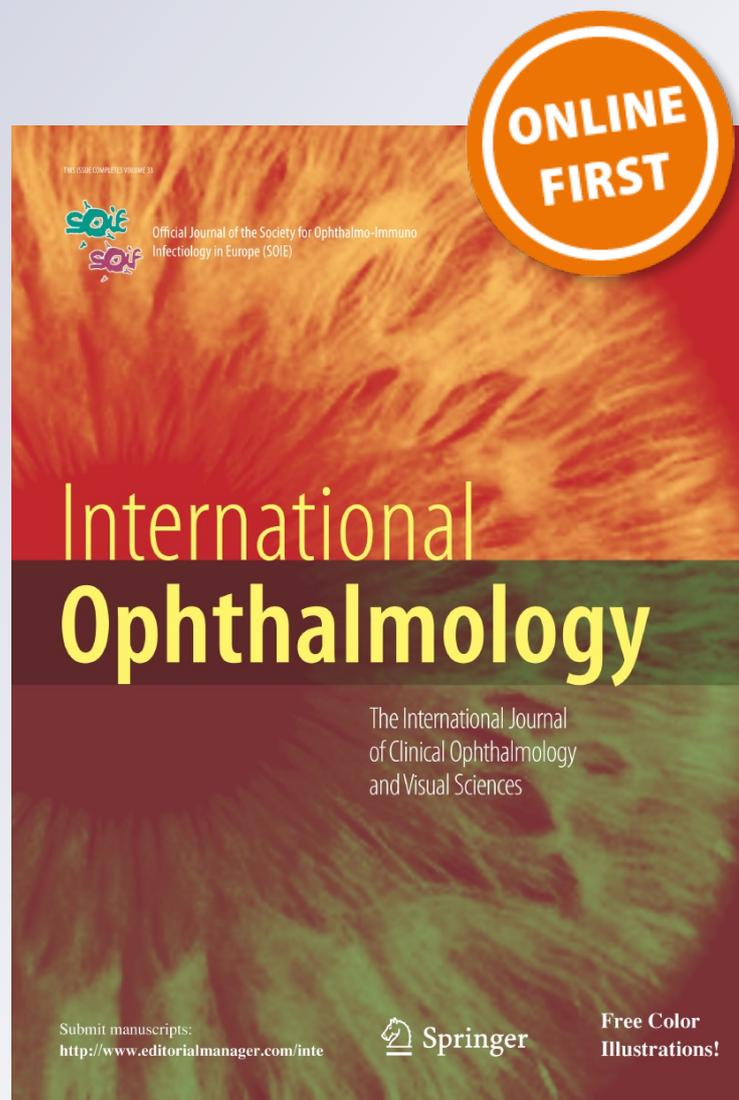# Glaucoma in southwest Nigeria: clinical presentation, family history and perceptions

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Glaucoma in southwest Nigeria: clinical presentation, family history and perceptions

**Bola J. Adekoya · Shaheen P. Shah ·
Adeola O. Onakoya · Abdulkabir A. Ayanniyi**

Abstract Knowledge of the presentation pattern of glaucoma helps in providing more understanding of the disease, leading to better control. The aim of this study was to determine the presentation pattern among newly diagnosed glaucoma patients in Lagos, Nigeria. This was a multicenter cross-sectional survey of newly diagnosed glaucoma patients, recruited over a four-week period. Socio-demographic characteristics, presenting history, awareness and perception on glaucoma, and basic examination findings were obtained. A total of 208 patients, including 90 (43.2 %) females with a mean age of 53.9 years were recruited. One hundred and forty-three (68.7 %) were self-referred patients with a mean duration of symptoms of 2.6 years. Fifty-five (26.4 %) patients gave a history of glaucoma in at least one family member. Ninety-five patients (45.7 %) were aware that glaucoma can cause visual loss, but 69 (72.6 %) out of these believed the visual loss is reversible. Seventy (33.7 %) patients had been previously diagnosed with glaucoma elsewhere. From the 208 patients, 35.5 % had visual impairment (presenting visual acuity [VA] of <6/18 in the better eye), while 15.5 % were blind (presenting VA in better eye <3/60). Lack of glaucoma awareness, positive family history and illiteracy were associated with late presentation of glaucoma. Late presentation is still a major concern among glaucoma patients in Southwest Nigeria, and there is a need to intensify present efforts aimed at increasing public awareness, emphasising the irreversible nature of the disease, as well as encouraging at-risk groups such as first-degree relatives to go for screening.

Keywords Glaucoma · Visual impairment · Blindness · Late presentation · Awareness

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Introduction

Glaucoma is the second most common cause of blindness and the foremost cause of irreversible blindness worldwide [1], being responsible for blindness in approximately 4.5 million people. Glaucoma

has been estimated to affect about 60.5 million people worldwide, and this has been predicted to increase to nearly 80 million by 2020 [2]. Primary open-angle glaucoma (POAG) is responsible for more than half of this figure [2, 3]. More than 95 % of the people blind from glaucoma live in the developing world [4]. The prevalence of glaucoma-related blindness in individuals aged ≥40 years was found to be 0.7 % [5] in Nigeria and, after cataract, it is the second commonest cause of blindness (16.7 %) [6]. Furthermore, a quarter of patients presenting to the outpatient department of eye clinics were found to be glaucoma patients in a Nigerian study [7]. The morbidity associated with glaucoma as seen in other causes of blindness is high in terms of reduced productivity and poor quality of life [8].

POAG is initially symptomless, and by the time VA is affected, irreversible loss of the nerve fiber layer has occurred. Many patients from poor countries tend to present with end-stage disease and it is not unusual to see patients in our environment presenting blind in one eye, with the other having advanced optic disc cupping. Socio-economic factors as well geographic factors have been implicated in the varying clinical features at presentation [3, 9–12]. This study was part of a state-wide situational analysis of glaucoma and its services in Lagos State, Nigeria. The purpose of this study is to describe the clinical characteristics of patients newly diagnosed with POAG and to determine risk factors associated with late presentation.

Methods

This was a descriptive, analytical cross-sectional study conducted in Lagos State, Nigeria. Twelve eligible centers were invited to participate in the survey, but only ten sites completed data collection. These included seven of the nine government-owned secondary level hospitals, and two government-owned tertiary level eye units. One large private eye hospital was included for comparative purpose. The selection criterion for the government hospitals was any institution with a functional eye unit and at least a senior registrar in ophthalmology in charge of patient management. It is believed that government hospitals are the largest provider of healthcare services for the population, accounting for approximately 70 % of care [13]. The private hospital included was selected

because it is the largest private eye hospital in the state with groups of practicing ophthalmologists. Other small, single-practice eye units were not included for feasibility reasons.

Data was collected using specifically designed patient questionnaires which were pilot-tested at two of the participating sites before commencement of study and then modified accordingly. The questionnaires were administered by ten trained research assistants (RA) over a 4-week period. All patients newly diagnosed with glaucoma by the consultant ophthalmologist or senior resident over the 4-week period (1–28 July, 2010) were included. The guidelines of the International Society of Geographical and Epidemiological Ophthalmology (ISGEO) which employs both structural and functional parameters at three levels of evidence [14, 15] and visual field defects based on Hodapp-Parrish-Anderson classification [16] are used in Nigeria.

Each patient had a face-to face interview with the RA during which time the questionnaires were administered. Data collected included socio-demographic characteristics, history of the presenting complaint, and awareness about glaucoma. Basic examination findings [VA, vertical cup/disc ratio (VCDR), and intraocular pressure (IOP)], were extracted from patient files. World Health Organisation categories of visual impairment and blindness were used [17], i.e., visual impairment is a presenting visual acuity of <6/18 in the better eye; and blindness is a presenting VA of <3/60 in the better eye. Late presentation was defined for the purpose of this study as either duration of symptoms >2 years, and/or visual impairment at presentation.

Ethical approval was obtained from the London School of Hygiene and Tropical Medicine, Lagos State University Teaching Hospital (LASUTH), and the Lagos State Health service Commission. Written informed consent was obtained from all participants. Data were entered and analyzed using SPSS version 17 (SPSS, Chicago, IL, USA), and Stata/IC 11.0 (StataCorp, LP, College Station, TX, USA). Frequency tables were generated for variables and tests of statistical significance between variables was performed using Chi squared. In calculating the odds ratio (OR) and its confidence interval (CI), a 2×2 contingency table and the risk estimate were generated using SPSS (analyse/descriptive statistics/crosstabs) and Stata. A p value of <0.05 was accepted as statistical significance.

Results

Demographics

A total of 208 (43.2 % female) newly diagnosed glaucoma cases were included in the study. Socio-demographic characteristics are shown in Table 1. The mean age was 53.9 ± 16.1) years (mean ± SD). Nearly half (44.2 %) of all patients were aged between 41 and 60 years. Fifty-eight (32.8 %) patients were traders, 91 (43.8 %) had at least secondary education, while 27 (13.0 %) had no form of formal education. Older patients (≥40 years) were more likely to visit government hospitals (OR 3.2, 95 % CI 1.1–8.7). All patients (100 %) that presented to the private hospital had at least primary education, while 157 (85.3 %) of patients presenting to the government hospital had at least primary education. Patients with at least a primary education were more likely to be male (OR 3.7, 95 % CI 1.4–10.2).

Referral pattern

The referral pattern of patients varied by which institution the patient presented to (Table 2). Of all patients presenting to the secondary and private centers, 80.6 and 83.3 %, respectively, were self referred (either routine and or as a result of eye complaints), while only 25.5 % of those presenting to the tertiary were self referred. There was no statistically significant relationship between referral source and age, gender and level of education.

Presenting history

One hundred and fifty-six (75.0 %) patients presented with poor vision in one or both eyes. Other ocular complaints include inability to read small print, itching, ache, redness, and heaviness of the eyes. The mean ± SD duration of symptoms was 2.6 ± 3.9 years. Fifty-two (25 %) patients presented with duration of symptoms of >2 years. Sixty-eight (32.7 %) and 11 (5.3 %) patients were known hypertensives and diabetics, respectively. Eighty-five (40.9 %) patients had visited at least one other hospital on account of their visual complaint before

Table 1 Socio-demographic characteristics of patients

	Male		Female		Total	
	n	%	*n*	%	*n*	%
Age (years)						
≤20	1	0.8	7	7.8	8	3.8
21–40	19	16.1	15	16.7	34	16.3
41–60	55	46.6	37	41.1	92	44.2
>60	43	36.4	31	34.4	74	35.6
Total	118	100.0	90	100.0	208	100.0
Marital status						
Married	102	86.4	60	66.7	162	77.9
Unmarried	16	13.6	30	33.3	46	22.1
Total	118	100.0	90	100.0	208	100.0
Occupation[a]						
Artisan	14	13.9	3	3.9	17	9.6
Civil servant	28	27.7	10	13.2	38	21.5
Retiree	31	30.7	18	23.7	49	27.7
Student	4	4.0	11	14.5	15	8.5
Trader	24	23.8	34	44.7	58	32.8
Total	101	100.0	76	100.0	177	100.0
Level of education						
None	8	6.8	19	21.1	27	13
Primary	29	24.6	17	18.9	46	22.1
Secondary	53	44.9	38	42.2	91	43.8
Graduate	24	20.3	16	17.8	40	19.2
Post-graduate	4	3.4	0	0.0	4	1.9
Total	118	100.0	90	100.0	208	100.0
Type of institution						
Tertiary	26	22.0	19	21.1	45	21.6
Secondary	82	69.5	57	63.3	139	66.8
Private	10	8.5	14	15.6	24	11.5
Total	118	100.0	90	100.0	208	100.0

[a] Data available for 177 patients

presenting to the study centers, with 13 (6.3 %) and 4 (1.9 %) patients having visited two and three hospitals, respectively. Thirty-one (14.9 %) patients gave a history of use of traditional medications for their ocular symptoms. There was no relationship with age, gender, level of education, duration of symptoms, and the use of traditional medications. Types of traditional medicine used included herbs, eye capsule, 'wiper', coconut water, urine, and 'holy' water.

Table 2 Referral pattern of patients according to institution

	Tertiary		Secondary		Private		Total	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Source of referral								
Self, due to eye complaint	8	17.8	106	76.3	14	58.3	128	61.5
Self, routine eye examination	3	6.7	6	4.3	6	25.0	15	7.2
GOPD of hospital	22	48.9	8	5.8	0	0.0	30	14.4
Other departments of hospital[a]	6	13.3	2	1.4	1	4.2	9	4.3
Another Government hospital	3	6.7	4	2.9	2	8.3	9	4.3
Referred from a private hospital	1	2.2	5	3.6	1	4.2	7	3.4
Referred from public screening	2	4.4	8	5.8	0	0.0	10	4.8
Total	45	100.0	139	100.0	24	100.0	208	100.0

GOPD general outpatient department

[a] Medical out-patient, surgical out-patient

Family history of glaucoma

Fifty-five (26.4 %) patients gave a history of glaucoma in at least one family member. Of these, 80.0 % were a first-degree relative (Fig. 1).

Glaucoma awareness

Regarding glaucoma awareness, 94 (45.2 %) patients had never heard of glaucoma. Among those who were aware (*n* = 114), 102 (89.5 %) indicated it was either during hospital visits or from family members. Other sources included radio/ television (9; 9.3 %), and from other sources (3; 1.5 %). Out of those who were aware of glaucoma as an eye disease, 95 (83.3 %) were aware that it could cause visual loss, but of these, 69 (72.6 %) believed that visual loss from glaucoma is reversible. Furthermore, among those who were aware of glaucoma (*n* = 114), 47 (41.2 %) were not aware of the fact that it is more common among family members, while 67 (58.8 %) were aware of this fact. Seventy (33.7 %) patients were already aware of their diagnosis of glaucoma at the time of newly presenting to the study centers, while 138 (66.3 %) were previously undiagnosed. There was no difference between those previously diagnosed and those newly diagnosed in terms of age, gender, source of referral, family history of glaucoma, duration of symptoms or VA in the better eye. However, those previously diagnosed were likely to have at least
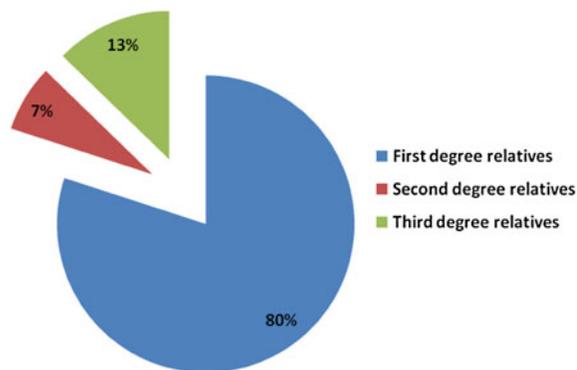

Fig. 1 Relationship status of family members with glaucoma

secondary education (OR 3.8, 95 % CI 1.8–8.5) and were more likely to be aware of glaucoma as a disease entity and that it is capable of causing visual loss (OR 19.4, 95 % CI 4.2–89.2).

Patient characteristics based on duration of presenting complaint

Associations between duration of presenting complaint and patient characteristics are shown in Table 3. Gender, age, marital status, level of education, use of traditional medication, and family history of glaucoma were not significantly associated with duration of presenting complaint. Patients with visual impairment in the better eye (VA <6/18) were 2.7 times (95 % CI; 1.3–5.4) more likely to be those with >2 years duration of symptoms.

Table 3 Association between duration of presenting complaint and patient characteristics

| | Duration of presenting complaint | | | | | | p value (χ^2) |
| | >2 years | | ≤2 years | | Total | | |
	n	%	n	%	n	%	
Gender							*
Male	35	67.3	83	53.2	118	56.7	
Female	17	32.7	73	46.8	90	43.3	
Age (years)							*
<40	8	15.4	30	19.2	38	18.3	
≥40	44	84.6	126	80.8	170	81.7	
Marital status							*
Married	40	76.9	122	78.2	162	77.9	
Unmarried	12	23.1	34	21.8	46	22.1	
Level of education							*
None	9	17.3	18	11.5	27	13.0	
Primary and above	43	82.7	138	88.5	181	87.0	
Use of traditional medication							*
Yes	10	19.2	21	13.5	31	14.9	
No	42	80.8	135	86.5	177	85.1	
Ever heard of glaucoma?							0.016
Yes	36	69.2	78	50.0	114	54.8	
No	16	30.8	78	50.0	94	45.2	
Can glaucoma cause visual loss?[a]							*
Yes	33	91.7	62	79.5	95	83.3	
No	3	8.3	16	20.5	19	16.7	
Is visual loss reversible?							*
Yes	24	72.7	45	72.6	69	72.6	
No	9	27.3	17	27.4	26	27.4	
Is glaucoma a familial disease?							*
Yes	21	58.3	46	59.0	67	58.8	
No	15	41.7	32	41.0	47	41.2	
Family history of glaucoma							*
Yes	16	30.8	39	25.0	55	26.4	
No	36	69.2	117	75.0	153	73.6	
Visual acuity better eye[b]							0.003
Visual impairment[c]	27	52.9	44	29.5	71	35.5	
Normal vision[d]	24	47.1	105	70.5	129	64.5	

* $p > 0.05$

[a] Applicable to those aware of glaucoma

[b] Data available for 200 patients

[c] VA <6/18

[d] VA ≥6/18

Examination findings

Two hundred (96.2 %) patients had complete documentation of visual acuity (VA). Presenting VA of patients is presented in Table 4. Seventy-one (35.5 %) patients had visual impairment (VA <6/18 in the better eye), 84 (42.0 %) had monocular blindness (VA <3/60 in at least one eye), and 31 (15.5 %) were bilaterally blind (VA <3/60 in the better eye). One hundred and 54 (74.0 %) and 155 (74.5 %) patients had

documentation of VCDR of right and left eyes, respectively, while 179 (86.1 %) and 181 (87.0 %) patients had documentation of IOPs for the right and left eyes, respectively. The mean ± SD VCDR was 0.73 ± 0.23 and 0.76 ± 0.19 in the right and left eyes, respectively, while mean ± SD IOP was 23.9 ± 10.1 and 25.0 ± 9.58 mmHg in the right and left eyes, respectively.

Patient characteristics based on presenting VA

Associations between presenting VA in the better eye and patient characteristics are presented in Table 5. Patients with a positive family history of glaucoma were 2.4 times (95 % CI 1.2–4.8) more likely to have visual impairment at presentation, compared with those without a family history. Furthermore, illiterate patients were 6.8 times (95 % CI 2.6–20.1) more likely to have visual impairment at presentation compared with those with a minimum of primary education.

Discussion

In keeping with the known epidemiology of primary glaucoma as a chronic non-communicable disease, the majority (79.8 %) of the patients were >40 years [18, 19], with the largest number between 41 and 60 years. Since glaucoma is a difficult disease to screen for in the general population on a continuous basis [20], it has also been recommended that opportunistic screening should be conducted on all patients >40 years presenting to the ophthalmic outpatient department for any reason, in addition to encouraging at-risk groups such as family members [21] to come forward for screening. These measures will hopefully reduce the blinding impact of glaucoma.

The majority of patients presenting to the secondary and private centers were self referred, while those presenting to the tertiary centers were referred by general practitioners at the hospital's general outpatient department. This is in accordance with the existing protocol of referral of patients to tertiary centers in these two sites, while most patients can walk into a private or secondary facility without any need for a formal letter. Integrated eye care workers such as general practitioners and optometrists constitute important routes of referrals for glaucoma patients [22, 23], and can be a great asset in the early detection of glaucoma, provided that suspected cases are promptly and appropriately referred. This is imperative in developing countries such as Nigeria where there is a general inadequacy in the number and distribution of ophthalmologists [24]. The ratio of ophthalmologists to the current population has been estimated to be approximately 1:360,000. It is noteworthy, however, that optometrists did not feature in this study as a referral source. Perhaps patients from other sources (such as from private hospitals) might have been seen at one point by optometrists and subsequently referred, but patients did not report it as such. It is also possible that patients may not be aware of the different specific cadres in ophthalmic practice, and might have wrongly categorized optometrists [25]. There is very little information in the literature about level of eye care practice (including glaucoma management) by optometrist in our environment.

Only 15 (7.2 %) patients were identified as a result of routine eye examination, the majority having significant visual symptoms including poor vision in one or both eyes; this is a poor prognostic sign as significant damage would have already occurred before the symptoms are noticed by the patient. The mean duration of symptoms in our study population was 2.6 years. This is less than the 4.3 years reported

Table 4 Presenting visual acuity of patients

Visual acuity	Right eye		Left eye		Better eye	
	n	%	*n*	%	*n*	%
6/6–6/18	95	47.5	101	50.5	129	64.5
<6/18–6/60	46	23.0	36	18.0	38	19.0
<6/60–3/60	4	2.0	3	1.5	2	1.0
<3/60	55	27.5	60	30.0	31	15.5
Total	200	100.0	200	100.0	200	100.0

Table 5 Associations between presenting VA in the better eye and patient characteristics

| | Visual acuity better eye[a] | | | | | | p value |
| | Visual impairment[b] | | Normal vision | | Total | | |
	n	%	n	%	n	%	
Gender							*
Male	39	54.9	73	56.6	112	56.0	*
Female	32	45.1	56	43.4	88	44.0	
Age (years)							*
<40	10	14.1	24	18.6	34	17.0	
≥40	61	85.9	105	81.4	166	83.0	
Use of traditional medication							*
Yes	15	21.1	16	12.4	31	15.5	
No	56	78.9	113	87.6	169	84.5	
Family history of glaucoma							0.009
Yes	25	35.2	24	18.6	49	24.5	
No	46	64.8	105	81.4	151	75.5	
Ever heard of glaucoma?							*
Yes	38	53.5	70	54.3	108	54.0	
No	33	46.5	59	45.7	92	46.0	
Prior awareness of glaucoma							*
Yes	23	32.4	44	34.1	67	33.5	
No	48	67.6	85	65.9	133	66.5	
Level of education							<0.001
None	20	28.2	7	5.4	27	13.5	
Primary and above	51	71.8	122	94.6	173	86.5	

* $p > 0.05$

[a] Data available for 200 patients

[b] VA <6/18

by Mafwiri et al. [10] in Tanzania. Univariate analysis of our data confirmed that patients with visual impairment in the better eye (VA <6/18) were 2.7 times (95 % CI 1.3–5.4) more likely to be those with >2 years duration of symptoms. Mafwiri et al. [10] also found that the risk of visual impairment was higher with longer duration of presentation. There was a significant relationship between awareness of glaucoma and duration of symptoms. This evidence underscores the importance of public health education in influencing health-seeking behavior of patients. The fact that most patients were seen after 2 years of onset of symptoms suggests deficiencies in the healthcare system that need to be addressed urgently. Late presentation is probably of multi-factorial origin, with patient factors, institutional factors, and general failures in the health system playing contributory roles.

This study found a statistically significant relationship between level of VA at presentation and family history of glaucoma and level of education. Patients with a positive family history of glaucoma and illiterate patients were more likely to have visual impairment at presentation. This may be related to some genetic predisposition and the fact that illiterate patients may be less likely to seek eye care. Lower level of education, low socio-economic class, and ignorance are deprivation factors that have been associated with late presentation of glaucoma and glaucoma blindness [9, 26].

Three-quarters of the patients presented to the study centers on account of poor vision in one or both eyes and 35.5 % of patients had visual impairment (WHO definition of presenting VA of <6/18 in the better eye), while 15.5 % were blind (VA in better eye <3/60) at presentation using VA criteria alone. These figures might be higher if visual fields were considered. This blindness figure is similar to 17.7 % found by Enock et al. [12], but lower than 29 % found by Mafwiri el al. [10], and 24.7 % found by Omoti et al. [11], using the same definition (Table 6). Reports from >20 years ago in Nigeria showed a much higher prevalence of blindness at presentation (31–40.6 %) [27, 28]. The lower prevalence found in this study might be due to

Table 6 Visual impairment and blindness and proportion of undiagnosed glaucoma among glaucoma patients in Africa

Location of study	Type of study	% with VI	% with monocular blindness[a]	% with blindness[b]	% undiagnosed glaucoma
Lagos, Nigeria (current study)	Hospital based	35.5	42.0	15.5	66.3
Temba, South Africa [33]	Population based	–	58.0	33.0	87.0
Dar es Salaam, Tanzania [10]	Hospital based	30.0	–	29.0	–
Benin City, Nigeria [11]	Hospital based	48.1	–	24.7	–
Irrua, Nigeria [12]	Hospital based	–	–	17.7	–
Tema, Ghana [34]	Population based	14.4	–	2.5	96.7
Akwapim south, Ghana [2]	Population based	–	–	9.5	93.0

VI visual impairment (VA in better eye <6/18)

[a] VA in at least one eye <3/60

[b] VA in the better eye <3/60

an increase in glaucoma awareness over time, but late presentation is still a common recurring factor reported by most studies in Africa [10–12, 29]. Nevertheless, these figures are still considerably high when compared with those from developed regions, and comparing rural and urban areas [29–31].

Seventy (33.7 %) patients were already aware of their diagnosis of glaucoma at the time of newly presenting to the study centers. The prevalence of undiagnosed glaucoma in this study is therefore 66.4 %. Approximately half of the glaucoma cases are estimated to be undiagnosed in more developed regions of the world [18, 32]. Even though this study was hospital based, the lower figure in the above studies might be due to the fact that they were conducted in more developed economies, where routine eye examinations and access to healthcare and awareness is higher. Prevalence of undiagnosed glaucoma among African patients is usually very high [3, 29, 33], with 87.0 and 96.3 % reported from South Africa [34] and Ghana [35], respectively.

Concerning glaucoma awareness, only half (54.8 %) of the patients had previously heard of glaucoma, mainly from hospital visits and relatives (89.5 %). This indicates the need for more public awareness campaigns in Nigeria where the literacy rate is 61 % [36] to increase public awareness of glaucoma and aid early detection. Radio and television sources of information were low in this study (9.3 %), and these are avenues for effective health education and communication [37]. Even though quite a significant proportion of those aware of glaucoma also know that it can cause visual loss, more worrisome is the fact that the majority believe visual loss is reversible. This notion, if uncorrected, can have serious consequences on patient compliance with management, especially medical therapy, as some may stop medications when there is no observed improvement in vision. Awareness about glaucoma was found to be significantly associated with duration of symptoms in this study. This is not surprising as people tend to act based on available information and ignorance is a well-recognized barrier to assessment of eye care services [9].

About a quarter of patients (26.4 %) gave a history of glaucoma in at least one family member, mainly in first-degree relatives (Fig. 1). This is supported by the fact that a positive family history is a risk factor for glaucoma [19, 21, 38]. In the Baltimore Eye Survey [39], 16.1 % of the patients with definite and probable glaucoma reported a history of glaucoma in first-degree relatives, while the Barbados Eye study found that 17.9 % of the participants with definite open-angle glaucoma reported a similar history. Maternal history was higher in this study, but sibling history was the highest in the Barbados study [38], with maternal coming second. Patients with a positive family history were found to be 2.4 times more likely to present with visual impairment in our study (Table 5). This suggests that perhaps hereditary factors also play a role in the severity of the disease, underscoring the need for relatives to go for screening as early as possible.

A limitation of this study is the fact that patients were selected through a diagnosis of glaucoma by the attending ophthalmologist or senior resident, without uniform diagnostic criteria among the different participating centers. This is likely to have introduced a selection bias, as the criteria for diagnosis might not be

completely uniform among different doctors; however, this was done to reflect the burden of glaucoma of each center based on their own definition of glaucoma. Moreover, all the ophthalmologists and senior resident doctors in all the study sites were trained in the country, using the same curriculum; therefore, criteria for the diagnosis of glaucoma is likely to be similar and variations, if any, are not likely to be very wide. Furthermore, the diagnosis of glaucoma in this study was mainly clinical, as gonioscopy and visual fields had not been performed at the time of patient recruitment. This was mainly due to the fact that the majority of the study sites lacked equipment for these tests [24].

Despite the limitations of this study, it is to the best of our knowledge, the first situational analysis of glaucoma services on a multicenter scale in Nigeria. The findings confirm that a large number of patients with glaucoma in Southwest Nigeria still present late, with the majority being self referrals due to symptoms of visual loss. Furthermore, glaucoma awareness was generally low in our study population showing the need to improve on present efforts aimed at increasing public awareness.

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