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Visual Acuity Screening and Associated Factors Among Drivers in Babil, Iraq: A Cross-Sectional Study

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Abstract :

Background: Visual acuity is essential for safe driving, enabling drivers to recognize road signs, detect hazards, and respond to traffic conditions. Impaired vision may compromise driving performance and increase accident risk. Factors such as age, gender, education, and corrective eyewear may influence visual acuity. This study aimed to assess visual-acuity values among drivers in Babil, Iraq, and examine their associations with sociodemographic characteristics and driving licence type to support improved vision screening and road safety

Objective: To assess recorded visual acuity values among drivers in Babylon, Iraq, and investigate their associations with demographic and driving-related characteristics, including age, gender, educational level, residence, driving licence type, and glasses use.

Methodology: A cross-sectional observational study was conducted using 300 driver records from Babylon, Iraq. Data included demographic characteristics, driving licence type, glasses use, and recorded visual-acuity values for both eyes. Visual acuity was analyzed using the recorded categories, as the measurement scale and clinical interpretation were undocumented. Descriptive statistics, Spearman correlation, Pearson's chi-square test, and Fisher's exact test were used to assess associations. Statistical significance was set at $p < 0.05$. A repeated identification number was identified and requires verification.

Results: The analysis revealed no statistically significant association between educational level and glasses use ($p = 0.289$) or between age group and glasses use ($p = 0.410$). Driving

licence type was significantly associated with age group ($p = 0.00034$) and gender ($p = 0.00074$). Exploratory associations were observed between glasses use and recorded visual acuity in the right eye ($p = 0.022$; OR = 3.08) and left eye ($p < 0.001$; OR = 7.23), although these findings require verification of visual-acuity coding. No significant associations were found between educational level and right-eye visual acuity ($p = 0.219$), residence category and right-eye visual acuity ($p = 0.359$), or educational level and residence category ($p = 0.086$).

Conclusion: Age was significantly associated with visual acuity, while driving licence type was associated with age and gender. No significant associations were found between glasses use and age or education, or between residence and visual acuity. Further studies are needed to clarify the relationship between vision and road safety.

Keywords:

Visual acuity, drivers, vision screening, driving safety, corrective eyewear

Introduction

Visual acuity is an essential component of visual function and plays an important role in safe driving. Drivers rely on clear vision to recognize road signs, identify pedestrians and other vehicles, judge distances, and respond appropriately to changing traffic conditions [1]. Reduced visual acuity may affect a driver's ability to detect potential hazards, particularly under challenging conditions such as poor lighting or adverse weather [2].

Road traffic safety is a major public health concern worldwide. Although road accidents can result from several factors, including driver behavior, road conditions, and vehicle-related problems, adequate vision is an important requirement for driving safely [3]. Visual acuity screening can help identify drivers who may have difficulty seeing clearly and who may benefit from further ophthalmic assessment or appropriate visual correction [4]. Several factors may be associated with visual acuity among drivers, including age, gender, educational level, use of corrective glasses, and other demographic characteristics [5]. Age-related changes in visual function may influence driving performance, while the use of appropriate corrective lenses may improve visual clarity in individuals with refractive errors. However, wearing glasses alone does not necessarily indicate that a person's vision is adequate for driving; visual acuity should be assessed using appropriate screening procedures [6]. In Iraq, assessing visual acuity among drivers may provide useful information about their visual health and help identify potential needs for eye-care services. In Babil Governorate, examining visual acuity and its associated factors can contribute to a better understanding of the visual characteristics of the local driving population [7].

Therefore, this cross-sectional study aims to assess visual acuity among drivers in Babil, Iraq, and investigate its association with selected demographic and related factors, including age, gender, educational level, and the use of corrective glasses [9]. The findings may help identify areas requiring further investigation and support recommendations for improving drivers' visual health. However, because of the cross-sectional design, the study can identify associations but cannot establish causal relationships between these factors and visual acuity or road traffic accidents.

Methodology

1. Study Design

A cross-sectional, observational study was conducted to assess recorded visual-acuity values among drivers in Babylon, Iraq, and to investigate their associations with selected demographic and driving characteristics. The study used driver records collected at a single period of assessment. The observational design allowed the examination of associations between variables but did not establish causal relationships.

2. Study Population and Sample Size

The study included 300 driver records from Babylon, Iraq. The participants had a mean age of 30.40 ± 11.16 years, with a median age of 27 years and an age range of 17–66 years. Of the total sample, 239 (79.7%) were males and 61 (20.3%) were females. Regarding driving licence type, 257 drivers (85.7%) held private driving licences, while 43 (14.3%) held public driving licences.

3. Data Collection

Data were obtained from the available driver dataset, which contained demographic, driving-related, and visual-acuity information. The variables included age, gender, educational level, residence category, driving licence type, glasses use, and recorded visual-acuity values for the right and left eyes.

The dataset included 300 records, although only 299 unique form identification numbers were present.

4. Assessment of Visual Acuity

Visual-acuity values for the right and left eyes were recorded and analyzed separately. The recorded values included 0.00, 0.20, 0.30, 0.40, 0.50, and 0.60. For some statistical comparisons, visual acuity was categorized into two groups: a recorded value of 0.00 and a value greater than 0.00.

The visual-acuity measurement scale and the clinical meaning of the value 0.00 were not documented in the available dataset. Therefore, these values were analyzed according to their recorded categories without classifying them as normal vision or visual impairment. Confirmation of the original measurement method is necessary before making clinical interpretations.

Glasses use was recorded as a categorical variable indicating whether a driver wore glasses. The available data did not establish whether glasses were worn during driving or whether the prescription provided adequate visual correction.

5. Study Variables

The main study variables were classified as follows:

- Primary variables: Recorded visual-acuity values for the right and left eyes.
- Demographic variables: Age, gender, educational level, and residence category.
- Driving-related variables: Driving licence type and glasses use.
- Additional variable: Drug-screening result.

Age was examined both as a continuous variable and as a categorized variable. The age groups used in the descriptive analysis were 17–29, 30–39, and 40–70 years. Residence was grouped into district/subdistrict, urban centre, and village categories for selected comparisons. These administrative residence categories were not considered equivalent to a definitive rural–urban classification.

6.Ethical Approval

Ethical approval for the present study was Popular Clinics Department/Medical Committees Section for Driving in Babylon. All participants were informed about the purpose of the study, and informed consent was obtained prior to sample collection IRB(1529-27-10-2026).

7. Statistical Analysis

Statistical analyses were performed using the recorded categories in the dataset. Continuous age data were summarized using the mean and standard deviation, as well as the median and range. Categorical variables were summarized using frequencies and percentages.

The Spearman rank correlation coefficient was used to examine the relationships between age and recorded visual-acuity values for each eye. Pearson's chi-square test was used to assess associations between categorized variables, including age group and recorded visual-acuity category, age group and glasses use, age group and driving licence type, gender and driving licence type, educational level and glasses use, and selected educational and residence categories. Fisher’s exact test was used to assess the association between glasses use and the dichotomized visual-acuity categories where appropriate. Odds ratios were reported for these comparisons in the supplied statistical results.A p-value of less than 0.05 was considered statistically significant. However, comparisons involving small category counts were interpreted cautiously, and exact or Monte Carlo methods may be more appropriate where chi-square assumptions are not met.

RESULTS

1. Demographic and driving characteristics

The study included 300 drivers, with most participants aged 17–29 years, male, and holding private driving licences. Only 7.3% of participants were recorded as wearing glasses.

Table1: Sociodemographic and Clinical Characteristics of the Study Participants

Characteristic	Result
Total sample	300
Age, mean ± SD	30.40 ± 11.16 years
Age, median (range)	27 (17–66) years
Age 17–29 years	170 (56.7%)
Age 30–39 years	79 (26.3%)
Age 40–70 years	51 (17.0%)
Male	239 (79.7%)
Female	61 (20.3%)
Private driving licence	257 (85.7%)
Public driving licence	43 (14.3%)
Wears glasses	22 (7.3%)
Does not wear glasses	278 (92.7%)

2. Distribution of recorded visual-acuity values

A recorded value of 0.00 was observed in 80.0% of right-eye records and 77.3% of left-eye records.

Table 2. Distribution of Recorded Visual Acuity Values in the Right and Left Eyes Among Study Participants

Eye	Recorded value	n	% of non-missing records
Right	0.00	240	80.0%
Right	0.20	42	14.0%
Right	0.30	11	3.7%
Right	0.40	1	0.3%
Right	0.50	4	1.3%
Right	0.60	2	0.7%
Left	0.00	231	77.3%
Left	0.20	49	16.4%
Left	0.30	14	4.7%
Left	0.50	2	0.7%
Left	0.60	3	1.0%
Left	0.40	1	0.3%
Left	0.50	2	0.7%
Left	0.60	3	1.0%

3. Age and visual acuity

Age showed weak, statistically significant positive correlations with the recorded visual-acuity values in both eyes.

Table 3. Association Between Age and Recorded Visual Acuity Values in the Right and Left Eyes Among Study Participants

Relationship	Coefficient / statistic	*p-value*
Age and right-eye visual-acuity value	$r_s = 0.176$	0.0022
Age and left-eye visual-acuity value	$r_s = 0.173$	0.0028
Age group and right-eye recorded value (0.00 vs >0.00)	$\chi^2 = 12.47$; df = 2	0.002

4. Associations among age, glasses use, licence type, gender, and education

Driving licence type was significantly associated with both age group and gender. No statistically significant associations were found between age group and glasses use or between educational level and glasses use.

Table 4. Associations Between Sociodemographic Characteristics, Driving Licence Type, and Glasses Use Among Study Participants

Relationship	df	p-value
Age group × wearing glasses	3	0.410
Age group × driving licence type	3	0.00034
Gender × driving licence type	1	0.00074
Educational level × wearing glasses	9	0.289

5. Wearing glasses and visual acuity

No statistically significant associations were found between educational level and right-eye visual-acuity category, residence category and right-eye visual-acuity category, or educational level and residence category.

Table 5. Associations Between Glasses Use, Visual Acuity, and Road Accident Outcomes Among Study Participants

Relationship	Reported result / status	Note
Wearing glasses × right-eye visual acuity	Fisher's exact p = 0.022; OR = 3.08	Exploratory association; verify acuity coding and table direction.
Wearing glasses × left-eye visual acuity	Fisher's exact p < 0.001; OR = 7.23	Exploratory association; verify acuity coding and table direction.
Corrective glasses while driving × road accidents	Not calculable	Accident outcomes and eyewear use at the time of an accident were not available.

6.Association Between Educational Level and Recorded Right-Eye Visual Acuity

Educational attainment was grouped as no formal education, primary, secondary (intermediate/preparatory), and higher education (diploma or above). Right-eye acuity was dichotomized into recorded 0.00 versus values greater than 0.00.

Table 6. Association Between Educational Level and Recorded Right-Eye Visual Acuity Values Among Study Participants

Educational level	Recorded 0.00, n	Recorded >0.00, n	Total
No formal education	6	3	9
Primary	70	24	94
Secondary	70	16	86
Higher	94	17	111

No statistically significant association was found between educational level and the recorded right-eye visual-acuity categories ($p = 0.219$).

7. Association Between Residence Category and Recorded Right-Eye Visual Acuity

The residence field contains administrative categories rather than an explicit rural/urban variable. The main categories were grouped as district/subdistrict (qadha/nahiya), urban center (markaz), and village (qarya); six records in other/unspecified categories were excluded from this three-category comparison.

Table 7. Association Between Residence Category and Recorded Right-Eye Visual Acuity Values Among Study Participants

Residence category	Recorded 0.00, n	Recorded >0.00, n	Total
District/subdistrict	163	46	209
Urban center	63	11	74
Village	8	3	11

No statistically significant association was observed between the three main residence categories and recorded right-eye visual acuity ($p = 0.359$).

.8. Association Between Educational Level and Residence Category

Table 8. Distribution of Educational Level According to Residence Category Among Study Participants

Educational level	District/subdistrict	Urban center	Village	Total
No formal education	7	1	0	8
Primary	74	15	5	94
Secondary	58	21	4	83
Higher	70	37	2	109

No statistically significant association between educational level and the three main residence categories ($p = 0.086$).

Discussion

The present study investigated visual acuity and road safety among 300 drivers in Babylon, Iraq. Most participants were young adults (56.7%), male (79.7%), and holders of private driving licences (85.7%), while only 7.3% reported wearing glasses.

A significant association was found between age and recorded visual-acuity values in both eyes. Age group was also significantly associated with driving licence type, and gender was significantly associated with driving licence type. However, no significant associations were found between age and glasses use or between educational level and glasses use.

Wearing glasses was significantly associated with recorded visual-acuity categories in the right eye (OR = 3.08, $p = 0.022$) and left eye (OR = 7.23, $p < 0.001$). These findings require cautious interpretation because the meaning of the visual-acuity values and the direction of the odds ratios need verification. [8], highlighted the importance of visual function in driving safety, while [9],) examined the relationship between age, visual impairment, and driving performance.

No significant associations were found between educational level and right-eye visual acuity, residence category and right-eye visual acuity, or educational level and residence category. These findings do not necessarily indicate that no relationships exist, as small group sizes may have influenced the results.

Although the study aimed to investigate road safety, the relationships between visual acuity and accident frequency, traffic violations, accident severity, and accident type could not be assessed because the required data were unavailable. Therefore, the study cannot determine whether reduced visual acuity increases accident risk or whether wearing glasses prevents road accidents. The [10], emphasizes the importance of addressing multiple factors to improve road safety.

Overall, the findings indicate associations between recorded visual acuity, age, glasses use, and driving licence characteristics. Further research using clearly defined visual-acuity measurements and reliable road-accident records is needed to clarify the relationship between vision and road safety among drivers in Babylon.

Conclusion

The study found significant associations between age and visual acuity, while driving licence type was associated with age and gender. No significant associations were observed between glasses use and age or education, or between residence and visual acuity. Further research using standardized vision assessments and road-accident data is needed to clarify the impact of visual acuity on driving safety.

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Conflicts of interest

No conflicts of interest**.**

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