Original Research

Clinical and sociodemographic characteristics of glaucoma patients at a tertiary referral facility in Zimbabwe

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Abstract

Purpose

To evaluate the clinical and socio-demographic profile of patients living with glaucoma and receiving care in a tertiary eye center in Zimbabwe.

Method

A hospital-based retrospective study of clinical records of glaucoma patients from January 2014 to December 2018. The study involved collating demographic information of patients, visual acuities, (VA) intraocular pressure, (IOP), cup-to-disc ratios, (CDRs), average retinal nerve fibers thickness, (RNFL), cup volume, cup-to-disc area, vertical cup-to-disc ratio, (VCDR), rim area, disc area, glaucoma hemifield test, visual field indices and the management of glaucoma.

Results

Nine thousand one hundred and eighty-five (9,185) folders were retrieved. Out of these, 432 (4.7%) qualified for the study and were analyzed. There were 267 (61.8%) males and 165 (38.2%) females. The mean age (± Standard deviation, SD) of the patients was 62.66 ± 15.94 years, (range 10 - 110 years). The means visual acuity (VA): OD =1.30 ± 1.06 Logarithm of the Minimum Angle of Resolution, (logMAR), OS = 1.33 ± 1.06 logMAR; IOP: OD = 29.51 ± 12.89 mmHg, OS: 29.17 ± 12.59 mmHg; CDRs: OD = 0.91 ± 0.14 D, OS = 0.92 ± 0.14 D; and the average RNFL thickness was 72.76 ± 18.26 μm and 71.24 ± 23.17 μm in the right and left eye respectively. The mainstay of treatment was medication only.

Conclusion

There were more males than females receiving glaucoma care at the tertiary level. Glaucoma cases included juveniles but the mean age was mostly the elderly. It was characterized by high IOPs, large CDRs, and thin RNFL suggestive of late presentation.

Keywords: glaucoma, intraocular pressure, cup-to-disc ratio, visual field, retinal nerve fiber

Introduction

It has been estimated that the second most prevalent cause of blindness worldwide is glaucoma and the most prevalent cause of irreversible blindness[1,2]. The commonest type of glaucoma among people of African descent has been reported to be primary open-angle glaucoma (POAG).[3,4] POAG is a progressive chronic optic neuropathy in which intraocular pressure (IOP) and other currently known factors such as heredity, age, gender among others contribute to the damage characterized by acquired atrophy of the optic nerve and loss of retinal ganglion cells[5]. Globally, researchers have evaluated glaucoma and its classification among various races[6-15].

The effective management of glaucoma depends on early presentation and diagnosis to prevent blindness.[16] The absence of pain conceals the need for regular eye examination especially in developing countries where access to health care facilities is costly[17]. Also, the glaucoma presentation pattern in developing countries is greatly influenced by underequipped eye care facilities, poor distribution of eye care resources, the inadequacy of skilled personnel for the eye industry, poor education and awareness, and poverty[17]. This pattern of presentation is different from that of the developed world[17].

The National Eye Health Strategy in Zimbabwe has reported that there is no research conducted to establish the prevalence of glaucoma[18]. Glaucoma services in the country remain centralized and districts are not serviced[18]. The country has three central hospitals with functional eye units, eight in each of the rural provinces and three in Zimbabwe Defense Forces, and all these facilities have inadequate equipment, and medicines[18]. Also, it has been reported that medications for the management of glaucoma are expensive and the lack of awareness of the disease leads to a late presentation at service delivery points[18]. Furthermore, there are 16 ophthalmologists with no optometrist in public health institutions to manage glaucoma in Zimbabwe[18].

In this study, the clinical presentation of glaucoma, as well as the socio-demographic features of patients, were reviewed. Clinical characteristics of glaucoma may differ among geographical locations and these characteristics can be influenced by the adherence to treatment specific to the

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geographical locations. Researchers have reported on the low levels of treatment compliance among patients with glaucoma due to inadequate patient education[19,20].

Presenting acuities are low because of the late presentation of patients with glaucoma for specialist care which leads to poor prognosis. The poor eye health services coupled with the late presentation and low levels of compliance to glaucoma management in developing countries like Zimbabwe warranted the need for this study[18]. This study aimed at determining the clinical and sociodemographic characteristics of patients living with glaucoma and receiving care in a tertiary referral center in Zimbabwe.

Methods

Study setting

This study was carried out at the premises of the Greenwood Park Eye Center in Harare. This facility is a private tertiary eye care facility with the full complement of eye care staff and unlike the public facilities have the necessary logistics and equipment for comprehensive glaucoma care, and it is one of the most utilized due to its indigenous ownership. The facility serves both insured (public and private insurance) and non-insured clients.

Study design

This was a hospital-based retrospective study of patients' records in the archives of Greenwood Park Eye Centre. The study involved collating patients' folders at the eye clinic. It sought to evaluate the socio-demographic characteristics and clinical profile of patients receiving glaucoma care in the facility in the past five years, thus, from January 2014 to December 2018.

Sampling technique

The sampling method was non-probability purposive sampling. The sampling method was based on the fact that the study involved all patients with glaucoma at the center for the past five years.

Inclusion and exclusion criteria

The study included Zimbabwean patients who had been diagnosed with glaucoma and receiving care at the Greenwood Park Eye Center from 2014 to 2018 but excluded clients whose diagnoses were inconclusive and non-Zimbabweans. Only clinical data on the first visit were included in the analysis while data on subsequent visits for patients with records of multiple visits were excluded.

Ethical review

Approval was granted by the Research Ethics Committee of Bindura University of Science Education, BUSE, Research, and Postgraduate Center with reference number RBGA/01/19.

Data collection procedure

Data collection involved the use of data extraction sheet to collect a data on the first visits of patients on socio-demographics, visual acuities, intraocular pressure, cup-to-disc ratio, average retinal nerve fibers thickness, cup volume, cup-to-disc area, vertical cup-to-disc, rim area, disc area, glaucoma hemifield test, visual field indices and the management of glaucoma. The ZEISS Cirrus HD-OCT and ZEISS Humphrey Perimeter were the equipment used for the optical coherence tomography and visual field assessment respectively during the study period.

The data on socio-demographics of patients included sex, age, home language, and occupational status. The clinical profile recorded were presenting visual acuities, presenting intraocular pressures, ophthalmoscopically determined vertical cup-to-disc ratios, cup volume, cup-to-disc area, vertical cup-to-disc on OCT, rim area, disc area, glaucoma hemifield test, visual field indices (MD, PSD), and average Retinal Nerve Fiber Layer (RNFL) parameter where available, management modality of glaucoma at the tertiary center.

Data analysis

Data were analyzed using the International Business Machines Corporation's Statistical Package for the Social Sciences, (IBM SPSS) version 21 (SPSS Inc, Chicago, USA). Categorical data were presented as frequencies. Descriptive statistics were computed for all variables after the data have been screened and normality tests were carried out. Thus,

Table 1: Age, home language, and occupation distribution according to sex

Demographics		Sex of Patient		Total (%)
		Male	Female	
Age group	Children (0 - 17)	2	1	3 (0.69)
	Youth (18 - 35)	15	9	24 (5.6)
	Adults (36 - 59)	91	40	131 (30.3)
	Elderly (> 60)	159	115	274 (63.4)
Home language	Shona	239	142	381 (88.19)
	Ndebele	16	15	31 (7.18)
	English	11	6	17 (3.94)
	Other Languages	1	2	3 (0.69)
Occupation	Employed	111	55	166 (38.4)
	Unemployed	66	74	140 (32.4)
	Retired	61	24	85 (19.7)
	Self Employed	29	12	41 (9.5)
Total		267	165	432 (100)

Table 2: Types of Glaucoma according to sex

Types of glaucoma	Sex		Total (%)
	Males	Females	
Unilateral	27	8	35 (8.1)
Bilateral	239	158	397 (91.9)
Infantile	4	3	7 (1.6)
Juvenile	21	13	34 (7.9)
Adult	242	149	391 (90.5)

Table 3: Clinical profile of participants

Variables	N	Minimum	Maximum	Mean	Std. D
VA OD (logMAR)	432	-.10	3.00	1.30	1.06
VA OS (logMAR)	432	-.30	3.00	1.33	1.06
IOP OD (mmHg)	402	8.00	80.00	29.51	12.89
IOP OS (mmHg)	386	8.00	80.00	29.17	12.59
Cup-Disc Ratio OD	313	.10	1.00	.91	.14
Cup-Disc Ratio OS	313	.40	1.00	.92	.14
Average RNFL – OD (µm)	96	30.00	115.00	72.76	18.26
Average RNFL – OS (µm)	93	.00	176.00	71.24	23.17
Cup Volume OD	99	.00	2.63	.59	.45
Cup Volume OS	96	.017	1.77	.65	.40
Cup-Disc Area Ratio – OD	99	.01	.93	.74	.16
Cup-Disc Area Ratio – OS	96	.33	.93	.77	.13
Vertical Cup-Disc Ratio - OD	99	.08	.95	.72	.16
Vertical Cup-Disc Ratio - OS	96	.07	1.63	.76	.17
Rim Area OD	99	.20	5.03	.97	.61
Rim Area OD	96	.09	8.82	.90	.93
Disc Area OD	99	1.19	5.01	2.42	.69
Disc Area OS	96	1.34	7.56	2.39	.78
Visual Field Index OD	43	12.00	100.00	77.98	31.04
Visual Field Index OS	42	2.00	100.00	72.26	34.37
Mean deviation OD (dB)	54	-32.71	.96	-9.70	10.34
Mean deviation OS (dB)	52	-32.97	18.88	-11.73	12.06
Pattern Std D – OD (dB)	54	-2.85	15.13	4.76	3.58
Pattern Std D – OS (dB)	51	1.50	15.76	5.21	3.42

the mean±standard deviation was computed for VAs, CDRs, IOPs, RNFL among others recorded upon the first visit.

Results

Nine thousand one hundred and eighty-five (9,185) folders/files were retrieved from the eye center's archives. A total of 432 participants met the inclusion criteria and were included in the study. Their ages ranged from 10 to 110 years (mean age = 62.66; Standard deviation, (SD) ± 15.94 years) giving a good picture of cases across age groups. Of the 432 participants, 267 (61.8%) were males and 165 (38.2%) were females i.e there was a preponderance of males reporting a case of glaucoma than females.

Age, home language, and occupation distribution according to gender

Cases of glaucoma reported to the clinic included juveniles but the mean age suggested most cases of glaucoma were of adult-onset (Table 1) which is typical of POAG. The commonest home language among the patients with glaucoma referred to the center was Shona (88.19%), followed by Ndebele (7.18). Though the majority of the patients were employed (38.4%), there was an almost equal percentage of unemployed (34.4%) reporting cases of glaucoma (Table1).

Prevalence and types of Glaucoma

The prevalence of glaucoma at the eye center for the five-years was 432 out of 9185 representing 4.7% (95% Confidence interval, (CI); 4.3-5.1) of the cases reported to the facility. The 432 cases were POAG, 35(8.1%) had unilateral glaucoma and the remaining 397(91.9%) had bilateral glaucoma (Table 2). The majority (90.5%) of cases were of adult-onset followed by the juvenile (7.9%).

Ocular parameters such as VA was routinely taken for all

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Table 4: Management of glaucoma according to sex

How the Disease Was Managed	Sex of Patient		Total (%)
	Male	Female	
Drugs/Medication Only	107	72	179 (41.4)
Trabeculectomy and Medication	78	40	118 (27.3)
Trabeculectomy (Surgery) Only	35	28	63 (14.6)
No Intervention on First Visit	26	13	39 (9.0)
Trabeculectomy, Medication and Counselling	6	7	13 (3.0)
Counselling Only	9	2	11 (2.5)
Medication and Counselling	3	2	5 (1.3)
Trabeculectomy and Counselling	3	1	4 (0.9)
Total	267	165	432 (100)

patients in each eye. However, IOP, CDRs, and RNFL among others were not routinely assessed for all patients. The consideration of VA measurement as a routine could have been informed by clinic-legal issues in eye care (Table 3).

The mainstay of treatment was the use of medications only (315, 41.4%) as shown in Table 4. Of these 315 who were managed with medications only (monotherapy), prostaglandin analogues accounted for 151 (47.9%) followed by beta-blockers 66 (21.0%) and alpha-2 adrenergic agonists 9 (2.9%). For combination therapy, prostaglandin analogues and beta-blockers constituted 57 (18.1%), and beta-blockers and alpha-2 adrenergic agonists 32 (10.1%).

Discussion

This study is the first to provide information on the socio-demographic characteristics and clinical profile of persons living with glaucoma in Zimbabwe. The study participants were mainly elderly with an average age of 63 years. Studies in Africa have reported a mean age of 50 years and older for patients living with glaucoma[21-26]. This suggests an excessive burden of glaucoma among the aged consistent with the literature[21-26]. It has been reported that age is a risk factor for glaucoma especially primary open-angle glaucoma[22,23]. There were more males than females in this study as the male to female ratio was 1.62:1 for both juvenile-onset and adult-onset, which is similar to the findings in hospital-based studies[21,23,26] in sub-Saharan Africa which reported more males than females. The reason for the higher ratio of males to females in this study may be due to the poor socio-economic status of women in Africa. This serves as a barrier to access eye care among women[21,23,26]. This can be confirmed from the occupations of the participants in this study which indicate that 44.9% of the females (165) were unemployed compared to 24.7% of the males (267) as shown in Table 1. Also, the National Health Insurance Scheme (NHIS) in Zimbabwe covers only cataract management among the priority eye diseases which makes management of glaucoma thrive on an out-of-pocket basis[18]. This admittedly makes comprehensive glaucoma care expensive and a great drain on the purse of persons living with glaucoma.

In this study, the prevalence of glaucoma in the tertiary setting was 4.7% (CI, 4.3-5.1) which is comparable to similar hospital-based studies in Africa which ranged from 4.0% - 9.4%.[27-29] The reported prevalence in sub-Saharan Africa in 2013 is pegged at an average of 4.0% for a given population[30]. The pattern of glaucoma in this study sample was evaluated through the clinical presentation as indicated on the patient's record. The mean presenting VA in this study corresponded to severe low vision according to the World Health Organization, (WHO) classification[31] suggesting late presentation of cases for advanced or specialist care[32].

The cup-to-disc ratio is a prominent sign of glaucoma among patients. The mean CDR as determined upon ophthalmoscopy in this study was very large (OD: 0.91 ± 0.14, OS: 0.92 ± 0.14). With the advancement in technology for the examination of the retina and optic nerve head, sophisticated techniques such as optical coherence tomography, (OCT), confocal scanning laser ophthalmoscopy, and scanning laser polarimetry are in place at well-equipped facilities to provide quantitative measurements[33-35]. The OCT is useful in the objective assessment of the vertical cup-to-disc ratio, (VCDR) but in this study, less than a quarter of the study participants had OCT examination records for VCDR recorded (Table 3). The poor patronage of the OCT examination can be attributed to the poor socio-economic status (a significant proportion were unemployed) of the participants since these services are not affordable to many.

The applanation tonometer was the instrument used at the tertiary eye center to measure intraocular pressure (IOP) since it is the gold standard for IOP measurement[36]. An increase in intraocular pressure is a risk factor for glaucoma. A mean IOP of 29.51 ± 12.89 mmHg and 29.17 ± 12.59 mmHg in the right and left eye respectively were observed in this study which is comparable with findings of other studies in Africa which reported mean IOPs of 33.9mmHg ± 12.7 mmHg for right eyes and 33.5mmHg ± 12.0 mmHg for left eyes.[21,22] The high IOP in this study may have resulted from difficulty in controlling the IOP at the primary and secondary level of eye care in the country which led to a late presentation for the tertiary glaucoma care.

The damage caused by glaucoma to the RNFL can be quantified through sensitivity tests such as OCT among patients. The average RNFL was 72.76 ± 18.26 μm and 71.24 ± 23.17 μm in the right and left eye respectively which is consistent with a study by O'Leary *et al.*[37] who reported a mean RNFL of 69.1 μm among glaucomatous eyes. Across the globe, similar studies have been conducted to determine the mean RNFL in glaucomatous eyes. A study by Hoh *et al.*[38] reported a thinner mean RNFL of 56.9 ± 21.5 μm in glaucomatous eyes, Khanal *et al.*[39] reported 85.43 ± 9.79 μm in eyes with Normal-Tension Glaucoma and 64.30 ± 14.45 μm in eyes with POAG, Subbiah *et al.*[40] also reported a mean RNFL thickness of 52.95 ± 31.10 μm in glaucomatous

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eyes and a recent study in Ghana[41] reported a mean RNFL of 85.84 ± 13.11 μm in glaucoma. The reported studies above had a reduction in RNFL compared to the average among normal eyes with RNFL ranging from 93.9 ± 1.2 μm - 110 ± 7.4 μm[37-43]. This reduction in RNFL was due to the progressive damage and loss of retinal nerve fibers a characteristic of glaucoma.

An integral part of glaucoma evaluation in terms of vision loss is the visual field test. In this study, the mean deviation and pattern standard deviation were -9.70 ± 4.76 decibels, (dB) and -11.73 ± 5.21 dB in the right and left eye respectively which is suggestive of moderate to severe stage glaucomatous visual field loss.

In the management of glaucoma, treatment modality is of great importance due to the progressive loss of vision which will eventually affect the quality of life of patients. Whether to commence treatment or not and which modality to adopt in a case of glaucoma is a complex decision that involves consideration of many factors, including visual, physical, medical, psychological, and social circumstances. The Ministry of Health in Zimbabwe has provided standard diagnosis and treatment guidelines for institutions with glaucoma specialist services however cost remains a major setback to its full implementation partly due to lack of care support for persons with glaucoma in the form of insurance package. [18] The mainstay of treatment among the study sample was the sole use of topical anti-glaucoma medications (Table 4) which is consistent with other studies[36]. The choice of treatment of glaucoma management option is informed by the target IOP intended, ocular structures or systemic adverse effects, and quality of life of the patient[36]. Other considerations may include cost and convenience. The National eye health strategy reported that though medicines for the management of glaucoma are available they are erratic and inadequate in Zimbabwe[18]. Patients' education on the disease process and, the rationale and goals of therapy, are paramount to a patient's adherence and meaningful participation in the development and achievement of an optimal treatment plan.

The limitation of this study was that hospital-based study results cannot be fully generalized for the entire population. Data is biased towards patients who are receiving care. It is recommended that a population-based study be done in the future.

The current study provides information on the socio-demographic and clinical profile of persons living with glaucoma and receiving tertiary care in Zimbabwe. There were more males than females receiving glaucoma care at the tertiary level. Glaucoma cases included juveniles but were mostly reported by the elderly. The glaucoma cases were characterized by high IOPs, large CDRs, and thin RNFL. An early presentation with moderate CDRs to the tertiary eye centers can help salvage some functional vision among Zimbabweans.

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