Original Research Article

Characteristics and Systemic Risk Factors of Glaucoma in Adult Patients Attending a Private Eye Clinic in Aba, Nigeria

ABSTRACT

Aim: This study is a hospital-based research which utilized a cross-sectional design to evaluate the characteristics and systemic risk factors of glaucoma in adult patients attending a private eye clinic in Aba, Nigeria.

Methodology: This study is a hospital-based research which utilized a cross-sectional design to evaluate the characteristics and systemic risk factors of glaucoma in adult patients attending a private specialist eye clinic in Aba, Nigeria, which provides comprehensive eye care services to a diverse population of patients over a period of 36 months. Adult patients who presented during the study period made up the study population. The Cochran formula was used to calculate a sample size of 220 patients, with a 5% margin of error and a 95% confidence level.

Results: The age distribution of the participants showed that older people had a higher prevalence of glaucoma, with 71.4% of the patients being 50 years of age or older. Male patients made up more of the study's patients (54.5%). A family ocular history was reported by 16.4% of the subjects, with parents being the most frequently impacted family members (59.5%). Hypertension (23.2%) and diabetes mellitus (5.9%) of all systemic disorders were the most common. Out of the 220 participants, 43.2% of them with glaucoma reported having symptoms for less than a year, 13.6% between one and two years, and 43.2% for more than two years. The two most typical co-existing eye diseases were cataracts (47.8%) and refractive problems (9.9%). The most common recorded intraocular pressure (IOP) was between 11-29mmHg. The visual acuity of the patients varied, with 33.6% and 37.7% of them having vision better than 6/18 in their right and left eyes, respectively. Age and different glaucoma types were shown to be significantly correlated in the study (p=0.020). Primary open angle glaucoma (POAG) constituted 88% while primary angle closure (PACG) constituted 12%. Of the primary open angle glaucoma, 3.4% and normal tension glaucoma (NTG).

Conclusion: This study advances our knowledge of the clinical traits and risk factors for glaucoma, which could help with early detection, treatment, and prevention methods.

Keywords: Characteristics, Eye clinic, Glaucoma, Systemic risk factors

1. INTRODUCTION

Glaucoma is a group of diseases which include those that are either linked with high intraocular pressure or normal pressure and are defined by a progressive optic neuropathy that causes the typical appearance of the optic disc and/or irreversible vision field impairment [1]. It is a public health issue, the second-leading cause of blindness after cataract, and accounts for 8% of global blindness [2]. Worldwide, it is estimated that 60.5 million people have glaucoma and that 8.4 million of them have lost their vision as a result of the disease [2].

By 2040, it is expected that there will be 111.8 million adults (aged 40 to 80) who have glaucoma [3, 4]. If glaucoma is identified early and treated effectively, blindness from it can be delayed or avoided [5]. Glaucoma affects roughly 1% of adults over the age of 50 worldwide, and its prevalence rises with age [3, 6]. Glaucoma affects roughly 4% of persons aged 40 and older and causes 15% of blindness in Sub-Saharan Africa, according to an assessment of pertinent population-based surveys of the diseases [5]. The prevalence in Eritrea, Liberia, Ghana, South Africa, and Malawi ranges from 0.66% to 1.79% [7-9]. The most prevalent type of glaucoma among Africans is primary open angle glaucoma (POAG) [10]. In Nigeria, 4.25 million people have moderate to severe visual impairment, while 1,130,000 people over 40 yearsare blind [11].

Glaucoma is one of the main causes of blindness in Nigeria, accounting for about 16.7% of all causes of blindness in the last Nigerian National Blindness and Visual Impairment Survey (NNBVIS). It is the leading cause of irreversible blindness and functional low vision in Nigeria. Similar findings were found in other studies in the country [12–16]. The prevalence is higher in the Southeastern part of the country than in other areas [5]. Igbos live mainly in the Southeastern portion of Nigeria, Yorubas in the Southwestern region, and Hausas in the northern region. These three main ethnic groups make up Nigeria. Following multivariate analysis in the last NNBVIS, the Igbo ethnic tribe was identified as a risk factor for the development of glaucoma and glaucoma blindness®. The study also identified increasing age, family history, diabetes, myopia and elevated IOP. However, this NNBVIS, though a population study was conducted over 15years ago. For optimal care, it is necessary to comprehend the present glaucoma clinical presentation and demographics in the various regions of Nigeria. It may be possible to learn more about inter-ethnic and geographical variations in glaucoma presentations and proportions in clinical studies until large population studies are carried out again. Such clinical data can also give important background data for glaucoma epidemiological survey design in this and other regions of the country. Therefore, this study carried out in Aba, Abia state in the Southeastern part of the country, was aimed at assessing the characteristics and systemic risk factors of glaucoma in adult patients attending a private eye clinic in Aba, Nigeria. In this study, glaucoma was diagnosed as optic nerve cup-disc ratio of 0.5 or more with glaucomatous field damage.

2. RESEARCH METHODOLOGY

2.1 Research Design

This study is a hospital-based research which utilized a cross-sectional design to evaluate the characteristics and systemic risk factors of glaucoma in adult patients attending a private specialist eye clinic in Aba, Nigeria, which provides comprehensive eye care services to a diverse population of patients over a period

of 36 months. The clinic is well-equipped to diagnose and manage various eye conditions, including glaucoma. Adult patients (over the age of 18) who presented during the study period made up the study population. The Cochran formula was used to calculate a sample size of 220 patients, with a 5% margin of error and a 95% confidence level. The study participants were chosen using a methodical random sampling methodology. Up until the target sample size was reached, every third patient who visited the clinic throughout the study period was invited to take part.

Data on sociodemographic traits, ocular history, family history of glaucoma, and systemic risk factors were gathered using a structured questionnaire. Before giving out the questionnaire, the participants' informed consents were obtained. The participants also got a thorough eye examination, which included visual acuity test, intraocular pressure (IOP) measurement using a Goldmann applanation tonometer as well as central visual field test using Bjerrum's screen. A slit lamp examination with a +90D lens was used to assess the fundus. A 2 mirror Goniolens was used was used in evaluating the type of glaucoma.

2.2 Inclusion and Exclusion Criteria

Adult patients (18 years and above) who presented in the eye clinic during the study period met the inclusion criteria. Patients that declined consent were excluded from the study.

2.3 Ethical Considerations

Before the commencement of the study, ethical approval was obtained from the ethical review board of Abia State University, Uturu. All participants provided their informed consent after receiving assurances regarding the privacy of their information. Participants could withdraw from the research at any moment without consequences.

2.4 Data Analysis

Data were cleansed to ensure accuracy before being loaded into a statistical software program (SPSS). The study participants' demographic details, systemic risk factors, and clinical characteristics were summarized using descriptive statistics. The association between age and the presence of glaucoma was examined using bivariate and multivariate logistic regression models. The p-value cutoff for statistical significance was set at less than 0.05.

3. RESULTS

This study on the characteristics and systemic risk factors on this cohort, examined the socio-demographic information, family ocular history, and current history of systemic diseases in a sample of 220 participants assessing eye care in a private eye clinic. The age distribution showed that 20 participants (9.1%) were less than 30 years old, 43 participants (19.5%) were between 30-49 years old, 86 participants (39.1%) are between 50-69 years old, and 71 participants (32.3%) were 70 years or older. The results showed that 120 participants (54.5%) were males and the remaining 100 participants (45.5%) females. According to their occupations, 43 participants (19.5%) were civil servant, 111 participants (50.5%) were self-employed and 66 participants (30.0%) unemployed (Table 1).

It was observed that 36 participants (16.4%) had positive family ocular history of glaucoma. When asked of the relationship to family member with ocular history (if yes),

19 participants (52.8%) said parents, 10 participants (27.8%) said sibling, 5 participants (13.9%) said both parent and sibling, 1 participant each said grandparent and others respectively. Concerning current history of systemic diseases, 51 participants (23.2%) had hypertension, 13 participants (5.9%) had diabetes mellitus, 8 participants (3.6%) had both hypertension and diabetes mellitus while 147 participants (66.8%) had no systemic disease. When asked about the duration of glaucoma symptoms, 95 participants (43.2%) said less than 1 year, 30 participants (13.6%) said between 1 and 2 years, and 95 participants (43.2%) said more than 2 years. Figure 1 shows the types of glaucoma. POAG was 85%, PACG was 12% and normal tension was 3%.

Regarding the duration of symptoms in glaucoma patients, 43.2% of the patients had symptoms for less than a year (<1 year), 13.6% had symptoms for 1-2 years, and 43.2% had symptoms for more than 2 years (>2 years) (Table 2). A significant number of the 220 glaucoma patients had other ocular pathologies with only 15% having no other ocular pathologies, 47.8% of the patients had cataracts, 9.9% had refractive errors, 1.6% had presbyopia, 5.9% had both refractive error and presbyopia, 9.9% had posterior segment diseases, and 9.9% had other diseases (Table 3). The visual acuity of the glaucoma patients in both the right and left eyes had no particular pattern except that about 41% of the patients were either bilaterally or unilaterally blind (Table 4).

The intraocular pressure (IOP) of glaucoma patients in both the right and left eyes show that only a quarter had IOPs >/= 30mmHg, while majority (64-68%) had IOPs within 10-29mmHg (Table 5). The distribution of different risk factors among various types of glaucoma, such as primary open-angle glaucoma (POAG), primary angle-closure glaucoma (PACG), and normal tension glaucoma (NTG) is presented in table 6. The table presents the $\chi 2$ (chi-square) test and p-value to determine the association between risk factors and glaucoma types. A statistically significant result is marked with an asterisk (*), such as in the case of age group (p=0.020), indicating that there is a significant association between age and the types of glaucoma.

Age is the statistically significant risk factor in all the different risk factors studied (Table 6). However, positive family history was 50% among the NTGs as against 14% and 15% among those with PACG and POAG respectively.

Table 1: Socio-demographic characteristics of patients with glaucoma

Socio-demographic	Frequency (n=220)	Percentage (%)
Age (in years)		
<30	20	9.1
30-49	43	19.5
50-69	86	39.1
≥70	71	32.3
Sex		
Male	120	54.5

Female	100	45.5
Occupation		
Civil servant	43	19.5
Self employed	111	50.5
Unemployed	66	30.0
Family ocular history		
Yes	36	16.4
No	184	83.6
If Yes, in who?		
Parent	19	52.8
Sibling	10	27.8
Both parent and siblings	5	13.9
Grandparent	1	2.8
Others	1	2.8
Current history of systemic disease		
Hypertension	51	23.2
Diabetes Mellitus	13	5.9
Hypertension/DM	8	3.6
None	147	66.8
Others	1	0.5
Duration of glaucoma symptoms (in years)		
<1	95	43.2
1-2	30	13.6
>2	95	43.2

Mean age=58.51±17.88 years

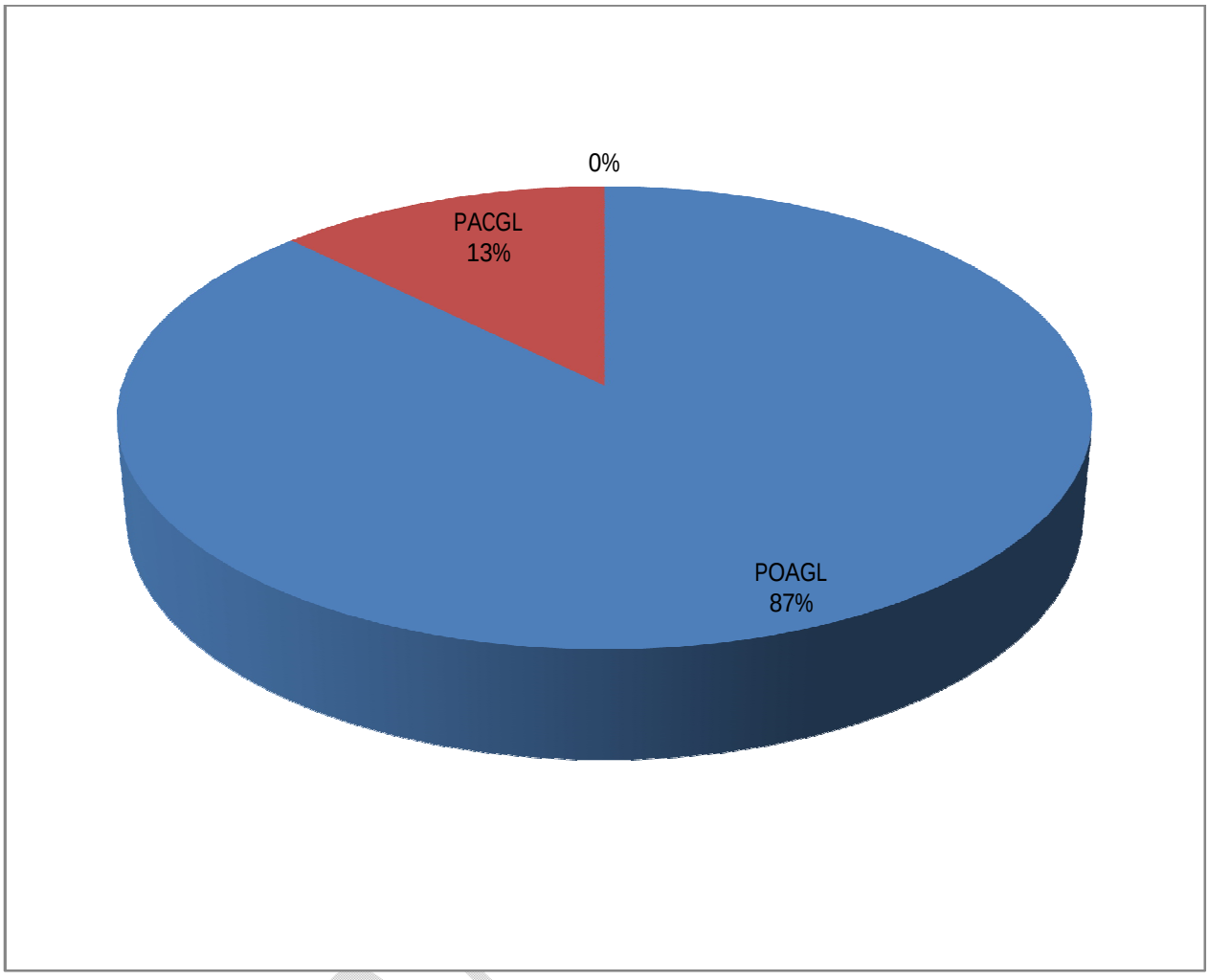

Figure 1: Types of Glaucoma

Table 2: Duration of symptoms

Duration (in years)	Frequency	Percent (%)
<1	95	43.2
1-2	30	13.6
>2	95	43.2

Table 3: Other ocular diseases

Variable	Frequency n=253*	Percent (%)
Cataract	121	47.8
Refractive error	25	9.9
Presbyopia	4	1.6
Refractive error/presbyopia	15	5.9
Posterior segment disease	25	9.9

Others	25	9.9
None	38	15.0

***Multiple responses**

Table 4: Visual acuity in the glaucoma patients

Visual acuity	Right eye n (%)	Left eye n (%)
≥6/18	74 (33.6)	83 (37.7)
<6/18-6/60	39 (17.7)	31 (14.1)
<6/60-3/60	14 (6.4)	15 (6.8)
<3/60-1/60	7 (3.2)	11 (5.0)
1/60-LP	70 (31.8)	66 (30.0)
NPL	16 (7.3)	14 (6.4)

Legend: LP = Light Perception,

Table 5: Intraocular pressure of Glaucoma patients

IOP (mmHg)	Right eye n (%)	Left eye n (%)
<10	19 (8.6)	19 (8.6)
10-19	71 (32.3)	63 (28.6)
20-29	71 (32.3)	87 (39.5)
≥30	56 (25.5)	48 (21.8)
Not done	3 (1.4)	3 (1.4)

Table 6: Risk Factors of Glaucoma

Types of Glaucoma

Note that normal tension glaucoma is a subset of POAG

Variables	POAG n (%)	PACG n (%)	Normal tension	χ^2	P-value
Age group (in years)	84 (44.9)	14 (51.9)	6 (100.0)		
<60	103 (55.1)	13 (48.1)	0 (0.0)	7.407 (FT)	0.020*
60+					
Sex					
Male	104 (55.6)	12 (44.4)	4 (66.7)		
Female	83 (44.4)	15 (55.6)	2 (33.3)	1.554 (FT)	0.478
Occupation					
Employed	130 (69.5)	21 (77.8)	3 (50.0)		
Unemployed	57 (30.5)	6 (22.2)	3 (50.0)	1.992 (FT)	0.368
Family ocular history					

Yes	29 (15.5)	4 (14.8)	3 (50.0)		
No	158 (84.5)	23 (85.2)	3 (50.0)	4.370 (FT)	0.102
Duration of symptoms (in years)					
<1	76 (40.6)	15 (55.6)	4 (66.7)		
1 & above	111 (59.4)	12 (44.4)	2 (33.3)	3.506 (FT)	0.181

FT= Fisher's test ***Statistical significance**

Note that normal tension glaucoma is a subset of primary open angle glaucoma.

4. DISCUSSION

The present study aimed to investigate the characteristics and systemic risk factors of glaucoma in adult patients attending a private eye clinic in Aba, Nigeria. The results of the study provided valuable insights into the prevalence of glaucoma, distribution of risk factors, duration of symptoms, and visual outcomes among these patients, which can inform public health interventions and clinical management strategies.

The age distribution of the participants showed that the majority (71.4%) were aged 50 years and above, with a predominance of participants in the 50-69 years old age group (39.1%). This suggests that glaucoma might be more prevalent in older individuals, which is consistent with a previous study [3] indicating that age is a major risk factor for glaucoma. Furthermore, the significant association between age and glaucoma types (p=0.020) suggests that different types of glaucoma may affect individuals at varying ages. This finding is also in line with previous research, which has established that the prevalence of glaucoma increases with age [17].

The gender distribution revealed that males (54.5%) slightly outnumbered females (45.5%). This is in line with previous research, which reported a higher prevalence of glaucoma among men [18]. However, this study did not assess the relationship between gender and glaucoma types, which could be an interesting aspect to explore in future research. Previous studies have reported mixed findings regarding the association between gender and glaucoma, with some suggesting that women may be at a higher risk for certain types of glaucoma [19].

Regarding occupation, 50.5% of the participants were self-employed, 19.5% were civil servants, and 30.0% were unemployed. Although this study did not find any significant association between occupation and glaucoma, further research is needed to determine whether occupational factors might contribute to the development of the disease.

Family ocular history was observed in 16.4% of the participants, with the majority (59.5%) having parents with a history of ocular disease. This finding supports the role of genetic factors in the development of glaucoma, as suggested by previous studies [20]. This underscores the importance of obtaining comprehensive

family histories during patient assessments and counseling at-risk individuals on the importance of regular eye examinations.

The presence of systemic diseases, such as hypertension and diabetes mellitus, has been previously reported as a potential risk factor for glaucoma [21]. In our sample, 23.2% of participants had hypertension, 5.9% had diabetes mellitus, and 3.6% had both conditions. These findings corroborate the association between these conditions and glaucoma, as reported in previous literature [22]. The high prevalence of hypertension among glaucoma patients is noteworthy, as it has been identified as a potential risk factor for the development and progression of glaucoma [23].

The duration of symptoms varied among the participants, with 43.2% reporting symptoms for less than one year, 13.6% for 1-2 years, and 43.2% for more than two years. This suggests that glaucoma patients might have different progression rates, possibly due to varying disease severity, treatment adherence, or other factors. This finding highlights the need for early detection and intervention to prevent the progression of glaucoma and vision loss. This result further revealed the variable nature of glaucoma progression and the need for personalized treatment strategies based on individual patient characteristics and disease course.

The presence of other ocular diseases was common among the glaucoma patients, with cataracts being the most prevalent (47.8%). This is consistent with previous research showing a high coexistence of cataracts and glaucoma [24, 25]. This finding underscores the importance of comprehensive ophthalmic evaluations and appropriate management of co-existing ocular conditions to optimize visual outcomes for glaucoma patients.

Visual acuity and intraocular pressure (IOP) measurements provided insights into the clinical status of the study participants. A considerable proportion of patients in our sample had relatively preserved visual acuity (≥6/18) in both eyes, with 33.6% in the right eye and 37.7% in the left eye. However, IOP measurements revealed a wide range of values, emphasizing the need for individualized IOP management in glaucoma care. These findings highlight the importance of monitoring visual acuity and IOP in glaucoma patients, as they are essential parameters for disease management and treatment.

Age was significantly associated with the forms of glaucoma when risk variables were distributed among them ($p=0.020$), supporting the idea that age is a key risk factor for the progression of the illness. Primary open-angle glaucoma (POAG, 85%), primary angle-closure glaucoma (PACG, 12%), and normal tension glaucoma (3%), were the three most prevalent types of glaucoma. This distribution resembles that found in other populations as stated by Tham et al. [4]. For particular patient populations, knowing the relative incidence of the various glaucoma forms might assist guide targeted prevention and treatment measures.

5. CONCLUSION

This study highlights the importance of understanding the socio-demographic factors, family ocular history, and systemic diseases in glaucoma patients to better tailor treatment and management strategies. The significant association between age and types of glaucoma emphasizes the

need for early detection and intervention, particularly in older age groups. Further research is necessary to explore other potential risk factors and their impact on glaucoma management and prognosis.

6. RECOMMENDATIONS

Based on the findings of this study, we recommend the following actions to address the challenges faced by the glaucoma patient population:

1. **Targeted Screening and Early Detection**: Given the significant association between age and the types of glaucoma, as well as the higher prevalence of glaucoma symptoms in patients aged 50 and above, targeted screening and early detection efforts should be prioritized for this age group. This can help identify and treat glaucoma at an earlier stage, potentially preventing irreversible vision loss.
2. **Address Coexisting Ocular Conditions**: Nearly half of the glaucoma patients in this study had coexisting cataracts, while others had refractive errors, presbyopia, and posterior segment diseases. Comprehensive eye care for glaucoma patients should include the identification and management of these coexisting ocular conditions to optimize vision and overall eye health.
3. **Focus on Systemic Disease Management**: Since hypertension and diabetes mellitus were prevalent in 23.2% and 5.9% of participants, respectively, managing these systemic diseases may help reduce the risk of developing or worsening glaucoma. Collaborative care between ophthalmologists and primary care physicians is essential to ensure that patients receive comprehensive care for their overall health.
4. **Public Awareness and Education**: Efforts should be made to increase public awareness of glaucoma and its risk factors, as well as the importance of regular eye examinations. This can be achieved through community outreach, social media campaigns, and collaborations with local healthcare providers.
5. **Occupational Health Programs**: Given the varied occupational backgrounds of the study participants, workplace-based health programs should be encouraged to promote regular eye examinations and address vision-related concerns, especially for those in high-risk occupations.
6. **Family History and Genetic Counseling**: With 16.4% of participants having a family ocular history, it is important to consider the role of genetic factors in glaucoma development. Genetic counseling and screening for at-risk individuals may help identify those with a higher likelihood of developing the disease.
7. **Longitudinal Studies and Continuous Monitoring**: Further research is needed to better understand the progression of glaucoma and the impact of various risk factors on the disease's development. Longitudinal studies with larger sample sizes and diverse populations can help provide more insights and inform more effective interventions for glaucoma patients.

By implementing these recommendations, healthcare providers and policymakers can work together to improve the prevention,

detection, and management of glaucoma, ultimately enhancing the quality of life for affected individuals and their families.

7. STUDY LIMITATIONS

The study's cross-sectional design makes it difficult to establish causal links between variables. The study relied on self-reported data for several variables, such as family ocular history and duration of glaucoma symptoms. This may introduce recall bias and subjectivity, as participants may not accurately remember or report their experiences.

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