RISK FACTORS AND SAFETY MEASURES FOR ROAD TRAFFIC CRASHES AMONG INTER-CITY COMMERCIAL DRIVERS IN KWARA STATE, NIGERIA

by

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DECLARATION

I, Salaudeen, Adekunle Ganiyu declare that this thesis titled **"Risk factors and Safety Measures for Road Traffic crashes among Inter-city Commercial Drivers in Kwara State, Nigeria"** was carried out and written by me and that it is the record of findings of my own original work. It has not been presented elsewhere for the award of any degree. All sources of information are duly acknowledged by means of references.

……. …….

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Supervisor

CERTIFICATION

This is to certify that this thesis titled **"Risk factors and Safety Measures for Road Traffic crashes among Inter-city Commercial Drivers in Kwara State, Nigeria"** was carried out and written by Salaudeen, Adekunle Ganiyu (Matric Number: 03/68KF011) and that it is the record of findings of the original work done by him. It has not been presented elsewhere for the award of any degree.

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DEDICATION

This Dissertation is dedicated to the Glory of Al-Mighty God, my late brother who was a victim of road traffic crash and other persons affected by road traffic injury.

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LIST OF ACRONYMS

DHIS	District Health Information System
NDHS	Nigeria Demographic and Health Survey
FCT	Federal Capital Territory
FRSC	Federal Road Safety Corps
HW	Health Worker
IEC	Information, Education and Communication
IPC	Interpersonal Communication skills
LGA	Local Government Area
M&E	Monitoring and Evaluation
MDA	Ministries, Departments and Agencies
NAFDAC	National Agency for Food Drugs Administration and Control
NARTO	National Association of Road Transport Owners
NCH	National Council on Health
NURTW	National Union of Road Transport Workers
NGO	Non-governmental organization
NPHCDA	National Primary Health Care Development Agency
RTEAN	Road transport Employer Association of Nigeria
RTC	Road Traffic Crash
RTA	Road Traffic Accident
SMOH	State Ministry of Health
UNICEF	United Nations Children Fund
UN-System	United Nations System
VDC	Village Development Committee
VHW	Village Health Worker
WHO	World Health Organization

ABSTRACT

Motorized road transport has brought benefits that were unimaginable 100 years ago. However, the price being paid as a result of road traffic injury for such benefits is too high. The incidence of Road Traffic Crashes (RTC) is rising world-wide, with 1.24 million people killed on the world's roads in 2010 due to non-compliance with safety measures. The objectives of the study were to: (i) assess the knowledge of risk factors for RTC among inter-city commercial vehicle drivers; (ii) determine the practice of safety measures of drivers; (iii) determine the prevalence of RTC among the respondents; (iv) determine the blood alcohol concentration of drivers before embarking on a journey; (v) assess the safety profiles of tyres used by inter-city commercial vehicles; and (vi) determine the perception of drivers on the enforcement of road safety laws in Kwara State.

This is a descriptive cross-sectional study in which multi-stage sampling method was adopted to select 410 inter-city commercial vehicle drivers in Kwara State. Quantitative and qualitative data were collected using an interviewer administered questionnaire, observational checklist, breathalyzers and coin test. Chi square, multiple regression and t test statistical analyses were done for the study variables and level of significance set at $p = 0.05$.

The findings of the study were that:

(i) majority of respondents (94.4%) had good knowledge scores of risk factors and safety measures of RTC. The observed relationship in training attendance and knowledge scores was statistically significant ($p < 0.05$);

(ii) the age group 26-55 years had good safety practices compared with those ≤ 25 years and > 55 years. The observed relationship was statistically significant ($p = 0.057$).

There was statistical significant relationship between respondents who practiced safety measures and those who carried out driving test before issuance of license ($p = 0.001$) and modes of driving skills acquisition ($p = <0.001$);

(iii) some respondents (7.1%) tested positive for alcohol and the mean blood alcohol concentration was 23.28± 23.32µg/dl;

(iv) three out of ten respondents (29.3%) had experienced RTC in the past;

(v) more than half of tyres were expired (53.3%-57.3%), between 52.0% and 57.3% of the tyres were worn-out and only 1.3% of vehicles had four tyres that passed all the tests; and

(vi) there was significant relationship between the knowledge of risk factors for RTC and perception of road safety laws ($p = 0.028$). There was statistically significant relationship between perception to road safety laws and practice of safety measures among respondents ($p = < 0.001$).

The study concluded that majority of vehicles have worn out tyres and RTC occurrence was common among respondents despite good knowledge of safety measures. It is recommended that regular assessment of blood alcohol of the drivers, vehicular tyre inspection, training, retraining, continuous orientation of the drivers and enforcement of relevant laws are critical to addressing the challenges of road safety in Nigeria.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Movement of passengers and goods from one place to another is made easy with different means of transportation viz: land (road, rail), air and water. Motorized road transport among others has changed the face of employment, trade, family life and health care, bringing benefits that were unimaginable 100 years ago. With this development, patients can be transported to emergency rooms, deliver relief materials at the sites of disasters and take holidays in places people would not have been able to visit before. However, the price being paid as a result of road traffic injury for such benefits is too high. Road Traffic Crashes (RTC) occur when a vehicle collides with another vehicle, pedestrian, animal, road debris, or other stationary obstruction, such as a tree or utility pole or when the vehicle loses control.[1,2] Worldwide, RTC lead to death and disability as well as high financial cost to the individual involved, family, community and society at large.

As early as 1962, a World Health Organization (WHO) report discussed the nature and dynamics of the problem of Road Traffic Accident (RTA)[3] and in 1974, the World Health Assembly (WHA) adopted Resolution WHA27.59, declaring road traffic accidents a major public health issue and calling Member States to address the problem.[4] This was reflected in the establishment in March 2000 of WHO's Department of Injuries and Violence Prevention, the development and implementation of a five-year WHO strategy for road traffic injury prevention, and greater financial and human support for road traffic injury prevention activities around the world.

Epidemiologically, road traffic crash is determined by the triad of the vehicle (agent), host (human), and environment such as road and visibility. A lot of risk factors influence the occurrence of RTC and consequent injuries. The factors that are associated with host include lack of knowledge and information on safe driving, poor personal perception of risks of RTC, drink-driving, impairment like sight, hearing and other sensory receptors, lack of adequate institutional legal frame work and poor enforcement of legislation. Vehicle and equipment factors include roadworthiness, tyre, lighting, horn and C-caution among others. Environmental factors include road design and layout, bad and improperly maintained road constituting death trap especially in the developing countries like Nigeria, inappropriate and absence of road signs, inappropriately constructed speed limits and poor weather visibility.[3]

Road traffic injuries are a major but neglected public health challenge that requires concerted efforts for effective and sustainable prevention. Of all the systems with which people have to deal every day, road traffic systems are the most complex and the most dangerous.[5] Health care workers are very aware of the burden to the health service and the community particularly in emergency care, rehabilitation and care following permanent injuries and the consequences of the loss of the bread winner or main carer in a family. Road traffic injuries are responsible for the majority of disability and occupational handicap from major traumatic injury.[5]

There were global concerns on road safety and injuries resulting from crashes, and as a matter of fact WHO dedicated World Health Day for 2004 to Road Safety. Within the World Bank, an interdisciplinary task force was established to ensure that this important issue was regarded as a major Public Health issue and tackled jointly by Transport and Public Health specialists.[5] Among

other international organizations, the United Nations Economic Commission for Europe, the United Nations Development Fund and the United Nations Children's Fund, have all stepped up their road safety activities over the past decade. In early 2003, the United Nations adopted Resolution (A/RES/57/309) on the global road safety crisis, followed by a report of the Secretary-General on the same topic to the 58th session of the United Nations General Assembly later that year.[6] In November 2003, a further Resolution (A/RES/58/9) was passed by the United Nations, calling for a plenary meeting of the United Nations General Assembly on 14 April 2004.[7] The purpose of the plenary meeting was to increase awareness of the magnitude of the road injury problem, and to discuss the implementation of the World report on road traffic injury prevention at the United Nations General Assembly.[5]

The joint WHO/World Bank report on road traffic injury prevention is an important part of the response to the world's road safety crisis. It is directed at international, regional and national policy-makers, international agencies and key professionals in Public Health, Transport, Engineering, Education and other sectors, and aims to stimulate action for road safety. It sets out universal principles rather than a "blue print" for worldwide application, recognizing fully the need to identify local needs and the adaptation of "best practices" accordingly.[5]

Strategies exist that are proven to reduce road traffic injuries and a number of countries have successfully used these strategies to reduce their road traffic deaths. The World report provides extensive information on leading risk factors for road traffic injuries and evidence on effective interventions, and makes recommendations to countries on how to improve national road safety.

Progress in implementing the recommendations of the World report was first reported in the *Global status report on road safety: time for action* (2009).[8]

In 2010 the United Nations General Assembly unanimously adopted a resolution calling for a Decade of Action for Road Safety 2011–2020, and for further Global status reports on road safety to monitor the impact of the Decade at national and global levels.[9] The 2013 report builds on the 2009 report, and provides additional data in a number of important areas. It serves as the baseline for monitoring the Decade.[10]

1.2 Statement of problem

Land transportation systems have become a crucial component of modernity. By speeding up communications and the transport of goods and people, they have generated a revolution in contemporary economic and social relations. However, incorporating new technology has not come about without cost: environmental contamination, urban stress and deteriorating air quality are directly linked to modern land transport systems. Above all, transportation is increasingly associated with the rise in road accidents and premature deaths, as well as physical and psychological handicaps. Losses are not limited to reduced worker productivity and trauma affecting a victim's private life. Equally significant are the rising costs in health services and the added burden on public finances.

In developing countries the situation is made worse by rapid and unplanned urbanization. The absence of adequate infrastructure in our cities, as well as the lack of or non-enforcement of legal

regulatory framework, make the exponential rise in the number of road accidents all the more worrisome.[5] The incidence of RTC is rising world-wide, in 2004, about 1.2 million people were known to die in road accidents worldwide[5] and 1.24 million people were killed on the world's roads in 2010.[10] Millions of others sustain injuries, with some suffering permanent disabilities. No country is spared this toll in lives and suffering, which struck the young particularly. Enormous human potential was being destroyed, with grave social and economic consequences.[5] Road traffic injuries are a growing public health issue, disproportionately affecting vulnerable groups of road users, including the poor. More than half the people killed in traffic crashes are young adults aged between 15 and 44 years, often the breadwinners in a family. Furthermore, road traffic injuries cost low-income and middle-income countries between 1% and 2% of their gross national product – more than the total development aid received by these countries.[5]

In the year 2002, the global mortality rate due to traffic accidents was 19 per 100,000 population while in Viet Nam the figure was 27 per 100,000 population. Road traffic collisions on the nation's roads claim five times more lives now than they did ten years ago. In 2003 a total of 20,774 incidents were reported, leading to 12,864 deaths, 20,704 injuries and thousands of billions of Viet Nam Dong in costs.[5] The main contributor to road crashes in Viet Nam is the rapid increase in the number of vehicles, particularly motorcycles, which increase by 10% every year. Nearly half of the motorcycle riders are not licensed, and three quarters did not comply with traffic laws. The development of roads and other transport infrastructure has not been able to keep pace with rapid economic growth.[5]

In Thailand, RTC are considered one of the top three Public Health problems in the country. Despite the Government's best efforts, there are sadly over 13,000 deaths and more than one million injuries each year as the result of road accidents, with several hundred thousand people disabled. An overwhelming majority of the deaths and injuries involve motorcyclists, cyclists and pedestrians.[5] Statistics show that in Brazil, 30,000 people die every year in road accidents. Of these, 44% are between 20 and 39 years of age, and 82% are men. Over 3,000 Kenyans are killed on their roads every year, most of them between the ages of 15 and 44 years. The cost to their economy from these accidents is in excess of US$ 50 million exclusive of the actual loss of life.[5]

A review of 38 studies found that pedestrian fatalities were highest in 75% of the studies, accounting for between 41% and 75% of all fatalities. Passengers were the second largest group of road users killed, accounting for between 38% and 51% of fatalities. In Kenya, between 1971 and 1990, pedestrians represented 42% of all crash fatalities; pedestrians and passengers combined accounted for approximately 80% of all fatalities in that country each year. In the city of Nairobi, between 1977 and 1994, 64% of road users killed in traffic crashes were pedestrians.[5]

Recent studies have shown that pedestrians and motorcyclists have the highest rates of injury in Asia. Injured pedestrians and passengers in mass transportation are the main issue in Africa. In Latin America and the Caribbean, injuries to pedestrians are the greatest problem.[10] Conversely, in most OECD countries, such as France, Germany and Sweden, car occupants represent more than 60% of all fatalities, a reflection of the greater number of motor vehicles in use. While there

are fewer motorcyclist, cyclist and pedestrian casualties, these groups of road users bear higher fatality rates. In several low-income and middle-income countries, passengers in buses and other informal public transport systems also constitute a significant group at high risk of road traffic casualties.[10]

Additionally, road crashes absorb a huge amount of financial resources particularly in developing countries. In economic terms, the cost of road crash injuries is estimated at roughly 1% of gross national product (GNP) in low-income countries, 1.5% in middle-income countries and 2% in high-income countries, estimated at over US$ 100 billion a year.[10]

By 2020, road traffic injuries are forecast to become the second leading cause of Disability-Adjusted Life Years lost in developing countries. However, decreasing the burden of injuries is one of the main challenges for Public Health in the next century.[10] Road traffic death toll represents only the "tip of the iceberg" of the total waste of human and societal resources from road injuries. WHO estimates that, worldwide, between 20 million and 50 million people are injured or disabled each year in road traffic crashes (the reason for the wide range of this estimate being the considerable, known underreporting of casualties).[10]

In Nigeria, a study conducted in Ilorin, Kwara State revealed that over three-quarters of the victims of road traffic crashes are young people.[11] Using epidemiological evidence from national studies, a conservative estimate can be obtained of the ratios between road deaths, injuries

requiring hospital treatment, and minor injuries, as being 1:15:70 in most countries. In many low-income and middle-income countries, the burden of traffic-related injuries is such that they represent between 30% and 86% of all trauma admissions.[12] The most productive age group, those aged between 15 and 44 years, is heavily represented in road traffic injuries; the economic impacts of injuries in this age group are therefore especially damaging. According to the WHO, injuries to individuals in this age group, "tend to affect productivity severely, particularly among the lowest-income groups whose exposure to risk is greatest and whose earning capacity is most likely to rely on physical activity". The incidence of road traffic crashes in Kenya illustrates this point; more than 75% of road traffic casualties are among economically productive young adults.[5]

A case study conducted in Bangladesh found that poor families were more likely than those better off to lose their head of household and thus suffer immediate economic effects as a result of road traffic injuries. The loss of earnings, together with medical bills, funeral costs and legal bills, can have a ruinous effect on a family's finances. Among the poor, 32% of the road deaths surveyed occurred to a head of household or that head's spouse, compared with 21% among those not defined as poor. Over 70% of households reported that their household income, food consumption and food production had decreased after a road death. Three quarters of all poor households affected by a road death reported a decrease in their living standard, compared with 58% of other households. In addition, 61% of poor families had to borrow money as a result of a death, compared with 34% of other families.[5] In cases where there is prolonged treatment or the death of the victim, the family may end up selling most of its assets, including land, and possibly becoming trapped in long-term indebtedness.

Some factors contribute to the occurrence of a collision and are therefore part of crash causation. Other factors aggravate the effects of the collision and thus contribute to trauma severity. Some factors may not appear to be directly related to road traffic injuries. Some causes are immediate, but they may be underpinned by medium-term and long-term structural causes. Identifying the risk factors that contribute to road traffic crashes is important in identifying interventions that can reduce the risks associated with these factors[5]. Alcohol and drugs of intoxication account for a large proportion of RTC world-wide[13]. In the developing world, roads are poorly built and are poorly maintained. As a result, the roads have become death traps. Vehicles are poorly maintained due to poverty, ignorance and corruption among enforcement agents and other stakeholders. All these factors are controllable by government policies and discipline citizens.[13]

In 2013, WHO reported that deaths from road traffic crash in 2010 were 5,279 (Nigeria), 1986 (Ghana) and 14,804 (South Africa) while the rates of deaths from road traffic crash were 33.7, 22.2 and 31.2 respectively. Traffic laws such as National drink-driving law, drink-driving law defined by Blood Alcohol Concentration (BAC) and random breath testing/police check point used for enforcement are available in the countries however, the effectiveness of overall enforcement (respondent consensus: scale 0-10) vary between the three countries. While Ghana had a score of 3, Nigeria and South Africa had a score of 2.[10]

1.3 Justification/Rationale for the study

Every day thousands of people are killed and injured on our roads. Men, women or children walking, biking or riding to school or work, playing in the streets or setting out on long trips, never return home, leaving behind shattered families and communities. Millions of people each

year will spend long weeks in hospital after severe crashes and many will never be able to live, work or play as they used to do. Current efforts to address road safety are minimal in comparison to this growing human suffering.[5]

Despite the enormous toll exacted by road traffic injuries, they have for many years been neglected and funding for interventions has not been commensurate with the scale of the problem. This is despite the fact that road traffic injuries are largely predictable and preventable and that the evidence base for effective interventions is extensive. Although the aim of reducing the annual burden of road traffic deaths has yet to be realized, the lack of increase suggests that interventions to improve global road safety may have mitigated deaths that would otherwise have occurred. Between 2007 and 2010, the number of road traffic deaths decreased in 88 countries, suggesting that progress can be made with sufficient national commitment. Of these 88 countries, 42 are high-income countries, 41 are middle-income, and 5 are low-income.[1, 2]

The Federal Road Safety Corps (FRSC) in Nigeria has been making efforts to reduce the scourge of RTC by enforcing traffic regulations on the road users particularly the commercial vehicle drivers. However, some factors responsible for RTC are not efficiently and effectively addressed by the concerned authorities. These factors include drink-driving, use of unsafe tyres, poor use of traffic laws and low perceptions of enforcement of traffic laws among the Nigeria commercial vehicle drivers.[4, 5] This study measured the levels of these risk factors and the information obtained will inform decision-making and policy direction in the country towards road safety.

The risk of dying as a result of a road traffic injury is highest in the African Region (24.1 per 100,000 population). Majority of these deaths occur among the car occupants [8] and careless driving has being identified as the most important factor in RTC over the period of study, accounting for over 35% of all incidents, while excessive speed was the second most common cause.[10] This therefore necessitates identifying some of the risk factors for road traffic crash particularly among commercial vehicle drivers. This study was carried-out among intercity commercial vehicle drivers because they are always in hurry in order to maximize profits particularly during festive periods; they usually carry large number of passengers and loads at a time; they also manage their tyres so as make more profits; most of the drivers tend to keep themselves going and alert by drinking alcohol with attendant increase risk of road crash.[10]

Several psychotropic substances taken for recreational (alcohol and illicit drugs) or medical purposes can impair driving performance either by disturbing the information processing mental function, promoting risk taking behaviour, or by decreasing response time. Among behavioural factors, alcohol plays an important role in car crashes, and accidents involving alcohol are more likely to result in injuries and deaths than crashes where alcohol is not a factor. A large proportion of accidents are attributable to alcohol (in Europe about 20%) mainly in young people: the intake of alcoholic beverages when associated with narcotics use may represent the most dangerous combination that increases the risk of serious crashes.[12] Despite global progress in strengthening drink–driving legislation, only 39 countries have their enforcement as "good" (8 or above on a scale of 0 to 10), indicating that better implementation of these laws needs urgent attention.[12]

Furthermore, most Nigeria commercial vehicle drivers are illiterates and do not pass through formal driving training/schools. Hence, their knowledge of road signs and obedience to road traffic regulations are poor. Many of them perceive law enforcement exercise beneficial to government as a way of revenue generation and not for the safety of road users. Limited information is available in this environment on drink-driving, tyre safety, and vehicle maintenance and driver perception of risk of RTC.

1.4 Definition of terms

All over the world RTC is determined by the factors of human, vehicles and environment. Using the William Haddon Matrix model of time sequence of road traffic injury, the phases can be divided into three: crash prevention (pre-crash) phase, injury prevention during the crash (crash) phase and life sustaining (post-crash) phase. The focus of this research work is on crash prevention phase. This includes identification of risk factors and its magnitude in RTA.

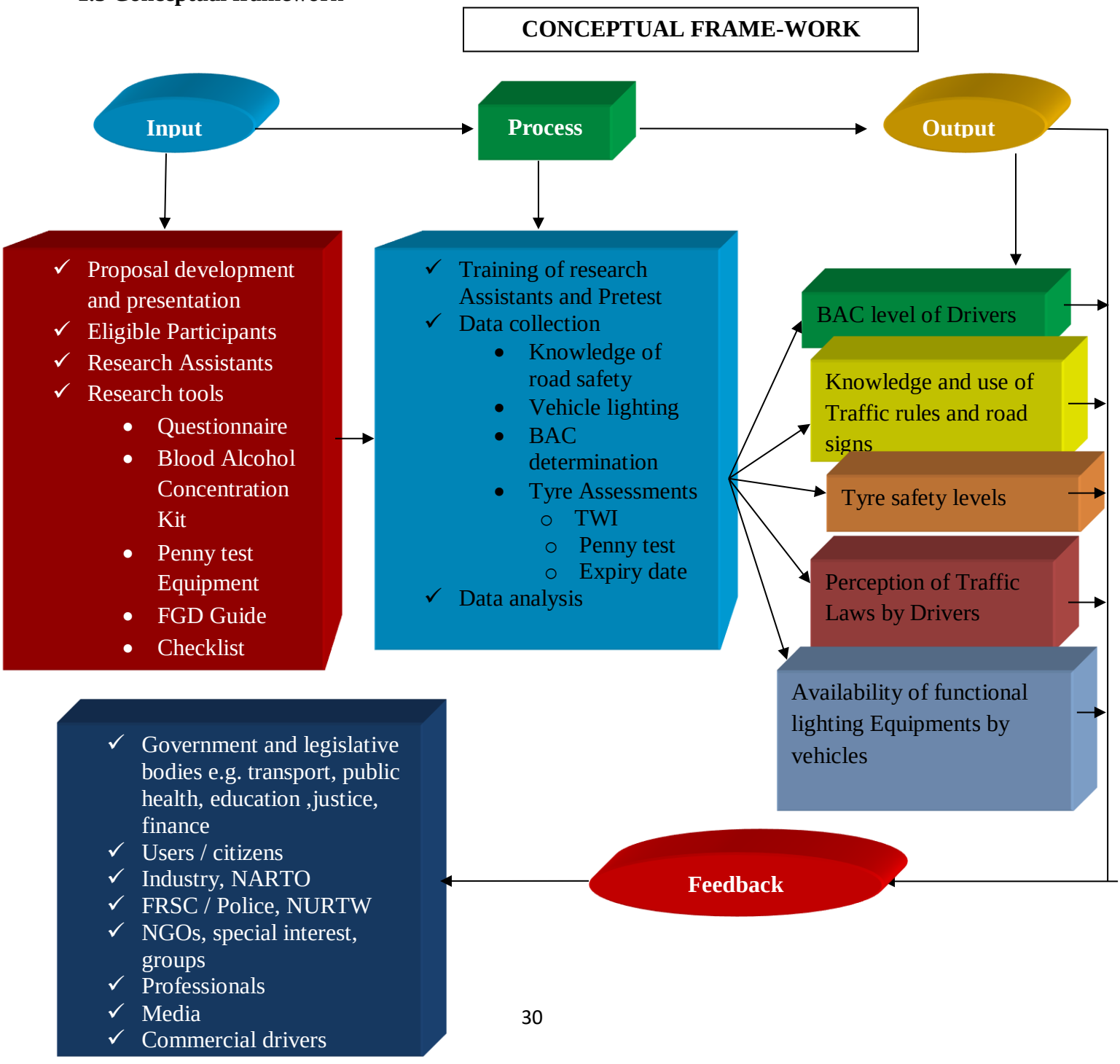
Input: These are activities and resources put in place like proposal development, study subjects, research assistants, and research tools like questionnaire, blood alcohol measurement kits, penny, checklist and focus group discussion guide.

Process: Activities carried out to achieve the desired outcome include training of research assistants, data collection, and measurement of study variables and use of observational checklist.

Output: The results and findings like blood alcohol level of drivers, level of knowledge on road safety, road worthiness of vehicle and perception on level of enforcement.

Feedback: The research outcome will be shared with all stakeholders involved in road traffic crash viz: Government, Transport, Education, Public Health, Justice, users, professionals, commercial drivers etc.

1.5 Conceptual framework



1.6 Research questions

1. What is the level of knowledge of inter-city commercial drivers in Kwara State on risk factors for road traffic crash?
2. What is the practice of safety measures among the respondents?
3. What is the blood level of alcohol of intercity commercial vehicle drivers in Kwara State immediately before take-off?
4. Are the tyres used by the intercity commercial vehicle drivers in Kwara State safe?
5. What is the perception of drivers on the enforcement of road safety laws in Kwara State?

1.7 Hypotheses

Null hypothesis

- There was no relationship between years of experience of inter-city commercial vehicle drivers in Kwara State and knowledge of risk factors for road traffic crash.
- Socio-demographic variables have no effect on practice of safety measures among commercial vehicle drivers.
- There was no relationship between perception of road safety laws and knowledge of risk factors of inter-city commercial drivers in Kwara State.

Alternative hypothesis

- There was relationship between years of experience of inter-city commercial vehicle drivers in Kwara State and knowledge of risk factors for road traffic crash.

- Socio-demographic variables have effect on the practice of safety measures among commercial vehicle drivers.
- There was relationship between perception of road safety laws and knowledge of risk factors of inter-city commercial drivers in Kwara State.

1.8 Objectives

General

To assess the safety measures and some of the risk factors for road traffic crash among inter-city commercial vehicle drivers in Kwara State.

Specific

1. To assess the knowledge of risk factors for road traffic crash among inter-city commercial vehicle drivers in Kwara State.
2. To determine the practice of safety measures among inter-city commercial vehicle drivers in Kwara State.
3. To determine the prevalence of road traffic crashes among the respondents.
4. To determine the blood alcohol concentration of inter-city commercial vehicle drivers before embarking on a journey.
5. To assess the safety profiles of tyres used by inter-city commercial vehicle drivers in Kwara State.
6. To determine the perception of drivers on the enforcement of road safety laws in Kwara State.

1.9 Scope of the study

The study focused on inter-city commercial drivers in registered private and organized motor parks in the three senatorial districts in Kwara State. The assessment of road traffic crash safety was limited to blood alcohol concentration among drivers, their knowledge of risk factors and safety practices and perceptions of enforcement of road safety laws and status of vehicles tyres.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

Nigeria is ranked second highest in the rate of road accidents among 193 countries of the world. It's been argued that ¾ of all accidents on Nigerian roads involve fatalities. Aside Boko Haram crisis, accidents are by far the main cause of violent death in Nigeria.[14] This finding corroborates WHO 2013 report which adjudged Nigeria the most dangerous country in Africa with 33.7 deaths per 100,000 populations every year.[15] According to the report, one in every four deaths in Africa occur in Nigeria with the remaining 64% in Democratic Republic of Congo, Ethiopia, Kenya, South Africa, Tanzania and Uganda.[15]

On the global scene, it was reported that twenty to fifty million more people sustain non-fatal injuries from a collision, and these injuries are an important cause of disability worldwide.[16] Ninety percent of road traffic deaths occur in low- and middle-income countries, which claim less than half the world's registered vehicle fleet. Road traffic injuries are among the three leading causes of death for people between 5 and 44 years of age. Unless immediate and effective action is taken, road traffic injuries are predicted to become the fifth leading cause of death in the world, resulting in an estimated 2.4 million deaths each year.[16]

Concerns of the spate of fatal car accidents compelled stakeholders into road safety management including the United Nations (UN) Assembly to seek for alternative means of curbing fatalities on the road. In May 11, 2011, UN adopted the period 2011 – 2020 as the UN Decade of Action

for Road Safety within which all efforts will concentrate on the official goal of 'stabilizing and then reducing' global road traffic fatalities by 2020. According to the then UN Secretary General, Ban Ki-Moon, lives would be saved through the Decade of Action for Road safety. For him, it is totally unacceptable that more than one million people die on the roads and more than fifty million are injured. Following the declaration by the UN in 2011, the Federal Road Safety Commission (FRSC) set out to adopt and domesticate the UN Action Plan by developing a number of programmes suitable for every road user in the country.[15, 16]

Gana et al in a study conducted in Omu Aran North-Central, Nigeria reported that human factors constitute about 80% of the cause of road traffic accidents recorded in the country. This includes dangerous overtaking at bends, crest of a hill, over speeding, driving under the influence of alcohol/drugs and the use of mobile phone while driving among others.[17] In another related study Oyeyemi opined in a situation where drivers operate mechanically deficient vehicles on the roads, carrying passengers and property without safety consideration constitute increased risk for road crashes. Such vehicles are not road worthy and they do not meet minimum safety standards. Bad weather condition leading to mist, haze, harmattan and sometimes heavy rainfall resulting in poor visibility and accidents.[18]

Oyeyemi concluded that Road Traffic Crashes constitute a major cause of death and loss of property in the country, depleting the workforce of the nation and rendering victims and their relatives to suffer severe psychological trauma. He went further to say that billions of naira worth of property including human beings, most of them belonging to the productive age group are consumed through automobile fire incidents on the roads due to accidents.[18]

Experts in Road Traffic Management reported that Nigeria has the highest rate of fatalities from motor accidents in Africa according to statistics. Nigeria leads 43 other nations with 230 deaths in 10,000 vehicle crashes followed by Ethiopia, Malawi and Ghana with 219, 183 and 178 deaths per 10,000 vehicles respectively.[19] International comparison indicates that the chance of a vehicle killing someone in Nigeria is 47 times higher than in Britain. The proportion of fatalities to injuries reported is also very high. For example, while Czech Republic has only one death in 197 accidents, France, one death in 175, South Africa, one death in 47 accidents, Nigeria has one death in 2.65 accidents.[20]

The economic growth of any country depends upon its transportation network, comprising of road, rail and air connectivity, of which road is the most critical in terms of movement of goods and passengers.[21] Good network of road is important as it provides connectivity between rural and urban areas. Along with this, road safety is an equally important aspect as it plays a key role towards a sustainable transportation development strategy.[22] The adverse impact of modern road transportation systems is injury and loss of life due to road accidents. While the road accident situation is improving in the high income industrialized countries, most developing countries are facing a worsening situation. The continuous socio-economic growth over the years is causing an increase in demand for transport service including road transport. With rapid growth in the number of vehicles on the road, more road conflicts develop by traffic accidents.[21]

2.2 GLOBAL EPIDEMIOLOGY OF ROAD TRAFFIC CRASH

Road traffic injuries are a growing Public Health issue, disproportionately affecting vulnerable groups of road users, including the poor. Every year, according to the statistics, 1.2 million people are known to die in road accidents worldwide.[5]Millions of others sustain injuries, with some suffering permanent disabilities and more than half the people killed in traffic crashes are young adults aged between 15 and 44 years – often the breadwinners in a family. Furthermore, road traffic injuries cost low-income and middle-income countries between 1% and 2% of their gross national product – more than the total development aid received by these countries.[10]

The European Commission estimates that car crash-related costs in Europe are around 160 billion Euros, approximately 2% of the Gross Domestic Product.[12] In several countries, car crashes are the first cause of death among subjects aged 15-30, with a direct heavy impact on the years of life lost; in young subjects, car crashes also represent one of the major causes of disability.[12]

Road traffic injuries are estimated to be the eighth leading cause of death globally, with an impact similar to that caused by many communicable diseases, such as malaria. They are the leading cause of death for young people aged 15–29 years, and as a result take a heavy toll on those entering their most productive years. At the national level, road traffic injuries result in considerable financial costs, particularly to developing economies. Indeed, road traffic injuries are estimated to cost low- and middle-income countries between 1–2 % of their gross national product, estimated at over US$ 100 billion per year.[3]

Several driver characteristics and driving behaviors due to age, diet, alcohol consumption, circadian rhythms, drug intake and diseases may contribute to a reduced alertness and induce drowsiness with dangerous consequences on driving ability thus increasing the risk of car crashes. It can be estimated that human factors concerning the psychophysical condition of the driver are involved in 60-80% of road accidents.[12]Crash involvement rates on a population basis are higher among males than females in all age groups. Most accidents involve subjects less than 25years (35%), whereas subjects aged over 70 years are involved in approximately 3% of car crashes.[12]

Most of the victims i.e. 147 (40.83%) of a study carried-out in India were young (15 to 30 years), 153 (42.50%) were passengers, 105 (29.16%) were pedestrians. Increased prevalence of RTA was also noticed at beginning i.e. 198 (55%) and end i.e. 69 (19.16%) of journey; in rainy and cloudy conditions (269 i.e. 74.72%) and in evening hours (3 to 7 p.m. 159 i.e. 44.16%). Out of 246 vehicles involved; 162 (65.85%) were old and ill maintained. The contributions of old vehicle to fatal injuries were 33 (50%). Head injury was found in 156 (43.33 %) cases and its associated case fatality rate was 90.90%. The estimated total days lost due to hospital stay was 4620 with an average of 12.83 days per each case.[23]

A study conducted in Ghana between1991 and 2011 reported the highest fatalities from RTI in 26-35 year old age group. The average incidence of the morbidity and mortality patterns from RTAs in the period were 61.9 and 7.6 per 100 000 population, respectively. The morbidity pattern was similar throughout the same period with a mean of 1.2 per accident. RTAs were responsible for a far higher rate of death among men, by an approximate ratio of 3:1. The highest incidence of road traffic accidents was in the month of November, followed by the month of

December. Saturday stood out as the day during which most road traffic accidents occurred.[24] Out of the 195 cases of road traffic accidents in a study in Owerri within a four-year period 2006-2009, 140(71.8%) were males. The highest proportion of cases occurred in the age group 20-29 years with a mean age occurrence of 39.7+17.1 years. The highest occurrence was recorded on Saturdays (17.95%) and in the month of July (12.8%). The "ember" months of September to December recorded the highest single proportion of accident cases (42.1%).[25] Currently in Nigeria road traffic crashes (RTC) data rate is 162 deaths per 100,000 populations.[25]

2.3 TRENDS OF ROAD TRAFFIC ACCIDENT IN NIGERIA

The World road accident problem dates back to 1863 when J. J. Lenoir built the first car in Paris, France. But it was not until after 1896 that the motoring facility was experienced. Indeed the first recorded death due to mechanical vehicle in the United States of America was in 1899.[26] Nigeria recorded her first road traffic accidents in Lagos in 1906.[27] For more than half a century thereafter, accident rates in the country remained low due to low vehicle population.[28] But from the 1970s following remarkable improvements in the economic prosperity in the country arising from the oil boom, the magnitude of the accident problem increased significantly. The period witnessed a substantial increase in private vehicle ownership (motor car fleet was reported to have increased by 183% between 1978 and 1987.[26] This was followed by the economic recession of 1980s characterized by increasingly inadequate and poorly maintained road infrastructure. The situation today has been exacerbated by the near absence of alternative modes of transportation as an estimated 90% of passengers and freight in Nigeria rely on the road network with the attendant challenge of increased number and incidence of road traffic accidents.

In 1976, these were 53,997 road traffic accidents, resulting in 7,717 deaths. In 1981, the magnitude reduced to 35,114 accidents but the deaths increased to 10,236, while in 1984 Nigeria was said to have the highest rate of road traffic death in Africa and indeed the world over with the chances of a vehicles killing someone in Nigeria was 47 times higher than Britain.[30] In 1988 there 25,292 road traffic accidents with as high as 9.077 deaths.[26]

Also, using the 1988 accident data alone, it was observed that on the average there was an embarrassing rate of 69 accidents and 24 deaths every day of that year. In 1989, the country led 37 other nations with 240 deaths in 10,000 vehicle accidents followed by Ethiopia with 200 and Malawi with 180 deaths per 10,000 vehicles. Sadly, the character of road traffic accidents in terms of frequency of occurrence and fatality rate has not changed over the years in Nigeria. Table 1 presents the statistics of the last five years. Within the period, an annual average of 8,153 accidents was recorded with 5,084 annual deaths and an average fatality rate of 5 per 100,000 population.[31] Perhaps one can safely conclude that this may be attributed to the activities of the Federal Road Safety Corps which assumed full road safety responsibilities in 2007. In terms of spatial spread the FRSC has shown that above 50% of the total accidents and fatalities were:

Table 2.1: Road Traffic Accidents in Nigeria

Year	Number of cases	Number of killed	Number of injured	Fatality rate per 100,000 population	Fatality rate per 110,000 vehicles
2007	8,477	4,673	17,794	9	NA
2008	11,341	6,661	27,980	6	NA
2009	10,854	5,693	27,270	5	NA
2010	5,330	4,065	18,095	4	NA
2011	4,765	4.327	17,464	4	6
Average	8,153	5.084	21,721	5	NA

Source: FRSC Documents, 2012

Report emanating from the nation's bureau of statistics (Q1 2017) regarding the category of vehicles involved in road crashes showed that 59% of vehicles are commercial (2,428), 40% are private (1,617), 1% are government (55) and the remaining are diplomat.[29]

In the same vein, it was also reported that in the first quarter of 2017 road transport data reflected that 2,556 road crashes occurred. Speed violation was reported as the major cause of road crashes in the same period and it accounted for 42.69% of the total road crashes reported. Loss of control and dangerous driving followed closely as they both accounted for 12.73% and 7.34% of the total road crashes recorded.[32]

The National Bureau of Statistics also reported a total of 8,672 Nigerians got injured in the road traffic crashes, 8,151 of the 8,672 that got injured; representing 94% are adults while the

remaining 521, representing 6% are children. Male accounted for 6,422 representing 74%, while 2,250 were female representing 26%, of the injured individuals.[29]

Similarly, a total of 1,466 got killed in the road traffic crashes within the first quarter of 2017, 1,363 of the 1,466 that got killed, representing 93% of the figure, are adults while the remaining 103, representing 7% are children. Within the Q1 under review, it was estimated that vehicle population was 11,458,370. Commercial vehicles accounted for 53.8% of the total vehicle population, private vehicles accounted for 44.5%, government vehicles accounted for 1.65 and diplomat vehicles accounted for 0.1%.[29]

Road transportation which has become such a dominant mode in Nigeria with patronage cutting across individual commuters, private, corporate and government organizations serves as coordinating basis for all modes of transport system. The restrictive nature of the water ways, coupled with the near collapse of the rail system, and the high cost of air travels have further exerted a lot of pressure on the road, as over 75 percent of the total movements in the country are made by road.[32]

The accident statistics also identified the high risk vehicles as cars, buses and motorcycles. But regardless of the vehicle types involved, road accidents in Nigeria are caused by various factors which include human error, engineering defects, poor vehicle alignment and inadequate or absence of road furniture among others. The National Bureau of Statistics (NBS) said 11.363 road accidents were recorded in 2016.[33] It was reported that speed violation was the major cause of the accidents in 2016, which accounted for 33.86 percent of the total road traffic accidents

reported. Loss of control and dangerous driving followed closely as they both accounted for 15.43 percent and 8.53 percent of the total road accidents recorded. A total of 30,105 Nigerians got injured in the accidents recorded in 2016. Twenty-eight thousand two hundred and fifty (28,250) of the 30,105 Nigerians that got injured, representing six (6) percent of the figure are children. Also, twenty two thousand seven hundred and five (22,705) male Nigerians, representing 75 percent were injured in the accidents in 2016, while 7,400 female Nigerians representing 25 percent got injured.[33]

Emmanuel in South west, Nigeria reported that the gloomy picture of injuries and death on Nigerian road was a result of dramatic changes in human behavior especially with the wave of globalization, modernization, and information communication technology which tries to close the gap between people and cultures.[34] However, the need for vehicular and human migration has created serious safety and risks concerns by the government, the motorist, the public and the general society especially in Nigeria as a result of crash injuries and damages arising from transport behavior.[34]

Nigeria, with a total land area of 910,771 square kilometers, is the most populous country in Africa, and the 7th most populous nation in the world. Its large land mass and burgeoning population correlate with its high level of vehicular population estimated at over 11,458,370 with a total road length of about 194,000 kilometers (comprising 34, 120 km federal, 30,500 Km, State and 129,580 km of local roads). Nigeria ranked as the country with the second largest road network in Africa in 2011. Its population density which varies in rural and urban areas (approximately 51.7% and 48.3% respectively) translates to a population- road ratio of 860

persons per square kilometers indicating intense traffic pressure on the available road network. This pressure contributes to the high road traffic accidents in the country.[35]

The Nigeria situation however, has reached such an alarming proportion even to the point of sheer frustration and near helplessness. Nigeria continues to feature in the bottom half of World Health Organization country rankings of road traffic accidents. The country's 149th ranking in 2009 out of 178 member states indicates the hazards associated with road transportation in a country largely dependent on its road network for economic, social and physical activities. Worldwide, road traffic accidents lead to death and disability as well as financial cost to both society and the individual involved. There is generally increasing incidence of morbidity and mortality rates of road traffic accidents. Road traffic accidents injure people every day, more so in developing countries like Nigeria.[36]

Akpoghomeh in his inaugural lecture described the occurrence of road crashes among the different states in Nigeria as worrisome, in his opinion the nation average fatality/severity index put at 525 per 1000 or one fatal crash in every two crashes was quite ominous for the country, especially when compared to developed countries of the world.[37]

Spatially, Sokoto and Jigawa States were said to have recorded the highest fatality/severity index. Other states with fatality/severity indices higher than the national average included Niger, Kogi, Plateau, Yobe, Taraba, Katsina, Bauchi and Kwara. At the other extreme were Lagos, Delta and Edo States. Lagos in particular witnessed a steady decline in fatality/severity index and this was adduced to the relatively high level of traffic congestion which reduces the tendency to

over speed as well as the fact that Lagos has the easiest accessibility to post-crash medical care in the metropolitan area and recently the most organized and efficient traffic management authority.[37]

The causes of fatal car accidents in Nigeria have been ramped into human, mechanical and environmental factors. The human factor accounts for up to 90% of accidents while the mechanical and environmental factors are subservient to it. Human factors include visual acuteness, driver fatigue, poor knowledge of road signs and regulations, illiteracy, health problems, excessive speeding, drug abuse and over-confidence while on the steering. Among the mechanical factors that lead to fatal car accidents in Nigeria are poor vehicle maintenance, tyre blowouts, poor lights, vehicles not roadworthy and broken down vehicles on the road without adequate warning.[38]

The environmental factors are summed up into heavy rainfall, harmattan, sun reflection, heavy wind, pot holes and un-tarred roads. These factors have independently and/or collective contributed to the high prevalence rate of fatal car accidents in Nigeria. The implications of fatal car accidents in Nigeria have been colossal. Despite the happiness and change of quality of family lives associated with owning a vehicle, its possession has made many families bereaved of their breadwinners or lovely.[38]

Agbonkhese et al in their report maintained that the socioeconomic costs of RTC in Nigeria are immense and the direct cost of traffic casualties can perhaps, at best be understood in terms of the labour lost to the nation's economy.[39] This was further expatiated when Pratte argued that

persons injured in accidents on Nigerian highways and streets no longer participate in the economic mainstream and this amounts to a loss of labour of millions of person's years to the nation.[40]

Paul in North-West, Nigeria, discovered in his studies showed human factor was a major cause of fatal road crashes in Nigeria, in his report over-speeding accounted for (27.7%), tyre burst (17.6%), loss of control (15.5%) and dangerous driving (13.6%). The study also discovered that certain characteristics of the road such as bridges (24.9%), built-up areas (24.9%) were the cause of accident while sharp bend (21.9%), U-turn/intersection (13.8%), stationary vehicles (6.2%), slope (4.2%), market (2.7%), potholes (1.4%) also contributes significantly to accidents along Zaria-Kaduna Expressway.[21]

Aworemi et al in Lagos, South-west, Nigeria reported that human, vehicle, roadway and environment had significant contribution of about 79.4% on the road traffic crashes in the study area. The human characteristics he noted includes; inattention, cigarette, medical conditions, alcohol and drug abuse; inattention to the roadway and surrounding traffic, speeding and disregarding traffic law and/or traffic control devices, which could result from confusion or unfamiliarity with the roadway. However, human factors they concluded were without doubt the most complex and difficult to isolate, as they are almost all very temporary in nature.[41]

Agbonkhese et al reported extensively in their study the influence of over speeding in the cause of road crashes in Nigeria. It was reported that an increase in average speed is directly related both to the likelihood of a crash occurring and to the severity of the consequences of the crash.

Travelling too fast for prevailing conditions or above the speed limit contributes to road traffic accidents. The risk of being injured increases exponentially with speed much faster than the average speed. The report cited the death associated with indiscriminate use of Sirens coupled with very high speed rates by private or political public office holders such as bank vehicles' drivers' or government vehicles' drivers' reported to cause a lot of road traffic accidents in Nigeria.[39]

Road crashes in Nigeria are not different from other African countries. Thuso et al reported that developing economies like Botswana have high levels of accident rates which are accounted for by many factors including road designs and most importantly driver behaviour.[42] In Saudi Arabia, Ansari et al posited that over 50% of accidents are caused by drivers speeding. Other causes include not obeying road signals and using incorrect methods of overtaking, U-turning and parking; an insignificant number was caused by alcohol.[43]

The challenges of road traffic accident necessitated the decision of the Federal Government of Nigeria to establish a Lead Agency with specific responsibilities to address the wanton destruction of lives and property on the highways. This became necessary because the nation lacks capacity to provide advance rescue services to handle emergency arising from road accidents.[44]

Eze reported in his study that most victims of RTA who could have survived during road crashed die as a result of poor handling, timing or even badly managed pre-hospital trauma life supported services. The worst scenario he stated was when such crashes occur at night in the country,

which hampers prompt search and rescue process due to poor visibility. There is also lack of necessary cooperation from the public and private hospitals who are not favourably disposed to receive victims of road crashes and provide them with the desire Medicare with dispatch.[45]

However, the establishment of FRSC by Decree No 45 of 1988 as amended by decree 35 of 1992 later cited as FRSC act (CAP 141) Laws of the Federation of Nigeria (LFN) 1990 and re-enacted as FRSC (Establishment) Act 2007 was in line with the principles of good governance. This singular act was responsible for drastic and sharp reduction in the reported cases of road traffic accidents in 1988, the year that the Federal Road Safety Corps was established.[46]

2.4 REVIEW OF HADDON MATRIX

Today, the work of Haddon (1980) is the most commonly used paradigm in the injury prevention field. Developed through the application of basic principles of public health to the problem of traffic safety, the Haddon Matrix as it is popularly called is used as a tool to assist in developing ideas to preventing injuries of many types. It provides a compelling framework for understanding the origins of injury problems and for identifying multiple counter-measures to address the problem.[47]

Dr. William Haddon has been described as the visionary of injury epidemiology and injury control, he was the director of the National Highway Traffic Safety Administration and the Insurance Institute for Highway Safety in the 1960s and 1970s. He used these positions to contribute significantly to road traffic safety.[48]

The basis behind his work was the simple argument that injuries can be examined within an epidemiologic framework. In its classic sense, the epidemiology triad considers the interaction of three factors in the development of disease; the host, the agent, and the environment. A key element in Dr. Haddon's work was the contention that the epidemiologic framework could be used to identify risk factors for injuries. Moreover, these risk factors were not just those related to the host, but also those pertaining to the vehicle, and the road (environment). He therefore, maintained that these factors also were key elements in the development of injuries.[47, 48]

To understand the factors underlying injuries from motor vehicle accidents, Haddon proposed that the elements of the epidemiology triad should be considered in unison with the crash sequence. The crash sequence can be examined in terms of three items; the circumstances surrounding the event prior to the crash occurring, the circumstances involved during the crash, and those involved after the crash. The Haddon Matrix illustrates how the crash sequence interacts with human, environment, and vehicular factors to define the frequency and severity of injury.[48]

Table 2.2: Typical Haddon Matrix

PHASE	HUMAN FACTORS		ENVIRONMENTAL FACTORS
Pre-crash	- Information - Attitudes - Impairment - Police Enforcement	- Roadworthiness - Lighting - Breaking - Speed management	- Road Design And Layout - Speed limits - Pedestrian facilities
Crash	- Use of restraints - Impairments	- Occupant restraints - Other safety devices - crash protective design	- Crash protective - Roadside objects
Post-crash	- First-aid Skills - Access to Medicines	- Ease of Access - Fire Risk	- Rescue Facilities - Congestion

Mateja in Slovenia also reported the strategies of injury prevention using Haddon Matrix; in his work he described the matrix as combining four columns for epidemiological factors and three rows for time phases. The Epidemiological factors defined by the columns in the matrix refer to the interacting factors that contribute to the injury process. The host is the person at risk of injury (e.g. driver of the vehicle) the agent of injury is energy (e.g. mechanical, thermal …) that is transmitted to the host through a vehicle (e.g. object, person …). While the social environment covers such social and legal norms as alcohol consumption or policies about licensing drivers. Physical environment include all characteristics of the setting in which the injury event takes place (e.g. high way …).[49]

The phases in the matrix refer to pre-event, event and post-event phases of the process that result in injury problem. The Pre-event phase encompasses all that determines whether an accident will take place (e.g. careless behavior, equipment design, surface with obstacles…). The Event phase includes all that determines whether injury will occur and its nature and severity once the accident takes place (e.g. use of helmet, height of equipment, protective surfacing, standards…). The Post-event phase encompasses all that determines the extent to which personal injury is limited and repaired after the actual accident is over (first aid, emergency and hospital treatment, rehabilitation programs…).[49]

The modern concept of Haddon Matrix as transform from Epidemiologic paradigm to Public Health Approach to Road Traffic Accident Crashes control globally, today, the work of Haddon is the most commonly used paradigm in the injury prevention field. Developed through the application of basic principles of public health to the problem of traffic safety, it is a tool to assist

in developing ideas to preventing injuries of many types. It provides a compelling framework for understanding the origins of injury problems and for identifying multiple countermeasures to address the problem.[50]

Sumaila in Minna, North-Central, Nigeria described modern innovations to the application of Haddon Matrix for crash control, using the framework, the 4-Es namely: Engineering (Roads and vehicles), Enforcement (laws) Education (Public awareness) and Emergency response (Post crash Medicare) have been developed as the main thrusts of accident prevention and control across the world. But most recent attempts at managing road safety in developing countries are encapsulated in the Safe system approach which regards road users as the weakest link.[51]

The Nigerian Road Safety Strategy (NRSS) 2016-2020 was a product of the Safe System approach to road safety management; it begins with the acceptance of human error and realization that Road Traffic Crashes (RTCs) cannot be completely avoided although most are preventable. It regards the road user as the weakest link in the transport chain, unpredictable and capable of error in spite of his level of education and access to information. The approach therefore transfers a major share of the responsibility from road users to those who design the road transport system but does not encourage road users' abdication of own duty. The goal of the safe system is to ensure that when crashes occur, they do not result in serious human injury or death. This is sought to be achieved by focusing on keeping the impact energies that can produce either death or serious injury below the threshold.[52]

Oyemaechi et al also posited that emphasis should be placed on the human factor. They opined that in Nigeria there is need to ensure that only drivers who are trained and certified are allowed to drive. Sadly, they noted this responsibility of the FRSC has not been effectively discharged. Individuals are issued driver's license without any certification of their driving competence and fitness to the extent that even blind or lame persons may be in possession of driver's license. The citizens more or less see a driver's license as a tool for identification and not for the purpose for which it is intended.[50]

The care given to an accident victim is crucial in the determinant of morbidity and mortality related to RTCs, to these Solagberu et al. in their study in Ilorin described the poor state of pre-hospital care of accident victims in Nigeria.[53] Mock et al described the significant of care given to victims of road crash in their publication; they posited that after a road crash, an organized pre-hospital care, as well as prompt medical attention, has proven to reduce the morbidity and mortality among the victims. In Nigeria, the state of post-trauma response is very poor.[54]

Adopting a public health approach with a view to tackling Nigeria's RTA burden mandates the creation of data systems that provide detailed, robust, consistent, and comparable information across accident sites nationwide over time. Analyses of such data will be crucial for highlighting the problem and for developing, testing, targeting, and evaluating interventions.[53, 54]

2.5 KNOWLEDGE AND USE OF SAFETY MEASURES AMONG COMMERCIAL DRIVERS

Knowledge and use of road safety rules, signs and symbols by road users, particularly intercity commercial vehicle drivers, are very important in the prevention of Road Traffic Crash (RTC). Drivers who do not have the knowledge of the high-way codes will not be able to use roads well despite the availability and accuracy of the road signs and symbols. These are put in place to reduce/stop the incidence of RTC. There are various studies that assessed the knowledge of drivers on the road signs and its use.

A Norwegian study of driver's knowledge of speed limit varied as older and experienced drivers had higher knowledge. Also, those who were stopped due to speed offences had increased knowledge of the speed limits and the relationship between speed and RTC. However, in the case of Nigeria, it has been documented that drivers especially commercial drivers do not obey traffic rules and regulations, observe speed limits or traffic signs on highways. Many park their vehicles improperly on the roads with no thought of the other road users.[57]

In a study in Lagos, Nigeria the drivers had poor knowledge of road signs (59.0%) and poor knowledge of maximum speed limits (100%).The mean score for road sign test was 32.3%±12.4 while for maximum speed limits it was 9.9%±16.7. The highest proportion of drivers who had poor knowledge scores were among the oldest (97.1%), least educated, (91.9%) and least experienced (89.5%) drivers.[58] A similar study by Onuka AOU et al in Southwest Nigeria showed that 59% of commercial drivers repeatedly disobey speed limit, 75% wrongfully

overtake another vehicle, and 62.2% did not obey road signs/pavement markings where available.[25]

2.6 DRINK-DRIVING AMONG COMMERCIAL VEHICLE DRIVERS

Drinking and driving increases the risk of being involved in a crash, as well as the severity of resulting injuries. The driving starts to be impaired at very low levels of alcohol consumption, with the risk of crash involvement growing rapidly as consumption increases. The vast majority of adult drivers are affected or impaired with a blood alcohol concentration (BAC) of 0.05 g/dl. At a BAC level of 0.1 g/dl, the crash risk is approximately five times higher than that of someone with a BAC level of zero.[55, 56] Young and novice drivers who drink and drive have a greatly increased risk of a crash compared to more experienced drivers.[10] The effects of alcohol impairment are magnified when combined with fatigue. This explains why alcohol is considered a particular risk for commercial drivers, who spend long hours on the road and also have legal responsibilities for the passengers or cargo they carry.

Studies have shown the relative risk of crash involvement starts to increase significantly at blood alcohol concentration (BAC) level of 0.4g /dl.[57] In Nigeria the legal limit of alcohol is 0.05g/100ml blood alcohol concentration level, but enforcement of the law is weak because alcohol testing equipment is unavailable.[58]

Generally, the rates of alcohol impaired driving (BAC = 80g/dl) among drivers involved in crashes ranges from 30% to 53% in low income countries while in high income countries, 20% of fatally injured drivers have BAC in excess of legal limited.[59] A study among commercial drivers in Michigan, USA showed that the mean score rate for alcohol screening was 0.38 $\pm$ 1.2 which was higher than the government drivers. Another study by Oluwadiya et al in Ibadan, Nigeria showed the prevalence of paraga (an alcoholic herbal preparation) use among commercial drivers was 43.2% out of which 25.6% of them had been involved in RTC after taking the drink.[60] Yet another study in Nigeria by Ogazi C showed that 67.2% of commercial drivers admitted to alcohol consumption driving the day, while in Ghana, 64% of all intoxicated drivers were commercial drivers in a study by Asimah G et al.[61, 62]

Similar study among commercial drivers by Omika AUO et al in South west Nigeria showed that 15% of commercial drivers drove under the influence of alcohol. An exercise to control drunk driving reduced road traffic crash fatalities by 28% in 1999 in Scotland.[63] The knowledge of commercial drivers concerning fatigue as a risk factor for RTC in a study by Aworemi JR et al in south west Nigeria showed that all the commercial drivers identified fatigue due to long hours of driving as a risk factor for RTC.[64]

2.7 CONDITIONS OF NIGERIA ROADS

The roadway as an environmental factor in the causation of road traffic crash is very crucial. The poor road conditions in Nigeria have been cited as a reason for increase road traffic crash.

Federal Road Safety Corps (FRSC) reported that Nigerian roads were the second worst in the world and that state of the roads placed the country on the 191st position out of 192 countries

whose roads were currently rated based on safety standards. The study in Akwa Ibom, Nigeria revealed that a greater percentage of the roads in the area are unpaved and it is recommended that efforts should be made to increase the length of paved roads in the area to attract socio-economic development.[65]

In the developing world context, the road is a major factor in RTA. Many roads have become death traps with potholes dotted along the length and breadth of the roads. Often roads are blocked by broken-down vehicles or by garbage dumped by agencies of government. Road signs, on the very few occasions they are present, are often unhelpful if not deceptive. It is government that builds and has the responsibility to maintain these roads. Uncompleted projects are often hastily 'commissioned' often for the ulterior motive of futile immortalization of a name. The end result is that the roads are very poorly built and soon lapse into disrepair, posing danger to man and machine. [65]

2.8 SAFETY OF TYRES

Vehicle tyres have certain features that determine the safety level of such tyres. Drivers should have the basic knowledge of tyre safety measures in order to prevent road traffic crash. A driver should check the safety level of his vehicle tyres before purchase or embark on a journey. This includes expiry date of tyre, tread wear indicator, tyre specification, load index and speed rating of the tyres. The sidewall of a tyre contains information for one's safety and knowledge. Being able to read sidewall markings will help one better understand the performance of each tyre and

provide information for mounting and servicing the tyre. The sidewall provides valuable information about the tyre including the specifications, the brand, and the type of construction. All numbers are standardized and recognized by tyre manufacturers around the world.[66]

2.8.1 TYRE FUNDAMENTALS[67]

Federal law requires tyre manufacturers to place standardized information on the sidewall of all tyres. This information identifies and describes the fundamental characteristics of the tyre and also provides a tyre identification number for safety standard certification and in case of a recall.

Tyre expiry date[67]

All tyres have a date code imprinted on the sidewall. The date code reveals the week the tyre was manufactured, and the year. Before year 2000, the date code had three digits. Since 2000, it has had four. The first two digits are the week of the year (01 = the first week of January). The third digit (for tyres made before 2000) is the year (1 = 1991). For most tyres made after 2000, the third and fourth digits are the year (04 = 2004). This can be used in determining the expiry date of the tyres.

Every tyre is designed with a tread wear indicator (TWI) which is a raised section moulded into the grooves of a tyre. In passenger car tires, the TWI is around 1.6 mm and the tyre shoulder is labelled with TWI or the ∆ symbol.

TWI indicates the tread wear limit and helps vehicle owners understand the tread wear so they know when to replace the tires. When the tread is levelled with the TWI, the tread pattern will be separated and the tires need to be replaced immediately.

Note: When tread wear limit is reached, handling, braking, and water evacuation will significantly be decreased. Extremely dangerous!

Sidewall Cracks

Tyre shows signs of deterioration

If a person's tyres have any of the conditions mentioned above, it is recommended that the person visits the nearest Professional Service Center to replace the tyres.[70]

Tread wear of a tyre can also be checked by penny or coin test. The depths of the vertical and horizontal grooves in the tyre are checked at interval of about 15" apart round the tyre by using a coin. The tyre is considered safe if part of the coin's head is obscured. Otherwise, the tyre is not safe for car use.[71]

How to Check Tyre Tread Depth: The Penny Test[67, 68]

When it comes to checking tire tread, there are a number of methods that can help to know if it's time to replace a tyre. Heavily worn tread will prevent a tyre from performing as designed and can lead to unsafe driving conditions. One of the simplest, most common ways to check tread depth requires nothing more than a penny and a few moments.

In measuring tyre tread depth with a Coin, U.S. coins can be substituted for a tire tread depth gauge as tyres wear to the critical final few 32nds of an inch of their remaining tread depth.

A penny is placed into several tread grooves across the tyre. If part of Lincoln's head is always covered by the tread, then more than 2/32" of tread depth remaining.

2/32" remaining tread depth

A quarter is placed into several tread grooves across the tyre. If part of Washington's head is always covered by the tread, then more than 4/32" of tread depth remaining.

4/32" remaining tread depth

A penny is placed into several tread grooves across the tyre. If the top of the Lincoln Memorial is always covered by the tread, it means more than 6/32" of tread depth remaining.

6/32" remaining tread depth

Once the approximate remaining tread depth is determined in the first location, the measurement is completed by measurement of each tire by placing the coin into additional locations at least 15

inches apart around the tyre's central circumferential groove, as well as in its inner and outer grooves. This will help detect uneven wear caused by mechanical or service conditions.

Other Ways to Check Tire Tread[68]

Tread Depth Gauge - A simple way to check the tyre tread depth is by using a tread depth gauge. One can find tyre tread depth gauges at a local auto parts store. There are many models available, but an inexpensive simple graduated probe gauge will work just fine. All is required is to stick the probe into a groove in the tread and press the shoulders of the probe flat against the tread block and read the result. All gauges should measure in both 32nds of an inch and millimetres.

Tread Wear Indicator Bars - Another indicator of worn out tread already lives in a tires themselves. Every performance, light truck, or medium commercial tyre comes equipped with indicator bars (or wear bars) embedded between the tread ribs at 2/32". They're there to help monitor tread depth and make decisions about tyre replacement. Just check if the tread is flush with the indicator bars. If they are, it's time to replace the tire.

2.9 EPIDEMIOLOGY OF TYRE RELATED ACCIDENTS

Road transport is the most commonly used mode of transportation in Nigeria and it accounts for more than 90% of the sub-sector's 3% contribution to the Gross Domestic Product (GDP).[69] Road activities involve the conveyance of passengers en-masse or in small numbers, the

transportation of animals, farm produce and merchandise and rendering of mobile services (banks, libraries, clinics, etc.). Road networks are the arteries of infrastructure in the modern society contributing significantly to the distribution of goods and human population.[70] These are the single most important capital asset in the transport sector of any country and contribute 90% of mobility while other means account for 10% in Nigeria.[71]

Development of roads is no doubt a technological breakthrough so also is the development of automobiles. This breakthrough has however given rise to a menace every society has come to live with. It occurs every day across the world and it remains the single commonest cause of death among youths worldwide. Considering the loss of valuable lives and talents to the nations, pains and financial strains inflicted on several families, road traffic accidents remain a menace that should be fought in all its aspects.

The causes of crashes and fatalities are usually complex and involve many factors. Researches on road traffic crashes have shown that there are 3 major classifications for the causes of these crashes namely:

1. Human factors/ driver factors
2. Mechanical factors/ vehicle factors
3. Environmental factors/ roadway factors

A percentage of crashes are caused by mechanical failure of a vehicle, such as some form of tyre failure, brake failure, or steering failure. The vehicle and roadway interaction like skid resistance play a major role in stopping the vehicle from encroaching the off road features like wheelbase,

median and other traffic signage. Other vehicle characteristics like wheelbase and height of center of gravity play an important role in rollover crashes. Improvements have been made in the manufacture of tyres and vehicle design; however, defects can still occur or be the product of poor vehicle maintenance. Mechanical factors most at times result from irregular and poor maintenance of vehicle which often result in RTC. This constitutes about 12% of road crashes. Sometimes such irregular maintenance may lead to stoppage of the vehicle, or development of other faults that affect the control of the vehicle, especially when the vehicle is on high speed, these could lead to crashes.[70, 71, 72]

Crashes due to mechanical factor have to do with malfunctioning of the vehicle which eventually leads to loss of control of the vehicle and invariably to RTC. These factors include malfunctioning of engine, poor steering mechanism, tyre burst, brake failure, failed wipers during rainy season, spilled oil leading to crashes, faulty security gadgets, defective lighting system, defective horn faulty wheel balancing and alignment, absence of rear mirror, leaking fuel that may result to fire outbreak,[61,62] exhaust fumes or smokes leading to temporary road blindness, lack of reflective triangle, incompetent wheel nuts, electrical fault, inconsistency in vehicle load design, lack of seatbelt,[69] etc. studies have shown that more than 60% of all road traffic crashes are related to vehicular issues. There is no direct evidence that points to defective or sub-standard tyres as the cause of a particular crash. The closest data element is "flat tyre or blowout". Even in these cases, crash investigators do not record what caused the tyre failure. Tyre failures, especially blowouts, are typically associated with rollover crashes.

It is possible that a combination of lesser quality tyres (lesser quality being defined here as designs that do not adequately dissipate heat, which causes the tyre to rapidly build-up heat which ultimately causes the tyre failure) being operated in an under-inflated state and/or an overloaded state could account for many of the tyre failures, since both under-inflation and overloading increase heat build-up in the tyre. Severe under-inflation coupled with an emergency steering maneuver could cause the tyre to "de-bead," i.e., separate from the rim, which could "trip" the vehicle and cause it to roll over.

A tyre-related risk of some kind or another has been involved in approximately 15% of accidents investigated in the 2000s, which is a slightly lower figure than in the 1990s. During this decade there have been, on average, 33 tyre-related accidents annually. A tyre-related risk is involvedin every seventh fatal crash. In wet conditions, some kind of tyre related risk has been involved in 9 percent of incidents in the 2000s, while in the 1990s the proportion was almost 15 per cent.[72]

The National Automotive Sampling System - Crashworthiness Data System (NASS-CDS) data for 1995 through 1998 were examined and average yearly estimates are shown in Table below. The table shows that there are an estimated 23,464 tow-away crashes caused by tyre blowouts or flat tyres per year. Blowouts cause a much higher proportion of rollover crashes (4.81 %) than non-rollover crashes (0.28 %); and the rate in light trucks (6.88 percent) is more than three times the rate in passenger cars (1.87%).[70]

Table 2.3 Estimated Annual Average Number (1995-98 NASS) and Rates of Blowouts or Flat Tyres Causing Tow-away Crashes[31]

	Tyre Related Cases	**Percent Tyre Related**
Passenger Cars Total	*10,170*	*0.31%*
Rollover	1,837 (18%)	1.87%
Non-rollover	8,332 (82%)	0.26%
Light Trucks Total	*13,294*	*0.99%*
Rollover	9,577 (72%)	6.88%
Non-rollover	3,717 (28%)	0.31%
Light Vehicles Total	*23,464*	*0.51%*
Rollover	11,414 (49%)	4.81%
Non-rollover	12,049 (51%)	0.28%

Examination of these crashes by speed limit of the highway, (knowing that the heat build-up is related to speed) revealed that of the 414 fatalities, 306 (74 %) and also 6,590 (64 %) out of the 10,275 injuries occurred on highways with posted speed limits of 55 mph or higher.[55]

Table 2.4 shows the estimated number of fatalities and injuries in those cases in which a flat tyre/blowout was considered the cause of the crash. There are an estimated 414 fatalities and 10,275 non-fatal injuries in these crashes.[55]

Table 2.4 Injuries/Fatalities in Crashes Caused by Flat Tyre/Blowout[28]

	Non-fatal AIS 1	**Non-fatal AIS 2**	**Non-fatal AIS 3**	**Non-fatal AIS 4**	**Non-fatal AIS 5**	**Fatalities**
Number of Injuries	8,231	1,476	362	155	51	414

2.10 FACTORS RESPONSIBLE FOR THE USE OF LOW QUALITY TYRES[72]

Motorists buy used tyres for a variety of reasons such as the low price, for use as a spare, or because owners don't plan on keeping the vehicle for very long. They buy them assuming that used tyres are safe. While many used tyres are purchased because of tight budgets, consumers across socio-economic strata are lured by one thing—the appearance of a bargain. What they don't bargain for is the lack of safeguards that allows potentially unsafe used tyres to make their way back into the market.

According to the Rubber Manufacturers Association, a tyre industry trade group, an estimated 30 million used tyres are sold to motorists annually. That represents approximately 10 percent of the 318 million new tyres sold in the U.S. annually.[72] The bulk of the used tyre market is supported by large multi-state recyclers who do little more than give each tyre a visual inspection to

determine that tread depth is adequate and wholesale them back into the market. Tyres that have at least 2/32nds of an inch of tread left and no obvious visual defect are often cleaned and even painted black to make it appear new and then resold. The scope and magnitude of the used tyre problem is an unknown because the business operates with no oversight.

In the statistics collected by European companies involved in the collection of used tyres, statistics has demonstrated that there has been an alarming rise in the number of tyres with the legal minimum tread depth. 70% of all used tyres collected are around this minimum and about 15% are under the legal minimum.[73] Safety Research & Strategies began looking into the used tyre market after finding that a significant number of crashes documented in its "aged" tyre research were purchased used. These tyres, most of which were six years old or older, were sold to consumers who believed they were getting tyres that were safe, based on their outward appearance.

2.11 RISK ASSOCIATED WITH USE OF LOW QUALITY TYRES

Tyres are undoubtedly the most critical safety component on a vehicle. Where the rubber meets the road affects traction, handling, steering, stability and braking. Because of this, a sudden tyre failure can have serious consequences particularly if it occurs at highway speeds in a vehicle with a high center of gravity.

Many tyres today are easily capable of going 60,000 to 80,000 miles[74] or more provided they are properly installed, maintained, aligned and inspected regularly. With proper care and "normal" use, most tyres will go the distance without a problem. But sometimes tyres fail, even if the

failure rate is only one in a million tyres, a trial lawyer will argue it is one failure too many for his clients. Tyres are a vehicle's only contact with the road; therefore the condition of a vehicle's tyres is crucial to its safe use.

NHTSA estimates that tire failure causes approximately 11,000 crashes a year. The most common cause of failure includes tread separations, blowouts, bald tires and under-inflated tires. Under inflated tires or worn down treads are a major cause of failure. Under-inflation has also been said to be responsible for poor fuel economy, sluggish handling, longer stopping distances and increased stress on tire components.[75]

The percentage of vehicles experiencing tyre problems is significantly higher among vehicles that rolled over as compared to vehicles that did not roll over for all vehicle body types: passenger cars, pickups, SUVs, and vans. Of all SUVs experiencing tyre problems in the pre-crash phase, 45 percent rolled over. For the other body types (passenger cars, pickups, and vans), fewer than 25 percent of the vehicles experiencing tyre problems rolled over. Thus, tyre problems experienced in the pre-crash phase were more likely to result in a rollover in SUVs than in other vehicle types.[76]

The Department for Transport revealed that illegal, defective and under-inflated tyres were responsible for more than 1,210 road casualties in Great Britain in 2010. Road Casualties in Great Britain report shows that 18 motorists were killed during the year from defective tyres bringing the number of tyre related deaths in the U.K. to 164 between2005 to 2010.[68] Also, vehicles of drivers found to be at fault in high-speed accidents were found to be six times more likely to have worn tyres than those of the other drivers involved. During the period 2000–2005 there were a total of 1,292 accidents; of these 198 were incidents relating to the tyres of the party

responsible for the accident. A total of 248 people died in tyre-related accidents and 73 were severely injured.[69]

Road tyres must have a minimum tread depth of 1.6mm to be roadworthy. Driving on anything less is extremely dangerous especially in wet weather; low tread depth cannot disperse the water quickly enough allowing water build-up between the tyre and the road surface. When this occurs the car loses grip with the surface of the road and may easily and unexpectedly slide (aquaplane). Loss of grip from poor performing tyres is most dangerous in an emergency situation when a car needs to stop quickly, or change direction quickly. Then, worn tyres can kill!

2.12 ROLE OF REGULATORY AGENCIES IN ROAD TRAFFIC CRASH PREVENTION

With the continued rising trend of road traffic accidents in Nigeria then, which placed it as one of the most road traffic accident (RTA) prone countries worldwide (second to Ethiopia) (FRSC, 2012), the Nigerian Government saw the need to establish the present Federal Road Safety Corps in 1988 to address the carnage on the highways.[77]

The Federal Road Safety Corps (FRSC), Vehicle Inspection Office (VIO) and the Nigerian Police (Motor Traffic Department) all have a common goal of prevention and reduction of accident occurrences in Nigeria. The functions of the FRSC generally relates to making the highway safe for motorists and other road users; recommending works and devices designed to eliminate or minimize accidents on the highways and advising the Federal and State Governments including the Federal Capital Territory Administration and relevant government agencies in the localities where such works and devices are required and educating motorists and members of the public on the importance of discipline on the usage of roads.[78]

Directorate of Road Traffic Service, (DRTS), popularly known as Vehicle Inspection Office (VIO), is a government agency saddled with the task of transport management on Nigerian roads within the Federal Capital Territory (FCT) and the 36 states of the federation. DRTS was established by law to specifically issue driver's license, vehicle papers registration, production and issuance of plate numbers and inspection of vehicles.[79]

Akpoghomeh in his study critically appraise the role and responsibilities of FRSC as that of making the highway safe for motorists and other road users; recommending works and devices designed to eliminate or minimize accidents on the highways and advising the Federal and State Governments, including the Federal Capital Territory accordingly; and educating motorists and members of the public on discipline on the highway.[80]

Specifically, the Commission covers about 18 items on its statutory responsibilities, which encompass preventing and minimizing of road traffic accidents, clearing of obstructions on the highway, public enlightenment, providing prompt attention and care to victims on road traffic accidents. It also involves determining and enforcing speed limits for all categories of roads and vehicles, cooperating with agencies and groups engaged in road safety activities to prevent highway accidents, and conducting researches into the causes, effects and methods of preventing road traffic accidents.[80, 81]

To achieve effective monitoring and evaluation of road crashes data in Nigeria, the FRSC developed and adopted certain tools and documents to ensure efficient capturing of information

through the Establishment and Enabling act of the organization and its various amendments; the Accident Record files; the Road Transport Safety Standardization Scheme (RTSSS); Public Awareness Manuals and Printed Materials and the Nigerian Road Safety Strategy (NRSS).[81]

Sani stated in a public lecture organized for FRSC officers in Jos, North-Central, Nigeria the various objectives of the commission which includes to educate road users most especially drivers on the importance of road discipline and proper use of roads and highways. The public enlightenment unit of the FRSC he stated is charged with the responsibility of providing public education to educate road users in general and drivers in particular on the rules guiding road usage and the consequences of flagrant disobedience of traffic rules and regulations. The strategies adopted include: organization of workshop/seminars/lectures and drivers' improvement courses, carrying out rallies at motor parks, literacy campaigns inculcating in the road users the knowledge of the highway traffic code, playing of jingles on radios and televisions among others.[82]

The FRSC over the years have brought to bear several reforms in a bid to making the Nigerian road safe to all motorists, these reforms are revamping of the National Uniform Licensing Scheme-spectrum for a robust identity management system using biometrics to support unique identification of licence holders and a plate numbers regime tied to individual owners and not just the vehicle; launching of New Biometric Drivers Licence ,the biometrics driver's licence, which meets international standards, makes multiple possession by any driver impossible. Making roads safer through increasing highway enforcement-in implementing its critical mandate of accident prevention and making roads safer, the FRSC within the reforms initiated by this administration, embarked on strategic activities for preventing and minimizing road traffic

carnage (RTC) through enforcements as well as providing prompt attention and care to victims of road crashes.[86]

Establishment of Modern Emergency Centre Adoption of the Nigeria Road Safety Strategy (2014 – 2018): The Nigeria Road Safety Strategy (NRSS) document was designed to pave the way for concerted national action on reducing fatal and serious injury on Nigerian roads. Adoption of the Road Transport Safety Standardization Scheme (RTSSS): Installation of Speed limit Devices Improving fleet management and road safety literacy.[83]

The responsibilities of ensuring safe road in Nigeria is not limited to FRSC alone, Somuyiwa et al reported that by law, the FRSC is empowered to produce while the VIOs are to issue driver license in the country. The operational procedure is that VIOs carry out driver testing and recommend successful candidates to FRSC for production of their license. The produced license would be forwarded to the VIO for issuance. He however, lamented that this legal arrangement makes the management of driver license rather untidy. The result is that the Nigerian driving population is faced with many forged and invalid driver licenses, multiple issuance from different states of the country and underage and sometimes aged licensed drivers. The fact that the issuing authorities are agencies of state governments, it is not surprising that emphasis is on revenue generation casting doubts on the credibility of the process and the competence of the recipients.[84]

At the global scene the International Federation supported by the Global Road Safety Partnership created in 1999, the Global Road Safety Partnership (GRSP) brings together Governments and governmental agencies (UN), the private sector and civil society organizations to address road

safety issues in the World. Global Road Safety Partnership is operational in 20 countries on every continent committed to support National Societies to either reinforce existing services and resources or identify ways to become more involved in road safety.[85]

World Health Organization also created a global platform, called the United Nation road safety collaboration, which gathers twice a year about 40 organizations involved in road safety. The International Federation and GRSP are active members of this platform by doing advocacy and sharing good practice.[86]

Globally, more than 80 countries around the world sponsored a United Nations resolution declaring a Decade of Action for Road Safety in May 2011. The resolution aims to save an estimated five million lives by 2020 through a five-pillared approach: improved road safety management, safer roads and mobility, safer vehicles, safer road users and an improved post-crash response. The U.N. initiative has already produced a series of "how to" manuals designed to assist governments in implementing recommendations from the World Health Organization's report on road traffic injury prevention. Additional manuals cover topics such as pedestrian safety, seat belt use, drinking and driving and helmet safety.[86]

In addition, the 100 million Red Cross Red Crescent volunteers worldwide work at the heart of communities and are in direct contact with the general public. They are extremely effective in educating and informing people about safe behavior on the roads, not only when driving but also when using the roads as pedestrians or cyclists. Youth make up more than half of Red Cross Red Crescent volunteers and are particularly persuasive when they work as peer educators with other young people. National Societies are recognized globally as leaders in first aid. They deliver first

aid courses to the general public and to targeted people, strengthening communities' capacities to prepare and respond to road crashes.[85, 86]

2.13 CHALLENGES TO ENFORCEMENT OF ROAD SAFETY REGULATIONS

Is a general knowledge that most Nigerian drivers have no regards whatever for traffic laws and regulations: They do not observe speed limit any more than they obey traffic signs on the highway. With no thought on the other road users, they overtake anywhere and anyhow.[35] Maduagwu further stated that Nigerian drivers even park parallel on the middle of the road to greet one another or to chat, holding other Traffic to ransom. He however, attributes this to discipline which is a major manifestation of the so-called Nigerian factor that is noticed on the roads.[87] Many are of the view that in order to be effective in traffic law enforcement, policing activities should be structured so as to pose a meaningful and immediate deterrence threat would be traffic offender.

Gana et al in their assessment of challenges of enforcement of traffic laws and road safety regulations identifies the following as major challenges: Lack of adequate funding: Less than adequate funding through annual budgetary releases to FRSC have not been enough to execute capital projects and cater for overhead costs. He posited that about 95% of residential and office accommodation in the Crops are rented. A lot of money is paid on maintenance of patrol vehicles, ambulances, motor bikes and rent leaving little or nothing for other projects like purchase of more heavy duty tow vehicles for removal of obstructions on the highways and other services.[17]

In addition, lack of Adequate Communication gadgets: For efficiency and effective operations like patrolling the highways and rendering rescue services, vital operational equipment like Walkie Talkies are required to enable Road Marshals to share information among themselves. These equipments are also needed to alert other patrol teams at different locations ahead wherever there are reported case of emergencies and tracking recalcitrant traffic offenders.[17]

Regular and effective training of Manpower was also identified by Gana et al in their study. The need to have officers and men well trained in related field like law to prepare them for prosecution of traffic offenders cannot be overemphasized. Other areas are rescue and emergency services, ICT and human resource development among others. This would build more confidence in staff to discharge their duties more firmly.[17]

Among the challenges bedeviling enforcement of traffic regulations in Nigeria Gana et al identified was lack of inter-Agency Cooperation: FRSC receives less than adequate cooperation from key government agencies. For instance, whenever the Corps embarks on Special operations like enforcement of use of safety helmets and end of year special patrols, the Nigeria police Force would be approached to assist provide security. Unfortunately, the expected cooperation is never forth coming. Similarly, some judges either for personal reasons makes judicial pronouncements that weaken the course of law enforcement. For example, inspite of the provision in Section 15 of FRSC (Establishment) Act 2007 that the operation of the Crops shall n the same vein, Gana et al posited that officers of the FRSC are regularly exposed to assault; cover all public highways, some judges have not accepted the position of the law on this, hence judgments have been awarded against FRSC whenever there is dispute.[17]

Violent traffic offenders have physically assaulted Road Marshals on duty several times simply because these offenders see FRSC staffs as defenseless since members of the Crops are not armed. Despite the provisions of Section 19 of FRSC (Establishment) Act 2007 which allows members of the Crops exposed to high risk to bear arms, the Federal Government is yet to grant administrative approval to that effect.[17]

Indiscipline and Lawlessness was also identified by the authors as constituting great challenges to enforcement of traffic regulations in the country. They reported that there is high level of indiscipline in the country exhibited by both the elite and illiterate members of the society especially as it regards Route Violation. Uniformed men drive against traffic and at times mount illegal road blocks causing obstructions on the road. Tanker and trailer drivers park indiscriminately on the highways with reckless abandon. Some Nigerians are not willing to wear safety helmets due to cultural biases because of their dress code.[17]

Furthermore, corruption and misconduct on the part of law enforcement officers make them to compromise. Such officers collect bribes from motorists and allow them to ply the highways with overloaded and rickety vehicles among other traffic offences. This is why serials traffic offenders continue to violate traffic rules and regulation with impunity.[17]

And lastly, lack of traffic signs on major roads poses serious challenges to traffic law enforcement. The present networks or roads are poorly constructed, not regularly maintained and in most cases, these roads do not have traffic signs. The absence of good roads creates traffic congestion and multiple road traffic accidents.[17]

These challenges were also reported by the Tanzanian government in its National Safety Policy document where it was extensively stated that there is weak compliance with existing road safety rules and procedures and lack of oversight and enforcement; lack of capacity in the majority of working level staff and members of the road safety council were part of reasons enforcement of rule was hampered. It was also reported that corruption and collusive practices and other outside influences are seriously impacting on road safety enforcement.[88]

2.14 NATIONAL AND INTERNATIONAL INITIATIVE TO PROMOTE ROAD SAFETY

Of all the systems with which people have to deal every day, road traffic systems are the most complex and the most dangerous.[10] However, series of safety initiatives and interventions have been implemented by national governments and international agencies to prevent the occurrence of road traffic injuries, minimize their severity when they occur, and reduce the severity of victims' injuries and the impact on other road users. This section provides an overview of the wide range of interventions for road safety. It is important to state that proven initiative in some settings may not easily be transferable elsewhere except with careful adaptation and implementation. Afukas noted that Bogota in Columbia has attempted to reduce exposure to risk through measures that include a mass transit programme for the vulnerable road users and restriction on trucks access to the city during certain hours of the day.[11]

One other road safety intervention in the Netherlands and the United Kingdom include providing pedestrian and cyclist with self-crossing road facilities. According to Macaulay and McInerney, this measure has reduced road injuries and deaths by 14%.[12] However, it was recommended that the facilities should be properly lit and devoid of many steps and long detours to be effectively

used by pedestrians. They stated further that in situation where these facilities are not well lit and free of detours, pedestrians are not likely to use them, but prefer to cross the highway at slightest opportunity. For instance, a study in Brazil found that many pedestrians who had been struck by vehicles had chosen to climb over the central traffic lane barriers rather than climb a flight of stairs to a footbridge.[13]

In Uganda, the construction of overpass for pedestrians on a major highway in Kampala had little effect either on pedestrian road behavior or on the incidence of crashes and injuries because of its inappropriate location.[23] From these analyses, it could be stated that measures that restraint access to different parts of the road network could enhance safety and reduce road deaths. Preventing pedestrians and cyclists from accessing motorways and preventing motor vehicle from entering pedestrian zones are two-well established initiatives for minimizing contact between high speed traffic and unprotected road users.

The use of speed bumps that are appropriately incorporated into road design and advisory speed limits at sharp bends has proved to reduce road traffic incidents (RTI), especially among pedestrians in Malaysia. A systematic review and meta-analysis confirmed that area-wide traffic-calming schemes can reduce road crash-related deaths and injuries. In addition, a 2004 summary of research findings suggests that automated speed enforcement has a significant impact on controlling speeding.[23] Another meta-analysis found that speed cameras led to a 14 percent reduction in fatal crashes and a 6 percent reduction in nonfatal crashes in less developed countries.[13]

An important road safety measure is vehicle occupant restraints. In this regard, the use of seat belt continues to be the most important form of occupant restraint. In Nigeria, for instance, legislation, information, and enforcement either by the Nigeria Police (NPF) or the Federal Road Safety Corps (FRSC) is necessary for ensuring driver use of these restraints. A study by Ogunsanya showed that use of seat belt reduces fatal injury by 23-30% in Nigeria.[7]

Another study found an average reduction of 9 percent in fatal injuries.[15] A review in the United Kingdom found that crash protection improvements reduced casualties 15 percent compared with 11 percent for drunk-driving measures and 6.5 percent for road safety engineering measures.[25]

In Nigeria, policies have been put in place to enhance road safety. For instance, FRSC in collaboration with Federal ministry of works (FMW), NPF and State governments have installed high speed limits and signs on the highway, conduct road safety audits and safety impact assessment, remove markets, motor parks, and other obstructions from highway in line with the right of way rule. Government has to provide designated parking areas on most highways to prevent obstruction caused by illicit parking. In some urban centers in Nigeria, government promotes the use of mass transit system and develops transport policies that encourage high occupancy vehicles. Example is the Bus Rapid Transit (BRT) in Lagos that ply a route specifically designated for it.[6]

In association with the FMW, the FRSC has promoted the design and construction of safer roads to ensure access and mobility, perform regular maintenance in line with approved work schedule for various road categories, develop and maintain campaigns on proper road usage and good road

behavior, and establish many trauma care centers and accident emergency clinic. In addition, the FRSC has implemented a uniform traffic law violation booking system nationwide, the Federal and General hospitals to maintain and share data on RTIs for proper information and policy making, attempted to enforce the installation of speed limiting devices on cars, enforce compliance against overloading and use of seat belt, and the ban of certain modes of transport in metropolitan areas.[7]

In 2007, African Leaders at the Road Safety Conference recognized the successes recorded in developed climes and adopted a declaration to mainstream road safety management in individual countries. 37 countries, including Nigeria assented to this declaration.[52]

The key turning point in road safety management occurred in March 2010 when the UN Global Decade of Action was endorsed by over 100 countries. The Decade of Action requires all assenting countries to make concerted efforts at reducing road crashes and fatalities by a minimum of 50% by 2020. The guiding principles underlying the Decade of Action are the development of a road transport system that accommodates human error and the vulnerability of the human body.[53, 54]

In response to the United Nation Global Decade of Action, the Government of Nigeria developed the Nigeria Road Safety Strategy (NRSS). The NRSS seeks to bring the issue of road safety to the fore, recognizing it as a pressing issue with potentially huge economic benefits and ensuring it is ranked equitably in terms of investment and allocation of funds.[52]

The NRSS provides a more targeted and coordinated approach for improving safety on Nigerian roads and invariably reducing road traffic crashes as it adopts a holistic system for managing all the variables that interact on the roads viz Road Users, Vehicles, the Road itself and Road (Safety) Managers. The UN's projected fatality rate for Nigeria in 2020 is 3.2 per 10,000 vehicles; the NRSS suggests a target of 2.5 per 10,000 vehicles for 2020 (or 50% of 5 per 10,000 vehicles recorded in 2012). Adoption and implementation of the NRSS will reduce the fatality on Nigerian roads thereby permitting continued productivity of the Nigerian people.[52]

Key strategic initiatives defined in the NRSS include: Establishment of a central database of road traffic data; Review and upgrade road design standards; Promotion of the construction and maintenance of roads and the road network to meet the mobility and access needs of all users; Capacity building for comprehensive inspection of all vehicle imports; Awareness campaigns on proper road use; Improved responsiveness to post crash emergencies; and Identification and deployment of funds to identified strategic activities.[52]

Prior to the development of the National Road Safety Strategy in response to Global need, the Federal and State government in Nigeria came up with other initiatives. These initiatives and other responses, however, have been driven by the FRSC and State Governments. Some of these include:

•Creation of the Motor Vehicle Administration (MVA) Department of the FRSC in 1992. The Department works with stakeholders such as the Joint Tax Board (JTB), Conference of Vehicle Inspection Officers, Motor Licensing Authorities and States Board of Internal Revenue to create an efficient MVA in the country, maintaining production of quality Number Plates for all

categories of vehicles and National Driver's Licence for certified driver applicants in the country.[52]

•Establishment of Lagos State Traffic Management Authority (LASTMA) in 2000. In the wake of Nigeria's newly rediscovered democracy, Lagos State Government established its own traffic management authority to combat the traffic management challenges in the State especially with regards to road users' compliance with traffic rules and regulations. Following the successes achieved in Lagos State, other State Governments have established similar agencies.[52]

•Establishment of the Lagos State Motor Vehicle Administration Agency (MVAA) in 2007. The responsibilities for the Agency include issuance of Certificate of Title of a motor vehicle; issuance and renewal of all categories of Motor Vehicle and Drivers License; Learners Permit and other related matters. The Agency also reserves the right to revoke, suspend or withdraw any license granted pursuant to the provision of the enabling law.[52]

Presentation of a memo to the National Councils on Works, Housing and Urban Development in 2009. The FRSC sought to strengthen the contribution of the States in Motor Vehicle Administration and Traffic Management by highlighting the need to establish State Agencies for the purpose of vehicle administration and requested the adoption of a Law on MVA.[52]

Other countries around the world have come up with various initiatives aim reducing road traffic accidents. The Nigeria Road Safety Strategy cited some countries around the world with peculiar strategic plan to meet the Global Decade of Action Plan vis-à-vis:

Ghana developed a National Road Safety Strategy in 2001 ((updated in 2006 and 2011)) with the vision of becoming the safest road transport system in Africa. A targeted goal of 20% decline in

the total number of road traffic crashes from the 2005 level by 2017 and reduce fatalities by 50%. The country has achieved a reduction of fatality rate from 36/10,000 vehicles in 1996 to 18.76 in 2008.[52]

In the same vein, Australia also developed a national action plan on National Road Safety Strategy prepared in 1992 (updated in 2010) with the vision to achieve no death. The targeted goal was to achieve 40% decrease in the number of road user fatalities per 10,000 inhabitants by 2010 compared with the 1999 rate. So far the country has achieve Reduction in road crash fatalities over the last 30 years, despite a 50% growth in population & registered motor vehicles.[89]

Canada was no different from other countries of the world; the Canadian government developed Road Safety Vision-2001, prepared in 1996 (updated in 2000) with the vision to have the safest roads in the world. The main goal of the action plan was to have 30% decreases in the average number of road users killed or seriously injured. To this end, the country hasachieved 10% decrease in the road crash fatalities; 16% decline in serious injuries and lowest death toll in > 60 years.[90]

Sweden was not left behind in the development of initiative to help achieve safe road transportation. The strategic plan was envisioned to achieve zero fatality: “all fatalities or serious injuries reduced to zero by 2020” - christened as Vision Zero, prepared in 1997. At the inception the goal was to achieve 50% decrease in the number of road users killed by 2007 compared with

1997. By 2009, the country had achieved 13% and 34.5% decreases in the number of road users killed in 2007 and 2009 respectively compared with 1997.[90]

The NRSS provides a more targeted and coordinated approach for improving safety on developed and developing countries roads and invariably reducing road traffic crashes as it adopts a holistic system for managing all the variables that interact on the roads viz Road Users, Vehicles, the Road itself and Road (Safety) Managers.

CHAPTER THREE

METHODOLOGY

3.1 DESCRIPTION OF STUDY AREA

Kwara State is located at the geographical and cultural confluence of the North and South of Nigeria, (in the north central geographical zone) with a landmass of 32,500km^2. The State shares border with some other states in the country; Niger state in the north, Osun, and Ekiti states in the west, Kogi state in the east and Oyo state in the north west. Also, the State has international border along Baruten LGA where a lot of vehicular movements take place. The capital city of the State is Ilorin. It lies between longitude 8^0 30'N and latitude $5^0$00E and about 302 kilometres north of Lagos, 602 kilometres south of Kaduna and about 475 kilometres south of Abuja, the capital of Nigeria. Kwara state has 3 senatorial districts: Kwara south, Kwara central and Kwara north. Kwara State has a projected population of 3, 003,257 for 2016 based on 2006 national census and annual growth rate of 3.0%.[92]

Kwara central senatorial district is made up of five Local Government Areas (LGAs) viz: Ilorin East, Ilorin West, Ilorin South, Moro and Asa LGAs. Kwara South senatorial district has seven LGAs; these are Ifelodun, Irepodun, Isin, Offa, Oyun, Ekiti and Oke-Ero LGAs. There are four LGAs in Kwara north and these include: Kaiama, Baruten, Edu and Patigi LGAs. The indigenous people are mainly Yoruba and Hausa Fulani, Nupe, Baruba and Bokobaru. Other tribes include Igbo, Tiv, and other ethnic groups in Nigeria. The major religions are Islam and Christianity.

The occupations of the residents include civil services, commercial driving, farming, trading, artisans, organized private sector and weaving of traditional attires. Kwara State has interconnection of roads across all the sixteen Local Government Areas. Also there are Federal roads linking the state with the neighbouring states. The road networks across the Local Government Areas link the State with other states in Nigeria and offers reliable road transport services to places like Lagos, Ogun, Osun, Ondo, Oyo, Ekiti, Kogi, Niger, Kaduna and Plateau States. Similar services are available to and from Onitsha, Port Harcourt, Abuja, Aba and other parts of Nigeria. Although some of these roads are bad and in a deplorable state that require immediate rehabilitation.

The major inter-city motor parks in Kwara are listed in the table below: Each of the motor parks was shared and headed by the chairman under the overall chairman at the state headquarters of the National Union of Road Transport Workers (NURTW) and Road Transport Employers Association of Nigeria (RTEAN). Each park is shared by both bodies of commercial drivers. There are a total of 5,510 commercial drivers comprising 3,478 and 2,032 in NURTW and RTEAN respectively.

These commercial drivers provide a means of intra and interstate transportation for the greater number of people in Kwara State (63.7%) [93] as in most developing countries. There were 878 health facilities in the state include 85 government owned Primary Health Care centers, 14 secondary health facilities, but only one tertiary health institution, that is University of Ilorin Teaching Hospital.

Table 3.1 Distribution of major inter-city motor parks in Kwara State

Kwara Central	Kwara North	Kwara South
Offa garage, Shao, and Oko-olowo, Maraba, Akerebiata, Saw mill, Ojatuntun, Oja-Oba, Oloje and Afon, Eyen korin and Ote-Egba.	Jebba, Bacita, Lafiagi, Patigi, Kaiama, Gwaria, Ilesha, Okuta, Gwanara and Kosubosu	Offa, Ajase-Ipo, Omu-Aran, Share, Ganmo, Oke-Onigbin, Oke-Ode, Ora, Iloffa, Osi, Oro, Igbaja, Isanlu-Isin, Erin-Ile, Ijagbo Idofian and and Owode

The Federal Road Safety Corps (FRSC) and the Nigeria Police have offices in each LGAs in the state to monitor and enforce road safety laws. Print and electronic media were sometimes used to educate the general population on road safety. There are six driving schools in the State where prospective drivers can acquire the knowledge of driving (four in Ilorin, one each in Offa and Omu-Aran). The roads linking many of the LGAs with the State capital are tired but in various deplorable state. The climates and visibility of the environment for vehicular movement is not usually compromised except when there is heavy rainfall for short time.

3.2 ADVOCACY AND COMMUNITY ENTRY

Letter of introduction was obtained from the Department of Epidemiology and Community Health, University of Ilorin to the NUTRW and RTEAN State chapter Chairman and copies made available to the park Chairmen. The letter requested the permission and cooperation of the chairmen and drivers, while highlighting the purpose and benefits of the study. Among the motor

parks that were visit where advocacy and sensitization about the study was done include Offa, Saw mill, Maraba, Oloje motor parks in Ilorin. In addition, Ilesha Baruba and Kosubosu motor parks in Baruten LGA were visited. In Kaiama LGA, advocacies were done in Ilorin motor park, Kaiama and Gwaria motor parks. Advocacy visits were paid to Owode and Idi-Ogun motor parks in Offa LGA. Also, Egbe and Ilorin motor parks were visited in Omu-Aran, Irepodun LGA. The Chairmen and respective executive councils of each motor parks were met during the visits. The visit provided opportunity for the drivers to ask some pertinent questions about the study. Thereafter, commitments, cooperation and support for the study were obtained.

3.3 STUDY DESIGN

This is a descriptive cross-sectional study of road safety and risk factors for road traffic crash among inter-city commercial drivers in Kwara State, Nigeria. Quantitative data was collected using an interviewer administered questionnaire to assess the knowledge and use of road signs, correlates that determine its use among commercial drivers. Observational checklist was used to collect information on the safety of tyres and lighting of vehicles in relation to road worthiness. The blood alcohol concentration of respondents was determined using Breathalyzers. In addition, two focus group discussions were conducted to obtain information on the state and safety of the roads and perception on existing law enforcement on road safety among the drivers and FRSC.

3.4 STUDY POPULATION

The study population is inter-city commercial drivers who are registered with NUTRW and RTEAN in Kwara State. These drivers are those who drive passengers-conveying motor vehicles from one town or city to another.

3.5 INCLUSION CRITERIA

The inclusion criteria for the study were commercial drivers registered with Kwara State Chapters of NURTW and RTEAN, those whose primary occupation or main source of livelihood is driving, and convey passengers on inter-city with motor vehicles which could be buses or cars. It also include drivers involve in driving commercial vehicles for a minimum of six months. The study also involve drivers of vehicles transporting passengers.

3.6 EXCLUSION CRITERIA

The study excluded commercial drivers who did not have a park in Kwara State, and those who were part-time drivers. Commercial drivers who were apprentice during the time of study were excluded. Also, long vehicle (trucks) drivers and drivers carrying goods only were also excluded from the study.

3.7 SAMPLE SIZE DETERMINATION

The minimum sample size will be calculated using the Fischer's formula[94] where the sample size is more than 10,000.

Thus: $n = \frac{z^2pq}{d^2}$

Where

n =minimum sample size

z =standard normal deviate which is 1.96 (at 95% confidence level)

p =Proportion of commercial drivers with good knowledge of RTC in a previous study in Lagos, Nigeria= 41.0%[56]

q = 1-0.41 = 0.59

d = (The Precision or the tolerable margin of error set at 0.05)

Substituting

$$n = \frac{1.96^2 \times 0.41 \times 0.59}{0.05^2}$$

n = 371.7 =372

For population size less than 10,000, the formulae used is

$n_f = n /(1 + n/N)$

Where N = 5,510 (the population of NURTW and RTEAN commercial drivers in Kwara)

Substituting;

n=sample size for population more than 10,000

n_f= sample size for population less than 10,000

n_f= 272/(1 +272/5510)

n_f= 259.2 = 260

A minimum sample size of 260 was calculated. However, a total of 410 respondents were used for the study

3.8 SAMPLING TECHNIQUE

The study was carried out in the three senatorial districts of Kwara State. Proportional allocation of respondents was done based on population from each senatorial district. Multi-stage sampling technique was used viz:

Stage 1: A simple random sampling technique using the balloting method was adopted to select four major parks in each of the Kwara Senatorial districts. The parks selected where the study was carried out were Offa, Saw mill, Maraba, and Oloje motor parks in Kwara central, Ilesha Baruba, Kosubosu, Gwaria and Ilorin motor park in Kaiama from Kwara North. Owode and Idi-Ogun motor parks in Offa LGA and Egbe and Ilorin motor parks in Omu-Aran were selected from Kwara south senatorial district.

Stage 2: In each of the parks selected, systematic sampling method was used to select desired number of respondents among commercial drivers based on proportional allocation. The NURTW and RTEAN members were 5,510 in the state. There were 2,634 in Kwara central, 1,868 in Kwara south and 1,008 members of the 2 associations in Kwara north. Therefore, by proportion 196 inter-city commercial drivers were allocated and selected from Kwara central, while 139 and 75 drivers were respectively selected from Kwara south and Kwara north.

The list of the drivers in the selected parks served as the sampling frame. Replacement with the next person on the sampling frame was done for those not available or unwilling to participate in the study. In each park selected, the first respondent was chosen using simple random sampling

by balloting method. The sampling interval was pre-determined by calculation from each of the sampling frame from the respective parks. Seventy five vehicles were selected and inspected based on the probability of travelling on the day the checklist was administered.

3.9 DATA TOOLS / RESEARCH INSTRUMENTS

The data for the study was collected using the following tools:

1. **Questionnaire** assessed the knowledge of the respondents on road safety rules and signs as well as their perceptions on law enforcement of road safety in Nigeria. For each correct response a score of 1 was awarded while wrong answer attracted zero mark. Total scores of 7-10 was graded good, 4-6 marks was fair and less than 4 marks was regarded as poor.
2. **Breathalyzer** was used to determine the Blood Alcohol Concentration of the commercial vehicle drivers.
3. One penny US **Coin** was used to test the tyre tread wear of the vehicles used by the commercial drivers.
4. **Observational Checklist** was used on 75 vehicles who were proposed to travel on the day of visit, to assess simple maintenance of the vehicles and road worthiness.
5. **Focus group discussion guide** was used to elicit qualitative information on state of the roads, enforcement of laws among others.

3.10 STANDARD OPERATING PROCEDURES

Blood Alcohol Concentration[95]

The study was carried out to determine the Blood Alcohol Concentration of the commercial drivers using breathalyzer device. This assessment was done in a room within the garage office

of the NURTW and RTEAN to ensure confidentiality. The measurements were done by the Researcher and supported by two research assistants who are medical doctors in postgraduate training. This was done after the interviewer administered questionnaire was completed.

The device has a **mouthpiece**, a tube through which the suspect blows air, and a **sample chamber** where the air goes.

The **Breathalyzer** device contains:

- A system to sample the breath of the respondents
- Two glass vials containing the chemical reaction mixture
- A system of photocells connected to a meter to measure the colour change associated with the chemical reaction

Requirements for breathalyzer use[95]

- A new mouthpiece for each test subject
- Do not expose the sensor to high alcohol concentrations, e.g. by rinsing the mouth with high-proof alcoholic beverages just before starting the measurement. This reduces the sensor service life.
- Keep sufficient distance from transmitters and mobile phone antennas.

Requirements for the test subject[95]

- Maintain a waiting period of at least 15 minutes after drinking alcohol before the test is applied.

- Alcohol residues within the mouth may cause incorrect measurement values. Use alcoholic mouth spray, or consumes medical syrups or drops. Rinsing out the mouth with water or non-alcoholic beverages will not help reduce the waiting period!

Before sampling, the test subject should be breathing normally and calmly.

Rapid inhaling and exhaling through the mouth is to be avoided.

The test subject must be able to provide the required minimum respiratory volume of 1.2 L. for this purpose; the breathing flow must be constant for a certain minimum blowing period.

Automatic measurement[95]

The sampling is automatically triggered after reaching the minimum respiratory volume and the minimum blowing period.

Preparation

- Insert a new mouthpiece in to the mouthpiece connection
- Switch on the device
- After two seconds, “wait” appears on the display.
- After six seconds, “Ready” appears on the display and a short acoustic signal sounds. Simultaneously, the current test number is displayed. The green lamp flashes. The device is ready to start the measurement.

Performing the measurement[95]

- The test subject must breathe evenly and continuously in to the mouthpiece. A continuous tone sounds and the green lamp flashes when a sufficient breathing flow volume has been reached.

"Blow" appears on the display while the breath sample is taken.

After delivering a sufficient breath sample, the green lamp goes out and the continuous tone falls silent.

"Wait Analyzing" appears on the display.

Test Result[95]

After 5 to 25 seconds (depending on the device temperature and the measured concentration), the measuring result appears on the display.

Error during breath sample delivery[95]

If the breath sample volume is insufficient, "insufficient volume" appears on the display. A horn sounds briefly and the red lamp flashes.

- To repeat the breath sample, press the on button.

  The device can be used again after approx. four seconds.

When exhaling unsteadily, e.g. by abruptly stopping to exhale or by sucking towards end of breath sample, "Blow interruption" appears on the display.

A horn sounds and the red lamp flashes.

To repeat the breath sample, press the on button. The device can be used again after 4 to 30 seconds.

Further measurement[95]

- Press the on button to prepare a new measurement. During the recovery period of sensor

Notice
Temporarily switching off the device will not reduce the waiting period!

Removing the mouthpiece[95]

- Push the mouthpiece upwards out of the mouthpiece holder.
- Dispose of the mouthpiece according to the local regulations.

Principle of chemical reaction[95]

To measure alcohol, a suspect breathes into the device. The breath sample is bubbled in one vial through a mixture of sulfuric acid, potassium dichromate, silver nitrate and water. The principle of the measurement is based on the following chemical reaction:

In this reaction:

1. The sulfuric acid removes the alcohol from the air into a liquid solution.
2. The alcohol reacts with potassium dichromate to produce: chromium sulfate potassium sulfate acetic acid water

The silver nitrate is a catalyst, a substance that makes a reaction go faster without participating in it. The sulfuric acid, in addition to removing the alcohol from the air, also might provide the acidic condition needed for this reaction.

During this reaction, the reddish-orange dichromate ion changes color to the green chromium ion when it reacts with the alcohol; the degree of the color change is directly related to the level of alcohol in the expelled air. To determine the amount of alcohol in that air, the reacted mixture is compared to a vial of un-reacted mixture in the photocell system, which produces an electric current that causes the needle in the meter to move from its resting place. The operator then rotates a knob to bring the needle back to the resting place and reads the level of alcohol from the knob -- the more the operator must turn the knob to return it to rest, the greater the level of alcohol. **95**

Limitation of the device

Incorrect measurement can also happen after the test subject burps or vomits, drink aromatic beverages (e.g. fruit juices).[95]

3.11 ASSESSMENT OF TYRE SAFETY

The study also assessed the safety level of the vehicle tyres used by the commercial drivers. Two methods were used for the assessment. The first method involved visual inspection of tyres for tread wear indicator (TWI) and manufacturing date to determine the expiry date of the vehicle tyres. The second method was determination of the depth of tread of vehicle tyres by a coin test. The procedures for the assessment are described below.

Visual inspection of tyres

i. Tread wear indicator

Every tyre is designed with a tread wear indicator (TWI) which is a raised section molded into the grooves of a tyre. In passenger car tires, the TWI is around 1.6 mm and the tyre shoulder is labelled with TWI or the ∆ symbol.

TWI indicates the tread wear limit and helps vehicle owners understand the tread wear so they know when to replace the tires. When the tread is levelled with the TWI, the tread pattern will be separated and the tires need to be replaced immediately. When tread wear limit is reached, handling, braking, and water evacuation will significantly be decreased. [67, 68] Extremely dangerous!

On inspection, the tyre shoulder by the sidewall of tyre will be searched for a TWI label or ∆ symbol. The tread wear indicator is usually labelled round the tyre at about 15 inches interval.

ii. Expiry date

Every tyre is designed with a four digits number written in a rounded rectangular shape on the sidewall. The number represents the date when the tyre was manufactured, where the first two digits indicate the week and the last two digits the year of manufacture. Life span of a newly manufactured tyre is four years. The manufacturing date of the vehicle tyres was inspected and used to calculate the expiry date of the tyre. This was done by subtracting the manufacture date of the tyre from 4 years. It can also be done by estimating the age of the tyre in week/year from

the date of manufacture and then subtract the current age of the tyre from 4 years. However, a tyre can still be road unsafe before its expiry date if it has travelled a distance of 30,000km or more; sidewall has multiple bulges, cracks and cuts; has tread wears at TWI limit; et cetera. [67, 68]

iii. Penny/Coin test

In the United States, tyre tread depth is measured in 32nds of an inch. New tyres typically come with 10/32" or 11/32" tread depths, and some truck, SUV and winter tires may have deeper tread depths than other models. The U.S. Department of Transportation recommends replacing tyres when they reach 2/32", and many states legally require tyres to be replaced at this depth. [67, 68]

The idea of the penny test is to check whether the 2/32" threshold is reached. Here's how it works:

1. A penny is placed between the tread ribs on a tire. A "rib" refers to the raised portion of tread that spans the circumference of a tire. Tire tread is composed of several ribs.
2. The penny is turned so that Lincoln's head points down into the tread.
3. If the top of the coin head disappears between the ribs. If it does, then tread is still above 2/32", if the entire head is seen, it may be time to replace the tire because the tread is no longer deep enough.

When performing the penny tire test, each tire is checked and various places *around* each tire. Special attention is paid to areas that look the most worn. Even if parts of tread are deeper than 2/32", the tire is replaced when any areas fail the penny test.

Consistent wear around the whole tire is normal, but uneven tread wear could be a sign of improper inflation, wheel misalignment, or a variety of other things. If uneven tread wear is observed, a technician should inspect the vehicle.

3.12 PRE-TESTING

Pre-testing was done using 40 questionnaires, which is 10% of 400 (estimated sample size) in Ogbomoso, Oyo State because of its similar characteristics with Kwara State. After this, appropriate corrections were made to the questionnaire.

3.13 TRAINING OF RESEARCH ASSISTANT

Four research assistants were recruited and trained on data collection using the interviewer administered questionnaire. They were required to explain to respondents in situations where respondents don't understand questions.

3.14 DATA COLLECTION METHOD

Data was collected and edited manually to detect omission and to ensure uniform coding, after which data was entered into the computer. All study variables were collected and analysed based on the study variables

3.15 DATA ANALYSES

Data analysis was done using EPI INFO version 3.5.1 and SPSS software package. Important variables from data collected were presented as frequency tables, and cross tabulation. An appropriate test of significance (Chi-square, t test) were used to test statistics and the level of significance was predetermined at less than 0.05 at 95% confidence level.

3.16 ETHICAL CONSIDERATIONS

Ethical approval for study was obtained from the Ethical Review Committee, University of Ilorin. Permission was sought from the different motor parks chairmen. Informed consent was obtained before interview from the respondents while explaining that any information provided would be confidential. The purpose and benefits of the study were explained accordingly.

3.17 LIMITATIONS OF STUDY

- Due to the nature of their occupation (ambulatory), gathering of respondents especially for test was difficult
- Assessing the vehicles was seen by drivers as looking for fault and its legal implications. Assurance was given that it is for academic exercise.

CHAPTER FOUR

RESULTS

Findings from 410 respondents interviewed, vehicle inspection and focus group discussion are presented.

Table 1: Socio-demographic variables of respondents (N = 410)

Socio-demographic variables	Frequency	Percent (%)
Age group (years)		
≤ 25	16	3.9
26 – 35	62	15.1
36 – 45	131	32.0
46 – 55	109	26.6
56 – 65	74	18.0
> 65	18	4.4
Mean ± SD	46.78 ± 11.27	
Median (IQR)	45.00 (40.00 – 55.00)	
Range	22 – 73	
Sex		
Male	409	99.8
Female	1	0.2
Religion		
Islam	370	90.3
Christianity	39	9.5
Others	1	0.2
Ethnicity		
Yoruba	387	94.4
Hausa	8	2.0
Igbo	6	1.5
Others	9	2.1
Educational level		
None	123	30.0
Primary	166	40.5
Secondary	103	25.1
Tertiary	18	4.4
Marital status		
Single	13	3.2
Married	388	94.6
Widowed	9	2.2

SD: Standard deviation; IQR: Inter-quartile range

The mean age of the respondents was 46.78 ± 11.27 years. Men constituted 99.8% of the respondents. Majority 370 (90.3%) of respondents were Muslims and 39 (9.5%) were Christians. Yoruba ethnicity accounted for 387 (94.4%), Hausa were 2.0% and 1.5% were Igbo. On literacy

level, 18 (4.4%) had tertiary, 103 (25.1%) secondary, 166 (40.5%) primary and 123 (30.0%) had no formal education. In terms of marital status, 94.6% were married, 2.2% were widowers and 3.2% were single.

DRIVING PROFILE OF RESPONDENTS

Table 2: Respondents' driving experience and licensing (N= 410)

Variable	Frequency	Percent
Driving experience (years)		
≤ 10	64	15.6
11 – 20	123	30.0
21 – 30	107	26.1
31 – 40	91	22.2
> 40	25	6.1
Possession of driver's license		
Yes	393	95.9
Did eye test before given the license (n=393)		
Yes	296	75.3
Did driving test before issuance the license (n=393)		
Yes	320	81.4
Renewal of license as at when due (n=393)		
Yes	385	98.0
Valid Driver's License (n=385)		
Sighted	289	75.1

Of the total respondents, 64 (15.6%) had been driving for less than ten years, 123 (30.0%) were in driving business for 10-20 years, 107 (26.1%) had spent 21-30 years on the job, 91 (22.2%) had been on the job for 31-40 years and 25 (6.1%) for more than 40 years. Although, majority 393 (95.9%) had drivers' license, only 289 (75.1%) of respondents had valid license. Only 296 (75.3%) had eye test before obtaining their licenses. The proportion of those who had driving test before issuance of license were 81.4% (320).

Table 3: Mode of driving skill acquisition of respondents (N= 410)

Mode of driving skill acquisition*	Frequency	Percent
Friends	37	9.0
Family members	54	13.2
Self	25	6.1
Driving School	8	2.0
Co-drivers	113	27.6
Apprentice	44	10.7
Mentor	120	29.3

: Multiple responses allowed

Few respondents 37 (9.0%) learnt the art of driving from friends, 54 (13.2%) from family members, 25 (6.1%) reported self-effort, 8 (2.0%) from driving school, 113 (27.6%) co-driver, 44 (10.7%) as apprentice and 120 (29.3%) reported through mentoring.

Table 4: Training and seminar attended by respondents (N = 410)

Variable	Frequency	Percent
Ever attended road safety seminar or workshop		
Yes	351	85.6
No seminars attended (n=351)		
1 – 2	166	47.3
>2	185	52.7
Time of last seminar attended (n=351)		
<6 months	214	61.0
6 – 12 months	54	15.4
Seminar organizers (n=351)		
FRSC	294	83.8
VIO	10	2.8
Drivers' Union	38	10.8
State government	5	1.4
Others	4	1.1
Facilitators of the seminar (n=351)		
FRSC staff	327	93.2
VIO staff	12	3.4
Others	12	3.4
Willingness to attend future road safety seminar		
Yes	306	74.6

Majority, 351 (85.6%) of respondents attended safety seminar 185 (52.7%) attended more than 2 seminars. The last time respondents attended training was reported as: less than 6 months 214 (61.0%), 6-12 months for 54 (15.4%) and more than 12 months for 83 (23.6%) of those who have had the training.

Of the trainings attended by respondents, 298 (83.8%) mentioned that it organized by FRSC, 10 (2.8%) reported that they attended the workshop organized by the VIO and 38 (10.8%) participated in the training organized by their Union and only 5 (1.4%) attended the training organized by the State Government. Officers from the FRSC was reported by 327 (93.2%) respondents to have facilitated the training they attended. Three-quarter of respondents 306 (74.6%) were willing to attend road safety training/seminar in future.

Table 5: Respondents' involvement in road traffic crashes (RTC)

Variable	Frequency	Percent
Ever had road traffic crash (RTC) as a driver (N = 410)		
Yes	121	29.5
Number of times involved in RTC (n=121)		
1	95	78.5
≥ 2	26	21.5
Period of the day RTC occurred (n=121)		
Morning	77	63.6
Night	44	36.4
Self-reported severity of RTC (n=121)		
No injury	85	70.2
Mild to Moderate injury	30	24.8
Severe injury	6	5.0
Last time RTC occurred (n=121)		
<1 year	18	14.9
1 – 2 years	10	8.3
3 – 5 years	21	17.4
> 5 years	72	59.5

Less than a third 121 (29.5%) of respondents had experienced road traffic crashes in the past. Of those who had experienced RTC, majority 95 (78.5%) had one RTC, while 26 (21.5%) had two or more RTC. Many respondents, 77 (63.6%) reported that the crash occurred in the morning while 44 (36.4%) reported that it occurred at night. On the severity of the RTC, 85 (70.2%) declared that there was no injury sustained, 30 (24.8%) reported mild to moderate injuries while only 6 (5.0%) claimed it was severe. Among those involved in accident, 18 (14.9%) had the last RTC in less than a year, 10 (8.3%) had the last RTC in 1-2 years, 21 (17.4%) in 3-5 years and 72 (59.5%) reported that the last time they were involved in road traffic crash was more than 5 years ago.

KNOWLEDGE OF SAFETY MEASURES AMONG RESPONDENTS

Table 6: Knowledge of factors for road traffic crashes (N=410)

Factors	Yes n (%)	No n (%)	Don't know n (%)
Young driver (age < 24 years)	164 (40.0)	230 (56.1)	16 (3.9)
Older driver (more than 60 years)	159 (38.8)	236 (57.6)	15 (3.7)
Male driver	81 (19.8)	320 (78.0)	9 (2.2)
Female driver	142 (34.6)	256 (62.4)	12 (2.9)
Professional drivers	95 (23.2)	302 (73.7)	13 (3.2)
Over speeding	399 (97.3)	5 (1.2)	6 (1.5)
Reckless driving	403 (98.3)	2 (0.5)	5 (1.2)
Ignoring traffic lights	399 (97.3)	7 (1.7)	4 (1.0)
Use of mobile phones while driving	401 (97.8)	4 (1.0)	5 (1.2)
Other road user like pedestrians, motorcycle riders, vehicle passengers	393 (95.9)	12 (2.9)	5 (1.2)
Illiteracy	190 (46.3)	217 (52.7)	3 (0.7)
Poor driving skills	399 (97.3)	8 (2.0)	3 (0.7)

Two in every five respondents 164 (40.0%) stated that young age of drivers could predispose in RTC. More than half 236 (57.6%) did not know that older persons constitute a significant risk for RTC if the person is a vehicular operator. Few respondents 81 (19.8%) said that being a male driver could be responsible for RTC while 142 (34.6%) felt that the driver being a female could result in RTC. About one-fifth 95 (23.2%) of respondents stated that being a professional driver could constitute a risk to cause RTC. Less than half, 190 (46.3%) of respondents mentioned that illiteracy predisposed to RTC, 393 (95.9%) said other road users cause RTC while 97% identified use of mobile phone while driving, poor driving skill, over speeding and ignoring traffic lights as predisposing to RTC. Almost all respondents 403 (98.3%) identified reckless driving as a risk factor for crashes.

Table 7: Knowledge of health related risk factors for road traffic crashes N=410

Health factor	Yes n (%)	No n (%)	Don't know n (%)
Long hours of driving	282 (68.8)	120 (29.3)	8 (2.0)
Poor vision (eye sight)	390 (95.1)	16 (3.9)	4 (1.0)
Driving under the influence of alcohol	388 (94.6)	18 (4.4)	4 (1.0)
Using performance enhancing drugs (Indian hemp, nicotine, caffeine, cocaine)	384 (93.7)	19 (4.6)	7 (1.7)
Driving when on sedatives drug (cough syrup, piriton, valium etc)	396 (96.6)	8 (2.0)	6 (1.5)
Medical conditions like, epilepsy	399 (97.3)	5 (1.2)	6 (1.5)
Fatigue	399 (97.3)	6 (1.5)	5 (1.2)
Physically challenged people	396 (96.6)	9 (2.2)	5 (1.2)

About two-thirds of respondents 282 (68.8%) knew that driving for long hours could result in RTC. Majority, 390 (95.1%) and 388 (94.6%) also had the knowledge that poor vision and driving under the influence of alcohol could predispose to RTC respectively. Most respondents 384 (93.7%), 396 (96.6%), 399 (97.3%) respectively mentioned that use of hard drugs, driving when on sedatives and medical conditions like epilepsy are risk factors for RTC. Almost all respondents 399 (97.3%) and 396 (96.6%) had the knowledge that fatigue and persons who are physically challenged could be predisposed to RTC.

Table 8: Knowledge of environmental related risk factors for road traffic crashes N=410

Environmental/ road factor	Yes n (%)	No n (%)	Don't know n (%)
Excessive sunrays (glare from the sun)	331 (80.7)	73 (17.8)	6 (1.5)
Poor road condition	392 (95.6)	13 (3.2)	5 (1.2)
Indiscriminate road block	394 (96.1)	11 (2.7)	5 (1.2)
Robbery on the road	398 (97.1)	6 (1.5)	6 (1.5)
Harmattan haze/ Mist	335 (81.7)	67 (16.3)	8 (2.0)
Rain	344 (83.9)	60 (14.6)	6 (1.5)
Night driving	267 (65.1)	135 (32.9)	8 (2.0)
Fallen trees and stray objects/ animals	387 (94.4)	15 (3.7)	8 (2.0)
Inadequate signal/ road signs	401 (97.8)	4 (1.0)	5 (1.2)

Majority 331 (80.7%) of respondents stated that glare from the sun could cause RTC. Almost all 392 (95.6%) respondents knew that poor road layout is a risk factor for crashes. Only few of the respondents 11 (2.7%) did not know that road blocks could predispose to crashes. Road robbery, haze weather and rain were respectively identified by 398 (97.1%), 335 (81.7%) and 344 (83.9%) of respondents as factors that could cause crashes. Night driving, fallen trees/ collapsed bridges and inadequate road signs were identified as being responsible for RTC by majority of the respondents.

Table 9: Knowledge of vehicle related risk factors for road traffic crashes N=410

Vehicular factor	Yes n (%)	No n (%)	Don't know n (%)
Bad vehicle parts (absorber, alignment)	398 (97.1)	5 (1.2)	7 (1.7)
Brake failure	403 (98.3)	3 (0.7)	4 (1.0)
Wiper malfunction	393 (95.9)	13 (3.2)	4 (1.0)
Mechanical/ electrical fault in vehicle	396 (96.6)	10 (2.4)	4 (1.0)
Poor head light/ break light/rear light	403 (98.3)	3 (0.7)	4 (1.0)
Tyre burst (bad tyre)	402 (98.0)	3 (0.7)	5 (1.2)
Old or overage vehicle (> 20years)	312 (76.1)	92 (22.4)	6 (1.5)

Bad vehicle parts, brake failures and wiper malfunctions were identified by 398 (97.1%), 403 (98.3%) and 393 (95.9%) of respondents respectively as predisposing to crashes. Mechanical /electrical fault in vehicle, poor head light, break light and tyre burst were some of the vehicular factors mentioned by 396 (96.6%), 403 (98.3%) and 402 (98.0%) of respondents respectively as risk factors of RTC. About three-quarters 312 (76.1%) respondents stated that vehicle older than twenty years could be responsible for RTC.

Table 10: Knowledge scores of risk factors and safety measures for road traffic crashes (N = 410)

Variable	Frequency	Percent
Knowledge of risk factors		
Good	387	94.4
Fair	18	4.4
Poor	5	1.2
Knowledge of safety measures		
Good	372	90.7
Poor	38	9.3

Many respondents 387 (94.4%) had good knowledge of risk factors of RTC and very few 5 (1.2%) had poor scores. Knowledge of safety measures was good in 372 (90.7%) respondents and poor in 38 (9.3%).

Table 11: Relationship between knowledge of risk factors and socio-demographic variables

	Knowledge of risk factors					
Variable	**Good n (%)**	**Fair n (%)**	**Poor n (%)**	**Total n (%)**	**χ^2**	***p* value**
Age group (years)						
≤ 25	14 (3.4)	2 (0.5)	0 (0.0)	16 (3.9)	1.624[Y]	0.804
26 – 55	285 (69.5)	13 (3.2)	4 (0.9)	302 (73.6)		
>55	88 (21.5)	3 (0.7)	1 (0.2)	92 (22.4)		
Education Level						
None	114 (27.8)	6 (1.5)	3 (0.7)	123 (30.0)	2.371[Y]	0.667
Primary	155 (37.8)	9 (2.2)	2 (0.5)	166 (40.5)		
Post-Primary	118 (28.8)	3 (0.7)	0 (0.0)	121 (29.5)		
Marital status						
Single	13 (3.2)	0 (0.0)	0 (0.0)	13 (3.2)	2.189[Y]	0.701
Married	365 (89.0)	18 (4.4)	5 (1.2)	388 (94.6)		
Widowed	9 (2.2)	0 (0.0)	0 (0.0)	9 (2.2)		

χ^2: Chi square; *: *p* value <0.05

More respondents 285 (69.5%) of middle age 26-55 years had good knowledge of risk factors for road traffic crashes. Very few respondents 1 (0.2%) among older age group (>55 years) had poor knowledge of risk factors for road crashes, while none among < 25 years had poor knowledge scores. However, the observed difference in knowledge of risk factors for road traffic crashes and age was not statistically significant p = 0.804.

The higher the literacy level the more the knowledge of road traffic crashes among respondents. Respondents with no formal education 3 (0.7%) and 2 (0.5%) with only primary had poor knowledge scores of risk factors for RTC. None had poor knowledge of RTC among those with post-primary education. The difference was however not statistically significant (p = 0.667).

Table 12: Relationship between knowledge of risk factors and driving experience of the respondents

Variable	Knowledge of risk factors Good n (%)	Fair n (%)	Poor n (%)	Total n (%)	χ^2	*p* value
Duration driving						
≤10 years	57 (13.9)	5 (1.2)	2 (0.5)	64 (15.6)	2.410[Y]	0.660
11 – 30 years	218 (53.1)	10 (2.4)	2 (0.5)	230 (56.1)		
>30 years	112 (27.3)	3 (0.7)	1 (0.2)	116 (28.3)		
Possession of driver's license						
Yes	372 (90.7)	16 (3.9)	5 (1.2)	393 (95.9)	1.244[Y]	0.536
No	15 (3.7)	2 (0.5)	0 (0.0)	17 (4.1)		
Valid driver's license (n=385)						
Yes	275 (71.4)	10 (2.6)	4 (1.0)	289 (75.1)	0.854[Y]	0.652
No	89 (23.1)	6 (1.6)	1 (0.3)	96 (24.9)		
Underwent driving test before obtaining the license (n=393)						
Yes	301 (76.6)	14 (3.6)	5 (1.2)	320 (81.4)	0.370[Y]	0.831
No	71 (18.1)	2 (0.5)	0 (0.0)	73 (18.6)		

χ^2: Chi square; *: *p* value <0.05

More respondents 218 (53.1%) who had spent 11-30 years and 112 (27.3%) of those who had more than 30 years' experience as a driver had good knowledge of risk factors for RTC. Two (0.5%) respondents with less than 10 years on the job had poor knowledge of risk factors for RTC compared with 1 (0.2%) among those who have spent 30 years. There was no statistical significance difference between years of experience on the job and knowledge of RTC (p = 0.660).

Possession of driver's license has no statistical significant relationship with knowledge of risk factors for RTC (p = 0.536). Also, there was no statistical significant difference between driving test for license and knowledge of risk factors for RTC

Table 13: Relationship between knowledge of risk factors and training received

Variable	Knowledge of risk factors Good n (%)	Fair n (%)	Poor n (%)	Total n (%)	χ^2	*p* value
Ever attended road safety training						
Yes	336 (81.9)	13 (3.2)	2 (0.5)	351 (85.6)	7.160[Y]	0.027
No	51 (12.4)	5 (1.2)	3 (0.7)	59 (14.4)		
No seminars attended (n=351)						
1 – 2	164 (46.7)	2 (0.6)	0 (0.0)	166 (47.3)	4.758[Y]	0.092
> 2	172 (49.0)	11 (3.1)	2 (0.6)	185 (52.7)		
Time of last training attended (months) (n=351)						
< 6	206 (58.7)	7 (2.0)	1 (0.3)	214 (61.0)	0.229[Y]	0.891
≥6	130 (37.0)	6 (1.7)	1 (0.3)	137 (39.0)		
Facilitator of the training						
FRSC	314 (89.5)	11 (3.1)	2 (0.6)	327 (93.1)	1.497[Y]	0.473
VIO + others	22 (6.3)	2 (0.6)	0 (0.0)	24 (6.9)		

χ^2: Chi square; *: *p* value <0.05

Majority of respondents 336 (81.9%) that had good knowledge of risk factors for RTC attended training compared with 51 (12.4%) who did not. The observed difference in training attendance and knowledge scores was statistically significant (p = 0.027). Of the respondents that attended seminars or trainings, though those that participated in more than two, 172 (49.0%) had good knowledge scores compared with 164 (46.7%) that had one or two trainings, the difference however, was not statistically significant p = 0.092. More than half of respondents 206 (58.7%) that had good knowledge scores of risk factors for RTC had last training less than 6 months prior to this study while 130 (37.0%) had last training more than 6 months. The difference was not statistically significant p = 0.891. Similarly, there was no statistically significant difference in knowledge scores and facilitators at the training (p = 0.473).

Table 14: Relationship between knowledge of risk factors and road traffic crashes experience among respondents

Variable	Knowledge of risk factors Good n (%)	Fair n (%)	Poor n (%)	Total n (%)	χ^2	*p* value
Ever had RTC as a driver						
Yes	118 (28.8)	2 (0.5)	1 (0.2)	121 (29.5)	2.247[Y]	0.325
No	269 (65.6)	16 (3.9)	4 (1.0)	289 (70.5)		
Number of RTC had (n=121)						
1	93 (76.9)	2 (1.7)	0 (0.0)	95 (78.5)	0.498[Y]	0.780
≥ 2	25 (20.7)	0 (0.0)	1 (0.8)	26 (21.5)		
Severity of RTC (n=121)						
No injury	83 (68.6)	2 (1.7)	0 (0.0)	85 (70.2)	6.057[Y]	0.194
Mild to serious injury	29 (24.0)	0 (0.0)	1 (0.8)	30 (24.8)		
Fatal	6 (5.0)	0 (0.0)	0 (0.0)	6 (5.0)		
Last time RTC occurred (years) (n=121)						
< 1	16 (13.2)	2 (1.7)	0 (0.0)	18 (14.9)	9.742[Y]	0.135
>1	102 (84.3)	0 (0.0)	1 (0.8)	103 (85.1)		

χ^2: Chi square; *: *p* value <0.05

Of the total respondents in this study, 118 (28.8%) were involved in RTC and had good knowledge of risk factors compared with 269 (65.6%) that had good knowledge scores but never involved. The difference was not statistically significant (p = 0.325). There was no statistically significant difference in knowledge scores of risk factors and number of RTC, severity and the last time RTC happened among the respondents p = 0.780, 0.194 and 0.135 respectively.

Table 15: Relationship between knowledge of risk factors and mode of driving skill acquisition of respondents

	Knowledge of risk factors					
	Good	**Fair**	**Poor**	**Total**	χ^2	***p* value**
Variable	**n (%)**	**n (%)**	**n (%)**	**n (%)**		
Friends	35 (8.5)	1 (0.2)	1 (0.2)	37 (9.0)	5.030[Y]	0.956
Family members	52 (12.7)	1 (0.2)	1 (0.2)	54 (13.2)		
Self	23 (5.6)	2 (0.4)	0 (0.0)	25 (6.1)		
Driving School	8 (2.0)	0 (0.0)	0 (0.0)	8 (2.0)		
Co-driver	106 (25.9)	6 (1.5)	1 (0.2)	113 (27.6)		
Apprentice	41 (10.0)	1 (0.2)	2 (0.4)	44 (10.7)		
Mentor	113 (27.6)	7 (1.7)	0 (0.0)	120 (29.3)		

χ^2: Chi square

There was good knowledge scores among those who learnt the art of driving by mentoring 113 (27.6%) and co-drivers 106 (25.9%) compared with those who attended driving school 8 (2.0%). The difference in knowledge scores was however not statistically significant p = 0.956.

Table 16: Safety measures practiced by the respondents while driving (N=410)

Safety measures	Always n (%)	Sometimes n (%)	No n (%)
Obey speed limit	339 (82.7)	23 (5.6)	48 (11.7)
Obey traffic lights	363 (88.5)	10 (2.4)	37 (9.0)
Observe road signs	367 (89.5)	5 (1.2)	38 (9.3)
Use seat belt	351 (85.6)	12 (2.9)	47 (11.5)
Rest when fatigued/ stressed during driving	355 (86.6)	13 (3.2)	42 (10.2)
Maintain vehicle in good condition	368 (89.8)	2 (0.5)	40 (9.8)
Avoiding alcohol and drugs (kolanut, tobacco, caffeine etc) while driving	361 (88.0)	4 (1.0)	45 (11.0)

Majority of the respondents practiced safety measures which include obeying speed limit 339 (82.7%), obeying traffic light 363 (88.5%), observing road signs 367 (89.5%), using belts 351 (85.6%), resting when fatigued 355 (86.6%), maintaining the vehicle in good condition 368 (89.8%) and not ingesting alcohol while driving 361 (88.0%).

Table 17: Safety check conducted on the vehicles by respondents before embarking on journey (N=410)

Safety check of vehicle	Always n (%)	Sometimes n (%)	No n (%)
Water level in the radiator	371 (90.5)	1 (0.2)	38 (9.3)
Oil level	371 (90.5)	1 (0.2)	38 (9.3)
Tyre pressure	370 (90.2)	3 (0.7)	37 (9.0)
Lighting system such as headlamps	371 (90.5)	1 (0.2)	38 (9.8)
Brake and clutches	372 (90.7)	1 (0.2)	37 (9.0)
Wipers	369 (90.0)	3 (0.7)	38 (9.3)
Horns	370 (90.2)	2 (0.5)	38 (9.3)
Gauge tyre before travelling	371 (90.5)	2 (0.5)	37 (9.0)
Battery	372 (90.7)	2 (0.5)	36 (8.8)

Concerning safety checks of the vehicles, majority of the respondents check water level in radiator 371 (90.5%), check lighting system 371 (90.5%), check brakes and clutches 372 (90.7%), check horns and spare tyre 370 (90.2%).

Table 18: Observational checklist findings of driver related issues N=75

Variable	**Yes n (%)**	**No n (%)**	**Total**
Availability of driver's license	68 (90.7)	7 (9.3)	75 (100)
Validity of driver's license (n = 68)	57 (83.8)	11(16.2)	75 (100)
Availability of head rest	74 (98.7)	1 (1.3)	75 (100)

One in every ten respondents 7 (9.3%) did not have driver's license, and of those who had it, 57 (83.8%) possessed a valid license. Head rests were available in 74 998.7%) vehicles.

Table 19: Observational checklist findings of vehicle accessories N=75

Variable	**Yes** **n (%)**	**No** **n (%)**
Availability of side mirror		
Central	73 (97.3)	2 (2.7)
Right	73 (97.3)	2 (2.7)
Left	70 (93.3)	5 (6.7)
Availability of functional horn	73 (97.3)	2 (2.7)

Right side mirror was available in 73 (97.3%) and left side mirror in 70 (93.9%) of vehicles inspected. Many 73 (97.3%) of the vehicles had functional horn.

Table 20: Observational checklist findings of vehicle safety functionality N=75

Variable	Functional n (%)	Not functional n (%)	Unavailable n (%)
Seat belt			
Driver's seat	67 (89.3)	3 (4.0)	5 (6.7)
Passenger's seat (front)	57 (76.0)	4 (5.3)	14 (18.7)
Headlights	69 (92.0)	4 (5.3)	2 (2.7)
Trafficators			
Front right	72 (96.0)	0	3 (4.0)
Front left	72 (96.0)	0	3 (4.0)
Rear right	72 (96.0)	0	3 (4.0)
Rear left	72 (96.0)	1 (1.3)	2 (2.7)
Break light			
Right	71 (94.7)	2 (2.7)	2 (2.7)
Left	72 (96.0)	1 (1.3)	2 (2.7)

On inspection of vehicles, 67 (89.3%) had functional seat belts while 3 (4.0%) had dysfunctional seat belts. The seat belts for the front passenger were functional in 57 (76.0%) of the vehicles while 4 (5.3%) had non-functional seat belts and 14 (18.7%) had none. About two-thirds 69 (92.0%) of vehicles had functional headlights and others were either not functional or available.

Trafficators of 72 (96.0%) vehicles were in good condition. Break lights were functional in 71 (94.7%) and 72 (96.0%) vehicles on the right and left respectively.

Table 21: Observational checklist findings of vehicle required items N=75

Variable	**Functional n (%)**	**Not functional n (%)**	**Unavailable n (%)**
Fire extinguishers	53 (70.7)	11 (14.7)	11 (14.7)
C-caution	66 (88.0)	3 (4.0)	6 (8.0)
Windshield wiper	71 (94.7)	1 (1.3)	3 (4.0)

Less than three-quarters 53 (70.7%) of the vehicles had good fire extinguishers with 14.7% of fire extinguishers not been in good condition and not available in 11 (14.7%). Only 66 (88.0%) vehicles had functional C- caution. Windshield wipers were good in 71 (94.7%) vehicles while the wipers were not available in 3 (4.0%) vehicles.

THE PREDICTORS OF USE OF SAFETY MEASURES AMONG THE RESPONDENTS

Table 22: Relationship between practice of safety measures and socio-demographic variables of the respondents

Variable	Practice of safety measures Good n (%)	Poor n (%)	Total n (%)	χ^2	*p* value
Age group (years)					
≤ 25	13 (3.2)	3 (0.7)	16 3.9)	5.710	0.057
26 – 55	280 (68.3)	22 (5.4)	302 (73.7)		
>55	79 (19.3)	13 (3.2)	92 (22.4)		
Education Level					
None	112 (27.3)	11 (2.7)	123 (30.0)	1.967	0.373
Primary	147 (35.9)	19 (4.6)	166 (40.5)		
Post-Primary	113 (27.6)	8 (2.0)	121 (29.5)		
Marital status					
Single	12 (2.9)	1 (0.2)	13 (3.2)	0.234^{Y}	0.889
Married	352 (85.9)	36 (8.8)	388 (94.6)		
Widowed	8 (1.9)	1 (0.2)	9 (2.2)		

χ^2: Chi square; *: *p* value <0.05

More respondents 280 (68.3%) in the age group 26-55 years had good safety practices compared with those ≤ 25 years 13 (3.2%) and > 55 years 79 (19.3%). The observed difference was statistically significant p = 0.057. Literacy level of the respondents had no statistical significant relationship with practice of safety measures p = 0.373. Similarly, marital status and number of children had no significant relationship with practice of safety measures p = 0.889, 0.217 respectively.

Table 23: Relationship between practice of safety measures and driving experience of the respondents

Variable	Practice of safety measures Good n (%)	Poor n (%)	Total n (%)	χ^2	*p* value
Duration driving					
≤10	59 (14.4)	5 (1.2)	64 (15.6)	0.769	0.680
11 – 30	210 (51.2)	20 (4.9)	230 (56.1)		
> 30	103 (25.1)	13 (3.2)	116 (28.3)		
Possession of driver's license					
Yes	356 (86.8)	37 (9.0)	393 (95.9)	0.004^{Y}	0.949
No	16 (3.9)	1 (0.2)	17 (4.1)		
Valid driver's license (n=385)					
Yes	263 (68.3)	26 (6.8)	289 (75.1)	0.171^{Y}	0.679
No	86 (22.3)	10 (2.6)	96 (24.9)		
Did driving test before given the license (n=393)					
Yes	297 (75.6)	23 (5.9)	320 (81.4)	10.021	0.001
No	59 (15.1)	14 (3.6)	73 (18.6)		

χ^2: Chi square; *: *p* value <0.05

About half 210 (51.2%) of the respondent that had good safety practices were on the job for between 11-30 years, while 103 (25.1%) who had good safety practices had spent more than 30 years as drivers, only 59 (14.4%) of those who had within 10 years' experience had good safety practices. The difference in safety practices and years of experience on the job was not statistically significant p = 0.680. Possession and validity of driver's license have no statistical significant relationship with practice of safety measures among respondents p = 0.949, 0.679 respectively. Of all respondents with driver's license, 297 (75.6%) had good safety practices and did test before licensed. There was statistical significant relationship between practice of safety measures and subjected to driving test before issuance of license p = 0.001.

Table 24: Relationship between practice of safety measures and training undergone by the respondents

Variable	Practice of safety measures Good n (%)	Poor n (%)	Total n (%)	χ^2	*p* value
Ever attended road safety training					
Yes	322 (78.5)	29 (7.1)	351 (85.6)	2.937	0.086
No	50 (12.2)	9 (2.2)	59 (14.4)		
No seminars attended (n=351)					
1 – 2	155 (44.2)	11 (3.1)	166 (47.3)	1.112	0.291
> 2	167 (47.6)	18 (5.1)	185 (52.7)		
Time of last training attended (months) (n=351)					
< 6	194 (55.3)	20 (6.0)	214 (61.0)	0.850	0.356
≥ 6	128 (36.5)	9 (2.6)	137 (39.0)		
Facilitator of the training					
FRSC	306 (87.2)	21 (6.0)	327 (93.2)	21.364	<0.001
VIO + others	16 (4.6)	8 (2.3)	24 (6.8)		

χ^2: Chi square; *: *p* value <0.05

More respondents 322 (78.5%) that had good safety practices attended road safety training compared with 50 (12.2%) who did not attend training. The difference in safety practices and training attendance was not statistically significant p = 0.086. The number of trainings or seminars attended by respondents and the last time training was provided has no statistical significant relationship with practice of safety measures p = 0.291, 0.356 respectively. Many respondents 306 (87.2%) that had good safety practices attended training facilitated by FRSC compared with 16 (4.6%) who had good practice but reported training was facilitated by VIO and other organizations. There was statistically significant difference in facilitator of training and safety practices among respondents p = <0.001.

Table 25: Relationship between practice of safety measures and involvement in road traffic crash by the respondents

Variable	Practice of safety measures Good n (%)	Poor n (%)	Total n (%)	χ^2	*p* value
Ever had RTC as a driver					
Yes	110 (26.8)	11 (2.7)	121 (29.5)	0.006	0.938
No	262 (63.9)	27 (6.6)	289 (70.5)		
Number of RTC had (n=121)					
1	85 (70.3)	10 (8.3)	95 (78.5)	0.442^{Y}	0.506
≥ 2	25 (20.7)	1 (0.8)	26 (21.5)		
Severity of RTC (n=121)					
No injury	78 (64.5)	7 (5.8)	85 (70.3)	0.252^{Y}	0.881
Mild to serious injury	26 (21.5)	4 (3.3)	30 (24.8)		
Fatal	6 (4.9)	0 (0.0)	6 (4.9)		
Last time RTC occurred (years) (n=121)					
< 1	16 (13.2)	2 (1.7)	18 (14.9)	0.015^{Y}	0.902
≥ 1	94 (77.7)	9 (7.4)	103 (85.1)		

χ^2: Chi square; *: *p* value <0.05

Many respondents 262 (63.9%) who had good safety practices had no history of RTC compared with 110 (26.8%) who had RTC. The difference in the level of safety practices and ever had RTC was not statistically significant p = 0.938. The number of RTC, severity of injury sustained and the last time respondents had RTC had no significant relationship with safety practices while driving p = 0.506, 0.881, 0.902 respectively.

Table 26: Relationship between practice of safety measures and tutors of respondents in driving

	Practice of safety measures				
	Good	**Poor**	**Total**	χ^2	***p* value**
Variable	**n (%)**	**n (%)**	**n (%)**		
Friends	31 (7.6)	6 (1.5)	37 (9.0)	44.661[Y]	<0.001
Family members	47 (11.5)	7 (1.7)	54 (13.2)		
Self	25 (6.1)	0 (0.0)	25 (6.1)		
Driving School	6 (1.5)	2 (0.5)	8 (2.0)		
Co-driver	107 (26.1)	6 (1.5)	113 (27.6)		
Apprentice	29 (7.1)	15 (3.7)	44 (10.7)		
Mentor	119 (29.0)	1 (0.2)	120 (29.3)		

χ^2: Chi square; *: *p* value <0.05

Of the respondents that had good practice, 119 (29.0%) learnt driving by mentoring while 107 (26.1%) learnt from co-drivers, only few 6 (1.5%) were taught at the driving school. There was statistically significant difference between safety practices and who taught respondents the art of driving p = <0.001.

BLOOD ALCOHOL CONCENTRATION OF THE RESPONDENTS

Table 27: Blood alcohol concentration of intercity commercial vehicle drivers just before embarking on a journey (N = 410)

Variable	Frequency	Percent
Alcohol test		
Positive	29	7.1
Negative	381	92.9
Blood alcohol concentration (n = 29)		
Range (Min. – Max)	3 – 105	
Median (Inter-quartile range)	14.00 (7.00 – 34.00)	
Mean ± SD	23.28 ± 23.32	

The respondents that tested positive for alcohol were 29 (7.1%), while 381 (92.9%) were negative. The mean level of blood alcohol concentration was 23.28± 23.32µg/dl

CONDITION OF TYRES OF RESPONDENTS' VEHICLE

Table 28: Assessment of tyres of the vehicles N=75

Variable	Expired n (%)	Not expired n (%)
Front		
Right	35 (46.7)	40 (53.3)
Left	35 (46.7)	40 (53.3)
Rear		
Right	32 (42.7)	43 (57.3)
Left	34 (45.3)	41 (54.7)

Of the 75 vehicles inspected, 35 (46.7%) had the front tyres on the right and same number on the left expired while the rear tyres expired in 32 (42.7%) and 34 (45.3%) of right and left side of the vehicles respectively.

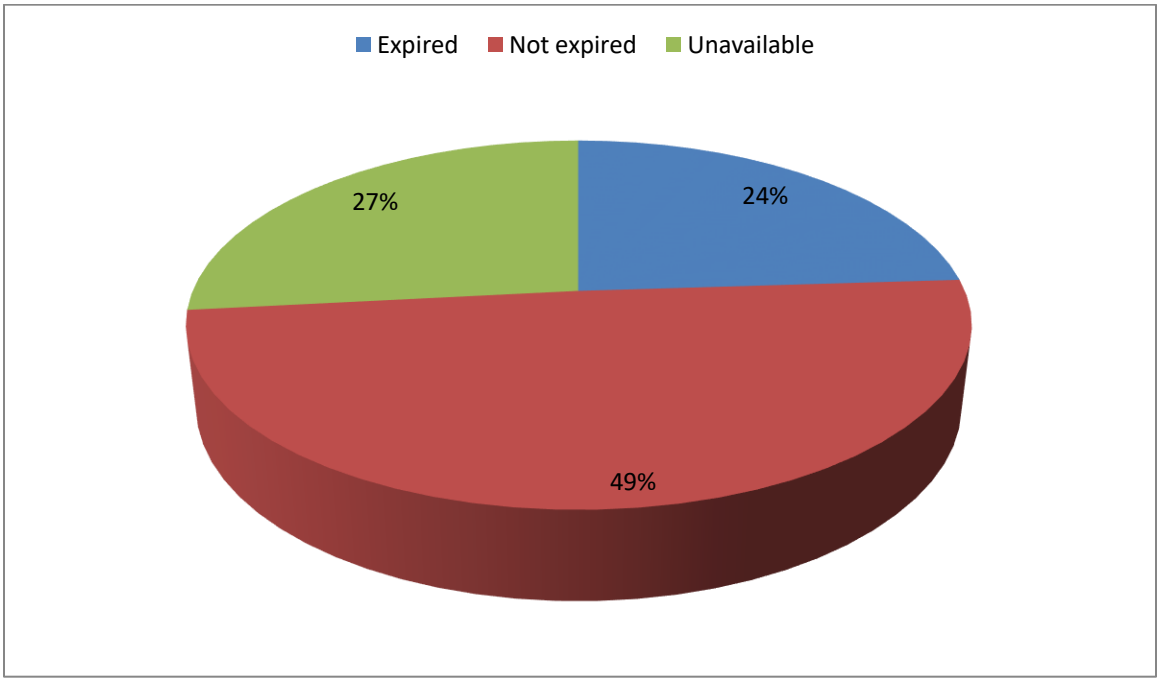


Figure 1: Observations from the inspection of extra tyres of the vehicles N=75

About one-quarter 18 (24.0%) of the vehicles inspected had expired extra tyres, 37 (49.3%) not expired and 20 (26.7%) did not have extra tyre.

Table 29: Condition of Tyre using Tread Wear Indicator (N=75)

Tread Wear Indicator	Reached n (%)	Not reached n (%)	Total (%)
Front			
Right	41 (54.7)	34 (45.3)	75 (100.0)
Left	43 (57.3)	32 (42.7)	75 (100.0)
Rear			
Right	39 (52.0)	36 (48.0)	75 (100.0)
Left	42 (56.0)	33 (44.0)	75 (100.0)
Extra tyre	39 (70.9)	16 (29.1)	55 (100.0)

The thread wear indicator revealed 41 (54.7%) and 43 (57.3%) tyres were worn on front right and left sides respectively, and 39 (52.0%) and 42 (56.0%) on right and left rear tyres respectively. Of the 55 extra tyres, 39 (70.9%) were worn.

Table 30: Condition of tyre using coin test N=75

Tyre Coin Test	Passed n (%)	Failed n (%)
Front		
Right	33 (44.0)	42 (56.0)
Left	36 (48.0)	39 (52.0)
Rear		
Right	43 (57.3)	32 (42.7)
Left	41 (54.7)	34 (45.3)
Extra tyre (n=55)	35 (63.6)	20 (36.4)

Using the tyre coin test, 33 (44.0%) of the right and 36 (48.0%) of the left front tyres passed. Of the rear tyres, 43 (57.3%) on right and 41 (54.7%) on the left passed the coin test. Thirty five (63.6%) extra tyres passed the coin test.

Table 31: Status of tyres of vehicles using expiry date, tread wear indicator and coin test (N=75)

Variable	Frequency	Percent
Number expired		
0	28	37.3
1	8	10.7
2	12	16.0
3	4	5.3
4	23	30.7
Tread wear (reached)		
0	23	30.7
1	6	8.0
2	9	12.0
3	7	9.3
4	30	40.0
Coin test (passed)		
0	26	34.7
1	7	9.3
2	6	8.0
3	10	13.3
4	26	34.7

About a third 28 (37.3%) of the vehicles inspected had all the four tyres unexpired, 8 (10.7%) had one tyre expired, while 12 (16.0%) and 4 (5.3%) had two and three of their tyres expired respectively. Twenty-three vehicles (30.7%) had all the four tyres expired. Of the 75 vehicles inspected, 30 (40.0%) had all the four tyres worn out and tread wear had been reached and 23 (30.7%) had the four tyres in which tread wear has not been reached. Similarly, 26 (34.7%) of the vehicles failed the coin test and the same number passed the coin test.

Table 32: Status of extra tyre of the vehicle using expiry date, tread wear indicator and coin test (N = 55)

Variable	Frequency	Percent
Expiry date		
Extra Expired	24	43.6
Not Expire	31	56.4
Tread wear		
Reached	31	56.4
Not reached	24	43.6
Coin test		
Passed	26	47.3
Failed	29	52.7

Of the 55 vehicles inspected, 24 (43.6%) had expired tyres, 31 (56.4%) had tread wear reached and 29 (52.7%) failed the coin test.

Table 33: Number of test passed by vehicular tyres inspected (N = 75)

Number of test passed	Frequency	Percent
3	1	1.3
2	2	2.7
1	5	6.7
0	67	89.3

*****Tyres were tested using Expiry date, Coin test and Tread wear

Only one vehicle has four tyres passed all the three tests, while 67 (89.3%) vehicles had four tyres that could not pass all the tests.

Table 34: Number of test passed by extra tyre of the vehicles (N = 55)

Variable	Frequency	Percent
Number of test passed		
3	3	5.5
2	26	47.3
1	20	36.4
0	6	10.9
Passed test		
Yes	3	5.5
No	52	94.5

Three of the extra tyres (5.5%) passed all the three tests, while 26 (47.3%) passed 2 tests and 6 (10.9%) did not pass any test.

PERCEPTION OF DRIVERS ON THE ENFORCEMENT OF ROAD SAFETY LAWS

Table 35: Respondents' Arrest /Booking for violation of road safety laws (N = 410)

Variable	Frequency	Percent
Ever been arrested or booked for road safety violation		
Yes	324	79.0
Vehicle inspected for necessary safety tools (n=324)		
Yes	228	70.4
Warned (n=324)		
Yes	167	51.5
Number of warning in the last 6 months (n=167)		
1	144	86.2
≥ 2	23	13.8
Time of last booking (months) (n=201)		
< 6	58	28.9
6 – 12	28	13.9
>12	115	57.2
Number of booking in the last 1 year (n=201)		
1	100	49.8
≥ 2	101	50.2
Reason for booking was genuine (n=201)		
Yes	176	87.6
Booking done by (n=201)		
Police	9	4.5
FRSC	186	92.5
VIO	6	3.0

Out of the 410 respondents that participated in the study, 324 (79%) of them had been booked for committing road traffic offence of which 74 (22.8%) had the issue settled by their union, 228 (70.4%) had their vehicles inspected for necessary safety tools. About half of those booked, 167 (51.5%) were warned for the offence and 144 (86.2%) issued 1 warning in the last six months. Of the 201 respondents that were booked, 115 (57.2%) were last booked more than 12 months ago while 28 (13.9 %) were last booked between 6 to 12 months. Of the 201 respondents booked

in the last one year, 101 (50.2%) had more than 2 bookings. Majority of the respondents 176 (87.6 %) that were booked felt the reason for booking was genuine. Many 186 (92.5 %) respondents reported that FRSC officers booked them 6 (3.0 %) mentioned VIO.

Table 36: Payments for violation of road safety laws by respondents

Variable	Frequency	Percent
Payment made to (n=201)		
Officer	21	10.4
Bank	180	89.6
Demanded for off-record payment by an officer n=201		
Yes	102	50.7
No	99	49.3
Payment of requested money (n=102)		
Yes	35	34.3
No	67	65.7
Action taken by officer on refusal to pay (n=67)		
Delayed You	49	73.1
Made You Pay To Bank	9	13.4
Arrested You	5	7.5
Collected Vital Documents	4	6.0

A total of 180 (89.6 %) respondents made payments to the bank on account of bookings. One-quarter 102 (24.9%) reported that officers demanded money for the offence committed and (65.7%) refused to give money to the officer while 35 (34.3%) gave. For refusal to pay the officers on the road, 49 (73.1%) mentioned they were delayed, 9 (13.4%) were made to pay in the bank, 5 (7.5%) were arrested and 4 (6.0%) had their vital documents collected.

Table 37: Respondents' perception of role of law enforcement officers on the road* (N=410)

Variable	Frequency	Percent
Too many on the road	122	29.8
Help to reduce accident	202	49.3
Maintain orderliness	104	25.4
Duplication of duties	18	4.4
Have no effect on RTC prevention	29	7.1
Too stringent in law enforcement	94	22.9
Appropriate in law enforcement	316	77.1

*multiple response

Some respondents 202 (49.3%) described the activities of law enforcement on the roads as a way to help reduce accidents, others believed that they were too many on the road 122 (29.8%), maintain orderliness 104 (25.4%), and very few said they have no effect 29 (7.1%) and 18 (4.4%) were of the opinion that it is merely duplication of duties. More than three-quarters 316 (77.1%) described the road safety rules/laws as being appropriate.

Table 38: Relationship between perception of road safety laws and socio-demographic variables of the respondents

Variable	Perception Appropriate n (%)	Stringent n (%)	Total n (%)	χ^2	*p* value
Age group (years)					
≤ 25	12 (2.9)	4 (1.0)	16 (3.9)	0.041	0.979
26 – 55	233 (56.8)	69 (16.8)	302 (73.7)		
>55	71 (17.3)	21 (5.1)	92 (22.4)		
Education Level					
None	99 (24.2)	24 (5.9)	123 (30.0)	3.616	0.163
Primary	120 (29.3)	46 (11.2)	166(40.5)		
Post-Primary	97 (23.7)	24 (5.9)	121 (29.5)		
Marital status					
Single	10 (2.4)	3 (0.7)	13 (3.2)	1.672[Y]	0.433
Married	297 (72.4)	91 (22.2)	388 (94.6)		
Widowed	9 (2.2)	0 (0.0)	9 (2.2)		

χ^2: Chi square; *: *p* value <0.05

More respondents 233 (56.8%) in the age group 26-55 years believed the road safety laws are appropriate compared with 12 (2.9%) of those ≤ 25 years. There was no relationship between age of respondents and perception of road safety laws (p = 0.979). The literacy level of respondents has no statistical significant relationship with perception to road safety laws p = 0.163.

Table 39: Relationship between perception of road safety laws and driving experience of the respondents

Variable	Perception			χ^2	*p* value
	Appropriate n (%)	Stringent n (%)	Total n (%)		
Duration driving					
≤10	51 (12.4)	13 (3.2)	64 (15.6)	0.346	0.841
11 – 30	177 (43.2)	53 (24.4)	230 (56.1)		
> 30	88 (21.5)	28 (6.8)	116 (28.3)		
Possession of driver's license					
Yes	303 (73.9)	90 (22.0)	393 (95.9)	0.055	0.814
No	13 (3.2)	4 (1.0)	17 (4.1)		
Valid driver's license (n=385)					
Yes	227 (59.0)	62 (16.1)	289 (75.1)	1.295	0.255
No	70 (18.2)	26 (6.8)	96 (24.9)		
Did driving test before given the license (n=393)					
Yes	248 (63.1)	72 (18.3)	320 (81.4)	0.157	0.691
No	55 (14.0)	18 (4.6)	73 (18.6)		

χ^2: Chi square; *: *p* value <0.05

More experienced drivers among respondents believed the road safety laws are appropriate as demonstrated by 177 (43.2%) and 88 (21.5%) of those that spent 11-30 and more than 30 years on the job respectively. Few 51 (12.4%) of those in the range 10 years' experience had similar perception, however, there was no statistical significant relationship between years of experience and perception of road safety laws p = 0.841. Possession of driver's license and whether respondents had driving test before issuance of license had no statistical significant relationship with perception to road safety laws p = 0.814, 0.691 respectively.

Table 40: Relationship between perception of road safety laws and training received by respondents

Variable	Perception			χ^2	*p* value
	Appropriate n (%)	Stringent n (%)	Total n (%)		
Did eye test before given the license (n=393)					
Yes	226 (57.5)	70 (17.8)	296 (75.3)	0.380	0.537
No	77 (19.6)	20 (5.1)	97 (24.7)		
Ever attended road safety training					
Yes	275 (67.1)	76 (18.5)	351 (85.6)	2.242	0.134
No	41 (10.0)	18 (4.4)	59 (14.4)		
No seminars attended (n=351)					
1 – 2	134 (38.2)	32 (9.1)	166 (47.3)	1.047	0.306
> 2	141 (40.2)	44 (12.5)	185 (52.7)		
Time of last training attended (months) (n=351)					
< 6	164 (46.7)	50 (14.3)	214 (61.0)	0.947	0.330
≥ 6	111 (31.6)	26 (7.4)	137 (39.0)		
Facilitator of the training					
FRSC	262 (74.6)	65 (18.5)	327 (93.2)	8.879	0.002
VIO + others	13 (3.7)	11 (3.1)	24 (6.8)		

χ^2: Chi square; *: *p* value <0.05

Of the respondents that did eye test before issuance of driver's license, 262 (57.5%) believed the road safety laws are appropriate while 70 (17.8%) mentioned that the laws are two stringent. The observed difference in the perception of road safety laws and performance of eye test before issuance of license was not statistically significant p = 0.537. Majority 275 (67.1%) of those that attended training perceived the road safety laws as appropriate while 76 (18.5%) believed the laws are stringent. There was no statistical significant difference between the perception to road safety laws and training attendance p = 0.134.

Table 41: Relationship between perception of road safety laws and road traffic crashes experience of the respondents

Variable	Perception Appropriate n (%)	Stringent n (%)	Total n (%)	χ^2	*p* value
Ever had RTA as a driver					
Yes	95 (23.2)	26 (6.3)	121 (29.5)	0.201	0.653
No	221 (53.9)	68 (16.6)	289 (70.5)		
Number of RTA had (n=121)					
1	77 (63.6)	18 (14.9)	95 (78.5)	1.691	0.193
≥ 2	18 (14.9)	8 (6.6)	26 (21.5)		
Severity of RTA (n=121)					
No injury	69 (57.0)	16 (13.2)	85 (70.2)	0.480^{Y}	0.786
Mild to serious injury	22 (18.2)	8 (6.6)	30 (24.8)		
Fatal	4 (3.3)	2 (1.7)	6 (5.0)		
Last time RTA occurred (years) (n=121)					
< 1	15 (12.4)	3 (2.5)	18 (14.9)	1.141^{Y}	0.285
≥ 1	80 (66.1)	5 (19.0)	103 (85.1)		

χ^2: Chi square; *: *p* value <0.05

Among the respondents that had RTC, 95 (23.2%) was of the opinion that road safety laws are appropriate, 26 (6.3%) believed the laws are stringent; there was however no statistical significant difference between the perception of respondents to road safety laws and occurrence of RTC p = 0.653. Many 77 (63.6%) of those that had RTC once were of the opinion that the road safety laws are appropriate while 18 (14.9%) felt the laws are stringent, similarly, more respondents who had two or more crashes believed the laws are appropriate compared with 8 (6.6%) that opined they are stringent p = 0.193.

Table 42: Relationship between perception of road safety laws and the knowledge of risk factors and practice of safety measures

Variable	Perception			χ^2	*p* value
	Appropriate n (%)	Stringent n (%)	Total n (%)		
Knowledge of risk factors					
Good	303 (73.9)	84 (20.5)	387 (94.4)	7.124[Y]	0.028
Fair	12 (2.9)	6 (1.5)	18 (4.4)		
Poor	1 (0.2)	4 (1.0)	5 (1.2)		
Practice of safety measures					
Good	296 (72.2)	76 (18.5)	372 (90.7)	14.159	<0.001
Poor	20 (4.9)	18 (4.4)	38 (9.3)		

χ^2: Chi square; *: *p* value <0.05

Majority of the respondents 303 (73.9%) with good knowledge scores of risk factors for RTC perceived that the road safety laws are appropriate. Few respondents 12 (2.9%) with fair knowledge of risk factors felt the laws are appropriate. Some of the respondents 84 (20.5%) among those with good knowledge believed the road safety laws are stringent. There was significant relationship between the knowledge of risk factors for RTC and perception of road safety laws p = 0.028.

Many respondents 296 (72.2%) who perceived the road safety laws appropriate had good safety practice for RTC. Of the respondents with poor safety practices, 20 (4.9%) opined that road safety laws are appropriate while 18 (4.4%) of them believed that those laws are stringent. There was statistically significant relationship between perception to road safety laws and practice of safety measures among respondents p = < 0.001.

Table 43: Relationship between perception of road safety laws and tutor of respondents in driving

	Perception				
Tutor	**Appropriate n (%)**	**Stringent n (%)**	**Total n (%)**	χ^2	***p* value**
Friends	26 (6.3)	11 (2.7)	37 (9.0)	8.505	0.203
Family members	42 (10.2)	12 (2.9)	54 (13.2)		
Self	19 (4.6)	6 (1.5)	25 (6.1)		
Driving School	7 (1.7)	1 (0.2)	8 (2.0)		
Co-driver	80 (19.5)	33 (8.0)	113 (27.6)		
Apprentice	35 (8.5)	9 (2.2)	44 (10.7)		
Mentor	102 (24.9)	18 (4.4)	120 (29.3)		

χ^2: Chi square; *: *p* value <0.05

Some respondents 102 (24.9%) who learnt the skills of driving by mentoring felt the road safety laws are appropriate while 33 (8.0%) of those taught by co-drivers believed the laws are stringent. There was no statistical significant difference between perception of road safety laws and who taught respondents how to drive p = 0. 203.

Table 44: Medical screening tests carried out by the respondents

Variable	Frequency	Percent
Ever carried out medical check up (N = 410)		
Yes	249	60.7
Frequency of medical checkup (n=249)		
Every 2 years	99	39.8
Every 3 years	18	7.2
Every 5 years	7	2.8
Not Regular	125	50.2
Time of last medical test (n=249)		
< 6 months	148	59.4
6 – 12 months	30	12.0
> 1 year	71	28.5
Components of test done (n=249)		
Only physical examination	125	50.2
Physical examination and eye test	119	47.8
Eye test only	5	2.0
Motivation for medical test/ screening (n=249)		
Personal	212	85.1
Medical advice	37	14.9

Less than two-thirds of the respondents, 249 (60.7%) had ever done a medical checkup. Of the respondents ever done medical checkup, 99 (39.8%) had it every 2 years, and 125 (50.2%) were not regular with the checkup. And 148 (59.4%) had last medical test less than 6 months, 125 (50.2%) had only physical examination done. Majority respondents 212 (85.1%) had the medical test based on personal request, while few 37 (14.9%) of them had medical advice as motivation for the screening.

Table 45: Eye/vision tests done by the respondents

Variable	Frequency	Percent
Ever carried out eye test (N = 410)		
Yes	106	25.9
No	304	74.1
Outcome of test (n = 106)		
Good Eye Sight	72	67.9
Need Glasses	13	12.3
Need Drugs	35	33.0
Regular Eye Check	10	9.4
Need Surgery	4	3.8
Ever had eye trauma (N = 410)		
Yes	23	5.6
No	387	94.4

A total of 106 (25.9%) respondents had ever done an eye test, out of which 72 (67.9%) had good eye sight. Only 23 (5.6%) of the total respondents reported ever had eye trauma.

Table 46: Visual Acuity of respondents (N = 410)

Visual acuity	Frequency	Percent
Right eye		
≤ 0.5*	53	12.9
0.67	47	11.5
0.83	18	4.4
1.00	292	71.2
Left eye		
≤ 0.5*	51	12.4
0.67	47	11.5
0.83	11	2.7
1.00	301	73.4
Visual status of respondents (N=410)		
< 0.50 poor/impaired vision	45	11.0
≥ 0.50 normal vision	365	89.0

IQR: Inter-quartile range; SD: Standard deviation;* ≤ 0.5: poor vision

Visual acuity assessment revealed that 53 (12.9) had poor vision on the right eye and 51 (12.4%) on the left. Among the respondents, 293 (71.2%) and 300 (73.4%) of respondents had visual acuity of 1 in right and left eyes respectively. Of the total respondents, 365 (89.0%) had good vision while 45 (11.0%) had poor vision.

Table 47: Multiple Logistic regression to determine the predictors of practice of safety measure in commercial drivers (respondents)

Variable	Coefficient	Odds ratio	*p*-value
Age group (years)			
≤ 25[REF]			
26 – 35	2.217	9.182	0.093
36 – 45	3.230	25.271	0.013*
46 – 55	2.146	8.548	0.053
56 – 65	1.209	3.350	0.255
> 65	1.163	3.200	0.405
Underwent driving test before obtaining license	2.342	10.403	0.005*
Underwent eye test before obtaining license	-22.214	0.001	0.995
Facilitator of the training (n=351)			
FRSC[REF]			
VIO	19.618	0.001	0.999
Others	-2.484	0.083	0.034*
Appropriate perception about road safety laws	1.854	6.388	0.004*
Mode of driving skill acquisition			
Friends	-0.878	0.416	0.492
Family members	-0.199	0.820	0.876
Self	20.775	0.001	0.998
Driving school	-1.308	0.271	0.352
Co-driver	0.711	2.038	0.541
Apprentice	-0.993	0.371	0.407
Mentor	19.137	0.001	0.996

Percent of cases correctly classified: 93.51 %

Those respondents who had driving test before license, had appropriate perception of road safety laws, attended seminar facilitated by others and in age group 36-45 years were predicted of safety measures while driving.

FOCUS GROUP DISCUSSION RESULTS

FINDINGS OF FOCUS GROUP DISCUSSION WITH DRIVERS

1. **Factors responsible for RTC on roads**

   All participants identified bad roads and poor road maintenance as part of factors responsible for road traffic crashes. As they exclaimed '*Bad roads and lack of road maintenance are part of main reasons causing road traffic crashes in Nigeria*'.

   Other factors identified as responsible for road traffic crashes by participants were over speeding, poor weather condition particularly rain and poorly maintained vehicles.

2. **How does the road affect vehicular crashes?**

   Once the road is bad, the vehicle will not be able to move very well and possibility of errors in driving leading to crashes is very high. One of the participants said '*it hampers vehicular movement*. The pothole on the roads is a strong factor for road crashes in this country. *Sometimes the road has many sharp bent which may be the cause of crashes in some of the cases*.

3. **How do you think drivers perceive RTC?**

Participants unanimously said drivers do not like road crashes and try to prevent it. One of the participants said *it is a bad thing and we do not want it happen*. We also think everybody has a duty in preventing road traffic crashes.

4. **What is the standard of vehicles on the road?**

Used vehicles are the only option within our reach for commercial activities, and lack of proper spare parts has affected vehicle standard. We are managing what we have because we need to take care of our family. *Majority of our vehicles are old as they spent up to 15 years plying the road and were bought as used vehicles*.

5. **How does law enforcement agents affect RTC?**

Federal Road Safety Corps assists whenever accidents occur and help in rescue operations of the victims of road traffic crashes. One of the participant mentioned that '*They cause accidents whenever they chase cars while others stop vehicles abruptly brandishing their weapons'*. Another participant said '*the police stop vehicles abruptly risking their own lives and that of the drivers'*. The general consensus is that they help in rescue in cases of road traffic crashes.

6. **Effect of road signs**

Majority of the participants attested that the road signs are very important and good to guide everybody, this will foster road safety practices. However, one of the participants said '*the benefit is limited as not many drivers are not well educated*'.

7. **Do drivers obey rules guiding driving?**

Participants in the discussion were not bothered about the existing laws, as they ask that '*are there laws in Nigeria*'? One of the participants said '*the laws are selective and not*

applied uniformly across the country'. Another participant mentioned that '*we do not obey road signs since we have a tight schedule and sometimes even law enforcement agent do not obey the laws*.

8. Weather conditions affecting RTC

All participants unanimously mentioned that rain, dew and harmattan weather can affect road crashes.

9. How can you collectively reduce RTC?

Participants suggest regular road maintenance, availability of spare parts, security agencies should be friendly with drivers and continuous education on road signs.

FINDINGS OF FOCUS GROUP DISCUSSION WITH ROAD SAFETY OFFICERS

1. Factors responsible for road traffic crashes

Road safety officers that participated in the discussion mentioned factors responsible for road traffic crashes as human like driving dangerously, phone call when driving; mechanical factors like bad vehicles; weather like heavy down pour. Additionally, one of participants said '*human factors include pedestrians e.g. crossing wrongly and hawkers e.g. selling of items on the road*'.

2. How Nigeria roads affect vehicular movement and crashes

Discussants in the FGD unanimously said bad roads, potholes, absence of road signs cause slow traffic movements and can predispose to road traffic crashes.

3. How drivers perceived RTC

The understanding of drivers is that they usually feel road traffic crashes is caused by evil spirits and that charms can prevent them from having accidents; some of them feel that only bad roads can cause crashes. One participant mentioned that drivers believe road crashes '*is an act of God*'

4. Suitability of vehicles used in Nigeria in respect to RTC

Most vehicles were bought fairly used and were usually imported. Tyres used are also from temperate regions and are therefore not suitable for the tropical region as ours. *Vehicle maintenance is the main problem which is a factor in road traffic crashes*.

5. How do law enforcement agencies reduce or increase RTC

Participants overwhelmingly said the law enforcement officers only reduce road traffic crashes most of the time but do not increase it. They do this by ensuring proper use of road signs and enforcing the various laws. However, one of the participants said '*bribery of law enforcement agents can also give rise to road traffic crashes when such agents instead of correcting issue of overload takes bribe*'. Also inappropriate stoppage of vehicle can cause road crashes. There is need for public enlightenment by law enforcement agents to help reduce road traffic crashes.

6. Do the current laws improve road safety or reduce accidents

The current laws improve road safety and reduce accidents as long as they are enforced.

7. Do drivers obey rules guiding driving and to what extent is the compliance with road safety laws?

There are many gaps in compliance with road safety laws. Most of the commercial drivers are not educated and as such knowledge of the rules is lacking.

8. Limitations in compliance with road safety laws

One important factor identified for non-compliance with the road safety laws was the literacy level of drivers.

9. How can we reduce road mishap

The road safety officers unanimously agreed that to reduce road mishap in Nigeria, the drivers must obey traffic laws and continuous public enlightenment on how to prevent road traffic crashes by law enforcement officers.

CHAPTER FIVE

DISCUSSION

The mean age of the respondents in this study was 46.78 ± 11.27 years. This reflected that active population group are involved in commercial driving. Although the age range from 22 to 74 years, this showed the wide spectrum of individuals involved in transportation at early stage of life and continue till older age. Majority (90.3%) of respondents were Muslims and Yoruba ethnicity accounted for 94.4%. This is because there were more Muslims in the study sites (Kwara State) and it is predominantly Yoruba speaking area.

On literacy level, a quarter 25.1% of the respondents attended secondary school. Many of the respondents either had primary (40.5%) or no formal education (30.0%). Driving work does not require advance education, therefore, it is not surprise that three-quarters either had primary or no formal education. In fact, it is because of challenges of job opportunities in Nigeria that probably made the 4.4% of those with tertiary education to be engaged in driving work.

About one-third of the respondents (30.0%) were in driving business for 10 to 20 years and 26.1% had spent between 21 and 30 years on the job. These findings are consistent with age distribution of the respondents because most drivers start learning the art of driving between 15 and 20 years of age. This finding implied that major motor parks in the State are saturated with experienced and mature drivers where it is expected that compliance to safety rules and regulations will be given high priority. Although, 95.9% had drivers' license, only 75.1% of respondents had valid license. This is far from expectation as these are professional drivers

whose only occupation is driving yet possession of license is sub-optimal. It clearly showed that there were gaps in monitoring and enforcement of laws if one in every four commercial drivers has no valid license.

Only 75.3% of the respondents underwent eye test before obtaining their licenses. Eye test is a pre-requisite for issuance of driving license. This observation implied that some of the commercial drivers on the road cannot be said to have a good sight to drive. This has serious implication for road traffic crashes. Similar to eye test, one (18.6%) in five drivers were given license without driving test. This is a guide on estimate of risk involved while on the road and implication for policy makers and regulatory bodies in the society. Many of the respondents learnt the art of driving from friends (13.2%), co-driver (27.6%), and through mentoring (29.3%). This is because friends and co-drivers are not likely to collect money or charge high fees for the services rendered. Additionally, people preferred free training option where learning is done by familiarity or in exchange for other services. Again, it is just in recent years that there exist organized private training centers for driving when the public owned could not meet the need of clients.

Majority, 85.6% of the respondents had ever attended road safety seminar or workshop and more than half, 52.7% attended more than 2 seminars. This clearly showed that stakeholders in road safety are providing useful information and enlightenment for the commercial drivers. This is expected to translate to improved safety and reduction in road crashes ultimately. It was reported that 61.0% had the seminar less than six months prior to this study. This finding showed that regular capacity building and human development in road safety is on-going and this should be

encouraged, supported and sustained. Majority of the respondents (83.8%) reported that FRSC organized the seminar they attended and 93.2% mentioned that officers from the FRSC facilitated the seminar they attended. This observation is in-line with one of the core functions of the road safety agency of government. Gana and Emmanuel in 2014 revealed that FRSC has done well in its performance in educating drivers on road safety measures.[17] This corroborated the findings in this study and justified the knowledge of risk factors among the drivers because they have attended seminars organized by FRSC.

About a third (29.5%) of the respondents had experienced road traffic crashes in the past. Of those who had experienced RTC, 78.5% had one RTC, while 21.5% had two or more RTC. This reflected the magnitude of road crashes in Nigeria. This implied that concerted efforts are required by all stakeholders to address the challenges in road safety and reduce road traffic crashes. In addition, data generation and management should be supported as there may be under reporting of road traffic crashes. Almost two-thirds, 63.6% of respondents that were involved in road crashes reported that the crash occurred in the day time and 36.4% persons reported that it occurred at night. The occurrence of crash in the night reported in this study is similar to a study conducted in India where 44.16% of crashes occur in the evening hours.[14] However, less than 10% of those who travel by road were involved in night travel. This implied that travel activity of less than 10% accounted for more than a third of the crashes. Therefore, if night travel is averted, a third of road crashed will be prevented. Additionally, rescue operations and provision of assistance and support services to victims of road crashes are often limited during the night hours.

On the severity of the RTC, 24.8% reported mild to severe injuries were sustained in this study. It has been reported that in many low-income and middle-income countries, the burden of traffic-related injuries is such that they represent between 30% and 86% of all trauma admissions, millions of others sustain injuries, with some suffering permanent disabilities. Enormous human potential were being destroyed, with serious social and economic consequences.[5,12] Among those involved in crashes, 14.9% had the last RTC in less than a year while 8.3% had the last RTC in 1-2 years ago. This showed that road crashes is a frequent problem and concerted efforts are required by all relevant stakeholders to combat the menace.

Respondents in this study demonstrated some level of knowledge of road safety including risk factors involved in crashes. Two in every five respondents (40.0%) stated that under age of drivers could result in RTC. This is because this age group is associated with youthful ideas and exploration where risky driving are employed and often culminated in road crashes. More than half, 57.6% did not know that older persons constitute a significant risk for RTC if they serve as vehicular operators. This is a reflection of gap in knowledge of some risk factors. It is obvious that at older age, special senses are diminished in activity and this will affect not only judgement but other aspect of body response coordination.

Less than half, 46.3% of the respondents mentioned that illiteracy predisposed to RTC. This is true because some level of education is required to understand road signs and instructions for compliance. Majority, 95.9% said other road users may be a factor in RTC. Pedestrians who are not observant of road signs and careful enough while on the road could be source of crash. This

is often common when people are crossing road where there is no zebra crossing or it is available but not used.

As expected, 97% identified use of mobile phone while driving as one of the factors predisposing to RTC. The diversion of attention and lack of concentration when on phone call while driving could predispose to road crashes. Self-control, discipline and enforcement of laws are required to address the unpleasant behavior. Respondents knew poor driving skills, over speeding and ignoring traffic lights as predisposing factors to RTC. This level of knowledge is expected for a professional driver. It is important that respondents demonstrated this basic understanding of road safety measures to guide them while driving so that crashes on the road can be reduced.

About two-thirds of respondents, 68.8% knew that driving for long hours could result in RTC. This is similar to a study by Aworemi JR et al in South West Nigeria in which 100% of commercial driver identified fatigue as a risk.[64] Fatigue and long hour of driving could lead to loss of concentration and poor judgement while on the road. Majority, 95.1% knew that poor vision could cause RTC. Inability to see clearly will affect movement and constitute significant risk for road crashes. This level of knowledge demonstrated that respondents had some basic understanding of road safety measures.

Driving under the influence of alcohol was asserted by 94.6% of the respondents as a risk factor that could predispose to RTC. Similarly, most respondents mentioned that use of hard drugs, driving when on sedatives and medical conditions like epilepsy are risk factors for RTC. Several psychotropic substances taken for recreational (alcohol and illicit drugs) or medical purposes can

impair driving performance either by disturbing the information processing mental function, promoting risk taking behaviour, or by increasing response time. [12] Among behavioural factors, alcohol plays an important role in car crashes, and accidents involving alcohol are more likely to result in injuries and deaths than crashes where alcohol is not a factor. [12] A large proportion of crashes are attributable to alcohol (in Europe about 20%) mainly in young people: the intake of alcoholic beverages when associated with narcotics use may represent the most dangerous combination that increases the risk of serious crashes.[12]

Almost all, 95.6% of the respondents knew that poor road construction is a risk factor for crashes. This is common occurrence in our society where roads are constructed based on economic gains and little consideration for safety. For example, limited bend should be on the road and as much as possible road should be straight. The implication of this for policy makers is that road design and construction should be monitored at all stages. Bad vehicle parts 97.1%, brake failures 98.3% and wiper malfunctions 95.9% were identified by respondents as predisposing to crashes. The aspect of vehicular problem that could be responsible for RTC known to respondents showed that they are well equipped and skilled in road safety awareness and measures. Studies have shown that more than 60% of all road traffic crashes are related to vehicular issues. [69]

Mechanical and electrical faults in vehicle, poor head light, break light and tyre burst were some of the vehicular factors mentioned by most of the respondents as risk factors of RTC. This clearly reflected the good knowledge scores of respondents on risk factors for crashes. Many respondents, 94.4% had good knowledge of risk factors of RTC, similarly, 90.7% had good

practice of safety measures and only 9.3% scored poor. Again, this demonstrated the experience gathered by respondents as commercial drivers over the years and also the level of capacity building and sensitization received.

More respondents, 69.5% of middle age 26-55 years had good knowledge of risk factors for road traffic crashes while few respondents 0.2% among older age group (>55 years) had poor knowledge of risk factors for road crashes. However, the observed difference in knowledge of risk factors for road traffic crashes and age was not statistically significant p = 0.804. This observation differ from what is obtained in a Norwegian study which established relationship between age of drivers and knowledge of speed limit; the older and experienced drivers had higher knowledge.[57] Also, in a study conducted in Lagos where 97.1% of the older drivers had poor knowledge[58] as compared with this study where many of the older drivers had good knowledge of the risk factors for road traffic crashes. This disparity could associated to varying literacy level of the respondents involved in those studies.

The higher the literacy level the more the knowledge of road traffic crashes among respondents. Respondents with no formal education 0.7% and 0.5% with only primary had poor knowledge scores of risk factors for RTC. The difference in education level was however not statistically significant (p = 0.667). Since more than half of the respondents had some level of education and driving work does not require advance study could explain the observed relationship. There was no statistical significance difference between years of experience on the job and knowledge of RTC (p = 0.660). In this study majority of the respondents had spent more than 10 years on the

job, therefore the level of knowledge when compared duration on the job may not elicit any difference.

Majority of respondents, 81.9% that had good knowledge of risk factors for RTC attended seminar compared with 12.4% who did not. The observed difference in seminar attendance and knowledge scores was statistically significant (p = 0.027). The seminar has imparted significantly on capacity of drivers and ultimately road safety and crash reduction. This implied that seminar attendance should be encourage and sustained. Training of drivers by law enforcement officers goes a long way in ensuring compliance with road traffic laws as seen in a study in Oyo and Lagos state where education from the FRSC improved the road habits of commercial drivers[96]

Of the respondents that had good knowledge scores of risk factors of RTC, 58.7% had last training less than 6 months prior to this study. This means that regular seminar should be organized to reinforce information given to the drivers. Of the total respondents in this study, 28.8% were involved in RTC and had good knowledge of risk factors compared with 65.6% that had good knowledge scores but never involved. The difference was not statistically significant (p = 0.325). Although not significant, the implication of this is that more drivers used the knowledge acquired during seminar and thereby possibly reducing road crashes.

There was good knowledge scores among those who learnt the art of driving by mentoring 27.6%, and co-drivers 25.9% compared with those who attended driving school 2.0%. The difference in knowledge scores was however not statistically significant p = 0.956. This implied that available opportunities for driving skills acquisition should be explored since there was no comparative significant advantage. Majority of the respondents practiced safety measures which include obeying speed limit 82.7%, obeying traffic light 88.5%, observing road signs 89.5%, using belts 85.6%, resting when fatigued 86.6%, maintaining the vehicle in good condition 89.8% and not ingesting alcohol while driving 361 (88.0%). The respondents demonstrated good safety practices in many aspect of driving. This showed that they are experienced drivers and put knowledge garnered during the seminar to use.

Regular and continuous maintenance of vehicle is fundamental to avert road crashes. Concerning safety checks of the vehicles, majority of the respondents checked water level in radiator 90.5%, check lighting system 90.5%, check brakes and clutches 90.7%, check horns and spare tyre 90.2%, have fire extinguishers 87.3% and did wheel alignment and balancing 89.8%. This demonstrated that respondents gave safety practice the necessary priority.

One in every ten respondents 9.3% did not have driver's license, and of those who had it, 83.8% possess valid licenses. Monitoring of drivers by regulatory agencies is required because lack of valid license has serious implications on legality of driving. It was observed that some other accessories of vehicle were either not functional or not available. Less than three-quarters 70.7% of the vehicles had good fire extinguishers. Only 88.0% vehicles had functional C- caution.

Windshield wipers were good in 94.7% vehicles. Some of the drivers find it difficult to buy vehicle accessories once it will not affect the engine or movement of the vehicle. A study of vehicles plying Benin-Asaba expressway showed 62.6% have functional fire extinguisher and 28.4% non-functional.[82]

More respondents, 68.3% in the age group 26-55 years had good safety practices compared with those ≤ 25 years 3.2% and > 55 years 19.3%. The observed difference was statistically significant p = 0.057. This fall within active age for many jobs and they are more versatile to entrench safety practices. Literacy level of the respondents had no statistical significant relationship with practice of safety measures p = 0.373.

Of all respondents with driver's license, 75.6% had good safety practices and carried out driving test before issuance of license. There was statistical significant relationship between those that practiced safety measures and those who carried out driving test before issuance of license p = 0.001. It is obvious that those who carried out driving test were more likely to conform to standard practice.

Many respondents 63.9% who had good safety practices had no history of RTC compared with 26.8% who had RTC. The difference in the level of safety practices and ever had RTC was however, not statistically significant p = 0.938. Though not statistically significant, it showed good safety practice may reduce road crashes.

Of the respondents that had good practice, 29.0% learnt driving by mentoring while 26.1% learnt from co-drivers, 1.5% were taught at the driving school. There was statistically significant difference between safety practices and modes of driving skills acquisition by respondents p = <0.001. Mentoring in any job provide opportunity for hands-on practical skill acquisition and learning is by experience. This has helped the drivers in the practice of safety measures.

The respondents that tested positive for alcohol were 7.1%, and the mean level of blood alcohol concentration was 23.28± 23.32µg/dl. Alcohol has strong association with RTC. Monitoring of commercial drivers is required to enhance road safety. This will provide the basis of strategic interventions and will reduce alcohol consumption while driving.

Of the vehicles inspected, 53.3% had their front tyres (right and left) expired while the rear tyres expired in 57.3% and 54.7% of right and left side of the vehicles respectively. About one-quarter 24.0% of the vehicles inspected had expired extra tyres. This implied that passengers were exposed to risk as they travel on the road. Similarly, the thread wear indicator revealed worn tyres in 54.7% and 57.3% on right and left front tyres respectively, and 52.0% and 56.0% on right and left rear tyres respectively. Of the 55 extra tyres, 70.9% were worn-out. This clearly demonstrated that more than half of tyres used on the road were not safe. Burst tyre is said to have being responsible for 6.7% of RTC in 2015 in Nigeria.[97] This is similar to a study conducted nationwide where 44% of tyres were expired.[98]

Using the tyre coin test, 56.0% of the right and 52.0% of the left front tyres did not pass. Of the rear tyres, 42.7% on right and 45.3% on the left did not pass the coin test. Thirty five 36.4% extra tyres did not pass the coin test. There is consistency in the status of tyres assessed by coin test, thread wear indicator and expiration. The implications of these findings pose serious threat to road travel and increase the risk of road crashes. This is in contrast to a nationwide FRSC study where 18% of tyre were worn out.[98]

Out of the 410 respondents that participated in the study, 79% of them had been booked for committing road traffic offence at one time or the other, of which 22.8% had the issue settled by their union. The proportion of driver booked for various reasons was high and it may be due to the fact that many of them hardly obey traffic laws and commit these offences repeatedly[25,55] probably due to the fact that they may perceive that these laws are not strongly enforced.[99] Among the law enforcement officers as seen in Nassarawa State study where most of them perceived the enforcement of road traffic laws as being low.[42] Continuous health education may indeed increase the compliance of commercial drivers in obeying traffic laws as seen in studies carried out among drivers in Oyo and Lagos States where there was a marked improvement in road traffic habits' by drivers as a result of repeated health education received by FRSC officials.[96]

Majority of the respondents 87.6 % that were booked felt the reason for booking was genuine. One-quarter 24.9% reported that officers demanded money for the offence committed and 65.7% refused to give money to the officer. For refusal to pay the officers on the road, 73.1% mentioned they were delayed. The higher concentration on financial penalties for road offences is not necessarily a deterrent from violating traffic laws as many drivers in Nigeria usually set aside monies for these eventualities, more like a daily running costs further compounded by the fact that some of these fines are actually meager . Generally, there is need for supervision and monitoring of FRSC officers on the road.

Some respondents 49.3% described the activities of law enforcement on the roads as a way to help reduce crashes, others believed that they were too many on the road 29.8% and very few said they have no effect 7.1% and 4.4% were of the opinion that it is merely duplication of duties. The attitude and orientation of drivers could explain the perception they have on law enforcement agents. Drivers with longer duration of driving were also found to have a better perception of road safety laws.[96]

More than three-quarters 77.1% described the road safety rules/laws as being appropriate. There was no statistical significant difference between age of respondents and perception of road safety laws ($p = 0.979$). The literacy level of respondents has no statistical significant relationship with perception to road safety laws $p = 0.163$. The road safety law awareness is necessary among the commercial drivers so that they can abide by the rules. Laurent & Florent demonstrated that age, level of education and frequency of use of a vehicle (duration of driving) were found to be

moderately associated with perception of certain road safety laws (penalty/ surveillance and social communication).[43] This affirms that age and duration of driving is related to perception of safety laws.

Of the respondents that underwent eye test before issuance of driver's license, 57.5% believed the road safety laws are appropriate while 17.8% mentioned that the laws are stringent. The observed difference in the perception of road safety laws and performance of eye test before issuance of license was not statistically significant $p = 0.537$. The creation of awareness on road safety laws will provide opportunity for the drivers to follow the rules and conduct appropriate test while requesting for license.

Majority, 67.1% of those that attended seminar perceived the road safety laws as appropriate while 18.5% believed the laws are stringent. There was no statistical significant difference between the perception to road safety laws and seminar attendance $p = 0.134$. This difference is expected as it has been established that FRSC play more roles in educating motorist through various enlightenment campaigns on road safety than any other agencies.[17]

Many 63.6% of those that had RTC once were of the opinion that the road safety laws are appropriate while 14.9% felt the laws are stringent, similarly, more respondents who had two or more crashes believed the laws are appropriate compared with 6.6% that opined they are stringent $p = 0.193$. Those that had RTC would have identify their mistakes and learnt lessons on

safety measures and accident prevention. The multiplicity of enforcement agencies strongly influences the perception of drivers about law enforcement in relation to their appropriateness or otherwise.

Majority of the respondents 73.9% with good knowledge scores of risk factors for RTC perceived that the road safety laws are appropriate. This implied that more training is needed to equip more people with information and knowledge on road safety laws. There was significant difference between the respondents knowledge of risk factors for RTC and perception of road safety laws $p = 0.028$. This is in line with a study on Perceived Legitimacy of Traffic Laws Enforcement where the average of the study sample considered the enforcement of safety laws as fair; especially on drink driving and seat belt laws.[98] Closely related to this is the findings in a study of attitude of drivers to road safety; which revealed that majority (95%) of the respondents felt that seat belts reduce the risk of serious injury for both drivers and passengers.[99]

Many respondents 72.2% who perceived that the road safety laws are appropriate had good safety practice for RTC. There was statistically significant difference between perception to road safety laws and practice of safety measures among respondents $p = < 0.001$. The more respondents perceived the road safety laws as appropriate the more they engage in practice of safety measures. It therefore implied that a robust re-orientation is required to change the perception of commercial drivers.

Visual acuity assessment revealed that 12.9% had poor vision on the right eye and 12.4% on the left. Of the total respondents, 11.0% had poor vision. Most of the respondents that had ever had a medical checkup carried out were on the grounds of personal request. There is a dearth of studies regarding regular medical checkup for drivers.[12] Also most of the respondents had never carried out eye test prior to this study. Even though the respondents did not perceived themselves at risk of poor vision, it is a strong risk factor for RTCs since there is a resultant difficulty in reading road signs which can lead to road crashes.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1 Conclusions

Respondents in this study demonstrated high level of knowledge and understanding of road safety including risk factors involved in crashes. Majority of the respondents had good knowledge scores of risk factors and safety measures of road traffic crashes. This is a reflection of years of experience garnered by respondents as commercial drivers and also the level of seminars, trainings and sensitization received. About two-thirds of respondents knew that driving for long hours, fatigue, alcohol consumption, use of drug among others could lead to loss of concentration and poor judgement while on the road. Majority knew that poor vision could affect movement and constitute significant risk for road crashes. Majority of respondents that had good knowledge of risk factors for RTC attended training compared with those who did not. The observed relationship in training attendance and knowledge scores was statistically significant.

The respondents demonstrated good safety practices in many domains. Majority of the respondents practiced safety measures which included obeying speed limit, obeying traffic light, observing road signs, using belts, resting when fatigued and maintaining the vehicle in good condition among others. Concerning vehicle related safety, majority of the respondents checked water level in radiator, lighting system, brakes and clutches, horns and spare tyre. The high level of caution and maintenance demonstrated by the respondents showed that safety practices were given priority.

More respondents in the age group 26-55 years had good safety practices compared with those ≤ 25 years and > 55 years. The observed relationship was statistically significant p = 0.057. There was statistical significant relationship between respondents who practiced safety measures and those who carried out driving test before issuance of license p = 0.001. Literacy level of the respondents had no statistical significant relationship with practice of safety measures p = 0.373. Of the respondents that had good practice, less than a third acquired driving skills by mentoring while few others learnt from co-drivers. There was statistically significant relationship between safety practices and modes of driving skills acquisition p = <0.001.

Some respondents tested positive for alcohol and the mean blood alcohol concentration was 23.28± 23.32µg/dl. About a third of the respondents had experienced road traffic crashes in the past.

Assessment of the status of tyres of the vehicles revealed that enormous risks were involved in road travel as more than half were expired. Forty percent of all vehicles assessed had all four tyres reached the thread wear indicator. Of the vehicles assessed, more than one-quarter had no extra tyres, and a third of extra tyres were worn-out. Using the coin test, more than a third of all inter-city commercial vehicles inspected had all four tyres that failed the test. Only one vehicle had tyres that passed all the three tests. This revealed that there is serious threat to road travel and increase risk of road crashes.

Some respondents described the activities of law enforcement on the roads as a way to help reduce crashes, others believed that they were too many on the road but helped to maintain

orderliness. More than three-quarters described the road safety rules/laws as being appropriate. Majority of the respondents with good knowledge scores of risk factors for RTC perceived that the road safety laws are appropriate. There was significant relationship between the knowledge of risk factors for RTC and perception of road safety laws $p = 0.028$. There was statistically significant relationship between perception to road safety laws and practice of safety measures among respondents $p = < 0.001$.

6.2 Recommendations

1. Law enforcement agencies and licensing authorities should ensure basic medical test and assessment are done before issuance of driving license. This will not only detect unnoticed disease or medical conditions but will provide opportunity for only those who are fit to be certified commercial drivers.
2. Private, public institutions and organizations should provide or strengthen existing driving skill acquisition centres with global best practices in training of drivers with required skills and knowledge.
3. Training and retraining of commercial drivers should be encouraged on regular basis by stakeholders including government, individuals, cooperate organizations and non-governmental organizations. This will provide opportunities for self-development and better driving skills. Also, public education, awareness and enlightenment on road safety and crash prevention should be done by all stakeholders involved in road safety.

4. The Federal Road Safety Corps and other relevant agencies should conduct regular blood alcohol concentration assessment on drivers while on the road and institute appropriate sanctions where necessary.
5. The FRSC, NURTW and RTEAN should work in collaboration toward road safety free of crashes by ensuring regular assessment of tyres of vehicles before take-off and while on the road.
6. Regular and continuous monitoring of activities of law enforcement agencies on the road by appropriate coordinating or supervising institution is required to guide abuse of power.

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APPENDIX I

QUESTIONNAIRE

Assessment of Safety Measures and Risk Factors for Road Traffic Crash among Inter-city Commercial Drivers in Kwara State, Nigeria

Dear Respondent,

This questionnaire is designed to assess risk factors for road traffic accidents among inter-city commercial drivers in Kwara State. The information obtained will be used purely for research purpose and shall be held in absolute confidence.

I, having been duly informed about the above research work, have decided to participate in the study.

Signature/thumb print_____ Date:_____

(Study Subject)

Signature _____ Date:_____

(Researcher/Research Assistant)

Instruction: Please Tick (√) in the box or fill as appropriate.

SECTION: A

SOCIODEMOGRAPHIC CHARACTERISTICS

1. Age:_____ years (as at last birthday)
2. Sex: Male [ ] Female [ ]
3. Marital Status: Single [ ], Married [ ], Divorced [ ], Separated [ ] Widowed [ ]
4. Number of children:_____
5. Educational level: No Formal [ ], Primary [ ], Secondary [ ], Tertiary [ ]
6. Religion: Christianity [ ], Islam [ ], Traditional [ ], Others specify_____
7. Ethnicity: Yoruba [ ], Hausa [ ], Nupe [ ], Fulani [ ], Igbo [ ], Bokobaru [ ] Batonu [ ] Others specify_____
8. Name of Garage where you work as driver _____
9. LGA of work as driver _____
10. How much do you receive per trip on the average _____
11. How many trip per week _____

SECTION B

DRIVER'S EXPERIENCE

Please fill or tick as appropriate.

11. Who taught you how to drive (tick as applicable)? _____

    Friends [ ], Family members [ ], Self [ ], Driving school [ ], co-driver[ ],

    Apprentice [ ] Mentor [ ] Others specify [ ]

12. How long have you been driving as commercial driver? (In Years) _____
13. Do you have a driver's license? Yes [ ] No [ ]
    If No, go to Q19
14. If Yes, did you undergo eye test before you were given? Yes [ ] No [ ]
15. If Yes to Q13, did you undergo driving test before you were given? Yes [ ] No [ ]
16. If Yes to Q13**,** do you renew your license as at when due? Yes [ ] No [ ]
17. If Yes to Q16, is your driver's license valid? Yes [ ] No [ ]
18. What class of driver's license do you have? _____
19. If No to Q13, why? _____
20. Have you ever attended any road safety training/ seminar/workshop? Yes [ ] No [ ]
21. If No skip to 24

22. If Yes**,** how many times in last 3 years?_____
23. When was the last training you attended. < 6 months [ ] 6-12 months [ ] > 12 months [ ]
24. Who organized the seminar/workshop?_____
25. Who facilitated the training _____
26. Are you willing to attend? Yes [ ] No [ ]
27. Have you ever had any road traffic crash as a driver? Yes [ ] No [ ]
    If yes, how many RTC did you have _____ If NO, go to section D
28. If yes**,** please fill the table below._____

Year	**Month**	**Day**	**Morning/Night**	***Severity**			**Cause**
				A	**B**	**C**	

*Severity (A) No injury [ ], (B) mild to serious injury (i.e. requiring hospitalization of driver or passenger) [ ], (C) Fatal(involving death) [ ]

29. When was the last time you had RTC < 1 year [ ] 1-2 years [ ] 3-5 years [ ] > 5 years [ ]

SECTION C

KNOWLEDGE OF RISK FACTORS

Which of the following do you know is a risk factor for RTA? (Tick in the appropriate box)

S/No	**Risk Factor**	**Yes**	**No**	**Don't know**
	Human/Driver Factor			
41.	Young driver (Aged 18-24yrs)			
42.	Older Driver (more than 60yrs)			
43.	Male Driver			
44.	Female Driver			
45.	Professional drivers			
46.	Beliefs in Use of charm/juju			
47.	Driving for long hours			
48.	Poor vision (eye sight).			
49.	Driving under the influence of alcohol.			

50.	Not praying before driving			
51.	Using of hard drugs like Indian hemp, nicotine, caffeine, cocaine to improve alertness			
52.	Driving when on sedatives e.g. syrup, piriton, valium			
53.	Medical conditions like, epilepsy			
54.	Use of mobile phones while driving.			
55.	Fatigue			
56.	Other road user like pedestrians, motorcycle riders, vehicle passengers			
57.	Physically challenged people			
58.	Illiteracy			
59.	Poor driving skills			
60.	Inadequate signal/ road signs			
61.	Over speeding			
62.	Reckless driving			
63.	Ignoring traffic lights			
	Environmental/road factor			
64.	Sunrays (glare from the sun)			
65.	Poor road layout			
66.	Road block			
67.	Robbery			
68.	Harmattan haze/mist			
69.	Rain			
70.	Night driving			
71.	Potholes, collapsed bridges			
72.	Fallen trees and stray objects/animals.			
Vehicle factor				
73.	Bad vehicle parts (Tyre, absorber, alignment)			
74.	Brake failure			

75.	Wiper malfunction			
76.	Mechanical/electrical fault in vehicle.			
77.	Poor head light, break light			
78.	Tyre burst (bad tyre)			
79.	Overloading			
80.	Poor maintenance			
81.	Old or overage vehicle (> 20 years)			
82.	Other specify:…….			

SECTION D

RISK FACTORS FOR ROAD TRAFFIC CRASH

Please tick any of the following conditions/factors as applicable to you

	Factors	**Yes**	**No**
28.	Age < 18 years		
29.	Age ≥ 60 years		
30.	No formal education		
31.	Male driver		
32.	Poor vision		
33.	Medical condition (DM, Hypertension, migraine**)**		
34.	Regular alcohol intake		
35.	Driving > 6hours (fatigue)		
36.	Eating/smoking while driving		
37.	Use mobile phone while driving		
38.	Substance abuse (kolanut, bitter kola, take caffeine drinks)		

39.	Over speeding		
40.	Passenger overload		
41.	Regular night travel		

SECTION E

PRACTICE OF SAFETY MEASURES

Did you do any of the following before or while driving a vehicle? Please tick as appropriate.

S/No	Safety Measures	Yes/Always	Yes/Sometimes	No
77.	Obey speed limit			
78.	Obey traffic lights			
79.	Observe road signs			
80.	Use seat belt			
81.	Rest when fatigued/stressed before driving			
82.	Maintain vehicle in good condition			
83.	Not ingest alcohol while driving			
84.	**Safety_check_of_vehicle:**			
85.	Water level in the radiator			
86.	Oil level			
87.	Cuts, puncture, depth of threading and tyre pressure			
88.	Lighting system such as headlamps, pointer			
89.	Brakes & clutches			
90.	Wipers			
91.	Horns, spare tyre			
92.	Do you gauge your tyre before travelling			
93.	Fire extinguisher			
94.	Battery			

95.	Alignment / balancing			
96.	Others (specify) ……			

SECTION F

MEDICAL/VISION TEST

97. Have you ever done a medical checkup in the past? Yes [ ] No [ ]
98. Frequency of medical checkup. Every 2 yrs [ ] Every 3 yrs [ ] Every 5 yrs [ ] not regular [ ]
99. When was the last time medical test done? < 6 months [ ] 6-12 months [ ] > 1 yr [ ]
100. Where was the last medical test done _____
101. What were the components of medical test done. Only physical exam [ ] Physical and lab test [ ] Eye test only [ ] others (specify) …….
102. What informed the components of test done. Personal request [ ] Medical advice [ ] others (specify) ……..
103. Have you ever gone for eye checkup? Yes [ ] No [ ]
104. If No, why? _____
105. If Yes, what prompted you?_____
106. What were you told? (tick as applicable to you)

Good eyesight [ ]

Need glasses [ ]

Should not drive [ ]

Need drugs [ ]

Regular eye check [ ]

Need surgery [ ]

Others 9specify) ……..

107. Did you comply with the advice given during checkup? Yes [ ] No [ ]
108. If NO, Why?_____
109. If YES, what is the level of compliance. Tick as applicable Few [ ] Many [ ] All [ ]
110. Did you ever have eye trauma. Yes [ ] No [ ]
111. Do you use glasses. Yes [ ] No [ ]
112. Reason for use of glasses. Fashion [ ] Sun shade [ ] Driving [ ] Reading [ ]
113. What is the source of glasses. Prescribed [ ] Purchase unprescribe [ ]
114. Was there any need to follow up with checkup Yes [ ] No [ ]
115. If there is need, did you go for follow up. Yes [ ] No [ ]
116. Give reason for your response…….

……

……

SECTION G

ENFORCEMENT OF ROAD SAFETY LAWS

117. Have you ever been arrested/ booked by law enforcement agencies on road safety. Yes [ ] No [ ]

118. If yes, was the issue settled by your union Yes [ ] No [ ]

119. Did your vehicle inspected for the necessary safety tools. Yes [ ] No [ ]

120. Were you warned. Yes [ ] No [ ]

121. How many times were you warned in the last 6 months ……

122. When was your last booking. < 6 months [ ] 6-12 months [ ] > 12 months [ ]

123. How many times were you booked in the last 1 year ……

124. What was/were the reason(s) for your booking …….
……

125. Did you think the reason for your booking was genuine/justify. Yes [ ] No [ ]

126. Who booked you. Police [ ] FRSC [ ] VIO [ ] [ ] others (specify)……

127. Who did you pay to. Officer [ ] Bank [ ] Revenue collector [ ] others ……

128. Did any officer of road safety ever demand money from you. Yes [ ] No [ ]

129. Did you give the money requested. Yes [] No [ ]

130. Mention the minimum amount ever paid …….

131. Mention the maximum amount ever paid ……

132. If you refused the money, what was the response of the officer. Delayed you [ ] Made you pay to bank [ ] Arrested you [ ] collected vital documents [ ] others (specify) ……

133. How will you describe the law enforcement agents on the road (tick as applicable) Extorting money [ ] cause accident [ ] cause traffic [ ] too many on the road [ ] help to reduce accident [ ] maintain orderliness [ ] duplication of duties [ ] has no effect [ ] Others (specify) ……

134. How will you describe the road safety laws/rules. Appropriate [ ] Too stringent [ ]

135. Have ever being given road safety information/training by law enforcement agencies. Yes [ ] No [ ]

136. If yes, when. < 6 months [ ] 6-12 months [ ] > 12 months

137. Who organized the training Police [ ] FRSC [ ] VIO [ ] others …….

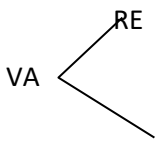
138. Did you pay for the training Yes [ ] No [ ]

139. If yes, how much ……

140. Any certificate for the training Yes [ ] No [ ]

SECTION H

141. Eye Examination for Visual Impairment by using Snellen's chart.



LE

142. Breath Alcohol Tests

Blood Alcohol Concentration

143. Blood Pressure:

OBSERVATIONAL CHECKLIST.

Please tick the applicable one

1) Availability of driver's license. Yes [ ] No [ ]
2) Validity of driver's license. Yes [ ] No [ ]
3) Availability of seat belt. Driver: Yes Functional [ ] Yes not Functional [ ] No [ ]
4) Passenger in front seat: Yes Functional [ ] Yes not Functional [ ] No [ ]
5) Tyres: Right front Expired [ ] Not Expired [ ]
6) Left front Expired [ ] Not Expired [ ]
7) Right rear Expired [ ] Not Expired [ ]
8) Left rear Expired [ ] Not Expired [ ]
9) Extra Expired [ ] Not Expired [ ]
10) Availability of extra tyre: Yes, not expired [ ] Yes, expired [ ] No [ ]
11) Tyre Tread Wear Indicator (TWI) Right front TWL reached [ ] TWL Not reached [ ]
12) Left front TWL reached [ ] TWL Not reached [ ]
13) Right rear TWL reached [ ] TWL Not reached [ ]
14) Left rear TWL reached [ ] TWL Not reached [ ]
15) Extra tyre TWL reached [ ] TWL Not reached [ ]
16) Tyre pass coin test Right front Passed [ ] Failed [ ]
17) Left front Passed [ ] Failed [ ]
18) Right rear Passed [ ] Failed [ ]
19) Left rear Passed [ ] Failed [ ]
20) Extra tyre Passed [ ] Failed [ ]
21) Availability of headlights: Yes Functional [ ] Yes not Functional [ ] No [ ]
22) Availability of trafficators :Right front Yes Functional [ ] Yes not Functional [ ] No [ ]
23) Left front Yes Functional [ ] Yes not Functional [ ] No [ ]

24) Right rear Yes Functional [ ] Yes not Functional [ ] No [ ]

25) Left rear Yes Functional [ ] Yes not Functional [ ] No [ ]

26) Availability of break light: Right Yes Functional [ ] Yes not Functional [ ] No [ ]

27) Left Yes Functional [ ] Yes not Functional [ ] No [ ]

28) Availability of fire extinguishers: Yes Functional [ ] Yes not Functional [ ] No [ ]

29) Availability of C-caution Yes Functional [ ] Yes not Functional [ ] No [ ]

30) Availability of head rest: Yes [ ] No [ ]

31) Availability of windshield wiper: Yes Functional [ ] Yes not Functional [ ] No [ ]

32) Availability of Side mirror: Right Yes [ ] No [ ]

33) Left Yes [ ] No [ ]

34) Adequacy of vehicle Oil gauged? : Yes [ ] No [ ]

35) Availability of functional Horn: Yes [ ] No [ ]

FOCUS GROUP DISCUSSION GUIDE

1. What are the factors responsible for road traffic accident
2. How do Nigeria roads affect vehicular movement and accident
3. How do you think drivers perceived RTC
4. How can you describe the suitability of vehicles used in Nigeria in respect to RTC
5. How do law enforcement agencies reduce or increase RTC (FRSC, police, VIO)
6. Is the current laws improve road safety or reduce accidents.
7. Do you think drivers obey rules guiding driving and to what extent is their compliance with road safety laws.
8. What are the weather conditions in Nigeria that can affect RTC
9. What are your limitations in compliance with road safety laws
10. How can we collectively reduce road mishap

APPENDIX II

INFORMATION SHEET

WHAT IS THE STUDY ABOUT?

This is a research study designed to assess the risk factors and safety measures for road traffic crashes among Inter-city commercial drivers in Kwara State, Nigeria.

NAME AND AFFILIATION OF THE RESEARCHER

Dr. Adekunle Salaudeen

Epidemiology and Community Health Department, University of Ilorin, Ilorin

SPONSORS OF THE RESEARCH: This research is self sponsored

PURPOSE OF THE RESEARCH: This research is being conducted in partial fulfilment for the requirements for the award of PhD in Epidemiology

PROCEDURE(S) OF THE RESEARCH

The participants will be expected to answer questions on age, sex, educational status and other socio-demographic variables. They will also be required to answer questions on risk factors for road traffic crash (RTC), practices of safety measures against RTC and their driving experiences. Blood alcohol level will be determined by use of breathlazer. and observational checklist will be conducted.

COMPENSATION: No injuries or adverse events are expected to result from this study, and as such, no compensation will be required.

CONSEQUENCES OF PARTICIPATING IN THE STUDY

By participating in the research, the commercial drivers will have the benefit of re-assessing their knowledge of risk factors and practices of safety measures against RTC. There are no envisaged adverse events that could arise from the study. However, the participants can choose to withdraw from the study at any stage without repercussions.

MODALITY OF PROVIDING TREATMENTS/ACTIONS TO BE TAKEN IN CASE OF INJURIES: This is not applicable for this study.

POST RESEARCH BENEFITS: The participants will have the benefit of knowing blood pressure and status of their vision.

CONFLICTS OF INTEREST: There are no known apparent or potential conflicts of interest.

DETAILED CONTACT INFORMATION:

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ADDRESS: Department of Epidemiology and Community Health, University of Ilorin

E-MAIL: adekunlesalaudeen@yahoo.com

PHONE NUMBER: 08036708106

APPENDIX III

Workplan for the study

S/N	Activity	Outcome	Duration	Remarks
1.	Training of RA/Pre-test	Validated data tool	2 weeks	
2.	Data Collection	Completed data tool	6 weeks	
3	Data analysis	Results	4 weeks	
4.	Thesis writing	Thesis	8 weeks	
5	Defense	Corrected Thesis	2 weeks	