Assessment of visual acuity of commercial long-distance drivers in Benin City, Edo State, Nigeria

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Received: 19 April 2019
Revised: 20 September 2019
Accepted: 29 September 2019
Published: 28 February 2020

Delta Journal of Ophthalmology 2020, 21:57–63

Objective
To assess the visual acuity of commercial long-distance drivers in Benin City, Nigeria.
Patients and methods
A descriptive cross-sectional study design was used, and data were collected for 315 commercial long-distance drivers and their vehicles from January to October, 2013. Respondents were recruited using systematic random sampling technique. The study instruments included structured interviewer-administered questionnaires. Data were analyzed using SPSS, version 20.
Results
The results showed that 114 (36.2%) drivers were within the age group of 31–40 years. Most of the respondents [272 (86.3%)] were married; almost all the respondents [311 (98.7%)] were males, whereas four (1.3%) were surprisingly females. More than half of the respondents [172 (54.6%)] had a secondary level of education, whereas 12 (3.8%) had no formal education. Less than a tenth [30 (9.5%)] were visually impaired, with two (0.6%) having severe visual impairment, whereas majority of respondents had normal visual acuity [285 (90.5%)]. There were statistically significant associations between the respondents' level of education ($P<0.001$) driving experience ($P<0.001$), blood pressure ($P<0.007$), and visual acuity. Regression analysis [odds ratio (95% confidence interval)] showed that respondents with secondary level of education and above were 2.762 (1.162–6.563) times more likely to have normal vision compared with their counterparts with primary level of education or none.
Conclusion
Approximately a tenth of the commercial drivers were visually impaired. This emphasizes the need for regular health checks, especially for visual screening and blood pressure measurement among this occupational group.

Keywords:
commercial drivers, long distance, visual acuity

DJO 21:57–63

1110-9173

Introduction

Good vision is essential to operating a motor vehicle. Any marked loss of visual acuity or visual fields will diminish an individual's ability to drive safely. A driver with a significant visual defect may fail to detect another vehicle, pedestrians, and/or warning signs and will take an appreciably longer time to perceive and react to a potentially hazardous situation [1].

Vision screening is a requirement for drivers' licensing in Nigeria, Ghana, South Africa, and other African countries. In fact, the only components of fitness to drive mentioned in the highway code are visual fitness and alcohol legal age limit [2–4].

The two most important aspects of vision in relation to driving are visual acuity and visual fields. The minimum visual acuity requirement for driving in Nigeria as set by the Federal Road Safety Commission, to be tested at a distance of 6 m, is 6/9 in the better eye and 6/24 in the second eye for commercial drivers [5,6]. Visual field is not included. It is a traffic offence to drive with defective vision in Nigeria [2]. However, a driver is unfit to drive when visual acuity in the better eye is worse than this minimum. Visual fields are defined as a measure of the extent of peripheral (side) vision. Good rotation of the neck is also necessary to ensure adequate overall fields of vision, particularly for monocular drivers. Visual fields may be assessed initially by confrontation, although it is an inexact test for monocular vision (one-eyed driver) [1]. Monocular

 DOI: 10.4103/DJO.DJO_19_19

drivers have a reduction of visual fields owing to the nose obstructing the medial visual field. They also have no stereoscopic vision and may have other deficits in visual functions. People with monocular vision are generally not fit to drive a commercial vehicle [1]. People having all but minor forms of diplopia are generally not fit to drive [1]. Persons with progressive eye conditions such as cataract, glaucoma, optic neuropathy, and retinitis pigmentosa should be monitored regularly and should be advised in advance regarding the potential future effect on their driving ability so that they may consider appropriate lifestyle changes [1,4]. There is no color vision standard for drivers, either private or commercial. However, drivers who have a significant color vision deficiency are advised about how this may affect their responsiveness to signal lights and the need to adapt their driving accordingly.

It is estimated worldwide, that 1.2 million people are killed in road crashes each year and as many as 50 million people are injured. Projections indicate that these figures will increase by ~65% over the next 20 years unless there is new commitment to prevention [7,8]. This number is more than the population of countries like Montenegro, Mauritius, Malta, and Soa Tome and Principe [9]. Human factors are responsible for 95% of accidents investigated [2,5,10]. These human factors include actions like inappropriate and excessive speed; intake of alcohol, medicinal, or recreational drugs; fatigue; and poor eyesight of road users. These human factors are related to the knowledge of drivers concerning their health status and road safety [11]. Drivers especially in developing countries are not aware of the importance of fitness in relation to road safety [12]. This is as a result of poor public enlightenment on the need for a fit driver and poor enforcement of the provisions of the highway code concerning visual screening before issuance of driver's license and absence of legislation on driver's fitness in Nigeria [6,12].

In Nigeria, visual screening and normal alcohol levels are mandatory for drivers licensing. Yet, most (84%) commercial drivers had no visual examination done before issuance of a driver's license [12–18]. This raises questions on the level of implementation of road safety codes. Approximately 15% of commercial bus drivers are unfit to drive; this is because they were either unaware of it or had a wrong perception of what constitutes an adequate fitness for driving when using visual acuity as a measure [6]. Most (80.4%) of them actually believed their vision was good enough to drive a commercial vehicle. This presents a great risk toward road traffic crashes occurrence in Nigeria [6,12,19–21]. This study was done to assess the visual acuity of commercial long-distance drivers and factors affecting it.

Patients and methods

A descriptive cross-sectional study was carried out between January and October, 2013 among 315 selected commercial long-distance drivers in Benin City. This study was conducted in Benin City, the capital of Edo State. The city is made up of three local government areas, namely, Oredo, Egor, and Ikpoba-Okha. The total population of Benin City as of 2006 was 1 085 676 [22,23]. Benin City serves as a transit area, with four major highways linking the eastern part of Nigeria to the northern part and the western part of Nigeria to the east. The highways include the Lagos-Benin express road, which connects Benin to the Western part of Nigeria; the Benin-Sapele highway, which connects Benin to the Niger-Delta region; the Benin-Asaba-Onitsha highway, which connects Benin to the East; and the Benin-Auchi-Okene highway, which connects Benin to the Northern parts of Nigeria. Commercial driving is a common occupation and there are numerous commercial road transport operators in the city carrying passengers to different states in Nigeria. A systematic random sampling technique was used in selecting the respondents for this study.

A list of registered parks was obtained from the State Ministry of Transport, Edo State. A total of 1022 drivers involved in long-distance transportation in 17 registered parks were used for this study. After which, the sampling interval was calculated using $k=N/n$ [total number of commercial drivers in Benin City (N)/ sample size (n)=1022/315=3].

A sampling frame consisted of the nominal roll of all drivers (as presented by the management of each park) involved in long-distance driving in each of the registered park involved in long-distance travels in Benin City. The first unit (driver) was selected using simple random sampling between driver 1 and driver 3 on the sampling frame. Then, using the sampling interval (k) of three as calculated above, every third (kth) driver on the list of drivers was recruited from each transport company until the sample size of 315 was achieved. For example, if a driver with serial number 1 was selected using simple random sampling, the next driver was the driver with serial number 4 (1+3=4), then 7th, 10th, 13th, 16th, 19th, 22nd, 25th driver, and so on.

Ophthalmic examinations

Ocular examination was done on all the participants by a senior registrar in Ophthalmology Department. These included visual acuity test, which was done in the open field during the day, using the Snellen's chart (or illiterate E chart) placed at 6 m from the respondents. More than two errors in reading the letters of any line were regarded as a failure to read that line. Each eye was tested separately unaided and with pinhole in cases where visual acuity was less than 6/6. Visual acuity of 6/6–6/18 was considered to be normal, less than 6/18–6/60 was classified as visual impairment, and less than 6/60–3/60 was classified as severe visual impairment, whereas visual acuity less than 3/60 was classified as blindness [12,14,24,25]. Full-field visual field test was done on each respondent by an ophthalmologist using confrontation [12,14,25].

Blood pressure

This was done using manual mercury sphygmomanometer blood pressure monitor placed on the arm of the participant. The participant was seated quietly for at least 5 min in a chair with their backs supported and their arms bared and supported at heart level. Two or more readings separated by 2 min were averaged. If the first two readings differed by more than 5 mmHg, additional readings was obtained and averaged [26]. A blood pressure of more than 170/100 mmHg was regarded as abnormal and respondent unfit to drive [26,27]. Blood pressure was graded using the WHO/International Society of Hypertension classification of hypertension (Table 1) into normal, prehypertension, hypertension class I, hypertension class II, and hypertension class III [27,28].

Ethical approval was obtained from the ethical committee of the University of Benin Teaching Hospital. Permission was obtained from the community leaders and Drivers' Union leaders. Individual informed consent was attached to each questionnaire, and the respondent gave his or her consent before the questionnaires were filled. Data collection tools were pretested among selected commercial long-distance drivers operating in Auchi, Estako West, Local Government Area of Edo State. The location is ~200 km from Benin City. Collected quantitative data were entered and analyzed using Statistical Package for Scientific Sciences (SPSS), version 20 (IBM Incorporated, Armonk, New York, USA), as used in the other studies [15,21,24,25]. Descriptive and inferential analysis was carried out in line with the objectives of the study.

Table 1 WHO/International Society of Hypertension classification of hypertension

Category	Systolic blood pressure (mmHg)	Diastolic blood pressure (mmHg
Optimal	<120	<80
Normal	120–129	80–84
Prehypertension	130–139	85–89
Hypertension class I	140–159	90–99
Hypertension class II	160–179	100–109
Hypertension class III	>180	>110

Quantitative variables that are normal in distribution such as age and weight were expressed as means±SD. Qualitative data like sex, educational status, and marital status were presented as diagrams and percentages. Logistic regression was used to identify predictive variables for visual acuity. Statistical test of association was carried out using a 95% confidence interval.

Results

More than a third of the respondents [114 (36.2%)] were within the age group of 31–40 years, 91 (28.9%) were in the 41–50-year age group, whereas 18 (5.7%) fell within the 61–70-year age group. Most of the respondents [272 (86.3%)] were married, 28 (8.9%) were single, 10 (3.2%) were cohabiting, whereas two (0.6%) were separated. Most of the married respondents [247 (90.8%)] were in monogamous marriages and 242 (89.0%) had nuclear families. Almost all the respondents [311 (98.7%)] were males, whereas four (1.3%) were surprisingly females. More than half of the respondents [172 (54.6%)] had a secondary level of education, 112 (35.6%) had a primary level of education, whereas 12 (3.8%) had no formal education. With respect to ethic groups, 169 (53.3%) respondents were Benin, 48 (15.1%) were Esan, 21 (6.6%) were Igbo, and 19 (6.0%) were Urhobo; moreover, smaller proportions were Etsako [15 (4.8%)], Yoruba [nine (2.9%)], Isoko [eight (2.5%)], Owan [seven (2.2%)], Itsekiri [seven (2.2%)], Ukwuani [seven (2.2%)], and Ibibio [three (1.0%)]. Most of the respondents [300 (95.2%)] were Christians, 10 (3.2%) were traditional in their beliefs, whereas five (1.6%) were Muslims. A total of 293 (92.7%) respondents were residents in Edo State, seven (2.3%) were resident in Lagos, and seven (2.3%) in Delta, whereas smaller proportions were residents of Oyo, Kwara, and Rivers [(0.6%) each] (Table 2).

Visual examination of the respondents

Less than a tenth [30 (9.5%)] were visually impaired, with two (0.6%) having severe visual impairment,

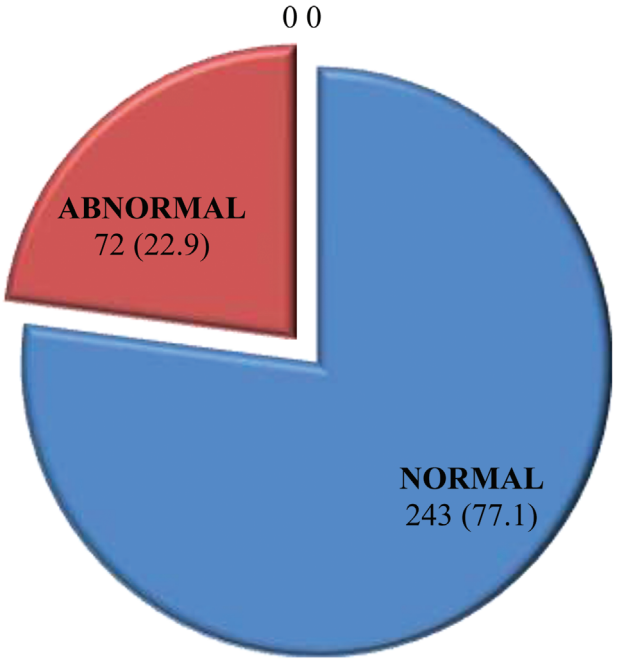
Table 2 Sociodemographic characteristics of the respondents

Variables	Frequency (*N*=315)	%
Age (years)		
21–30	26	8.3
31–40	114	36.2
41–50	91	28.9
51–60	66	20.9
61–70	18	5.7
Marital status		
Single	28	8.9
Married	272	86.3
Cohabiting	10	3.2
Separated	2	0.6
Divorced	3	1.0
Marriage type (*N*=272)		
Monogamous	247	90.8
Polygamous	25	9.2
Family type		
Nuclear	242	76.8
Extended	73	23.2
Sex		
Male	311	98.7
Female	4	1.3
Level of education		
No formal education	12	3.8
Primary	112	35.6
Secondary	172	54.6
Tertiary	19	6.0
Ethnic group		
Benin	169	53.7
Esan	48	15.2
Igbo	21	6.7
Urhobo	19	6.0
Etsako	15	4.8
Yoruba	9	2.9
Isoko	8	2.5
Owan	7	2.2
Itsekiri	7	2.2
Ukwuani	7	2.2
Ibibio	3	1.0
Others	2	0.6
Religion		
Christianity	300	95.2
African traditional religion	10	3.2
Islam	5	1.6
State of residence		
Edo	293	93.0
Lagos	7	2.3
Delta	7	2.3
Oyo	2	0.6
Kwara	2	0.6
Rivers	2	0.6
Others	2	0.6
Duration of driving (years)		
0–10	84	26.7
11–20	113	35.9
21–30	63	20.0
31–40	49	15.6
41–50	6	1.8

Table 3 Visual acuity of commercial long-distance drivers

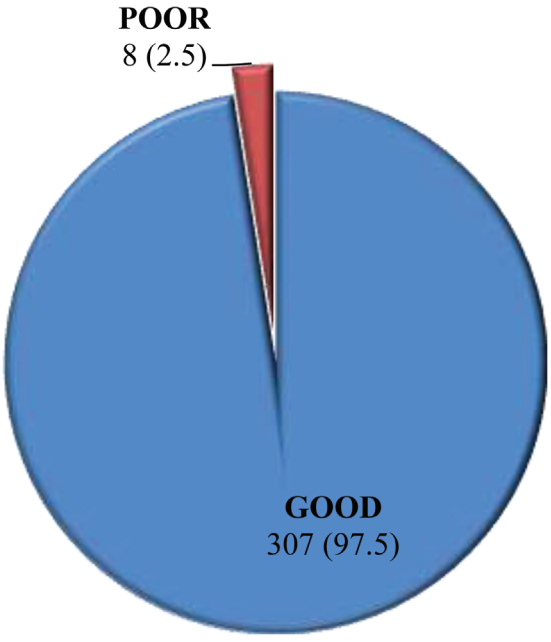
Visual acuity	Frequency (*N*=315)	%
Normal (6/6–6/18)	285	90.5
Visual impairment (<6/18–6/60)	28	8.9
Severe visual impairment (<60/60–3/60)	2	0.6

Figure 1



Respondents' visual field.

Figure 2



Respondents' monocular vision.

Table 4 Respondents' visual acuity and sociodemographic variable, and history of RTA

Variables	Visual acuity [*n* (%)]			Test statistic	*P* value
	Normal vision	Visual impairment	Severe visual impairment		
Age group					
21–30	25 (96.2)	1 (3.8)	0	Fisher's exact=20.545	0.002*
31–40	109 (95.6)	5 (4.4)	0		
41–50	83 (91.2)	8 (8.8)	0		
51–60	54 (81.8)	12 (18.2)	0		
61–70	14 (77.8)	2 (11.1)	2 (11.1)		
Sex					
Male	281 (90.4)	28 (9.0)	2 (0.6)	Fisher's exact=1.962	0.999
Female	4 (100.0)	0	0		
Level of education					
No formal	6 (50.0)	6 (50.0)	0	Fisher's exact=23.939	<0.001*
Primary	98 (87.5)	12 (10.7)	2 (1.8)		
Secondary	164 (95.3)	8 (4.7)	0		
Tertiary	17 (89.5)	2 (10.5)	0 (0.0)		
Marital status					
Single	26 (92.9)	2 (7.1)	0	Fisher's exact=9.475	0.624
Married	245 (90.1)	25 (9.2)	2 (0.7)		
Cohabiting	10 (100.0)	0	0		
Separated	2 (100.0)	0	0		
Widower	2 (66.7)	1 (33.3)	0		
Type of marriage					
Monogamous	223 (90.3)	22 (8.9)	2 (0.8)	Fisher's exact =0.840	0.764
Polygamous	22 (88.0)	3 (12.0)	0		
Duration of driving (years)					
0–10	80 (95.2)	4 (4.8)	0	Fisher's exact=21.996	0.001*
11–20	105 (92.9)	8 (7.1)	0		
21–30	55 (87.3)	8 (12.7)	0		
31–40	41 (83.7)	8 (16.3)	0		
41–50	4 (66.7)	0	2 (33.3)		
Blood pressure					
Normal	106 (91.4)	10 (8.6)	0	Fisher's exact =15.556	
Prehypertension	85 (90.4)	9 (9.6)	0		0.007*
Hypertension class I	54 (93.1)	2 (3.4)	2 (3.4)		
Hypertension class II	22 (75.9)	7 (24.1)	0		
Hypertension class III	18 (100.0)	0	0		
Ever had an RTA					
Yes	132 (87.4)	17 (11.3)	2 (1.3)	Fisher's exact=3.908	0.092
No	153 (93.3)	11 (6.7)	0		

RTA, road traffic accidents. *Statistical significance.

whereas most respondents had normal visual acuity [285 (90.5%)] (Table 3).

A total of 243 (77.1%) of the respondents had normal visual field whereas 72 (22.9%) had abnormal visual field (Fig. 1).

Moreover, eight (2.5%) had poor monocular vision, whereas 307 (97.5%) had good monocular vision (Fig. 2).

Determinants of visual acuity

Overall, 23 (96.2%) of the respondents aged 21–30 years had normal vision compared with 14 (77.8%) of those aged 61–70 years. There was a statistically significant association between the age of the respondents and their visual acuity. This was statistically significant (P=0.002).

There were statistically significant associations between the respondents' level of education, driving experience, and blood pressure and vision impairment (P<0.001, 0.001, and 0.007, respectively) (Table 4).

Respondents with secondary level of education and above were 2.762 times more likely to have normal vision compared with their counterparts with primary level of education or none. This was statistically significant (P=0.021) (Table 5).

Table 5 Determinants of normal visual acuity among respondents

Predictors	*B* (regression coefficient)	*P* value	Odd ratio	95% CI for odd ratio	
				Lower	Upper
Age (years)					
<40	0.725	0.212	2.065	0.662	6.447
≥40[a]					
Educational status					
≤Primary[a]					
≥Secondary	1.016	0.021**	2.762	1.162	6.563
Driving experience (years)					
≤20	0.152	0.771	1.164	0.419	3.228
>20[a]					
Blood pressure					
Normal[a]					
Elevated	0.078	0.852	1.082	0.475	2.464
Constant	1.440	<0.001**	4.219		

R^2=4.1–8.8%. CI, confidence interval. [a]Reference category. **Significant.

Discussion

The visual acuity of commercial long-distance drivers is critical to their role as drivers. The finding that more than a two-third of the respondents were less than 50 years is congruent with findings done in Ile Ife [12,15], Ilorin [6,16], and Jos [14], Nigeria, and Dar es Salaam, Tanzania [17]. Generally, the workforce is in this age group. Older persons tend to quit driving after a few years owing to the difficulty and stress of the task.

Most drivers were male, indicating that women usually do not commonly join the profession. Similar trends were observed in Ile Ife [12,15], Ilorin [6,16], Ibadan [18,19], and Jos [14], Nigeria, and in Cape Coast, Ghana [20]. Moreover, a study done in Australia [21] showed that only 1.4% of the drivers were women. These findings are not rare, as driving is a male-dominated occupation. It may involve long days away from home and presents a sociocultural challenge for women who are engaged in commercial driving.

More than half of the commercial drivers had completed secondary level of education. This is similar to the findings of a study done in Ile Ife [12]. This contrasts with the studies done in Ibadan [18,19], Ilorin [6,16], Cape Coast Municipality, Ghana [20], and Dar es Salaam, Tanzania [17], where most drivers had completed only primary school education and no formal education. This may be attributable to the higher secondary school attendance rates [23] and higher literacy level [22] (in English) in the study area when compared with others as revealed by Nigeria Education Data Survey. This encouraging literacy level could be useful in health education and improved visual health-seeking behavior of the drivers.Most respondents had normal visual acuity, whereas 9.5% had abnormal visual acuity, 0.3% had monocular vision, and 22.9% had abnormal visual field. This implies that one in every 10 commercial driver had visual acuity not compatible with safe driving. In Brisbane, Australia, 6% was reported [24]. This disparity may be owing to the fact that the latter study used less than 6/12 as cutoff for abnormal visual acuity. Studies done in four major towns in Nigeria showed concordance with the aforementioned studies, where prevalence of abnormal visual acuity among drivers was 3.3% in Ife [12], 3.5% in Jos [14], 6.1% in Oshogbo [25], and 5.6% in Ibadan [19]. Higher percentages were observed in studies done in Cape Coast Ghana [20] (12%). A study done in Oshogbo, Osun state [25], revealed higher prevalence of drivers with monocular vision. These variations may be explained by the different standard used in this study, where visual acuity of less than 6/18 was considered as visual impairment. These findings underscore the fact that some commercial drivers who fail to meet the stipulated criteria for eligibility to drive still do obtain licenses to drive [6]. There is the need to strictly enforce this component of the laws by the Drivers and Vehicle Licensing Authority. Thus, driver's license should not be issued without visual fitness examinations.

Conclusion

A tenth of the commercial drivers were visually impaired. There were statistically significant associations between the respondents' level of education, driving experience, blood pressure, and their visual acuity. It is recommended that visual screening for drivers should be included as a perquisite for issuance of commercial driver license.

Commercial drivers with poor visual health should be treated before allowed to drive or redeployed to other roles within the company like administrative and managerial roles. The drivers' union should have peer group cooperation, discussions, and advocacy on how best to ensure all members have regular health checks especially visual screening.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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