



Glaucoma Knowledge, Self-Reported Risk Factors, and Eye-Care Access in Selected Rural and Urban Communities of Abia State, Nigeria

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Abstract

Background: Glaucoma is a progressive optic neuropathy and is the leading cause of irreversible blindness globally. Blindness can be prevented by public awareness of glaucoma, identification of risk factors, and eye-care habits. This study aimed to compare the knowledge, self-reported risk factors, and access to eye care services between selected rural and urban communities of Abia State, Nigeria.

Methods: A community-based comparative cross-sectional study was conducted among 468 adults aged ≥ 40 years (234 rural, 234 urban). Participants were selected using a multistage sampling method and completed a pre-tested interviewer-administered questionnaire. Ten items assessed glaucoma knowledge; a score ≥ 5 was classified as good knowledge. Data were analyzed using descriptive statistics and chi-square tests, with statistical significance set at $p < 0.05$.

Results: Rural residents had significantly lower glaucoma awareness (35.9% vs 69.7%; $p < 0.001$) and good knowledge (33.3% vs 68.4%; $p < 0.001$) compared with urban residents. Compared to urban respondents, rural respondents were less likely to be aware of key prevention messages, such as glaucoma has no early symptoms (32.1% vs 85.5%), glaucoma runs in families (21.4% vs 59.8%), and blindness is preventable (29.9% vs 76.9%). There were no significant differences in self-reported risk factors by setting. Access to eye care was markedly lower in rural areas (34.2% vs 74.4%; $p < 0.001$). Of those who could get access, 65.0% of rural people only had eye checks when they had symptoms, compared to 50.0% of urban people who had annual eye checks. Cost was the main barrier in both groups, followed by distance and lack of symptoms. The pattern of barriers did not differ significantly between communities ($\chi^2 = 0.50$, $p = 0.781$).

Conclusions: Significant rural-urban disparities exist in glaucoma knowledge and preventive

eye-care practices in Abia State. Targeted health education and community-based screening programmes, particularly in rural areas, are urgently needed to reduce avoidable blindness from glaucoma.

Keywords: glaucoma knowledge; risk factors; eye-care access; rural health; urban health; Nigeria

Introduction

Glaucoma is a family of optic neuropathies, or nerve diseases, characterized by injury to the retinal ganglion cells and typical optic nerve damage (1). Glaucoma cannot be reversed if vision is lost, but early identification and management of glaucoma can slow disease progression (2). The public health problem is that many people don't notice early signs of glaucoma, so waiting for people to complain about their vision may result in late presentation. Also, glaucoma is a disease that is growing in prevalence globally, and is expected to affect 111.8 million individuals by 2040, disproportionately affecting Africa and Asia (3-5).

Glaucoma is a major burden in Nigeria. The Nigeria National Blindness and Visual Impairment Survey projected an overall prevalence of 5.02% of adults aged 40 years and over having glaucoma, with open-angle glaucoma being the most common form of the disease (6). The population-based studies in Nigeria have also shown older age, family history, and eye and systemic features as key correlates of open-angle glaucoma (7). Hospital-based studies have also shown that patients with glaucoma often present at advanced stages, with a significant proportion already blind at diagnosis, highlighting the importance of early detection and treatment (8). The relevance of targeted knowledge to these findings is highlighted by the fact that individuals with knowledge and awareness of the condition are more likely to accept testing for the condition and to seek care before the onset of irreversible visual loss (9, 10).

Knowledge is more than just hearing the word "glaucoma." Knowledge regarding glaucoma can be useful to recognize that it can occur without symptoms in its early stages, is a family disease, is more likely to occur as people get older, can be treated, and that eye examinations are necessary even with no symptoms (11, 12). Research conducted in Nigeria has highlighted the possibility that awareness and detailed knowledge can be different. An urban outreach study in South-East Nigeria, for instance, revealed a higher level of awareness than an adequate level of knowledge about the disease, while qualitative studies in the neighboring state of Anambra pointed to the significance of risk perception and health-seeking behaviour in glaucoma prevention (13, 14).

Access to care also impacts the capacity to put knowledge into practice. The African scoping review recently conducted in Nigeria revealed some factors that may limit glaucoma care, which included costs, travel distance, low education, unemployment, and inadequate diagnostic capacity (15). The barriers may be different in rural and urban settings due to the differences in transport, specialist services, and socioeconomic factors (16). Yet local evidence on the differences in knowledge, self-reported risk factors, and care-seeking behaviors between rural and urban areas in Abia State is limited.

This manuscript provides a separate analysis of the same community survey, which yielded a paper on prevalence and clinical determinants of glaucoma. The present analysis is limited to community awareness and knowledge, self-reported glaucoma-associated risk factors, access to eye care, routine eye-check practices, and barriers to care. It thus tackles another public health

issue: Do the information and service requirements for early detection of glaucoma vary between rural and urban populations? The general objectives of the study were to examine the differences in the knowledge of glaucoma and risk factors among selected rural and urban communities in Abia State.

Methods

Study design and setting

The study was a comparative cross-sectional study carried out between July and October, 2025 in selected communities of rural and urban areas of Abia State, South-East region of Nigeria. The rural study area was in Ikwuano Local Government Area while the urban study area was in Umuahia North Local Government Area. Residents of the chosen community were eligible if they were adults (40 years or older). Those who failed to complete the interview and/or examination process were not included.

Study Population

These adults (age 40 and above) were community-dwelling adults who had been living in the selected communities for at least one year before the study was conducted. The age cut-off was selected based on the fact that the risk of glaucoma markedly rises after age 40, and this age group represents the population at highest risk for glaucoma-related visual impairment.

Inclusion Criteria

1. Adults aged 40 years or older
2. Residents who had lived in the selected community for at least one year before the study
3. Individuals who provided voluntary written informed consent

Exclusion Criteria:

1. Individuals unable to complete the interview or clinical examination due to physical or cognitive limitations
2. Individuals with pre-existing ocular conditions (e.g., acute eye infection, recent eye surgery, severe corneal opacity) that could confound glaucoma diagnosis or affect self-report of risk factors
3. Individuals who declined to participate or withdrew consent during the study

The sampling technique and sample size

Sample Size Calculation: We used the formula for comparing two proportions for the minimum sample size:

$$N = \frac{[A+B]^2 \times [(p1 \times (1-p1)) + (p2 \times (1-p2))]}{[p1-p2]^2}$$

Where:

A = 1.96 (standard normal deviate for 5% significance level)

B = 0.84 (Standard normal deviate for 80% power)

The prevalence of glaucoma in the urban population, $p_1 = 4.0\%$ (17)

In the rural population, the prevalence of glaucoma $p_2 = 1.6\%$ (17)

A minimum sample size was calculated for each group of 214 participants. The sample size ($n = 234$) was inflated for a 10% non-response/attrition to account for 468 total participants per group.

Sampling Procedure

A multi-stage sampling technique was used:

Stage 1 (Stratification): Abia State's LGAs were stratified into rural (12 LGAs) and urban (5 LGAs). One urban LGA (Umuahia North) and one rural LGA (Ikwo) were selected by balloting.

In stage 2 (Ward selection), one ward was selected from each LGA using balloting: Umuahia Urban I (urban) and Oboro III (rural).

In stage 3 (Community Selection), one community from each ward was selected (Umuahia town is considered urban while Nnono community is considered a rural community).

In stage 4 (Participant Selection), systematic sampling was employed. Sample frames were created for each community based on an estimated adult population. The sampling interval (k) was determined by dividing the estimated population size (N) by the desired sample size (n). For the rural community, $k = 15$; and for the urban community, $k = 90$ (estimated population was ~3,500 and ~21,000, respectively). The starting point was randomly chosen between 1 and k , and every k th eligible adult was selected until the desired number of persons was obtained.

Data Collection and Measures

Pre-tested, structured interviewer-administered questionnaires and a short clinical eye examination to confirm the diagnosis of glaucoma were used to collect data (see companion paper for details).

Questionnaire Development and Pre-testing: The questionnaire was developed in English based on a review of the literature and adapted to the local context. It was pre-tested with a sample of 23 urban medical students and 23 rural church members not included in the main study sample. The pilot test was used to help clarify ambiguous questions, eliminate redundant items, and reorder the sections. The final version was given in English or translated into Igbo by trained interviewers, as participants wished, to achieve full understanding.

Study Instrument

Data were collected using a structured interviewer-administered questionnaire with the following sections:

Section A: Sociodemographic characteristics (age, sex, occupation, education, marital status, religion)

Section B: Glaucoma awareness and knowledge (10 items, see knowledge scoring below)

Section C: Self-reported risk factors (family history of glaucoma, hypertension, diabetes mellitus, history of eye trauma, use of unprescribed eye drops, and regular physical exercise)

Section D: Eye-care access, eye-check practices, barriers to eye-care, willingness to participate in free eye-checks

Knowledge questions: There were 10 knowledge questions that included knowledge about raised intraocular pressure, age as a risk factor, familial nature of glaucoma, treatability, irreversibility of glaucoma blindness, association with hypertension and diabetes, asymptomatic early course, preventability of blindness, and distinction between glaucoma and cataract. There were 1 point per correct answer and 0 points for each incorrect or "don't know" answer. If the score was ≥ 5 out of 10, it was considered "good knowledge"; otherwise, it was considered "poor knowledge".

Clinical Examination: All participants were examined for visual acuity (Snellen/illiterate E chart), anterior segment examination, intraocular pressure (Perkins handheld applanation tonometer), and fundoscopy for optic disc evaluation using the International Society for Geographical and Epidemiological Ophthalmology (ISGEO) criteria for glaucoma diagnosis (18). These data are not used directly in the present analysis, but were used in the prevalence paper to identify glaucoma cases.

Validity and Reliability

Face and Content Validity: The questionnaire was initially reviewed to ensure it was relevant to the study objectives and included important domains by three public health experts and two ophthalmologists. Items were revised with expert feedback for ambiguous items.

Construct Validity: Based on the pilot data, the 10 items of the knowledge scale had good internal consistency (Cronbach's $\alpha = 0.78$), suggesting that the items assessed a common knowledge construct.

Reliability: Test-retest reliability was tested by giving the same knowledge test to 20 participants (10 rural, 10 urban) two weeks later. The intraclass correlation coefficient (ICC) was 0.82, which meant that responses were stable over time.

Inter-rater Reliability: Two days of training were provided to research assistants in interviewing techniques. Pilot testing was used to assess interrater agreement, which was excellent (Cohen's $\kappa > 0.85$) for the knowledge scoring.

Statistical Analysis

Data were coded in a Microsoft Excel spreadsheet, cleaned, and then analyzed in IBM SPSS Statistics version 25. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize participant characteristics, knowledge responses, risk factors, and care-seeking practices. Pearson chi-square tests (or Fisher's exact test when the expected number of cells was < 5) were used to compare categorical variables between the rural and urban respondents. A Two-tailed, independent samples t-test was performed to compare the mean ages of the two groups. A p -value of < 0.05 was deemed statistically significant.

Ethical considerations

Before data collection, ethical approval was obtained from the Ethics Committee, School of Public Health, University of Port Harcourt, and the Research and Ethics Committee, Federal Medical Centre Umuahia. All participants gave written informed consent. If participants were not able to read the consent form, the contents were explained before obtaining consent.

Results

Participant characteristics

A total of 468 persons were recruited, with 234 from rural and 234 from urban areas, all of whom provided data for the questionnaires. Rural respondents were older on average than urban respondents (46.23 ± 12.41 vs 40.82 ± 11.58 years; $p = 0.001$). There was a slight majority of women in both communities. The main occupation in the rural community was farming (45.3%), while civil service (33.3%) and trading (30.3%) were more common in the urban community. A higher percentage of urban respondents had tertiary education (35.9%) compared with rural respondents (17.9%) (Table 1).

Table 1. Selected characteristics of study participants by place of residence

Characteristic	Rural (n = 234)	Urban (n = 234)
Age, mean +/- SD (years)	46.23 +/- 12.41	40.82 +/- 11.58
Sex: male	108 (46.2)	104 (44.4)
Sex: female	126 (53.8)	130 (55.6)
No formal education	28 (12.0)	12 (5.1)
Primary education	70 (29.9)	43 (18.4)
Secondary education	94 (40.2)	95 (40.6)
Tertiary education	42 (17.9)	84 (35.9)
Farmer	106 (45.3)	0 (0.0)
Trader	59 (25.2)	71 (30.3)
Civil servant	19 (8.1)	78 (33.3)
Artisan	0 (0.0)	40 (17.1)
Unemployed	35 (15.0)	25 (10.7)
Other occupation	15 (6.4)	20 (8.6)

Values are n (%) unless otherwise indicated. The difference in mean age was statistically significant (independent-samples *t* test, *p* = 0.001).

Awareness and knowledge of glaucoma

The awareness of glaucoma was significantly lower among rural respondents as compared to urban respondents (35.9% vs 69.7%, chi-square = 52.13, *p* < 0.001). In addition, the proportions of correct responses for nearly all knowledge items were higher for urban respondents. The largest gaps between rural and urban populations were in the recognition that glaucoma may not have symptoms in the early stages (32.1% vs 85.5%), that blindness can be prevented if treated in time (29.9% vs 76.9%), and that glaucoma tends to run in families (21.4% vs 59.8%). In the overall analysis, 33.3% of rural respondents and 68.4% of the urban respondents (chi-square = 45.37, *p* < 0.001) were knowledgeable about glaucoma (Table 2).

Table 2. Awareness and knowledge of glaucoma by place of residence

Knowledge item / correct response	Rural n (%)	Urban n (%)	p-value
Had heard of glaucoma	84 (35.9)	163 (69.7)	<0.001
Glaucoma is associated with raised intraocular pressure	60 (25.6)	150 (64.1)	<0.001
Glaucoma is more common after age 40 years	100 (42.7)	180 (76.9)	<0.001
Glaucoma can run in families	50 (21.4)	140 (59.8)	<0.001

Knowledge item / correct response	Rural n (%)	Urban n (%)	p-value
Glaucoma can be treated	85 (36.3)	190 (81.2)	<0.001
Blindness from glaucoma cannot be cured	140 (59.8)	160 (68.4)	0.064
Hypertension is a glaucoma-related risk factor	50 (21.4)	140 (59.8)	<0.001
Diabetes is a glaucoma-related risk factor	40 (17.1)	120 (51.3)	<0.001
Glaucoma can be asymptomatic early	75 (32.1)	200 (85.5)	<0.001
Glaucoma-related blindness can be prevented	70 (29.9)	180 (76.9)	<0.001
Cataract is not the same as glaucoma	110 (47.0)	141 (60.3)	0.007
Overall good knowledge (score >= 5/10)	78 (33.3)	160 (68.4)	<0.001

Good knowledge was defined as a score of 5 or more out of 10 items. *P*-values are from chi-square tests comparing rural and urban respondents.

Self-reported risk factors and access to eye care

The frequency of self-reported family history of glaucoma, hypertension, diabetes, eye trauma, use of unprescribed eye drops and regular physical activity was not statistically different between the two communities, although these frequencies were numerically different. Access to eye care, however, had a significant difference between rural and urban respondents (chi-square = 65.20, *p* < 0.001), with 34.2% of rural respondents reporting access compared to 74.4% of urban respondents. Attendance was good for both communities at the free glaucoma screening programme (91.0% rural and 92.7% urban) (Table 3).

Table 3. Self-reported glaucoma-related risk factors and preventive eye-care indicators

Indicator	Rural n (%)	Urban n (%)	Chi-square	p-value
Family history of glaucoma	32 (13.7)	46 (19.7)	2.50	0.110
Hypertension	62 (26.5)	79 (33.8)	3.10	0.078
Diabetes mellitus	27 (11.5)	39 (16.7)	2.20	0.130
History of eye trauma	19 (8.1)	23 (9.8)	0.27	0.600
Use of unprescribed eye drops	56 (23.9)	67 (28.6)	1.15	0.280
Regular physical exercise	112 (47.9)	124 (53.0)	1.05	0.310

Indicator	Rural n (%)	Urban n (%)	Chi- square	p- value
Access to eye care	80 (34.2)	174 (74.4)	65.20	<0.001
Willing to participate in free screening	213 (91.0)	217 (92.7)	-	-

Values refer to respondents reporting the indicated characteristic. P-values compare rural and urban respondents using chi-square tests. A dash indicates that no comparison statistic was reported for that indicator.

Eye-check practices and barriers to care

In terms of eye care access, the rural respondents were more likely to seek eye check-ups when they felt they needed them (65.0%), compared to the urban respondents (50.0%) who were more likely to have annual eye checks. There was a significant difference between communities in the distribution of eye-check frequency ($\chi^2 = 29.27$, $p < 0.001$). In both communities, the primary barrier to accessing eye care was the cost of services, distance to an eye-care facility and lack of symptoms being the next most common barriers. There was a difference in the reported barrier pattern between communities ($\chi^2 = 0.50$, $p = 0.781$).

Table 4. Eye-check practices and barriers to eye care by place of residence

Measure	Rural	Urban	Chi- square	p- value
Eye-check frequency among those with access to care (rural n = 80; urban n = 174)			29.27	<0.001
Every 6 months	10 (12.5)	36 (20.7)		
Yearly	18 (22.5)	87 (50.0)		
Only as needed	52 (65.0)	51 (29.3)		
Barrier among those without access to care (rural n = 154; urban n = 60)			0.50	0.781
Cost	74 (48.1)	27 (45.0)		
Distance to eye-care facility	53 (34.4)	20 (33.3)		
No symptoms	27 (17.5)	13 (21.7)		

Values are n (%). The chi-square test for each section compares the distribution of categories between rural and urban respondents.

Discussion

This study found a clear rural-urban gap in glaucoma-related knowledge and in the conditions needed for preventive eye care in Abia State. Approximately seven in ten respondents in the urban community were aware and had good knowledge about glaucoma,

whereas fewer than four in ten in the rural community were aware and had good knowledge. Rural respondents were less likely to recognize key prevention messages, including that glaucoma may have no early signs or symptoms, it can run in families, and blindness can be avoided with early detection and treatment. These gaps are significant because people may seek care after significant, irreversible damage has already occurred (19).

The findings of the knowledge are consistent with the Nigerian evidence that knowledge alone does not ensure understanding for prevention. Kizor-Akaraiwe and colleagues noted in a study on the awareness of adequate knowledge among participants of an eye outreach programme in South-East Nigeria that awareness was greater than adequate knowledge (13). The urban community in the present study had a higher profile of knowledge as compared to the rural community; however, the knowledge was found not to be universal even among the urban respondents (13). The rural burden seen here is similar to the results obtained by a previous study in the adult rural population in Osun State, where glaucoma awareness and attitude showed the population required population-based education (20). Similarly, a comparative study in Bangladesh found significantly lower knowledge and awareness among rural patients compared to urban patients, highlighting the persistent urban-rural gap in glaucoma literacy across different settings (21). Also, low awareness and poor knowledge have been reported in semi-urban and rural communities in other parts of Nigeria such as South-South and South-East (19, 22). While caution must be used when making direct percentage comparisons due to differences in study populations, content in the questionnaires, and the scoring points, the overall message is the same: health communication must go beyond the naming of glaucoma.

The most significant knowledge gap involved recognition of the asymptomatic early course of glaucoma. Less than one-third (32.1%) of rural respondents were aware that glaucoma can present early without symptoms, compared to more than three-quarters (85.5%) of urban respondents. This discovery sheds light on the above-reported care-seeking pattern, whereby even those in the rural areas who indicated eye care access were most likely to seek examination when required. However, symptom-driven attendance is not sufficient to prevent attendance if the symptoms are not present in the early stages. Glaucoma should be explicitly mentioned as a disease for which good vision is not an exclusion, and it should be emphasized that adults 40 years old and over should have regular comprehensive eye examinations, especially if they have a family history or other factors that increase their risk (23, 24).

The study also showed that both communities had self-reported risk factors. The results were 13.7% of the rural respondents reported family history compared with 19.7% of the urban respondents, 26.5% of the rural respondents reported hypertension, while 33.8% of the urban respondents reported hypertension, and 23.9% of the rural and 28.6% of the urban respondents reported using unprescribed eye drops. These distributions were not statistically different between settings, but they were common, thereby justifying the use of risk-based screening messages in both settings. Age and family history have been identified in population-based studies in Nigeria as relevant factors in the determination of the risk of open-angle glaucoma, and should be asked about in community education and in primary care visits (7). Unprescribed eye drops, which are relatively common, could be used inappropriately, so it would be helpful for people to be aware of the dangers of using unprescribed eye drops and to seek eye care from trained professionals (25, 26).

The greatest rural-urban difference in the current analysis was access to eye care. Nearly three-quarters of the urban respondents, compared with only one-third of rural respondents, reported access. In both locations, the most commonly cited barriers to access were cost and distance to an eye-care facility when access was not available. This is similar to the general picture presented in the Nigerian evidence base, in which financial limitations, travel distance, education, employment and service limitations all play a role in the restriction of glaucoma care (15, 27, 28). The pattern of barriers did not differ significantly between communities ($p = 0.781$); however, the overall accessibility of care was significantly lower in rural areas, and the pattern of care was more symptom-driven.

Interestingly, there was a high level of acceptance of glaucoma screening programme participation in both communities (over 90%). This means that community-based screening and referral interventions would be acceptable. Such programmes may be implemented in the primary health-care centres, market associations, faith-based groups, and community leaders in the rural areas, and there must be definite referral paths to eye-care providers. Screening should be accompanied by counselling and support services; screening alone is not enough if the participants have no access to transport, confirmatory assessment, or long-term treatment. Communication should employ simple Igbo and English messages, emphasize family screening, and educate people that the diseases of cataract and glaucoma are distinct (9).

Limitation of the study

The study was cross-sectional and could not thus draw causal relationships between knowledge, access, risk exposure, and subsequent eye-health behaviour. Certain risk factors and barriers were self-reported and are subject to recall and/or reporting bias. The findings should not be construed as representative of the entire rural and urban population in Nigeria, as the samples were selected from certain communities in one state. The 10-item knowledge score was study-specific, and the threshold for good knowledge should be taken with this caveat. Nevertheless, the equal-sized, community-based comparison and pre-tested interviewer-administered questionnaire provide useful local evidence for designing differentiated eye-health interventions.

Conclusion

The knowledge level on glaucoma and access to preventive eye care were significantly low in the rural community compared to the urban community in Abia State. The biggest identified needs were lack of knowledge of the early, symptom-free nature of glaucoma, familial risk, and the fact that vision loss is preventable. Risk factors reported by participants were present in both locations, while limited access to eye care and symptom-driven eye checks were particularly prominent in the rural setting. Eye-health programmes in Abia State need to integrate targeted rural education with low-cost outreach eye screening, referral assistance, and ease of routine eye examinations.

Recommendations

1. Ensure sustained rural glaucoma education through primary health-care clinics, churches, markets, radio & community leaders; messages should include: asymptomatic disease, family history, age > 40 years, regular examination.
2. Incorporate opportunistic glaucoma-risk education and referral into hypertension and diabetes clinics to identify adults with appropriate comorbidities.

3. Conduct screening outreach and outreach services with a clear referral and follow-up process at regular intervals, particularly in rural areas where eye care services are less readily available.
4. Minimize financial and travel restrictions by providing subsidized screening, travel assistance (where possible), and better co-ordination between primary and specialist eye services.
5. Reduce the use of eye drops without supervision by advocacy activities in the community, pharmacy, and patent medicine vendors.

Related-publication statement

A companion manuscript, based on the same cross-sectional community survey, explores the prevalence and clinical determinants of glaucoma. The present manuscript focused on a different question and provides different findings: glaucoma awareness and knowledge, self-reported risk factors, access to eye care, routine eye-check practices, and barriers to care. Does not replicate prevalence estimates or adjusted determinant analyses that accompany the manuscript and came from a different source.

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Conflict of Interest

All authors declare that they have no conflicting interests. There are no financial or personal relationships that might have influenced or biased the conduct and/or reporting of this research.

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