

## ORIGINAL ARTICLE

# Spectrum of Glaucoma Presentation in a Nigerian Tertiary Hospital

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## ABSTRACT

**Purpose:** The aim of this study was to report the types and severity of glaucoma at presentation in patients attending the glaucoma clinic of the University College Hospital, Ibadan, Nigeria. This information will help in designing an awareness and management strategy that will help in reducing glaucoma blindness. **Materials and Methods:** Consecutive new glaucoma patients of all age groups who presented to the glaucoma clinic of the University College Hospital, Ibadan, over a 1-year period between January and December 2009 were evaluated. Each patient had a complete ophthalmic evaluation, including intraocular pressure (IOP), visual acuity, visual field, optic disc assessment and gonioscopy. **Results:** A total of 336 patients (669 eyes) presented with glaucoma (mean age was  $56.5 \pm 16.5$ , 56.3% male) during this period. The mean presenting IOP was  $23 \pm 11.6$  mmHg and 48.5% of the 669 eyes evaluated had severe glaucoma (MD > -12dB, cup to disc ratio of  $\geq 0.9$ ). Primary open angle glaucoma (POAG) was the most common form (51.2%), glaucoma suspects were 55 (16.4%), 66 (19.6%) patients had normal tension glaucoma (NTG), 28 (8.3%) patients had primary angle closure glaucoma (PACG), and 15 (4.5%) patients had secondary glaucoma. **Conclusion:** POAG is the most common form of glaucoma seen in the glaucoma sub-specialty clinic in Nigeria. NTG and PACG were common in this case series. A large proportion of the patients had advanced disease at presentation.

**Keywords:** Glaucoma, Nigeria, types, and glaucoma severity

## INTRODUCTION

Glaucoma is an optic neuropathy with characteristic optic disc changes and visual field defect. It is the second most common cause of blindness and the leading cause of irreversible blindness worldwide<sup>[1,2]</sup> and in Nigeria.<sup>[3]</sup> Quigley *et al.*<sup>[1]</sup> estimated that the number of people with glaucoma will increase to 79.6 million by 2020 and of these 74% will be open angle glaucoma (OAG).

Primary open angle glaucoma (POAG) is the most common type of glaucoma in Africa.<sup>[4-8]</sup> The Baltimore eye study<sup>[9]</sup> found the prevalence of POAG in people of African descent to be four times greater than in

Caucasians. Ntim-Amposah *et al.*<sup>[7]</sup> reported a POAG prevalence of 8.5% among adults aged 40 years and older in Ghana. Observations among West African ancestrally-related populations in the Caribbean also show a very high prevalence of POAG.<sup>[10,11]</sup> Although studies confirm that POAG is the predominant form of glaucoma in Africans, there are other forms of glaucoma in West Africa.

In order to properly characterize the different types of glaucoma and to ensure appropriate management, it is important to perform routine gonioscopy and critically examine all patients. In a study done in Ghana, Herndon *et al.*<sup>[12]</sup> noted that all the patients with PACG were being followed up as POAG and receiving chronic medical treatment.

To the best of our knowledge, there is at present no representative population-based glaucoma survey in Nigeria. Until such data becomes available, hospital-based studies may reflect the distribution of the subtypes and severity of glaucoma in Nigeria. This

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information will be useful in designing an awareness and management strategy that may help in reducing glaucoma blindness in Nigeria.

## MATERIALS AND METHODS

This retrospective, descriptive study was conducted among new glaucoma patients who presented to the eye clinic of the University College Hospital (UCH), Ibadan, Nigeria, with a diagnosis of glaucoma between January and December 2009. All patients with complete key outcome variables were included. The study followed the tenets of the declaration of Helsinki.

Each patient had a complete history and ophthalmic evaluation, consisting of uncorrected and best corrected visual acuity using the standard definitions of visual impairment proposed by the World Health Organization,<sup>[13]</sup> slit-lamp examination, biomicroscopic optic disc assessment, intraocular pressure by Goldmann applanation tonometry, and gonioscopy using a 4-mirror Posner lens. The anterior chamber angle was graded using the Schaffer's grading system,<sup>[14]</sup> which is based on the width of the anterior chamber angle recess. The degree, distribution and the color of the trabecular meshwork pigmentation, the presence of new vessels, synechiae and exfoliative material were also documented. Intraocular pressure of 21 mmHg and above was considered abnormal.

Automated full-threshold perimetry was performed for subjects with best-corrected visual acuity better than 6/60 using the 24-2 SITA standard program on the Humphrey 740 Visual Field Analyzer (Dublin, California, USA). The pupils of all patients with open angles were dilated and stereoscopic examination of the vitreous, retina and optic nerve head was performed with a 78-diopter lens. The vertical cup to disc ratio (CDR) was recorded using the largest value of the cup superiorly from the 11 to 1 o'clock to the inferior aspect between 5 and 7 o'clock positions. Secondary causes of glaucoma were also ruled out from both the history and the clinical examination.

A diagnosis of glaucoma was made based on the evidence of glaucomatous optic neuropathy (typical cupping of the optic nerve head with vertical CDR of  $\geq 0.7$  or difference in the vertical CDR of 0.2 between the two eyes, rim thinning or rim loss, focal notching, saucerisation of the optic nerve head, retinal nerve fiber loss, and disc hemorrhage) with corresponding visual field defects with or without a raised IOP. The 97.5<sup>th</sup> percentiles for CDR and CDR asymmetry were found to be 0.7 and 0.2, respectively, in African population based surveys.<sup>[4-6]</sup>

Criteria for diagnosis of POAG were age at diagnosis of 40 years and older, open angle on gonioscopy and the following: (1) IOP > 21 mmHg in each eye; (2) glaucomatous optic neuropathy in each eye; and (3) visual field defects consistent with glaucoma. Patients who had features (2) and (3) above but with a consistent IOP less than 21 mmHg were diagnosed with normal tension glaucoma (NTG). Juvenile open-angle glaucoma (JOAG) was diagnosed in patients younger than 40 years but more than 5 years of age with features of POAG, without evidence of buphthalmos or breaks in Descemet's membrane.

Primary angle-closure glaucoma (PACG) was diagnosed if the individual had evidence of angle-closure from gonioscopy in more than two quadrants with glaucomatous optic nerve changes and corresponding visual field defects. Primary angle-closure glaucoma was further classified as acute or chronic based on the presence or absence (of) or acute features of elevated IOP.

Exfoliative glaucoma (XFG) was defined as glaucoma (open angle or closed angle) associated with characteristic exfoliation material on the anterior lens surface on slit lamp biomicroscopy in addition to any of the following on gonioscopy: Hyperpigmented trabecular meshwork or Sampaolesi line or exfoliative material in the angle recess.

Secondary glaucoma was defined as the presence of any ocular or systemic abnormalities predisposing to glaucoma. In patients with phacomorphic glaucoma, where a lenticular opacity precluded a view of the optic disc, glaucoma was defined as the presence of a hyper mature cataract, a visual acuity of HM or worse, the presence of an afferent pupillary defect and an IOP of  $\geq 30$  mmHg.

Data collected was collated and analyzed using SPSS version 16 (SPSS, Inc, Chicago, USA). Frequencies and means were generated to observe patterns of variable distribution among the patients. Bivariate analysis was conducted using cross-tabulations and Chi-square test to evaluate associations between categorical variables. A *P* value < 0.05 was considered significant

## RESULTS

A total of 336 consecutive new patients with glaucoma (669 eyes) who presented during this 1 year period fulfilled the diagnostic criteria of this study and constituted the study population. Their mean age was  $56.5 \pm 16.5$  years (range, 11 to 95 years; median 60 years). Most of the patients were males (56.0%).

Table 1 shows the age and sex distribution of the glaucoma patients. One hundred and seventy five patients (52.1%) were within the 5<sup>th</sup> and 6<sup>th</sup> decades of life. Forty nine patients (14.6%) were below 40 years. Primary open angle glaucoma accounted for 172 patients (51.2%). Out of this number, JOAG accounted for 49 patients (14.6%), NTG accounted for 66 patients (19.6%) of all the patients and PACG 28 patients (8.3%) [Table 2]. All the secondary glaucomas were unilateral and accounted for 15 eyes (4.5%). Nine eyes had glaucoma secondary to trauma/uveitic glaucoma, 4 eyes had exfoliative glaucoma, while 2 eyes had pigmentary glaucoma.

The mean IOP for the right and left eyes were 22.89 ± 11.49 and 23.14 ± 11.57 mmHg, respectively. The mean vertical cup to disc ratio in the right and left eyes were 0.79 ± 0.21 and 0.81 ± 0.20, respectively. Visual fields were done in 645 eyes (96.41%) out of the 669 eyes examined and almost 50% of them presented with severe disease, less than a third presented in the early stage of the disease [Table 3]. Overall, about 44.6% of the patients presented with at least one eye blind while 29.7% of the patients presented with bilateral blindness based on visual acuity.

Overall, POAG including NTG, was diagnosed in 70.8% of the study patients. Males were more than females (59.1%). The mean age of POAG patients was 58.3 ± 15.2 years. Excluding patients with NTG the mean IOP in the right eyes was 27.8 ± 11.7 mmHg and 28.6 ± 11.5 mmHg in the left eyes. The mean vertical CDR was 0.89 ± 0.16 in the right eyes and 0.90 ± 0.15 in the left eyes.

Majority of the patients (67.4%) had severe disease with a vertical CDR of ≥ 0.9 in at least one eye. In the NTG subset, the mean IOP was 14.83 ± 2.89 mmHg in the right eyes and 14.62 ± 2.98 mmHg in the left eyes. The mean vertical CDR was 0.72 ± 0.18 in the right eyes and 0.75 ± 0.15 in the left eyes.

Primary angle closure glaucoma was diagnosed in 28 patients (8.3%). There was a slight male preponderance (53.6%). The mean IOP was 28.4 ± 12.81 mmHg in the right eyes and 28.03 ± 12.47 mmHg in the left eyes, respectively.

## DISCUSSION

This survey was performed on patients presenting to the eye clinic of the University College Hospital, Ibadan Nigeria. Primary open angle glaucoma was the most common form of glaucoma accounting for about 70.8% of the patients (inclusive of the NTG and JOAG patients). The most common form of glaucoma was POAG and

**Table 1: Demographic characteristics of the patients with glaucoma**

Characteristics	Number (%) (n=336)
Sex	
Male	188 (56.0)
Female	148 (44.0)
Age	
<20	10 (3.0)
20-29	19 (5.7)
30-39	20 (6.0)
40-49	41 (12.2)
50-59	75 (22.3)
60-69	100 (29.8)
70-79	48 (14.3)
80-89	21 (6.3)
90-99	2 (0.6)
Ethnic group	
Yoruba	317 (94.3)
Igbo	15 (4.5)
Hausa	4 (1.2)

**Table 2: Distribution of glaucoma subtypes**

Glaucoma subtypes	Number (%)
POAG (excluding NTG)	172 (51.2)
NTG	66 (19.6)
Glaucoma suspects	55 (16.4)
Secondary glaucoma	15 (4.5)
PACG	28 (8.3)

POAG: Primary open angle glaucoma, NTG: Normal tension glaucoma, PACG: Primary angle closure glaucoma

**Table 3: Severity of the disease at diagnosis using the visual fields**

Mean deviation (dB)	RE (%)	LE (%)
<6	108 (33.5)	96 (29.8)
6-12	62 (19.3)	68 (21.1)
>12	152 (47.2)	158 (49.1)

RE: Right eye, LE: Left eye

this is similar to reports from different clinic-based studies in Nigeria.<sup>[15-17]</sup> Previous studies elsewhere in Sub-Saharan Africa have shown that POAG accounts for at least 45% of all cases of glaucoma.<sup>[4,5]</sup>

Approximately 15% of the patients seen in the clinic were younger than 40 years of age. This is similar to other studies that have been conducted among other indigenous African populations.<sup>[12,18]</sup> This also corroborates the existing knowledge that glaucoma occurs at a younger age in Africans.<sup>[4,6,19]</sup> It is possible that the earlier age of onset of glaucoma among blacks may contribute to the greater glaucoma blindness in this population since they would have the disease for a longer time.

Using either the visual field or visual acuity, 29.7% were blind in both eyes at presentation, while 44.6% were

blind in at least one eye at presentation. Using the visual field alone, more than half of the patients presented with severe disease. Similar high prevalence of bilateral blindness was reported in clinic-based studies in Tanzania (29%),<sup>[20]</sup> Northern Nigeria (21%)<sup>[21]</sup> and Ethiopia (23.9%).<sup>[22]</sup> Our finding is slightly higher than the 17.7% figure in a recent study from Benin-City,<sup>[16]</sup> but less than the 34% rate reported in Kaduna about three decades ago<sup>[23]</sup> and the 40.6% rate reported in Ibadan almost four decades ago.<sup>[24]</sup>

This may be due to improved awareness and level of education, the increased availability of ophthalmology services, even in rural and suburban areas. Another reason may be the different visual acuity definitions employed for blindness; while the Kaduna study used visual acuity of counting fingers at less than 1 meter to define blindness, this study employed visual acuity of less than counting fingers at 3 feet.

The peak incidence of glaucoma was in the 6<sup>th</sup> decade, and the mean age in patients with POAG was 58.3 years, which is a decade earlier than in Caucasians. This finding is similar to previous reports showing that the onset of POAG in Africans is 1-2 decades earlier than Caucasians.<sup>[25,26]</sup>

The IOP in POAG patients excluding NTG patients was similar to reports from Ghana, a West African country.<sup>[12]</sup> When the subset of NTG was however added, the mean IOP was lower and similar to the results of Burhmann,<sup>[4]</sup> and Leske in Barbados.<sup>[11]</sup> The differences may reflect the different instruments used in obtaining IOP. In this study we reported the proportion of NTG as 19.6%.

There was a slight male preponderance among patients with PACG. The difference in this setting could likely be due to unequal access to health care with males having more accessibility to health care facilities rather than a true sex difference. The proportion of PACG in this study is comparable to a study in Ghana,<sup>[12]</sup> but higher than reports from Benin.<sup>[16]</sup> It is however lower than reports from a hospital based study in South Africa which was done a mixed race. In a study done in Ethiopia, the proportion of PACG was reported to be 18.5%<sup>[22]</sup> and in a study done in Benin Nigeria, the proportion was reported to be 1.7%.<sup>[15]</sup> This disparity may be due to differences in study design. Also, the importance of gonioscopy in clinical evaluation of glaucoma patients cannot be over emphasized.

We reported the secondary forms of OAG such as exfoliative glaucoma. Although many studies in Africa did not report exfoliative glaucoma, we found a few patients in our cohort with this form of glaucoma. Exfoliation glaucoma was not reported in

studies done in Ghana,<sup>[12]</sup> Tanzania,<sup>[4]</sup> and in many Nigerian studies.<sup>[15-17,23]</sup> However, a prevalence of 6.7% was reported in a study done during a glaucoma training workshop in the Gambia.<sup>[27]</sup> A prevalence of 6% was also reported by Kaimbo *et al.* in the Congo.<sup>[28]</sup> It has been reported to be the most common type of glaucoma (35.2%) seen in a recent study done in Ethiopia.<sup>[22]</sup> This relatively high prevalence in Ethiopia and lower prevalence in much of West Africa may be due to environmental or genetic influences. Limitation of this study is its clinic-based design and therefore generalization of the findings may not be applicable. We however believe that it is a baseline for future population-based studies. In summary, we reported that POAG remains the most common form of glaucoma. Normal tension glaucoma and PACG are not uncommon. Although XFG is rare, we reported the disease in a few patients. We recommend careful slitlamp examination and gonioscopy in patients to properly characterize glaucoma patients in our environment. We also recommend a population-based study to properly define the types of glaucoma in Nigeria.

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