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Traffic Accident Due to Minibus Taxies in Addis Ababa: Significant Causes and Possible Countermeasures

Ehitayhu Mesele Hagos

Thesis presented in fulfillment of the requirements for the degree of Master of Transportation Sciences, specialization
Traffic Safety

SUPERVISOR :

Prof. dr. Tom BRIJS

CO-SUPERVISOR :

Prof. dr. Yongjun SHEN

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PREFACE

I thank the Almighty God for granting me the strength and good health during the period preparation of this thesis. I would like to acknowledge my Supervisor, Prof. Dr. Tom Brijs for his dedicated support and guidance at the most opportune occasions throughout the process. I also acknowledge the support I received from Prof. Dr. Yongjun Shen and Dr. Bikila Tekelu for their support as an advisor. I also want to thank Addis Ababa Road Traffic Management Agency (AARTMA) for providing important information relevant to my research. Finally, I acknowledge my family, friends, and colleagues who offered me a great support system and encouragement to make sure that I finished my research on time.

ABSTRACT

Traffic fatality and injuries due to traffic accident have been a big challenge around the globe, especially in developing countries. This study attempted to explore the significant causes of a traffic accident that occurs by minibus taxis in Addis Ababa, the capital city of Ethiopia. Considering the fact that minibus taxis high involvement in a traffic accident than private vehicles, this study tried to compare the driver's aberrant behaviour. In this study, Manchester DBQ with 19 items that include error, ordinary and aggressive violations was used. The questioner was distributed to 100 drivers, for 50 minibus taxi and for 50 private vehicle drivers.

In addition, in order to determine speeding and acceleration/deceleration activity, smartphone application called Road Skipper was used. 12 drivers were invited to participate in this activity as well. Furthermore, in order to have basic information regarding the role of mechanical dynamics of the vehicle such as steer conversion and lack of mandatory maintenance on a traffic accident, the current study tried to address this issue using questioner. Questioners were given to senior mechanics in Addis Ababa. Following that, for analyzing the data, descriptive calculation, independent t-test, and one-way ANOVA were performed. The results showed that minibus drivers scored higher on all DBQ items than Private vehicle drivers. However, no differences between different driving experience on the DBQ item scores were found. In addition, there was only a very small difference in speeding, acceleration, and deceleration average scores among private vehicle and minibus drivers. Moreover, results from mechanic questioner showed that lack of mandatory maintenance also identified as main causes for a traffic accident. Even though steer conversion was not rated as a significant reason as lack of maintenance, the result showed that steer conversion also plays an important rule for causing a traffic accident in Addis Ababa.

Keywords: Traffic accident, Addis Ababa, Causes, Minibus taxi drivers, Private vehicle drivers, Speeding

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1. INTRODUCTION

The epidemic of deaths and injuries due to a road traffic accident is a global public health problem. World health organization recent reports show that more than 1.2 million people lose their lives in road crash each year and 50 million peoples suffer from an injury because of road crash(Organization, 2015). Low and middle-income countries take the major share of death due to a road traffic crash. In addition, low and middle-income countries lose approximately 3% of their GDP because of road crash every year (Organization, 2015). Ethiopia considered as one of the developing countries in Africa and the country records a high rate of road traffic crash every year.

Ethiopia located in Eastern Africa and share a border with Kenya to the south, Eritrea to the north, Sudan and South Sudan to the west, Somalia to the east, Djibouti to the northeast. It is a landlocked country with a population of 105 million (World Bank, 2016). The national population growth rate is approximately 2.5%, and the urban population has increased from 15.6% in 2005 of the national population to 19.4% in 2015 and it is forecast to reach 24.1% in 2025(Collins, 2013). The total area of the country is 1,104,300 sq. km(Ethiopian, 2006). Agriculture is the backbone of the country's economy by containing 85% of employment and covering 45% of the gross domestic product of the country (Ethiopian, 2006). Ethiopia is a developing country with a low level of income with a very high rate of population growth. Most of the population lives in the rural area and the country has a low level of urbanization. Following that, the development of the country in terms of economy is very low as well. It is because of different reasons such as low investment in important sectors. Those important sectors include investment in the transportation sector. It is known that transport plays a significant role in facilitating different economic activities in national economic growth(Banister & Berechman, 2001). However, transport is still at a very early stage in Ethiopia. Unlike motorized transport mode, Non-motorized transport modes such as walking, and animal transport is very widely used in the country.

The amount of vehicle in Ethiopia is very low compared to other developed countries. However, the country records a very high number of traffic fatalities. In fact, there were 2581, and 3362 recorded road fatalities in Ethiopia during 2010, and 2013 respectively which shows an increase of 30% (Addis Ababa city Road Safety Strategy, 2017). Road safety has not been taking as a major social issue for a very long period in the past. Now a day's the government consider this public issue and it is been a while since road safety included on government annual plan. Following that government forms responsible bodies for road safety such as the National Road Safety Council and Road Safety Committees in regional administration, Traffic Planning Management Organization and Traffic Management Agency in the capital city. Furthermore, the government enhances opportunities for international and national stakeholders to work in road safety issue to reduce the road traffic crash. Though road safety is still a burning issue and it is in the infant stage in Ethiopia.

1.1 Addis Ababa

1.1.1 Location and Size

Addis Ababa is located at 9°1'29.89"N and 38°44'48.8"E. It has an annual average temperature of 16°C and rainfall of above 1000 mm. Average temperature and rainfall don't have much difference in Addis Ababa. The city is found near the centre of the country and serves as the capital city of Ethiopia. It has five gates that connect the city to the rest of the country, these include Entoto gate, Lambert gate, Kliti gate, Ambo gate, and Jimma gate. The altitude in Entoto is 2900 meters and 2300 meters in St. Joseph area above sea mean level. Due to this altitude variation, Addis Ababa happens to be the fourth highest capital city in the world (Tafesse, 1986). According to CSA 1999 as cited by (Bitew, 2002), 56% of the city is an urban area that has 98.7% of the city residents and remaining 44% of the city is a rural area that contains 1.3% of the city residents.

1.1.2 Topography

Addis Ababa has slopy terrain type and is exposed to flooding, besides it has a number of rivers and streams that pass through the city starting from north to the south (Bitew, 2002). These rivers and streams in the city affect the development of the transport infrastructure because it requires big investment while the available resource or budget is limited. Furthermore, these terrain types are also not comfortable to drive on, especially for old cars that are forced to drive up and down (Bitew, 2002).

1.1.3 Population Growth

As shown in figure 1 below, the population of the city as well as the registered vehicles increased by 7.1% and 119% respectively from 2014 to 2017 (Addis Ababa Annual Road Safety Report, 2016/7). Women account for 54% of the population of the city. The population has also a rapid growth trend, it had 2.4% annual growth rate.

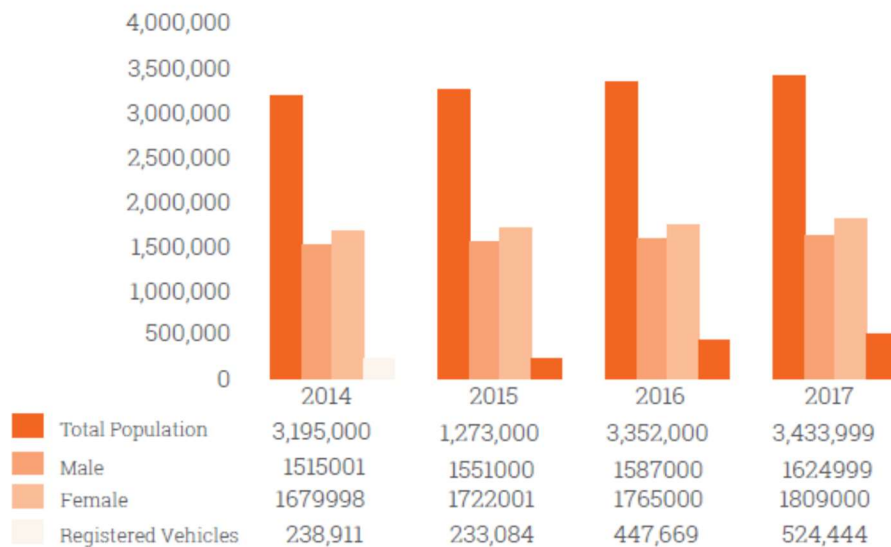


FIGURE 1 Growth trends in Addis Ababa population and registered vehicle (Addis Ababa Annual Road Safety Report, 2016/7)

1.1.4 Traffic Situation in Addis Ababa

Most of the accident occurs in the capital city, Addis Ababa. Addis Ababa is a political center where the Federal Government and Oromia Regional State Government are located. It is the largest city in Ethiopia with an estimated population of 3.4 million and 524,444 registered vehicles (Central statistics agency of Ethiopia, 2016). The city covers 540 square kilometres and it is divided into 10 sub-cities. Besides, it is also the center where the international organizations such as the United Nations Economic Commission for Africa (UNECA) and African Union (AU), and diplomatic Organizations are located (Addis Ababa Annual Road Safety Report,2016/7). Being the capital city of the country, it has a significant role in economic, social, political and administrative perspectives. Addis Ababa is the economic centre of Ethiopia where most financial and commercial institutions are located. The city is growing and getting wider and wider in very rapid phase every year.

The city has the appearance of a radial road system. It evolved focusing around the city centre that consists of five main arterial roads which able to connect and access new expansion at a national or regional level. In order to reduce travel distance, time and energy, Addis Ababa's transport office have been taking different measures like combining these radial routes with a set of ring roads and moreover, it also used to discourage long distance trip through the city centre. Currently, the city has 395.27 km is asphalt road and 934.34 km non-asphalt road with road gross density of 1.45% that includes asphalt and non-asphalt roads adequate to support the smooth running and development of the social and economic integration of the city (Addis Ababa city Transport Authority,2016). The modes of an urban transport system in the city, are categorized in to motorized and non- motorized traffic. Hence the motorized mode of transport includes public bus; minibus; taxis and non-motorized transport such as walking. 30% of the urban mobility covers by taxis, city buses and private cars. More specifically, they cover 72%, 26% and 4% of the urban mobility respectively(Fanueal, 2006). While 70% of urban mobility is covered by foot. Most of road safety problems and traffic congestion seen in Addis Ababa could be a result of weak enforcement capability, inefficient use of road networks, dangerous driving behaviour or poor design of the road(Fanueal, 2006).

1.2 Problem Statement

Even though road transport has a significant role in developing the economy and connecting society, it also generates social and economic external costs(Shefer & Rietveld, 1997). These external costs of transport include air pollution, road traffic crash, noise, traffic congestion, occupying public space and the like (Rallis, 1977). Accordingly, the epidemic of deaths and injuries due to a road traffic accident which is a result of transportation is a global public health problem. Due to the increase of motor vehicles worldwide, in parallel, the travel miles also increase. These leads to rising the exposure of people to a traffic accident as well. In fact, World Health Organization recent reports show that more than 1.2 million people lose their lives in road crash each year and 50 million peoples suffer from an injury because of road crash(Organization, 2015). Low and middle-income countries take the major share of death due to a road traffic crash. Developing countries, for instance, African countries are showing growth in the economy and change the lifestyle of the inhabitants. This brings a need for a corresponding infrastructure and service that enable the inhabitant to meet the lifestyle they are looking for. The infrastructure such as road network is one of the components that used to fulfil the public needs. However, in Africa, mostly the government failed to cope up with the public need and failed to provide this necessary infrastructure and services. Accordingly, African capital cities possess rapid traffic accident crises because of insufficient road networks, rare road construction, lack of road maintenance on time, rapid traffic growth, insufficient parking lots, and unorganized traffic management(Belachew, 1997).

Even though low and middle-income countries account for 54% of worlds registered vehicle, 90% of road traffic deaths occur in those countries which is a disproportionate number of deaths relative to their level of motorization (Organization, 2015). Most of the road accidents lead to fatalities or serious disabilities which abolish many families. Besides, family members are exposed to poverty due to the loss of their usual breadwinner through traffic fatalities or the high costs incurred in medical costs (Organization, 2015). In fact, due to under-reporting limitation, the true figure of the problem is not addressed. In fact, it is even bigger, usually, the police road traffic fatality report represents only the top of the pyramid. Overall, according to world health organization (2015) report, Low and middle-income countries lose approximately 3% of their GDP because of road crash every year (Organization, 2015). Ethiopia label as a developing country with very high road traffic accident figure. Addis Ababa, the capital city of Ethiopia, lost around 470 peoples annually with 2085 peoples being injured with high severity, and a further 23,510 faced property damages due to traffic accidents (Addis Ababa annual road safety report, 2016/7). However, the number of people who dies on Ethiopian roads kept increasing. The report from WHO (2013) reveals that in Ethiopia 3362 people lose their life because of a road traffic accident (Violence, Prevention, & Organization, 2013). By considering under-reporting limitation the actual number injured in road traffic accidents can be expected to be at least twice as larger (Bitew, 2002).

In Ethiopia, there are a few big cities and many small city centres while urban areas are exposed to these negative consequences of road transport due to high spatial densities and availability of infrastructures that enable to realize road transport. In addition because of the concentration of administration, economic activities, high density of population and vehicles in these few big cities, the proportion of accident occurring in these areas is very significant (Addis, 2003). Accordingly, 42% of all the injuries caused by road traffic accidents occur in the cities, and over 90% of all injury accidents occurred in Addis Ababa (Bitew, 2002). Addis Ababa as a capital city of Ethiopia, host several international and national organization. Consequently, it is experiencing rapid growth of population and motorization. In Addis Ababa, road traffic fatalities have been increasing as an inhabitant and the number of vehicles has increased. The number of road fatalities in the city increased from 443 in 2015 to 477 in 2017 and registered vehicles also have increased 120% in the past four years (Addis Ababa Annual Road Safety Report, 2016/7).

There is a very low rate of private motor vehicle ownership in the city which means that the involvement of motor vehicles in fatal crashes is dominated by commercial motor vehicles. Most of them owned and operated in order to sell goods or to give passenger transport services, such as minibus taxis or construction haulage. Different national report estimated the proportion of fatalities that involve commercial motor vehicles for the years 2004/05, 2007/08 and 2009/10. These estimates reported that taxis, mini-bus taxis, buses and trucks were involved in 73%, 75% and 85% of fatal crashes respectively (Addis Ababa Road Safety Strategy, 2016/7).

In order to challenge the road traffic crash in Addis Ababa, it is necessary to study and identify the magnitude causes of the road traffic crash. Based on the identified causes, constructing a suitable solution has long been recognized by many countries which have more safe transport system (Rolison, Regev, Moutari, & Feeney, 2018). In Addis Ababa, traffic accident data clearly shows that mostly minibus taxis involve in road traffic crash compared to other groups of vehicles. However, there is a gap in the literature particularly in the issue of about why the minibus taxis score high road traffic crash more than the other type of vehicles such as private vehicles in the city. This study discussed the significant causes of road traffic crash due to minibus taxis and possible interventions, particularly in Addis Ababa city.

1.3 Objective

1.3.1 General Objective

The general objective of the study was to explore major causes of road accident due to minibus taxies in Addis Ababa and to forward possible suggestion and recommendation to alleviate the problem.

1.3.2 Specific Objects

The study has the following specific objectives:

1. To identify significant causes of why the minibus taxies highly involve in traffic accident compare to other vehicles particularly private vehicles.
2. To identify if there was a significant relationship between the technical issue of the vehicle and the traffic accident.
3. To suggest measures for keeping the safety of minibus taxies users and road users in general
4. To suggest various countermeasures

1.4 Research Questions

The main premise of this research was to identify major causes of minibus taxies crashes and their potential countermeasures that can be identified to mitigate minibus taxies crashes in Addis Ababa. This study tried to address the issue with the following research questions that promise to provide a better insight into ways of reducing minibus taxies crashes in the city. The main question formulated for this research was:

What are the significant causes of minibus taxies for high engagement with a road crash in Addis Ababa city?

More specifically the following sub research questions need to be addressed, namely: -

1. What are significant causes that lead minibus taxies to the traffic accident?
2. Can differences in driving behaviour between minibus taxi and private vehicle drivers explain the difference in crash involvement?
3. Did these minibus taxies have a technical issue which leads them to a traffic accident?
4. What could be the possible interventions to meet the desired safety on using minibus taxies in Addis Ababa?

2. METHODOLOGY

2.1 Participant

100 drivers participated on DBQ questioner Fifty of them were minibus taxi drivers and the remaining fifty drivers were private vehicle drivers. The participants founded through Ethiopian Road Safety Association. In addition, 6 private and 6 taxi drivers participated in Road Skipper test. Besides, five mechanics also participated in the study. All participants received a request letter for willingness to participate in this study.

2.2 Design

A comparative cross-sectional study was implemented to assess the magnitude cause of traffic accident among minibus taxies and private vehicles in Addis Ababa. Accordingly, self-report questioner implemented to collect necessary data regarding minibus taxi and private vehicle drivers driving behaviour. Furthermore, information related to the mechanical problem of the minibus taxies and private vehicles were collected from senior mechanics in Addis Ababa using self-report questioner method. In addition, smartphone application called Road Skippers was used to assess information regarding speeding, accelerating and deceleration rate per trip among minibus taxi and private vehicle drivers.

2.3 Procedure

Participants were selected from the Ethiopian Road Safety Association. Selected samples registered in Ethiopian Road Safety Association under Megenagna, Legahar and Kaliti district. 60 private vehicle and 60 taxi drivers were contacted and told about the research. Road skipper smartphone application and DBQ items were explained and asked their willingness to participate in the research. They agreed to participate and were provided a copy of questioner with the cover letter explaining the study. Consequently, 12 of them (six private and six minibus taxi drivers) were asked to install road skipper application in their phone and start recording their trip. The participants answered the questioner anonymously. The questioners were each given a code in order to differentiate the taxi and private vehicle drivers.

In addition, seven known garages working in Addis Ababa were contacted by the researcher and informed about the research and asked their willingness to participate in this study. Five garages agreed to participate and were provided copies of the questioner with the cover letter explaining the research. The garages then distributed the questioner to the mechanics who work for them. After three days the garages collected the filled-out questioner and return it to the researcher.

2.4 Materials

2.4.1 Manchester Driver Behaviour Questioner

In this study Manchester driver behaviour questioner (DBQ) was used. Manchester driver behaviour questioner is one of the most widely used tools to evaluate self-reported aberrant driving behaviours (Lajunen & Summala, 2003). It was developed by Reason, Manstead, Stradling, Baxter, and Campbell in the United Kingdom in 1990(Reason, Manstead, Stradling, Baxter, & Campbell, 1990). The Manchester DBQ is an assessment tool designed to identify aberrant driving behaviour to investigate drivers' behaviours and related factors with traffic crashes (Wishart, Freeman, & Davey, 2006). The original model has been adapted and modified, it consists of two behaviour components called errors and violations(Reason, 1990). The modified version includes slip and laps with ordinary and deliberate violation identified as highway code violations and interpersonal aggressive violations respectively (Lajunen & Summala, 2003).

This tool has been implemented and validated in different countries such as China(Li, van Zuylen, & van der Horst, 2014; Xie & Parker, 2002), Australia (Dobson, Brown, Ball, Powers, & McFadden, 1999), Britain (Parker, McDonald, Rabbitt, & Sutcliffe, 2000),New Zealand (Sullman, Meadows, & Pajo, 2002) , Iran and Turkey (Şimşekoğlu et al., 2013) , Norway(Iversen & Rundmo, 2012) and Czech (Sucha, Sramkova, & Risser, 2014).

In this study. the modified Manchester driver questioner that consists of 19 items, which was developed by (Özkan, Lajunen, Chliaoutakis, Parker, & Summala, 2006) was used. According to(Parker et al., 2000) as cited by (Özkan et al., 2006) laps and slip doesn't have an influence on driving safety, hence these two variables, has been eliminated from the questioner. In addition, according to (Lajunen & Summala, 2003), as cited by (Özkan et al., 2006) due to socially desirable responds, the aggressive violation which is *driving when you suspect you might be over the legal blood alcohol limit* has been eliminated from the questioner in order to avoid biased response.

The first part of the questioner contained demographic questions. In this section, the respondents were asked about their age, sex, involvement in a traffic accident for the past three years and driving experience period. Following that DBQ with 19 item questions were asked. Hence, the second part contained three items on aggressive violations, eight items on ordinary violations and eight items on error. The drivers were asked to fill out the questioner in a six-point Likert scale which is from 0 meaning never to 5 meaning always. The questioner was translated to the local language, Amharic in order to avoid the language barrier and to make sure that the participant understood the questions clearly. The translation primarily aimed at maintaining the conceptual equivalent of sentences or words with the original DBQ in the English language. In order to check if there was jargon or terminology difference while translating, the Amharic version of the DBQ questioner was translated back to English by bilingual professionals.

2.4.2 Questioner for Mechanics

This questioner aimed to address the technical issues that could cause a traffic accident. In Addis Ababa, there are different kinds of cars that are imported from various counties around the world. Accordingly, the vehicles with the right-hand steering could be imported and converted to left side steering in the garage to follow the country traffic system. Such steering conversation requires a high level of expertise in the field especially on modifying the internal features like breaking system, steering system and car engine(Dahl, 1960). In addition, other components like the airbag and the gear selector need a professional assessment. If not, it could cause a road traffic crash(Dahl, 1960). The questioner was filled out by selected senior mechanics, in order to identify technical issues that play a role in aligning traffic accident.

In this study, the questioner was adapted from Africa Insurance Private Limited Company crash event format. This format used to record the vehicle crash events that includes demographic information, vehicle states and damage extent of the vehicle. It has also a section which records the perceived cause of the crash.

The adapted questioner used in this study started with demographic questions about sex and age, followed by work experience on maintenance of crushed minibus taxi due to a traffic accident. In the next section, they were asked to rate the defect vehicles that visited a garage for the past three years technical causes for traffic accident such as steer conversion and lack of maintenance on a 5-point Likert scale. The last part of the questioner asked the respondents, to state other technical causes and their technical suggestion to prevent minibus taxis crash due to technical problems.

2.4.3 Road Skippers

In most cases, studies related to traffic safety has been made based on secondary data's such as police report or past crash history that used to identify the dangerous location and significant factors that contribute to traffic crash events. However, such data can be analysed in aggregate level only, since the data doesn't contain individual personal driving information that enables to do microscopic safety analysis(Hu, Chiu, Ma, & Zhu, 2015). Recently, GPS devices, automatic recording systems, smartphone application has been used for traffic safety-related studies. For instance, DMR and ADR automatic recording system was used in Tokyo to record vehicle dynamic data while driving such as hard braking, rapid acceleration, pre and post-accident data and the like (Ueyama, Ogawa, Chikasue, & Muramatu, 1998). A study in Sydney also use GPS data observation to measure driving behaviour of the participant drivers and the behavioural measure includes maximum, minimum, average and standard differentiation of speed, the frequency of acceleration and deceleration while driving(Ellison, Greaves, & Daniels, 2012). There are also various studies that used smartphone applications to study driver behaviour. For example, the study in the USA used a smartphone application to identify risky behaviour of drivers(Hu et al., 2015).

Another example of using a smartphone application for road safety purpose could be the study in Virginia, these study attempts to show how the smartphone application used to detect traffic accident automatically and notify a central emergency dispatch after the occurrence of a traffic accident with photographs of the situation and the GPS location of the scene(White, Thompson, Turner, Dougherty, & Schmidt, 2011).

Using these applications or devices allows collecting data in the field while the vehicle is operating which is more reliable and fresher compared to secondary data. In addition, currently, since most drivers are the customer of a smartphone, it is easier to track and collect the required data for the given study.

In this study, smartphone application called Road Skippers was used to collect information regarding acceleration/deceleration and over speeding that committed by drivers. These data were collected for two weeks on 6 minibus taxi and 6 private vehicle drivers. The collected data enabled to assess which drivers engaged in over speeding, accelerating/decelerating while driving among minibus taxi and private vehicle drivers in Addis Ababa.

The participants meaning 6 minibus taxi and 6 private vehicle drivers were introduced to the application by the researcher and collected data while they drive. Particularly, the application was collecting data regarding deceleration /acceleration and over speeding while driving. The software collected the information and directly copied it to the main station. Finally. The researcher received the collected data from the main station and prepare the data for analysis and interpretation.

3. DATA ANALYSIS

Descriptive statistics methods like frequency, percentage calculation, was used to describe the demographic characteristics of the drivers. In addition, there was descriptive analysis for data that was collected from senior mechanics, regarding steer conversion and lack of maintenance.

Cronbach's alpha reliability coefficient was used for assessing the internal consistency of the DBQ scale scores. One-way ANOVA was conducted to identify if there is a significant difference between the minibus taxi drivers and private vehicle drivers on DBQ items. In addition, Independent t-test was performed to determine the differences on the DBQ mean score of the participants.

Speeding, acceleration and deceleration data that were collected using Road Skipper application and were analysed using an independent t-test analysing method. Comparison of speed, acceleration/deceleration per trip among minibus taxi and private vehicle drivers was performed. The comparison explained in terms of speeding, acceleration and deceleration score differences among taxi and private vehicle drivers.

4. RESULTS

4.1 Preliminary Data

Table 1 shows the demographic characteristics of drivers participate in the study. A total of 100 drivers, 50 minibus taxi drivers and 50 private vehicle drivers participated in the survey. The mean age of the study population was 29.31 with the range of 18-59. The largest proportion of the participants was males (87%) and female participants proportion was 13%. Participants were asked to indicate the crash involvement during the past three years. Accordingly, 34% of the participants reported having a traffic crash in the past three years. 20% of them were taxi drivers and the rest 14% were private vehicle drivers. Around 36% of the participants have one to four years, 35% of the participants have four to seven years and 29% of the participants have eight and more than eight years of driving experience. For minibus taxi drivers, the average driving hour per day was around 10 hours whereas for private vehicle drivers the average driving hour per day was around 4 hours. In general, 45% of population study reported that they drive one to four hours per day, 28 % of the participants drive five to nine hours per day and 27% of the participants drive ten and more than ten hours per day.

TABLE 1 Preliminary Data of Participants

<i>Variables</i>	<i>Frequency</i>	<i>Percentage</i>
Age group		
Less than 26 years	39	39%
27-30 years	34	34%
Above 31 years	27	27%
Gender		
Male	87	87%
Female	13	13%
Driver Type		
Mini bus taxi	50	50%
Private vehicle	50	50%
Education		
Basic	1	1%
Elementary	6	6%
Secondary	27	27%
Higher education	66	66%
Crash involvement		
Yes	34	34%
No	66	66%
Driving experience		
Less than 4 years	36	36%
4-7 years	35	35%
Above 8 years	29	29%
Driving hour per day		
Less than 4 hours	45	45%
4-9 hours	28	28%
Above 9 hours	27	27%

4.2 Reliability Coefficients

The internal consistency of the DBQ scale scores was examined by calculating Cronbach's alpha reliability coefficients, which are presented in Table 2. Table two presents Cronbach's alpha and number of items of the DBQ. The items have a Cronbach alpha scale greater than 0.7. In general, the examination results revealed that the DBQ items has good internal consistency.

TABLE 2 Reliability Coefficient

<i>DBQ Items</i>	<i>Cronbach's Alpha</i>	<i>No. of items</i>
Error	0.81	8
Ordinary Violation	0.82	8
Aggressive violations	0.82	3

4.3 Independent T-test Output

An independent t-test and one-way ANOVA were conducted to determine the differences in the DBQ mean score of the participants based on their socio-demographic factors. An independent sample t-test was conducted to compare the error, ordinary violation and aggressive violation with gender and driver type. Accordingly, there was a significant difference in DBQ error item scores for male ($M=1.52$, $SD=0.79$) and female drivers ($M=0.73$, $SD=0.43$; $t(26.1) = 5.33$, $p=0.01$). The magnitude of the differences in the mean was very large (eta squared=0.22). In addition, there was a significant difference in DBQ ordinary violation scores for male ($M=1.95$, $SD=0.84$) and female drivers ($M=0.93$, $SD=0.53$; $t(22.4) = 5.96$, $p=0.01$). The magnitude of the differences in the mean was very large (eta squared=0.27). Besides, there was significance difference in aggressive violation scores for males ($M=1.81$, $SD=1.06$) and females ($M=0.77$, $SD=0.75$; $t(19.99) = 4.38$, $p=0.01$) and the magnitude of the differences in the mean was very large (eta squared=0.16).

Similarly, an independent t-test was conducted to compare error, ordinary violation and aggressive violation with driver type. There was significance difference in DBQ error items score for taxi ($M=1.81$, $SD=0.79$) and private vehicle drivers ($M=1.02$, $SD=0.59$; $t(90.4) = 5.33$, $p=0.01$). The magnitude of the differences in the mean was very large (eta squared=0.25). Furthermore, there was also significant difference in ordinary violation for taxi drivers ($M=2.2$, $SD=0.90$) and private vehicle drivers ($M=0.145$, $SD=0.65$; $t(89.2) = 4.74$, $p=0.01$) with eta squared=0.19. There was also significance difference in aggressive violation scores for males ($M=1.90$, $SD=1.2$) and females ($M=1.39$, $SD=0.93$; $t(93) = 2.67$, $p=0.01$) with eta squared=0.07.

4.4 ANOVA Results

One-way ANOVA tests were conducted to determine the differences on the DBQ mean score of the participants based in their age, driving experience and driving hour per day groups.

4.4.1 Age groups

One way between groups analysis of variance was conducted to explore the impact of age on committing a driving error, as measured by DBQ driving error items. Subjects were divided into three groups according to their age (group 1: 26 years old or less; group 2: 27 to 30 years old; group 3: 31 and above years old). There was statistically no significant difference for the three age groups [$F(2,97) = 1.11, p = 0.33$]. The actual difference in mean scores between groups was quite small. The effect size, calculated using eta squared, was 0.02. In addition, a one-way ANOVA test was conducted to identify the impact of age on committing an ordinary violation, as measured by DBQ ordinary violation items. there was no significant difference for the three age groups [$F(2,97) = 2.44, p = 0.09$] with eta squared = 0.05. Consequently, one-way ANOVA test was performed to identify age impact on committing aggressive violation as measured by DBQ aggressive violation items. And there was no significant difference for the three age groups [$F(2,97) = 2.6, p = 0.08$] with eta squared of 0.05.

4.4.2 Driving experience

A one way between groups analysis of variance was conducted to identify the impact of driving experience on committing a driving error, as measured by DBQ driving error items. Samples were divided into three groups according to their driving experience (group 1: 4 or less years; group 2: 4 to 7 years; group 3: 8 and above years). There was no significant difference between the three driving experience groups [$F(2,97) = 0.41, p = 0.67$]. The effect size, calculated using eta squared, was 0.01. One-way ANOVA test was also performed to identify the influence of driving experience on committing an ordinary violation, as measured by DBQ ordinary violation items and there was no significant difference for the three driving experience groups [$F(2,97) = 1.77, p = 0.18$] with eta squared = 0.04. Similarly, one-way ANOVA test was conducted to explore the influence of driving experience on committing aggressive violation there was no statistically significant difference for the three driving experience groups [$F(2,97) = 3.62, p = 0.03$] with eta squared = 0.07.

4.4.3 Driving hour per day

A one way between groups analysis of variance was conducted to explore that impact of driving hours per a day on committing a driving error, ordinary violation and aggressive violation. Samples were divided into three groups according to their driving hours per day (group 1: 4 or less driving hours per day; group 2: 4 to 9 driving hours per day; group 3: 9 and above driving hours per day). With respect to error items, there was a statistically significant difference for the three-driving hour per day groups [$F(2,97) = 12.91, p = 0.01$] with eta squared = 0.21. Besides with respect to the ordinary violation, there was statistically significant difference for the three driving hour groups [$F(2,97) = 12.99, p = 0.01$] with eta squared = 0.21. Finally, with respect to the aggressive violation, there was statistically significant difference for the three driving hours per day groups [$F(2,97) = 4.49, p = 0.01$] with eta squared value of 0.08.

4.4.4 Road skippers' application results

Speeding, acceleration and deceleration rate per trip collected using road skipper's smartphone application. Table 1 present average acceleration, deceleration and speeding within average trip among taxi and private vehicle drivers.

TABLE 3 Road Skipper Results

<i>Driver type</i>	<i>Average acceleration score</i>	<i>Average deceleration score</i>	<i>Average Speeding score</i>
Taxi driver	9.64	9.67	10
Private vehicle driver	8.95	9.14	10

The speeding, accelerating and decelerating scores were contextual to the road environment. The result with a value close to zero implies that the driver is highly engaged with harsh braking or speeding. In the other hand having a score close to 10 implies that the driver is not engaged with high acceleration, harsh deceleration and speeding activity.

An independent t-test was also conducted to determine speeding, acceleration and deceleration score difference among private vehicle and taxi drivers. Accordingly, there was no significant difference in speeding($p=0.3$), acceleration ($p=0.5$) and deceleration($p=0.3$) score among taxi and private vehicle drivers.

4.5 Result from Mechanics Questioner

A total of 5 mechanics participated in this study. All of them were males with the age of 20, 25, 32,37 and 47 years. They have 6 years work of experience on average. Participants were asked to rate a lack of maintenance and steer conversion as a cause of crashed vehicles for the past three years. They gave the rate based on the vehicles that visited their garage for the past three years. All the participant (100%) reported that lack of maintenance as the main cause of the crashed vehicles and 70% of participants rate that steer conversion as frequent causes of the vehicle crash that visited their garage. Furthermore, they were also asked to report if there are other frequent causes beyond lack of maintenance and steer conversion. Accordingly, they reported using very old vehicles, using spare parts from other vehicles with a different model, using very old spare parts especially the breaker and maintaining a vehicles unprofessionally as other main causes of vehicle crash. The mechanics also stated creating awareness about use of annual maintenance, using new spare parts or not using spare part from other model, always maintain the vehicle by professionals as a solution.

5. DISCUSSION

For the occurrence of a road traffic crash, human behaviour, infrastructure and vehicle capacity plays an important role.

This study aimed to identify the main causes of a traffic accident committed by minibus taxi drivers in Addis Ababa. Moreover, the study aimed to identify why minibus taxis involve in a road traffic crash in high rate compared to other vehicle groups. For that, the study tried to assess the differences between taxi drivers and private vehicle drivers in terms of driving behaviour and vehicle capacity and observe if the results explain engaging with a road traffic crash. The study neglect infrastructure impact because it is common for both minibus taxi and private vehicle drivers.

Drivers response to driving behaviour questioner showed a significant difference in driving behaviour among minibus taxi and private vehicle drivers. Accordingly, the result revealed that minibus taxi drivers are engaged with driving error, aggressive violation and ordinary violation than private vehicle drivers while driving. This finding is consistent with research conducted by (S. A. Newnam & Watson, 2009).

However, with respect to error, ordinary violation and aggressive violation; this study found no significant differences between drivers with different age groups. These could be because of the study samples had condensed age group. These findings were inconsistent with previous research on examining the driving behaviour across age and years of education in Addis Ababa (S. Newnam, Mamo, & Tulu, 2014). Besides, there was no significant difference in error and ordinary violation score across driving experience groups. Whereas with respect to the aggressive violation, there was a significant difference between driving experience groups.

Driving longer time per day especially without having a necessary break in between leads to fatigue. The finding showed that minibus taxi drivers drive more hours per day than private vehicle drivers because their job demands often involvement irregular hours of work (Brown, 1994). The minibus taxi drivers reported longer driving hour than private vehicle drivers per day. As a result, there was a significant difference among private vehicle and minibus taxi driver in committing an error, aggressive violation and ordinary violation. The result showed, minibus taxi drivers engaged with risky driving behaviour. These finding is consistent with the research of effects of excessive speeding and falling asleep while driving on crash injury severity in Ethiopia (Abegaz, Berhane, Worku, Assrat, & Assefa, 2014).

Although it is difficult to compare the difference of driving behaviour among female and male drivers because of the limited number of female drivers' sample, the results showed that female drivers have more safe driving behaviour than male drivers. Similar studies also identified that female drivers have more safe driving behaviour compared to male drivers (Hassen, Godesso, Abebe, & Girma, 2011).

The scores from road skipper's application showed that there was no significant difference in speeding, acceleration and deceleration score among private vehicle and taxi drivers.

The average score result showed that private drivers are engaged in speeding, acceleration and deceleration activity than minibus taxi drivers. These could be because of taxi drivers drive in assigned taxi lines that have congested traffic. However private vehicle drivers can use any lane they choose to drive on, as a result they could choose longer but less congested roads which encourage to speeding, acceleration or deceleration.

The finding from mechanics questioner showed that lack of maintenance and steer conversion are one of the main causes for occurrence of road traffic crash in Addis Ababa. This research showed the same finding with the research of the effect of used cars on African road traffic accidents (Akloweg, Hayshi, & Kato, 2011).

Furthermore, the mechanics added possible main cause for traffic crash in Addis Ababa including very old vehicles, using spare parts from other vehicles with a different model, using very old spare parts especially for the breakers and maintaining vehicles unprofessionally.

6. IMPLICATION

The findings from this research have practical applications for road traffic research in Ethiopia. The findings appear that driving behaviour among private vehicle and minibus taxi drivers explains the over presentation of taxies in a road crash. The current study was the first study to investigate driving behaviour using road skipper's smartphone application in Ethiopia. Accordingly, the study finds that acceleration, deceleration and speeding score per trip is almost similar among private vehicle drivers and taxi drivers. The study finding also revealed that lack of maintenance and steer conversion causes a traffic crash in Addis Ababa. Hence these finding contributes to give priorities for main risk factors and develop compatible countermeasures.

7. LIMITATIONS

This study is exposed to the weakness associated with measures of behaviour based on self-report questioners. One of the main weakness of self-report questioner is that the great possibility of influenced by social desire bias. However, Lajunen and Summala study revealed that bias due to social desire report on DBQ response is minimum (Lajunen & Summala, 2003). In addition, the DBQ was prepared in English first and translated to the local language, Amharic. Accordingly, some technical terms may not have been translated accurately and could bias the results. However, the translation made by bilingual professionals. Hence the bias from a translation was insignificant. The questioner for mechanics adopted from crash event format used by Africa Insurance private limited company. This questioner was used for this study for the first time and this should be taken into account while interpreting the findings.

Although a larger group of drivers were interested to participate in the study, the sample population size minimized due to the need of smartphone for Road skipper's application. It should also note that sometimes the Road Skipper's application was not recognizing the GPS location of the drivers, the phone could finish battery while recording and the speed limit used by the application was not similar with the actual speed limit for the road, rather the score was contextual to the road environment. By considering this, the software developer tried to update the application and enabled it to recognize the GPS location of the driver.

8. CONCLUSION AND RECOMMENDATION

The current research aimed to identify major causes of a road traffic crash in Addis Ababa, Ethiopia. Particularly, the study focused on exploring the major causes of a road traffic crash that occurs due to minibus taxis in Addis Ababa. The study finding showed that minibus drivers engaged with error, ordinary and aggressive volitions. As a result, engaging with risky driving behaviours could explain the significant number of minibus taxis crash involvement in Addis Ababa. Moreover, lack of maintenance, using very old minibus taxis and unprofessional garage service were other risk factors for minibus taxis in Addis Ababa. Besides, the study finding revealed, acceleration, deceleration and speeding were not significant risk factor for minibus drivers. The study used the road skipper application to collect speeding, acceleration and deceleration rate per trip and the application failed to provide score based on the accurate speed limit of the road. Therefore, these finding needs further investigation.

In order to create road safety awareness in the society, basic road safety education shall incorporate with the regular education program and it shall be given starting from kindergarten. Trainings and workshops related to the consequences of long driving hour without having a break in between shall be given to minibus drivers through minibus taxi association. Furthermore, the government can take European legislation about mandatory break time of drivers as an example strategy and shall develop a traffic law that force minibus taxi drivers to take a mandatory brake time within a maximum of five hours driving. In general road safety trainings shall be given to minibus taxi drivers through their association. In addition, basic vehicle maintenance skills shall incorporate with driver licence education. The government should also enforce vehicle standards related to steer regulations through annual vehicle inspection and the government shall develop a policy that encourages importing new cars and new spare parts instead of old cars and old spare parts. In order to get the desired outcome out of enforcing traffic law, the enforcement needs to be implemented with zero tolerance to ensure that offenders face consequences for their action.

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APPENDIX 1: MANCHESTER DBQ QUESTIONNAIRE IN ENGLISH

Hasselt University

School of Transportation Science

This questionnaire prepared to assess driving behaviour in Addis Ababa among taxi and private vehicle drivers.

Questionnaire identification number _____

Introduction and consent form

Hello, my name is Ehitayhu Mesele. I came from Hasselt university; school of transportation science and I would like to forward some questions to you related to driving behaviour. The questionnaire contains questions about different types of driving behaviour. It only takes about 10 minutes to complete the questionnaire. Thus, if you are willing to participate in the survey, you can take the questionnaire and complete the questions. Completed or returned surveys are highly confidential, and the questionnaires are used only for the purpose of this study.

Are you willing to participate in the study? _____

Part I: Demographic Information

1. Gender Male Female

2. Age: _____

3. What is your highest level of education?

- Basic (read and write only)
- Elementary school completed (1-8 grades)
- High school completed (9-12 grades)
- Higher education (degree or diploma holder)

4. Driving experience: _____

5. Involvement in traffic accident in the past three years

Yes No

6. Driving hours per day: _____

Part 2: Driving Behaviour

No	Items	Never	Hardly Ever	Occasionally	Quite Often	Frequently	Always
		0	1	2	3	4	5
1	Queuing to turn left onto a main road, you pay such close attention to the main stream of traffic that you nearly hit the car in front.						
2	Fail to notice that pedestrians are crossing when turning into a side street from a main road.						
3	Sound your horn to indicate your annoyance to another road user.						
4	Fail to your rear-view mirror before pulling out, changing lanes etc.						
5	Brake too quickly on a slippery road or steer the wrong way in a skid						
6	Pull out of a junction so far that the driver with right of way has to stop and let you out.						
7	Disregard the speed limit on a residential road.						
8	On turning left, nearly hit a cyclist who has come up on your inside.						
9	Miss "Give Way" signs, and narrowly avoid colliding with traffic having right of way.						
10	Attempt to overtake someone that you hadn't noticed to be signalling a right turn.						
11	Become angered by another driver and give chase with the intention of giving him/her a piece of your mind.						

12	Stay in a motorway lane that you know will be closed ahead until the last minute before forcing your way into the other lane.						
13	Overtake a slow driver on the inside.						
14	Race away from traffic lights with the intention of beating the driver next to you.						
15	Drive so close to the car in front that it would be difficult to stop in an emergency.						
16	Cross a junction knowing that the traffic lights have already turned against you						
17	Become angered by a certain type of driver and indicate your hostility by whatever means you can.						
18	Underestimate the speed on an oncoming vehicle when overtaking.						
19	Disregard the speed limit on a motorway.						

APPENDIX 2: MANCHESTER DBQ QUESTIONER IN AMHARIC

ሀሰልት ዩኒቨርሲቲ
የ ትራንስፖርት ሳይንስ ትምህርት ቤት
የ ትራፊክ ደህንነት ትምህርት ክፍል

ይህ መጠይቅ በ አዲስ አበባ ከተማ የሚገኙ የታክሲ እና የግል መኪና አሽከርካሪዎችን የአካዳሚ ባህሪ ለማጥናት የተዘጋጀ ነው።

የመለያ ቁጥር :.....

የተሳታፊዎችን ፈቃደኝነት መጠየቂያ ቅጽ

ጤና ይስጥልኝ ፤ እህትአየሁ መሰለ እባላለሁ። የመጣሁት ከሀሰልት ዩኒቨርሲቲ የትራንስፖርቱቸን ሳይንስ ትምህርት ቤት ነው። ከዚህ በታች ተሽከርካሪዎን በሚያሸከረክሩበት ወቅት የሚተገብሩትን የአካዳሚ ባህሪዎ ዙሪያ የተወሰኑ ጥያቄዎችን ልጠይቆት እወዳለሁ።
መጠይቁ የተለያዩ የአካዳሚ ባህሪዎን የሚዳሰሱ ጥያቄዎችን አካቶዋል። ይህንን መጠይቅ መልሶ ለመጨረስ ወደ 10 ደቂቃ ገደማ ብቻ ነው የሚፈጀው። በመሆኑም መጠይቁን ተመልክተው ለመሳተፍ ሙሉ ፍቃድዎ ከሆነ ብቻ መጠይቁን ወስደው ጥያቄዎቹን በመሙላት መሳተፍ ይችላሉ። የተሞሉ ወይም የተመለሱ መጠይቆች በከፍተኛ ደረጃ ሚስጥራዊነታቸው የተጠበቀ ከመሆኑም ባሻገር መጠይቆቹ የሚውሉት ለዚህ ጥናት አላማ ብቻ ነው።

በጥናቱ ላይ ለመሳተፍ ፍቃደኛ ኖት ?

ክፍል 1: መሰረታዊ መረጃ

1. ጾታ ወንድ ሴት

2. እድሜ : _____

3. ያጠናቀቁት የትምህርት ደረጃ?

መሰረተ ትምህርት (ማንበብ እና መጻፍ)

የመጀመሪያ ደረጃ (1-8 ክፍል) ያጠናቀቁ

ከፍተኛ ሁለተኛ ደረጃ (9-12 ክፍል) ያጠናቀቁ

ከፍተኛ ትምህርት (ዲፕሎማ፣ ዲግሪ ና ከዛ በላይ) ያላቸው

4. የ የአሽከርካሪነት ልምድ: _____

5. ባለፉት ሶስት ዓመታት አደጋ አጋጥመዎታል?

አዎን አይ

6. በቀን ለምን ያህል ሰዓት ያሽከረከራሉ?

.....

ክፍል 2: የአነጻጽ ባህሪን የሚዳስስ መጠይቅ

እባክዎ ከቀረቡት አማራጮች የኔን አመለካከት በሚገባ ይግለጻል ያሉት ቁጥር ግረጌ ስር ምልክት ያድርጉ።

ቁጥር	የጉዳዩ ዓይነት	በፍፁም	እምብዛም	አልፎ አልፎ	ዘወትር	በተደጋጋሚ	ያለማቋረጥ
		0	1	2	3	4	5
1	በግራ በኩል ታጥፈው ወደ ዋናው መንገድ ለመግባት ተሰልፈው፣ ከፊት ለፊትዎ ካለው መኪና ጋር ለመጋጨት እስኪያስችልዎ ድረስ በዋናው ትራፊክ ፍሰት ላይ ትኩረቶችን አድርገዋል።						
2	ከዋናው መንገድ ወደ መጋቢ መንገድ ሲታጠፉ፣ መንገድ ለሚያቋርጡት እግረኞች ትኩረት አለመስጠት						
3	የእርስዎን ንዴት ለሌሎች መንገድ ተጠቃሚዎች ለማመልከት ጥሩንባውን ይነፋሉ፡						
4	መስመሩን በመልቀቅ፣ ወዘተ ከመስመሩ ከመውጣቱ በፊት በኋላው ማያ መስታወት ሳይጠቀሙ ይቀራሉ						
5	በሚያንሸራተት መንገድ ላይ በፍጥነት ፍሬን ይይዛሉ ወይም በመንሸራተት በተሳሳተ መንገድ ይነጻሉ						
6	በስተቀኝ ያለው ሹፌር ቆሞ እስኪያሳልፍ ድረስ ከመስቀለኛ መንገድ ይወጣሉ						
7	በመኖሪያ መንገድ ውስጥ የአነጻጽ ፍጥነቱን አላከብሩም						

8	ወደ ግራ ሲታጠፉ፣ በስርዎ በኩል የገባውን ብስክሌት ነጂ ለጥቂት ሊመቱት ነበር						
9	ቅድሚያ ስጥ የሚለውን ምልክቶች በመሳት፣ቅድሚያ ከሚገባው መንገደኛ ጋር መጋጨትን ለጥቂት አስቀርተዋል።						
10	አንድ ግለሰብ ወደ ቀኝ ለመታጠፍ ያሳየውን ምልክት ባለማስተዋል ለመቅደም ሞክረዋል።						
11	በአንዱ ሹፌር ተናደው ይሄንኑ ንዴት ለመወጣት በሚል አላማ ሌላኛውን አሳደዋል።						
12	ወደ ሌላ አቅጣጫ በመቀየር ከመገደዶ በፊት እስከመጨረሻዎ ድቂቃ ወደ ፊት እንደሚዘጋ በሚያውቁት የመኪና መንገድ ላይ ቆይተዋል።						
13	በአስፋልት ውስጥ ቀስ ብሎ የሚነዳውን ሹፌር ቀድመዋል።						
14	ከአጠገቦም የሚገኘውን ሹፌር ለመቅደም የትራፊክ መብራት ጥሰው ሄደዋል።						
15	ድንገት ለማቆም አስቸጋሪ እስኪሆን ድረስ ከፊትዎ ካለው መኪና ጋር አስጠግተው ነድተዋል።						
16	የትራፊክ መብራቱ ሊያሳልፍዎ እንደማይችል እያወቁ መስቀለኛ መንገዱን አቋርጠዋል።						
17	በአንድ የተወሰነ ሹፌር የተነሳ ንዴት አጋጥመዎት በማንኛውም						

	በሚችሉት መንገድ ጥላቻዎን አሳይተዋል።						
18	አንድን መኪና በሚቀድሙበት ጊዜ ከፈትዎ የሚመጣውን መኪና ፍጥነት መጠን አሳንሰው ገምተዋል።						
19	በአስፋልት ላይ ሲያሽከረክሩ የፍጥነት መጠኑን አላከበሩም።						

APPENDIX 3: MECHANICS QUESTIONER IN ENGLISH

Hasselt University

School of Transportation Science

This questionnaire prepared to assess main technical failures of minibus taxis that causes road traffic crash in Addis Ababa.

Questionnaire identification number _____

Introduction and consent form

Hello, my name is Ehitayhu Mesele. I came from Hasselt university; school of transportation science and I would like to forward some questions to you related to road traffic crash causes. The questionnaire contains questions about different technical failure or status that could cause traffic accident. It only takes about 7 minutes to complete the questionnaire. Thus, if you are willing to participate in the survey, you can take the questionnaire and complete the questions. Completed or returned surveys are highly confidential, and the questionnaires are used only for the purpose of this study.

Are you willing to participate in the study? _____

1. Gender Male Female
2. Age: _____
3. What is your highest level of education?
- Basic (read and write only)
- Elementary school completed (1-8 grades)
- High school completed (9-12 grades)
- Higher education (degree or diploma holder)
4. Working experience on maintain or on giving service for crashed minibus taxis: _____
5. For minibus taxis that visited your garage in the past three years, steer conversion was the reason for the occurrence of traffic accident.
- Hardly Ever Occasionally
- Quite often Frequently Always
6. For minibus taxis that visited your garage in the past three years, lack of maintenance was the reason for the occurrence of traffic accident.
- Hardly Ever Occasionally
- Quite often Frequently Always
7. Beyond, lack of maintenance and steer conversion, if there are other technical issues that could cause traffic accident, please use the following blank space to list them.
-
8. According to you, what could be the solution or countermeasure for the specified causes?
-

APPENDIX 4: MECHANICS QUESTIONER IN AMHARIC

ሀሰልት ዩኒቨርሲቲ
የ ትራንስፖርት ሳይንስ ትምህርት ቤት
የ ትራፊክ ደህንነት ትምህርት ክፍል

ይህ መጠይቅ በ አዲስ አበባ ከተማ የሚገኙ የታክሲ ግጭቶችን መንስኤ ለማጥናት የተዘጋጀ ነው።

የመለያ ቁጥር :.....

የተሳታፊዎችን ፈቃደኝነት መጠየቂያ ቅጽ

ጤና ይስጥልኝ ፤ እህትአየሁ መሰለ እባላለሁ። የመጣሁት ከሀሰልት ዩኒቨርሲቲ የትራንስፖርት ሳይንስ ትምህርት ቤት ነው። ከዚህ በታች የትራፊክ አደጋ ዙሪያ የተወሰኑ ጥያቄዎችን ልጠይቆት እወዳለሁ።

መጠይቁ የተለያዩ የትራፊክ ግጭት መንስኤዎችን የሚዳስሱ ጥያቄዎችን አካቶዋል። ይህንን መጠይቅ መልሶ ለመጨረስ ወደ 7 ደቂቃ ገደማ ብቻ ነው የሚፈጀው። በመሆኑም መጠይቁን ተመልክተው ለመሳተፍ ሙሉ ፍቃድዎ ከሆነ ብቻ መጠይቁን ወስደው ጥያቄዎቹን በመሙላት መሳተፍ ይችላሉ። የተሞሉ ወይም የተመለሱ መጠይቆች በከፍተኛ ደረጃ ሚስጥራዊነታቸው የተጠበቀ ከመሆኑም ባሻገር መጠይቆቹ የሚውሉት ለዚህ ጥናት አላማ ብቻ ነው።

በጥናቱ ላይ ለመሳተፍ ፍቃደኛ ኖት ?

1. ጾታ ወንድ ሴት

2. እድሜ :-----

3. ያጠናቀቁት የትምህርት ደረጃ?

- መሰረተ ትምህርት (ማንበብ እና መጻፍ)
- የመጀመሪያ ደረጃ (1-8 ክፍል) ያጠናቀቁ
- ከፍተኛ ሁለተኛ ደረጃ (9-12 ክፍል) ያጠናቀቁ
- ከፍተኛ ትምህርት (ዲፕሎማ፣ ዲግሪ ና ከዛ በላይ) ያላቸው

4. ከትራፊክ አደጋ ጋር በተያያዘ ተበላሽተው ወይም በግጭት የተነሳ ጥገና ፈልገው የሚመጡ መኪኖችን ፣ በማስተናገድ ያሉት የመካኒክነት የስራ ልምድ:-----

5. ባለፉት ሶስት ዓመታት የትራፊክ አደጋ አጋጥሞአቸው፣ የጥገና አገልግሎት ፈልገው የመጡት ተሽከርካሪዎች የትራፊክ አደጋ መንስኤ፣ የመሪ መዛወር ነው።

- እምብዛም አልፎ አልፎ
- ዘወትር በተደጋጋሚ ያለማቋረጥ

6. ባለፉት ሶስት ዓመታት የትራፊክ አደጋ አጋጥሞአቸው፣ የጥገና አገልግሎት ፈልገው የመጡት ተሽከርካሪዎች የትራፊክ አደጋ መንስኤ፣ ወቅታዊ ጥገና ማነስ ነው።

- እምብዛም አልፎ አልፎ
- ዘወትር በተደጋጋሚ ያለማቋረጥ

7. ከለይ ከተጠቀሱት መንስኤዎች ባሻገር፣ ለትራፊክ አደጋ መንስኤ ይሆናል የሚሉት የቴክኒካል ችግር ካለ ከታች ባለው ባዶ ቦታ ላይ ያስፍሩ።

.....

8. በእርሶ አስተያየት፣ ለተጠቀሱት የትራፊክ አደጋ መንስኤዎች እነደመፍትሄ የሚያስቀምጡት ሀሳብ ካለ ከታች ባለው ባዶ ቦታ ላይ ያስፍሩ።

.....

APPENDIX 5: INDEPENDENT T-TEST OUTPUT**A. Gender**

Group Statistics

	<i>Gender</i>	<i>N</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Std. Error Mean</i>
<i>Gender with Error</i>	0	87	1.5158	.79328	.08505
	1	13	.7308	.43255	.11997
<i>Gender with Ordinary Violation</i>	0	87	1.9511	.83513	.08954
	1	13	.9327	.52444	.14545
<i>Gender with Aggressive Violation</i>	0	87	1.8084	1.06097	.11375
	1	13	.7692	.75012	.20805

B. Driver Type

Group Statistics

	<i>Driver type</i>	<i>N</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Std. Error Mean</i>
<i>Driver Type with Error</i>	0	50	1.8100	.79188	.11199
	1	50	1.0175	.58739	.08307
<i>Driver type with Ordinary violation</i>	0	50	2.1925	.90464	.12794
	1	50	1.4450	.65376	.09246
<i>Driver type with Aggressive violation</i>	0	50	1.9533	1.15275	.16302
	1	50	1.3933	.93481	.13220

APPENDIX 6: ONE-WAY ANOVA ANALYSIS OUT PUT

A. Age with DBQ Items

<i>Age with Error</i>	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.422	2	.711	1.114	.332
Within Groups	61.912	97	.638		
Total	63.334	99			

Age with Ordinary Violation

Between Groups	3.595	2	1.797	2.441	.092
Within Groups	71.417	97	.736		
Total	75.012	99			

Age with Aggressive violation

Between Groups	5.816	2	2.908	2.565	.082
Within Groups	109.958	97	1.134		
Total	115.773	99			

B. Driving experience with DBQ Items

<i>Driving experience with error</i>	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.524	2	.262	.405	.668
Within Groups	62.810	97	.648		
Total	63.334	99			
<i>Driving Experience with Ordinary Violation</i>					
Between Groups	2.635	2	1.318	1.766	.177
Within Groups	72.377	97	.746		
Total	75.012	99			
<i>Driving Experience with Aggressive violation</i>					
Between Groups	8.035	2	4.018	3.617	.031
Within Groups	107.738	97	1.111		
Total	115.773	99			

C. Driving Hour per day

<i>Driving hour with Error</i>	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	13.312	2	6.656	12.907	.000
Within Groups	50.022	97	.516		
Total	63.334	99			
<i>Driving hour with Ordinary Violation</i>					
Between Groups	15.846	2	7.923	12.990	.000
Within Groups	59.165	97	.610		
Total	75.012	99			
<i>Driving hour with Aggressive violation</i>					
Between Groups	9.824	2	4.912	4.497	.014
Within Groups	105.949	97	1.092		
Total	115.773	99			