UNDERSTANDING OF TRAFFIC SIGNS BY DRIVERS ON URBAN ROADS – A CASE STUDY OF ILORIN, KWARA STATE

ABSTRACT

Traffic signs are commonly used traffic safety tools, developed to provide crucial information in a short time to support safe driving 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. 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%.

Introduction

The number of vehicles on roads has increased due to technological and economic 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 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).

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 was 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).

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 2004) 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 the level of understanding of the traffic signs. 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.

1.3 Aim and Objectives of the Study

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

The specific objectives are to:

- **i.** identify which driver's characteristics played prominent role in the non-compliance of drivers to traffic control devices;
- **ii.** determine the percentage understanding of the warning, regulatory, informatory and road signs;
- **iii.** determine the overall percentage of drivers who understand the traffic control device;

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).

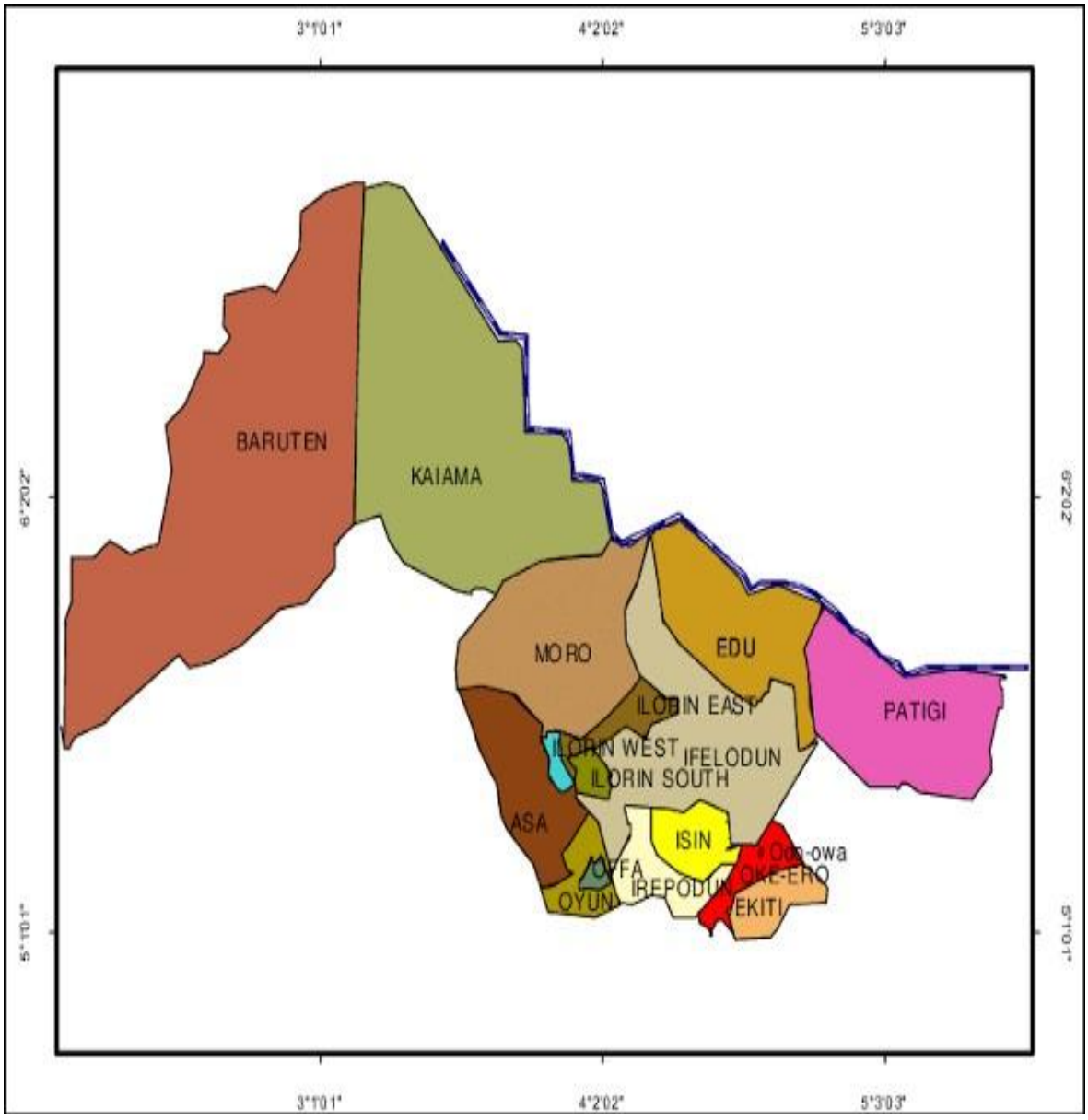

Figure 1: Map of Kwara State showing the location of Ilorin West, Ilorin East, and Ilorin South (sample areas). (Olabode and Ajibade, 2010)

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).

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.

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.

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 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 1 shows the map of Kwara State, arrows pointing to the 3 local government areas.

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.

Survey Questionnaire Design

The questionnaire 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 centers, local business owners and customers, professional drivers serving along the segment.

RESULTS AND DISCUSSION

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 1

Table 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

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).

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).

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 below while the results are presented in the following sections.

Understanding of Warning Signs

Figure 2 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 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 average percentage of correct answers of these signs was 56.1% which indicated that the comprehension was very poor.

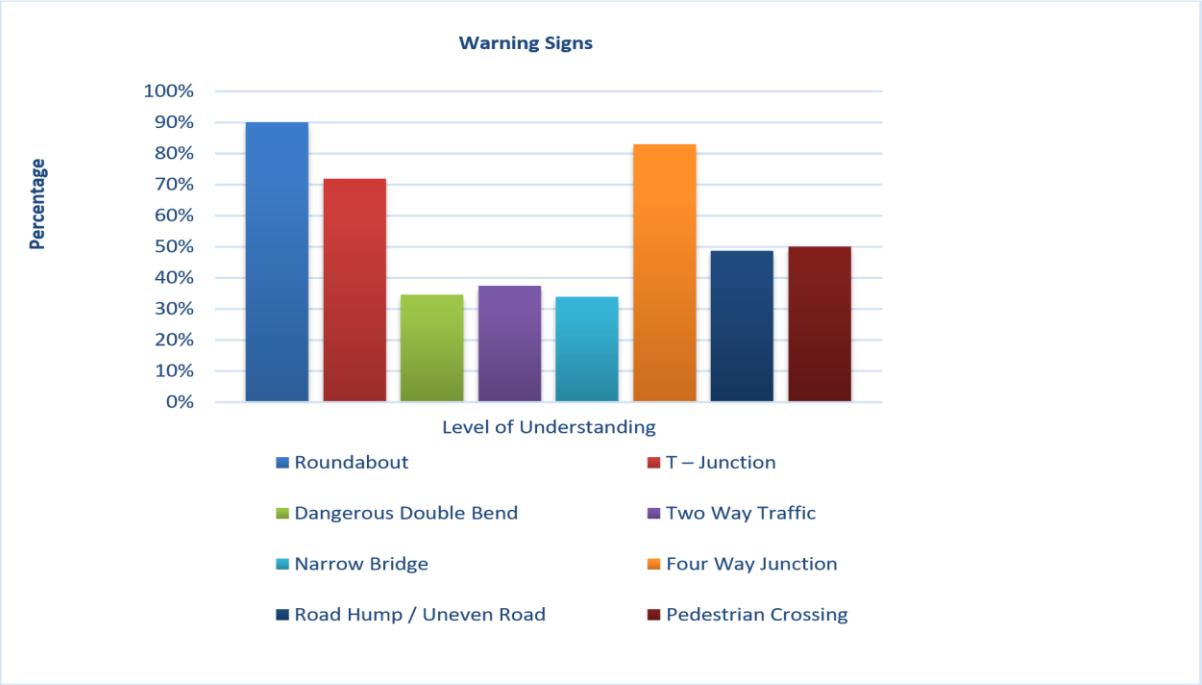

Figure 2: Understanding of Warning Signs

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 and the result presented in Figure 3. 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

Figure 3: Understanding of Regulatory Signs

Understanding of Information Signs

A total of six information signs (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. 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%.

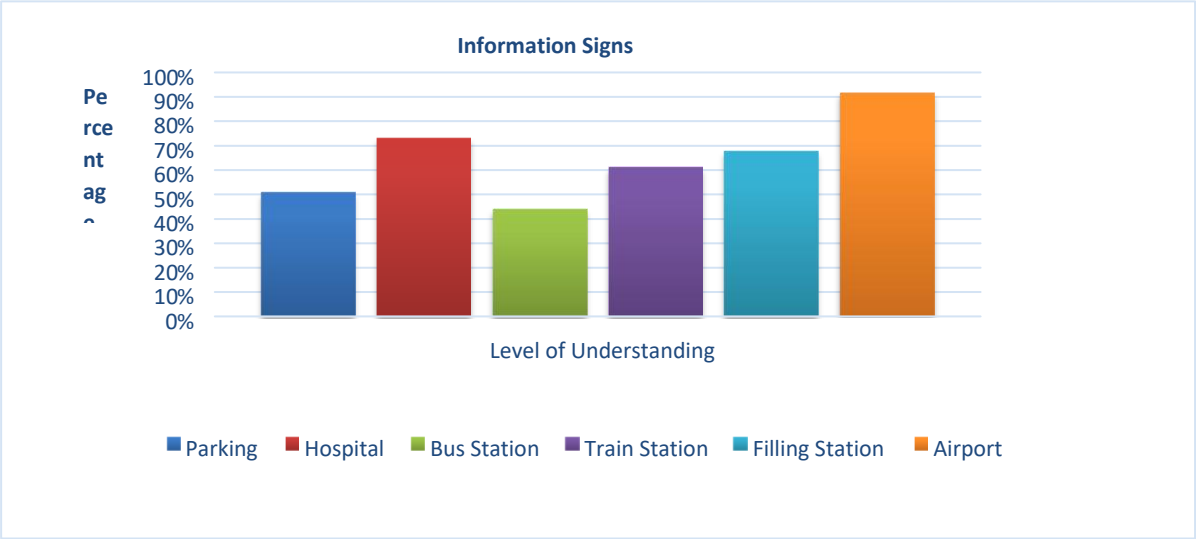

Figure 4: Understanding of Information Signs

Understanding of Road Markings

Figure 5 shows the result of drivers' comprehension of road markings. A total of five road markings (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. 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%.

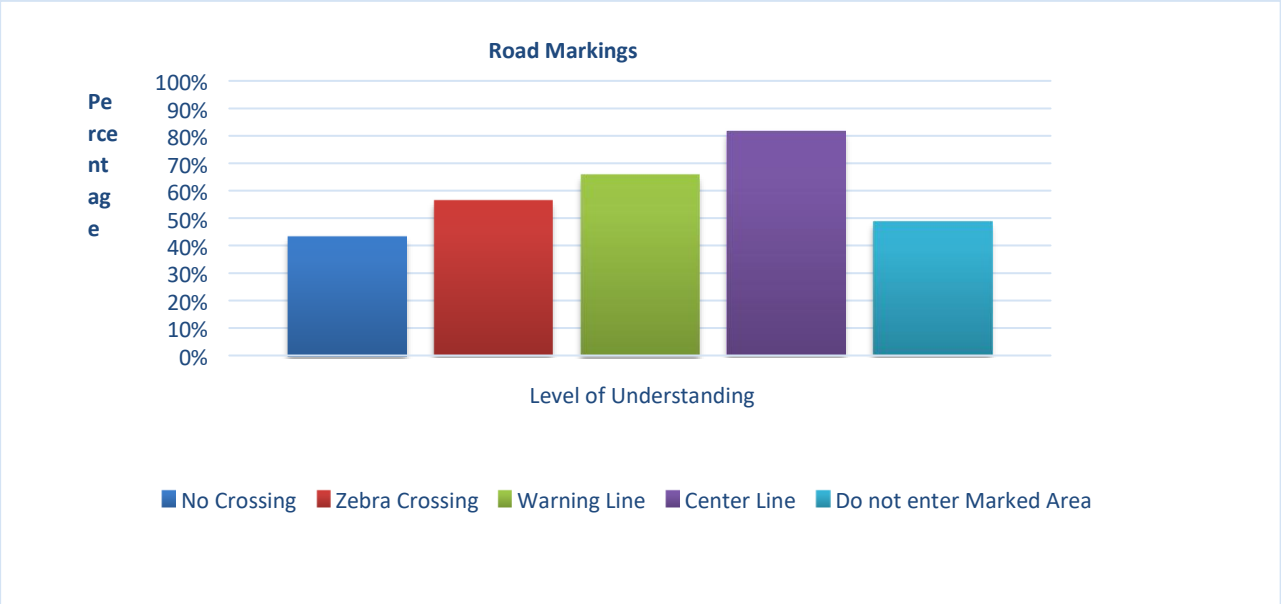

Figure 5: Understanding of Road Markings

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 6. The overall percentage of drivers who correctly understood the traffic control devices in Ilorin was found to be 60%.

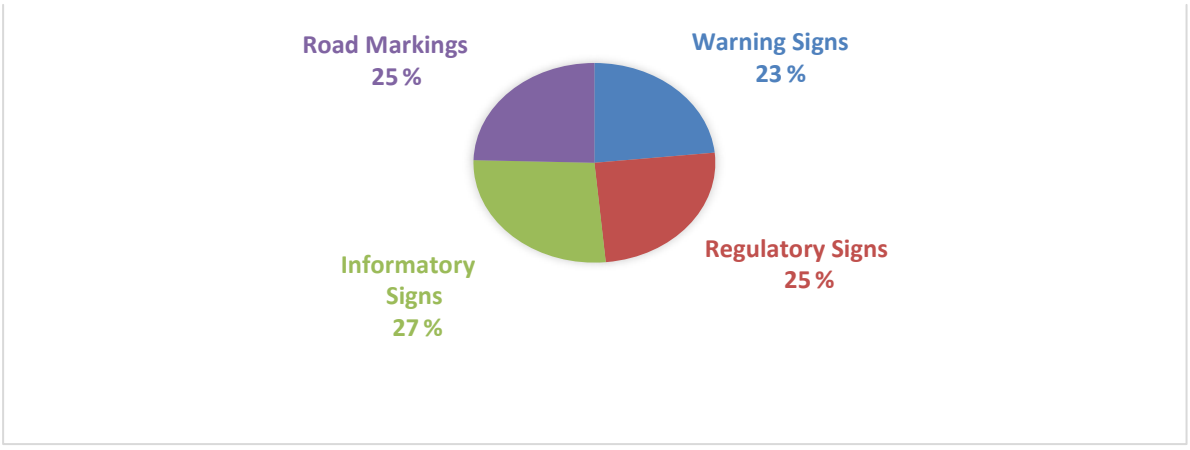

Figure 6: Drivers Over all Understanding of Traffic Signs

CONCLUSION AND RECOMMENDATIONS

Conclusion

The study has been able to investigate the comprehension of drivers to traffic control devices in Ilorin.

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

i. The majority of the respondents who participated in the study were male, majority are educated having gone through secondary school education and more of the respondent are of commercial vehicle type
ii. Information signs were well understood by drivers than other traffic control devices examined with the average understanding level of 64.6%.
iii. 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.
iv. These results agree with other research work that drivers generally have problems in understanding traffic signs.

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.

REFERENCE

A Guide to Traffic Signing (2009): Ministry of Infrastructure Development, Safety and Environment Unit, United Republic of Tanzania. Retrieved from http://www. mow.go.tz/uploads/publications/89f5cfe80559f1839a334fcb22b86603.pdf

Adedeji, J.A., Abejide, S.O. and Hassan, M.M. (2016). Effectiveness of Communication Tools in Road Transportation: Nigerian Perspective. *International Conference on Traffic and Transport Engineering,* Belgrade, November 24-25.

Agbonkhese, O., Yisa, G.L., Agbonkhese, E.G., Akanbi, D.O., Aka, E.O. and Mondigha, E.B. (2013). Road Traffic Accidents in Nigeria: Causes and Preventive Measures. *Civil and Environmental Research*, 3(13): 90-99.

Ajadi, B.S., Adaramola, M.A., Adeniyi, A. and Abubakar, M.I. (2016). Effect of Effluents Discharge on Public Health in Ilorin Metropolis, Nigeria. *Ethiopian Journal of Environmental Studies & Management*, 9(4), 389 – 404.

Al-Madani, H. and Al-Janahi, A.R. (2002). Assessment of Drivers' Comprehension of Traffic Signs Based on Their Traffic, Personal and Social Characteristic. *Transportation Research Part F*, 5, 63–76.

Al-Madani, H. and Al-Janahi, A.R. (2002). Role of Drivers' Personal Characteristics in Understanding Traffic Sign Symbols. *Accident Analysis and Prevention*, 34, 185-196.

Choocharukula, K. and Sriroongvikrai, K. (2017). Road Safety Awareness and Comprehension of Road Signs from International Tourist's Perspectives: A Case Study of Thailand. *Transportation Research Procedia 25C*, 4522–4532.

Gana, A.J., and Emmanuel, J.A. (2014). Road Transportation and Traffic Law Enforcement in Nigeria: A case study of the Federal Road Safety Corps (FRSC), *West African Journal of Industrial & Academic Research,* 11(1), 134-151.

Kadiyali, L.R. (1987). Traffic Engineering and Transportation, *Khanna publishers*, New Delhi, India.

Kirmizioglu, E. and Tuydes-Yaman, H. (2012). Comprehensibility of Traffic Signs among Urban Drivers in Turkey. *Accident Analysis and Prevention* 45, 131– 141.

Makinde O.O. and Opeyemi, D.A. (2012). Understanding of Traffic Signs by Drivers – A Case of Akure City, Ondo State, Nigeria. *ARPN Journal of Science and Technology*, 2(7), 608 – 612.

Makinde, O.O. and Oluwasegunfunmi, V. (2014). Comprehension of Traffic Control Devices amongst Urban Drivers-A Study of Ado-Ekiti, Ekiti State, Nigeria. *European Journal of Engineering and Technology*, 2(1), 9 - 19.

Mathew, T.V. and Krishna Rao, K.V. (2007). Traffic Signs: Chapter 36. Available from http://nptel.ac.in/courses/105101008/28.

Murat, Y.S and cakici, Z. (2017). Comparative Analysis Of Public Transport Users' Perception Targeting Sustainable Transportation.

National Bureau of Statistics (2016). National Population Estimates, National Bureau of Statistics, Abuja, Nigeria.

Ogunmodede, T.A., Adio, G.O., Ebijuwa, A.S., Oyetola, S. and Akinola, J.O. (2012). Factors Influencing High Rate of Commercial Motorcycle Accidents in Nigeria. *American International Journal of Contemporary Research*, 2(11): 130-140.

Ogunmola, A.A. (2013). Signs and Symbols as a Communication strategy: A semiotic study of highway codes in Nigeria. *New Media and Mass Communication*, 19.

Olabode, A. and Ajibade, L. (2010). Environment induced conflict and sustainable development. A case of Fulani-Farmers' conflict in Oke-Ero LGAs, Kwara State, Nigeria.

Shinar, D. and Vogelzang, M. (2013). Comprehension of Traffic Signs with Symbolic Versus Text Displays. *Transportation Research Part F*, 18, 72 – 82.

Shinar, D., Dewar, R.E., Summala, H. and Zakowska, L. (2003). Traffic Sign Symbol Comprehension: a Cross Cultural Study. *Ergonomics*, 46(15), 1549–1565.

Umar, I.K. and Bashir, S. (2019). Comprehension of Road Traffic Signs by Various Road Users in Kano City. *Cumhuriyet Scientific Journal*, 40(1), 197-203.