



The Port Harcourt Hospital Glaucoma Study

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Authors' contributions

This work was carried out in collaboration between all authors. Author EAA designed the study, wrote the protocol and wrote the first draft of the manuscript. Authors AOA and NEC managed the analyses of the study in conjunction with a statistician. Author NEC managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aim: To study the prevalence and risk factors of glaucoma in a health setting.

Methods: The study was descriptive cross sectional study in which all the staff of the University of Port Harcourt Teaching Hospital were recruited through proper mobilization during world glaucoma week. Subjects' intraocular pressures were assessed with Perkins applanation tonometer. Fundoscopy was done by direct ophthalmoscopy using Welch Allyn's ophthalmoscope. The criteria for a case were subjects who had a typical glaucomatous cupping appearance of the optic nerve head with cup/disc (c/d) ratio >0.7 in one or both eyes with direct ophthalmoscopy and slit lamp biomicroscopy with +78D volk lens such as optic disc notching, violation of the ISNT rule with or without raised intraocular pressures, suspects were patients with c/d ratio of between 0.5-0.7 in one or both eyes or a difference of 0.2 or more between c/d and no demonstrable optic disc notching or violation of ISNT rule on slit lamp biomicroscopy with +78D volk lens and normal subjects had c/d 0.4 or less.

Results: A total of 2047 subjects were seen. This represented 81.88% of the staff strength of 2500. Among the subjects 171(8.4%) had glaucoma, 387(18.97%) were suspects while

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1489(72.7%) were normal. 0.8% suspects were already blind while 7.2% had varying ranges of visual impairment. There was poor positive linear correlation between age and VCDR (Pearson's correlation coefficient $r=0.11$, $r^2=0.01$) and also poor linear correlation between age and IOP (Pearson's correlation coefficient $r=0.23$, $r^2=0.06$)

Conclusion: The prevalence of glaucoma at the University of Port Harcourt teaching hospital was 8.4%. 7.2% of the subjects already have visual impairment while 0.8% was already blind. This study also corroborates the factors that may cause late presentation since only 9.6% of the subjects had family history of glaucoma and as much as 90.6% had normal IOP.

Keywords: Glaucoma; intraocular pressure; vertical cup disc ratio.

1. INTRODUCTION

Glaucoma is the second leading cause of blindness, accounting for 8% of blindness among the 39 million people who are blind world-wide [1]. In Africa, glaucoma accounts for 15% of blindness and it is the region with the highest prevalence of blindness relative to other regions world-wide [2]. The overall prevalence of open angle glaucoma (OAG) in the US population 40 years and older is estimated to be 1.86% (95% CI, 1.75%-1.96%) [3]. A survey in southern Ghana reported that the prevalence of OAG was 8.4% (Confidence interval (CI) 7.74-9.06%) in those 30 years and above who have positive family history of glaucoma [4]. In western Cameroon [5], using a voluntary sample, it was reported that the prevalence of glaucoma was 8.2% (CI not reported). In a study in Nigeria [6] the prevalence of glaucoma suspects was 2.7% (CI not given). In this study, persons with intraocular pressure (IOP) greater than 21 mmHg were excluded and visual fields (VFs) were also not assessed.

The risk of blindness from glaucoma is influenced by the age of onset of glaucoma and the natural history [7] as well as the quality of care provided [8] and adherence to treatment and follow-up [9,10]. In Africa, there are the additional factors of poor awareness [11-13] poor access to care, and less than optimal diagnosis and management [14]. Furthermore, socio-economic deprivation exacerbates the situation, leading to very late presentation [15-16].

Generally studies have shown poor awareness among subjects with glaucoma. The glaucoma-specific blindness prevalence in different regions ranged from 0.26% in Ghana [17] while in Eritrea [17], Liberia [18] and Malawi [19] the glaucoma blindness prevalence in the study population of 50-year olds and above were 1.37%, 0.66% and 0.52%, respectively.

The Nigeria national blindness survey reported the all-cause prevalence of blindness to be 4.2% (CI 3.8-4.6%) [20,21] and the proportion of blindness due to glaucoma was 16.7% among those aged ≥ 40 years. The prevalence of blindness ranged from 3.3% (CI 2.4-4.5%) in the Delta ecological zone to 6.6% (CI 4.2-10.4%) in the northern Sahel ecological zone, and the proportion of blindness due to glaucoma varied from 13.2% in the Sudan Savannah to 23.5% in the Sahel ecological zones. The nationwide overall glaucoma-specific blindness prevalence was 0.7% (CI 0.55-0.88%) [22].

Risk factors for glaucoma are increasing age, higher IOP, lower systolic blood pressure (BP) to IOP ratio (BP/IOP), lower mean diastolic ocular perfusion pressure (diastolic BP minus IOP), thinner central corneal thickness (CCT), and a positive family history [23]. Racial variability of some of these risk factors at baseline has been demonstrated with higher IOP [24] and thinner CCT [24,25] in African-derived groups.

In the Ghana study that combined population-based and facility-based samples, older age (more than 60 years) and IOP greater than 31 mmHg were associated with more severe disease and the absence of family history was associated with delay in seeking treatment [26]. This study is necessitated in our environment because of the burden of blindness of glaucoma and the high economic burden of its management [27].

2. SUBJECTS AND METHODS

The study was descriptive cross sectional study in which all the staff of the University of Port Harcourt Teaching Hospital were recruited through proper mobilization during world glaucoma week 2011. The examination of suspects went on over a one month period (1st to 30th April, 2011). Ethical approval was obtained from the ethical committee of the University of

Port Harcourt Teaching hospital. The whole exercise followed the tenets of declaration of Helsinki. All the patients were assessed by the same investigators to ensure consistency of case definition. Subjects' intraocular pressure were assessed with Perkins applanation tonometer (MK2 Model). Subjects were in sitting position. They had their eye anaesthetized with local anesthetic (1% tetracaine) and then 2% fluorescein dye was applied. Intraocular pressure was measured while patient maintained primary position of gaze. For purposes of this study intraocular pressure of 10-20 mmHg was taken as normal while 21 mmHg and above was regarded as abnormal.

Fundoscopy was done by direct ophthalmoscopy using Welch Allyn's ophthalmoscope (Welch Allyn 11735 Ophthalmoscope (Skaneateles fall NY USA). All subjects with VCDR > 0.5 had a slit lamp biomicroscopy of the disc with +78 dioptre lens. The criteria for a case were subjects had to have a typical glaucomatous cupping appearance of the optic nerve head with cup/disc (c/d) ratio >0.7 in one or both eyes with characteristic optic disc defects(optic disc notching, violation of ISNT rule) in keeping with glaucoma on slit lamp biomicroscopy. The criteria for a suspect were patients with c/d ratio of between 0.5-0.7 in one or both eyes or a difference of 0.2 or less between c/d without demonstrable optic disc notching, normal ISNT rule on slit lamp biomicroscopy. The normal subjects had c/d 0.4 or less and healthy neuroretinal rim. Perimetry was not done because it was not available.

Background demographic information, personal and family and ocular history were also taken. Information including age, sex, family history of

glaucoma, as well as previous ocular history and occupational classification were obtained by the investigators

3. RESULTS

A total of 2047 subjects were seen. This represented 81.88% of the staff strength of 2500. These included 695(38.8%) males and 1104(61.4%) females. The mean ages by sex of the subjects were 40.440±7.864 for males and 41.296±7.979 for females. Commonest age group was 40-49 years. Subjects by department showed the nurses 151(8.4%) were the highest respondents while the least was laboratory medicine (1(0.1%) The mean IOP was 15.127±4.058 mmHg with 8 mmHg and 38 mmHg respectively being the lowest and highest IOP values. Furthermore 166(9.2%) had abnormal IOP of 21 mmHg and above 21mmHg as shown in Table 1.

Among the subjects 173(9.6%) had family history of glaucoma and 67(3.7%) were already on treatment for glaucoma.

Among the subjects 171(8.4%) had glaucoma, 387(18.97%) were suspects while 1489(72.7%) were normal as shown in Table 2.

Among the glaucoma subjects, 0.8% were already blind while 7.2% had varying ranges of visual impairment as shown in Table 3.

There was poor positive linear correlation between age and VCDR (Pearson's correlation coefficient r=0.11, There was also poor linear correlation between age and IOP (Pearson's correlation coefficient r=0.23, r²=0.06).

Table 1. IOP by age group

Age group (years)	IOP		Total
	Normal (≤21 mmHg)	Abnormal (>21 mmHg)	
10-19	2 (0.1)	0 (0.0)	2 (0.1)
20-29	160 (7.8)	3(0.2)	163 (8.0)
30-39	653 (31.9)	34(1.7)	687 (33.6)
40-49	872(42.6)	74 (3.6)	946(46.2)
50-59	149(7.28)	72(3.5)	221(10.8)
60-69	19(0.93)	5(0.25)	24(1.2)
70-79	4(0.2)	0 (0.0)	4(0.2)
Total	1859(90.8)	188(9.2)	2047(100.0)

Chi square = 154.15; p value = 0.001

Table 2. Occupation by glaucoma

Occupation	Status			Total
	Glaucoma	Suspect	Normal	
Artisan	8(0.4)	28(1.4)	124(6.1)	160(7.8)
CS	42(2.1)	75(3.7)	302(14.8)	419(20.5)
Health worker	63(3.1)	150(7.3)	580(28.3)	793(38.7)
Professional	25(1.2)	55(2.7)	253(12.4)	333(16.3)
Domestic worker	29(1.4)	69(3.4)	187(9.1)	285(13.9)
Driver	1(0.04)	0(0.0)	7(0.3)	8(0.4)
Intern	1(0.04)	1(0.04)	6(0.3)	8(0.4)
Security	2(0.1)	9(0.4)	30(1.5)	41(2.0)
Total	171(8.4)	387(18.9)	1489(72.7)	2047(100.0)

Chi square = 16.83; p value = 0.265

Table 3. Visual acuity category by gender

Visual acuity	Gender		Total	Chi-square	p-value
	Male	Female			
Normal	717(35.0)	1166(57.0)	1883(92.0)	86.22	0.001
Visual impairment	53(2.6)	94(4.6)	147(7.2)	0.08	0.774
Blindness	5(0.3)	12(0.5)	17(0.8)	ND	ND
Total	775(37.9)	1272(62.1)	2047(100.0)		

Not Derivable (ND) percentage too small for comparison

4. DISCUSSION

The prevalence of glaucoma at the University of Port Harcourt teaching hospital was 8.4%. This is higher than the prevalence in USA [3] which is in keeping with a study which showed that the average prevalence at all ages was higher in black populations than in white [28]. This could be due to racial variability of some of these risk factors to glaucoma such as higher IOP [24] and thinner CCT [24,25] in African-derived groups. This is however higher than that obtained in Ibadan glaucoma study which reported a prevalence of 2.7%.

Furthermore, this prevalence was equally higher than 0.7% obtained in the Nigerian national blindness survey [22] This could be attributed to increased awareness among the subjects used in this study who were hospital staff with higher health seeking behavior some of whom may have developed visual symptoms.

This is however close to the findings in Ghanaians and Cameroonians population. This could be due to the fact that the study subjects were volunteer groups some of whom may have developed symptoms as in our study. This is further corroborated by the fact that the Ghanaians study used subjects with positive

family history of glaucoma [4]. The prevalence of glaucoma suspects in this study was higher than that obtained in a population based study in Nigeria [6]. This may be due to the exclusion of subjects with IOP greater than 21 mmHg Bearing in mind that IOP is an established risk factor for glaucoma [23]. Glaucoma blindness in this study was lower than that obtained in Eritrea and Tembe, South Africa [20]. This could be due to the fact that this is a hospital based study not population based so the percentage of visually disabled employed will be low as well as the fact that the subjects have easier access to quality eye care and possibility of better adherence to therapy. This may further explain the less prevalence of glaucoma blindness in this study compared to that of global [1] and African burden of Glaucoma blindness. [2]The prevalence is higher in Ghanaian [26] and Liberian study. This may be due to other ocular comorbidities contributing to blindness in this study unlike in these other studies where glaucoma-specific blindness was assessed [29]. Other reasons could be late presentation secondary to socioeconomic deprivation and suboptimal diagnosis and management [15-16]. Other causes of late presentation in this study could be the high percentage of subjects with normal IOP and low percentage with positive family history to glaucoma, both of which are risk factors to

glaucoma [23-24]. Furthermore the low percentage of those on treatment and the accompanying glaucoma blindness could be due to high economic burden of glaucoma treatment [27,28]. Only 3.7% were already on treatment. This could be due to generalized poor awareness as glaucoma has been described as silent thief of sight [29].

5. CONCLUSION

The prevalence of glaucoma at the University of Port Harcourt teaching hospital was 8.4%. This study corroborates age as a risk factor for glaucoma having a poor but positive linear correlation with both IOP and VCDR.[30].

6. LIMITATIONS

Owing to the large number of subjects in this study and the unavailability of a perimeter as well as the fact it was a cross sectional study, we were unable to do visual field analysis. This would have been needful in making diagnosis.

Optical coherent tomography (OCT) was not done for the individual patients at the time of the study. This also would have been necessary to elucidate our diagnosis. However the assessment of the cup disc ratio and intraocular pressure would give enough information in a screening like ours to pick out at risk patients.

CONSENT

It is not applicable.

ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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