

Prevalence and Causes of Blindness Among Eye Patients Seen in a State Tertiary Hospital in Enugu, Nigeria

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Received date: June 05, 2025; **Accepted date:** June 14, 2025; **Published date:** June 21, 2025

Citation: Eze GC, Chukwunonye CR, Onah ES. Prevalence and Causes of Blindness Among Eye Patients Seen in a State Tertiary Hospital in Enugu, Nigeria. *J Med Res Surg.* 2025;6(3):92-99. doi:10.52916/jmrs254179

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ABSTRACT

Background: Vision is one of the most supreme human senses and plays a significant role in every facet of human life, with deleterious consequences for the individual whenever it is affected. There is a report of a high global burden of blindness and visual impairment.

Aim/Objective: The study aimed to determine the prevalence and causes of blindness among patients seen in the eye clinic at Enugu State University Teaching Hospital (ESUTH), Parklane.

Methods: A retrospective cross-sectional hospital-based study conducted in October 2023.

Results: There were 1006 cases, 648 were females (64.4%) and 358 were Males (35.6%). The mean age was 48.6 years, with the majority (57.5%) being between 41-70 Years old. Traders were more in the general study (25.2%). The prevalence of blindness was 6.9%, and Glaucoma was the commonest cause of blindness, accounting for 53.62% of the cases, followed by Cataract at 42.03%. The older age group (41 and above) were more frequently affected by blindness compared to the younger age group. Farmers had the highest number of those affected by blindness. 37.7% of those blind improved after treatment, of which the majority had cataract, while the majority of those who remained blind after treatment had glaucoma.

Conclusion: The study showed a significant prevalence of blindness, and the major causes are glaucoma and cataract which are either preventable or reversible. Therefore, there is a need to address these preventable and reversible causes of blindness.

Keywords:

Blindness, Cataract, Glaucoma, Ophthalmology, Eye vision.

Introduction

Blindness is one of the major disabilities that affect the psycho-socio-economic life of the concerned individual. It does not only affect the person but also the immediate family, friends, community, and in general the whole nation [1,2]. World Health Organization (WHO) has defined blindness as Visual Acuity (VA) presented as <3/60 in the better eye or visual field loss of <10 degrees from central fixation in the better eye with the best possible correction [2,3].

The number of people affected with blindness is on the rise, with WHO reporting over 39 million globally. Blindness affects people more in developing countries, with 9 out of 10 blind persons said to be from developing countries. The working age group is affected more in low-income countries, especially the Sub-Saharan African countries, where blindness is reported to be significantly on the increase [4-6]. In a hospital-based study in the south-eastern part of Nigeria, the prevalence of blindness was found to be 6.1% [4].

Different causes of blindness have been identified from various studies published in reputable journals. Cataracts is the leading

cause of blindness as identified by most studies [3,5,7-12]. A systematic review in 2017 reported that the global leading causes of blindness in all ages include cataract, glaucoma, Age-Related Macular Degeneration (ARMD), corneal opacity, trachoma, diabetic retinopathy, and uncorrected refractive error [7]. Studies in Nigeria reported similar pattern of blindness, with cataracts, refractive errors and glaucoma as leading causes [1,9,10]. Other causes of blindness like Retinitis pigmentosa and pterygium were also identified in a previous study in Nigeria [6].

This study aims to determine the prevalence and causes of blindness in eye patients in Enugu State University Teaching Hospital Parklane. The findings from this study could be valuable in understanding the prevalence and causes of blindness as well as developing measures to address them.

Materials and Methods

Methodology

This study is a retrospective cross-sectional hospital-based study carried out in October 2023.

Study population

Participants in the study were all the patients that attended the eye clinic of Enugu State University Teaching Hospital Parklane

(ESUTH) between 1st October 2023 to 31st October 2023. The hospital is located in the Southeast region of Nigeria. The study was conducted according to the guidelines of the Declaration of Helsinki.

Ethical clearance

Ethical clearance was obtained from the Ethics and Research Committee of ESUTH and strict confidentiality of patients' data was ensured.

Inclusion criteria

All patients seen between 1st October 2023 to 31st October 2023.

Exclusion criteria

Case notes with incomplete required information.

Study procedure, data collection and analysis

Case notes of all the patients seen at the eye clinic of ESUTH

from 1st October 2023 to 31st October 2023 were pulled out in batches from the medical records unit by a medical record officer who took note of the number of case notes being given out. Data was collected from these case notes and required information was obtained including biodata (age, gender, occupation, marital status, religion), presenting visual acuity, diagnosis, treatment given (drugs/eye drops, surgery, glasses), final visual acuity after treatment, cause of blindness for those blind. Blindness according to the WHO classification was used (visual acuity less than 3/60 in the better eye).

Following data collection, the complete case notes pulled out were returned to the medical records unit and handed over to the same medical record officer who cross-checked to make sure that the returned case notes were complete. Data collection was done within the hospital premises at the eye clinic of the hospital. No case note was taken out of the hospital premises in the process.

Table 1: Frequency and percentage distribution of respondents' demography.

Variable	Category	Frequency	Percent (%)
Age group	Below 21	151	15
	21-30	68	6.8
	31-40	93	9.2
	41-50	152	15.1
	51-60	211	21
	61-70	215	21.4
	71-80	92	9.1
	81-90	22	2.2
	91-100	2	0.2
Age (years)	Mean		48.56
Standard deviation		20.67	
Gender	Female	648	64.4
	Male	358	35.6
Marital status	Married	728	72.4
	Single	233	23.2
	Widow	45	4.5
Religion	Christianity	1006	100
Occupation	Artisan	97	9.6
	Civil servant	107	10.6
	Driver	12	1.2
	Engineer	9	0.9
	Farmer	137	13.6
	Lawyer	1	0.1
	Nurse	1	0.1
	Pastor	11	1.1
	Retired	122	12.1
	Student	198	19.7
	Teacher	54	5.4
	Trader	254	25.2
	Unemployed	3	0.3

The obtained data was input directly into a computer using an Excel sheet and analyzed with Statistical Package for Social Sciences version 26 (SPSSv26). Descriptive data was presented in tables and charts. Comparison was made using chi-square for categorical variables. A p-value less than 0.05 is considered to be significant.

Results

This section reports the results of 1006 respondents.

Table 1 presents the demographic characteristics of 1,006 respondents, aged between 1 to 93 years and a mean age of 48.6 years (SD=20.67). The majority of participants were between the ages of 41 and 70, comprising about 57.5 % of the sample. Females made up a larger proportion of the cases at 64.4%, while males constituted 35.6%. Most participants were married

(72.4%), with singles making up 23.2% and widows 4.5%. All respondents identified as Christians. Occupationally, the largest group were traders (25.2%), followed by students (19.7%), farmers (13.6%), and retirees (12.1%). Other occupations such as artisans, civil servants, and teachers were also represented in notable proportions, while a few identified as lawyers, nurses, or unemployed.

Table 2 shows the distribution of visual acuity among the participants in individual eyes, indicating that the majority had normal vision in both eyes, with 50.4% having normal vision in the right eye and 49.1% in the left eye. Mild visual impairment was present in 10.5% of participants' right eye and 9.9% of the left eye. Moderate visual impairment was observed in 17.7% of right eye and 18.4% of left eye. Severe visual impairment was less common, affecting 3.9% of right eye and 3.4% of left eye.

Table 2: Presenting Visual Acuity (PVA) in each eye.

Presenting visual acuity	Right eye (PVAR)	Left eye (PVAL)
Normal vision (VA $\geq$ 6/12)	507 (50.4%)	494 (49.1%)
Mild Visual impairment (VA <6/12-6/18)	106 (10.5%)	100 (9.9%)
Moderate visual impairment (VA <6/18-6/60)	178 (17.7%)	185 (18.4%)
Severe visual impairment (VA <6/60-3/60)	39 (3.9%)	34 (3.4%)
Blindness (VA <3/60)	176 (17.5%)	192 (19.1%)
Total	1006 (100.0%)	1006 (100.0%)

Table 3: Distribution of diagnoses in each eye.

Diagnosis	Right eye	Left eye
Normal findings	50 (5.0%)	69 (6.9%)
Anterior staphyloma	2 (0.2%)	0(0.0%)
Secondary glaucoma	0(0.0%)	1 (0.1%)
Albinism	1 (0.1%)	1 (0.1%)
Allergic conjunctivitis	52 (5.2%)	56 (5.6%)
Anterior uveitis	11 (1.1%)	3 (0.3%)
Aphakia	10 (1.0%)	7 (0.7%)
Age Related macular degeneration	3 (0.3%)	3 (0.3%)
Bacteria conjunctivitis	6 (0.6%)	6 (0.6%)
Blepharitis	3 (0.3%)	3 (0.3%)
Chalazion	4 (0.4%)	2 (0.2%)
Complicated cataract	5 (0.5%)	10 (1.0%)
Corneal ulcer	15 (1.5%)	12 (1.2%)
Dry Eye Syndrome	27 (2.7%)	26 (2.6%)
Glaucoma suspect	30 (3.0%)	29 (2.9%)
Glaucoma	326 (32.4%)	332 (33.0%)
Immature cataract	116 (11.5%)	125 (12.4%)
Mature cataract	52 (5.2%)	47 (4.7%)
Presbyopia	12 (1.2%)	11 (1.1%)
Pseudophakia	39 (3.9%)	30 (3.0%)
Pterygium	29 (2.9%)	20 (2.0%)
Refractive error	147 (14.6%)	145 (14.4%)
Trauma	15 (1.5%)	23 (2.3%)

Blindness accounted for a significant proportion in either eye, with 17.5% of participants blind in the right eye and a slightly higher 19.1% blind in the left eye.

Table 3 presents the distribution of eye diagnoses for the right and left eye in a sample of 1,006 patients. The most common condition in both eyes was glaucoma, diagnosed in 32.4% of the right and 33.0% of the left eye. Refractive error was also

prevalent, affecting 14.6% of the right and 14.4% of the left eye. Immature cataract followed closely, seen in 11.5% of right eye and 12.4% of left eye, while mature cataract, pseudophakia and allergic conjunctivitis were also frequently reported in both eyes. Many conditions appeared in small percentages, such as corneal ulcers, dry eye syndrome, glaucoma suspects, and various inflammatory and traumatic diagnoses, often below 3%.

Table 4: Prevalence of blindness (presenting visual acuity <3/60 in the better eye).

Blindness status	Frequency	Percentage (%)	95% Confidence interval (%)
Not blind	937	93.1	91.6 - 94.5
Blind	69	6.9	5.5 - 8.4
Total	1006	100	

Table 4 shows the prevalence of blindness at 6.9%.

In Table 5a, among the cases of blindness reported, glaucoma was the commonest cause, representing 53.62% of the cases.

Cataract followed at 42.03%, while congenital anophthalmos, corneal opacity, and corneal ulcer were each very rare, each constituting only 1.45% of the cases

Table 5a: Causes of Blindness (N=69).

Causes of blindness	Frequency	Percentage
Cataract	29	42.03%
Congenital anophthalmos	1	1.45%
Corneal opacity	1	1.45%
Corneal ulcer	1	1.45%
Glaucoma	37	53.62%
Total	69	100.00%

In Table 5b, there was a statistically significant association between age, marital status, and occupation with the causes of blindness. Those without blindness were predominantly younger individuals (below age 40), while older age groups (aged 41 years and above) were more frequently affected by conditions such as cataract and glaucoma, as well as other corneal pathologies. Married individuals constituted the majority in most categories, including cataract and glaucoma. Singles were more commonly found in the non-blind group or had rare congenital causes. Widowed individuals were disproportionately represented in blindness categories. Regarding occupation, farmers had the highest representation among those affected by cataract, glaucoma, and corneal disorders. Students and civil servants were primarily observed in the non-blind group. Traders and artisans also showed moderate rates of glaucoma and other visual impairments. Gender, on the other hand, showed no significant association with the causes of blindness. Both male and female participants exhibited similar distributions across the various categories of eye conditions.

Table 6a illustrates the visual outcomes of blindness after treatment. Of 69 participants blind at presentation, 26 (37.7%) regained some vision, while 43 (62.3%) remained blind (Figure 1).

In Table 6b, the majority of those who showed improvement after treatment had cataract (92.3%), while the majority of those who remained blind had glaucoma (83.7%).

Discussion

Blindness is a tragic phenomenon to the affected person, family, community, and the nation at large [5]. This study showed a wide age distribution ranging from 1 to 93 years, indicating a diverse age profile. The majority (57.5%) were between the

ages of 41 and 70. This is likely because the risk factors for the commonest causes of blindness and visual impairment increase with age. The Nigerian National Blindness and Visual Impairment Survey reported that blindness was associated with increasing age [13]. A study in Osogbo, Abia and Lagos also reported a higher frequency in similar age group [1,3,14]. Various other studies overseas have also noted such pattern (Afghanistan, Pakistan, China, USA, Ghana), [15-19] including the WHO report on blindness [2]. There were more females cases (64.4%) than males (35.6%) in the present study. There is no clear explanation for this, but it could be attributed to poor health-seeking behaviour in males in the study region; however, some studies, including the National Blindness and Visual Impairment survey, have reported a higher prevalence of blindness in females, thereby relating the risk of blindness to female gender [4,13]. Most participants were married (72.4%), likely a reflection of age rather than anything else, and all respondents identified as Christians, which is due to the regional dominance of Christianity.

While about half of the participants retained normal vision in each eye, there was a considerable burden of visual impairment, with moderate to severe impairments and blindness affecting a substantial portion of the population in either eye, suggesting that a notable number of individuals suffer from visual disabilities. This is in keeping with the WHO report of a high global burden of visual impairment [2]. In Nigeria, according to the National Blindness and Visual Impairment Survey, it is estimated that 4.25 million adults aged ≥ 40 years have moderate to severe visual impairment or blindness [13]. Other countries, such as the United Kingdom and the United States, have also reported a similar high prevalence of visual impairment. According to Royal National Institute of Blind People (RNIB), more than 2 million

Table 5b: Distribution of blindness and its causes by demographics (N=1006, n=total blindness=69).

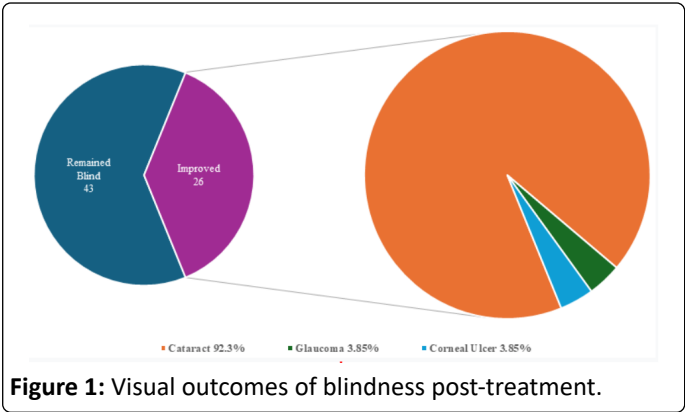
Demographic variable	No blindness (n=937)	Cataract (n=29)	Congenital anophthalmos (n=1)	Corneal opacity (n=1)	Corneal ulcer (n=1)	Glaucoma (n=37)	Total
Age group							
Below 21	150 (16.0%)	0	1 (100%)	0	0	0	151
21–30	66 (7.0%)	0	0	0	0	2 (5.4%)	68
31–40	93 (9.9%)	0	0	0	0	0	93
41–50	142 (15.2%)	7 (24.1%)	0	0	0	3 (8.1%)	152
51–60	200 (21.3%)	4 (13.8%)	0	0	0	7 (18.9%)	211
61–70	196 (20.9%)	5 (17.2%)	0	1 (100%)	0	13 (35.1%)	215
71–80	77 (8.2%)	8 (27.6%)	0	0	1 (100%)	6 (16.2%)	92
81–90	12 (1.3%)	4 (13.8%)	0	0	0	6 (16.2%)	22
91–100	1 (0.1%)	1 (3.4%)	0	0	0	0	2
χ^2 (p) 130.011 (.000)							
Gender							
Female	608 (64.9%)	18 (62.1%)	0	0	1 (100%)	21 (56.8%)	648
Male	329 (35.1%)	11 (37.9%)	1 (100%)	1 (100%)	0	16 (43.2%)	358
χ^2 (p) 5.280 (.383)							
Marital status							
Married	667 (71.2%)	26 (89.7%)	0	1 (100%)	0	34 (91.9%)	728
Single	230 (24.5%)	0	1 (100%)	0	0	2 (5.4%)	233
Widow	40 (4.3%)	3 (10.3%)	0	0	1 (100%)	1 (2.7%)	45
χ^2 (p) 43.494 (.000)							
Occupation							
Artisan	88 (9.4%)	2 (6.9%)	0	0	0	7 (18.9%)	97
Civil servant	105 (11.2%)	1 (3.4%)	0	0	0	1 (2.7%)	107
Driver	11 (1.2%)	0	0	0	0	1 (2.7%)	12
Engineer	9 (1.0%)	0	0	0	0	0	9
Farmer	110 (11.7%)	11 (37.9%)	0	1 (100%)	1 (100%)	14 (37.8%)	137
Lawyer	1 (0.1%)	0	0	0	0	0	1
Nurse	1 (0.1%)	0	0	0	0	0	1
Pastor	11 (1.2%)	0	0	0	0	0	11
Retired	113 (12.1%)	3 (10.3%)	0	0	0	6 (16.2%)	122
Student	196 (20.9%)	0	1 (100%)	0	0	1 (2.7%)	198
Teacher	47 (5.0%)	6 (20.7%)	0	0	0	1 (2.7%)	54
Trader	242 (25.8%)	6 (20.7%)	0	0	0	6 (16.2%)	254
Unemployed	3 (0.3%)	0	0	0	0	0	3
χ^2 (p) 85.408 (.017)							

Table 6a: Blindness status post-treatment

Status	Frequency	Percentage
Improved	26	37.7
Remained blind still	43	62.3
Total	69	100.0

Table 6b: Blindness status after treatment versus causes.

Cause of blindness	Improved	Remained blind	Total	Chi-square	p-value
Cataract	24(92.3%)	5 (11.63%)	29 (42.03%)	1694.676	0.000 (significant)
Congenital anophthalmos	0	1(2.33%)	1(1.45%)		
Corneal opacity	0	1(2.33%)	1(1.45%)		
Corneal ulcer	1(3.85%)	0	1(1.45%)		
Glaucoma	1(3.85%)	36(83.72%)	37 (53.62%)		
Total	26(100%)	43 (100%)	69(100%)		



people are living with sight loss in the UK [20], while the Centers for Disease Control and prevention (CDC) estimated that in 2017, more than 7 million people had vision loss or blindness in America [21].

This study also demonstrated that the most common diagnosis among the study participants was glaucoma, occurring in 32.4% of right eyes and 33.0% of left eyes, indicating a high burden of the disease in the population. Following glaucoma was cataract in various forms, affecting a total of 17.2% of right eyes and 18.1% of left eyes, and not too far behind was refractive error, affecting 14.6% of right eyes and 14.4% of left eyes. Other conditions, such as pseudophakia and allergic conjunctivitis, were also frequently reported in both eyes, reflecting the diversity of ocular pathology.

The prevalence for blindness was 6.9% (95% CI, 5.5%-8.4%). This is slightly higher than 4.2% reported by the National Blindness and Visual Impairment Survey [13]. Glaucoma was the leading cause at 53.62%, followed closely by cataract at 42.03%. Although, the high prevalence of cataract in this study did not reflect the WHO report of cataract being the leading cause of blindness globally [2,22] because glaucoma was the leading cause of blindness found in this study. This variation in findings could be explained, according to the WHO to be due to variable factors within and between countries that influence the causes of visual impairment, such as the availability of eye care services, their affordability, and the education of the population. For example, there is a higher proportion of visual impairment due to unoperated cataract in low and middle income countries whereas diseases such as glaucoma and age-related macular degeneration are more common in high income countries [2]. In the case of this study, cataract being reversible and the availability of easily accessible cataract surgery services within the study population could explain why it was not the leading cause. Also noteworthy is that the National Blindness

and Visual Impairment Survey reported a higher prevalence of glaucoma in the Southeast of Nigeria [13], which is the region where this study was conducted. Some other studies in the South East region of Nigeria have shown similar variation in findings, with glaucoma being the leading cause of blindness in the study population ahead of cataract. In a study in Awka, glaucoma led at 26%, with cataract closely behind at 23.3% [23].

Another study in Imo state also showed glaucoma as the leading cause [4]. Different other studies reported different leading causes, further buttressing that various factors can influence causes according to geographical region. A study in North Central Nigeria reported Uncorrected refractive error as the leading cause at 33.3%, followed closely by cataract at 28.3% and glaucoma at 13.3% [24]. It can be noted that the two leading causes in the above study were reversible factors, which could be a reflection of lower socioeconomic class and poor access and availability of eye care services in that region. Further contrasting findings were reported in a study in Poland where Age related Macular Degeneration (ARMD) at 18.2% was the leading cause of noncorrectable visual impairment, followed by cataract and amblyopia [25]. Another study done in USA reported ARMD as the overall leading cause of blindness, however, when analyzed according to race, cataract was the leading cause in African Americans while ARMD was the leading cause in whites [26]. Similarly, a Scandinavian study reported that while cataract was the leading cause of visual impairment in older age group, ARMD was the leading cause of blindness [27]. These all go to show that visual impairment and blindness is greatly influenced by various factors according to environment. This study, although differing in findings from the global number one leading cause of blindness, still demonstrates cataract and glaucoma as the two leading causes of blindness, aligning with the top two reported leading causes globally.

The relationship between demographic characteristics and causes of blindness was assessed. Age played a significant role in the distribution of blindness. Cataract and glaucoma were predominantly found among older adults. Married individuals represented the largest share of the population and had the highest number of cases for both cataract and glaucoma, this is likely because marriage acts as a proxy for age. Furthermore, Farmers recorded the highest frequencies for those affected by cataract, glaucoma, and corneal disorders, possibly due to greater exposure to environmental hazards, lower literacy level and limited access to treatment and preventive care. Traders and retired individuals also showed notable numbers of cataracts and glaucoma. Students and professionals such as engineers, nurses, lawyers, and clergymen were largely unaffected by most causes of blindness. These findings reflect that age-related

vulnerability, occupational exposure, reduced access to care or support or socioeconomic factors might contribute to the risk of blindness. This again agrees with what have been reported by the WHO [2] as well as other studies all over the world. A study in North Central Nigeria reported the highest prevalence of blindness amongst Farmers [24]. Similar findings of high prevalence of visual impairment and blindness amongst those with low literacy level and social class were also reported by studies in Afghanistan, China, Ghana, and South Africa [15,17,19,28].

There was a strong and statistically significant association between the cause of blindness and changes in blindness status post-treatment. Individuals with cataracts showed remarkable improvement, with 24 regaining vision after intervention, making up 92.3% of those who improved after treatment. In contrast, only 1 case of glaucoma improved following intervention. The one case of Corneal ulcer also improved following treatment. Thus demonstrating that glaucoma is an irreversible cause of blindness, while cataract is a reversible cause, agreeing with the Global Burden of Disease Study on causes of blindness and visual impairment that reported cataract as the leading cause of reversible blindness and glaucoma as the leading cause of irreversible blindness [22].

Conclusion

The findings suggest that blindness, particularly due to glaucoma and cataract is prevalent in our region, especially among older adults, and those in lower socioeconomic classes. These insights highlight the importance of age-targeted and population-specific interventions to prevent and manage avoidable and reversible causes of blindness. It also emphasizes the importance of treatment of reversible causes like cataract, while also highlighting the challenges associated with conditions such as glaucoma that often result in permanent vision loss, underlining the need for strengthened eye health services and preventive interventions. In all, there is a need for continued attention to glaucoma and cataract as primary causes of blindness in the study population, and while efforts are geared towards preventing and treating the reversible causes, aggressive creation of awareness and education on the irreversible ones are paramount.

Conflict of Interest

None.

Funding

None.

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