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Socio-demographic and Driving Characteristics Associated with Visual Standards for Driving among Mass Transit Drivers in Abuja, Nigeria.

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Abstract

Purpose: This study was conducted to ascertain the sociodemographic and driving characteristics associated with visual standards for driving among mass transit drivers in Abuja, Nigeria.

Methods: This was a descriptive cross-sectional study involving 415 mass transit drivers in Abuja who were selected by multistage sampling method. Consent was obtained from the respondents and a pretested, structured-questionnaire was administered including conducting clinical eye examinations on the study participants. Data analysis was done using IBM SPSS version 20.

Results: All the participants were males with a mean age of 41.2 ±6.9 years and most of them 392 (94.5%) possessed drivers' license. Only 36.9% of the drivers had an eye examination done before issuance of a driver's license. Data analysis using the binary logistic regression model revealed that the statistically significant predictors of visual standards among mass transit drivers were duration as a mass transit driver (coefficient β = -1.608, p = 0.042, Adjusted odds ratio [AOR] =0.200 (95% Confidence interval [CI]: 0.035, 0.807), and previous eye examination before driver's license renewal (β = 0.606, p = 0.021, AOR =1.834 (95% CI: 1.096, 3.067).

Conclusion: Higher driving duration and eye examination before issuance/renewal of driver's licence were associated with meeting visual standards for driving. Federal Road Safety Commission in conjunction with eye care sector should ensure routine visual assessment for driving among drivers. Also, routine eye health education should be carried out at road transport parks and via mass media on the importance of regular eye examination before issuance/renewal of driver's licence.

Key words: Socio-demographic, Driving characteristics, Mass transit drivers, Visual standards.

Introduction

Good vision is required for safe driving, hence the established link between driving-related injuries and vision problems[1,2]. Optimal visual functionality, compensatory and motor abilities are all required to drive effectively[1,2]. Impairment

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of the visual function can negatively affect the ability of drivers to safely manoeuvre automobiles on roads[3,4].

Mass transit drivers play a very important role in the transportation of large number of passengers and enormous quantity of goods, especially in areas where most of the population rely on public transportation[5]. Due to the reliance on public transportation, mass transit drivers are essential to socio-economic growth, hence it is important to protect them.[6]

The World Health Organisation (WHO) revealed that road injuries accounted for 1.3 million deaths out of the estimated 56.4 million people that died globally in 2015. About 92% of the deaths occurred in were from low and middle-income countries. Also, the value of road accidents is over $500 billion dollars globally.[7] For developing countries that contribute to approximately 85% of all road traffic accidents worldwide, this translates to a whooping sum of about $65 billion dollars yearly[7]. It is estimated that Road traffic accidents (RTAs) will be the 5th leading cause of death globally by 2030, if the menace is not curbed on time[8]. In Nigeria, road accidents are a leading cause of injuries, disabilities and trauma-related deaths. These accidents though mainly preventable are on the increase and account for the highest proportion of deaths on the African continent[9].

The required distance visual acuity (VA) requirement for driving in Nigeria as set by the Nigerian Federal Road Safety Commission (FRSC) is 6/9 in the better eye and 6/24 in the second eye for mass transit drivers[10]. A horizontal binocular visual field of vision of at least 140° with both eyes open is recommended for Nigerian drivers. Hence, a visual field of less than 110° at the horizontal plane is unacceptable for commercial driving in Nigeria[11]. Adherence to this standard is suitable to driving since a sufficient field of vision is an important solution to safe driving, together with good visual acuity. Mass transit drivers with visual acuity worse than the standard are probable to have problems reading and analysing road signage such as limit signs, speed, stop signs, exit signs, at distances considered safe for making car control decisions. Currently, there is no set benchmark for colour vision in Nigeria[12]. Given the importance of good vision in safe driving, this study was conducted to ascertain the sociodemographic and driving characteristics associated with visual standards for driving among mass transit drivers in Abuja, Nigeria. It is hoped that the study will generate evidenced-based information for effective

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policy implementation to improve safety on Nigerian roads.

Materials and methods

Study area

This study was carried out in the Federal Capital Territory (FCT), Abuja, Nigeria. The FCT has a landmass of 7,315 km^2 and is located in the Nigerian geographical centre in the North Central geopolitical zone of the country. The FCT is a multi-cultural society with different indigenous cultures and experiences an influx of people which boosts the population growth rate to 7.0%, a level above the national growth rate of 3.2%. The FCT comprises of 6 area councils which are: Abuja Municipal Area Council (AMAC), Bwari, Kuje, Kwali, Gwagwalada, and Abaji. The key economic driver in the FCT is the government, supported by hospitality industries, construction companies and the banking industries. In 2016, the FCT had an estimated population of about 3.6million persons[11].

Sample size determination

The study population included all registered mass transit drivers who have been driving within the FCT. The minimum sample size for this study was calculated using the sample size formula for one proportion, $n = z^2pq/d^2$. Where z = 1.96 (standard normal deviate); p = 0.195 (prevalence of visual impairment among drivers obtained from a study carried out in North Central Nigeria)[6]; q = 1- p; and d = 0.05 (desired level of precision). A value of 242 was obtained. With the addition of 10% non-response rate, the sample size was 268. A multistage sampling technique was employed, so, a design effect of 1.5 was multiplied to have a study sample size of 402. However, a sample size of 415 drivers was utilized for the study.

Sampling procedure

The study recruited drivers registered in the selected parks in Abuja, who had been driving for at least three months. A multi-staged sampling method was used in selecting the drivers. Stage one involved a simple random technique of selecting 2 area councils (Bwari Area Council and Abuja Municipal Area Council) by balloting out of 6 area councils in the FCT, Abuja. Secondly, simple random sampling method through balloting was done to pick 4 districts from the selected area councils. Also, simple random sampling method was used in selecting 1 motor park from each of the 4 districts selected. Finally, from the 4 selected motor parks, systematic sampling method was used to select the drivers that participated in the study. A sampling interval of 2 was obtained by dividing the total number of drivers in the 4 motor parks, 822 by the sample size of 415, which is approximately equal to 2. Every second driver was selected from each of the four participating motor parks till the sample size was completed.

Instrument for data collection

The instruments for data collection were a pretested and structured questionnaire and a clinical worksheet which was developed by the principal researcher for recording clinical

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measures of drivers. The questionnaire was divided into five sections namely: driver's socio-demographics; sections on knowledge; attitude; determinants of visual disorders; and lastly a section on driving history. The questionnaire was validated and the reliability coefficient was 0.87.

Data collection procedure

Visual function tests were done by the principal researcher and a supporting optometrist at a designated and bright space at the motor parks. The Snellen's chart (or illiterate E chart) was used to assess the distance visual acuity for those who could read and those who could not read respectively. The visual acuity charts were placed 6 meters (20 feet) from the participants and each eye was examined at a time. Colour vision was tested using the Ishihara pseudoisochromatic plates. Visual field test was estimated using the confrontation method and a good contrast test target. External eye examination was assessed using a pen torch while an internal eye examination to ascertain the presence or absence of pathologies was done using a direct ophthalmoscope.

Visual standards for driving was done using the better eye based on the maximum distant visual acuity (VA) requirement for driving in Nigeria as set by the Federal Road Safety Corps (FRSC) as a minimum of 6/9 in the better eye for commercial drivers[13].

Data management

All findings were documented on clinical report sheet attached to each participant questionnaire copy. The data collected were coded, cleaned, and analysed using IBM SPSS version 20. The level of significance was set at $p \leq 0.05$.

Simple frequency was calculated for the socio-demographic and driving characteristics of the study participants. Univariate analysis was carried out to describe the data. Continuous data such as age and driving durations were expressed as mean (standard deviation) respectively. Categorical data such as socio-demographic and driving characteristics were represented as frequencies and percentages. Bivariate analysis was carried out using a chi-squared test of association to determine the significance of associations between the outcomes and independent variables. All independent variables at $p < 0.20$ in the bivariate analysis were included in the binary logistic regression analysis.

Ethical consideration

Ethical approval was obtained from the Ethics and Research Committee of the College of Medical Sciences, University of Benin, reference number CMS/REC/01/VOL.2/023 and approval number of CMS/REC/2018/023 respectively. Permission to carry out the study was obtained from the Federal Ministry of Transportation, Federal Ministry of Health, Abuja Urban Mass Transport Company Limited, National Union

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of Road Transport Workers (FCT), Bwari Area Council and Abuja Municipal Area Council respectively. Individual informed consent was obtained from the study participants after they were educated on the purpose, procedures, benefits, and the minimal risks of the study before the questionnaire was administered. The respondents were also informed that they had the right to withdraw from the study any time they chose and that doing that would not affect them in any way. Health education on the importance of regular eye examination was given at the selected motor parks. Participants with detected visual impairments were given referrals to eye care centres close to them.

Results

Table 1 shows that the age of the participants ranged from 24 to 64 years with a mean (standard deviation) age of 41.2 ±6.9 years. Majority, 207 (49.9%) of them were in the age group 40 – 49 years. About two-thirds of the respondents, 274 (66.0%) were Christians. Three-quarters of the drivers, 314 (75.7%) were married. Over a third of the drivers, 153 (36.9%) were Igbos. Less than a quarter of the drivers, 84 (20.2%) had no formal education.

Table 2 shows that the driving characteristics of mass transit drivers in Abuja were majority of the study participants, 341 (82.2%) had been driving between 10 to 29 years and 344 (82.9%) acquired their driving license after attending driving school. A large proportion of the study participants 262 (63.1%) reported not having a previous eye examination before license renewal. Only 27 (6.5%) reported involvement in road traffic crash.

Table 3 reveals the socio-demographic characteristics associated with visual standards for driving. Drivers who were below 40 years of age 142 (86.6%) had a higher visual standard for driving compared to those above 40 years of age with 199 (79.3%). In addition, drivers with non-formal education, 67 (79.8%) had slightly lower visual standards for driving when compared to those with primary, 83 (87.4%) and at least secondary, 191 (80.9%) level of education. Furthermore, slight differences were observed in the visual standards for driving when religion, marital status and ethnicities of the drivers were compared. There was no statistically significant association (p =0.419, p=0.976, and p=0.354) between the variables and the visual standards for driving.

Binary regression analysis showed that drivers who were < 40 years of age were more likely by an odds ratio of 0.593 to be visually fit to drive compared to those who were ≥ 40 years and this was not statistically significant (p = 0.059, 95% CI = 0.344 – 1.020). See **Table 4**.

Drivers who had been driving between 10 – 29 years, 289 (84.8%) were found to have better visual standards for driving compared to those who had been driving for < 10 years, 40 (75.5%) and those driving for ≥ 30 years, 12 (57.1%). The association was statistically significant (χ^2 = 12.150, p = 0.002). Also, visual standards for driving reduced with increase in duration as a mass transit driver and the association was statistically significant (χ^2 = 8.067, p = 0.018). Surprisingly, drivers without previous

eye examination before license renewal, 225 (85.9%) had better visual standards for driving when compared to those who did, 116 (75.8%). The association was statistically significant (χ^2 = 6.673, p = 0.010). The association between driving duration per day; acquisition of driving license after driving school; ownership of driver's license; medium of driving license acquisition; and involvement in road traffic crash, and visual standards for driving were not statistically significant (p > 0.05) as shown in **Table 5**.

In **Table 6**, binary regression analysis showed that drivers who had been mass transit drivers for < 10 years were less likely by an odds ratio of 0.167 to be visually fit to drive compared to those who had been driving for ≥ 30 years and this was statistically significant (p < 0.026, 95% CI = 0.035 – 0.807). Drivers who had previous eye examination were more likely by an odds ratio of 1.834 to be visually fit to drive compared to those who did not have eye examination and this was statistically significant (p < 0.021, 95% CI = 1.096 – 3.067).

Discussion

The study provides valuable information on the eye health of mass transit drivers in Abuja, Nigeria. This study revealed that there was a statistically significant association between visual standards for driving and independent variables such as: duration of driving; driving duration as a mass transit driver; and previous eye examination before license issuance. Vision ideally should decline with increasing age, thus an occupation such as mass transit driving ought to have a standardized retirement age or age limit. This would reduce road traffic accidents and their consequences especially those associated with vision for commercial drivers such as senile reduced contrast sensitivity, reduced physical strength, flexibility, coordination and other age-related ocular degenerations[1,12,13].

Findings from this study also showed that the socio-demographics of the drivers recruited for the study such as age, educational qualification, religion, marital status and ethnicity had no statistically significant association with visual standards for driving at 5% significance level. This was different from the results of studies done in Oyo[14] and Imo[15] States of Nigeria.

Though it has been proven that visual acuity is related to certain aspects of driving performance such as the recognition of road signages[16]. Many studies have observed that visual acuity is weakly linked to the safety of drivers, hence, it is a poor screening test for identifying mass transit drivers who are at risk of future road traffic crash[16]. These findings highlight the fact that some of these mass transit drivers who did not meet these known criteria for fitness to drive still obtained licenses to drive and as such constitute a threat to the safety of passengers and other road users.

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In this study, almost all the drivers possessed valid drivers' licenses but only 36.9% of them had an eye examination prior to license issuance and renewal. This means that a significant proportion (63.1%) of mass transit drivers did not undergo any vision assessment. Some studies caried out in Nigeria[6,17–19] had a similar result with respect to possession of drivers' license. The high rate of possession of drivers' license could be as a result of routine monitoring by relevant agencies such as the road safety corps and security operatives that try to ensure safety and security on roads. The low rate of eye examination of the drivers is not commendable because drivers need a good visual perception and intense concentration of which good vision plays a great role. Poor vision increases the risk of road traffic crashes; hence, eye health education and campaign should be carried out in motor parks in order to improve the awareness and knowledge of the importance of good vision to driving[15,18,19]. In Nigeria, visual acuity better or equal to 6/9 in the better eye and 6/24 in the second eye is the only visual parameter currently recommended for measurement by the Federal Road Safety Commission before issuance of license, however, eye examination are not usually done before the issuance of the license[20].

Almost two-third of the drivers in this study drive for over 10 hours a day. It is well known that fatigue following hours of service can cause shortfalls in performance, including slower response times, attention failures and poor decision making while driving[21].

Though there is no convincing evidence that increased level of education leads to possible reduction of road traffic accidents, it is commendable that over three-quarters of the drivers that participated in this study had formal education with majority having secondary level of education. Some studies caried out in Nigeria[19,22] and Central Ghana Region[23] also had good literacy level of mass transit drivers. A study in Ilorin, Nigeria documented that 42.0% of drivers had formal education[24]. Increased level of education will make it easy for the drivers to benefit from road safety education programmes which can be organized to emphasize the importance of good vision to

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driving. In addition, the drivers will be able to identify and read road traffic codes and signs. There is a direct relationship between higher education and better understanding of traffic codes with possible adherence to safe driving[25].

All the drivers that participated in the study were males. This is in agreement with other similar studies[20,22–24,26–28]. Almost half of respondents were in the 40-49 years age range with a mean age of 41.2 ± 6.9 years. The mean age obtained in this study is similar to result observed in studies done in other states of Nigeria like: Imo[15], Osun[20], Akwa Ibom[13], and Kebbi[17]. In developing countries such as Nigeria, physically demanding and relatively high-risk occupations like mass transit driving are generally left to relatively stronger and younger men who can drive for longer hours.

On binary regression, analysis showed that driving duration as a mass transit drivers and previous eye exam before license renewal were significant predictors of visual standards for driving. This corroborates past studies that demonstrated a statistically significant association between previous eye exam and driving[16,29].

A major limitation of this study is that it was a cross-sectional descriptive study and as such cannot determine causality for the result obtained. In addition, a larger sample size preferably total population of the mass transit drivers in Abuja would have made generalization of the findings possible. Also, the failure to run a multivariate regression analysis to address all possible confounding variables was another limitation. The findings of this study will serve as a baseline for further related research in the study locale and the country at large.

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Conclusion

The study revealed that driving duration and eye examination before issuance/renewal of driver's licence were associated with visual standards for driving. Also, a significant proportion of drivers obtained their driving license without any prior eye examination. Visual standards for driving should be enforced on all drivers. Federal Road Safety Commission in conjunction with eye care sector should ensure routine visual standards for driving among drivers. Also, routine eye health education should be carried out at road transport parks and via mass media on the importance of regular eye examination before issuance/renewal of driver's licence.

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Authorship

VYA- Conception, design, manuscript drafting and revision for intellectual content, including final approval of manuscript.

PII- Conception, literature review, design, data collection, statistical analysis and manuscript drafting.

Conflict of interest

The authors hereby declare that there is no known conflict of interest in this study and its reported findings.

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Table 1: Socio-demographic characteristics of mass transit drivers in Abuja.

Variables	Frequency (n=415)	Percent (%)
Age group (years)		
20 -29	21	5.1
30 - 39	143	34.5
40 - 49	207	49.9
50 - 59	37	8.9
60 - 69	7	1.6
Religion		
Christianity	274	66
Islam	131	31.6
African Traditional Religion	10	2.4
Marital status		
Single	78	18.8
Married	314	75.7
Divorced	13	3.1
Widower	10	2.4
Ethnicity		
Igbo	153	36.9
Yoruba	101	24.3
Hausa	96	23.1
*Others	65	15.7
Educational level		
Non-formal education	84	20.2
Primary	95	22.9
Secondary	177	42.7
Tertiary	59	14.2

Mean age of drivers = 41.2 (±6.9) years ****Others include: Ibibio, Ijaw, Igala and Tiv***

Table 2: Driving characteristics of mass transit drivers in Abuja.

Variables	Frequency (n=415)	Percent (%)
Driving duration (years)		
< 10	53	12.8
10-29	341	82.2
≥ 30	21	5.1
Driving duration as a mass transit driver (years)		
< 10	174	41.9
10-29	234	56.4
≥ 30	7	1.7
Driving duration per day (Hours)		
< 10	153	36.9
≥ 10	262	63.1
Involvement in Road Traffic Crash		
Yes	27	6.5
No	388	93.5
Previous eye examination before license renewal		
Yes	153	36.9
No	262	63.1
Acquisition of driving license after driving school		
Yes	344	82.9

No	71	17.1
Ownership of driver's license		
Yes	392	94.5
No	23	5.5

Table 3: Socio-demographic characteristics associated with visual standards for driving among mass transit drivers in Abuja.

Variables	Visual standards		Chi-square	p-value
	Fit (n = 341)	Not fit (n = 74)		
Age of drivers (years)				
< 40	142 (86.6)	22 (13.4)		
≥40	199 (79.3)	52 (20.7)	3.610	0.057
Educational level				
Non-formal education	67 (79.8)	17 (20.2)		
Primary	83 (87.4)	12 (12.6)		
> Secondary	191 (80.9)	45 (19.1)	2.331	0.312
Religion				
Christianity	230 (83.9)	44 (16.1)		
Islam	103 (78.6)	28 (21.4)		
African Traditional religion	8 (80.0)	2 (20.0)	1.742	0.419
Marital status				
Ever married	64 (82.1)	14 (17.9)		
Never married	277 (82.2)	60 (17.8)	0.001	0.976
Ethnicity				
Igbo	127 (83.0)	26 (17.0)		
Yoruba	87 (86.1)	14 (13.9)		
Hausa	78 (81.2)	18 (18.8)		
Others	49 (75.4)	16 (24.6)	3.257	0.354

Table 4: Binary regression for visual standards for driving among mass transit drivers in Abuja by socio-demographic characteristics.

Predictors	β (Regression coefficient)	AOR (95% CI)	p-value
Age of drivers (years)			
< 40	-0.523	0.593 (0.344 – 1.020)	0.059
≥ 40**		1	

***** Reference category, CI = Confidence Interval***

Table 5: Driving characteristics associated with visual standards for driving among mass transit drivers in Abuja.

Variables	Visual standards for driving		Chi-square	p-value
	Fit (n = 341)	Not fit (n = 74)		
Driving duration (years)				
< 10	40 (75.5)	13 (24.5)		
10 – 29	289 (84.8)	52 (15.2)		
≥ 30	12 (57.1)	9 (42.9)	12.150	0.002*
Driving duration as a mass transit driver (years)				
< 10	147 (84.5)	27 (15.5)		
10 – 29	191 (81.6)	43 (18.4)		
≥30	3 (42.9)	4 (57.1)	8.067	0.018*
Driving duration per day (hours)				
< 10	128 (83.7)	25 (16.3)		
≥ 10	213 (81.3)	49 (18.7)	0.368	0.544
Acquisition of driving license after driving school				
Yes	284 (82.6)	60 (17.4)		
No	57 (80.3)	14 (19.7)	0.208	0.648
Ownership of driver's license				
Yes	320 (81.6)	72 (18.4)		
No	21 (91.3)	2 (8.7)	1.387	0.239
Involvement in Road Traffic Crash				
Yes	56 (84.8)	10 (15.2)		
No	285 (81.7)	64 (18.3)	0.385	0.535
Previous eye exam before license renewal				
Yes	116 (75.8)	37 (24.2)		
No	225 (85.9)	37 (14.1)	6.673	0.010*

Statistically significant

Table 6: Binary regression analysis for visual standards for driving among mass transit drivers by driving characteristics.

Predictors	β (Regression coefficient)	AOR (95% CI)	p-value
Duration as a mass transit driver (years)			
< 10	-1.787	0.167 (0.035 – 0.807)	0.026*
10 – 29	-1.608	0.200 (0.042 – 0.946)	0.042*
≥ 30**		1	
Previous eye exam before license renewal			
Yes	0.606	1.834 (1.096 – 3.067)	0.021*
No**		1	

Statistically significant, **Reference category, CI = Confidence Interval

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