KWARA STATE UNIVERSITY, MALETE, NIGERIA

SCHOOL OF POSTGRADUATE STUDIES (SPGS)

COMPREHENSION ANALYSIS OF TRAFFIC SIGNS BY DRIVERS ON URBAN ROADS IN ILORIN, KWARA STATE

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(19/67MCE/00007)

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An M.Eng. THESIS REPORT

BY

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DEPARTMENT OF CIVIL AND ENVIROMENTAL ENGINEERING, FACULTY OF ENGINEERING AND TECHNOLOGY, KWARA STATE UNIVERSITY, MALETE NIGERIA

AUGUST, 2022

DECLARATION

I hereby declare that this thesis titled Comprehension Analysis of Traffic Signs by drivers on urban roads in Ilorin, Kwara State is a record of my research. It has neither been presented nor accepted in any previous application for higher degree.

DAMILOLA SIKIRAT MUSTAPHA _____ Signature / Date

APPROVAL

This is to certify that this thesis by Mustapha Damilola Sikirat has been read and approved as meeting the requirements of the Department of Civil and Environmental Engineering for the award of the degree of Masters (M.Eng.) in Civil Engineering.

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DEDICATION

This research work is dedicated to Almighty Allah.

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ABSTRACT

Traffic signs are the oldest and most commonly used Traffic Control Device (TCD). These signs convey messages in words or symbols and erected to regulate, warn, or guide the road users (motorists, and pedestrians). Traffic signs are commonly used traffic safety tools, developed to provide crucial information in a short time to support safe drive; but the success depends on their comprehensibility by the drivers. Hence, this study investigated the level of understanding and compliance of traffic control devices among drivers with different sociodemographic characteristics in Ilorin. A descriptive research design of survey type was used in the conduct of the study. The population for this study covers commercial and private drivers in Ilorin. The three local government areas in Ilorin were selected Ilorin South, East and West and the following areas were selected, Ministry of Health, Flora School, Unilorin bus Terminal. University of Ilorin Teaching Hospital, Maraba Motor Park, Kwara State Polytechnic, Sawmill Garage, College of Education Ilorin and Oja Oba park. A multi-stage sampling technique was used to select three hundred and eighty-four (384) drivers from the population for the study. The research instrument used for the study is a well-structured questionnaire. The data gathered were analysed using frequency counts and percentage for the demographic data, overall percentage of drivers who correctly understood the traffic control device and factors that affect the non-understanding of drivers to traffic control devices. The average comprehension percentage of warning signs, regulatory signs, information sign, driver's knowledge of road marking 56.1%, 60.3%, 64.6% and 59% respectively. The study concluded that the overall percentage of drivers that understood traffic control devices in Ilorin was found to be 60%. Statistical analysis was done with SPSS. For chi- square, only the years of driving experience was found statistically significant with a p-value of 0.006 and for Analysis of variance (ANOVA) both educational experience and years of driving experience were found to be statistically significant with p-value of 0.001 and 0.000. It was deduced that major factors affecting the non-understanding of traffic control devices by drivers in Ilorin were lack of previous knowledge of the signs, lack of adequate enforcement and non-availability of control devices on most roads in Ilorin.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The number of vehicles on roads has increased due to technological and economical development in recent years (Kirmizioglu, 2012). As a result of this increase, traffic has been one of the most important parts of our daily lives as people spend more time in traffic thereby forcing drivers and other road users to face a higher risk of traffic accident. Globally more than 1.25 million people lose their lives annually due to traffic crashes. Everyday nearly 1,049 people under the age of 25 lose their lives in traffic accidents (World Health Organization, 2004; Makinde and Opeyemi, 2012).

Traffic signs are the oldest and most commonly used Traffic Control Device (TCD). These signs convey messages in words or symbols and erected to regulate, warn, or guide the road users (motorists, and pedestrians and other road users). Traffic signs are commonly used traffic safety tools, mainly developed to provide crucial information in a short time to support safe drive; but the success depends on their comprehensibility by the drivers (Kirmizioglu and Tuydes-Yaman, 2012). Traffic signs, however are most effective when they command attention, convey a clear and simple meaning, command respect of the road users and give adequate time for proper response (Canfield, 1999). Traffic signs use colour, shape, and words to convey information. However, the traffic signs cannot effectively serve their intended purpose if drivers do not understand the information concerning safe driving behaviour that is encoded in the sign (Makinde and Opeyemi, 2012).

The American National Standard Institute (ANSI Z535.3) (2011) advised that traffic signs should meet 85%, while the Organization of International Standardization (ISO 3864) pegged its own at 67%. Traffic signs in relation with congestion and road accident occurrences have

been a topic of considerable interest to researchers in the past few decades (Makinde and Opeyemi, 2012).

Research concerning traffic sign comprehension dates back to 1966 and that early studies focused on evaluating user understanding levels of local traffic signs and most of the results indicated that the general comprehension performance were not satisfactory Kirmizioglu and Tuydes-Yaman, 2012 and Murat and Cakici, 2017 reported 69% and 40% comprehension respectively. It also stated that Unsatisfactory comprehension of traffic signs is a common problem for drivers in many countries. This is related to the characteristics of the traffic control devices themselves.

Generally, drivers have problems in comprehension of traffic control devices. Drivers' personal characteristics control drivers' comprehension abilities with educational background as a major factor affecting the understanding of traffic control devices (Makinde and Oluwasegunfunmi, 2014; Umar and Bashir, 2019).

1.2 Problem Statement

Traffic has been one of the most important parts of our day to day lives as many spend a lot of time in traffic thereby forcing road users to have a higher risk of traffic accident.

The world health organization (WHO 2018) estimated road traffic fatalities in Nigeria as 39,802. In spite of these in the city of Ilorin, there are road signs, markings, and signals, amongst others, which are meant to guide road users and ensure their safety while traffic control signals are displayed by traffic officers to ensure free-flow of vehicular and human traffic. The essence is to reduce the rate of road traffic crashes. In spite of these, accidents continue to occur, and somehow tend to be on the increase. Therefore, there is need to investigate whether many road users are ignorant of the meanings of the signs, or do road users

intentionally violate the traffic rules? Consequently, this research was undertaken to assess the driver's personal characteristics in understanding of traffic signs in Ilorin, the capital city of Kwara State.

One of the major factor affecting safe driving is the comprehensibility of traffic control devices by drivers (yakut, 2006). However, it is worthy to note that the traffic control devices cannot serve their intended purpose effectively if the information encoded in the device is not properly understood by the drivers.

A major cause of traffic accident from general analysis shows that it is due to driver's mistake and traffic violation. Noncompliance problem appears to be concentrated in specific situations and/or with specific traffic control device; not stopping at stop signs, not giving way at intersections, exceeding the posted speed limit, travelling too fast for conditions, i.e., work zone (Pietrucha *et al*., 1989).

1.3 Aim and Objectives of the Study

This study intends to investigate the level of understanding and compliance of traffic control devices among drivers with different socio-demographic characteristics in Ilorin.

The specific objectives are to:

- **i.** identify driver's characteristics which played prominent role in the non-compliance of drivers to traffic control devices;
- **ii.** determine the overall percentage of drivers who understand the traffic control device;
- **iii.** determine factors that affect the non-comprehension of drivers to traffic control devices.

1.4 Research questions

This study was guided by the following research questions:

i. How effective are road traffic signs in Ilorin?

ii. Does educational background have any effect on road users' understanding of traffic signs?

iii. What is the percentage of understanding of these road signs by drivers in Ilorin?

iv. Why do drivers fail to comprehend and comply with traffic signs in Ilorin?

1.5 Scope and Limitation of the Study

The approach for this study focused on private and commercial drivers in Ilorin metropolis.

Sampling method was adopted for questionnaire assessment of the drivers' comprehension of traffic control device in town. The sample questionnaires were distributed in three local government areas with three (3) locations each, respectively.

(1) Ilorin South –

I. Ministry Of Health,

II. Flora School,

III. Unilorin bus Terminal.

(2) Ilorin East –

I. University Of Ilorin Teaching Hospital,

II. Maraba Motor Park,

III. Kwara State Polytechnic.

(3) Ilorin West –

I. Sawmill Garage,

II. College of Education Ilorin,

III. Oja Oba park.

1.6 Significance of the Study

This study concerned with the assessment of traffic control signs understanding by drivers in Ilorin. Attention were given to examining drivers' understanding of traffic control signs and reason for non-understanding of traffic control signs. Therefore, the study could be significant for the following reasons.

i. the study could be having some great importance to the government and officials at the future to improve drivers' license training and testing.

ii. even though the study is concentrated on traffic in Ilorin, the outcome to be obtained from this research could be helpful to officials committed to special effort to better drivers' understanding of a traffic control signs.

iii. the end result from the study may be helpful to gain valuable data and information about the traffic control signs understanding among drivers within personal characteristics and to suggest design solutions to enhance the traffic safety solution in these areas.

CHAPTER TWO

LITERATURE REVIEW

2.1 Traffic Control Devices

Traffic control device or road communication tools is a medium used for communicating between traffic engineer and road users, or mechanisms installed, placed or drawn on road or roadsides by the traffic engineers to communicate certain information to the road users. Furthermore, they are used to provide information to regulate, warn, and guide the road users in a traffic system (Ogunmola, 2013; Adedeji *et al.,* 2016). Some of these tools include: traffic signs, road marking, traffic signals, and parking controls. Furthermore, communication tools are usually the combination of linguistic and non-linguistic elements (Ogunmola, 2013) and are very important in reducing conflict and collision between the road users and road mishap; thus, their use is not an option to ignore. On the other hand, there is a need for the road users to properly understand and strictly obey these tools (Agbonkhese *et al.,* 2013). However, it must be noted that before the installation or positioning of communication tools, it should satisfy one or more of the following requirements such as; fulfilling a specific need, commanding attention from users, simple and should convey clear message, and providing adequate time for proper response (Mathew and Krishna Rao, 2007). In accomplishing the task set before the traffic communication tools, there are various characteristics which need to be put in place for this mechanism to work. These characteristics include; Colour (commonly red, green, yellow, black, blue and brown), Shape (Circular, triangular, rectangular and diamond), legend (Symbols) and Pattern, thus, consistency is of concern as these help the road users to identify them easily (Kadiyali, 1987; Mathew and Krishna Rao, 2007; Adedeji *et al.,* 2016). However, this is based on the fact that these mechanisms recognize the limitation of human (road users) involved, this talk more of the eyesight. Overall, it can be said that most traffic

signs available abide by these requirements yet, their maximum impact on the road are not felt but is this the case of Nigerian Road? (Adedeji *et al.,* 2016).

2.2 Traffic Signs

Traffic signs are the oldest and most used traffic control device (TCD). These signs convey messages in words or symbols and erected to regulate, warn, or guide the road users (motorists, and pedestrians). Traffic signs are commonly used traffic safety tools, mainly developed to provide crucial information in a short time to support safe drive; but the success depends on their comprehensibility by the drivers (Kirmizioglu and Tuydes-Yaman, 2012). Traffic signs, are most effective when they command attention, convey a clear and simple meaning, command respect of the road users and give adequate time for proper response (Canfield, 1999). Traffic signs use colour, shape, and words to convey information. However, the traffic signs cannot effectively serve their intended purpose if drivers do not understand the information concerning safe driving behaviour that is encoded in the sign (Makinde and Opeyemi, 2012).

One of the most reliable traffic control devices used to guide the safe and orderly movement of traffic and pedestrians are the traffic signs (Aguilar, 2015) and these should be a common sight when drivers pass around the busy networks and open highways. Traffic signs give information for routes, directions, and warnings for drivers, they are commonly installed at major intersections in cities and towns (Sigua, 2008). The traffic signs should be clear and should convey the intended message so that the road users can understand the message and see it visibly. The non-compliance of these rules and regulations will result in penalties and violations to the driver. Not paying attention and failing to understand instructions can prove to be harmful and even dangerous (Chan *et al.,* 2016; Fernandez *et al.,* 2020).

Clear and efficient signing is an essential part of the road system, and a road with poor signing or with badly maintained signs is not functioning well. Road users depend on signing for information and guidance, and road authorities rely on signing for traffic control and regulation, and for road safety.

Signs must only be used where there is a clear need for them. The incorrect or unnecessary use of a sign annoys drivers, and when this happens frequently, drivers lose respect for the sign and it becomes ineffective in situations where it is really needed. For the same reason, avoid using signs which impose a restriction which will be very unpopular and difficult to enforce. Drivers will stop taking signs seriously when they see others ignoring them without being caught (A Guide to Traffic Signing, 2009).

Using standard signs assists in their quick recognition, as does uniformity of shape, colour and lettering for each type. To obtain the full benefits of standardization, the signs must be used in a consistent manner (A Guide to Traffic Signing, 2009).

It is important that the message be presented in a simple way. The new signs make a great use of pictorial symbols, as these are much more effective than words and can be understood by those who cannot read. Signs with words are used only where there is no alternative. Signs must have sufficient impact to be noticed by drivers. This has been taken into account in the design of the signs, but the size and sitting of the sign are also relevant. For most signs there are several permitted sizes, and it is largely the speed of the traffic at the site that determines which size is appropriate (A Guide to Traffic Signing, 2009). The symbols and legends on signs must be easy to read. This has influenced the design of the symbols, lettering, letter spacing, colours, etc., but size is again of most importance, as drivers who are travelling fast need to be able to recognise a sign from a long distance away. This means that the symbols and lettering need to be large enough to enable drivers to recognise them at the required distance.

General advice on sign mounting and positioning is given below, and there is more guidance in the sections of the Guide dealing with specific sign classes. It will not always be possible to follow this advice exactly, because of site constraints. Check that:

1. The signs are clearly visible from the appropriate distance

2. There is no confusion about which road the sign refers to

3. The signs do not obstruct the view of drivers — especially at junctions

4. The signs are not placed where they could be struck by vehicles.

Signs should generally be sited on the left-hand side of the road. However, at sharp lefthand bends it may be better to put the sign on the right-hand side of the road where it will be more noticeable. On dual carriageway roads warning and regulatory signs should be installed in pairs one on the left-hand side and another on the median (A Guide to Traffic Signing, 2009).

Signs must be set back from the road to reduce the risk of them being hit by passing vehicles. Signs on traffic islands are especially vulnerable to being hit, and a small-size sign may have to be used to achieve the necessary clearance. Signs at the ends of traffic islands should be set back from the nose. Supports for overhead signs may need to be protected by safety barrier.

Figure 2.1 shows the general classification of traffic signs, and the meaning of some signs are presented in Tables 2.2 and 2.3 warning and regulatory respectively as the most common signs.

2.2.1 Regulatory Signs

Regulatory signs are used to control the actions of road users in the interests of safety and the efficient use of road space. Failure to obey regulatory signs is an offence. There are four groups of regulatory signs as classified in Table 2.3.

2.2.2 Warning Signs

Warning signs are used to alert drivers to danger or potential danger ahead. They indicate a need for extra caution by road users and may require a reduction in speed or another manoeuvre. Adequate warning signs can greatly assist road safety. To be most effective however, they should be used sparingly. Do not use warning signs (A Guide to Traffic Signing, 2009).

2.2.3 Guidance Signs

Guidance signs give road users information on how to find their way to their destination. They also help to reduce delay and keep traffic flowing smoothly and safely through junctions. Examples of guidance sign in Figure 2.3 includes:

Turn Left/Right: the "turn left/right" signs indicate to drivers the direction in which they must proceed. This sign must not be used without the necessary order or as a directional sign.

Turn Left/Right ahead: the "turn left/right ahead" sign is used to indicate that drivers must turn left or right at a junction ahead. This sign must not be used without the necessary order, or as a directional sign, except at a road approaching its junction with a dual carriageway road.

Keep Left/Right: the "keep left/right" sign is a regulatory sign, which indicates to drivers that they must pass the sign on the side indicated. No order or departmental site approval is required for its use.

It is important to note that the "keep left/right" sign and turn left/right sign must be correctly mounted in order to convey the intended message. Some device must be incorporated in portable frames to prevent the accidental rotation of circular signs. They must not be used to direct pedestrians when footways are diverted.

No Right Turn: the “no right turn” sign and the “no left turn” sign in conjunction with the necessary order, can be used when a side road is closed and traffic cannot turn into it. In such a case the traffic has to divert by travelling ahead.

No Overtaking: the “no overtaking” signs must not be used without an order. Its use at road works and would normally be in situations where existing double white lines have been obliterated and cannot be replaced quickly.

Road Narrows: The “road narrows” signs are used to give warning that the existing carriageway width becomes restricted. The actual manner in which the carriageway width is restricted will determine which of the signs should be used.

Two-way Traffic: “Two-way traffic” signs are used to warn drivers of two-way opposing or cross traffic at situations where its presence might not be readily appreciated. The sign is used where a length of dual carriageway road under construction narrows to a single carriageway road, or where all the traffic from one carriageway of a dual carriageway road has been diverted to the other.

2.2.4 Information Signs

The most common type of information sign is the supplementary plate that provides additional information to that given on the primary sign. A typical example is the “Distance to” sign which is sometimes used with warning signs to tell drivers the distance to the hazard. Other information signs indicate the presence of an information centre or other facility (A Guide to Traffic Signing, 2009).

Table 2.1: Classification of Regulatory Signs

Group	Sample sign	Function
CONTROL		Exercise control over the right of way of traffic
COMMAND		Instruct drivers what to do
PROHIBITION		Instruct drivers what they must not do
RESERVATION		Reserve road space for specific vehicle types

Source: (A Guide to Traffic Signing, 2009)

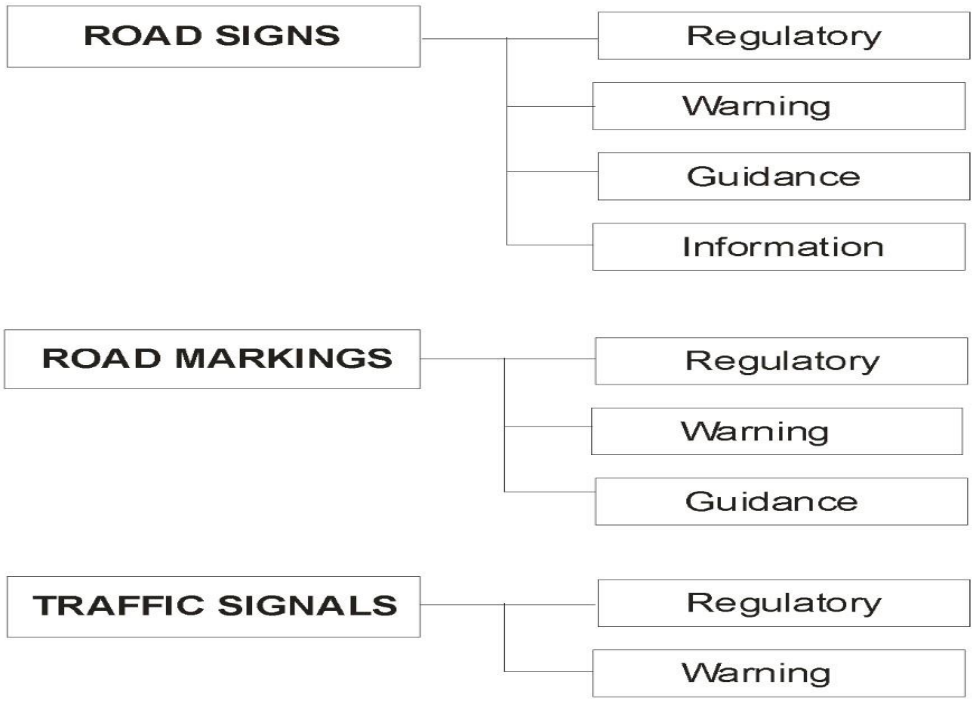

Figure 2.1: General Classification of Traffic Signs

Source: (A Guide to Traffic Signing, 2009)

Table 2.2: Warning and Regulatory Signs

WARNING SIGN	MEANING	REGULATORY SIGN	MEANING
	Y-Junction		No Right Turn
	Dangerous Double Bend (first to the left)		No Parking
	Narrow Bridge Ahead		No Left Turn
	Give Way to Traffic		No U Turn
	Cross Road or Four-Way Junction		Stop At Intersection
	T – junction		No Overtaking
	Sharp Bend Ahead		Speed Limit
	Roundabout		No Horn
	Long Grade Dangerous Hill		No Waiting
	School Children Crossing		No Stopping

Source: (Makinde and Opeyemi, 2012)

2.3 Safety Device Feature

Traffic communication tools converse safety categorically in three main ways, which are; regulatory signs, warning signs, and informative signs. In-depth explanations on these categories are available in studies of Horberry *et al.*, (2004), and Olumide and Owoaje (2016). The various examples of communication tools aforementioned mostly fall under any or all of these three categories except with the exceptional case which is the work zone signs (Mathew and Krishna Rao, 2007). In Nigeria, the importance of these tools is understood such that; in Nigeria road safety strategy 2012, traffic communication tools are one of the strategic goals in improving road infrastructures (Federal Ministry of Works, 2013). Globally, various researchers (Hulberty *et al.,* 1979; Makinde and Opeyemi, 2012; Ogunmola, 2013; Makinde and Oluwasegunfunmi, 2014) have conducted research on the effectiveness of these communication tools and road users basically misunderstood these tools. In Nigeria, studies showed that these tools are effective in their capacity but the Nigerian road users do not pay attention, rather these tools are seen as mere decorations on the roads (Ogunmola, 2013;

Adeboye *et al.,* 2014). Overall, it was, however, noticed that most of the studies concerning Nigeria are centered on the tools such as; traffic signs and signals, with little or no attention given to road marking as a traffic communication tools, thus road fatality continues to increase (Adedokun, 2015). Although the Highway Code of Nigeria entails the road marking as one of the major traffic communication tools, yet little study has put them into consideration (Adedeji *et al.,* 2016).

2.3.1 Cones and Cylinders

Cones and cylinders are used to delineate the traffic lane a driver should take past an obstruction, accident or road works. The portability of these devices is of particular advantage in emergencies or when they are used to delineate works which move progressively along a

carriageway. Traffic cones and cylinders shall conform to BS EN 13422:2004 “Vertical road signs (Oyeniyan and Anifowose, 2017).

2.3.2 Concrete Barriers

Concrete barriers are designed to separate two opposing streams of traffic. The distinctive side slope of these barriers is designed to contain a vehicle and redirect it back to the same traffic lane. Originally concrete barriers are designed to be used as centre median barriers to prevent head on collisions. During the past several years, however, the same concept has been used in bridge rails and for temporary barriers to protect crews that are reconstructing or maintaining the highway. Considering wide variety of conditions where concrete barriers are used, the overall reductions in accident costs might be somewhat greater than 50% (Oyeniyan and Anifowose, 2017).

2.3.3 Crash Cushion

The crash cushion was originally developed in the early 1960’s by the Texas State Department of Highways and Public Transportation in its research program. The original crash cushion was constructed of used 55-gallon paint drums connected together and secured to the ground by steel cables. Since the original design, several additional variations of the device have been developed by private industry. Other types of cushions use sand, water or plastic foam and containers consisting of plastic barrels, plastic tubes or old tires (Oyeniyan and Anifowose, 2017).

Crash cushions are designed so that a vehicle striking the cushion will be decelerated to a stop or be redirected in such a way that injuries to the occupants are greatly reduced. They are effective in reducing the severity of collisions with rigid obstacles at diverging roadways and bridge piers. Crash cushions continue to demonstrate that fatalities, severe injuries and property damages are drastically reduced (Traffic Signs Manual, 2009).

2.3.4 Breakaway Lighting Supports

Highway lighting provides increased visibility at night and contributes to safety. However, to be effective lighting supports need to be placed close to the travelled way. Errant vehicles frequently collide with these supports. Early installations were constructed with steel bases bolted rigidly to concrete foundations (Traffic Signs Manual, 2009; Oyeniyan and Anifowose, 2017).

2.3.5 Culvert Safety End Treatment

A culvert safety end treatment is designed to reduce the severity of motor vehicle collisions with large culverts. The treatment consists of standard steel pipe grate positioned over an exposed culvert or a sloped culvert end and embankment at 6:1. An errant vehicle colliding with the culvert grate will pass over the culvert, rather than being stopped by it (Traffic Signs Manual, 2009; Oyeniyan and Anifowose, 2017).

A vehicle unexpectedly leaving the highway may have a severe collision if it strikes a culvert wall. Culvert safety end treatments are designed so that errant vehicles will pass over a treated culvert, thus avoiding serious damage.

2.3.6 Safety Lighting

Safety lighting refers to the placement of lights (luminaries) at a particular point on a relatively short section of roadway for the specific purpose of improving night-time visibility. With the addition of safety lighting, the night-time accident rate reduction at intersection ranges from 28 to 62%. More complex channelized intersections have larger reductions than do relatively simple ones. At pedestrian crosswalks, accident reduction due to safety lighting is highly dependent upon the number of pedestrians using the crossing at night and ranges from 45 to 63% (Traffic Signs Manual, 2009; Oyeniyan and Anifowose, 2017).

2.3.7 Safety Zone Signs

In the operation and maintenance of highway networks, it is necessary from time to time to put in place temporary traffic management measures to facilitate safe road works, temporary closures or incident management, whilst keeping the traffic flowing as freely as possible. With high traffic flows on many roads, it is particularly important to plan all works activities and temporary closures to optimise safety, road space and work efficiency, whilst minimising road user congestion, delay and inconvenience (Oyeniyan and Anifowose, 2017).

Road works on or near a carriageway, cycleway or footway might impair the safety and free movement of vehicles, cyclists and pedestrians (particularly those with mobility and visual impairments). All reasonable steps should be taken to ensure that the effects of the works are reduced to a minimum (Oyeniyan and Anifowose, 2017). An example of safety zone signal is shown in Figure 2.4.

2.3.8 Road Works Sign

All road works sites should have a “road works” sign (Figure 2.6) exhibited on all approaches as the first sign seen by drivers. On motorways, and on all-purpose roads on which the national speed limit applies, the sign should be supplemented by a distance plate. The “road works” sign, supplemented where necessary by a plate indicating the distance over which the hazard extends, may also be used at the hazard itself. These plates may also be used on restricted all-purpose roads but are not necessary on roads with a permanent speed limit of 30 mph or less (Oyeniyan and Anifowose, 2017).

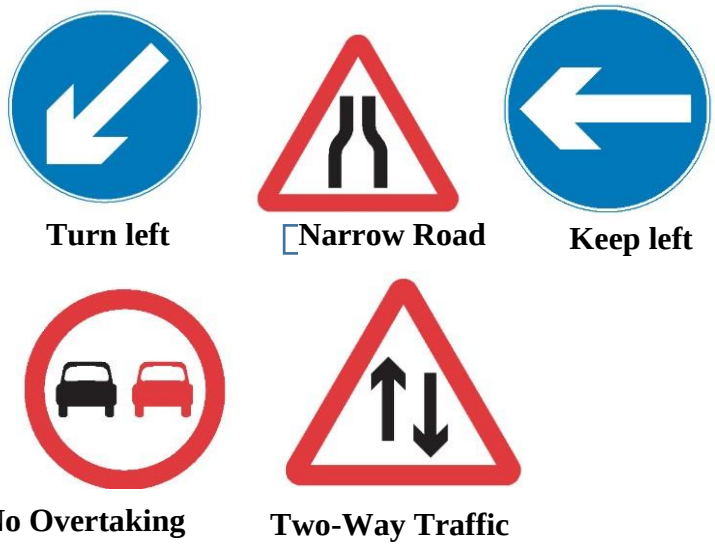

Figure 2.2: Guidance signs

Source: (Traffic Signs Manual, 2009)

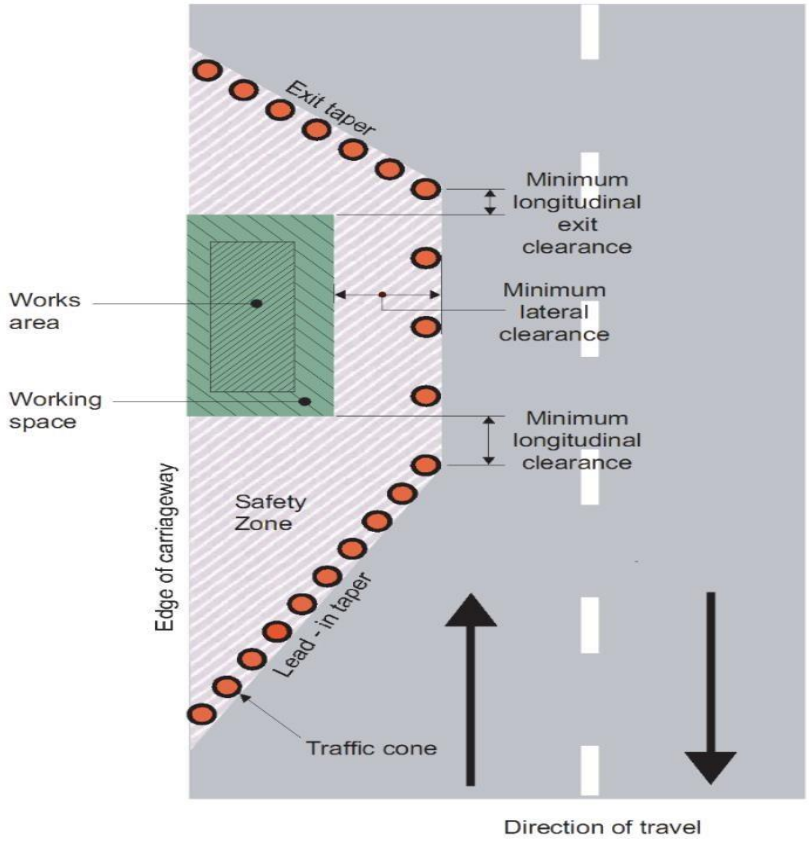

Figure 2.3: Safety Zones - Typical Site Layout

Source: (Traffic Signs Manual, 2009)

2.4 Comprehension of Road Signs

Compliance with road signs is important in the reduction of motorcycle accidents. A careful road User/Traveller who observes warning road signs will arrive his/her destination safely (Kumuyi, 2012). Traffic signs tell you about traffic regulations, special, hazards and other road conditions, construction areas, speed limits, etc. It is important for road users to be familiar with both signs and identify their special shapes and colours. To be able to do this effectively, one needs to be educated, but studies have shown that majority of okada riders are not educated or partially educated. In a study conducted by Onifade *et al*., (2012) found that most of the okada riders had little or no formal education, Ogunmodede, *et al*., (2012) reveals that commercial motorcyclist does not have formal education or that they are dropped out of school at the early stage, this may account for high level of ignorance among them as most of the motorcyclist cannot interpret road traffic regulations or signs. They do not follow the traffic rules and they in their mentality believe they are the king on the roads. Oyeyemi, (2003) stated that the FRSC is however aware of the low traffic culture in the country arising from low level of education therefore, the public enlightenment efforts utilize the workshops, seminars, rallies, campaign with leaflets, fliers, posters, billboards, rhymes, songs, slogans, advert in print and electronic media and so on to address the situation (Dahunsi and Owoeye, 2016).

Kirmizioglu and Tuydes-Yaman (2012) conducted a survey of comprehensibility of 30 typical traffic signs. Based on a total of 1,478 urban drivers in Turkey, it was found that many traffic signs were not known well by the drivers. In particular, only 12 signs were identified correctly by 70% or more of the participants. In another study in Israel (Shinar and Vogelzang, 2013), 48 undergraduate students were tested with 30 different traffic signs. The comprehension of traffic signs between symbolic and text displays was examined. Results indicated that text signs were better comprehended and the reaction time was improved for the symbolic signs with added text, especially for less familiar signs.

Guidance information in terms of sign designs and messages for international tourists at Orlando International Airport in Florida was examined as reported by Choocharukula and Sriroongvikrai (2017). A total of 486 tourists divided into three groups were analyzed, including those from Great Britain, Continental Europe, and Latin America. Different responses were observed for different groups of international tourists. For example, some abbreviations of International Drive were understood while others were not.

Shinar *et al*., (2003) investigated comprehension levels of traffic signs in Canada, Finland, Israel, and Poland. Based on 1,000 respondents categorized into five groups, i.e. novice drivers, tourists, older drivers, problem drivers, and university students, results indicated a significant difference in comprehension level and such a difference was found among specific sign messages, different countries, and different driver populations. In a similar vein, Al- Madani and Al-Janahi (2002) utilized 28 posted signs and tested with participants from Bahrain, Kuwait, Oman, Qatar and United Arab Emirates. From the findings, only 56% of the posted signs could be comprehended. The understanding of traffic signs was found be statistically related with drivers' years of education, gender, monthly income and nationality.

Dissanayake and Lu (2001) compared traffic control device comprehension between domestic and international drivers in Florida. From the analysis of 740 respondents, it was found that international drivers performed below domestic drivers in understanding traffic signs, markings, and traffic signal indications. Ward *et al*., (2004) tested 100 international road signs on 100 participants in North Carolina for their road sign comprehension. The findings indicated that a large number of international road signs could not be understood.

2.5 **Sample Size Determination Using Krejcie and Morgan Table** Krejcie and Morgan Table

The ever-increasing needs for a representative statistical sample in empirical research have created the demand for an effective method of determining sample size. To address the existing

gap, Krejcie and Morgan (1970) came up with a table for determining sample size for a given population. (Syed Abdul Rehman, 2021). See table 2.4

The table is constructed using the following formula for determining sample size.

Formula for determining sample size $S = X^2NP(1-P) + d^2(N-1) + X^2P(1-P)$

S= required sample size

X^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841)

N = the population size

P = the population proportion (assumed to be 50 since this would provide the maximum sample size) d = the degree of accuracy expressed as a proportion (.05).

(source: Krejcie and Morgan, 1970)

But there is no need of using the formula since the table of determining sample size has all the provisions you require to arrive at your sample size.

Table 2.3 shows the Krejcie and Morgan table for determining sample size for a given population.

Table 2.3: Sample Size Determination using Krejcie and Morgan Table

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970

NOTE : N = Population

S = Sample size

2.6 Review of Previous Studies

Kirmizioglu and Tuydes-Yaman (2012) conducted a survey of comprehensibility of 30 typical traffic signs. Based on a total of 1,478 urban drivers in Turkey, it was found that many traffic signs were not known well by the drivers. In particular, only 12 signs were identified correctly by 70% or more of the participants. In another study in Israel (Shinar and Vogelzang, 2013), 48 undergraduate students were tested with 30 different traffic signs. The comprehension of traffic signs between symbolic and text displays was examined. Results indicated that text signs were better comprehended and the reaction time was improved for the symbolic signs with added text, especially for less familiar signs.

Parham *et al*., (2003) studied driver understanding of the current U.S. system of yellow– white pavement markings through a driver survey. The survey was used to evaluate drivers' ability to describe the pavement marking colour code, drivers' reliance on pavement marking patterns when interpreting marking messages, and drivers' reliance on pavement marking colour when interpreting marking messages. Researchers surveyed 851 drivers in 5 states, with respondents representing 47 states, the District of Columbia, and Puerto Rico. The survey results indicate that drivers tend to use signs and other traffic as the primary cue to determine whether a road is one-way or two-way. A substantial proportion of respondents had an understanding of the use of marking colour to differentiate between one-way and two-way roads. Approximately 75% of the drivers surveyed understood the basic concept that a single broken yellow line separates opposing traffic on a two-lane road. The presence of a solid line (either double solid or solid and broken) in the centreline increases comprehension of directional flow to approximately 85%; more than 90% of the drivers surveyed understood that a solid line (either double solid or solid and broken) prohibits passing. Almost 95% of drivers indicated that passing is permitted with a broken line. The survey results indicate that the yellow–white pavement marking system is better understood than previously believed.

Shinar *et al*., (2003) investigated comprehension levels of traffic signs in Canada, Finland, Israel, and Poland. Based on 1,000 respondents categorized into five groups, i.e., novice drivers, tourists, older drivers, problem drivers, and university students, results indicated a significant difference in comprehension level and such a difference was found among specific sign messages, different countries, and different driver populations

Dissanayake and Lu (2001) compared traffic control device comprehension between domestic and international drivers in Florida. From the analysis of 740 respondents, it was found that international drivers performed below domestic drivers in understanding traffic signs, markings, and traffic signal indications. Ward *et al*., (2004) tested 100 international road signs on 100 participants in North Carolina for their road sign comprehension. The findings indicated that a large number of international road signs could not be understood.

Ford and Picha (2000) found that most of the teenage drivers participating in the survey had some degree of difficulty in understanding the traffic control devices that were evaluated. Out of 53 questions, only nine traffic control devices were understood, in terms of rates of correct response, by more than 80 percent of the respondents. Twenty of the traffic control devices evaluated were understood by more than 60 percent of the respondents. The remaining traffic control devices were understood by less than 60 percent of the teenagers who participated in the survey.

Al-Madani (2000) investigated the influence of drivers' comprehension of signs on accident involvement, citations received and seat belt usage. While knowledge of signs was increasing with seat belt usage, no significant association with accident involvement was observed; even when age was incorporated with the accidents. Similarly, no significant difference with number of citations received was observed. Furthermore, those with no speed citations, or low

number of speed citations, were not significantly better than those with high number of speed citations.

Al-Madani and Al-Janahi (2002a, b) examined the influence of drivers' accident involvement and personal characteristics on their understanding of 28 traffic regulatory and warning signs. A sample of 9000 drivers who were residents of Bahrain, Kuwait, Oman, Qatar and United Arab Emirates was used. Results showed that on average, drivers fully understood only 56% of all signs. The Gulf States, Asian and Arab drivers understood the signs less well, and were not much helped by the use of pictograms rather than written instructions. Male drivers scored higher than female drivers. Age, marital status, experience and accident rates had no obvious bearing on comprehension of signs. The overall conclusion was that personal characteristics, rather than accident involvement rates, are most clearly associated with comprehension capabilities. Table 2.4 presents the summary of the previous studies described above

2.7 Research Gap

From the review, it can be observed that while studied have been carried out on road sign comprehension in some parts of Nigeria, none of the studies has been investigated in Ilorin metropolis. Additionally, underlying factors that affect and influences the reason for nonunderstanding of drivers to traffic control devices have not been thoroughly examined. Thus, this research work tends to fill these gaps.

Table 2.4: Summary of Some Previous Studies

Author	Title	Conclusion	Limitation
Umar Bashir (2019)	Comprehension of Road Traffic Signs by Various Road Users in Kano City	Sex, education, driving experience and type of vehicle used seems to affect the comprehension level of drivers in Kano. Truck drivers have a poor understanding of the traffic signs lower than all other classes of road users	The research was conducted in Kano and factors that affect the non-understanding of drivers to traffic control devices
Adedeji *et al.*, (2016)	Effectiveness of Communication Tools in Road Transportation: Nigerian Perspective	The study concluded that the drivers have a good knowledge of these traffic communication tools but on an average of 92%, the road marking sampled are not available on the roads and have in one way or the other contributed to the fatality rate experienced.	The study was limited to North Eastern region and factors that affect the nonunderstanding of drivers to traffic control devices
Kirmizioglu and Tuydes-Yaman (2012)	Comprehensibility of Traffic Signs among Urban Drivers in Turkey	It was found that many traffic signs were not known well by the drivers	The research was conducted in Turkey and factors that affect the non-understanding of drivers to traffic control devices
Makinde and Opeyemi (2012)	Understanding of Traffic Signs by Drivers – A Case of Akure City, Ondo State, Nigeria	Age, Education and years of driving experience played prominent roles in drivers' understanding of signs, however marital status and gender had no effect	The research was conducted in Akure, Ondo State and factors that affect the non-understanding of drivers to traffic control devices

CHAPTER THREE

METHODOLOGY

The method adopted in this research work involved the use of questionnaire distributed to both private and commercial drivers within Ilorin metropolis. Three hundred and eighty-four (384) questionnaires were administered randomly amongst private and commercial drivers. The number of questionnaires used was determined using Krejcie and Morgan Table. The table 2.3 recommends use of 384 for a population of 1,000,000 and the population of Ilorin is above this limit.

3.1 Description of Study Area

Ilorin is a city that is situated in the traditional zone between the forest and savannah regions of Nigeria and serves as a gateway city between the northern and the southwestern part of Nigeria. Ilorin comprises of three local Government areas namely; Ilorin West, Ilorin East, and Ilorin South. The city performs dual administrative functions of a state capital and headquarters for Ilorin West local Government Areas. Ilorin is located on latitude 8º24` N and 83º6` N and longitude 4º10` E and 4º 36` E. It is situated at a strategic point between the densely populated South- Western and the sparsely populated middle belt of Nigeria. Ilorin is located in the transitional zone between the deciduous woodland of the South and dry savannah of North Nigeria (Ajadi *et al.,* 2016).

The sample areas in each of the local government were for Ilorin South – Ministry of Health, Flora School, Unilorin bus Terminal. For Ilorin East – University of Ilorin Teaching Hospital, Maraba Motor Park, Kwara State Polytechnic. For Ilorin West – Sawmill Garage, College of Education Ilorin, Oja Oba park. Figure 3.1 shows the map of Kwara State, arrows pointing to the 3 local government areas.

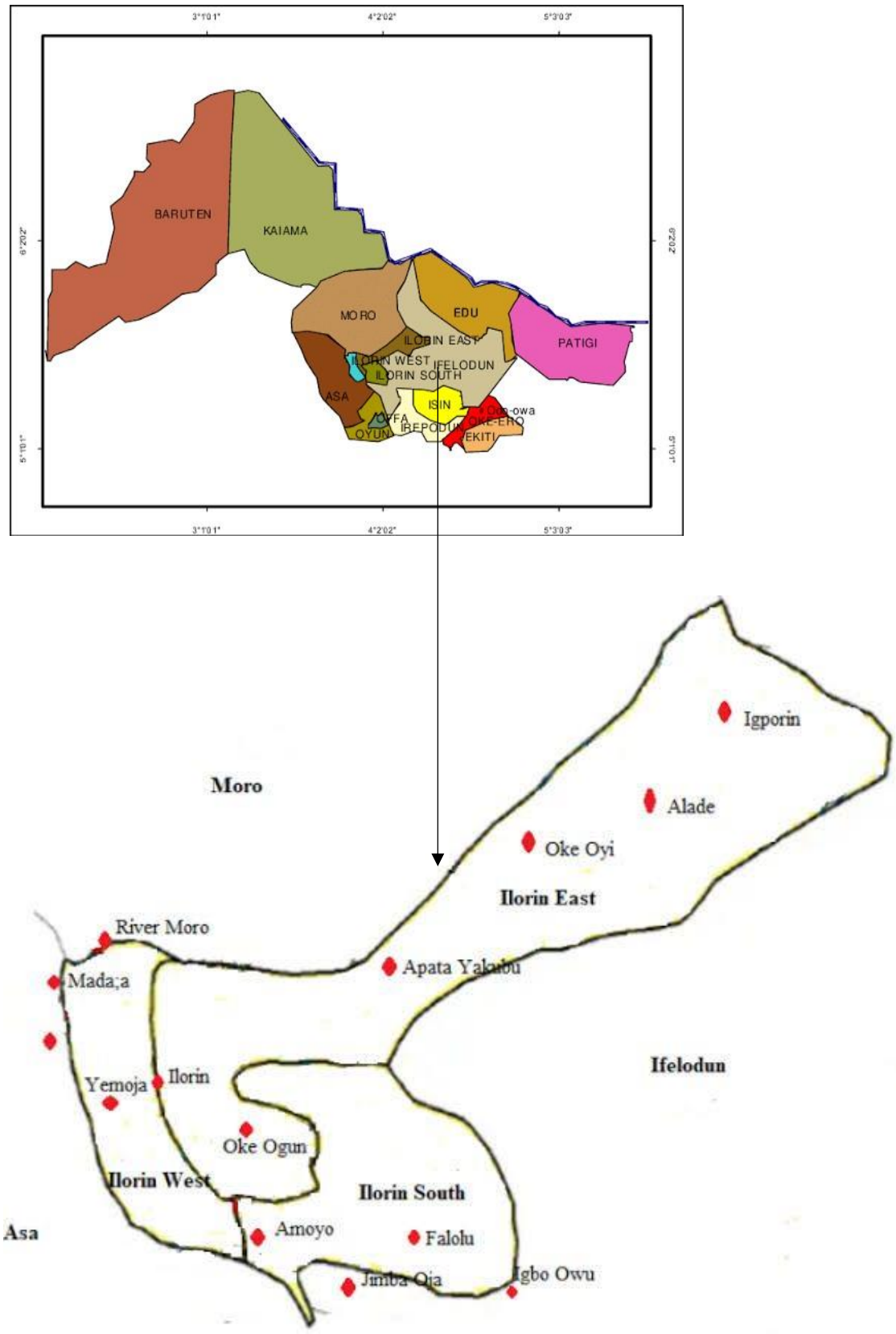

Figure 3.1: Map of Kwara State showing the location of Ilorin West, Ilorin East, and Ilorin South (sample areas). (Olabode and Ajibade, 2010)

3.2 Sample Approaching and Survey Administration

In-person interview technique was the chosen option to reach the potential respondents. A structured paper-based questionnaire was designed as the survey instrument.

3.3 Survey Questionnaire Design

The questionnaire as presented in Appendix A consists of three main parts; the first part was made up of short answer questions designed to give detailed information about the drivers' demographic characteristics such as the age, sex and educational background, driving experience and vehicle type. The second section was designed to assess the comprehension of traffic control devices by the drivers. This section has twenty-nine (29) multiple choice questions of different traffic signs made up of eight warning signs, ten regulatory signs, six information sign and five road markings. While the third section was used to examine possible factors that could affect the non-understanding of the traffic control device. The target group for this study are: the employees of public institutions, local people at shopping centres, local business owners and customers, professional drivers serving along the segment.

3.4 Data Collection through Questionnaires

3.4.1 Sampling

The metro area population of Ilorin in 2021 is 974,000 (United Nation, 2021), the sample size required to be taken into account was known by using the (Krejcie and Morgan 1970), The table 2.3 presented in the previous chapter gave us the sample size of 384 sample size for 1000000 population.

3.4.2 Distribution of Questionnaire

Distribution of questionnaires started in August, 2021 and ended in October, 2021. The structured questionnaire was personally administered to the respondent with the aim of

translating of the questionnaire in the local language for those that could not understand English language. Most drivers interviewed responded voluntarily with full cooperation.

3.4.3 Grouping of Data Collected

Section-A- The socio-demographic characteristics of drivers

This questionnaire survey used includes the personal information made up of short answer questions designed to give detailed information about the drivers' demographic characteristics such as the age, gender, driving experience, and educational background.

Section-B- This section focused on the comprehension of traffic control signs by the drivers and has twenty-nine (29) multiple choice questions of different traffic signs made up of eight warning signs, ten regulatory signs, six information sign and five road markings

Section-C Driver reason that could affect the non-understanding of the traffic control device. Principal factors that affect non-understanding of traffic control device are categorized as; lack of previous knowledge of the signs, lack of adequate enforcement, lack of traffic control device on road, inadequate time for proper response, non-clarity of traffic control devices.

3.4.4 Description of Collected Data

1. Age was categorized as;
    a. 18-24 years
    b. 25-30 years
    c. 31-40 years
    d. 41-50 years
    e. More than 51 years
2. Gender- classified as male and female.
3. Educational Background- The education level attained by the drivers was classified as follow;

a. Primary School

b. Secondary School

c. Tertiary

4. Vehicle Type – Commercial and Private
5. Driving Experience - this is numbers of the years the drivers have driven the vehicles and classified as Less than 5 years, Between 5 to 10 years and more than 10 years.
6. Understanding of warning signs: Pedestrian crossing, road hump, four-way junction, narrow bridge, two-way traffic, roundabout, dangerous bend, T-junction
7. Understanding of regulatory signs: no right turn, no parking, no left turn, no U turn, no overtaking, no horn, no pedestrian crossing, speed limit, no stopping, no waiting
8. Understanding of Information signs: parking, hospital, bus station, train station, filling station, airport
9. Understanding of road markings: no crossing, warning line, zebra crossing, centre line, do not enter marked area.
10. Factors that affect non-understanding of traffic control devices: lack of previous knowledge of the signs, lack of adequate enforcement, lack of traffic control device on road, inadequate time for proper response, non-clarity of traffic control devices. And Driver's response is categorized as;

    a) Strongly disagree

    b) Disagree

    c) Somewhat agree

    d) Agree

    e) Strongly agree

3.5 Data Analysis

3.5.1 Descriptive Analysis

Descriptive Statistics was used to present the quantitative descriptions in a manageable form. In this research study, using descriptive statistics helped us to simplify the large amounts of data in a sensible way which reduces lots of data into a simpler summary. The distributions were displayed, in graphs and tables using percentages. The completed questionnaires were analysed using a descriptive statistics of frequency counts and percentage, for the demographic and variables of the study using statistical package called (SPSS) version 24.0

3.5.2 Statistical Analysis

For more robust analysis of the survey data, using SPSS'24, this study utilized two statistical methods to examine the relationship between the demographic information of the drivers and their understanding of the traffic control signs and on the reasons for non-compliance to the traffic control signs. The methods are:

(1) Chi-square analysis to measure if understanding of traffic signs is dependent on age, gender, education, driver category, and years of driving experience.

(2) Independent sample t test and analysis of variance (ANOVA) were also used to check if there are differences in mean response of the drivers' gender, and category regarding reasons for noncompliance, and drivers' education, age, and years of driving experience towards reasons for noncompliance of the traffic light. Based on this, the following statistical hypothesis were derived

Hypothesis 1: There is a relationship between demographic information of drivers and their understanding of traffic light

Hypothesis 2: There are differences in mean response of drivers on their reasons for noncompliance of traffic light.

These two hypotheses were tested and analysed using SPSS'24, and the result were presented and discussed under chapter 4.

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter presents the result of data obtained for the study on the level of understanding and compliance of traffic control devices among drivers in Ilorin. The result of the demographic characteristics of the respondents, drivers' comprehension of traffic signs, reason for non-compliance, result from statistical analysis, major factor contributing to drivers' non-compliance to traffic control device.

4.1 Demographic Characteristics of Respondents

The demographic characteristics (Gender, Age, Educational Level, Category of Driver and Driving Experience) of the respondents examined is as presented in Table 4.1.

The results show that 63.1 % and 36.9 % of the respondents are male and female, respectively. This implies that the majority of the respondents who participated in the study were male which is in agreement with the previous findings by Makinde and Opeyemi (2012), Adedeji *et al.,* (2016) and Umar and Bashir (2019).

The educational level shows that 21.8 % of the respondents were primary school holders, 40.8 % were secondary school holders and 37.4 % attended tertiary institution. This implies that the majority of the respondents who participated in the study are educated having gone through secondary school education. This correlate with the study by Makinde and Oluwasegunfunmi (2014).

The profile shows that 10.4 %, of the respondents were within the age of 18-24 years, 9.9 % were 25-30 years, 41.3 % were 31-40 years, 30.6 % were 41-50 years and 7.8% were more than 51 years. This implies that the majority of the respondents who participated in the study ranged between 31-40 years. This result is in agreement with findings of Makinde and Opeyemi (2012) and, Umar and Bashir (2019) and common age range in Nigeria as reported by National Bureau of Statistics (2016).

Table 4.1: Profile of respondents examined

Characteristics		Number	Percentage (%)
Gender	Male	243	63.1
	Female	142	36.9
Age	18-24	40	10.4
	25-30	38	9.9
	31-40	159	41.3
	41-50	118	30.6
	More than 51	30	7.8
Educational Level	Primary school	84	21.8
	Secondary school	157	40.8
	Tertiary	144	37.4
Category of Driver	Commercial	243	63.1
	Private	142	36.9
Driving Experience	Less than 5years	46	11.9
	Between 5 to10years	155	40.3
	More than 10years	184	47.8

Two hundred and forty-three (243) respondents representing 63.1 % were commercial drivers while 142 respondents representing 36.9 % were private drivers. This implies that the majority of the respondents who participated in the study had commercial vehicle type.

Forty-six (46) respondents representing 11.9 % had less than 5years driving experience, 40.3 % had 5 to 10years driving experience and 47.8 % had more than 10 years driving experience. Majority of the respondents who participated in the study had more than 10 years driving experience which correspond to the findings by Gana and Emmanuel (2014) and Makinde and Oluwasegunfunmi (2014).

4.2 Drivers Comprehension of Traffic Signs

The questionnaire was administered to drivers on the understanding of the following traffic control signs: warning signs, regulatory signs, information signs and road markings. The responses are presented in the appendix while the results are presented in the following sections.

4.2.1 Understanding of Warning Signs

Figure 4.1 shows the result of drivers' comprehension of warning signs. A total of 8 warning signs were evaluated in this study. Roundabout, T-Junction, Dangerous Double Bend Two Way Traffic, Narrow Bridge, Four Way Junction, Road Hump / Uneven Road, Pedestrian Crossing. With understanding of 90%, 71.8%, 34.5%, 37.3%, 33.8%, 82.9%, 48.6%, 50% respectively.

The average percentage of correct answers of these signs was 56.1% which indicated that the comprehension was very poor. The signs that were well understood by drivers were "Roundabout" 90%, 'T-Junction" 71.8% and "Four-way junction" 82.9%. These high percentages could be attributed to the self-explanatory graphics in the signs. The least understood signs were "dangerous" double bend 34.5%, narrow bridge 33.8%- and two-way traffic 37.3%. The result is further presented in Appendix A.

4.2.2 Understanding of Regulatory Signs

A total of 10 regulatory signs, no right turn, no parking, no left turn, no U turn, no overtaking, no horn, no pedestrian crossing, speed limit, no stopping, no waiting were evaluated with the percentage understanding of 75.4%, 79.6%, 66.6%, 44.9%, 42.3%, 35.8%, 71.1%, 83.1%, 47.2%, 38.7% respectively with the result presented in Figure 4.2. The average percentage of the correct answer is 60.3%, which indicated that the comprehension was good. “Speed limit” 83.1%, “No parking” 79.6%, “No right turn” 75.4%, “No left turn” 66.9% and “No pedestrian crossing” 71.1% were well understood signs while “no horn 35.8% was the least understood sign. These high percentages of correct answers can be attributed to the self-explanatory graphics in these mandatory signs. The result is further presented in Appendix B.

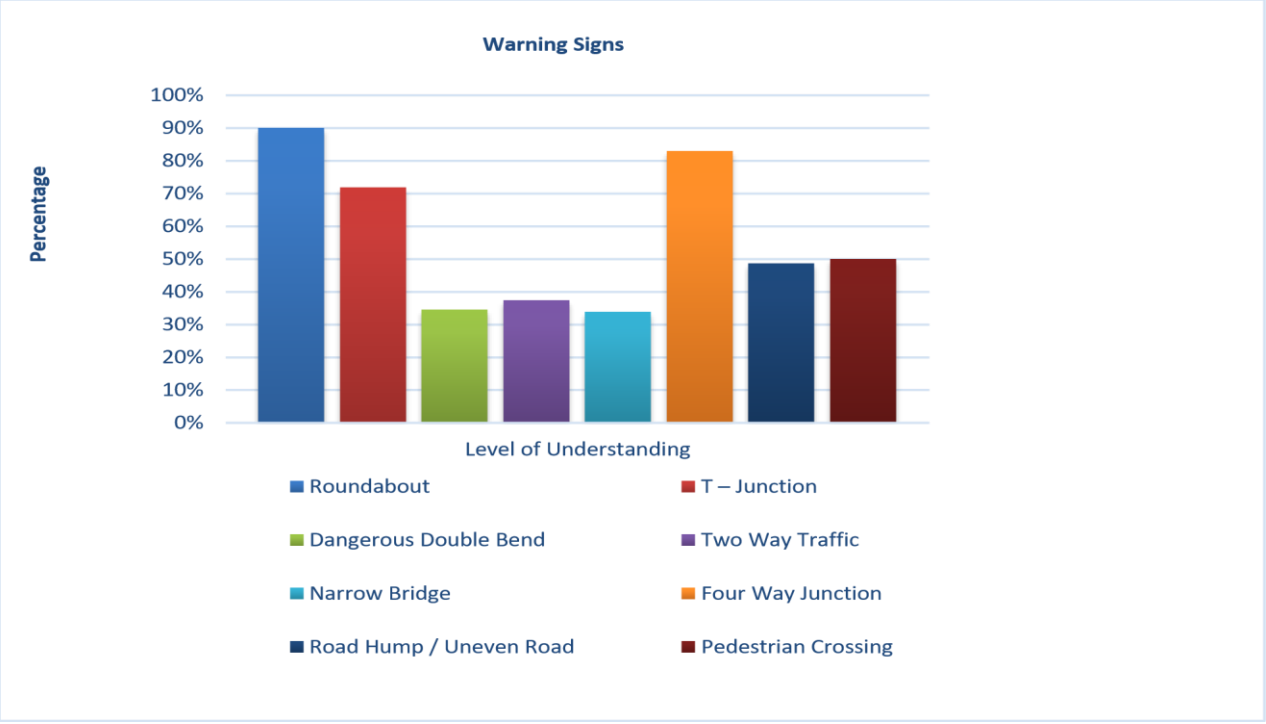

Figure 4.1: Understanding of Warning Signs

Figure 4.2: Understanding of Regulatory Signs

4.2.3 Understanding of Information Signs

A total of six information signs were assessed, parking, hospital, bus station, train station, filling station, airport) were assessed with percentage understandings of 50.7%, 73.2%, 43.7%, 61%, 67.6%, 91.5% respectively. and the result is shown in Figure 4.3. The average understanding level of these signs was 64.6% indicating good understanding. The signs well understood were “Airport” 91.5%, “Hospital” 73.2% and “Filling station” 67.6%. The result is further presented in Appendix C.

4.2.4 Understanding of Road Markings

Figure 4.4 shows the result of drivers’ comprehension of road markings. A total of five road markings were evaluated, no crossing, warning line, zebra crossing, centre line, do not enter marked area) were evaluated with the percentage understanding of 43%,56.3%, 65.5%, 81.7%, 48.6% respectively. and the average percentage of correct answer was 59% which indicated that the comprehension was poor. The road markings well understood are centre line and warning line with 81.7% and 65.5% respectively. These high percentages could be attributed

to the fact that these road markings are common and readily visible on roads. The least understood were “no crossing” 43%, “enter marked area” 48.6% and “zebra crossing” 56.3%. The result is further presented in Appendix D.

4.2.5 Overall Drivers Understanding of Traffic Signs

The average comprehension percentage of Warning Signs was 56.1 %, average comprehension percentage of Regulatory Signs 60.3 %, average comprehension percentage of Informatory Signs 64.6 % and average drivers’ comprehension of Road Markings was 59% as presented in Figure 4.5. The overall percentage of drivers who correctly understood the traffic control devices in Ilorin was found to be 60%.

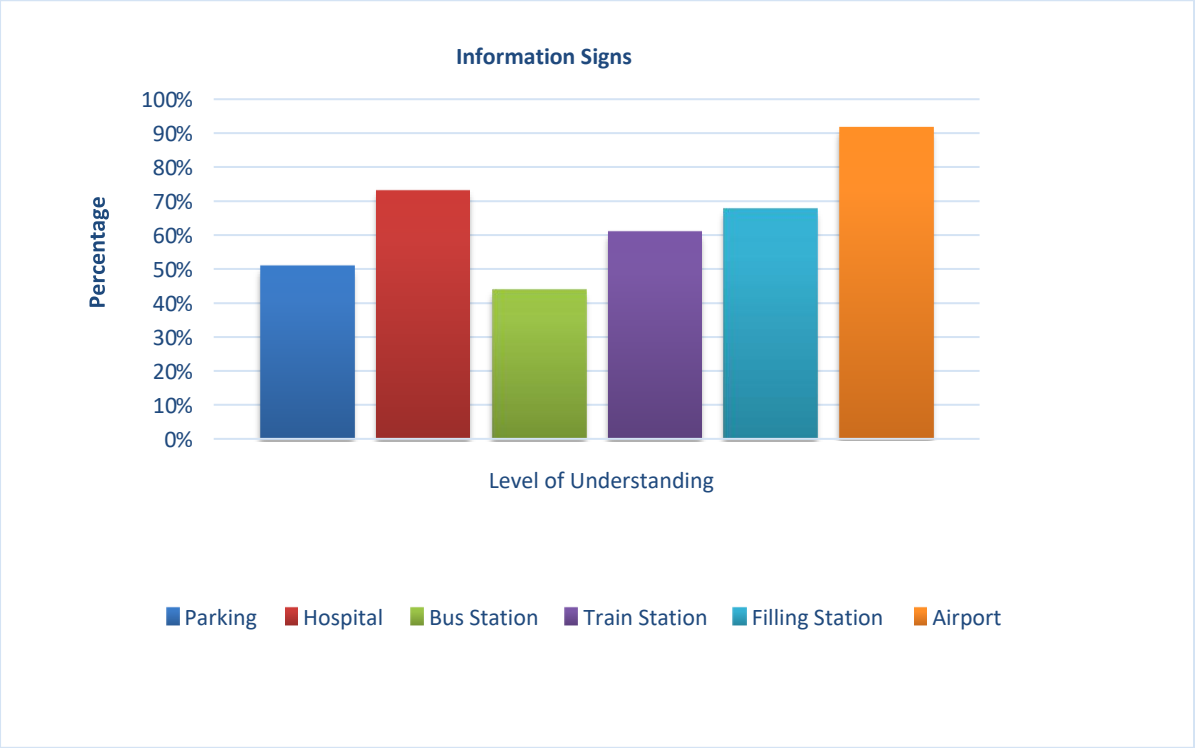

Figure 4.3: Understanding of Information Signs

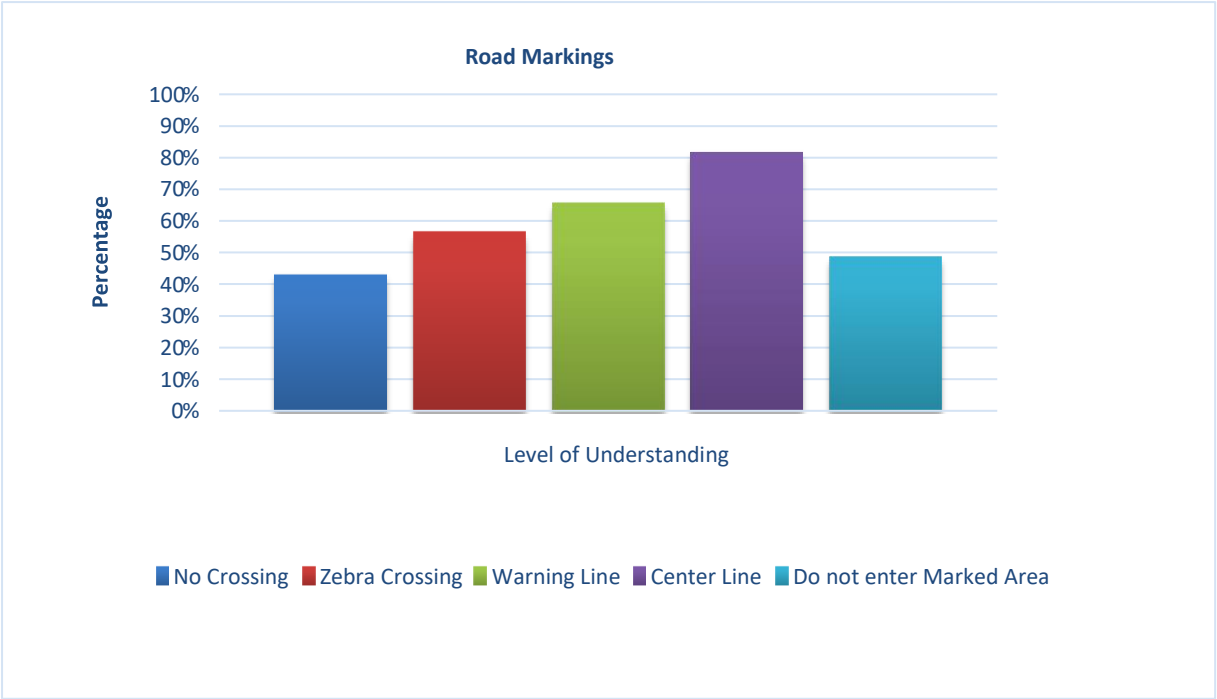

Figure 4.4: Understanding of Road Markings

Figure 4.5: Drivers Understanding of Traffic Signs

4.3 Reasons for non-compliance

Lack of previous knowledge of the signs, lack of adequate enforcement, lack of traffic control device on road, inadequate time for proper response and non-clarity of traffic control devices were determined to check the factors that affect the non-understanding of drivers to traffic control devices.

Figure 4.6 revealed that 19.5 %, 50.6 % of the respondents strongly agreed and agreed to lack of previous knowledge of the signs. 20.5 % somewhat agree while 5.7 %, 3.6 % disagree and strongly disagree to lack of previous knowledge of the signs. This indicated that majority of the respondents affirmed that lack of previous knowledge of the traffic signs affect the nonunderstanding of signs by drivers.

Figure 4.7 revealed that 11.2 %, 57.1 % of the respondents strongly agreed and agreed to lack of adequate enforcement signs. 24.4 % somewhat agree while 3.6 %, 3.6 % disagree and strongly disagree to lack of adequate enforcement on signs. most of the respondents affirmed that adequate enforcement by government is required for drivers to comprehend traffic signs.

Figure 4.8 revealed that 10.1 %, 52.7 % of the respondents strongly agreed and agreed to lack of traffic control. 29.9 % somewhat agree while 3.6 %, 3.6 % disagree and strongly disagree to lack of traffic control. Majority of the drivers believed that inadequate traffic control signs in Ilorin affect the non-understanding of signs by road users.

Figure 4.9 revealed that 12.5 %, 52.2 % of the respondents strongly agreed and agreed to inadequate time for proper response.28.6 % somewhat agree while 3.1 %, 3.6 % disagree and strongly disagree to inadequate time for proper response.

Figure 4.10 revealed that 4.2 %, 31.1 % of the respondents strongly agreed and agreed to non-clarity of traffic control devices.42.3 % somewhat agree while 14.8 %, 3.6 % disagree and strongly disagree to non-clarity of traffic control devices. Most of the drivers partially agreed that non-clarity of traffic control devices is a major that affect the non-understanding of signs by drivers.

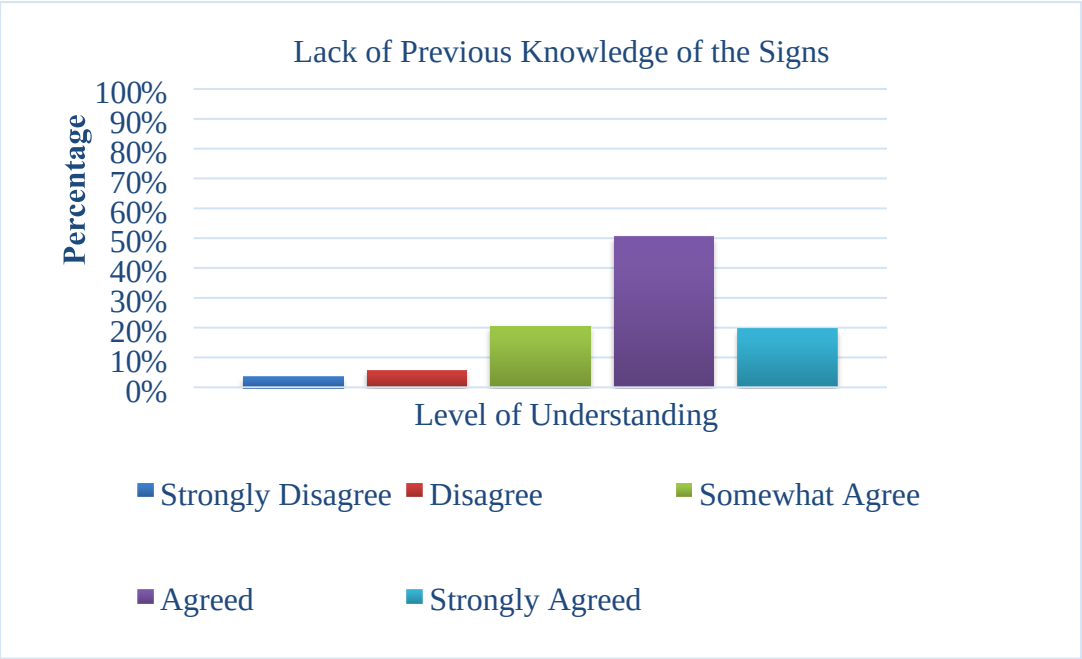

Figure 4.6: Lack of Previous Knowledge of the Signs

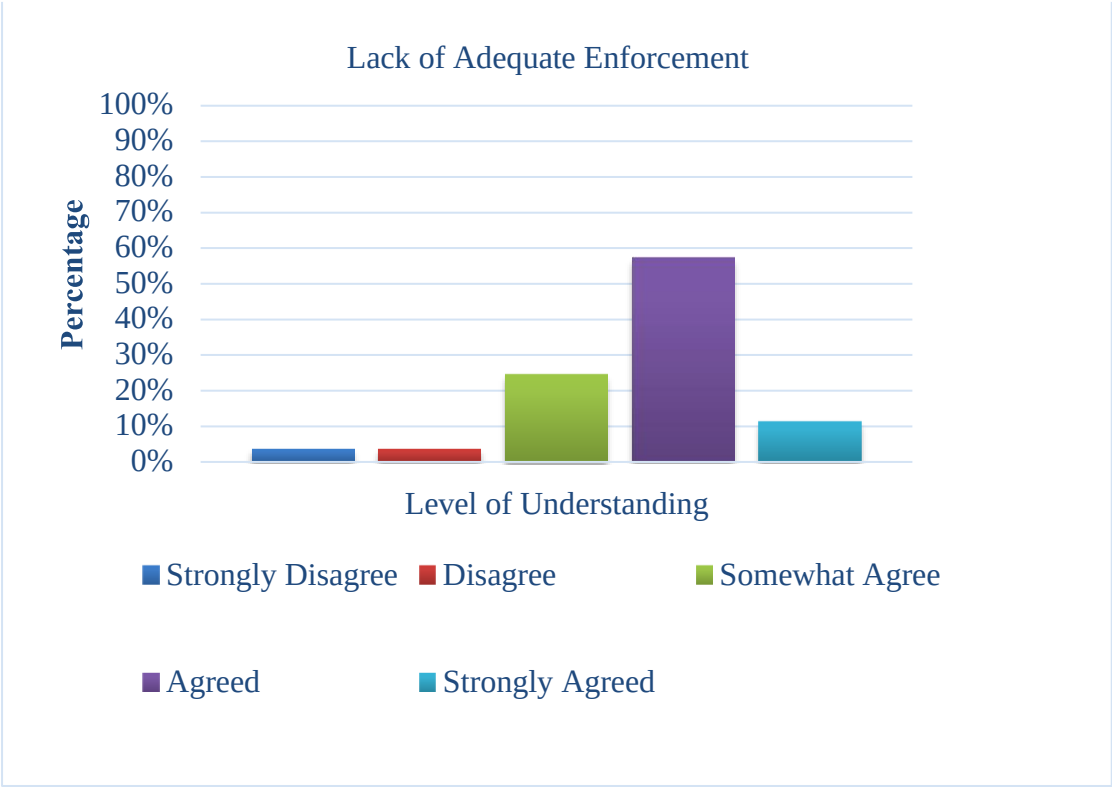

Figure 4.7: Lack of Adequate Enforcement

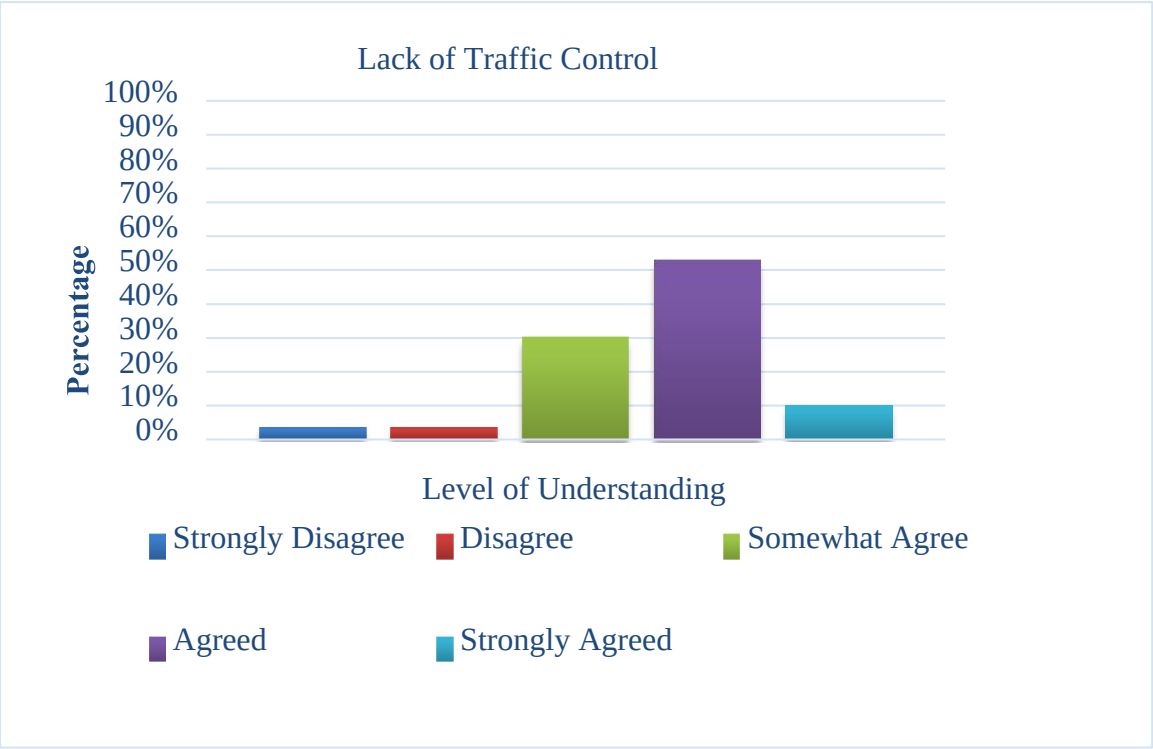

Figure 4.8: Lack of Traffic Control

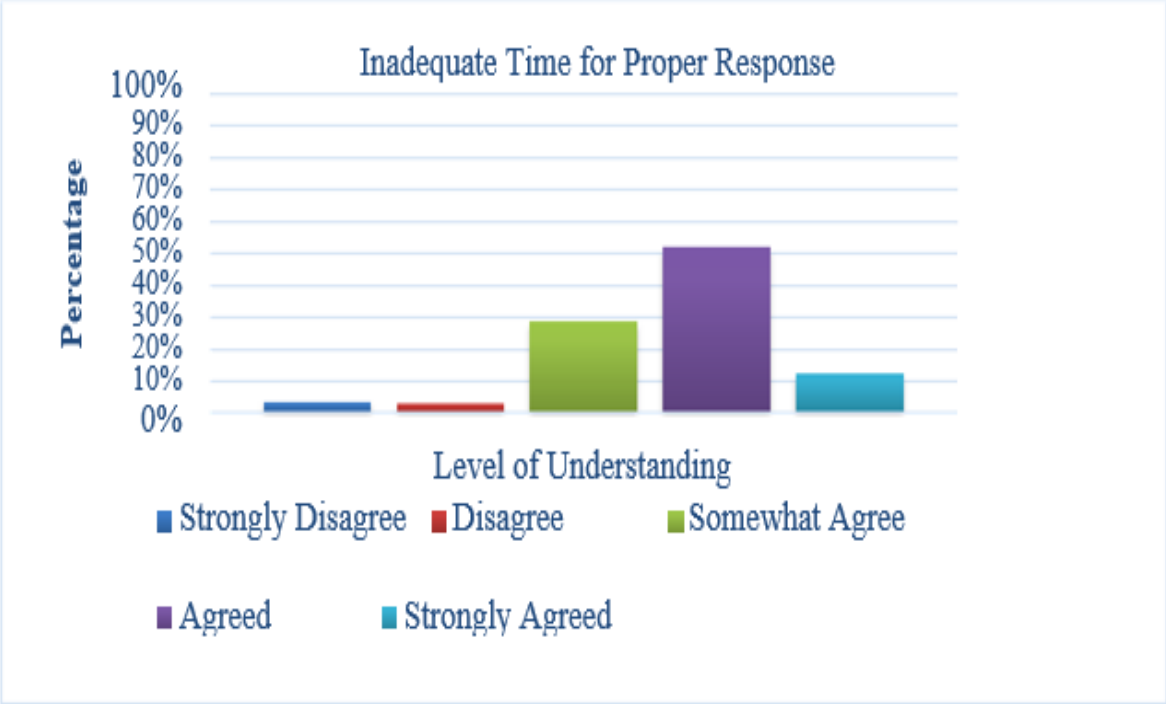

Figure 4.9: Inadequate Time for Proper Response

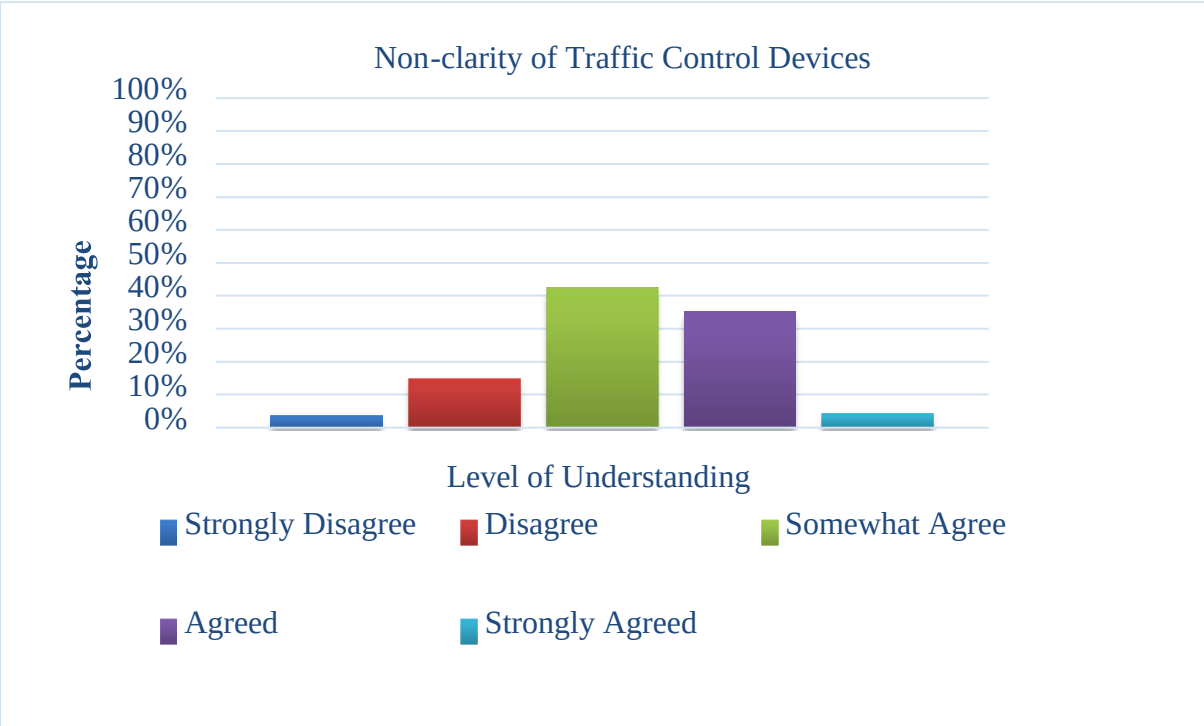

Figure 4.10: Non-clarity of Traffic Control Devices

4.4 Result from the advance statistical analysis

4.4.1 Chi-square analysis of Demographic background and Driver Understanding of Traffic sign.

The purpose of this test is to determine if a difference between observed data and expected data is due to chance, or if it is due to a relationship between the variables in this study. Therefore, a chi-square test is an excellent choice to help us better understand and interpret the relationship between our two categorical variables.

The Asymptotic Significance, or p-value, of the chi-square were run in SPSS. This value determines the statistical significance of the relationship as tested. In all tests of significance, if $p < 0.05$, there is a statistically significant relationship between the two variables.

The Table 4.2 provides the cross tabulation, otherwise known as chi-square analysis of the relationship between the demographic distribution of the drivers and their understanding of the traffic signs. As revealed in the table, there were no significant relationship between the gender

and their understanding of the traffic signs $\chi^2(3) = 5.248$, p − value > 0.05, this means that irrespective of the gender, the understanding of the four categories of traffic control signs, as shown in the figure 4.11 are not statistically different from each other. Also, regarding the age $\chi^2(12) = 8.857$, p − value > 0.05, education $\chi^2(6) = 3.535$, p − value > 0.05, and category of the driver $\chi^2(3) = 4.374$, p − value > 0.05, no evidence of statistically significant relationship with understanding of four categories of traffic control signs was reported. Their respective charts as regards the actual difference on the understanding of the traffic signs is are shown in the figure 4.12 for age, figure 4.13 for education, and figure 4.14 for category of driver. However, when it comes to driving experience, the chi-square value showed that there is evidence to support the statistical and significant relationship between the driving experience and understanding of traffic signs $\chi^2(6) = 18.143$, p − value < 0.05. This, in real sense, denoted that driver with lot of driving experience have the ability to understand and master the traffic signs than those with less driving experience. This, again, is shown in the Figure 4.15

Table 4.2: Significance of Demographic background and Driver Understanding of Traffic sign.

		Traffic sign		
Variables	**Chi-square**	**Df**	**p-value**	**Significant**
Gender	5.248	3	0.155	No
Age	8.857	12	0.715	No
Education	3.535	6	0.739	No
Category of Driver	4.374	3	0.224	No
Driving experience	18.143	6	0.006	Yes

4.4.2 ANOVA of Demographic Background and Driver Understanding of Traffic Signs

Having explained the result of the descriptive statistics and visualization of the reasons why the drive show non-compliance attitude to the traffic sign, it is essential to proof the result using statistical evidence. As a result, independent sample t-test (for gender and category of drivers), and analysis of variance (ANOVA) were employed to test whether there is statistical evidence.

Significant differences among group means are calculated using the F statistic, which is the ratio of the mean sum of squares (the variance_explained by the independent variable) to the mean square error (the variance left over). When the *p*-value falls below the chosen alpha value (0.05), then we say the result of the test is statistically significant.

The independent sample t-test result, table 4.3, showed that gender and category of driver has no difference in their response towards reason for non-compliance of traffic signs $p > .05$, this denoted that the drivers are not sentiment on the traffic sign based on the gender and whether they are commercial or private driver. For the ANOVA test, the result revealed that non-compliance of traffic sign is not dependent on age since no statistical significance difference is established $F (4, 380) = 0.867$, $p >. 05$. However, for the education with $F (2,382) = 17.23$, $p <. 05$ and driving experience with $F (2, 382) = 10.479$, $p < .05$, there is statistical evidence to support the claim of differences in noncompliance to traffic sign's responses based on education and driving experience. What was gotten from this result is that education and driving experience can certainly be the yardstick to obey the traffic light.

From the study education and years of driving experience is statistically significant which corresponds to the findings of Makinde and Oluwasegunfunmi (2014), Tolessa Gudeta Bedada (2019).

Table 4.3: Significance of drivers' responses towards reason for noncompliance of traffic signs.

Variables	stat value	Df	p-value	Significant
Gender	0.961	76	0.34	No
Age	0.867	4, 380	0.484	No
Education	17.23	2, 382	0.001	Yes
Category of Driver	1.792	383	0.074	No
Driving experience	10.479	2, 382	0.000	Yes

4.5 Major Factors Contributing Driver Non-compliance to Traffic Control Device

This section focuses on the identification and analysis of major factor contributing to driver's non-compliance to traffic control device.

4.5.1 Drivers Factor by Gender

Figure 4.11 shows the understanding of traffic signs based on gender and their corresponding numbers. For male drivers, a number of 65 understood road marking, 62 males with understanding of warning signs, informative signs being understood by 59 male driver and 57 males with clear understanding of regulatory signs. For the case of the female, road marking, warning signs, informative signs, and regulatory signs were understood by 32, 27, 48, 35 females, respectively. The male gender understands the traffic signs compared to the female which is in agreement to previous findings of Umar and Bashir (2009).

4.5.2 Drivers Factors by Age

Figure 4.12; below elaborates the age distribution of the drivers and its effects on the driver's non-understanding of traffic control devices. When drivers' understanding was compared by their age category, those drivers with an age 31-40 year had higher understanding of the traffic control signs. And drivers of 51 years and above have the least understanding of the traffic signs except for regulatory signs which drivers of 18-24years of age has the least understanding of regulatory signs. This result is in agreement with findings of Makinde and Opeyemi (2012) and, Umar and Bashir (2019) and common age range in Nigeria as reported by National Bureau of Statistics (2016).

4.5.3 Drivers Factor by Educational Background

Figure 4.13 shows that Among the four categories of educational background the number of drivers with primary school education is 20, 24, 21, 19 for road markings, warning signs, information signs and regulatory signs respectively, Those with secondary school are 41, 38, 43, 35 for road markings, warning signs, information signs and regulatory signs respectively and Those with tertiary has their highest level of education are 36, 27, 43, 38 for road markings, warning signs, information signs and regulatory signs respectively. This implies that the majority of the respondents who participated in the study are educated having gone through secondary school education. This correlate with the study by Makinde and Oluwasegunfunmi (2014).

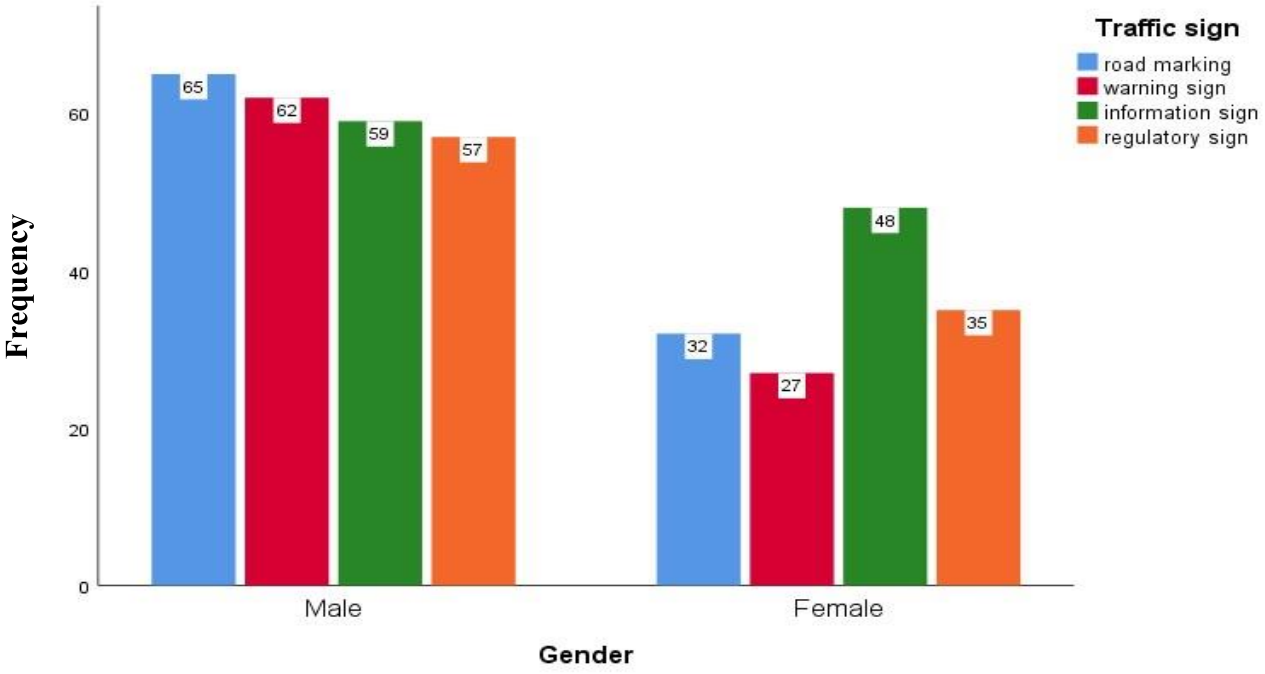

Figure 4.11: Illustration of traffic signs understanding by Gender

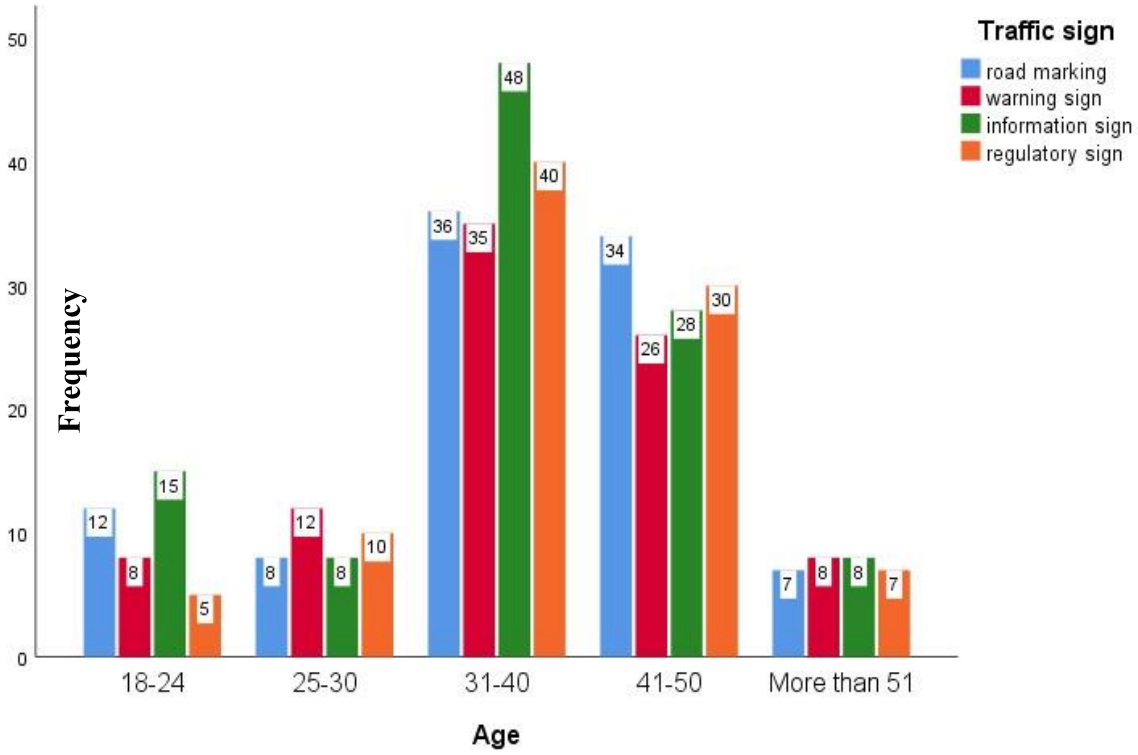

Figure 4.12: Illustration of traffic signs understanding by Age

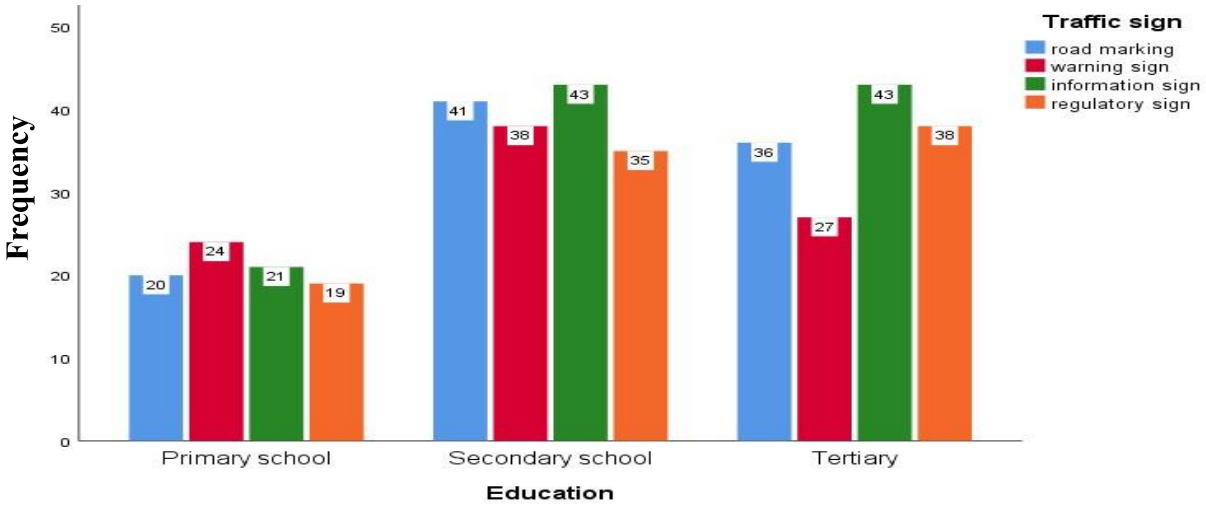

Figure 4.13: Illustration of traffic signs understanding by Education

4.5.4 Drivers factor by Driver's Category

This variable has two categories (private and commercial), Between the two categories, figure 14.14 showed that commercial drivers have the highest number of drivers who understands all the types of traffic control devices with 60, 59, 60 and 64 for road markings, warning signs, information signs and regulatory signs respectively. Private drivers have the number of drivers who understands as 37,30,47 and 28 for road markings, warning signs, information signs and regulatory signs respectively.

Figure 4.15, depicts that driver's with more than 10 years of experience have the highest number of understanding of road marking, information and regulatory signs with numbers of 45, 53, 45 but those with 5-10 years have the highest number of drivers understanding of warning signs which is 46. Those with the less than 5 years of driving experience have the least numbers of drivers who understands all the traffic control device, which correspond to the findings by Gana and Emmanuel (2014) and Makinde and Oluwasegunfunmi (2014).

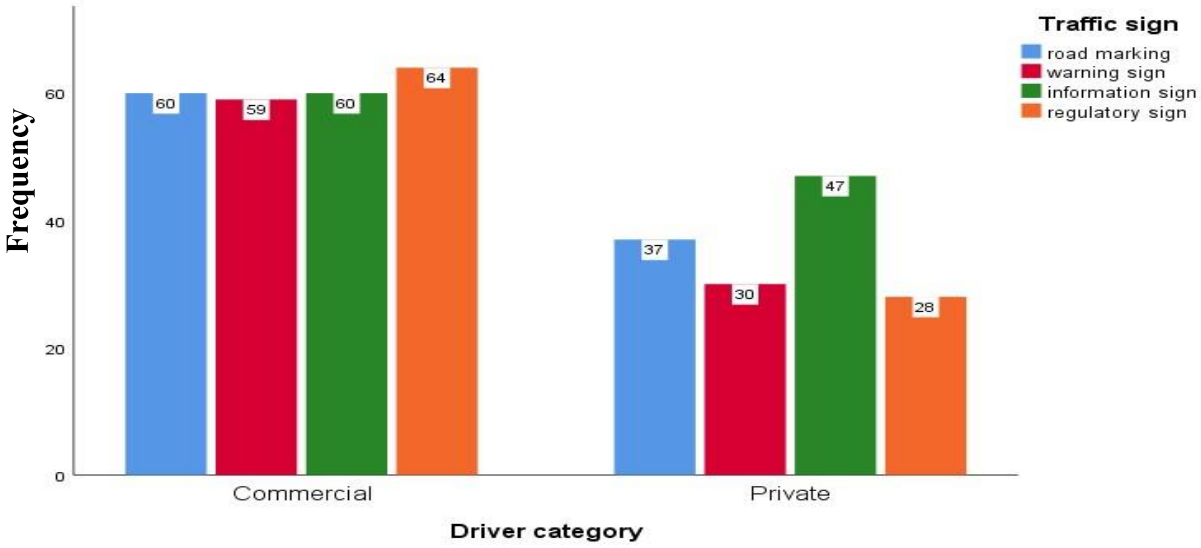

Figure 4.14: Illustration of traffic signs understanding by Driver Category

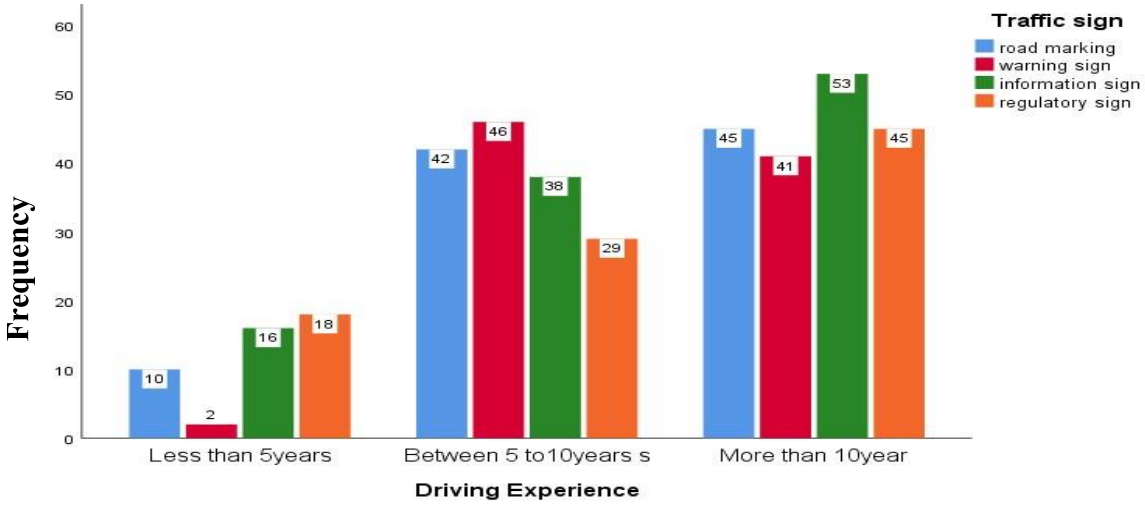

Figure 4.15: Illustration of traffic signs understanding by Driving experience

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The study has been able to investigate the comprehension and non-compliance of drivers to traffic control devices in Ilorin. The respondent to questionnaire interviewed revealed factors that have attributed to non-compliance of drivers to traffic control devices.

Based on the findings of the study, the following conclusions were made:

i. Driver's characteristics (Gender, Age, Educational Level, Category of Driver and Driving Experience) were found as factors affecting a driver's non-compliance with the traffic control device, although on education and years of driving experience are statistically significant. However, drivers between the ages of 18-24 years played prominent role in the non-compliance of drivers to traffic control devices compliance towards the traffic control device in Ilorin.

ii. The overall percentage of drivers (respondents) who correctly understood traffic control devices in Ilorin was found to be 60%. The findings also revealed that visible roads signs make it easier for the driver to see and obey the command and direction of the road sign.

iii. The major factors that affect the non-understanding of drivers to traffic control devices in Ilorin were lack of previous knowledge of the signs, lack of adequate enforcement and lack of traffic control devices on road. As over 50% of the respondents strongly agreed to this.

5.2 Recommendation

Based on the conclusion of the study, the following recommendations were made:

i. Control devices manual should be made compulsory to drivers (commercial and private drivers) in Ilorin metropolis for proper understanding of traffic control devices and improvements such as higher enforcement levels, stiffer violation penalties should be considered.

ii. Drivers (both commercial and private drivers) should be educated/trained on the traffic rules and signs and it uses/meaning through private or government in collaboration with FRSC driving schools for drivers before driving on the road in Ilorin metropolis and before driving license is issued to drivers. This is achievable by the proper use of educational materials such as posters, handbooks, campaigns, use of public media like radio and television, seminars and talk shows.

iii. Similar study should be carried out in other parts of the state.

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APPENDIX A: QUESTIONNAIRE

(Interview Questions for drivers)

As part of my Meng. Research thesis at Kwara State University Malete, I am conducting a survey that investigate the level of understanding and compliance of traffic control devices among drivers in Ilorin. I will appreciate if you could complete the following questions. Thank you for taking your time to fill in this questionnaire. Your answers will be treated with complete confidentiality.

SECTOIN A

SOCIO-DEMOGRAPHIC CHARACTERISTICS OF DRIVERS ‘

Tick (√) the correct from the given option (a, b, c, d), the one that best describe you

1. Age (years) (a) 18-24 (b) 25-30 (c) 31-40 (d)40-50 (e) More than 51
2. Gender (a) male (b) female
3. Educational level (a) primary school (b) secondary school (c) Tertiary
4. Vehicle Type (a) commercial (b) private
5. Driving Experience (a) less than 5 years (b) between 5 to 10 years (c) more than 10 years

SECTION B
DRIVERS COMPREHENSION OF TRAFFIC SIGNS

Below are different traffic signs, pick from the available option which best describes the image before it. Tick (√) the correct from the given option (a, b, c, d)

WARNING SIGN

1. (a) stop (b) pedestrian crossing (c) road hump (d) I have no idea
2. 
   (a) narrow bridge (b) Road Hump / Uneven Road (c) traffic light (d) I have no idea

3. 
(a) stop (b) I have no idea (c) road hump (d) Four Way Junction

4. 
(a) narrow bridge (b) roundabout (c) traffic light (d I have no idea

5. 
(a) Two Way Traffic (b) pedestrian crossing (c) road hump (d) I have no idea

6. 
(a) bend ahead (b) stop (c) roundabout (d) I have no idea

7. 
(a) Two Way Traffic (b) pedestrian crossing (c) Dangerous Double Bend

(b) (d) I have no idea

8. 
(a) T-junction (b) two-way traffic (c) U-turn (d) I have no idea

REGULATORY SIGNS

9. 
(a)no horn (b) No Right Turn (c) no U-turn (d) I have no idea

10. 
(a)no crossing (b) no overtaking (c) speed limit (d) I have no idea

11. 
(a)no left turn (b) no horn (c) No Parking (d) I have no idea

12. 
(a)no horn (b) no parking (c) no U-turn (d) I have no idea

13. 
(a)no left turn (b) No overtaking (c) No Parking (d) I have no idea

14. 
(a) No Horn (b) no horn (c) No Parking (d) I have no idea

15. 
(a) (a)no left turn (b) No overtaking (c) No Pedestrian Crossing (d) I have no idea

16. 

(a) speed limit (b) no overtaking (c) no crossing (d) I have no idea

17. 
(a)no crossing (b) No Stopping (c) speed limit (d) I have no idea

18. 
(a) No Waiting (b) no overtaking (c) speed limit (d) I have no idea

INFORMATION SIGN

19. 

(a) parking (b) rest area (c)one way (d) I have no idea

20. 

(a) Hospital (b) restaurant (c) hospital (d) I have no idea

21. 
(a) restaurant (b) hospital (c) Bus station (d) I have no idea

22. 
(a) parking (b) rest area (c) Train station (d) I have no idea

23. 
(a) filling station (b) restaurant (c) hospital (d) I have no idea

24. 
(a) hospital (b) restaurant (c) Airport (d) I have no idea

ROAD MARKINGS

25. 
(a) warning line (b) No Crossing (c) do not enter (d) no idea

26. 
(a) do not cross (b) warning line (c) Zebra Crossing No Crossing (d)I have no idea

27. 
(a) do not cross (b) warning line (c) center line (d) I have no idea

28. 
(a) Center Line (b) No Crossing (c) do not enter (d) no idea

29. . 
(a) Do not enter Marked Area (b) zebra crossing (c) do not enter (d) no idea

SECTION C

FACTORS THAT AFFECT NON-UNDERSTANDING OF TRAFFIC CONTROL DEVICES

The following are some reasons why drivers do not comply to traffic control devices using a scale 1 to 5 where 1 represent “Strongly disagree” 2 represent “Disagree” 3 represent “Somewhat agree” 4 represent Agreed” and 5 represent “Strongly agreed” indicate the extent to reach you agree with the following as features of value management.

S/NO.	REASONS FOR NON-COMPLIANCE	RATING				
		1	2	3	4	5
1	Lack of previous knowledge of the signs					
2	Lack of adequate enforcement					
3	Lack of traffic control device on road					
4	Inadequate time for proper response					
5	Non clarity of traffic control devices					

Appendix B: Understanding of Warning Signs

Signs	Percentage %
Roundabout	90
T – Junction	71.8
Dangerous Double Bend	34.5
Two Way Traffic	37.3
Narrow Bridge	33.8
Four Way Junction	82.9
Road Hump / Uneven Road	48.6
Pedestrian Crossing	50

Appendix C: Comprehension of Regulatory Signs

Signs	Percentage %
No Right Turn	75.4
No Parking	79.6
No Left Turn	66.6
No U – Turn	44.9
No Overtaking	42.3
No Horn	35.8
No Pedestrian Crossing	71.1
Speed Limit	83.1
No Stopping	47.2
No Waiting	38.7

Appendix D: Comprehension of Informatory Signs

Sign	Percentage %
Parking	50.7
Hospital	73.2
Bus Station	43.7
Train Station	61
Filling Station	67.6
Airport	91.5

Appendix E: Comprehension of Road Markings

Sign	Percentage %
No Crossing	43
Zebra Crossing	56.3
Warning Line	65.5
Center Line	81.7
Do not enter Marked Area	48.6

Appendix F.1: Lack of Previous Knowledge of the Signs

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
SD	14	3.6	3.6	3.6
D	22	5.7	5.7	9.4
SWA	79	20.5	20.5	29.9
A	195	50.6	50.6	80.5
SA	75	19.5	19.5	100.0
Total	385	100.0	100.0	

Appendix F.2: Lack of Adequate Enforcement

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
SD	14	3.6	3.6	3.6
D	14	3.6	3.6	7.3
SWA	94	24.4	24.4	31.7
A	220	57.1	57.1	88.8
SA	43	11.2	11.2	100.0
Total	385	100.0	100.0	

Appendix F.3: Lack of Traffic Control Devices

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
SD	14	3.6	3.6	3.6
D	14	3.6	3.6	7.3
SWA	115	29.9	29.9	37.1
A	203	52.7	52.7	89.9
SA	39	10.1	10.1	100.0
Total	385	100.0	100.0	

Appendix F.4: Inadequate Time for Proper Response

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
SD	14	3.6	3.6	3.6
D	12	3.1	3.1	6.8
SWA	110	28.6	28.6	35.3
A	201	52.2	52.2	87.5
SA	48	12.5	12.5	100.0
Total	385	100.0	100.0	

Appendix F.5: Non-clarity of Traffic Control Devices

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
SD	14	3.6	3.6	3.6
D	57	14.8	14.8	18.4
SWA	163	42.3	42.3	60.8
A	135	35.1	35.1	95.8
SA	16	4.2	4.2	100.0
Total	385	100.0	100.0	

Appendix G: Krejcie and Morgan Table for Determining Sample Size for Population

Sample Size Determination Using Krejcie and Morgan Table

KENPRO August 25, 2012

The ever increasing need for a representative statistical sample in empirical research has created the demand for an effective method of determining sample size. To address the existing gap, Krejcie & Morgan (1970) came up with a table for determining sample size for a given population for easy reference.

Table 1: Table for Determining Sample Size for a Finite Population

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970