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[Research Article]

Visual Function Test among Commercial Drivers in Tarauni Local Government Area Kano State.

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Abstract:

Clear vision is a critical requirement for safe driving, as it is one of the primary sensory inputs necessary for effective navigation and hazard detection. Drivers with optimal visual capabilities are generally at a lower risk of road traffic accidents (RTAs) compared to those with visual impairments. This study assessed various aspects of visual function including distance and near visual acuity, color vision, contrast sensitivity, stereopsis, and peripheral visual fields and their association with the occurrence of RTAs among commercial drivers in Tarauni Local Government Area of Kano State. A total of 250 male commercial drivers, aged between 20 and 65 years and with at least two years of driving experience, were recruited from four major motor parks. Participants underwent both external and internal ocular examinations, and were interviewed using structured questionnaires that explored their experiences with night driving glare, difficulties in reading road signs, history of RTAs, and awareness of vision screening requirements for driver's license issuance.

The results revealed that 11.6% of the drivers had a history of RTAs. Good visual acuity was observed in 75% of the participants, while 22.8% reported being significantly affected by glare from oncoming headlights during night driving. Statistically significant differences in visual acuity, color vision, contrast sensitivity, stereopsis, and near vision were observed across different age groups. Notably, only 10% of the drivers were aware that vision assessment is part of the driver's license issuance process. Based on these findings, the study recommends mandatory comprehensive eye examinations for older drivers, particularly those aged 65 and above, to detect and manage age-related ocular changes that could compromise driving safety.

Keywords: Visual Function Test, Commercial Drivers, Visual Acuity, Ocular Health, Road Traffic Accident, stereopsis, Visual Standard.

Introduction:

Driving is a visually demanding task that requires the constant coordination of sensory input and motor responses. Among all the sensory modalities, vision plays the most critical role in driving performance, accounting for about 90% of the information drivers need to perceive and respond to their environment effectively (Owsley & McGwin, 2010). Adequate visual function, including visual acuity, contrast sensitivity,

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stereopsis (depth perception), peripheral vision, and color vision, is essential for safe driving, especially in the case of commercial drivers who spend prolonged hours on the road and operate vehicles under varying conditions.

In Nigeria and many parts of the world, commercial drivers form a significant proportion of road users, contributing to the country's socioeconomic development through the transportation of goods and people. However, road traffic accidents (RTAs) remain a major public health concern, with a substantial proportion attributed to poor visual health and lack of regular eye screening among drivers (Ezenwa, 2011). The World Health Organization (2022) estimated that low- and middle-income countries, including Nigeria, account for more than 90% of global road traffic fatalities, with driver error, often related to poor vision, as a leading contributing factor.

The Federal Road Safety Commission (FRSC) of Nigeria has established visual standards for driver's license eligibility, mandating a minimum visual acuity of 6/9 in the better eye and at least 6/24 in the second eye for commercial drivers (FRSC, 2016). Despite these guidelines, enforcement and routine visual assessments remain weak, and many drivers continue to operate without undergoing comprehensive eye examinations. This raises concern, especially as age-related ocular conditions such as presbyopia, cataracts, and glaucoma become more prevalent with increasing age, potentially impairing driving ability and increasing the risk of accidents (Omolase et al., 2012; Emerole et al., 2013).

Previous studies in Nigeria have shown mixed findings regarding the relationship between visual function and driving performance. While some research suggests a direct link between poor vision and accident rates (Adekoya et al., 2009), others have found no statistically significant relationship (Omolase et al., 2012). Moreover, many studies have not comprehensively assessed multiple visual parameters or stratified findings by age group, leaving gaps in understanding how aging affects the visual capabilities of drivers and their potential implications for road safety.

Given this background, the present study was designed to evaluate the visual status of commercial drivers in Tarauni Local Government Area of Kano State, Nigeria. The study specifically aimed to assess visual acuity, contrast sensitivity, color vision, stereopsis, and peripheral visual field, and to explore their associations with age distribution and history of road traffic accidents. By generating data specific to this population, the study intends to inform policy decisions and advocate for stronger visual screening protocols in licensing procedures, ultimately contributing to safer roads and better ocular health among Nigerian drivers.

Methods:

Visual performance was assessed using standardized procedures. Distance and near visual acuity tests were conducted using the Snellen chart and reduced Snellen chart, respectively. Testing was done monocularly, starting with the right eye, with corrective lenses used where appropriate. Near vision was tested at a standard distance of 40 cm.

Visual acuity refers to the eye’s ability to resolve fine detail, which depends on the optical clarity and neural functioning of the visual system. Measurements are typically expressed in Snellen notation (e.g., 6/6 or 6/12), with normal vision being 6/6. Refractive errors, pupil size, and retinal or neural abnormalities can influence acuity.

Color vision was evaluated to determine the ability to recognize and differentiate colors, which is essential for interpreting traffic signals and signs. Color perception is mediated by cone photoreceptors responsive to short, medium, and long wavelengths. Deficiencies, whether congenital or acquired, were classified into monochromacy, dichromacy (protanopia, deuteranopia), and anomalous trichromacy.

This methodology allows for comprehensive assessment of the visual parameters most critical to driving safety, thus contributing valuable data toward public health interventions targeting RTA prevention.

Result

This study examined a total of 250 commercial drivers aged between 20 and 65 years. All participants were male. Visual acuity was assessed according to the Federal Road Safety Commission's driver's license issuing criteria, which classifies *good visual acuity* as 6/6 to 6/12 in the better eye, or 6/9 tested at 6 meters in the better eye and 6/18 to 6/24 in the second eye for commercial drivers.

Table 1: Mean Visual Acuity by Age Group

Age Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval	Minimum	Maximum
					Lower Bound – Upper Bound		
20–29 yrs	68	16.00	5.37	0.65	14.70 – 17.30	15	48
30–39 yrs	113	16.67	9.10	0.86	14.98 – 18.37	15	96
40–49 yrs	39	19.87	11.59	1.86	16.11 – 23.63	15	77
50–65 yrs	30	32.07	22.92	4.19	23.51 – 40.63	12	90
Total	250	18.84	12.34	0.78	17.30 – 20.37	12	96

Hypotheses

- Null Hypothesis (H_0): There is no significant difference in visual acuity across age groups.
- Alternative Hypothesis (H_1): There is a significant difference in visual acuity across age groups.

Table 2: ANOVA – Visual Acuity Across Age Groups

Source	Sum of Squares	df	Mean Square	F	Sig. (p-value)
Between Groups	6369.165	3	2123.055	16.555	0.000
Within Groups	31547.111	246	128.240		
Total	37916.276	249			

Interpretation: Since the p-value (< 0.05), we reject the null hypothesis and conclude that there is a significant difference in visual acuity across different age groups.

Table 3: Post Hoc Test (LSD) – Pairwise Comparison of Visual Acuity by Age Group

Age Group Comparison	Mean Difference (I–J)	Std. Error	Sig.	95% Confidence Interval
				Lower Bound – Upper Bound
20–29 vs 30–39 yrs	-0.673	1.738	.699	-4.10 – 2.75
20–29 vs 40–49 yrs	-3.872	2.275	.090	-8.35 – 0.61
20–29 vs 50–65 yrs	-16.067**	2.482	.000	-20.96 – -11.18

30–39 vs 40–49 yrs	-3.199	2.103	.129	-7.34 – 0.94
30–39 vs 50–65 yrs	-15.394**	2.326	.000	-19.98 – -10.81
40–49 vs 50–65 yrs	-12.195**	2.750	.000	-17.61 – -6.78

Note: *Significant at $p < 0.05$

Table 4: Mean Contrast Sensitivity by Age Group

Age Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval	Minimum	Maximum
					Lower Bound – Upper Bound		
20–29 yrs	68	1.8662	0.21431	0.02599	1.8143 – 1.9181	0.90	1.95
30–39 yrs	113	1.8226	0.25843	0.02431	1.7744 – 1.8707	0.75	1.95
40–49 yrs	39	1.5167	0.33567	0.05375	1.4079 – 1.6255	0.80	1.95
50–65 yrs	30	1.1750	0.50459	0.09213	0.9866 – 1.3634	0.15	1.95
Total	250	1.7090	0.37682	0.02383	1.6621 – 1.7559	0.15	1.95

Table 5: ANOVA – Contrast Sensitivity Across Age Groups

Source	Sum of Squares	df	Mean Square	F	Sig. (p-value)
Between Groups	13.135	3	4.378	48.466	0.000
Within Groups	22.223	246	0.090		
Total	35.357	249			

Hypotheses

- Null Hypothesis (H_0): There is no significant difference in contrast sensitivity across age groups.
- Alternative Hypothesis (H_1): There is a significant difference in contrast sensitivity across age groups.

Interpretation: The p-value is < 0.05, indicating that contrast sensitivity significantly differs across the age groups.

Discussion:

This study assessed the visual performance of 250 male commercial drivers in Tarauni Local Government Area of Kano State, Nigeria, aged between 20 and 65 years. The focus was on evaluating visual acuity, color vision, contrast sensitivity, stereopsis, peripheral visual field, and their associations with the incidence of road traffic accidents (RTAs).

The results showed a statistically significant variation in visual acuity across different age groups. Specifically, drivers aged 50–65 years had notably poorer visual acuity compared to those aged 20–29 years, as indicated by the ANOVA results ($p < 0.05$). This suggests that aging may have a deteriorating effect on visual functions

critical to safe driving. These findings are consistent with the study by Ngozi et al. (2015), which also found significant differences in visual parameters across age groups.

In contrast to the findings by Omolase et al. (2012), who reported no relationship between visual acuity and age distribution, this study observed a clear age-related decline in visual function, including contrast sensitivity and stereopsis. The post hoc analysis further confirmed that drivers in the older age group (50–65 years) had significantly lower contrast sensitivity and stereopsis compared to younger age groups.

Despite the observed visual impairments, 75% of the drivers still met the minimum Federal Road Safety Commission (FRSC) visual acuity standards of 6/6 to 6/12 in the better eye. This high level of compliance could explain the relatively low reported incidence of road traffic accidents (11.1%) among the respondents, aligning with findings by Joanne et al. (2009), who also suggested that good visual acuity is linked to safer driving outcomes.

Interestingly, this study did not find a significant association between poor visual acuity and road traffic accidents, which supports the findings of Emerole et al. (2013), who argued that distance and near visual acuity, as well as visual field limitations, may not independently predict crash risk. However, this study did find some association between visual field restriction and the history of road traffic accidents, indicating that drivers with visual field defects might be more susceptible to collisions.

Ocular pathology was also documented. Presbyopia was the most common condition (37.2%), followed by allergic conjunctivitis (23.6%), and pterygium (19.0%), findings which mirror those of Bola et al. (2008). Alarmingly, many drivers with these conditions had never undergone a formal eye examination, highlighting the urgent need for routine vision screening among commercial drivers.

Conclusion:

Based on the findings from this study, it can be concluded that there is a statistically significant difference in visual acuity among commercial drivers across different age groups, particularly between those aged 20–29 years and 50–65 years. Similarly, contrast sensitivity, stereopsis, and color vision were found to decline significantly with age, indicating an overall reduction in visual function among older drivers. However, despite these age-related visual impairments, no significant relationship was observed between poor visual acuity and the occurrence of road traffic accidents. Nevertheless, drivers with peripheral visual field restrictions showed a higher incidence of crash history, suggesting a possible link between visual field defects and accident risk. Additionally, the most common ocular conditions identified were presbyopia and allergic conjunctivitis, with a notable number of drivers having never undergone an eye examination. These findings highlight the importance of implementing regular and comprehensive vision screenings for commercial drivers, especially those over 50 years of age, to ensure early detection and management of visual impairments, ultimately contributing to safer driving and reduced road traffic accidents.

Recommendation

Based on the findings of this study, several important recommendations can be made to improve road safety and visual health among commercial drivers. First, it is essential to implement mandatory, periodic comprehensive eye examinations for all commercial drivers, particularly those aged 40 years and above. Such screenings should include assessments of visual acuity, contrast sensitivity, stereopsis, color vision, and peripheral visual fields, as these parameters were shown to decline significantly with age and may influence driving performance. Additionally, awareness campaigns should be initiated to educate drivers on the importance of eye health and the potential impact of untreated ocular conditions on driving safety. Health authorities and licensing bodies such as the Federal Road Safety Commission (FRSC) should also strengthen enforcement of visual standards during license issuance and renewal processes to ensure only visually fit individuals are allowed to drive commercially.

Limitation

Despite its valuable insights, this study has some limitations. First, the study population consisted exclusively of male drivers, which limits the generalizability of the findings to female commercial drivers, who may exhibit different visual or driving profiles. Secondly, the cross-sectional nature of the study restricts the ability to establish causal relationships between visual impairment and road traffic accidents. Also, data on road traffic accidents relied on self-reported history, which may be subject to recall bias or underreporting. Furthermore, the study was limited to a single local government area (Tarauni) in Kano State, which may not fully represent the broader population of commercial drivers across different regions in Nigeria. Future research should consider a larger, more diverse sample with longitudinal follow-up and objective accident records to validate and expand upon these findings.

Conflict of interest:

The authors declare that there is no conflict of interest.

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