



[Research Article]

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

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Published on 15th May, 2025. Revised on 4th August 2025

DOI: <https://doi.org/10.5281/zenodo.16736817>

Abstract:

Background: Good vision is a critical sensory component for safe driving, as it accounts for approximately 95% of the information needed during vehicular operation. This study aimed to assess various visual functions specifically distance and near visual acuity, color vision, contrast sensitivity, stereopsis, and peripheral visual fields and their association with the occurrence of road traffic accidents among commercial drivers in Tarauni Local Government Area, Kano State, Nigeria.

Method: A total of 250 male commercial drivers, aged 20 to 65 years with at least 2 years of driving experience, were selected from four major motor parks. Data collection involved both structured interviews and comprehensive ophthalmic examinations. The questionnaire assessed awareness of visual licensing requirements, difficulties seeing road signs, glare discomfort during night driving, and history of road traffic accidents.

Findings: Results indicated that 75% of drivers had good visual acuity, while 11.6% reported previous involvement in road traffic accidents. 22.8% experienced discomfort due to glare at night. Statistically significant differences ($p < 0.05$) were observed in visual acuity, contrast sensitivity, color vision, stereopsis, and near vision across different age groups. Notably, only 10% of participants were aware that vision testing is part of the licensing requirements.

Conclusion: The findings underscore the impact of age-related visual deterioration on driving performance and highlight the need for mandatory vision assessments, especially for older drivers. Routine ocular evaluations should be incorporated into driver licensing protocols to enhance road 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, 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:

Study Design

This study adopted a prospective descriptive cohort design aimed at evaluating the visual function of commercial drivers and its association with road traffic accident occurrence in Tarauni Local Government Area, Kano State, Nigeria. Both quantitative and clinical data collection methods were employed to ensure comprehensive assessment.

Study Setting and Population

The study was conducted among commercial drivers operating in four major motor parks within Tarauni LGA: Kano Line Motor Park, Unguwa Uku Motor Park, Maiduguri Park, and Naibawa Motor Park. The target population comprised male commercial drivers aged between 20 and 65 years, each with a minimum of two years of professional driving experience.

Sample Size and Sampling Technique

A total of 250 participants were recruited using purposive sampling, ensuring the inclusion of drivers across various age categories and from diverse parks within the LGA. The distribution of participants across the parks was as follows:

- Kano Line Motor Park – 110 drivers
- Unguwa Uku Motor Park – 60 drivers
- Maiduguri Park – 30 drivers
- Naibawa Motor Park – 50 drivers

Participants included in the study were male commercial drivers aged between 20 and 65 years who had a minimum of two years of continuous professional driving experience within Tarauni Local Government Area. All participants provided informed consent after receiving a full explanation of the study's objectives and procedures. Drivers were excluded if they had a history of ocular trauma or previous eye surgery, systemic illnesses known to affect visual function (such as diabetes mellitus or hypertension), or if they were unwilling

to participate. Additionally, individuals with incomplete clinical data or uncooperative behavior during examination were also excluded from the study.

Ethical Considerations

Ethical approval was obtained from the appropriate institutional review board. All participants were briefed about the study objectives and procedures. Informed consent was obtained, and confidentiality of responses and examination results was strictly maintained throughout the research process.

Data Collection Procedures

Interview and Questionnaire

Each participant completed a structured questionnaire administered by trained personnel. The questionnaire collected demographic data, driving history, previous involvement in road traffic accidents, awareness of vision screening during licensing, and subjective visual complaints (e.g., night glare, difficulty seeing road signs).

Ophthalmic Examinations

All clinical examinations were conducted under natural daylight conditions using standard optometric tools. The following visual function tests were performed:

- Visual Acuity (Distance and Near): Measured monocularly using a Snellen chart at 6 meters for distance and reduced Snellen chart at 40 cm for near vision.
- Color Vision: Evaluated using Ishihara pseudoisochromatic plates, with participants tested monocularly at a distance of approximately 75 cm.
- Contrast Sensitivity: Assessed using the Pelli-Robson contrast sensitivity chart under consistent lighting conditions.
- Stereopsis: Evaluated using Random Dot Stereograms, including the Fly Test, Animal Test, and Circles Test, with results graded in seconds of arc.
- Peripheral Visual Field: Assessed through the confrontation method, comparing the participant's field of vision with that of the examiner across the horizontal and vertical planes.
- Ocular Health Evaluation: External and internal eye examinations were performed using a pen torch and direct ophthalmoscope to identify common ocular pathologies such as cataract, glaucoma, conjunctivitis, or pterygium.

Data Analysis

Collected data were entered into a statistical software package and analyzed using Analysis of Variance (ANOVA) to determine differences in visual function across age groups. Post hoc analysis using the Least Significant Difference (LSD) test was applied where appropriate. Chi-square tests were used to assess associations between visual impairments and the history of road traffic accidents. A p-value of <0.05 was considered statistically significant for all inferential analyses.

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
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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 relationship between various visual functions and the occurrence of road traffic accidents among commercial drivers in Tarauni LGA, Kano State. All 250 participants were male, aged 20 to 65 years. A significant association was found between age and visual acuity, with drivers aged 50–65 years showing the poorest vision outcomes (Mean: 32.07, SD: 22.92), in contrast to younger groups. This supports findings by Ngozi et al. (2015) and Emerole et al. (2013), who reported age-related declines in visual performance including contrast sensitivity, stereopsis, and color perception.

Approximately 75% of drivers had visual acuity within acceptable standards defined by the Federal Road Safety Commission (FRSC), which requires 6/6 to 6/12 in the better eye and 6/24 in the second eye. This may explain the relatively low rate of self-reported road traffic accidents (11.6%) observed in the study. Similar findings were reported by Joanne et al. (2009). However, contrary to findings by Omolase et al. (2012), this study showed significant variations in contrast sensitivity, stereopsis, and color vision across age groups ($p < 0.05$), indicating that aging significantly impacts visual functions beyond acuity alone.

The prevalence of ocular pathologies such as presbyopia (37.2%), allergic conjunctivitis (23.6%), and pterygium (19.0%) is consistent with Bola et al. (2008), who documented similar patterns among commercial drivers. Alarming, many drivers with these conditions had never undergone prior eye examinations, highlighting the need for regular vision screening. Though visual field restriction was not strongly linked to road traffic accidents, it was observed in 25% of participants involved in crashes. This suggests a potential, albeit weak, link that warrants further longitudinal studies. Interestingly, knowledge about vision testing as a licensing requirement was low (only 10% of drivers were aware), underscoring a significant gap in awareness and regulatory enforcement.

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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