Epidemiology and Health System Journal
doi:10.34172/ehsj.26561 2025 Summer;12(3):120-128 http://ehsj.skums.ac.ir

Original Article

Prevalence of Cataract and Its Association with Sociodemographic Factors, Health-Related Conditions, and ABO Blood Groups in Birnin Kebbi, Nigeria

Tajudeen Olanrewaju Yahaya[1*], Rasheed Adebayo Yinusa[2], Zaharadeen Muhammad Yusuf[3], Sa'adatu Haliru[1], Priscilla Oluwaseyi Obi[1], Jibril Waziri Adamu[1]

[1]Department of Biological Sciences, Federal University Birnin Kebbi, PMB 1157, Kebbi State, Nigeria
[2]Department of Demography and Social Statistics, Federal University Birnin Kebbi, Nigeria
[3]Department of Biochemistry and Molecular Biology, Faculty of Chemical and Life Sciences, Usmanu Danfodiyo University, Sokoto, Nigeria

*Corresponding Author:
Tajudeen Olanrewaju Yahaya, Emails: yahayatajudeen@gmail.com; yahaya.tajudeen@fubk.edu.ng

Received: August 3, 2025
Revised: September 30, 2025
Accepted: October 4, 2025
ePublished: November 8, 2025

Abstract

Background and aims: The increaing prevalence of cataracts in Nigeria necessitates improved preventive strategies. Accordingly, this study assessed the prevalence of cataracts and their association with sociodemographic factors, comorbidities, and ABO blood groups in Birnin Kebbi.

Methods: A structured checklist was used to collect data from the medical records of 233 patients who attended the ophthalmology unit of two medical facilities between June 5, 2023, and June 5, 2024. Descriptive statistics were utilized to present data as frequencies and percentages. Moreover, chi-square tests and binary logistic regression were employed to test associations between cataract and explanatory variables at the 5% significance level.

Results: The overall prevalence of cataract was 23% (54 participants). In addition, binary logistic regression revealed that age was the strongest predictor of cataracts. Individuals aged 55–64 were nearly six times more likely to have cataracts than those aged ≤ 44 (OR = 5.82, 95% CI: 2.10–16.14, $P < 0.001$). Furthermore, male gender was significantly associated with increased risk (OR = 1.88, 95% CI: 1.01–3.51, $P = 0.042$). Comorbidities, including diabetes (OR = 3.49), hypertension (OR = 2.86), and glaucoma (OR = 2.64), were significant predictors ($P < 0.05$). Moreover, family history of cataract demonstrated the strongest effect, increasing the odds nearly 18-fold (OR = 17.6, 95% CI: 4.44–69.9, $P < 0.001$). Finally, ABO blood group, education, ethnicity, and religion were not significantly associated with cataracts.

Conclusion: Age, male gender, family history, and comorbidities are independent predictors of cataracts, highlighting the need for targeted prevention and early intervention strategies.

Keywords: ABO blood groups, Cataract, Ethnicity, Glaucoma, Hypertension

Introduction

Cataracts are a common ocular condition characterized by lens opacification, leading to progressive vision loss [1]. They result primarily from aggregating high molecular weight proteins or disrupting the microarchitecture of the lens [2]. Cataracts are broadly categorized into age-related and pediatric types or those arising from other etiologies. Age-related cataracts are the most prevalent, typically manifesting between 45 and 50. In contrast, pediatric cataracts are predominantly associated with hereditary and metabolic disorders [3]. Severe protein-damaging mutations are often linked to congenital cataracts, while milder genetic variants that increase vulnerability to environmental stressors have been implicated in age-related cataracts [2].

The global burden of cataracts is on the rise. They are the leading cause of preventable and treatable blindness, responsible for nearly half of all blindness cases worldwide [4]. In fact, cataracts surpass glaucoma, macular degeneration, and diabetic retinopathy combined in terms of prevalence [5]. Disability-adjusted life years attributable to cataracts globally increased by 91.2% between 1990 and 2019 [6]. As of 2020, cataracts affected over 100 million people, with 17 million cases resulting in blindness, of which 15.2 million were of the age-related type [7, 8]. In Nigeria, the situation is equally concerning. An estimated 4.25 million adults aged 40 years and above are visually impaired or blind, with cataracts contributing to over 58% of all blindness cases [9]. The socioeconomic impact of cataracts is significant. The annual expenditure on cataract surgeries is approximately $3.4 billion in the United States. In addition, the cost of a single cataract

surgery may exceed twice a patient's annual income in rural China [3]. Although national expenditure data are limited for Nigeria, the average price of cataract surgery in government hospitals is about $77.45 and $128.23 for the surgical fee and total treatment, respectively [10].

Despite its cost, surgery is one of the most cost-effective medical procedures for cataracts globally, with more than 30 million procedures annually [6]. However, the high prevalence of untreated cataract blindness, especially in developing countries, remains a critical challenge. Although cataract surgery is generally safe, it can occasionally result in a number of complications, such as vitreous loss, cystoid macular edema, and endophthalmitis [11]. Moreover, direct and indirect costs can hinder access to surgical care in low-resource settings [10]. Given these challenges, there is a need for complementary strategies to reduce the incidence of cataracts as part of global efforts to achieve the United Nations Sustainable Development Goals by 2030 [12]. Emerging evidence suggests that delaying the onset of cataracts by ten years could reduce the number of surgical interventions needed by half, significantly easing the healthcare burden, especially in low-resource countries [1]. Furthermore, preventive approaches through better understanding modifiable risk factors could be instrumental in reducing disease incidence while improving public health outcomes. Although aging is the major risk factor for cataract formation, other contributors, such as diabetes mellitus (DM), nutritional deficiencies, ultraviolet radiation exposure, and smoking, are well-documented [5]. Recently, attention has turned to the potential role of ABO blood groups and other individual-level factors in influencing disease susceptibility. The ABO blood group system classifies individuals into A, B, AB, and O based on the presence of specific antigens on the surface of red blood cells. While primarily used in transfusion medicine, these antigens have increasingly been recognized for their potential involvement in various diseases via some mechanisms, such as oxidative stress and chronic inflammation [13]. Although some studies have reported associations between ABO blood groups and disease susceptibility [14, 15], a definitive link with cataractogenesis remains unproven. Likewise, the relationship between cataracts and other determinants (e.g., comorbidities and sociodemographic characteristics) has not been established. The absence of conclusive evidence highlights the necessity for further research to elucidate the contribution of these factors to cataract development, which can, in turn, guide more targeted approaches to prevention, screening, and treatment.

Data on the prevalence of blindness and the role of cataracts are limited in the specific context of Birnin Kebbi, Northwestern Nigeria. A 2008 study reported a bilateral blindness rate of 4.5%, with cataracts accounting for 2.1% of these cases [16]. However, the influence of sociodemographic variables, ABO blood group genotypes, and chronic medical conditions on cataract incidence in this region remains largely unexplored. Therefore, this study seeks to determine the prevalence of cataracts and examine their associations with sociodemographic characteristics, health conditions, and ABO blood group genotypes among residents of Birnin Kebbi, Nigeria.

Materials and Methods

Description of the Study Site

Birnin Kebbi is a city in Kebbi State, Northwestern Nigeria. Geographically, it is located at a latitude of 12.4318° N and a longitude of 4.1956° E. The Hausa, Fulani, and Zuru ethnic groups predominantly inhabit the region. Additionally, the city hosts a significant population of settlers from various ethnic backgrounds, including Yoruba, Igbo, and Nupe, reflecting its cultural diversity.

The climate of Birnin Kebbi is characterized by a prolonged dry season, which typically extends from November to June. Moreover, temperatures can exceed 40°C during peak periods and drop below 20°C during cooler phases. However, the average temperature ranges from 26°C to 35°C. In addition, the area is frequently subjected to environmental conditions, such as dust storms, intense solar radiation, strong winds, smoke, and airborne debris, contributing to a higher risk of ocular health issues, including blindness [17].

Study Population

The study population comprised patients with eye conditions who visited the ophthalmology units of two state hospitals: Federal Medical Center, Birnin Kebbi, and Kalgo Medical Center.

Study Design and Data Collection

This study employed a retrospective design to investigate the prevalence of cataracts and their associations with demographic variables, ABO blood group types, and comorbidities. The comprehensive medical data of all patients who visited the ophthalmology labs of the two hospitals between June 5, 2023, and June 5, 2024, were obtained using a structured checklist. To ensure accuracy, the information was obtained and vetted by hospital information management specialists.

The checklist consisted of three sections:

- *Section A:* Captured sociodemographic information, including gender, age, religion, educational level, ethnicity, and marital status
- *Section B:* Documented health-related conditions, such as DM, hypertension (HTN), and glaucoma
- *Section C:* Recorded the patients' ABO blood group types

This study design enabled a systematic and comprehensive analysis of the relationships among the examined variables.

Sample Size Determination

The sample size for this study was calculated using Equation (1) [18]:

$$n = \left(\frac{N}{1 + Ne^2} \right) \quad (1)$$

Where n represents the sample size, while N is the total number of patients with eye conditions who attended the hospitals between June 2023 and June 2024. Moreover, e denotes the level of precision, which is between 0.10 and 0.01 (i.e., 10–1%).
Using 5% as e and N equaling 350, $n = 232.93$.
Approximately 233.

Eligibility Criteria

The inclusion criteria encompassed the medical records of all patients diagnosed with eye conditions between June 5, 2023, and June 5, 2024. The records were eligible if they contained comprehensive and relevant patient information. On the other hand, the exclusion criteria included medical records outside the specified study period or those with incomplete or insufficient data necessary for the study's objectives.

Data Analysis

The obtained data were cleaned using Microsoft Excel and exported into Stata (version 17) for analysis. Both descriptive and inferential statistical methods were employed. Descriptive statistics were employed to summarize the characteristics of the study population. In addition, frequencies and percentages were used to present the distribution of sociodemographic variables (e.g., age, gender, marital status, education, ethnicity, and religion) as well as health-related characteristics (including family history, comorbidities, and ABO blood groups).

For inferential statistics, chi-square tests of independence were conducted to examine bivariate associations between cataract status and the independent variables. A binary logistic regression model was applied to control for potential confounders and identify independent predictors of cataract. Moreover, logistic regression was chosen because the outcome variable (cataract diagnosis) was binary (Yes/No). This method allows for simultaneous adjustment of multiple covariates while estimating the relative odds of disease occurrence. The results of the regression analysis were reported as adjusted odds ratios with their corresponding 95% confidence intervals (CIs). Statistical significance was determined at a 5% level ($P < 0.05$). The use of CIs quantified the precision of the prevalence estimates and indicated the strength and reliability of observed associations. This rigorous analytical approach allowed for both descriptive and inferential interpretations of the factors associated with cataracts among respondents.

Results

Demographic Characteristics of Patients with Eye Conditions

Table 1 presents the demographic characteristics of the patients. The age distribution demonstrated that most participants were 65 years and above, followed by those within the 55–64 age group and the 45–54 age group. In terms of gender, a higher proportion of the patients were male. Regarding the level of education, over half of the patients had no formal education. The ethnic composition of the patients indicated that the Hausa ethnic group formed the majority, followed by the Fulani, Yoruba, and Igbo. As for marital status, a significant proportion of the patients were married or widowed.

Health-Related Conditions and ABO Blood Groups of Patients with Eye Conditions

Table 2 summarizes the health-related conditions and

Table 1. Demographic Characteristics of Patients With Eye Conditions (N = 233)

Variable	Categories	Frequency (N)	Percentage (%)
Age	15–24	5	2.1
	25–34	15	6.4
	35–44	22	9.4
	45–54	57	24.5
	55–64	61	26.2
	65 +	73	31.3
Gender	Male	144	61.8
	Female	89	38.2
Level of education	No education	127	54.5
	Primary	62	26.6
	Secondary	29	12.4
	Tertiary	15	6.4
Ethnicity	Hausa	120	51.5
	Fulani	58	24.9
	Yoruba	38	16.3
	Igbo	17	7.3
Marital status	Married	98	42.1
	Widow	87	37.3
	Divorced	39	16.7
	Single	9	3.9

Table 2. Health-Related Conditions and ABO Blood Groups of the Patients

Variable	Categories	Frequency (N = 233)	Percentage (%)
Family history	Yes	142	60.9
	No	91	39.1
Medical conditions	None	89	38.2
	Diabetes	59	25.3
	Hypertension	43	18.5
	Glaucoma	42	18.0
Blood groups	A^+	54	23.2
	A^-	40	17.2
	B^+	40	17.2
	B^-	29	12.4
	O^+	28	12.0
	O^-	22	9.4
	AB^-	15	6.4
	AB^+	5	2.1

ABO blood group distribution among the patients. In terms of family medical history of eye problems, the majority of the participants reported having a family history. Some respondents indicated that they have no known health issues regarding their current medical conditions. However, a notable proportion were diagnosed with DM, HTN, and glaucoma. The distribution of ABO blood groups among the respondents revealed that A^+ was the most common blood group, followed by A^- and B^+.

Prevalence of Cataract Among Patients with Eye Conditions

Figure 1 depicts the prevalence of cataract among the patients. Of the 233 patients with eye conditions, 54 (23%) were positive for cataract, while 179 (77%) were negative.

Association Between Cataract Diagnosis and Various Variables

Table 3 reveals the association between cataract diagnosis and various sociodemographic and health-related variables and ABO blood groups among the patients. The relationships were tested using the chi-square (Chi^2) test, with statistical significance at $P<0.05$. Cataract diagnosis was significantly associated with age ($P<0.001$). Additionally, the disease had the highest prevalence among the old age groups (55–64 years), followed by the age group 65^+ years. Therefore, age was a strong determinant of cataracts in this study.

There was a significant association between gender and cataract diagnosis ($P=0.029$). The 95% CI indicated that males exhibited the highest prevalence, suggesting a considerably greater burden than females. The observed male predominance may be associated with local risk exposures, differential access to healthcare, or occupation-related factors.

No significant association was found between education level and cataract diagnosis ($P=0.848$). The prevalence ranged from 59.1% to 73.3% across education levels, but differences were minor. The higher prevalence among tertiary-educated individuals likely reflects better diagnosis/healthcare access rather than higher disease risk. The cataract cases were most frequent among patients with no education, followed by those with primary, secondary, and tertiary education.

The results demonstrated no significant association

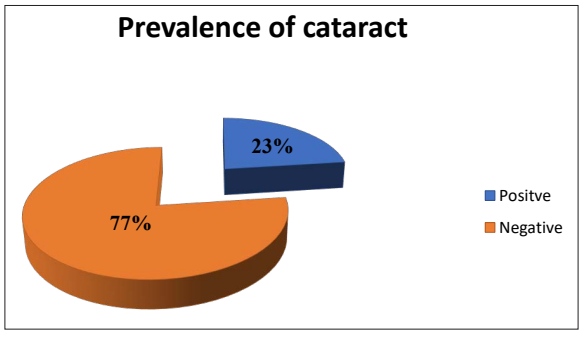

Figure 1. Prevalence of Cataract Among Patients With Eye Conditions

Table 3. Cataract Diagnosis and Its Association With Sociodemographic Variables, Health-Related Conditions, and ABO Blood Groups

Variable	Cataract Diagnosis			*P*-Value (Hypothetical)
	Yes n (%)	No n (%)	95% CI	
Age group				
15-24	1 (20)	4 (80)	0.5-71.6	
25-34	4 (27)	11 (73)	7.8 – 55.1	
35-44	6 (27)	16 (73)	10.7 – 50.2	$P<0.001$
45-54	12 (21.1)	45 (78.9)	11.4–34.4	
55-64	40 (78.4)	11 (21.6)	65.1–88.0	
65+	43 (58.9)	30 (41.1)	46.4–70.6	
Gender				
Female	56 (63.0)	33 (37.0)	52.5 – 72.2	$P=0.048$
Male	111 (77.1)	33 (22.9)	69.6 – 83.2	
Level of education				
No education	75 (59.1)	52 (40.9)	49.8–67.9%	
Primary	38 (61.3)	24 (38.7)	47.4–73.7	$P=0.848$
Secondary	20 (69.0)	9 (31.0)	49.2–84.7	
Tertiary	11 (73.3)	4 (26.7)	44.8–91.1	
Marital status				
Single	5 (55.6)	4 (44.4)	21.2–86.3	
Married	60 (61.2)	38 (38.8)	49.8–73.2	$P=0.841$
Widow	54 (62.1)	33 (37.9)	49.8–73.2	
Divorced	25 (64.1)	14 (35.9)	45.6–79.6	
Ethnicity				
Hausa	72 (60.0)	48 (40.0)	50.9 – 68.6	
Fulani	37 (63.8)	21 (36.2)	50.0 – 75.7	$P=0.185$
Yoruba	21 (55.3)	17 (44.7)	39.3 – 70.4	
Igbo	14 (45.2)	3 (17.6)	56.6 – 95.2	
Religion				
Christian	32 (71.1)	13 (28.9)	54.1–83.9	
Islam	110 (60.4)	72 (39.6)	52.7–67.6	$P=0.213$
Traditional	2 (33.3)	4 (66.7)	9.7–70.0	
Medical conditions				
None	0 (0)	89 (100)	0–5.0%	
Diabetes	59 (100)	0 (0)	92.4–100	$P<0.001$
Hypertension	43 (100)	0 (0)	89.4–100	
Glaucoma	42 (100)	0 (0)	89.1–100	
Family history				
No	0 (0)	89 (100)		$P<0.001$
Yes	142 (98.6)	2 (1.4)		
ABO blood groups				
A^+	33 (61.1)	21 (38.9)	46.9–74.1	
A^-	22 (55.0)	18 (45.0)	38.5–70.7	
B^+	23 (57.5)	17 (42.5)	40.9–72.9	
B^-	19 (65.5)	10 (34.5)	45.7–81.9	$P=0.620$
O^+	17 (60.7)	11 (39.3)	40.6–78.5	
O^-	12 (54.5)	10 (45.5)	32.2–75.6	
AB^-	8 (53.3)	7 (46.7)	26.6–78.7	
AB^+	3 (60.0)	2 (40.0)	17.0–92.7	

Note. CI: Confidence interval.

between marital status and cataract diagnosis ($P=0.841$). Among those diagnosed, the majority were married, followed by widows. By and large, slightly higher rates in widows/divorced reflect their older age profile instead of marital status itself.

Cataract diagnosis was not significantly associated with ethnicity ($P=0.185$). Hausa and Fulani formed the majority of cataract cases, which is consistent with their majority share of the study population. In addition, Igbo respondents had the highest prevalence, but the wide CI (56.6–95.2%) reflects the small sample size. Based on the findings, Yoruba showed a slightly lower prevalence compared to the northern groups. The chi-square result ($P=0.185$) indicated that the differences observed across ethnic groups are not statistically significant.

Religion and cataract diagnosis had no statistically significant association ($P=0.213$). Islam had the highest cataract prevalence, while Christianity constituted the second-highest prevalence.

A significant association was observed between medical conditions and cataract diagnosis ($P<0.001$). All individuals diagnosed with cataracts had at least one underlying medical condition, including DM, HTN, or glaucoma.

Family history was also significantly associated with cataract diagnosis ($P<0.001$). Nearly all diagnosed individuals had a positive family history of eye problems, whereas the majority of undiagnosed individuals had no such history.

There was no statistically significant relationship between ABO blood groups and cataract diagnosis ($P=0.620$). Blood group A^+had the highest number of diagnosed cases, followed by A^- and B^+. This distribution was similar in the undiagnosed group.

Binary Logistic Regression Analysis

Table 4 provides the results of a binary logistic regression analysis of factors associated with cataract diagnosis among patients. Age was the strongest predictor associated with cataract. Individuals aged 55–64 were nearly six times more likely to have cataracts than those aged ≤ 44. Moreover, gender was another significant predictor of cataracts. Males were almost twice as likely to be diagnosed. Comorbidities like DM, HTN, and glaucoma were all strong predictors associated with cataracts. Another key predictor among the patients was family history, which had the largest effect, increasing the odds of cataract diagnosis eighteen-fold. Based on the results, ABO blood groups were not significantly associated with cataracts. Similarly, education, ethnicity, and religion were not statistically significant predictors of cataracts.

Table 4. Binary Logistic Regression of Factors Associated With Cataract Among the Patients

Predictor Variable	Odds Ratio	95% Confidence Interval	*P*-Value
Age group (Ref: 15–44 years)			
45–54 years	2.51	1.07–5.89	0.037 *
55–64 years	5.82	2.10–16.14	<0.001 **
65 + years	3.82	1.46–10.00	0.006 **
Gender (Ref: Female)			
Male	1.88	1.01–3.51	0.042 *
Education (Ref: Tertiary)			
No education	1.51	0.48–4.77	0.484
Primary	1.38	0.41–4.64	0.606
Secondary	1.25	0.35–4.50	0.744
Ethnicity (Ref: Yoruba/Igbo)			
Hausa	1.62	0.74–3.54	0.220
Fulani	1.43	0.61–3.33	0.414
Religion (Ref: Christianity)			
Islam	1.31	0.68–2.52	0.414
Traditional	0.42	0.08–2.21	0.278
ABO blood Group (Ref: O)			
A	1.36	0.67–2.76	0.391
B	1.32	0.63–2.77	0.463
AB	1.12	0.40–3.16	0.835
Medical conditions			
Diabetes (yes)	3.49	1.66–7.36	<0.001 **
Hypertension (yes)	2.86	1.31–6.25	0.009 **
Glaucoma (yes)	2.64	1.19–5.89	0.018 *
Family history (yes)	17.6	4.44–69.9	<0.001 **

Discussion

Prevalence of Cataract Among the Patients

In this study, the prevalence of cataract among the patients was 23%, indicating that the condition poses a significant public health burden in Birnin Kebbi. This finding is consistent with a prevalence of 22.6% reported in Karu, Nasarawa State, Northern Nigeria [19]. However, it is substantially higher than the 3.9% prevalence reported in the IDO/OSI Local Government Area of Ekiti State, Southwestern Nigeria [20], but lower than the 62.1% recorded in a rural community in Southeastern Nigeria [21]. Regional disparities in cataract prevalence have been widely reported across Nigeria, with the Southwest consistently showing the lowest rates and the North and Southeast demonstrating higher rates. Unsafe traditional treatment practices and the hotter and drier climate of northern Nigeria may contribute to higher rates of cortical cataracts due to prolonged exposure to ultraviolet radiation [22].

Demographic Variables and Association with Cataract Prevalence

Among the 233 patients with eye conditions analyzed in this study, the majority were males ($P=0.048$), suggesting that males may be more susceptible to early-onset cataracts. This finding aligns with two reports documented in Northwestern Nigeria [23, 24]. However, it contradicts the findings of studies conducted in Imo State,

Southeastern Nigeria, and Katsina State, Northwestern Nigeria, where a higher prevalence of cataracts among females was reported [8, 25]. Female gender and residence in Northern Nigeria have been identified as general risk factors for blindness, further complicating the gender–cataract relationship [26].

In the current study, cataracts demonstrated a statistically significant association with age ($P<0.001$), with the highest prevalence observed among participants aged 55–64 and those aged 65 years and above. The observed age-related trend underscores age as a principal determinant of cataract within the study area and concurs with global findings. Cataracts are typically age-related and more prevalent in older adults, resulting from oxidative stress and chronic inflammation that lead to protein aggregation and lens opacification [6]. Our findings particularly conform to those of studies performed in Lagos and Kano, where cataract prevalence peaked among individuals aged 55 years and older [27]. Additionally, our results are in line with a high prevalence of cataracts noticed among cataract patients aged 61–70 years at the Nenwe Outreach Eye Center in Enugu [28]. The findings of studies from Ethiopia also support this trend, identifying adults aged 70–79 with the highest risk of cataracts [29].

The distribution of cataract cases by the level of education confirmed that individuals with no education constituted the majority. However, the differences were not statistically significant ($P=0.848$), implying that education level does not independently influence cataract occurrence. These results align with those of a previous study that recorded a high prevalence of cataracts among individuals with lower educational attainment in Lagos and Kano [27]. Similarly, it corroborates the findings of a study that reported an inverse relationship between educational level and cataract risk in Imo State [30]. The observed trend may be attributed to reduced health literacy, limited awareness of preventive eye care, and restricted access to healthcare services among individuals with lower education levels.

Regarding ethnicity, Hausa and Fulani individuals represented the majority of cataract patients; however, no statistically significant variation was found among ethnic groups ($P=0.185$). The non-significant association implies that ethnicity alone is unlikely to constitute a major determinant of cataract within the study area. Religion affiliations among those who were cataract positive indicated that the majority of cases were Muslims, followed by Christians; nevertheless, no statistically significant ($P=0.213$) association was observed in this regard. Notably, this composition closely aligns with the demographic structure of Kebbi State, where the Hausa and Fulani populations are predominant. Similarly, the religious distribution mirrors the religious composition of Birnin Kebbi. While no direct correlation was found between religious and ethnic affiliations and cataract risk, understanding these demographic patterns is crucial for tailoring healthcare services.

Based on the distribution of cataracts by marital status, cataract occurrence was the highest among singles (widowed, divorced, and never married) compared to married.

However, the variable was not significantly associated with cataract diagnosis ($P=0.841$). The absence of a significant relationship corresponds to the findings of a study conducted in Ekiti, Nigeria, where widowed individuals constituted a considerable proportion of cataract cases [31]. Similarly, it is consistent with the results of a study performed in India, where widows dominated [32]. A higher prevalence of cataracts was also observed among single individuals in Ethiopia [29]. Further, a meta-analysis showed that single (divorced, widowed, or single) individuals had a 4.59 times higher risk of developing cataracts than people who were married [33]. The high prevalence of cataracts among widowed and divorced individuals may be linked to socioeconomic factors that influence healthcare access.

Health-Related Conditions and Association with Cataract Prevalence

The analysis of medical conditions revealed that all individuals diagnosed with cataracts had at least one chronic illness, specifically DM, HTN, or glaucoma. This association was highly strong and statistically significant ($P<0.001$), confirming the well-established link between these systemic diseases and cataract development [34-36]. These chronic conditions induce oxidative stress, alter lens metabolism, and impair microvascular circulation in the eye, all contributing to cataract formation. Furthermore, family history emerged as another strong predictor, with almost all cataract patients reporting a positive family history of eye problems. This association was also highly significant ($P<0.001$), highlighting the probable hereditary or genetic predisposition of this population to cataract development. This finding aligns with the results of previous studies that linked genetic mutations or family history to cataract diagnosis [37, 38]. Cataracts are most commonly inherited in an autosomal dominant pattern, but autosomal recessive and X-linked inheritance modes have also been documented [39, 40].

Based on ABO blood group analysis, there was no statistically significant ($P=0.620$) association between ABO blood groups and cataract diagnosis, which is supported by previous research, showing that there is no direct biological link between cataract and ABO blood group genotypes. Although more cataracts were observed among individuals with A^+, A^-, and B^+blood types, this distribution likely mirrors the overall population composition. Hence, ABO blood type does not constitute a reliable predictor of cataract occurrence within the study area. These findings are consistent with those of previous studies, demonstrating no significant association between ABO blood groups and cataract risk [41-43]. Individuals with blood types A and B represented a higher prevalence, probably because the blood types are associated with

an increased risk of thrombotic events, which could indirectly contribute to ocular complications, including cataracts [44-46].

A major limitation of this study was the small sample size, as a larger sample might have produced more reliable results. With a larger sample, an association might have been established with variables that showed no significant relationships, particularly the ABO blood group genotypes. It should be noted that the limited sample size was due to the retrospective nature of the study. Additionally, many patients in the study area prefer traditional treatment, which reduces their hospital visits.

Conclusion

Our results revealed that cataract cases occurred mostly among respondents aged 55 years and above. In addition, male gender, comorbid medical conditions, particularly DM and HTN, and a positive family history of eye disease were significantly associated with cataract diagnosis in this population. Conversely, education level, ethnicity, marital status, religious affiliation, and ABO blood group genotypes demonstrated no statistically significant associations with cataract occurrence.

These findings carry important public health implications, particularly given cataracts' socioeconomic impact, including vision loss, decreased workforce productivity, increased dependency, and higher healthcare costs. They further reinforce the complex interplay between chronic diseases, genetic predisposition, and sociodemographic factors in the pathogenesis of cataracts. This emerging trend represents a serious public health concern that demands multidisciplinary research and targeted interventions.

Evidence-based public health strategies are essential to reduce the burden of cataracts in Birnin Kebbi and similar settings. They should include routine and early eye screening programs, particularly for individuals with known risk factors, and promotion of ultraviolet-blocking eyewear to minimize sun-related lens damage. Equally important is public education on diets rich in antioxidants (e.g., vitamins C and E, lutein, and zeaxanthin), which may delay cataract progression. Likewise, special attention should be directed toward males, individuals with a family history of eye diseases, and those diagnosed with DM, HTN, or glaucoma. Moreover, it is recommended that further research validate these findings. Specifically, genetic and epidemiological studies, including longitudinal cohort designs, should be conducted to investigate the influence of heredity and environmental exposures on the onset of cataracts. Insights from such studies can inform more precise prevention, early detection, and management strategies, ultimately improving ocular health outcomes in Northern Nigeria and beyond.

Acknowledgments

This article was derived from a research project approved by the Ethics Committee of the Federal University, Birnin Kebbi, Nigeria (approval No. FUBK/41/2024). The researchers gratefully thank the patients who participated in this study.

Authors' Contribution

Conceptualization: Tajudeen Olanrewaju Yahaya.
Data curation: Rasheed Adebayo Yinusa.
Formal analysis: Yahaya Tajudeen Olanrewaju, Rasheed Adebayo Yinusa.
Investigation: Sa'adatu Haliru, Priscilla Oluwaseyi Obi, Jibril Waziri Adamu.
Methodology: Yahaya Tajudeen Olanrewaju, Zaharadeen Muhammad Yusuf.
Project administration: Tajudeen Olanrewaju Yahaya.
Resources: Sa'adatu Haliru, Priscilla Oluwaseyi Obi, Jibril Waziri Adamu.
Software: Rasheed Adebayo Yinusa.
Supervision: Tajudeen Olanrewaju Yahaya.
Validation: Rasheed Adebayo Yinusa.
Writing–original draft: Tajudeen Olanrewaju Yahaya.
Writing–review & editing: Tajudeen Olanrewaju Yahaya, Rasheed Adebayo Yinusa, Zaharadeen Muhammad Yusuf.

Competing Interests

The authors declare that there is no conflict of interests.

Ethical Approval

This study received ethical approval (approval No. FUBK/41/2024) from the Ethics Committee of the Federal University, Birnin Kebbi, Nigeria. The research strictly adhered to the guidelines for conducting studies involving human participants as outlined by the Committee. Written informed consent was obtained from the patients or their legal guardians before accessing their medical records. More importantly, the confidentiality and anonymity of all obtained information were rigorously maintained throughout the study.

All procedures were conducted based on the ethical principles outlined in the Declaration of Helsinki for medical research involving human subjects, first adopted in 1964 and most recently amended in October 2024.

Funding

None.

References

1. Lu A, Duan P, Xie J, Gao H, Chen M, Gong Y, et al. Recent progress and research trend of anti-cataract pharmacology therapy: a bibliometric analysis and literature review. Eur J Pharmacol. 2022;934:175299. doi: 10.1016/j.ejphar.2022.175299.
2. Shiels A, Hejtmancik JF. Biology of inherited cataracts and opportunities for treatment. Annu Rev Vis Sci. 2019;5:123-49. doi: 10.1146/annurev-vision-091517-034346.
3. Alshamrani AZ. Cataracts pathophysiology and managements. Egypt J Hosp Med. 2018;70(1):151-4. doi: 10.12816/0042978.
4. Canatan AN. Restoring sight: exploring cataracts as the leading treatable cause of blindness: a narrative review. Turk Med Stud J. 2024;11(1):1-8. doi: 10.4274/tmsj.galenos.2023.2023-7-2.
5. Nartey A. The pathophysiology of cataract and major interventions to retarding its progression: a mini review. Adv Ophthalmol Vis Syst. 2017;6(3):178. doi: 10.15406/aovs.2017.06.00178.
6. Wang L, Li X, Men X, Liu X, Luo J. Research progress on antioxidants and protein aggregation inhibitors in cataract prevention and therapy (review). Mol Med Rep. 2025;31(1):22. doi: 10.3892/mmr.2024.13387.
7. Latebo AA, Assefa NL, Ferede TW, Bekele MM, Demilew KZ. Prevalence of cataract and its associated factors among adults aged 40 years and above living in Durame town, southern Ethiopia, 2023: a community-based cross-sectional study. BMJ Open. 2024;14(12):e089741. doi: 10.1136/bmjopen-2024-089741.

8. Onyia O, Aghaji AE, Ubaka C, Achigbu EO, Ejiakor IL, Mbatuegwu AI, et al. Assessing the cataract surgical rate and gender equity in cataract services in south-east Nigeria. BMJ Open Ophthalmol. 2024;9(1):e001326. doi: 10.1136/bmjophth-2023-001326.
9. Maji IK, Muhammad S, Waziri SI, Rabiu MM, Yusuf M, Muhammad L, et al. An assessment of economic loss associated with cataract vision impairment for sustainable development in Borno state, Nigeria. Soc Impacts. 2024;4:100089. doi: 10.1016/j.socimp.2024.100089.
10. Aniemeka DI, Buchan J, Adeke AS, Dange A, Momoh N. Estimated number of cataract surgeries performed in government hospitals in Nigeria and factors affecting cataract surgical activity. Niger J Ophthalmol. 2023;31(1):11-8. doi: 10.4103/njo.njo_42_21.
11. Kang C, Lee MJ, Chomsky A, Oetting TA, Greenberg PB. Risk factors for complications in resident-performed cataract surgery: a systematic review. Surv Ophthalmol. 2024;69(4):638-45. doi: 10.1016/j.survophthal.2024.04.002.
12. Rabiu MM, Taryam MO, Yusuf M, Maji IK. The economic impacts of cataract surgery on sustainable vision and quality of life in Katsina state. Health Care Sci. 2023;2(2):112-9. doi: 10.1002/hcs2.39.
13. Yahaya TO, Oladele EO, Mshelia MB, Sifau MO, Fashola OD, Bunza MD, et al. Influence of ABO blood groups and demographic characteristics on the prevalence of type 2 diabetes in Lagos, southwest Nigeria. Bull Natl Res Cent. 2021;45(1):144. doi: 10.1186/s42269-021-00603-0.
14. Yahaya T, Oladele E, Ahmed H, Obhiojeifoh S, Haruna A, Akinola O. Distribution of ABO blood groups and selected diseases among students of Federal University Birnin Kebbi, Nigeria. Suranaree J Sci Technol. 2022;29(1):1-8.
15. Yahaya TO, Attahiru AK, Ibrahim AB, Adewale MK, Fari AZ, Saadatu A. Demographic characteristics and ABO blood group genotypes distribution among sickle cell anemia patients in Birnin Kebbi, northwestern Nigeria. Majalah Biomorfologi. 2024;34(2):83-92. doi: 10.20473/mbiom.v34i2.2024.83-92.
16. Rabiu MM, Muhammed N. Rapid assessment of cataract surgical services in Birnin-Kebbi local government area of Kebbi state, Nigeria. Ophthalmic Epidemiol. 2008;15(6):359-65. doi: 10.1080/09286580802399078.
17. Shin J, Lee H, Kim H. Association between exposure to ambient air pollution and age-related cataract: a nationwide population-based retrospective cohort study. Int J Environ Res Public Health. 2020;17(24):9231. doi: 10.3390/ijerph17249231.
18. Yamane T. Statistics: An Introductory Analysis. 3rd ed. New York: Harper & Row; 1973.
19. Okudo AC, Akanbi T. An evaluation of a cataract surgical camp in New Karu LGA, Nasarawa state, Nigeria. Open J Ophthalmol. 2021;12(1):70-6. doi: 10.4236/ojoph.2022.121008.
20. Adeniyi MA, Adewoye RK, Popoola GO, Aderukuola B, Ibrahim AO, Azees AS. Awareness, prevalence and risk burden of cataract among adults in IDO/OSI local government area, a rural community of Ekiti state, southwest Nigeria. Int J Community Med Public Health. 2023;10(9):3077-85. doi: 10.18203/2394-6040.ijcmph20232663.
21. Amobi C, Nwosu SN, Okpala NE, Igboegwu EE. Prevalence of cataract in adults in a rural community in south-eastern Nigeria. Trans Ophthalmol Soc Niger. 2019;4(1):66-8.
22. Gilbert CE, Murthy GV, Sivasubramaniam S, Kyari F, Imam A, Rabiu MM, et al. Couching in Nigeria: prevalence, risk factors and visual acuity outcomes. Ophthalmic Epidemiol. 2010;17(5):269-75. doi: 10.3109/09286586.2010.508349.
23. Ndife TI, Alhassan MB, Musa D. Profile of cataract surgical patients at the national eye centre, Kaduna, Nigeria. Niger Med J. 2024;65(2):153-61. doi: 10.60787/nmj-v65i2-379.
24. Amos SB, Oyefabi MA, Akang J. Gender differences and financing patterns of cataract operated adult patients attending a tertiary health facility in northern-western Nigeria. West J Med Biomed Sci. 2022;3(3-4):59-65. doi: 10.5281/zenodo.7573014.
25. Taryam MO, Rabiu MM, Muhammad N, Oladigbolu K, Abdurrahman H. Prevalence and causes of blindness and visual impairment; and cataract surgical services in Katsina state of Nigeria. Br J Ophthalmol. 2020;104(6):752-6. doi: 10.1136/bjophthalmol-2019-314572.
26. Kurawa MS, Abdu L. Demographic characteristics and visual status of patients undergoing cataract surgery at a tertiary hospital in Kano, Nigeria. Ann Afr Med. 2017;16(4):170-4. doi: 10.4103/aam.aam_123_16.
27. Echebiri SI, Odeigah PG, Myers SN. Case-control studies and risk factors for cataract in two population studies in Nigeria. Middle East Afr J Ophthalmol. 2010;17(4):303-9. doi: 10.4103/0974-9233.71592.
28. Ozioko NM, Okoloagu NM, Onah ES, Catherine. Pattern of Eye Disease in Nenwe rural eye clinic, Nigeria: a seven-year review. Int J Clin Exp Ophthalmol. 2024;8(2):4-15. doi: 10.29328/journal.ijceo.1001056.
29. Wale MZ, Derbew M, Tilahun M, Terefe M. Cataract and associated factors among adults visiting ophthalmic clinic at Debre Markos comprehensive specialized hospital, northwest Ethiopia, 2020. SAGE Open Med. 2021;9:2050312121989636. doi: 10.1177/2050312121989636.
30. Rolnick K, Buck S, Mezu-Nnabue K, Eickhoff J, Esenwah E, Mezu-Ndubuisi OJ. Influence of socio-economic status and educational achievement on cataract formation in a rural community in Imo state, south-eastern Nigeria. Cogent Med. 2017;4(1):1326212. doi: 10.1080/2331205X.2017.1326212.
31. Fadamiro CO, Ajite KO. Socio-demographic characteristics and presenting visual acuity of beneficiaries of a free cataract surgical intervention in Ekiti state, south-western Nigeria. J Ophthalmol Clin Res. 2022;9(2):100. doi: 10.24966/ocr-8887/100100.
32. Khan J, Shaw S. Risk of cataract and glaucoma among older persons with diabetes in India: a cross-sectional study based on LASI, Wave-1. Sci Rep. 2023;13(1):11973. doi: 10.1038/s41598-023-38229-z.
33. Seid K, Lakew G, Yirsaw AN, Kebede N, Tefera M, Bogale EK, et al. Burden and determinants of cataract among adult patients over 40 years old in Ethiopia: a systematic review and meta-analysis, 2024. Discov Med. 2025;2(1):79. doi: 10.1007/s44337-025-00268-y.
34. Yu X, Lyu D, Dong X, He J, Yao K. Hypertension and risk of cataract: a meta-analysis. PLoS One. 2014;9(12):e114012. doi: 10.1371/journal.pone.0114012.
35. Kiziltoprak H, Tekin K, Inanc M, Goker YS. Cataract in diabetes mellitus. World J Diabetes. 2019;10(3):140-53. doi: 10.4239/wjd.v10.i3.140.
36. Kyari F. Managing cataract surgery in patients with glaucoma. Community Eye Health. 2019;31(104):88-90.
37. Javadiyan S, Craig JE, Souzeau E, Sharma S, Lower KM, Pater J, et al. Recurrent mutation in the crystallin alpha A gene associated with inherited paediatric cataract. BMC Res Notes. 2016;9:83. doi: 10.1186/s13104-016-1890-0.
38. Stump MP, García AM, Arrocha DP, Cárdenes IO, Rodriguez RG, Delgado RG, et al. VP10.09: fetal congenital cataract and genetic mutation. Ultrasound Obstet Gynecol. 2021;58(S1):132-3. doi: 10.1002/uog.24162.
39. Shiels A, Hejtmancik JF. Inherited cataracts: genetic mechanisms and pathways new and old. Exp Eye Res. 2021;209:108662. doi: 10.1016/j.exer.2021.108662.
40. Khan L, Shaheen N, Hanif Q, Fahad S, Usman M. Genetics of congenital cataract, its diagnosis and therapeutics. Egypt J Basic Appl Sci. 2018;5(4):252-7. doi: 10.1016/j.ejbas.2018.07.001.
41. Ankur, Kolekar S, Nanda Kumar LG, Askari IH. Incidence of

cataract in ABO blood group system. MedPulse Int J Physiol. 2019;11(3):69-70. doi: 10.26611/10311312.
42. Jafari R, Ahmadi H, Chaibakhsh S, Rostamian Motlagh F, Heydarian S, Ahmadzadeh Amiri A, et al. Evaluation of the frequency of ABO and Rh-Hr blood-group systems in different acquired cataracts type. BMC Res Notes. 2023;16(1):245. doi: 10.1186/s13104-023-06524-7.
43. Jain S, Gupta CP. Association of cataract in ABO blood group system. Ophthalomology. 2023;12(3):1-5. doi: 10.36106/gjra.
44. Groot HE, Villegas Sierra LE, Said MA, Lipsic E, Karper JC, van der Harst P. Genetically determined ABO blood group and its associations with health and disease. Arterioscler Thromb Vasc Biol. 2020;40(3):830-8. doi: 10.1161/atvbaha.119.313658.
45. Leonardo Gordinho A, Rosado S, Mesquita T, Ferreira NR. Blind spot: blindness as initial presentation of subarachnoid haemorrhage. BMJ Case Rep. 2018;2018:bcr2017222745. doi: 10.1136/bcr-2017-222745.
46. Carl H, Soumya R, Srinivas P, Vani R. Oxidative stress in erythrocytes of banked ABO blood. Hematology. 2016;21(10):630-4. doi: 10.1080/10245332.2016.1187824.