Prevalence of Cataract in Relation to Socio-demographic Factors: A Population Based Cross Sectional Study of Adults in Imo State Nigeria

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ABSTRACT

Cataract is among the major causes of blindness and visual impairments among adults globally. The present study was designed as a population based cross sectional study aimed at determining the prevalence of cataract in relation to factors of socio demographics among adults in Imo State South Eastern Nigeria. Subjects were examined of the presence of cataract via Slit Lamp Biomicroscopy**.** Lens opacity was performed using Lens Opacity Classification System (LOCS) III system. A slit lamp examination was conducted and the presence and severity of specific lens opacity were compared. Socio-demographic information was obtained using a validated study questionnaire. Data analyses were conducted through descriptive and inferential analysis. Descriptive technique was used to describe the data characteristics in a frequency distribution. Chi square test was used to test for association between class variables. Logistic regression method was used to establish significant factors to cataract and odds ratios were computed to account for size effect measures. A total of 792 adults were studied and the prevalence of cataract was 3.7% (29 out of 792) in the study area. Significant socio-demographic risk factors found include age (P=0.000, χ^2= 48.85), occupation (P=0.000, χ^2= 40.69), education (P=0.001, χ^2= 19.99) and household income level (P=0.004, χ^2= 15.55). The odds for cataracts was lower in younger age such as 45-50 years than in older age such as 60 and above (OR =0.05, 95% CI =0.01, 0.23). it was also lower among higher school education level participants (OR =0.071, 95% CI =0.009, 0.561) against the non-formal education group. The disease was high among low household income (7.1%). In conclusion, cataract prevalence in relation to socio-demographic factor remained a challenging factor to the that needed to be taking into account in any preventive measures against the burden of the disease.

Keywords: Cataract, adults, Prevalence, Socio-demographics, Imo State

INTRODUCTION

Cataract is among the major causes of blindness and visual impairments with up to 95 million people affected by the disease around the world (Liu, et al., 2017). A current systematic review and meta analysis study on estimated global vision loss burden due to cataract indicated that an increase of 29.7% in cases of cataract blindness has been recorded globally (Pesudov et al., 2024). Cataract has remained a public health concern especially in low and middle-income countries (LMIC) including Nigeria. It accounts for nearly half of all cases of blindness in LMIC and 5% in high-income countries (Jiang, 2023; Samuel, et al., 2021). A study in Nigeria found that 44.2% of total blindness was as a result cataract (Singabele et al., 2010).

Several demographic factors may affect the risk of cataract. For instance, strong positive relationship has been established between cataracts and age, usually classified as senile or age related (Garg et al., 2020; Hong et al., 2022). Age-related cataracts constitute approximately 50% of the 285 million visually-impaired people globally; 39 million (13.7%) of whom are blind (Pascolini and Mariotti, 2012). Over 90% of cataract cases are concentrated in individuals aged ≥ 50 years in lower middle-income countries (LMICs) where health care access

is limited.

It has also been reported that that sunlight exposure, increases the risk of cataract disease (Vashist et al., 2020). Other established associating socio-demographic factors include low socioeconomic status (SES), marital status (Yawson et al., 2014) and educational status (Rolnick et al., 2017). Also, higher prevalence of cataract among individuals with lower income, lower education, urban residency, female sex, and intake of antidepressants has been reported (Rim, et al., 2015; Yawson et al., 2014).

Therefore, cataract in relation to socio demographic characteristics is a major burden for health-care around the world. Although attempts have been made to identify the actual effects attributable to specific demographics factors such as age, gender, occupation, education level, family history, the relationship between the two has remained inconsistent in different areas.

The obvious fact still remained that the association between cataract and factors of socio-demographics has posed some health challenges either in the disease prevention or treatment. Cataracts can be treated with a short outpatient surgery, but in many developing regions of the world like Nigeria, the surgery to remove cataracts is not likely to be affordable by many due to structural demographics that may be related to poverty. At present, there exists paucity of studies relating cataract with socio demographic factors in Nigeria. Therefore it is important to estimate the prevalence of cataract and its association with factors of demographics in sub areas such as Imo state Nigeria. It is expected that the present study could serve as a framework to initiate strategies to prevent development of cataract, retard progression and reduce the cost and other associating burdens for cataract surgery.

MATERIALS AND METHODS

The index study was designed as population based cross-sectional study to assess socio-demographic data obtained from the participants through the use of a questionnaire. The subjects were individuals who were residents of Imo state and must have lived in the state at least 6 months before the commencement of the study.

Study Area

The study was conducted in Imo state Nigeria. It covered the three geo political zones of the state namely Imo East (Owerri Zone), Imo West (Orlu Zone) and Imo North (Okigwe Zone). Imo state is one of the 36 states of Nigeria. It is located in the south eastern region of the country, specifically between the lower River Niger and the upper Imo River. It is inhabited mainly by the Igbo ethnic group whose major occupation is agriculture and trading. Owerri is the capital of the state and also its major city. Other cities in the state include Orlu, Okigwe, Mbaise, Oguta, Mbano and Obowo. The state lies within latitudes 4°45'N and 7°15'N, and longitude 6°50'E and 7°25'E with an area of around 5,100 sq km (Fig. 1). Christianity is the predominant religion. Igbo language is the predominant language and English language is the official language of communication. The population of Imo State is about 3,927,563 according to 2006 population census(NBS, 2007). Imo state Consists of 27 local government area namely: Aboh Mbaise, Ahiazu Mbaise, Ehime Mbano, Ezinihitte, Ideato North, Ideato South, Ihitte/Uboma, Ikeduru, Isiala Mbano, Isu, Mbaitoli, Ngor Okpala, Njaba, Nkwerre, Nwangele, Obowo, Oguta, Ohaji/Egbema, Okigwe, Onuimo, Orlu, Orsu, Oru East, Oru West, Owerri Municipal, Owerri North and Owerri West.
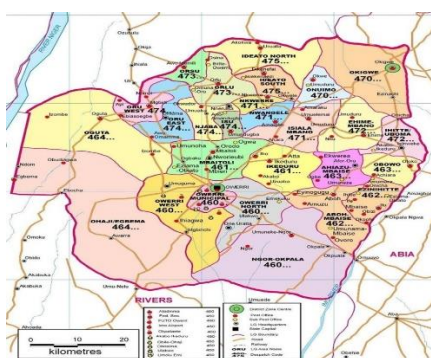

Fig. 1.0: Map of Imo State (**Coordinates:** 5° 29'N 7°2' E)

Study Sample Size

The study sample size was estimated using the appropriate sample size technique for computations of cross-sectional prevalence studies (Sample size= n= Z^2 x $(P (1-P))/e^2$)) suggested in earlier studies (Cochrane, 1977; Naing et al., 2022).

We assume Z =1.96 (Z statistic for 95% level of confidence), e=5% marginal error and p as prevalence proportion from previous study (usually from previous studies), we considered p as 3.9% based on reported prevalence for cataract found in Nigeria (Adeniyi et al., 2023), therefore applying the formula gives, a minimum sample size of 360 was obtained. The sample was increased by 10% for attrition purposes and also doubled (792) so as to cover wider number of people.

Method of Data Collection

A pre-tested structured questionnaire instrument was used to collect the study data from consented eligible participants. The questionnaire was administered by the researchers. The language for questionnaire construction was English Language but was translated in Igbo Language some of the respondents who cannot read or understand English Language. The socio demographic variables contained in the instrument include age (in years), gender (classified as male/ female), occupation, education and monthly household income in Naira (₦).

Slit lamp biomicroscopy was performed by experienced optometrists to identify abnormalities of the anterior segment. Under topical anesthesia using 0.5% proparacaine, intraocular pressure (IOP) was measured with a handheld Perkins applanation tonometer (HA-2, Kowa Xinghe, Japan) using 0.5% proparacaine and fluorescein staining of the tear film. The right eye was measured first and one reliable measurement was recorded for each eye. The instrument was calibrated before use on each day of testing.

For cataract measurements, the grading of lens opacity was performed by trained optometrists, according to a written standardised protocol, using the Lens Opacity Classification System (LOCS) III system (Chylack, 1993). After dilatation of pupils with tropicamide 1% and phenylephrine hydrochloride 2.5% eye drops (repeated twice if necessary), the participant was examined at a slit lamp (Model BQ 900, Haag-Streit, Bern, Switzerland), and the presence and severity of specific lens opacity were compared and documented according to LOCS III standard photographs.

Method of Data Analysis

Data analysis was performed using IBM-SPSS statistics version 26 (SPSS Inc. Chicago, Illinois USA). Data analysis involved using descriptive and inferential analysis. The first step in data analysis is to clean the data to ensure data consistencies and reliability. This involved checking for missing data and outliers, Descriptive statistics was used to summarize and describe the data collected. Hence frequency distribution table (including distribution charts and percentage distribution) was computed for categorical variables while summary statistics such as mean and standard deviations were estimated for continuous measured variables. The cross-tabulations technique was used to examine the relationship between the prevalence of cataract and classes of different. Inferential statistics was used to test hypotheses and make predictions about the population based on the sample data. This involved using techniques such as chi-square test and logistic regression analysis. All tests were performed at 5% significant level. Probability value (p <0.05) was used to explain statistical significance and the odds ratio (OR) was used to explain effect size measures.

Ethical Consideration

The study ethical approval was obtained from the School of Health ethical Committee of Imo State University, Owerri. Participation in the study was made voluntary among the subjects and verbal informed consent was obtained from all the participants before they were allowed to take part in the study.

RESULTS

A total of 792 persons participated in the study. The socio-demographic characteristics of the participants are

contained in table 1. The table clearly shows that the largest number of the participants fall within 40- 45 years (n=307: 38.8%), followed by the 46 -50 years old at 110 (13.9%). The least falls within 61 - 65 years at a frequency of 65 (8.2%). Majority of the participants were females (427: 53.9%). In terms of the occupation, more than one quarter engage in trading or business activities (215: 27.1%), about one fifth (161: 20.3%) were civil or public servants, and close to that (154:19.4%) were manual workers (artisans) while 126 (15.9%) were farmers. Many of the participants were literates. While only 61 (7.7%) attended colleges, vocational schools and universities, 234 (29.5%) attained up to secondary education level, and 194 (24.5%) had up to high school education level. Those that had no formal education were 147 (18.6%) in all. The household monthly income was not quite high among the study group. Up to 246 (31.1%) earns household income of 31,000-50,000 Naira per month, and only 40 (5.1%) earn above 90,000 Naira (₦) per month but close to one fifth (156: 19.7%) earn lower than the current National minimum wage of 30,000 Naira per month in Nigeria (as at the time of data collection).

Table 1: Socio-demographic Characteristics of the study Participants

Frequency	Frequency (n=792)	Percent (%)
Age		
Less than 40	69	8.7
40 – 45	307	38.8
46 – 50	110	13.9
51 – 55	78	9.8
56 -60	97	12.2
61-65	65	8.2
66 and above	66	8.3
Gender		
Male	365	46.1
Female	427	53.9
Occupation		
Farmer	126	15.9
Manual worker (Artisans)	154	19.4
Civil/ Public servants	161	20.3
House worker	81	10.2
Others	55	6.9
Trading/Business	215	27.1
Education Level		
Non formal	147	18.6

Primary	156	19.7
Secondary	234	29.5
High school	194	24.5
College/ vocational school/ University	61	7.7
Monthly Household Income in Naira (₦)		
Less than or equal to 30,000	156	19.7
31,000 - 50,000	246	31.1
51,000-70,000	207	26.1
71,000 - 90,000	143	18.1
91,000 and above	40	5.1

Prevalence of Cataract among the study Group

The prevalence of cataract in the study area is represented in table 2. The table shows that out the 792 persons studied, cataract was present in 29 (3.7%), while it was absent in 763 (96.3%). Therefore, it implies that the prevalence of cataract was found to 3.7% in this study.

Table 2: Distribution for presence and non-presence of Cataract among the study Group

Presence of Cataract	**Number (%)**
Yes	29 (3.7%)
No	763 (96.3%)
Total	792

Socio Demographic Factors in relation to the occurrence of Cataract

The relationship between Socio Demographic factors and rate of cataract occurrence among the study population is represented in table 3. From the table, significant associating socio demographic factors to cataract disease, include age (P=0.000, χ^2= 48.85), occupation (P=0.000, χ^2= 40.69), education (P=0.001, χ^2= 19.99) and household income level (P=0.004, χ^2= 15.55).

Table 3: Scio Demographic Factors in relation to the occurrence of Cataract in the study population

Socio Demographic Factors		**Cataract: None**		**Cataract: Yes**					**95% CI**	
	Total	**Freq**	**%**	**Freq**	**%**	**χ^2**	**P**	**OR**	**Lower**	**Upper**
Age (years)										
Less than 40	69	69	100	0	0.0		0.997	0.000	0.000	.
40 – 45	307	305	99.3	2	0.7		0.000	0.048	0.010	0.230

46 – 50	110	107	97.3	3	2.7		0.022	0.203	0.052	0.796
51 – 55	78	74	94.9	4	5.1		0.141	0.392	0.112	1.366
56 -60	97	94	96.9	3	3.1		0.036	0.231	0.059	0.908
61-65	65	56	86.2	9	13.8		0.769	1.165	0.420	3.234
66 and above	66	58	87.9	8	12.1		**REFERENCE GROUP**			
Total	792	763	96.3	29	3.7	43.85	0.000			
Gender										
Male	365	353	96.7	12	3.3		**REFERENCE GROUP**			
Female	427	410	96.0	17	4.0		0.604	1.220	0.540	2.839
Total	792	763	96.3	29	3.7	0.27	0.604			
Occupation										
Farmer	126	110	87.3	16	12.7		**REFERENCE GROUP**			
Manual worker (Artisans)	154	148	96.1	6	3.9		0.228	0.430	0.109	1.693
Civil/ Public servants	161	158	98.1	3	1.9		0.001	0.033	0.005	0.236
House worker	81	80	98.8	1	1.2		0.054	0.056	0.003	1.049
Others	55	52	94.5	3	5.5		0.038	0.096	0.010	0.883
Trading/Business	215	215	100	0	0.0		0.993	0.000	0.000	.
Total	792	763	96.3	29	3.7	40.69	0.000			
Education Level										
Non formal	147	137	93.2	10	6.8		**REFERENCE GROUP**			
Primary	156	144	92.3	12	7.7		0.766	1.142	0.478	2.728
Secondary	234	229	97.9	5	2.1		0.031	0.299	0.100	0.893
High school	194	193	99.5	1	0.5		0.012	0.071	0.009	0.561
College/ vocational school/ University	61	60	98.4	1	1.6		0.164	0.228	0.029	1.824
Total	792	763	96.3	29	3.7	19.99	0.001			
Household Income in Naira (₦)										
≤ 30,000	156	145	92.9	11	7.1		**REFERENCE GROUP**			
31,000 - 50,000	246	234	95.1	12	4.9		0.363	0.676	0.291	1.572
51,000-70,000	207	204	98.6	3	1.4		0.013	0.194	0.053	0.707

71,000 - 90,000	143	141	98.6	2	1.4		0.031	0.187	0.041	0.859
91,000 and above	40	39	97.5	1	2.5		0.306	0.338	0.042	2.699
Total	792	763	96.3	29	3.7	15.55	0.004			

Cataract occurred more among the over 60 years old compared to other age groups. Taking the oldest age group (66 years and above) as the reference group, the odds of having cataracts was found to be significantly lower among the 45-50 years by 95% (P < 0.0001, OR =0.05, 95% CI =0.01, 0.23), and also 80% lower among the 46 -50 years (P = 0.022, OR =0.203, 95% CI =0.052, 0.796) compared to the reference age group. Gender was not significant but the prevalence of cataract was higher among females (4.0%) than males (3.6%). Females in the area were at greater disadvantage about the disease with odds of over 1.2 times higher (OR =0.122, 95% CI =0.540, 2.839).

Significant difference in occupations was found between public or civil service and farming. The odds for having cataract was found to be 97% significantly lower among civil or public servants compared to the rate among farmers (P =0.001, OR =0.033, 95% CI =0.005, 0.236). The less educated were more affected by the disease in the study area. The odds ratio shows that there exist 70% risk for cataract lower among secondary education level group (OR =0.299, 95% CI =0.100, 0.893), and 93% lower risk among high school (OR =0.071, 95% CI =0.009, 0.561) compared to no formal education group.

The relationship with household income shows that cataract occurred more on households with lower income compared to those of the higher income group. The disease rate was found to be highest (7.1%) among households family income of less than 30,000 naira per month. Using the lowest income category (≤ ₦30,000) as a reference variable, the odds for the disease was found to be 80.6% (OR= 0.194, 95% CI =, 0.707) and 81.3% (OR= 0.187, 95% CI= 0.041, 0.859) significantly lower among households whose income were between 51,000 – 70,000 naira (OR= 0.194, 95% CI =, 0.707), and 71,000 – 90,000 naira.

DISCUSSION

Cataract is a preventable disease yet it could lead to loss of sight of when not treated or prevented. Therefore is a disease of major health concerns and this study targeted to estimate its prevalence and association with factors of socio-demographics in the study area. This present study found cataract prevalence to be 3.7%. This rate is relatively high considering the severe consequences and burdens of the disease. However, this study finding seems consistent with 3.9% prevalence reported in Ekiti, Southwest Nigeria (Adeniyi, et al, 2023). It is higher than 1.6% reported in another study in Nigeria (Olokoba, et al., 2016), but lower than 7.8% (95% CI: 5.0–10.6) reported in Ethiopia (Wolde Kentayiso et al., 2023). Likely cause of discrepancy in prevalent rates is the variation in age for the studies. The present study included all adults unlike some other studies that considered only age groups of 40 years and above as their participants. In any case, the studies indicated that the presence of cataract is an obvious challenge.

Significant socio-demographic factors for cataract development found in this study include age, education level, occupation and household income. Advancing age was found to be significant risk factor for cataract development with greater odds in this study. This finding is similar to other study reports (Khoza, et al, 2020). Though gender was not found significant in the present study, female sex showed higher prevalence of for cataract. This finding is in line with some other findings suggesting higher prevailing risk of cataract for females (Khan & Shaw, 2023; Hugosson & Ekstrom, 2020; Tang et al., 2016). It has been suggested that oestrogen plays a role in protecting the lens from oxidative stress (Jee st al., 2021; Nuzzi & Caselgrandi, 2022). Thus, decreasing oestrogen levels after menopause would increase the risk for cataract. Consistent with previous research, age was found to be a major cause of variation for the development of cataract in both females and males (Hugosson & Ekstrom, 2020). It has been reported while female is may be considered as having greater risk of cataract, it all depends on the aging rate for the gender groups considered (Fang et al., 2022), or presence of other diseases such as diabetes (Khan & shaw, 2023).

Significant occupations include civil or public service and farming, with lower odds found among civil or public

servants compared to farmers. This is not a surprise since people who are engaged in farm work and other outdoor jobs are more likely to be very exposed to sunlight and other associating risk factors of cataract (Modenese & Gobba, 2018; Vashist et al., 2020). The less educated were more affected by the disease in the study area than the higher education level participants. Subjects that attained secondary and high school education level showed more reduced risk of cataract compared to the non-formal education participants. Education has been reported as a positive factor in disease prevention since been educated exposes one to learning basic skills in addition to knowledge of disease prevention (Gagnon, 2021; Wang et al., 2022). Therefore possible explanation to this result is that higher education is likely to come with more awareness, greater prevention and control opportunities, including more influence on lifestyle adjustments, all of which are protective to cataract development (Fikrie et al., 2021; Meng et al., 2024).

The relationship with household income shows that cataract occurred more on households with lower income compared to those of the higher income group. Findings suggest that earning less than minimum wage is a likely predisposition to cataract development. The risk of having cataracts has been reported to have increased with decreases in household income (Nam et al., 2015). It has been reported that low-income groups are more likely to be deprived of access to healthcare facilities and are less likely to have routine medical checkups (Wan et al., 2020).

CONCLUSION

In conclusion, cataract prevalence is relatively high in the study area. Socio-demographic factor remained a challenging factor to the development of the disease in the population. It therefore implies socio-demographic factors should be taking into account in order to reduce the burden of cost and rate of blindness caused by to cataract in Imo State and other areas of similar characteristics.

Strength and Weakness

The present study recorded a wider coverage of the study population which is an obvious strength to the study. On the other hand, the study was weakened in such a way that eye examination and test for cataract was performed only on a center located at randomly selected communities. However, publications of the outreach were offered before commencement of the outreach to allow greater participations beyond the communities selected for the eye test.

Conflicts of Interest

The authors hereby declare no conflicts of interest.

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