

Eye screening for automobile drivers: the need to make it mandatory Eye test among automobile drivers

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ABSTRACT

Objective: To determine ocular health status among automobile drivers in Birnin Kebbi. **Methods:** Structured questionnaire was used to collect data on automobile drivers' socio-demographic characteristics, visual conditions and challenges relevant to adequate visual functions. Also conducted were eye tests including visual acuity, visual field, colour vision, subjective refraction, pen-light eye examination, funduscopy and applanation tonometry. **Results:** Forty-two male automobile drivers with a mean age of 41.7 SD 8.7. All had at least 3 years driving experience and thought eye test was at least necessary before driving. However, only 4 (9.5%) ever had an eye test to obtain a driving license. Though, 39 (92.9%) engaged in daylight and night driving, 5 (11.9%) did not see well at night, 4 (9.5%) had blurred vision to road side objects, one (2.4%) had experienced transient visual obscurations driving and one (2.4%) wore corrective eyeglasses while driving. None had difficulty recognizing shades of colours. Four had visual acuity worse than 6/12. Ocular conditions among the drivers' eyes include refractive errors 48, pinguecula 37, pterygium 17, glaucoma 4 and cataract 2. The commonest refractive error was presbyopia. Two drivers had glaucoma and 4 were glaucoma suspects. The care given included counselling 6 (8%), prescription 11 (28%), and referral for eye care 12 (48%). **Conclusion:** Potentially vision impairing eye conditions exist among automobile drivers and pre-licensing eye test is poorly observed. The need to enforce eye test before the issuance and renewal of driving license is underscored.

Keywords: automobile drivers, driving license, eye screening, safe driving, vision disorders

INTRODUCTION

Normal visual functioning is an essential requirement for driving legally or otherwise. Impaired visual functioning including visual acuity, visual field, depth perception and colour vision endangers the lives of the motorist and the public alike. Therefore, visual standards have been set for vehicle drivers across the globe¹⁻⁴. Regrettably, this is not strictly observed in many societies endangering lives and properties^{5,6}.

Clear comfortable vision is essential for driving for a number of reasons. One, the drivers need to be able to judge distances. Second, it helps in reading road signs and traffic lights. Very importantly, it assists the drivers to respond to changes in environment quickly and efficiently. Impaired vision may translate to delayed response to critical situations exposing the drivers, passengers and other road users to avoidable dangers.

It is estimated that approximately 90% of our daily activities require the use of our vision. When it comes to driving, vision is clearly the most important of our senses. There are a number of eye conditions that can cause visual impairment among drivers; commonly uncorrected refractive errors. Others including cataract, glaucoma, diabetic retinopathy, age related macular degeneration and retinitis pigmentosa can increase the risk of vehicular accidents among drivers^{4,7,8}.

Because clear vision is invaluable to driving it has become more important to consider vision screening as a prerequisite for vehicular driving and in designing traffic safety policy. Mandatory vision screening for the issue or renewal of driver's license helps to ensure drivers are fit to safely operate vehicles. Moreover, a number of potential blinding conditions may be detected early during vision screening for selected populations,^{9,10,11} including

vehicle drivers. The objective of this paper was to report the ocular health status among a cohort of automobile drivers to underscore the need for pre-licensing eye testing.

MATERIAL AND METHODS

This study was carried out on 27th of January 2010 among a cross-section of automobile drivers drawn across Kebbi State, Nigeria. The venue was multipurpose hall, city campus, Waziri Umar (Gwandu) Federal Polytechnic, Birnin Kebbi. The study was conducted following the guidelines as contained in the declaration of Helsinki. Written informed consent was obtained from each participant.

The study was conducted following a request by Birnin Kebbi; commanding the Federal Road Safety Commission (FRSC) to carry out eye test for selected government automobile drivers. The objective was to determine the adequacy of the drivers' visual function, a requirement for issuance of driver's license. The FRSC is an authority in Nigeria charged with the responsibility of preventing accident and consequential loss of lives on Nigerian roads among others.

The study comprised of two parts including questionnaire, and relevant ocular examination/test. The pre-tested questionnaire sought the driver's socio-demographic characteristics, visual conditions and challenges relevant to adequate visual functions. The ocular examination focused on visual acuity, visual field and colour vision. Others included subjective refraction, pen-light eye examination, funduscopy and applanation tonometry.

Two trained ophthalmic nurses who understood and were fluent in Hausa language (spoken by the participants) administered the questionnaire. Another ophthalmic nurse carried out visual acuity test on the participants. Furthermore, an optometrist carried out subjective refraction while another optometrist performed colour vision test using Ishihara colour plates. The eye examination/test was concluded by an ophthalmologist including confrontation perimetry, anterior segment examination using pen-light and direct ophthalmoscopy. Goldman applanation tonometry was later conducted for deserving participants at Federal Medical Centre, Birnin Kebbi where they were referred.

The diagnosis of glaucoma was based on cup to disc ratio (CD) >0.5 and visual field constriction, with or without any or all of the following CD asymmetry of at least 0.2 between fellow eyes, intraocular pressure (IOP) >21mmHg and diminished visual acuity traceable to glaucoma. The glaucoma suspects

were based on CD>0.4 and CD asymmetry of at least 0.1 between the fellow eyes.

The data was collated and analysed using epi info version 3.5.1.

RESULTS

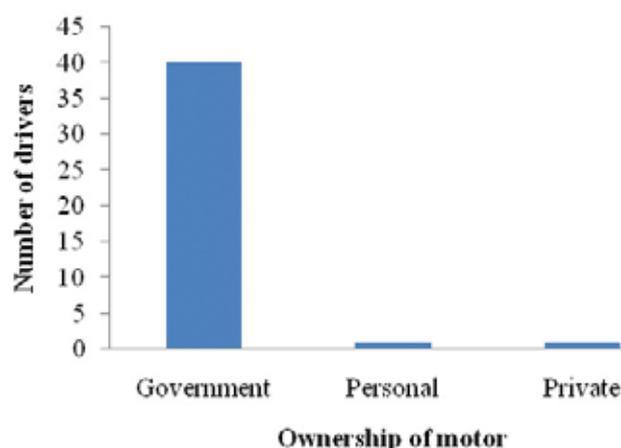
Forty-two male drivers with age range 25-58, mean age 41.7 SD 8.7. Their demographic characteristics are in [Table 1].

Table 1: Demographic characteristics of the drivers

Age Group	No	Educational level	No	Marital status	No
25-29	6	No formal education	3	Married	39
30-34	3	Qur'anic	9	Single	2
35-39	6	Primary	23	Divorced	1
40-44	11	Secondary	7		
45-49	7				
50-54	8				
55-59	1				

The drivers' experiences included more than 5 years; 41 (97.6%) and at least 3 years; 1 (2.4%) of driving. The drivers were engaged mainly by government [Figure 1].

Figure 1: The ownership of motor vehicle



Thirty-two (76.2%) never had previous eye test and 10 (23.8%) had based on reasons such as previous eye problem (4), to obtain driving license (4) and routine eye test (2). All indicated their opinion on the necessity of eye test before getting driving license including, very necessary 25 (59.5%) and necessary 17 (40.5%). Forty-one (97.6%) were non-commercial full-time drivers and only one (2.4%) was a commercial part-time driver.

Most of the drivers 39 (92.9%) engaged in both daylight and night periods driving, and only 3 (7.1%) in daylight driving. However, thirty-seven (88.1%) admitted clear night (driving) vision and 5 (11.9%) did not. All (100%) assured ability to see distant objects while driving. However, 38 (90.5%) appreciated objects by the road side while the rest 4 (9.5%) admitted blurred vision of road side objects. Forty-one (97.6%) drove using unaided vision and only one (2.4%) wore corrective eyeglasses while driving. None of the 42 (100%) had experienced diplopia in his driving career. Though majority 41 (97.6%) never experienced transient visual obscurations while driving but one (2.4%) admitted it. All 42 (100%) had no difficulty recognizing shades of colours. Ocular Examination findings

The distribution of the uncorrected visual acuity (VA) among the drivers is in [Table 2].

Table 2: Uncorrected visual acuity among the drivers

VA	VARE	VALE
6/4	5	4
6/5	7	7
6/6	25	23
6/9	2	5
6/12	1	1
6/18	-	1
6/24	-	1
6/36	2	-

VA=visual acuity, VARE=visual acuity right eye, VALE=visual acuity left eye

Four of the drivers (8 eyes) were wearing corrective eyeglasses improving their VA to 6/6 in 7 eyes and 6/12 in an eye. The ocular conditions among the drivers are in [Table 3].

Table 3: Eye conditions among the drivers

Diagnosis	Number of drivers	Number of eyes
Refractive error	24	48
Pinguecula	20	37
Pterygium	10	17
Glaucoma	2	4
Cataract	1	2

The pattern of refractive errors among the drivers is in [Table 4].

Table 4: Pattern of refractive errors among the drivers

Refractive error	RE	No	LE	No
Presbyopia	Plano add +1.00 DS	3	Plano add +1.00 DS	3
	Plano add +1.25 DS	1	Plano add +1.25 DS	1
	Plano add +1.50 DS	6	Plano add +1.50 DS	6
	Plano add +1.75 DS	3	Plano add +1.75 DS	3
	Plano add +2.00 DS	2	Plano add +2.00 DS	2
	Plano add +2.25 DS	2	Plano add +2.25 DS	2
	Total	17		17
Hyperopia	+0.50 DS	1	+0.50 DS	2
	+1.00 DS	1	+1.00 DS	1
	+1.75 DS	1		
	Total	3		3
Combined H & P	+0.50 DS add +2.00 DS	1	+0.75 DS add +1.25 DS	1
	+1.00 DS add +1.25 DS	1	+0.50 DS add +2.00 DS	1
	Total	2		2
Myopia	-0.75 DS	1	-0.75 DS	1
	-1.25 DS	1	-1.25 DS	1
	Total	2		2

P&H=Presbyopia and Hyperopia, RE=right eye, LE=left eye, DS=dioptr sphere

The commonest refractive error was presbyopia. All the drivers with VA of 6/4 did not accept presbyopia correction.

Glaucoma and glaucoma suspects

Two of the drivers had features of glaucoma and (4) presented findings suspicious of glaucoma [Table 5].

Table 5: Findings suggestive of glaucoma among the drivers

Category	Age	Eye	VA	VF	C: D	Disc	IOP (mmHg)
Glaucoma							
1	50	RE	6/6	Normal	0.6	Pale	24
		LE	6/12	Constricted	0.8	Pale	44
2	42	RE	6/36	Constricted	0.6	Pale	17
		LE	6/18	Constricted	0.7	Pale	17
Glaucoma suspect							
1	53	RE	6/6	Normal	0.7	Pink	17
		LE	6/5	Normal	0.7	Pink	17
2	41	RE	6/4	Normal	0.5	Pink	18
		LE	6/4	Normal	0.7	Pink	19
3	30	RE	6/5	Normal	0.6	Pink	16
		LE	6/5	Normal	0.4	Pink	17
4	39	RE	6/4	Normal	0.5	Pink	15
		LE	6/6	Normal	0.4	Pink	13

RE=right eye, LE=left eye, VA=visual acuity, VF=visual field, C: D=cup to disc ratio, IOP=intraocular pressure

Colour vision defect

None of the drivers had colour vision defect on Ishihara colour plates assessment.

Care received

Care received included counselling 6 (8%), prescription 11 (28%), and referral for eye care 12 (48%).

DISCUSSION

This is a report of ocular health status among automobile drivers in Birnin Kebbi, Nigeria. The ocular findings among motorists should be of interest to automobile drivers and the public especially, the authority whose responsibility is ensuring accident free vehicle driving. Vision disorders have been noted as a safety risk to all automobile drivers and passengers.^{4,12} The demographic characteristics revealed motorists mostly in the prime of their life, having primary school education and married. The age distribution however, is not without implication for ocular health. More than 64% of the participants were at least 40 years old, an age above which some vision

threatening ocular conditions including glaucoma, cataract, age related macular degeneration among others are common.¹³⁻¹⁷ Screening of individuals above age 40 for eye conditions have been recommended¹⁸ and should be of interest especially to motorists and authorities responsible for ensuring accident free vehicle driving among others. Meanwhile, attention should be paid to the level of education of the motorists in designing road sign/accident free messages in order to have desired impact. Marital status revealed that there were motorists – in this study - who have dependants and social implications.

The motorists in this study were mostly government employees, full time and non-commercial drivers. Though all admitted eye testing as essential for prospective drivers and all had at least 3 years of driving experience, the majority never had an eye test. This real discordance between opinion and practice can be of grave implication on issues having direct impact on safety of lives as in this study. The poor compliance to pre-licensing eye test is not peculiar to this cohort of vehicle drivers since it has been reported elsewhere.^{5,6} There is a pressing need to enforce eye test before issuance and renewal of motor driving license among motorists.

The essential visual functions necessary for driving including visual acuity, visual field and colour vision were assessed in this study. Only one driver had bilateral uncorrected visual acuity worse than 6/12 which improved to 6/6 with correction. All the six eyes with visual acuity of 6/12 or worse improved with correction. Though slight variations exist for mandatory visual functions levels for drivers across societies but visual acuity of at least 6/12 in both eyes, horizontal visual field of 700 in each eye and normal colour perception^{1,2,3,4} are believed safe for driving. However, while visual acuity is only weakly related to crashes, peripheral vision appears to play a more critical role and colour vision deficiency by itself is not a threat to safe driving⁴.

It is a fact that a test of visual acuity associated with obtaining glasses or a driver's license may not necessarily detect sight-threatening conditions. Therefore, funduscopy should be conducted for the prospective drivers as such screening may be the only opportunity to detect potential blinding conditions as found in this study. Eye screening for selected population are known to be effective in detecting many ocular problems that are amenable to interventional measures⁹⁻¹¹.

Refractive errors including presbyopia, hyperopia and myopia were the most common

ocular conditions found among the drivers. Uncorrected refractive error is a known cause of visual impairment and blindness, and can limit ability to drive. The observed presbyopia preponderance is not unexpected as participants' mean age is in the presbyopic age group.¹⁸⁻²¹ Both pinguecula and pterygium appeared common among the study group. This might be related to the dry and hot ambient conditions where participants have been living over years, this study was conducted in the Sahel savanna belt of Nigeria. Moreover, the drivers due to professional calling are exposed to vagary of weather conditions including hot, cold, wind, and dust among others which are known risk factors for pinguecula and pterygium.^{22,23} Pterygium is a potential blinding condition either by way of inducing refractive error or direct occlusion of visual axis.^{24,25} Pterygium can induce glare and loss of contrast sensitivity with implication on driving.²⁶ The aforesaid underscored the need for eye test before issuance and renewal of driving license as pterygium can rapidly progress over time.

Meanwhile, cataract and glaucoma are visual impairing conditions found in this study. Cataract is notorious for causing glare especially during night driving²⁷⁻²⁹. When cataract is advanced there is direct occlusion of visual axis leading to varying levels of diminishing visual acuities. Aside, cataract can induce diplopia, refractive error and colour distortion²⁸ with implication on driving. On the other hand glaucoma is more dangerous as visual acuity may be preserved in the presence of constricted visual field³⁰. Two drivers had glaucoma with constricted field. The constricted visual field notwithstanding, the improved visual acuity on correction of coexisting refractive errors in these patients could mask glaucoma especially where detailed eye examination is impossible or not carried out. The visual field is most likely getting worse over time; appropriate treatment retarding progression notwithstanding. Therefore, the drivers should benefit from occupational rehabilitation. The driver may be redeployed to a unit of the organization considered safe for the residual visual field. This would prevent possible motor accident resulting from drivers having constricted visual field.

The aforesaid glaucoma as well as observed findings suspicious of glaucoma underscored the need for eye test before the issuance and renewal of driving license. The observed cup to disc ratio of > 4 and asymmetry between fellow eyes were criteria used to categorize 4 drivers as glaucoma suspects, the normal visual acuities and pink discs

notwithstanding. It should be noted that the patients should also be assessed with automated visual field analyser, as compared to only confrontation perimetry used in this study with its limitations.

It is remarkable none of the drivers had colour vision defect on Ishihara colour plates. This should not be interpreted as no colour vision defect among the automobile drivers in the region where the study was carried out in view of sample size of the study population. A number of medicare were received by the drivers during the screening for eye conditions including counselling, prescription, and referral for eye care.

CONCLUSION

Potentially vision impairing eye conditions exist among automobile drivers and pre-licensing eye test is poorly observed. The need to enforce eye test before the issuance and renewal of driving license is underscored.

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