(REVIEW ARTICLE)

Assessment of compliance level of road users to road traffic signs in Kaduna Metropolis, Nigeria

Isa Ibrahim Hassan [1,*], John Engbonye Sani [1], Ali Muhammad Anwar [1], Mustapha Mohammad Mamman [2], Abubakar Ahmad Shehu [1] and Badamasi Abdulrahman [2]

[1] Department of civil Engineering, Nigerian Defence Academy, Kaduna.
[2] Department of civil Engineering, University of Jos, Nigeria.

Abstract

Traffic signs as a traffic control device for traffic safety aims to regulate and control traffic by providing information about the road and its environment for road users. This study investigated an assessment of compliance level of road users to road traffic signs in Kaduna metropolis, Nigeria. A total of ten (10) symbolic warning, (10) regulatory-prohibitory signs and ten (10) informative signs were investigated. Using a survey method, data were collected using questionnaires as the instrument. Employing Slovin's formula, a sample of 100 was arrived at. Using simple random sampling technique, one hundred and twenty (120) questionnaires were administered to drivers (private and commercial), pedestrians, cart pusher within the various part of the city in Kaduna, 105 of the questionnaires were returned and 100 was selected as well completed and discarded the remaining 5. Statistical instrument and Microsoft excel data processing and charts. The analysis showed that there is a low level of awareness of traffic signs by road users represent 43% level of awareness. Age, Education and years of driving experience played prominent roles in drivers' understanding of signs, however marital status and gender had no effect.

Keywords: Assessment; Compliance level; Kaduna metropolis; Road traffic signs; Road users

1. Introduction

In recent time, movement is necessary and compulsory for all human activities in search for basic necessities of life and in carrying out their daily activities. However, in the course of such movements, there exist some unavoidable negative consequences in which accident is one. Accident is an unpleasant event that happens unexpectedly especially in a vehicle or motorcycle which causes injury, damage of properties, and loss of lives. The rate of accident is worrisome in Nigeria due to the state of disrepair of Nigeria roads, lack of road caution, road signs, and other road safety devices, recklessness of drivers and motorcycle riders among others. Automobile transportation in particular has been marked by accident, injuries and fatalities right from inception and traffic accident has emerged as the single source of death throughout the world [1]. Road crashes and causalities lead to high physical, psychological, material and economic cost [2].

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 etc.). 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 [3]. Traffic signs, however are most effective when they command attention, convey a clear and simple meaning, command respect of the road users and give

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* Corresponding author: Hassan II; Email: osahmartinz@gmail.com
Department of civil Engineering Nigerian Defence Academy, Kaduna.

adequate time for proper response [4]. Traffic signs provide drivers with appropriate warning and information and signal requirements and directions. [5]. 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 [6].

The American National Standard Institute (ANSI Z535.3) advice that traffic signs should meet 85%, while the Organization of International Standardization (ISO 3864) pegged its own at 67% [7]. Traffic signs in relation with congestion and road accident occurrences have been a topic of considerable interest to researchers in the past few decades.

To put it simply, traffic signages are symbolized, illustrative guidance for road user for safer and more convenient traveling. It might look countless when it comes to road symbols used in Nigeria, but actually, we can classify them in to 3 main purposes. However, in Kaduna state, majorly in the metropolis, traffic signs exist in some spots. Although in short provisions at various location. This study is to look at an assessment of compliance level of road users to road traffic signs in Kaduna metropolis. Traffic signs on road are signs erected at the side of or above roads to give instructions or information. The first modern road signs erected on a wide scale were designed for riders or high or "ordinary" bicycles in the late 1870s and early 1880s. These machines were fast, silent and their nature made them difficult to control. [8]. The first sign made its debut in 1915 in Detnot. This was actually a year after the electric traffic signal was erected in [9] 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.

1.1. Study Area

Kaduna metropolis lies between Latitudes of the Equator and Longitute of the Greenwich Meridian. The project selected points are Mando Round about junction, Kawo Junction, Ludgard round-about, Singer round-about, NEPA round-about, Leventis round-about. The city formerly occupied a land area of in 1960 which increased significantly to in 2009 due to spatial expansion [10].
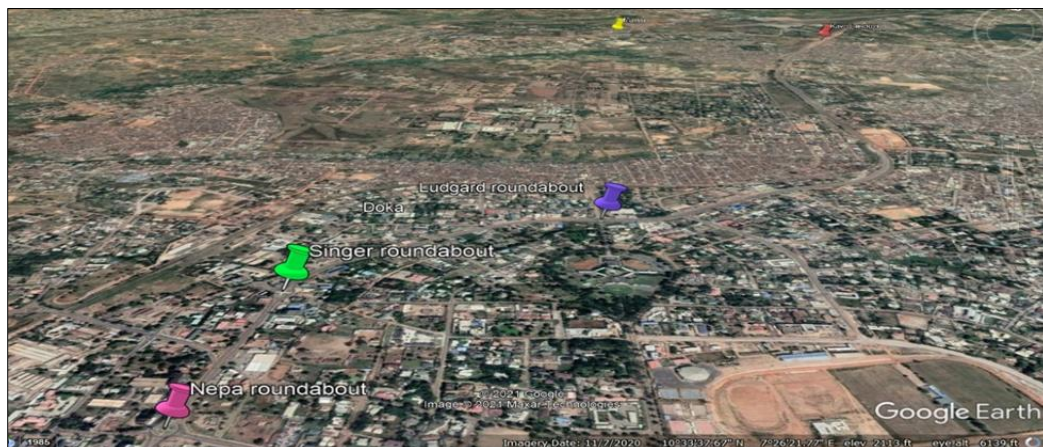
Figure 1 Map of Kaduna Metropolis (Source: Google Earth January II Hassan 2020)

2. Literature Review

Signs can be grouped under three (3) broad categories as follows: warning, regulatory and informative sings.

2.1. Regulatory signs

These signs serve notices of restrictions, requirements and prohibition. Usually regulatory signs are circular in shape. They include the STOP sign, NO HORN, etc., basically signs that assign the right of passage to merging roads or interception [11] In Figure 2 below are the signs used.

Figure 2 Regulatory Signs **[11]**

2.2. Warning signs

These signs generally provide information to drivers about impending conditions on the road. Thus, these signs seek to provide forehand advice about approaching conditions for drivers to prepare themselves vigilantly to respond adequately to the condition. In Figure 3. Below are signs used?

Figure 3 Warning Signs [11]

Informatory signs: As the name suggests Informatory signs give drivers information about places and facilities and route of particular interest or value. Usually these signs are rectangular but directional signs normally have one end pointed [12]. In Plate 4 below are the signs used.

Figure 4 Informatory Signs [12]

[13] Concluded that traffic signs are components of road infrastructures that are meant to assist road users in safely navigating to their destinations. This study sought to assess the comprehension level of drivers in the Emirate of Abu Dhabi (UAE). The respondents' overall performance was an improvement on earlier studies, however, there is still much to be improved upon. Although earlier studies found that driver's age, marital status, gender, nationality, level of education and type of vehicle all had a statistically significant impact on road sign comprehension, the data analysis for this study did not support such a conclusion. Furthermore, contrary to earlier studies, a higher percentage of males failed to correctly identify the "advance warning signs" compared to female respondents. One of the most critical

findings from this study is the ability to identify the category of road signs that are problematic to drivers in Abu Dhabi. This finding should assist driving instructors and police driving assessment officers in redesigning their teaching materials and assessments, respectively. The fact that despite increased fines driving violations persist points to the need to shine a spotlight on the training of drivers and the assessment methods for issuing licenses, as well as requirements for license renewal.

[14] From their study on Comprehension of Road Traffic Signs by Various Road Users in Kano state concluded that the low comprehension level among truck drivers and tricycle users may be associated with their low education level as the majority of road users in this category hardly make it to the high school. Another factor is the manner in which driver's license are issued in Nigeria as most drivers do not undergo the required training before obtaining the license. The relationship between a driver's level of comprehension and involvement in a traffic accident which has not been considered in this research should be studied in the future. Future research should also focus on obtaining the correlation between response time and comprehension level among various road users in Kano state. The comprehension level among the road users can be improved by sanitizing the license issue procedure in such a way that, all prospective drivers must undergo training through which they will learn a lot and be familiarized with all necessary traffic signs before been issued with a driving license.

[15] Concluded that transportation causes the movement of humans, goods and services from the area of abundance to the areas of scarcity for human development. The increase in traffic on the road and other human factors have led to road crashes resulting in loss of lives and other valuables. The introduction of road signs is to inform or communicate to the driver the nature of the road, what he/she needs to do and to be disciplined on the road. This study has found out that even when the highway drivers understand these signs, they simply ignore them and drive recklessly on the highway. Based on the findings, it is recommended that Federal Road Safety Corps (FRSC) should institute refresher programs for highway drivers at regular intervals for the drivers to have fresh thoughts of safe driving in their minds. Again, FRSC should make traffic signs available to every driver at the issuance of driving license

[16] Concluded that comprehensibility of traffic signs is very important in road safety since when signs are understood and followed it safeguards road users from rapid road accidents. The results generally showed a fair understanding of the traffic signs with the exception of the Informatory Signs which recorded a below acceptable limit of 62.3%, both the regulatory and warning signs recorded a satisfactorily 90.9 % and 78.7 % respectively. Averagely, a score of 82.53 % was recorded which is also satisfactory per ISO 3864, ANSI Z535.3 and DVLA, Ghana standards. The study further established that driving experience had a part to play in traffic sign comprehension as from the results drivers who had driven more understood the signs better. The results also revealed that the older drivers above 45 years and younger ones below 24 years understood the signs less. Another point to note, can be drawn from the trend established that drivers with higher educational backgrounds performed much better than those with low educational backgrounds. This presupposes that education has a significant effect on traffic sign comprehensibility, therefore it is imperative for Licensing and Regulatory Authorities to incorporate in their operations routine training programs directed towards educating drivers on road safety.

[17] From the findings of the study on the communicativeness of road traffic, they concluded that although road signs in Uyo Urban are highly communicative, the level of compliance with the demands of the signs is low. It is also concluded that educational qualification is not a major factor in understanding and interpreting road traffic signs.

[18] Concluded from their study that education had a significant effect on the understanding of traffic signs as observed in the results. In general, gender had no effect on the understanding of traffic signs since there was no female driver as an inter-city driver. The findings agree with other research work that drivers generally have problems in understanding traffic sings.

[11] Examined the Role of Drivers' Personal Characteristics in Understanding Traffic Sign Symbols, Accident Analysis and Prevention. A sample of 9000 drivers who were residents of Bahrain, Kuwait, Oman, Qatar, and United Arab Emirates was used. Result showed that on average, drivers really understood 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 the pictograms rather than written instructions, male drivers score 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.

[19] Investigated the influence of drivers' comprehension of signs on accidents involvement, citation 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

no citation 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.

The basic requirement of traffic signages is that it should provide a uniform traffic control which has along life and needs little maintenance. The cost of fulfilling this requirement varies in each case and depend on the traffic signage numbers and type of traffic signages and the condition of road. The manual on uniform traffic control devices (MUTCD) for streets and highways. [20].

3. Methodology

The method used was questionnaire as a research instrument tagged on Assessment of Compliance level of Road users to road traffic signs in Kaduna metropolis, Kaduna, Nigeria. Using Likert Scale [21]. The questionnaire was divided into three sections. Section A is to acquire the respondents' bio-data information such as name, age range, highest qualification, category of road user, number of years in the city. Section B deals with the level of awareness of road traffic signs in existence among road users. Section C are on the major roads plied by the road users with road traffic signs, orientation on road traffic signs and what are the barriers to effective utilization of road traffic signs by road users in Kaduna metropolis.

3.1. Mean score

This was adopted in analyzing each variable in the questionnaire to weigh the degree of responses. 2 is regarded as the cut-off point, any item that falls below 2.0 consider Rejected response while any item above 2.0 is considered as an Accept. The cut-off point for the 3-points scale is arrived at using the formula:

$$Mean\ Score = \frac{\sum Fx}{\sum F} \dots\dots\dots\dots\dots\dots (1)$$

Where: $\sum$ = Summation, F = Fraquency, x = Variable

$$Mean\ Score = \frac{3+2+1}{3} = 2.0$$

3.2. Data Sampling Techniques and Sample Size

Sample according to [22] is related with the selection of a subset of individuals from within a population to estimate the characteristics of whole population. The sample size should be carefully fixed so that it will be adequate to draw valid and generalized conclusions [23]. The required sample size is determined using Slovin's formula for calculating sample size. The Slovin's formula is given as:

$$n = \frac{N}{3+Ne^2}$$

Where: $n = desire\ sample\ size, N = population\ size, e = margin\ of\ error\ allowed.$

The metro area population of Kaduna in 2021 was 1,113,000.

N = 1,113,000, n = desire sample size, and e =10%

$$n = \frac{1,113,000}{3+1,113,000(0.01)^2} = 97\ responses, Say\ n = 100\ responses$$

The sampled population is one hundred (100) selected from five points in Kaduna metropolis. 120 questionnaires were administered in all using simple random sampling technique. 105 were returned and 100 was selected as well completed and the remaining 5 discarded.

3.3. Data analysis techniques

The data analysis consists of statistical instrument and Microsoft excel data processing and chart.

4. Results and discussion

From the questionnaires that was administered on 120 respondents. However, 100 completed was selected from the returned questionnaires and the findings are presented below:

4.1. Section A

This section is to acquire the respondents' bio-data information such as name, age range, highest qualification, category of road users, and number of years in city.

Table 1 Biography variables of the Respondents

	Variable	Frequency	Percentage
Age	21-25years	22	17.6
	26-30years	36	36.7
	31& Above	42	51.2
Units	Mando Round-about	20	20.0
	Kawo Junction	20	20.0
	Lugar Round-about	20	20.0
	NEPA Round-about	20	20.0
	Leventis Round -about	20	20.0
Qualifications	HND	16	16
	B.Tech/B.Sc	36	36
	M.Sc/ M.Tech	28	28
	PhD.	0	0
	SSCE, Primary cert. non-literate	20	20
Professional Qualification	NIA	0	0
	NIOB	0	0
	COREN	52	52
	ICAN	4	4
	Nurse, Doctors, Traders, Craftsmen.	44	44
Category of Road Users	Pedestrian	20	20
	Car Owners	76	76
	Motor Cycle, Tricycle,Bicycle, Cart Pushers	4	4
Years in the City	1-3	0	0
	3-5	0	0
	5-10	12	12
	Above 10 years	88	88

Table 1 above shows that the age distribution of the respondents is as follows; 21-25 years is 17.6%, 26-30 years 36.7%, and above 31 years is 51.2%. In terms of educational qualification, 16% of the respondents possessed a minimum of HND, B.Tech/B.sc 36%, M.Sc/M.Tech 28%, PhD. 0%, 20% had the secondary school certificate and the First School Leaving Certificate respectively. On professional qualification of the respondents registered with NIA and NIOB is 0%

respectively, with COREN is 52% and for nurses, Doctors, traders, and craftsmen is44%. For the category of road users, pedestrians are 20%, car owners are 76%, and motor cycle, tricycle bicycle and cart pushers is 4%. On the number of years in the city 1-3 years and 3-5 years possesses 0% respectively, 5-10 years possesses 12%, and above 10 years possesses 88%.

4.2. Section B

This section deals with questions on what are the level of awareness of road traffic signs existence among road users in Kaduna.

Table 2 Level of awareness of road traffic sign variables of the Respondents

S/No	Statement	Highly Aware	Aware	Not Aware	Mean (X)	Standard Deviation	Decision
1	Overtaking Prohibited	72	20	8	2.64	1.27	Accept
2	Stop at Intersection	28	20	52	1.76	1.04	Reject
3	Stop Police	76	24	0	2.76	1.37	Accept
4	N0 Right Turn	36	40	24	2.12	1.01	Accept
5	N0 "U" Turn	32	44	24	2.08	1.00	Accept
6	NO STOPPING	52	12	36	2.16	1.01	Accept
7	No Entry for Lorries	40	24	36	2.04	1.00	Accept
8	No Horn	8	8	84	1.24	1.37	Reject
9	Speed Limit (Maximum)	44	48	8	2.36	1.09	Accept
10	Litter Prohibited	4	8	88	1.16	1.43	Reject
11	A Railway Level Crossing with Gate	20	24	56	1.64	1.09	Reject
12	Railway Level Crossing without Gate	4	12	84	1.20	1.40	Reject
13	General Danger Sign	12	16	72	1.40	1.24	Reject
14	Children Crossing	36	52	12	2.24	1.04	Accept
15	Carriageway Narrows	4	32	64	1.40	1.20	Reject
16	Pedestrian Crossing	24	40	36	1.88	1.01	Reject
17	Narrow Bridge	20	16	64	1.56	1.13	Reject
18	"Y" Junction	12	12	76	1.36	1.27	Reject
19	Dangerous Double Bend (First to Left)	12	4	84	1.28	1.33	Reject
20	Road Work	4	60	36	1.68	1.07	Reject
21	Parking	36	40	24	2.12	1.01	Accept
22	Hospital	44	44	12	2.32	1.07	Accept
23	Advance Direction Sign	12	8	80	1.32	1.30	Accept
24	Filling Station	20	44	36	1.84	1.02	Reject
25	First Aid Station	16	24	60	1.56	1.14	Reject
26	Telephone	16	24	60	1.56	1.14	Reject
27	Direction Sign	52	36	12	2.40	1.11	Accept
28	Direction Sign To Airport	44	52	4	2.40	1.11	Accept
29	Direction Sign To Train Station	40	20	40	2.00	1.00	Accept
30	Restaurant	40	8	52	1.88	1.01	Reject
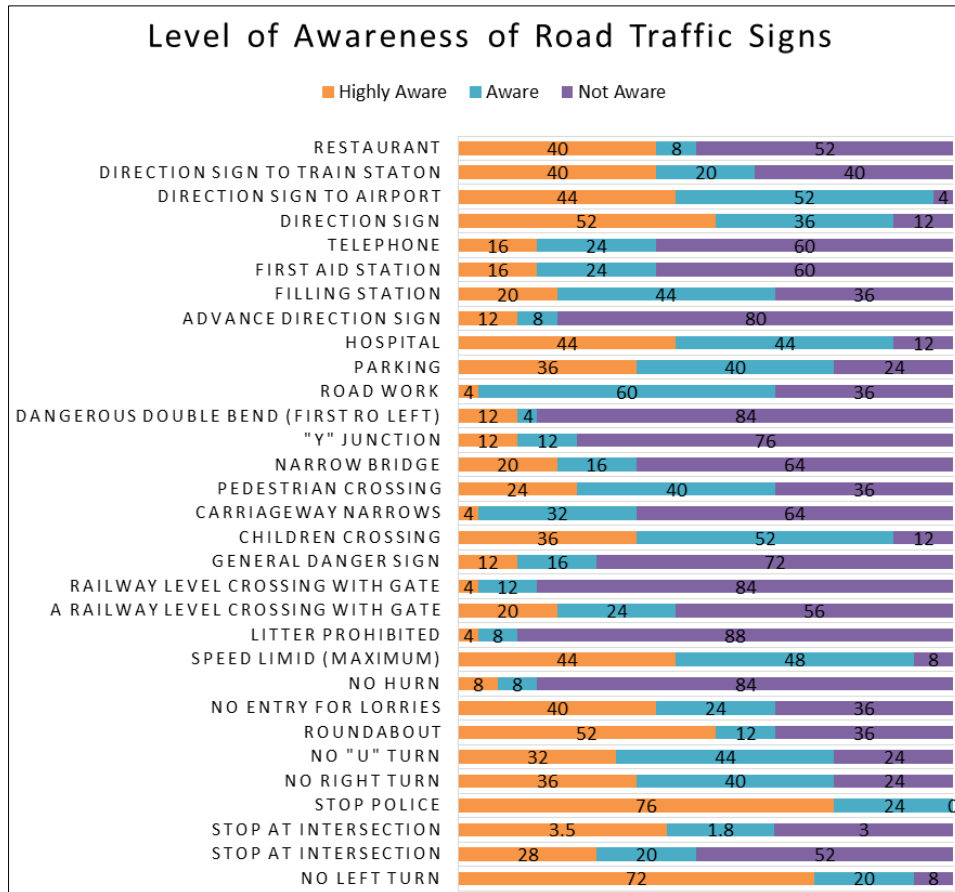
Figure 5 Level of Awareness of Road Traffic sign in Kaduna Metropolis

From Table 2 above, the statement with mean value above 2.0 and the corresponding standard deviation and a decision as accepted shows that the particular traffic sign that have a level awareness. Also, from the number accepted result to reject it shows that 13 out of the 30 traffic signs are well known which in variable means there are no enough awareness of road traffic signs as seen in Figure 5 above with "No Aware" responses. Stop Police traffic sign have the highest mean value 2.76 to show the level of awareness. Railway level crossing without gate has the lowest mean value of 1.20 with standard deviation of 1.09.

4.3. Section C

This section is on the questions; are the major roads plies by the road users in Kaduna metropolis with road traffic signs, orientation on road traffic signs and what are the barriers to effective utilization of road traffic signs by road users in Kaduna metropolis.

From Figure 6 below, it can be observed on whether having highway codes? 48% respondents answered in the affirmative while 52% said no, only 8% attended orientation/training organized by Vehicle Inspection Officers (VIO) while 92% do not. 36% attended orientation on road signs and other safety tips organized by Federal Road Safety Commission while 64% do not, 72% have valid driving license while 28% do not, and 76% said they did not attend driving school before using the road while for 24% went for driving school.

From Figure 7. below, on the question are the major roads plies by the road users in Kaduna metropolis with road traffic signs? 54% answered in the affirmative, while 46% in the negative.

From Table 3 and Figure 8 below, barriers to effective utilization of road traffic signs, inadequate road signs with highest mean value 3.64 and standard deviation 1.19 shows that it is a barrier to effective utilization. Drunkenness has a low mean value 1.76 and 1.59 standard deviation which could not be a barrier to effective utilization of road traffic signs.
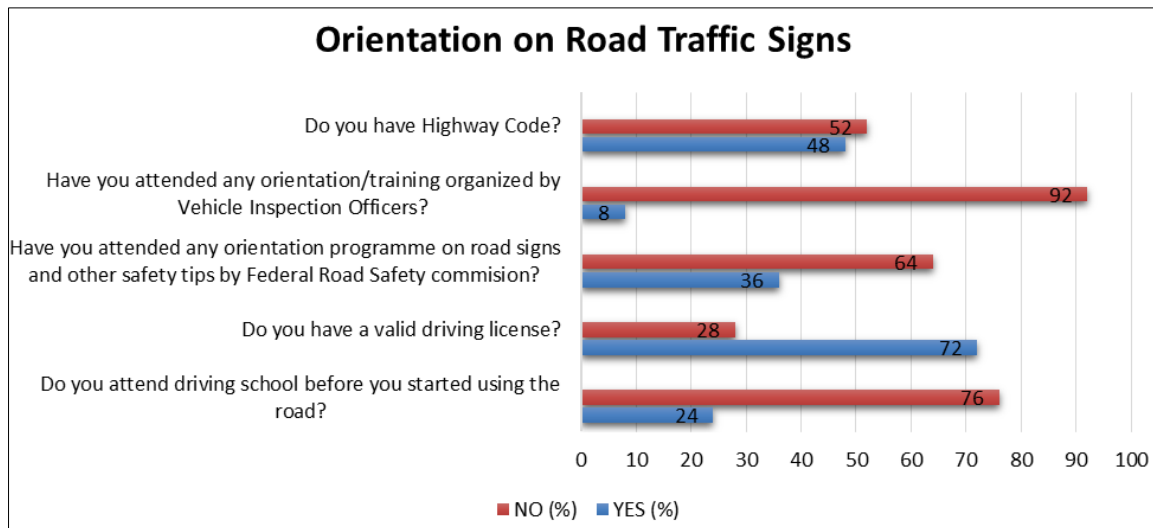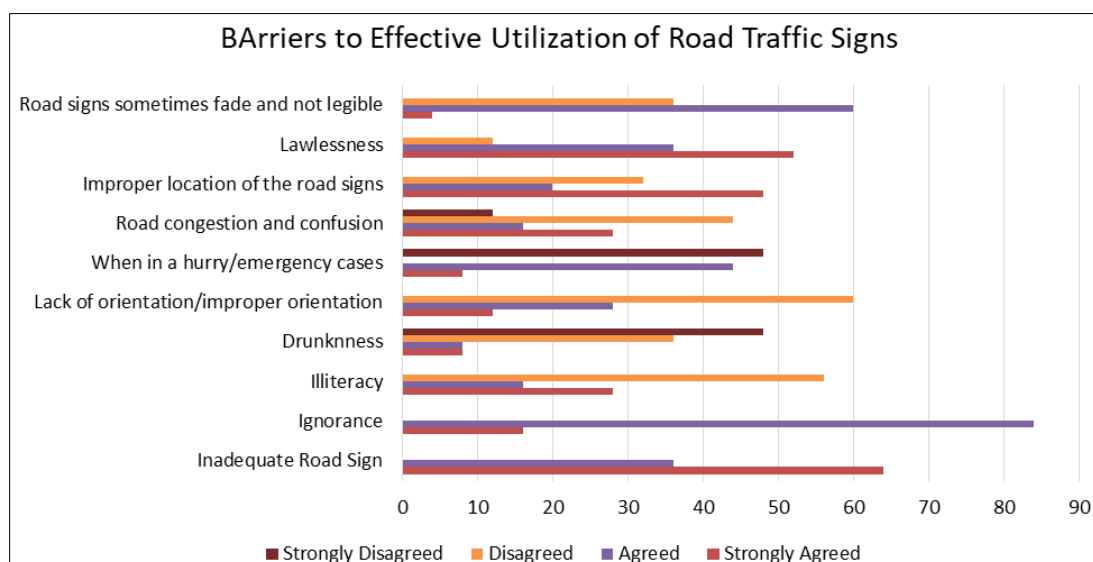
Figure 6 Orientation on road traffic sign in Kaduna Metropolis
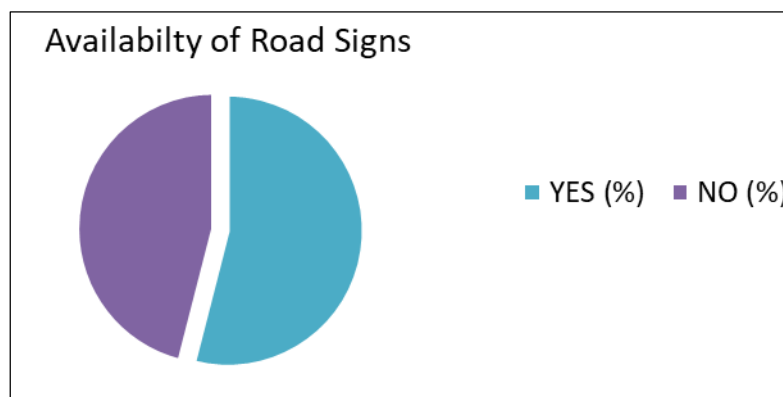
Figure 7 Major roads plies by users with road traffic sign in Kaduna Metropolis

Figure 8 Barriers to Effective Utilization of Road Traffic sign in Kaduna Metropolis

Table 3 Barriers to effective utilization on road traffic sign variables of the Respondents

S/No	Statement	Strongly Agreed	Agreed	Disagreed	Strongly Disagreed	Mean (X)	Standard Deviation	Decision
1	Inadequate road sings	64	36	0	0	3.64	1.19	Accept
2	Ignorance	16	84	0	0	3.16	1.01	Accept
3	Illiteracy	28	16	56	0	2.72	1.04	Accept
4	Drunkenness	8	8	36	48	1.76	1.59	Reject
5	Lack of orientation/improper orientation	12	28	60	0	2.52	1.02	Accept
6	When in a hurry/emergency case	8	44	0	48	2.12	1.01	Accept
7	Road congestion and confusion	28	16	44	12	2.60	1.07	Accept
8	Improper location of the road signs	48	20	32	0	3.16	1.01	Accept
9	Lawlessness	52	36	12	0	3.40	1.07	Accept
10	Road signs sometimes fade and not legible	4	60	36	0	2.68	1.02	Accept

5. Summary of Findings

During the survey carried out in this study, the researchers identified a wide range of level of poor-compliance level to road traffic signs in the study area. They are as follows:

- Most of the respondents are above 31 years with 51.2% and the least fall within 21-25 years with 17.6%. In terms of educational qualification, most of the respondents are educated only 20% had the secondary school certificate and the First School Leaving Certificate respectively. For the category of road users, pedestrians are 20%, car owners are 76%, and motor cycle, tricycle bicycle and cart pushers are 4%. And most of the respondents stayed for more than 10 years in the study area.
- From Table 1the number accepted result to reject it shows that 13 out of the 30 traffic signs are well known which in variable means there are no enough awareness of road traffic signs as seen in Fig. 1 above with "No Aware" responses. Stop Police traffic sign have the highest mean value 2.76 to show the level of awareness. Railway level crossing without gate has the lowest mean value of 1.20 with standard deviation of 1.09.
- From Fig.2 above, it can be observed that 48% respondents answered in the affirmative on having Highway Code while 52% said no, most of the respondents did not attend organized orientation, and only 8% and 36% attended orientation organized by Vehicle Inspection Officers and Federal Road Safety Commission respectively. Most of the respondents have valid driving license with 72% and 76% of them did not attend driving school before using the road.

Most of the respondent 54%, answered in affirmative on the major roads plies by the road users in Kaduna metropolis with road traffic signs, while 46% in the negative.

From Table 3 above, on barriers to effective utilization of road traffic signs, inadequate road signs with highest mean value 3.64 and standard deviation 1.19 shows that it is a barrier to effective utilization. Drunkenness has a low mean value of 1.76 and 1.59 standard deviation which could not be a barrier to effective utilization of road traffic signs.

6. Conclusion

From the findings of this study, it is hereby concluded that there are road traffic signs available with the response of 54% affirmative. That educational qualification is not a major factor in understanding and interpreting road traffic signs going by the demographic characteristic representation in the result sheet. Collaborating the work of [17].

The level of awareness can be stated as fair comparing it with the work done by [14] which have 76% level of awareness. 13 out of 30 road traffic signs represent 43.3% level of awareness.

On the road user's orientation of road traffic signs, the responses show that there is no enough orientation but there are more people using driver's license. It could be concluded also that there are barriers to effective compliance on road traffic signs in Kaduna metropolis following the corresponding result on the table with inadequate road sign with high mean value, which implies the statement stand.

Recommendations

From the outcome of the research it is recommended that:

- There should be a mandatory enforcement of the use of road traffic signs.
- Coupled with periodic road safety education and re-training should be organized for road user by the government to ensure that they are familiar with road signs and other safety precautions.
- Further studies could still be done on level of awareness to improve the understanding of road traffic signs.

Compliance with ethical standards

Acknowledgments

Disclosure of conflict of interest

Authors declare no conflict of interest.

References

[1] Ademiluyi IA. "An appraisal of the Role of the Federal Road Safety Commission in Ensuring a Sustainable Road Accident Reduction in Nigeria". Nig. J. Res. and Prod, 10(2), 2007.

[2] Tim De Ceunynck, Caroline Arien, Kris Brijs, Tom Brijs, Karin Van Vlierden, Johan Kuppens, Max Van Der Linden, and Geert Wets. "Proactive Evaluation of Traffic Signs Using a Traffic Sign simulation" European Journal of Transport and Infrastructure Research (EJTIR); 15(2): 184-204, Issue. 2015

[3] Erkut Kirmizioglu and Hediye Tuydes-Yaman "Comprehensibility of Traffic Signs among Urban Drivers in Turkey", Accident Analysis and Prevention, Department of Civil Engineering, Middle East Technical University, Universiteler Mah. Dumlupinar Blv. No.1, 06800 Cankaya, Ankara, Turkey Volume 45, Pages 131– 141. 2012.

[4] Canfield RR. Traffic Signs and Markings. In: James L. Pline; "Introduction to Traffic Engineering. Traffic Engineering Handbook", 5th Edition. Institute of Transportation Engineers (ITE), Washington DC. @1999; (DLC) 99041568 (OCoLC) 41991431, 411-452. http://worldcat.org/isbn/0935403329

[5]   1Martin Hudak and 2Radovan Madlenak "The Research of Driver's Gaze at the Traffic Signs" CBU International Conference on Innovations in Science and Education PRAGUE, CRECH REPUBLIC March 23-25, 2016. WWW.CBUNI.CZ, WWW.JOURNALS.CZ. 1Martin Hudak, Department of Communications, the Faculty of Operation and Economics of Transport and Communications, University of Zilina, Zilina, Slovak Republic, martin.hudak@fpedas.uniza.sk; 2Radivan Madlenak, Depaartment of Communications, The Faculty of Operation and Economics of Transport and Communications, Universityof Zilina, Zilina, Slovak Republic, Radovan.madlenak@fpedas.uniza.sk

[6]   Imoh Udeme Udo, Usanga Idorenyin Ndarake, Udokpo Udeme udeme, Etuke Julius "Challenges on the Exposition of Traffic Signs and Symbols to Lagos State Road users" International Journal of Innovative Research in Advance Engineering (IJIRAE) ISSN: 2349-2163 Issue 09, Volume 8 (September 2021)

[7]   Wolff JS, Wogalter MS. Comprehension of Pictorial Symbols: Effect of Context and Test Method, Human Factors. 40: 173–186. 1998.

[8]   Arc. Mike Oziegbe Onolememen, FINA, FNIM. Honourable Minister, "Highway Manual Part1: Design Volume VI: Road Traffic Signs and Road Markings" Abuja, Nigeria, Federal Republic of Nigeria, Federal Ministry of Works, 2013.

[9]   Dahunsi, F. T and Owoeye, P.O. "The use of road signs, traffic control services and other road safety information toward accident reduction among Okada riders (Commercial motorcyclists) in Ado-Ekiti, Nigeria". University Library, Ekiti State University, Ado-Ekiti; Scholarly Journal of Science Research and Essay Vol 5(2), pp. 16-24, June 2016. Available online http://www.scholarly-journal.com/SJSRE ISSN 2315-6147@2016 Scholarly-Journals

[10]   Christopher Ndabula, Godwill Geofrey Jidauna, Kehinde Taofik Oyatayo, Averik P. Danjuma, Iguisi EO." Analysis of Urban Flood Plain Encroachment: Strategic Approach to Flood and Flood Plain Management in Kaduna metropolis, Nigeria, Journal of Geography and Geology. 4(4) DOI: 10. 5539/jg.v4n1p170, . March 2012.

[11]   Al-Madani H, Al-Janahi AR." Role of Drivers' Personal Characteristics in Understanding Traffic Sign Symbols, Accident Analysis and Prevention". Issue number 2, Volume (34): pp185-196. ISSN: 0001-4575, 2002-3.

[12]   Hulbert S, Beers J, Flower P. "Motorist's Understanding of Traffic Control Devices, American Automobile Association (AAA), Foundation for Traffic Safety, 8111 Gatehouse Road Falls Church, VA United States 22047. 1979-3. Pp56

[13]   Al-Rousan Taleb and Abdullahi A. Umar. "Assessment of Traffic Comprehension Levels among Drivers in Emirate of Abu Dhabi, UAE". Infrastructure 2021; 6: 122. https:doi.org/10.3390/infrastructures6090122, www.mdpi.com/journal/infrastructures

[14]   Umar, Bashir "Comprehension of Road Traffic Signs by Various Road Users in Kano City in Kano City" Cumhuriyet Sci. J., Vol. 40-1(2019) 197-203.

[15]   C.A. Asadu Jones Gilbert Ijoh Ayuwo JG. "Knowledge and Observance of Road Communication Signs among Commercial Drivers in South-south, Nigeria" New Media and Mass Communication DOI: 10.7176/NMMC. Vol6781-87, Corpus ID: 59488525, 2018.

[16]   Kwadwo Appiah Boateng, Harold Atobra-Acheampong, Nana Poku Agyeman, Emmanuel Adu Gyamfi "Comprehensibility of Road Traffic Signs among Urban Drivers (Case Study; Sunyani Municipality, Ghana)" International Journal of Research in Engineering and Technology, DOI: 10.15623/IJRET.2016.0510001, Corpus ID: 168222852 Volume: 05 Issue: 10 Oct-2016, Available @ https://ijret.esatjournals.org

[17]   Uwem Udo Akpan, Nsikan Senam, Promise Paul Elijah "The Communicativeness of Road Traffic Signs in Oyo, Akwa Ibom state of Nigeria" Department of Communication Arts, University of Uyo, Uyo, Akwa Ibom State, Nigeria. International Journal of Education and Research. Vol. 3 No. 2 February 2015; 3. ISSN: 2201-6333 (Print) ISSN: 2201-6740(online)

[18]   Makinde Opeyemi Oluyemi and Opeyemi David Akinyiwola. "Understanding of Traffic Signs by Drivers- A Case of Akure City, Ondo State, Nigeria" Rufus Giwa Polytechnic, Owo Vol. 2, No. 7 ISSN 2225-7217 ARPN Journal of Science and Technology ©2011-2012 All right reserved.

[19]   Al-Madani, H. "Influence of Driver's Comprehension of Posted Signs on Their Safety Related Characteristics, Accident Analysis and Prevention". 2000; 32(4): 575–581. Doi: 10.1016/s0001-4575(99)00084-6

[20]   Federal Highway Administration (FHA). Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), Washington D.C. 2000. Department of Transportation Federal Highway Administration (August 21, 2002) ISBN-10: 0160512034

[21]   Sorrel Brown "Likert Scale examples for Surveys. ANR Program Evaluation Iowa State University Extension. 2010 sorrel@iastate.edu, https: www.extension.iastate.edu/Ducuments/ANR/Lil

[22]   Robert M Groves "Survey Errors and Survey Costs", ISBN 0-471-67851-1, 2004.

[23]   Ajay S. Singh and Micah Masuku "Sampling Techniques and Determination of Sample Size in Applied Statistics Research: An Overview" International Journal of Commerce and Management United Kingdom http://ijecm.co.uk/, Vol. II, Issue 11 , November 2014, ISSN 2348 0386.