Nigerian Medical Journal
NIGERIA MEDICAL ASSOCIATION
Print ISSN 0300-1652, E-ISSN 2229-774X

Original Research

Clinico-demographic Profile of Patients with Early Primary Open Angle Glaucoma at a Tertiary Private Eye Hospital in Lagos, Nigeria

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Abstract

Background: This study aimed to characterize the clinical and sociodemographic profiles of Nigerian patients with early-stage primary open-angle glaucoma (POAG), with the goal of highlighting the significance of timely diagnosis in enhancing glaucoma treatment outcomes.

Methodology: This cross-sectional study involved participants aged ≥ 40 years with early POAG. The participants underwent a slit-lamp examination of the anterior and posterior segments. The examination included gonioscopy, after which only eyes with open angles were selected. A central visual field test was conducted, and one eye of each participant who met the criteria for early POAG was selected for optical coherence tomography/angiography test (OCT/A). The relevant data were analyzed using the Statistical Package for Social Sciences (SPSS) version 26, with statistical significance set at $p<0.05$, with a 95% confidence interval.

Results: There were 90 participants with a mean age of 54.5 ± 10.1 years, comprising 54 males (60%). All participants had a best-corrected visual acuity (BCVA) of at least LogMAR 0.48, and the mean central visual field (CVF) MD was -3.50 ± 1.0 dB. The mean retinal nerve fiber layer (RNFL) thickness was 97.79 ± 17.33. The mean peripapillary vessel density (VD) was 50.21 ± 4.54%. Nearly half (47.8%) of the participants had other systemic medical conditions, primarily hypertension or hyperlipidemia.

Conclusion: Patients with early POAG were asymptomatic and had good visual acuity and minimal RNFL thickness reduction. This highlights the importance of routine hospital screening of people 40 years and older to aid early diagnosis of POAG.

Keywords: Early Glaucoma; Primary Open Angle Glaucoma; Clinico-Demographic Profile; Vessel Density.

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How to cite: Umeh VC, Nathaniel GI, Ogunro A.Clinico-demographic profile of patients with Early Primary Open Angle Glaucoma at a Tertiary Private Eye Hospital in Lagos, Nigeria. Niger Med J 2025; 66 (3):1105-1112.https://doi.org/10.71480/nmj.v66i3.851.

Quick Response Code:

Introduction

Glaucoma is a group of neurodegenerative diseases leading to irreversible loss of retinal ganglion cells, characteristic optic neuropathy, and typical visual field losses. [1-2] It is a public health problem and a leading cause of irreversible blindness globally. [3-4] It is the second leading cause of blindness in Nigeria.[5] About 60.5 million people are burdened with glaucoma globally, while8.4 million of this population are already blind from glaucoma.[6] In addition, the number of persons aged 40-80 years affected by glaucoma has been projected to rise significantly from 76.0 million in 2020 to 111.8 million by 2040. [7] Africa (mostly POAG) and Asia (mostly PACG) are expected to be the worst hit from this rise. [7] POAG is the most common type of glaucoma in Africa.[8] It is also the most reported form of glaucoma in Nigerian hospital-based studies. [9-10]

Previous glaucoma studies in Nigeria highlighted late presentation, advanced glaucoma, and visual impairment as common features among Nigerian glaucoma patients. However, there is a lack of information on the profile of patients with early POAG. This study will bridge this knowledge gap and, in addition, enhance advocacy for early detection/diagnosis and appropriate treatment for the prevention of glaucoma blindness.

Methodology

This was a hospital-based cross-sectional study of participants with early POAG at the glaucoma clinics of the Eye Foundation Hospital, 27 Isaac John Street, GRA Ikeja, Lagos, Nigeria. Ethical approval for the study was obtained from the Lagos State University Teaching Hospital Ethical Review Board, and the study adhered to the Tenets of the Helsinki Declaration. Consecutive consenting participants aged 40 years and above with already diagnosed early glaucoma were recruited into the study over a 3-month period. The sociodemographic profile of the participants was obtained using an interviewer-administered questionnaire, following which the participants underwent a full ocular examination (including indirect gonioscopy using Ocular 3-mirror goniolens) prior to CVF assessment (Humphrey Field Analyzer II, Zeiss Humphrey Matrix 715). Participants with reliable CVF meeting the criteria for early POAG were selected for OCT and OCTA scans.

Early POAG was defined as open anterior chamber angles (Schaffer's 3 and above) on gonioscopy, VCDR >0.4, and CVF Mean deviation (MD) less than -6 dB, with glaucoma hemifield test (GHT) outside normal limits on a reliable Humphrey 24-2 perimetry (Humphrey Field analyser II, Zeiss Humphrey Matrix 715). [12-13] Intraocular pressure was not considered in this definition. [14]

Participants with dense cataracts, previous ocular trauma, retinal pathologies, other types of glaucoma, advanced forms of glaucoma, unreliable CVF results, preperimetric glaucoma, and poor-quality scans (<6/10) were excluded.

The OCT and OCTA scan was centred around the ONH and covered a 4.5×4.5 mm^2 area. The peripapillary region was defined as a 750-µm width elliptical annular area extending from the optic disc margin and was divided into eight sectors. The peripapillary vascular densities (VDs) were measured and summarized into superior, inferior, nasal, and temporal quadrants. The average VD of the four quadrants (nasal, inferior, superior, and temporal) was calculated.

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 26. Frequencies and proportions were used to summarize categorical variables, while the mean, mode, and median were used for numerical variables. Statistical significance was set at $P < 0.05$, with a confidence interval of 95%.

Results

This study included 90 participants aged 40-69 years, who comprised 54 males and 36 females. The females (56.1 ± 10.4 years) were fewer and slightly older than the males (53.5 ± 9.9 years); however, the difference in age was not statistically significant (p 0.25). Most of the participants in this study had

attained at least a secondary education and were married. The demographic profiles of the participants are summarized in Table 1. All eyes had a best corrected VA greater than LogMAR 0.48 (Snellen 6/18), and a few with uncorrected visual acuity (UCVA) less than LogMAR 0.48 (Snellen 6/18) improved significantly on refraction.

Nearly half (47.8%) of the participants had other systemic medical conditions, primarily hypertension or hyperlipidemia. Table 2.

All participants were within the first five years of glaucoma diagnosis, while a fifth of the participants had a positive family history of glaucoma. All participants were on topical glaucoma medication, while very few had undergone laser therapy (selective laser trabeculoplasty) or trabeculectomy. Table 2.

The Peripapillary RNFL thickness obeyed the ISNT rule in all eyes (100%); however, fundoscopy estimated a lower percentage of 38.9%. OCTA peripapillary VD distribution also negated the ISNT rule.

Table 1: Demographic profile of participants

Variables	**Frequency** (%) (n=90)
Demography	**n (%)**
Right eye	50 (55.6%)
Left eye	40 (44.4%)
Gender	
Male	54 (60.0%)
Female	36 (40.0%)
Age (years)	
40-49	31 (34.4%)
50-59	26 (28.9%)
60-69	33 (36.7%)
Mean	54.5 ± 10.1 years
Marital status	
Single	0 (0%)
Married	88 (97.8%)
Divorced	0 (0%)
Widowed	2 (2.2%)
Education	
Primary	2 (2.2%)

Secondary	10 (11.1%)
Tertiary	78 (86.7%)
Ethnicity	
Igbo	21 (23.3%)
Yoruba	55 (61.1%)
Hausa	7 (7.8%)
0thers	7 (7.8%)
Family history of glaucoma	
Yes	18 (20.0%)
No	72 (80.0%)
Past medical history	
Hypertension	23 (25.6%)
hyperlipidaemia	9 (10.0%)
Diabetes mellitus	6 (6.7%)
Asthma	1 (1.1%)

Table 2: Clinical profile of participants

Variables	**Frequency (%)**
Uncorrected visual acuity	
LogMAR 0.00 - 0.48	80 (88.9%)
LogMAR 0.50 – 1.0	10 (11.1%)
Corrected visual acuity	
LogMAR 0.00 – 0.48	90 (100.0%)
LogMAR 0.50 – 1.0	0 (0.0%)
VCDR	
0.5	31 (34.4%)
0.6	27 (30.0%)
0.7	23 (25.6%)
0.8	9 (10.0%)
ONH notching	

Present	11 (12.2%)
Absent	79 (87.8%)
ISNT rule	
Positive	55 (61.1%)
Negative	35 (38.9%)
Mean CVF MD	-3.50 ± 1.0
RNFL thickness	
Inferior	118.97 ± 19.06
Superior	118.04 ± 25.74
Nasal	91.56 ± 17.34
Temporal	62.56 ± 10.94
Average	97.79 ± 17.33
OCTA VD	
Inferior	50.39 ± 7.82%
Superior	50.38 ± 5.91%
Nasal	48.37 ± 5.67%
Temporal	51.28 ± 5.64%
Average	50.21 ± 4.54%
Treatment	
Topical antiglaucoma medications	90 (100.0%)
Laser (SLT)	8 (8.9%)
Trabeculectomy	3 (3.3%)
Explanatory notes: **VCDR**-vertical cup disc ratio, **ONH**- optic nerve head, **ISNT**- inferior, superior, nasal, temporal; CVF **MD**- Central visual field mean deviation, **RNFL**-retinal nerve fibre layer, **OCTA VD-** Optical coherence tomography angiography vascular density	

Discussion

This study evaluated the sociodemographic and clinical profiles of early glaucomatous Nigerians aged ≥ 40 years. Previous Nigerian studies documented the prevailing characteristics of patients presenting with glaucoma, notably advanced disease, poor vision, blindness in one eye, illiteracy, and poor adherence to medications/clinical review schedule. [9-11] The participants in this study had at least a minimum of secondary education, were within the first five years of diagnosis, and lived within the urban settlements around the study location. These factors could explain their earlier presentation and good visual status

compared to participants in previous Nigerian studies. Furthermore, a significant number of participants in this study had a family history of glaucoma, which may have aided their early presentation.

Hypertension, hyperlipidemia, and diabetes mellitus (DM) have been previously documented as risk factors for POAG. [15-17] These conditions were noted in this study. Hyperlipidemia occurred in a significant proportion of participants. This may reflect their age, but also a primer to further investigate for associations between hyperlipidemia and glaucoma in Nigerian eyes, as had been done for DM. [18]

The participants in this study were within the first 5 years of POAG diagnosis (mean 2 years), had commenced glaucoma treatment, had a mean VCDR of 0.61 ± 0.10, and a mean CVF MD of-3.5db ± 1.0. The reported VCDR contrasts with that previously documented in Southwest Nigeria [10], which reported a VCDR >0.7 in over 70 percent of eyes in their glaucoma clinics compared to just 35% in this study. [10] Table1. This is not unexpected, as the previous study included all categories of glaucomatous damage, and not early POAG. However, this finding suggests that with early diagnosis, only a few patients present with a VCDR greater than 0.7. It is also noteworthy that none of the participants were visually impaired or blind, despite having the VCDR of 0.61±0.10. The mean CVF MD in this study was also lower than that in previous Nigerian studies. [9,19] This was because of the inclusion criteria. The early commencement of treatment in these participants is in line with the results from the Early Manifest Glaucoma Trials, which elucidated the effect of early treatment on slowing down glaucoma progression. [20]

The RNFL thickness distribution in this study was in tandem with the ISNT rule despite the diagnosis of early POAG. The average RNFL thickness (97.79 ± 17.33 μm) in this study was comparable to a previous study in Lagos, Nigeria. [19] The RNFL thickness, however, is lower than that of RNFL thickness in normal African eyes. [21-22] These findings suggest that there is an established loss of RNFL in early POAG, which does not alter the ISNT thickness rule nor give the characteristic notching and may not be associated with any form of visual impairment or vision loss (asymptomatic).

The VD in eyes with early POAG in this study was the thickest in the temporal quadrant, thus negating the ISNT RNFL thickness rule, indicating that the VD distribution was independent of the peripapillary nerve fiber distributions because more vessels subserve the papillomacular bundle compared to other populations of retinal nerve fibers. This VD distribution pattern is similar to that in Caucasians with POAG.[23] The average VD was also comparably lower than the VD in normal Caucasian eyes.[23] This finding denotes an established optic nerve head (ONH) vascular compromise in early POAG despite the absence of visual impairment.

Limitations

In this study, only one eye per participant was studied; thus, there was no data for inter-eye variability. A study including both eyes in eyes with early POAG will be able to provide this data.

Recommendation

A much larger prospective study in Nigeria involving major ethnic nationalities will present more generalizable data for Nigeria. A follow-up study on early POAG patients will be essential to help check for progression while on their treatment regimen.

Conclusion

Early POAG patients in this study were educated, lived in urban areas, were within the first five years of glaucoma, and had commenced glaucoma treatment. They also demonstrated minimal visual field MD reductions, RNFL thickness, and Peripapillary VD reductions, but had no visual impairment. Primary Open Angle Glaucoma is largely asymptomatic in the early stages and can only be detected by routine screening of people 40 years of age and older with or without a family history and treat it appropriately.

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