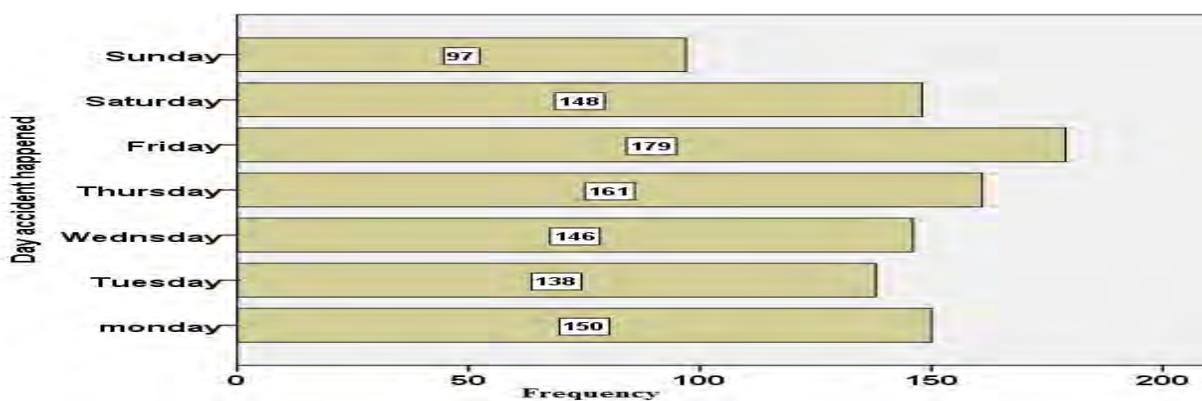
**Figure 3:** Number of traffic Accidents per hour in sub cities of Addis Ababa by Time of Day, (March 2010- February 2014).

Regarding the place of accident 304(29.8%) of the victims had the accident when they were crossing the zebra line, 278(27.3%) walking directly (walking on the left or the right side of the road) and 12 (1.2%) while they were playing. Almost all children affected by RTAs were pedestrians 994(95.7%). Most of the RTAs 347(34.1%) took place around the children's residence and the vicinity of schools 161(15.8%). (Figure 4)



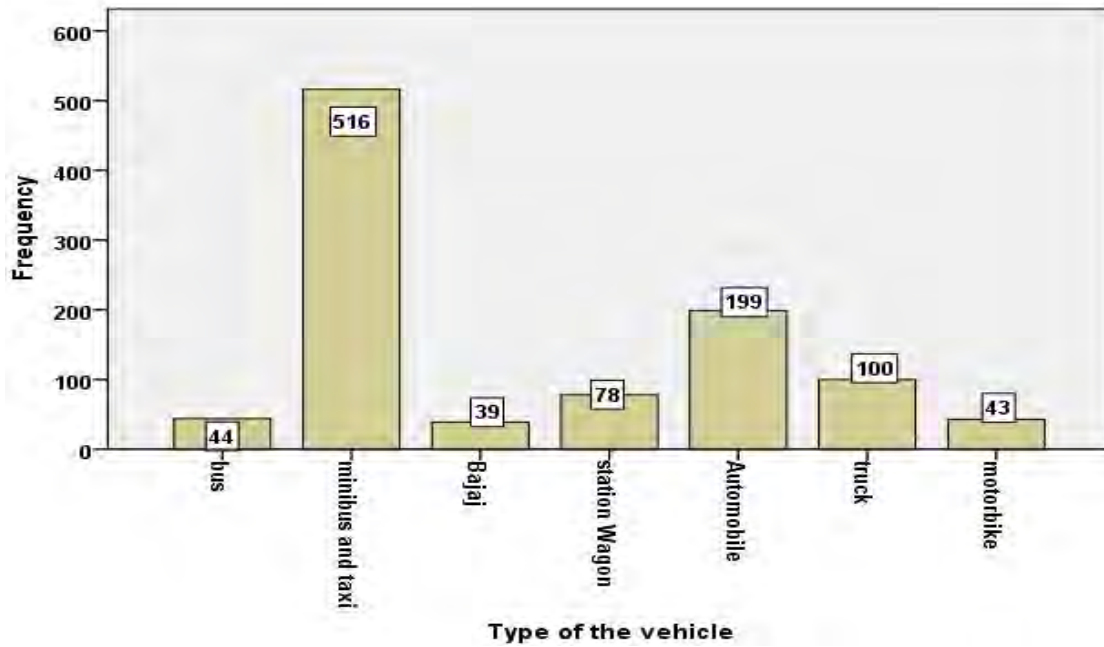
**Figure 4:** Distribution of RTA by place in sub cities of police traffic offices of Addis Ababa city from March 2010- February 2014.

More accidents 176 (17.6%) were registered on Friday followed by Thursday 161 (15.8%); and 150 (14.3%) on Monday. The lowest number of accidents registered was on Sunday 97(9.5%) (Figure 5)



**Figure 5:** Distribution of RTA in children by day in sub cities of police traffic offices of Addis Ababa city (March 2010-February 2014).

Out of 1019 accidents minibus and taxis were responsible for 516(50.6%) of RTAs followed by automobiles 199 (19.5%). Bajaj had the lowest 39(3.8%) accident rate. (Figure 6)



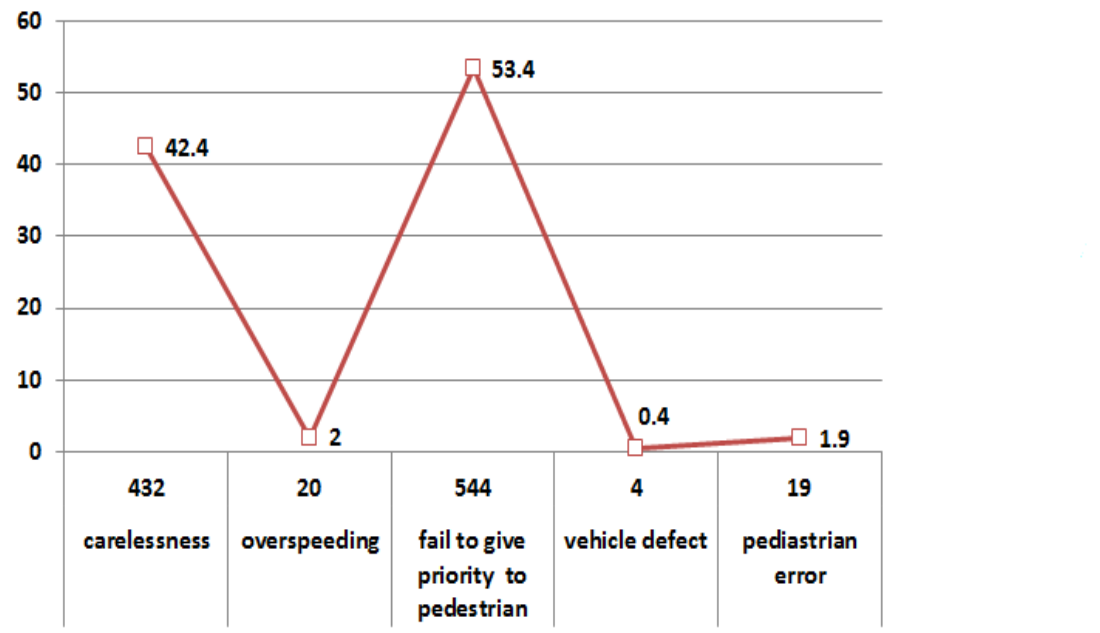
**Figure 6:** Distribution of motor vehicles in RTA in sub cities of police traffic offices of Addis Ababa city (March 2010-February 2014).

Kolfe Keraniyo sub city had the highest number of accidents 198(19.4%), followed by NifassilkLafto subcity116 (11.4%), and Bole sub city 109(10.7%). The lowest record of RTA (71)7% was registered in Gulele sub city (Table 5).

**Table 5:** Distribution of motor vehicles RTA by sub cities: (March 2010-February 2014) in Addis Ababa.

	Outcome of the accident			Total
	Death	Severe injury	Slight injury	
Cherkos	2	30	46	78
Bole	12	70	27	109
Nifas Silk	15	58	43	116
Arada	8	51	39	98
Gulele	11	18	42	71
Sub City Akaki	18	40	16	74
Kolfe Keranyo	34	98	66	198
Yeka	12	34	26	72
Lideta	7	41	58	106
Addis Ketema	6	70	21	97
Total	125	510	384	1019

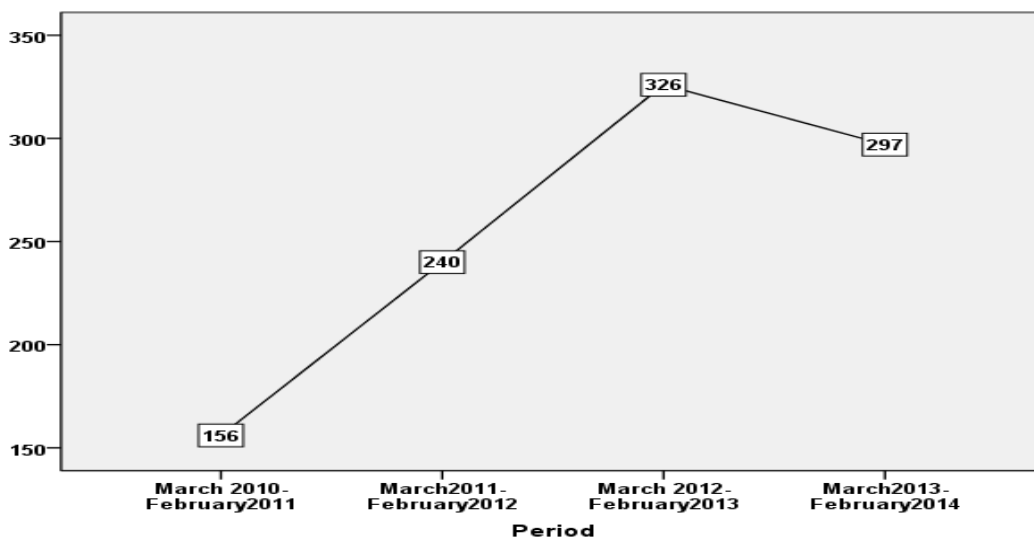
Nine hundred seventy six (97.8%) of the accidents were due to the driver's fault. Failure to give priority to pedestrians is the primary cause of the accident 544(53.4%), and 432(42.4), were due to carelessness of the drivers. Pedestrian errors were the lowest cause of accidents in children 19 (1.9%) Figure 7)



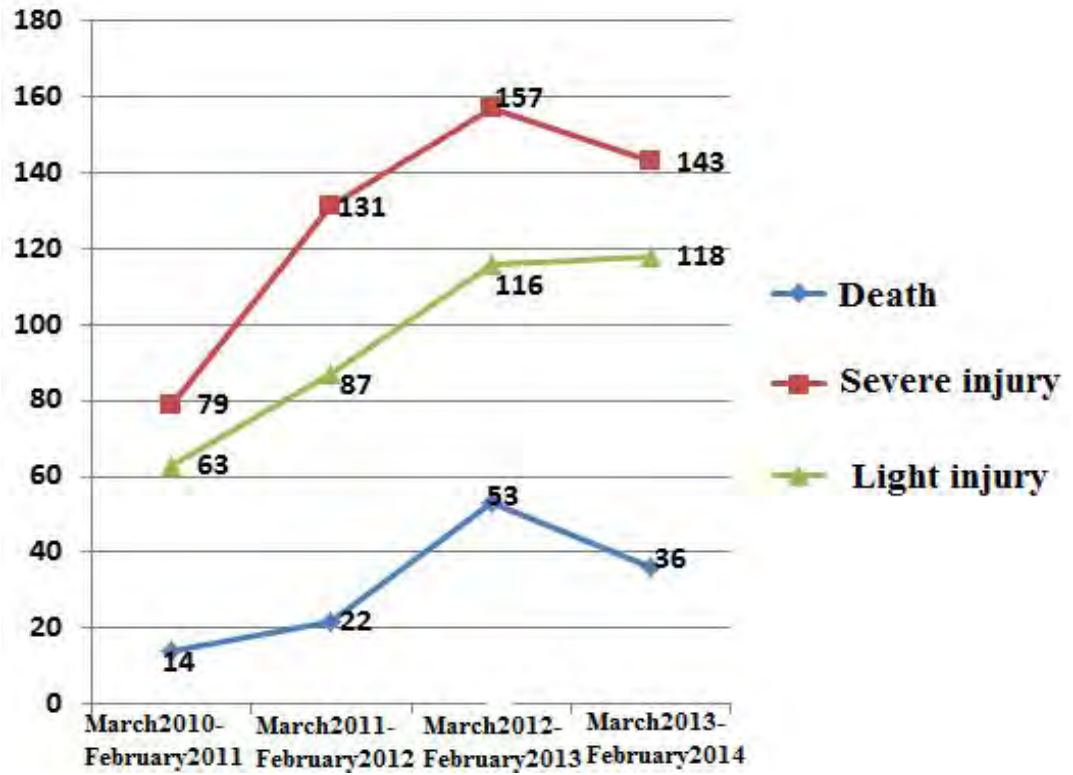
**Figure 7:** Distribution of RTA by causes in sub cities of Addis Ababa city police traffic offices (March 2010-February 2014).

### 5.3. TRENDS OF ROAD TRAFFIC ACCIDENT (MARCH 2010- FEBRUARY 2014)

RTAs increased in number throughout March 2010 to -February 2013. From March 2010-February 2013 both light injury and death nearly doubled within 1 year (March 2011- February 2012). There is a slightly downward movement from March 2013-February 2014. In all outcomes of RTA (death, severe injury, and light injury) the number of RTAs peaked to 326(32.0%) in March 2012-February 2013 compared to all other years. (Figure 8 and 9)



**Figure 8: Distribution of RTAs from March 2010- February 2014 in sub cities of Addis Ababa.**



**Figure 9:** Trends of road traffic accident in sub cities of Addis Ababa (March 2010- February 2014).

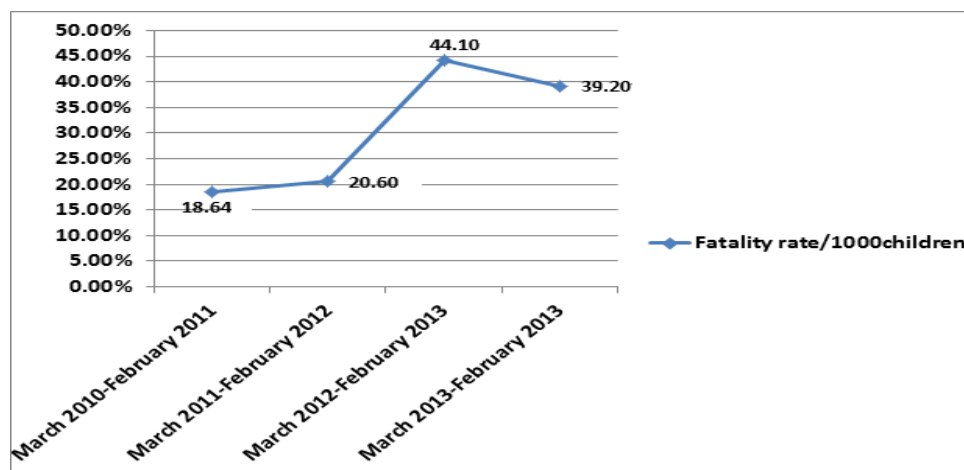
Figure 10 below shows that the volume of RTA increased from 156(15.3%) in March2010 to 297(29.1%) in February 2014, It nearly doubled within the four years period. Fatal RTA were 19 (15.2%) in March 2010-February 2011but doubled to 40 (32%) by March 2013-February 2014. Non-fatal RTA increased as well from 137(15.3%) to 257(28.7%) (Figure 10)



**Figure 10:** Trends of fatal and nonfatal RTAs in sub cities of Addis Ababa (March 2010-February 2014).

### Fatality rate per 1000 injury

From 1000 children 123(12.3%) children died due to road traffic accident. **(Figure 11)**



**Figure 11:** Fatality rate per 1000 injury in sub cities of police traffic offices of Addis Ababa (March2010-February 2014).

#### **5.4 FACTORS ASSOCIATED WITH RTA IN CHILDREN OF ADDIS ABABA**

Most of the factors that increase the risk of road traffic injuries for the general population do so similarly for children. Thus children are affected by the aspects related to drivers and the features connected to vehicle and road environment. Of the entire road traffic accidents 994 (97.5%) of the accidents occurred in good road condition (asphalted) while gravel accounted for 25(2.5%) of the accidents. Regarding movement of the child during the accident 656(64.4%) of the accidents occurred while the children were crossing the road. Almost all children affected by RTAs were pedestrians 994(95.7%), 22(2.3%) were passengers and 2(0.2%) were bicyclist.

RTAs were highest 299 (29.3%) among vehicles with 5-10 years of service. Vehicles with 2-5 years of service 249 (24.4%) stood second and lowest accidents were recorded in vehicles less than 1 year of service 50(4.9%) (Table 6)

Table 6 Frequency distribution related to accident (direct and indirect) in sub cities of police traffic offices of Addis Ababa (March2010-February2014). N=1019(100%)

<b>Variables</b>	<b>Frequency</b>	<b>Percent (%)</b>
<b>Movement of child during the accident</b>		
While crossing zebra line.	132	13.0
Walking directly	304	29.8
Crossing from right to the left.	278	27.3
Crossing from left to the right.	246	24.1
Hanging/gripping in a car	47	4.6
While playing	12	1.2
<b>Road user</b>		
Vehicle Passenger	19	1.9
Pedestrian	994	95.7
Motorcycle Passenger	4	0.4
Bicyclist	2	0.2
<b>Service years of vehicle</b>		
≤1 year	50	4.9
1-2 year	87	8.5
2-5 year	210	20.6
5-10 year	249	24.4
> 10 year	299	29.3
Unknown	124	12.2
<b>Total</b>	<b>1019</b>	<b>100</b>

Driver related characteristics like age, sex; educational background and driving experience were not significantly associated with fatal accident in bivariate analysis. Only driver vehicle relationship was significant. Drivers between 19-30 years of age accounted for 52(41.6%) of the fatal and 401(44.9%) of the non-fatal accidents, followed by drivers between 31-50 years of age accounting for 50(40%) of the fatal accidents and 331(37.0%) of the non-fatal accidents.

One hundred and twenty one (96.8%) of the fatal accidents and 825(92.3%) of the nonfatal accidents were by male drivers. Drivers who completed secondary school were responsible for 79 (63.2%) of fatal accidents and 541(60.5%) of the non-fatal accidents. That was, followed by drivers who completed primary school education 32 (25.6%) of the fatal accidents and 230(25.7%) of the non-fatal accidents. The lowest were drivers who completed higher education of post graduate level 1 (0.8%) of the fatal accidents and 18(2.0%) of the non-fatal accidents. Drivers with driving experience of between 5-10 years were responsible for 34 (27.2%) of the fatal accidents and 212 (23.7%) of the non-fatal accidents; followed by drivers with driving experience 2-5 years 32 (25.6%) of the fatal accidents and 185 (20.7%) of the non-fatal accidents. Vehicle owners were responsible for 30(24.0%) of the fatal accidents and 219(24.5%) of the non-fatal accidents (Table 7).

Table 7 Driver related characteristics associated with RTA in sub cities of police traffic offices of Addis Ababa (March 2010-February 2014).

Variables	Outcomes			
	Death/fatal no. (%)	Nonfatal no. (%)	Crude OR(95% C.I)	p-value
<b>Age</b>				
<18 yrs. old	3(2.4%)	23(2.6%)	0.80(0.21,3.03)	0.74
19-30 yrs. old	52(41.6%)	401(44.9%)	0.80(0.42,1.50)	0.48
31-50 yrs. old	50(40.0%)	331(37.0%)	0.93(0.49,1.75)	0.81
> 50 yrs. old	14(11.2%)	86(9.6%)	1.00	
Unknown	6(4.8%)	53(5.9%)	0.69(0.25,1.92)	0.48
<b>Sex</b>				
Male	121(96.8%)	825(92.3%)	2.34(0.56,9.91)	0.25
Female	2(1.6%)	37(4.1%)	1.00	
Unknown	2(1.6%)	32(3.6%)	0.87(0.12, 6.50)	0.89
<b>Educational background.</b>				
Illiterate	0 (0.0%)	7(0.8%)	1.00	
Religious education	0 (0.0%)	4(0.4%)	1.00	1.000
Primary school	32 (25.6%)	230(25.7%)	224796732.21	0.999
Secondary school	79 (63.2%)	541(60.5%)	235937882.63	0.999
Higher education	12 (9.6%)	54(6.0%)	359050336.16	0.999
greater than higher	1 (0.8%)	18(2.0%)	89762584.04	0..999
unknown	1 (0.8%)	40(4.5%)	40393162.82	0.999
<b>Driver vehicle relationship</b>				
Owner	30(24.0%)	219(24.5%)	1.00	
Hired	88(70.4%)	614(68.7%)	1.88(0.64, 5.57)	0.25
Other*	3(2.4%)	6(0.7%)	1.98(0.70,5.57)	0.261
Unknown	4(3.2%)	55(6.2%)	<b>6.88(1.23,38.31)</b>	<b>0.028</b>

Table 8: Below shows, age of a child, movement of a child during the accident, driving experience, vehicle type, vehicle years of service and causes of injury were significantly associated with fatal accident in bivariate analysis. Fifty eight (58) (46.4%) fatalities occurred in children 7-10 years of age. Another group of 41(32.8%) 11-14 years of age stood second. One hundred and fourteen (91.2%) fatal accidents and 798(89.3%) non-fatal accident occurred in pupils, followed by servant 4(3.2%) fatal accidents and 10(1.1%) non-fatal accidents. Thirty eight (30.4%) fatal accidents and 208 (23.3%) non-fatal accidents occurred while crossing from left to the right side of the road. Another 35(28.0%) fatal accidents and 269(30.1%) non-fatal accidents while walking directly. One hundred twenty one 121(96.8%) fatal accidents and 873(97.7%) non-fatal accidents were among pedestrians. Vehicles with >10 years of service were responsible for 16 (12.8%) fatal accidents and 256 (28.6%) non-fatal accidents. Failure to give priority to pedestrians accounted for 67(53.6%) fatal accidents and 477(53.4%) non-fatal accidents (Table 8).

Table 8 Factors associated to accident (direct and indirect) in sub cities of police traffic offices of Addis Ababa (March2010-February2014).

Variables	Outcomes			
	Death no. (%)	Alive no. (%)	Crude OR(95% C.I)	p-value
<b>Age of the child</b>				
4-6 years old	26(20.8%)	130(14.5%)	1.00	
7-10 years old	58 (46.4%)	315(35.2%)	<b>2.19 (1.29, 3.75)</b>	<b>0.004</b>
11-14 years old	41 (32.8%)	449(50.2%)	<b>2.012 (1.31,3.08)</b>	<b>0.001</b>
<b>Sex</b>				
Male	84(67.2%)	570(63.8%)	0.92(0.56, 1.53)	0.749
Female	41 (32.8%)	324(36.2%)	1.00	
<b>Health condition</b>				
Healthy	124(99.2%)	894(100.0%)	0.000	1.000
Physical disability	1(0.8%)	0(0%)	1.00	
<b>Movement of child during the accident</b>				
When crossing zebra.	9(7.2%)	123(13.8%)	1.00	
Walking directly	35(28.0%)	269(30.1%)	<b>0.22(0.05, 0.96)</b>	<b>0.043</b>
Crossing from right to the left.	34(27.2%)	244(27.3%)	0.39(0.10, 1.51)	0.173
Crossing from left to the right.	38(30.4%)	208(23.3%)	0.42(0.11, 1.62)	0.207
hanging/gripping car	6(4.8%)	41(4.6%)	0.55(0.14, 2.12)	0.383.
While playing	3(2.4%)	9(1.0%)	0.439(0.09, 2.09)	0.302
<b>Road user</b>				
Vehicle Passenger	3(2.4%)	16(1.8%)	302921673.598	0.999
Pedestrian	121(96.8%)	873(97.7%)	223923772.465	0.999
Motorcycle Passenger	1(0.8%)	3(0.3%)	538527419.729	0.999
Bicyclist	0(0.0%)	2(0.2%)	1.00	

<b>Vehicle type</b>				
Bus	6(4.8%)	38(4.3%)	1.00	
Truck	21(16.8%)	79(8.8%)	1.270(0.48,2.35)	0.628
motorbike	3(2.4%)	40(4.5%)	<b>2.139(1.11, 4.11)</b>	<b>0.023</b>
minibus and taxi	56(44.8%)	460(51.5%)	0.60(0.17, 2.12)	0.430
Bajaj	6(4.8%)	33(3.7%)	0.98(0.58,1.65,)	0.938
Station Wagon	11(8.8%)	67(7.5%)	1.46(0.55, 3.88)	0.445
Automobile	22(17.6%)	177(19.8%)	1.32(0.61, 2.87)	0.482
<b>Vehicle years of service</b>				
<1 year	1(0.8%)	49(5.5%)	1.00	
1-2 year	3(2.4%)	84(9.4%)	0.136(0.02, 1.06)	0.057
2-5 year	31(24.8%)	180(20.1%)	<b>0.239(0.07, 0.85)</b>	<b>0.027</b>
5-10 year	31(24.8%)	218(24.4%)	1.15(0.602, 2.20)	0.670
> 10 year	43(34.4%)	256(28.6%)	0.951(0.50, 1.82)	0.879
Unknown	16(12.8%)	107(12.0%)	1.123(0.61,2.08)	0.712
<b>Movement of the driver during accident</b>				
straight moving	113(90.4%)	765(85.6%)	3.25(0.44,24.34)	0.251
inappropriate use guide"meri" to the left side of the road	6(4.8%)	61(6.8%)	2.17(0.25,18.99)	0.486
inappropriate use guide "meri" to the right side of the road	5(4.0%)	46(5.1%)	1.00	
other	1(0.8)	22(2.5%)	0.26(0.26,21.72)	0.439
<b>Road condition</b>				
Asphalt	122(97.6%)	872(97.5%)	1.03(0.30, 3.48)	0.967
Gravel	3(2.4%)	22(2.5%)	1.00	
<b>Location</b>				
Organization	37(29.6%)	261(29.2%)	1.35(0.45, 3.99)	0.591
Residence	49(39.2%)	298(33.3%)	1.56(0.53, 4.57)	0.416
Market	7(5.6%)	122(13.6%)	0.54(0.15, 1.96)	0.353
Entertainment	7(5.6%)	35(3.9%)	1.90(0.51, 7.05)	0.337

School	21(16.8%)	140(15.7%)	1.42(0.46, 4.40)	0.538
faith organization	4(3.2%)	38(4.3%)	1.00	
<b>Causes of injury</b>				
careless driving	49(39.2%)	383(42.8%)	2.30(0.30, 17.63)	0.422
over speeding	7(5.6%)	13(1.5%)	<b>9.69(1.06, 88.65)</b>	<b>0.044</b>
fail to give priority	67(53.6%)	477(53.4%)	2.53(0.33, 19.24)	0.370
vehicle defect	1(0.8%)	3(0.3%)	6.00(0.29, 124.1)	0.246
pedestrians error	1(0.8%)	18(2.0%)	1.00	

A multiple logistic regression was considered for the following variables: age, sex, and movement of the child during the accident, age of the driver, driving experience, and driver vehicle relationship, age of vehicle, location of accident, movement of the vehicle or driver during the accident and location of injury however, age of child, movement of the child during the accident and driving experience were strongly and significantly associated with fatal RTIs.

Children 4-6 years of age were **2.19** times more likely to die compared with children 11-14 years of age **AOR 2.19, 95% C.I (1.29, 3.75)**. Children in the age group of 7-10 years were **2.15** times more likely to die compared with children 11-14 years of age **AOR 2.15, 95% C.I (1.34, 3.46)**. Children who were playing at the time of accident were **9.13** times more likely to die than children who were crossing zebra line at the time of accident, **AOR 9.13, 95% C.I (1.72, 48.47)**.

Drivers with <1 year driving experience were **2.77** times more likely to lead to death compared to drivers with > 10 driving experience, **AOR 2.77, 95% C.I (1.16,6.66)**. Drivers with 2-5 years driving experience were **2.14** times more likely to lead to death compared with drivers who had > 10 years of driving experience **AOR 2.14,95% C.I (1.17,4.05)(Table 9)**.

Table 9 Association of fatal road traffic accident with selected risk factors in sub cities of police traffic offices of Addis Ababa (March 2010-February2014).

Variables	Outcomes		Crude OR (95%C.I)	Adjusted OR(95% C.I)
	Death no. (%)	Alive no. (%)		
<b>Age of child</b>				
4-6 yrs. old	121(96%)	825(92.3%	2.36(0.56, 9.92)	<b>2.43(1.34,4.41)</b>
7-10 yrs. old	2(1.6%)	37(4.1%)	0.87(0.12, 6.50)	<b>2.15(1.34,3.46)</b>
11-14 yrs. old	2(1.6%)	32(3.6%)	1.00	1.00
<b>Movement of child during the accident</b>				
While crossing zebra	9(7.2%)	123(13.8%)	1.00	1.00
Walking directly	35(28.0%)	269(30.1%)	0.22(0.05, 0.96)	1.53(0.66,3.56)
Crossing from right to the left.	34(27.2%)	244(27.3%)	0.39(0.10, 1.51)	1.63(0.69,3.86)
Crossing from left to the right.	38(30.4%)	208(23.3%)	0.42(0.11, 1.62)	1.71(0.72,4.05)
hanging/gripping car	6(4.8%)	41(4.6%)	0.55(0.14, 2.12)	1.91(0.58,6.28)
While playing	3(2.4%)	9(1.0%)	0.439(0.09, 2.09)	<b>9.13(1.72,48.47)</b>
<b>Driving experience</b>				
<1 year	13(10.4%)	56(6.3%)	3.83(0.81,18.04)	<b>2.77(1.16,6.66)</b>
1-2 year	5 (4.0%)	101(11.3%)	0.82(0.15, 4.41)	0.44(0.15,1.28)
2-5 year	32(25.6%)	185(20.7%)	2.85(0.65, 12.49)	<b>2.14(1.17,4.05)</b>
5-10 year	34(27.2%)	212(23.7%)	2.65(0.61, 11.54)	1.67(0.91,3.06)
> 10	29(23.2%)	235(26.3%)	1.00	1.00
Unknown	10 (8.0%)	72 (8.1%)	2.04(0.46, 8.93)	0.50(0.49,54.02)
No experience	2 (1.6%)	33 (3.7%)	2.29(0.48, 11.05)	0.39 (0.08,2.01)

## **CHAPTER 6: DISCUSSION**

This study intended to assess the magnitude of road traffic accident and describe the factors associated with road traffic accidents among children in Addis Ababa city.

A total of 1019 RTAs occurred in children between March 2010- February 2011 resulting in high morbidity and mortality in sub cities of Addis Ababa, Ethiopia. This study alarms and calls for action because of the huge magnitude of the problem in the area. It also revealed a strong positive association between fatal road traffic accident and age of child, driving experience and movement of the child during the accident.

The result of this study showed that the rate of RTA increased from March 2010 to February 2014. Similar findings were reported in previous studies (7).

In line with previous studies as a child gets older the risk of road traffic accident increases and males were more affected by road traffic accidents compared to females (16, 22).

Most of the RTAs occurred during rush hours. This is in agreement with previous study (36). However one fourth of the accident in this study occurred between 7:00 am – 9:00 am this is higher than the finding of previous studies and it might be attributed to difference in study population (36).

Almost all children affected by RTAs were pedestrians 994(95.7%), passengers were 22(2.3%), while only 2(0.2%) were bicyclist. This is dissimilar to, finding from Karachi, Pakistan where it was shown that 26% were pedestrians, 21 percent passengers, and 2 per cent bicyclist. The reason for this might be due to the socio economic difference between Ethiopia and Pakistan (37).

Regarding to movement of the child during the accident, children got RTAs While crossing zebra 304(29.8%) followed by while crossing from right to left 246(24.1%) and left to right 43 (4.6%), Therefore 656(64.4%) of the accidents occurred while the child is crossing the road. This is in tune with Whitbread, the ‘ability to synthesize information, from their peripheral fields of vision and their auditory sense, is limited, which can lead to their missing critical cause of danger, thus

increasing their risk of road traffic injury' (19). However, according to Zeedyk, 'they exhibit poor skills in recognizing dangerous places to cross the road, relying exclusively on the visible presence of cars in the vicinity. They are also unlikely to assess the presence of oncoming traffic with accuracy. "Blind" sections of the road, obstacles by the road that could obscure a child from a driver's field of vision and complex road junctions are not perceived by young children as threatening situations' (20). Finally, Pitcairn said: 'Road traffic crashes involving young children include a large proportion of "dart and dash" cases. In such cases, a child pedestrian is injured through a "critical behavioral error", where it has failed to stop or slow down before attempting to cross the road. This type of behavior is due to a child's "centration" –the inability of the child to switch attention from one task to another '(21).

High number of accidents 179(17.6%) occurred on Friday. 161 (15.8%) Thursday 150 (14.7%); on Monday 148 (14.7%); on Saturday, 146(14.3%) on Wednesday. The lowest number of accidents took place on Sunday 97 (9.5%). A study done from Akaki to Adama, the busiest highway in Ethiopia coming from and outgoing to the main port; showed RTA occurred highest 399(17.3%) on Monday; 368 (15.9%) on Thursday, and lowest on Wednesday 201 (8.7%). (7), the reasons for the variation could be the study was carried out on a different setting.

Among the six categories of places the number of accidents is higher in residential areas (34.1%) followed by organizations (29.2%) and school (15.8%) unlike, a study done in Addis Ababa shows injuries and number of accidents are the highest (54.9%, and 61.2% respectively) for organization (2), this discrepancy might be most of the time children play in their residential areas and also there are no traffic polices/traffic/ laws near residential areas.

The majority of the drivers involved in the RTAs were drivers who completed secondary school education 620 (60.8%). Two hundred sixty two (25.7%) drivers completed primary school education. Similarly, a study conducted in Addis Ababa showed that majority of the drivers 770 (57.4%) involved RTAs completed secondary/high school education and 207(15.4%) of the drivers completed primary school education (32).

Drivers in the age group of 18-30 years were highly responsible with the largest number of RTAs 453 (44.5%). followed by 31-50 years, 381(37.4%) RTAs occurred by people in the age group of 31-50 years. This finding is similar with different studies (2, 7, 3).

Drivers with greater than 10 years of experience were responsible for the majority of road traffic accidents 264 (25.9%), 246(24.1%) by 5-10 years of experience. A similar finding in California showed that having more driving experience were found to exercise more risky behaviors which is the main determinant of fatality (33). Contrary to the current study, the Akaki-Adama study showed that drivers with 3-5 years of experience were frequently committed RTAs while drivers 1-3 years of experience committed less (7).

Regarding driver vs. vehicle relationship RTAs were more common among hired ones 702(68.9%) than vehicle owners 249 (24.4%). is the finding is similar to the study done from Adama to Akaki 1923 (83.7 %) hired drivers and 344 (15%) vehicle owners, (7), The difference might be due to owners in Addis Ababa city drive more than those in the Akaki-Adama study, who are more likely to be hired drivers..

RTAs were highest 299 (29.3% among vehicles with 5-10 years of service), Vehicle with 2-5 years of service 249 (24.4%) stood second and lowest in less than 1 year vehicle service 50(4.9%), a similar study Bahir Dar showed that Most of the vehicles in the fleet are very old without proper maintenance, Besides many un roadworthy vehicles are on the roads because of the socio- economic situation and lack of enforcement (36).

In the current study 994 (97.5%) of RTAs occurred in good road surface type which is asphalted and 25(2.5%) accidents occurred in gravel. This is unlike the study done in Bahir Dar where 268 (77.3%) accidents occurred on good-asphalted roads, while 68 (19.6%) were on gravel road surfaces (36). The difference in road surface might be due to Addis Ababa having a relatively better road condition than Bahir Dar.

Minibuses /Taxies and automobiles had RTAs, 516 (50.6%) and 199 (19.5%) respectively. The reason might be due to the fact that people use minibuses/taxies more than automobiles. A study in Addis Ababa by Tewolde showed that taxis and automobiles had highest RTA 918(29.6%) and 721 (26%) (2).

Nine hundred seventy six (97.8%) of the accidents were due to the driver's error, 4 (0.4 %) were due to vehicle defect and 19 (1.9%) due to pedestrian error: The result is comparable with the study done in Bahir Dar where drivers' error accounted for 251 (72.3%) and pedestrians' error accounted for 19 (8.4%), while vehicle defect accounted for 17 (4.9%) (36). the fact that most of the RTAs occurred due to drivers' error in the current study could be explained by the nature of the study subjects being children. Children are not expected to assume the same responsibility as drivers.

Drivers with <1 year driving experience were **2.77** times more likely to lead to death compared to drivers with > 10 years driving experience, **AOR 2.77, 95% C.I (1.16,6.66)**. Drivers with **2-5** years driving experience were **2.14** times more likely to lead to death compared with drivers who had > 10 years of driving experience **AOR 2.14, 95% C.I (1.17, 4.05)**; the possible explanation for this could be the knowledge and skills gained during drivers training program might not be adequate.

Most of the time the fail to give priority for pedestrians is the major contributing factor (cause) which is responsible to many of the RTAs in children of Addis Ababa 544(53.4%): followed by carelessness of the driver 432(42.4%) and over speeding 20 (2%), similarly study done in Mekelle showed that, denying pedestrian's priority, not keeping an appropriate distance while driving, driving on the left side and over speeding, ranks from first to fourth respectively (1).

## **CHAPTER7. STRENGTHS AND LIMITATIONS OF THE STUDY**

### **7.1. STRENGTHS**

This study is the first of its kind done on RTA of children in Ethiopia and therefore it can be taken as a pioneer.

The study covered 10 sub cities dating from March 2010 up to February 2014 (4 years) and is reasonably comprehensive, because it included all registered RTAs in children.

### **7.2. LIMITATIONS**

This study has several limitations. Records of the road traffic accidents offices mainly focused on the driver related factors.

The data on RTA of the offices were not available in electronic data base and had to be collected manually from handwritten day registration books. This took more time than is needed and cost more than expected

The day registration records were not consistent in that sometimes the age, other times the sex of the child was not recorded. These had to be excluded from the sample.

## **CHAPTER 8 CONCLUSION AND RECOMMENDATION**

The major reasons for the accidents were failure to give priority for pedestrians 544 (53.4%): carelessness of the driver 432 (42.4%) and over speeding 20 (2%), ranking from first to fourth respectively. Ninety seven point 8 percent of the accidents were caused by the drivers' error.

Drivers with age group of 18-30 years and Drivers with less experience were highly responsible for the largest number of RTAs.

With regards to places of accidents: residential areas, organizations and school were ranked from first to third respectively.

So, this study is the first of its kind and needs to be done in further in a more organized manner for Addis Ababa but also for other cities in the country.

Multiple interventions which include road safety laws, enforcement of speed limits, legislation and enforcement of drink-driving laws, proper and adequate training of drivers and public education need to be in place to respond to this high morbidity and mortality associated with road traffic accidents.

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## 10. ANNEX INFORMATION SHEET

Annex-two: checklist Sub-city: \_\_\_\_\_ Year \_\_\_\_\_

Section1. Questions related to Socio demographic and other variables related to child pedestrian/passenger

S.no	Question/variable	Response	Remark
1	Age	1.4-6 years 2.7-10 years 3.11-14 years	
2	Sex	1.Male 2.Female	
3	Health condition	1.healthy 2.Blind or partially Blind 3.Deaf or partially deaf 4.Physical disability 5.Others	
4	Occupation	1.student 2.Street 3.vendor daily laborer 4.servant 5.shoeshine 6.toddled(woyala)	
5	Movement of child during the accident	1 While crossing zebra 2.walking directly 3. While crossing from right to the left. 4 while crossing from left to the right. 5. hanging /gripping a	

		car
		6.while playing
6	Road user	1.Vehicle Passenger 2. Pedestrian 3.Motorcycle Passenger 4. Bicyclist 5.Bicycle passenger 6.Others> _____
7	Time of the accident	_____
8	Day of the accident	1.Monday 2.Tuesday 3.Wendsday 4.Thursday 5.Friday 6.Saterdag 7.Sunday

Section2. Questions related to the driver, Socio demographic and other variables

S.no	Question/variable	Response	Remark
9	Age	1.<18 yrs. old 2.18-30 yrs. old 3.31-50 yrs. old 4.> 50 yrs. old 5.unknown	
10	Sex	1.male 2.female 3.Unkown	
11	Educational background	1. Illiterate 2. Religious education 3. Primary school 4. Secondary school	

		5. Higher education 6.greater than higher education 7.unknown
12	Driving experience	1.<1 year 2.1-2 year 3.2-5 year 4.5-10 year 5.> 10 year 6.unknown 7.noexpreince
13	Driver vehicle relationship	1.owner 2.hired 3.other 4.unknown
14	Movement of driver during the accident	1.straight moving 2unappropriate use of guide("meri")to the left 32unappropriate use of guide(meri)to the right 4.other (specify)

Section3. Questions related to Vehicle and direct and indirect factors related to the accident

S.no	Question/variable	Response	Remark
15	Vehicle type	1.buses 2.minibuses taxies 3.bajaj 4.cart 5.cobra 6.Automobile 7. Liquid cargo 8.toyota 9.other /specify 10 track 11.motor bike	and
16	Vehicle years of Service	1. $\leq$ 1 year 2.1-2 year 3.2-5 year 4.5-10 year 5.> 10 year 6.unknown	
17	Road condition	1.asphalt 2.gravel /pista	
18	Location	1.organization 2.residence 3.market 4.entertainment 5.shcool 6.faith organization	

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Causes of injury

- 1.careless driving
- 2.overspeeding
- 3.fail to give priority
- 4.vehicle defect
- 5.road defect
- 6.pedestrian error
- 7.following too closely
- 8.other(specify)

Section5. questions related to outcome of accident

20

Result of injury

1. Death
2. Sever injury
3. Slight injury

Annex: two checklists in Amharic

ክፍል 1. ስለህፃኑ ማህበራዊ ሁኔታ የሚመለከቱ ጥያቄዎች

ተ.ቁ	ጥያቄ	መልስ	ማብራርያ
1	እድሜ		
2	ፆታ	1. ወንድ 2. ሴት	
3	የህፃኑ የጤና ሁኔታ	1. ጤናኛ 2. አይነስወር/ከፊል አይነስወርነት 3. መስማት የተሳነወ/በከፊል መስማት የተሳነወ 4. አካል ጉዳተኛ 5. ሌላ (ይገልፅ)	
4	ሥራ	1. ተማሪ 2. ጎደና 3. የ ቀን ስራተኛ 4. የቤት ስራተኛ 5. ሊስትሮ 6. የመኪና ረዳት	
5	በአደጋ ጊዜ የህፃኑ እንቅስቃሴ	1. ዜብራሲያ ቋርጥ 2. በመንገድ ዳርሲ ሄደ/ቀጥታ ዚንዝ 3. ከቀኝ ወደ ግራሲ ቃርጥ 4. ከግራ ወደ ቀኝ ሲቃርጥ 5. ሌላ	
6	መንገድ ተጠቃሚ	1. የመኪና ተሳፋሪ 2. እግረኛ 3. ሞተር ሳይክል ተሳፋሪ 4. በሳይክል ሲጓዥ 5. የሳይክል ተሳፋሪ 6. ሌላ _____	
7	አደጋው የደረሰበት ሰዓት	_____	
8	አደጋው የደረሰበት ቀን	1. ሰኞ 2. ማክሰኞ 3. እርብ 4. ሀሙስ 5. አርብ 6. ቅዳሜ 7. እሁድ	

**ክፍል 2. ስለ አሽከርካሪ ማህበራዊ ሁኔታ የሚመለከቱ ጥያቄዎች**

ተ.ቁ	ጥያቄ	መልስ	ማብራርያ
9	እድሜ	1. ከ18 አመት በታች 2. ከ18-30 አመት 3. ከ31-50 አመት 4. ከ 50 አመት በላይ 5. ያልታወቀ	
10	ፆታ	1. ወንድ 2. ሴት 3. ያልታወቀ	
11	የትምህርት ደረጃ	1. ያልተማረ 2. የሀይማኖት ትምህርት 3. አንደኛ ደረጃ ት/ቤት 4. ሁለተኛ ደረጃ ት/ቤት 5. ከፍተኛ ትምህርት 6. ከከፍተኛ ትምህርት በላይ 7. ሌላ (ይገለፅ)	
12	የማሽከርከር ልምድ	1. ከ1 አመት በታች 2. ከ1-2 አመት 3. ከ2-5 አመት 4. ከ5-10 አመት 5. ከ 10 አመት በላይ 6. ያልታወቀ	
13	የአሽከርካሪና ተሽከርካሪ ግንኙነት	1. የተሽከርካሪ ባለቤት 2. ተቀጣሪ	

		3.ሌላ (ይገለፅ)
		4.ያልታወቀ
14	በአደጋ የአሽከርካሪው እንቅስቃሴ	1.ቀጥታ ሲጓዝ 2.መሪ ያለአግባብ ወደ ቀኝ ሲጠመዝዝ 3.መሪ ያለአግባብ ወደ ግራ ሲጠመዝዝ 4.ሌላ (ይገለፅ)

**ክፍል 3. ስለተሸከርካሪና ስለአደጋው ቀጥተኛና ቀጥተኛ ያለ ሆነ ግንኙኝነት ያላቸው ጥያቄዎች**

ተ.ቁ	ጥያቄ	መልስ	ማብራርያ
15	የተሸከርካሪ አይነት	1.ባስ 2.ሚኒባስና ታክሲ 3.ካርጎ 4.ተሳቢ 5.ኮብራ 6.አውቶሞቢል 7.ቦቲ 8.ቶቶታ	
16	የተሸከርካሪ የአገልግሎት ዘመን	1.ከ 1 አመት በታች 2.ከ1-2 አመት 3.ከ2-5 አመት 4.ከ5-10 አመት 5.ከ 10 አመት በላይ 6. ያልታወቀ	
17	የመንገድ ንጣፍ	1.አስፋልት 2.ከረኮንች	

- |    |                 |   |
|----|-----------------|---|
| 18 | አደጋው የተከሰተበት ቦታ | <ul style="list-style-type: none"> <li>1. በድርጅት</li> <li>2. በመኖር ያለ አካባቢ</li> <li>3. በገበያ</li> <li>4. በመዝናኛ ቦታ</li> <li>5. በት/ቤት</li> <li>6. ሌላ (ይገለፅ)</li> </ul>   |
| 19 | የአደጋው ምክንያት     | <ul style="list-style-type: none"> <li>1. በቸልተኝነት</li> <li>2. ከተወሰነ ፍጥነት በላይ በመንዳት</li> <li>3. ለእግረኛ ቅድሚያ ባለመስጠት</li> <li>4. የመኪና ብልሽት</li> <li>5. የመንገድ ብልሽት</li> <li>6. የእግረኛ ችግር</li> <li>7. ርቀት ጠብቆ ባለመከተል</li> <li>8. ያልታወቀ</li> </ul> |

ክፍል: 4 የአደጋው ውጤት

ተ.ቁ	ጥያቄ	መልስ	ማብራርያ
20	የአደጋው ውጤት	<ul style="list-style-type: none"> <li>1 ሞት</li> <li>2. ከባድ አደጋ</li> <li>3. ቀላል ጉዳት</li> </ul>	

## DECLARATION

I, the undersigned, declare that this thesis is my original work, has not been presented for a degree in this or another university and that all sources of materials used for this thesis have been duly acknowledged.

Name: - Almaz Berhe (B.Sc.)

Signature \_\_\_\_\_

Place: Addis Ababa University, Ethiopia

Date of submission: 23/6/2014

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

Name: Dr Amsale Cherie (PHD)

Signature \_\_\_\_\_

Date \_\_\_\_\_