Glaucoma Related Morbidity at A Tertiary Care Eye Hospital

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Purpose: To report pattern and burden of glaucoma related morbidity in terms of visual impairment and structural damage to optic nerve in patients presenting for the first time at glaucoma clinic of a tertiary care eye hospital.

Design of Study: A cross sectional observational study.

Participants: All patients aged above 16 years reporting for the first time at glaucoma clinic of Al-Shifa Trust Eye Hospital, Rawalpindi from 1st July 2006 to 30th June 2007.

Methods: After taking history, a detailed ocular examination of all the patients including visual acuity using snellen chart, refraction trial for best corrected visual acuity, slit lamp examination, applanation tonometry (with tonopen in unco-operative patients), gonioscopy (with four mirror Posner lens), stereoscopic assessment of the cup disc ratio (with Heidelberg retinal tomogram) and visual field (Humphery static perimetery, 30-2 program and Frequency doubling technique) testing was performed. All data was recorded on a special proforma and then assessed using statistical software SPSS version 12.0.

Results: A total number of 800 new patients were examined in the glaucoma clinic from 1st July 2006 to 30th June 2007. Among these 800 patients, 487 (60.9%) were male and 313 (39.1%) were female. 132 subjects (16.5%) were identified as blind with a visual acuity of <3/60 in both eyes while an additional 325 subjects (40.6%) had a visual acuity of <3/60 in one eye. Crude estimate of the frequency of blindness (Table 2) was slightly higher in women as compared to men (OR, 1.07; 95% CI, 0.87–1.27). Blindness was associated with illiteracy (OR, 2.80; 95% CI, 2.15–3.45), age of patients 60 years and above (OR, 1.38; 95% CI, 1.07–1.69) and advanced cupping in both eyes (OR, 2.75; 95% CI, 2.18–3.32). Blindness was more frequent in patients of neovascular and pseudoexfoliation glaucoma. Regarding the structural damage, 33% of the patients presented to us when the cup disc ratio in their better eye had worsened to 0.8 or more.

Conclusion: Glaucoma is leading cause of blindness, and warrents detailed investigation of strategies for prevention. As It is a fact that advanced stage of glaucoma at diagnosis has been one of the most important factors for glaucoma caused blindness, targeted screening, breaking down barriers to access and a campaign to create awareness among the people regarding importance of regular eye examinations may be effective in reducing the number of patients going blind from glaucoma. Using the available data from the health surveys, improving awareness, case detection, and early treatment of glaucoma are the fields which need our attention. In short, a combined effort by governments, NGOs, ophthalmologists and primary health care providers can be helpful to prevent the world from glaucoma related blindness.

Introduction

Glaucoma is one of the leading causes of irremediable blindness and vision loss. There will be 60.5 million people with open angle glaucoma and angle closure glaucoma in 2010, increasing to 79.6 million by 2020, and of these, 74% will have open angle glaucoma[1]. A systematic review of all population based surveys on blindness and low vision by the WHO in 2002 estimated 37 million people blind worldwide, with 4.4 million (12.3%) attributable to glaucoma, second only to cataract (48%).[2]

Glaucoma is known as the "sneak thief" of sight – unwittingly affecting patients often without any early warning signs. Most of the studies conducted worldwide have shown that a large number of glaucoma patients presenting at hospitals are blind. One of the reasons for late presentation in glaucoma is that the disease usually spares the central vision in its early stages. Even after completely losing vision in one eye a large number of patients remain unaware of the condition and they present to the hospital only when vision in the other eye also deteriorates. Another reason for the late detection of the disease is that there is no good screening test that can be utilized for the detection of the disease in eye camps or other screening programs. This stark reality makes glaucoma awareness of primary importance as it alone can make a difference for the millions of people around the world who are suffering from glaucoma without even knowing it. Blindness due to glaucoma results in a lot of socioeconomic implications to society and loss of productive working hours. Finding the patient while there is still some useful vision to save is one of the major challenges in the management of glaucoma.

Pakistan is a developing country with an estimated population of 162550500, making it the sixth most populous country in the world [3]. The problems of poverty, lack of education, transport and health infrastructure have further added problems to the detection and management of glaucoma in Pakistan. The planning of eye care programmes requires data on the prevalence and causes of blindness. Unfortunately planning is often hampered by the lack of the

data due to improper documentation in the past. This study is an effort to report the burden of glaucoma related morbidity in terms of visual impairment and structural damage after which people come to seek medical advice. The findings reported in this article also include distribution of blindness by gender, age and education and type of glaucoma.

Participants

It is a cross sectional observational study that included all diagnosed glaucoma patients and glaucoma suspects above 16 years of age reporting for the first time at the glaucoma clinic of Al-Shifa Trust Eye Hospital, Rawalpindi from 1st July 2006 to 30th June 2007 .All wrong referral to glaucoma clinic (optic atrophy non- glaucomatous, uveites etc) were excluded from study.

Materials and Methods

All conformed glaucoma patients were enrolled and documentation was done on special Performa. After a brief history (complaints, past history, family history) a detailed ocular examination of all the patients was performed. Auto-refractometer was used to determine the refractive errors and the best corrected visual acuity was checked by quailfied optometrists using Snellen chart. Low grades of vision like perception / projection of light, hand movements or counting fingers were further reconfirmed by ophthalmologists before starting the examination. The examination included slit lamp biomicroscopy, applanation tonometry (tonopen in un co-operative patients), gonioscopy (using four mirror posner lens) and stereoscopic assessment of the vertical cup disc ratio (CDR) with Heidelberg retinal tomogram. In selected cases investigations like Nerve fiber layer analysis, frequency doubling perimetry and / or Humphrey Static automated perimetry were advised. The data entered on the proformas was analyzed using statistical software SPSS version 12.0

Definitions

Blindness: The WHO definition of blindness was used in this study[4]. Blindness was defined as a presenting visual acuity (i.e., with glasses for distance, if normally worn, or unaided) of less than 3/60 in the better eye. As visual fields were assessed in only a subgroup of the sample, constricted visual fields were not included in the definition of blindness.

Structural Damage: Structural damage was measured in terms of the optic disc cupping and graded as follows:

Grading of Structural damage	Cup Disc Ratio
Mild to Moderate Damage	CDR both eyes < 0.8
Uniocular Severe damage	CDR one eye > 0.8
Binocular Severe damage	CDR both eyes > 0.8

Results

A total number of 800 new patients were examined in the glaucoma clinic from 1st July 2006 to 30th June 2007. Among these 800 patients, 487 (60.9%) were male and 313 (39.1%) were female. The male to female ratio was 1.55:1. The age of the patients ranged from 16-103 years with a mean age of 57.7years (± 17.47 Std. Dev).

Of those examined, 132 subjects (16.5%) were identified as blind with a visual acuity of <3/60 in the better eye while an additional 325 subjects (40.6%) had a visual acuity of <3/60 in one eye (Table 1). Crude estimate of the frequency of blindness (Table 2) was slightly higher in women as compared to men (OR, 1.07; 95% CI, 0.87–1.27). Frequency of blindness was significantly higher in illiterate subjects than those who were literate (OR, 2.80; 95% CI, 2.15–3.45). No case of bilateral blindness was noted in patients who had education of graduation or above, however unilateral blindness was recorded even in 16 patients with this educational status (Table 3).

Table 1: *Pattern of visual impairment in glaucoma patients.*

Grading of Visual Acuity	Frequency	Percentage
Both Eyes VA > 3/60	311	38.9%
One Eye VA < 3/60	325	40.6%
Both Eyes VA < 3/60	132	16.5%
Uncooperative (Cannot even respond to illiterate E chart)	32	4%
Total	800	100.0%

Table 2: *Pattern of visual impairment in glaucoma patients according to gender.*

Grading of Visual Acuity	Gender Frequency		Total
	Male	Female	
Both Eyes VA > 3/60	179	132	311
One Eye VA < 3/60	208	117	325
Both Eyes VA < 3/60	78	54	132
Uncooperative [Cannot even respond to illiterate E chart]	22	10	32
Total	487	313	800

Patients age of 60 years and above was also strongly associated with blindness (OR, 1.38; 95% CI, 1.07–1.69). About 18.69% of the patients aged 60 years or above were blind while unilateral blindness was recorded in 43.91% patients in this age group (Table 4). Regarding the types of glaucoma, blindness was more frequent in neovascular and

Table 3: *Pattern of visual impairment in glaucoma patients according to level of education.*

Grading of Visual Acuity	Frequency of patients with various levels of education									Total
	Non Educated	**Can read Quran**	**Primary or less**	**Middle**	**Matric**	**FSc**	**BA**	**MA**	**Post Graduate**	
Both Eyes VA > 3/60	89	53	40	25	42	23	22	15	2	311
One Eye VA < 3/60	115	52	45	41	42	14	11	5	0	325
Both Eyes VA < 3/60	83	17	18	6	5	3	0	0	0	132
Uncooperative	14	0	2	8	8	0	0	0	0	32
Total	301	122	105	80	97	40	33	20	2	800

Table 4: *Pattern of visual impairment in glaucoma patients according to age.*

Grading of Visual Acuity	Frequency of patients in various age groups				Total
	Below 40 yrs	**40 to 49 yrs**	**50 to 59 yrs**	**60 yrs and above**	
Both Eyes VA > 3/60	59	32	68	152	311
One Eye VA < 3/60	39	28	56	202	325
Both Eyes VA < 3/60	18	9	19	86	132
Uncooperative	8	3	1	20	32
Total	124	72	144	460	800

pseudoexfoliation glaucoma. Almost 25% of the patients with neovascular glaucoma and 20% with pseudoexfoliation glaucoma had bilateral blindness (Table 5). 33% of the patients presented to us when the cup disc ratio in their better eye had worsened to 0.8 or more (Table 6). Blindness was strongly associated with cup disc ratio of 0.8 or worse in both eyes (OR, 2.75; 95% CI, 2.18–3.32) (Table 7).

Discussion

The WHO review in 2002 has reported a reduction in blind-ness due to ocular infections. The frequency of blindness from cataract also appear to be less than predicted. However the management of chronic eye diseases (glau-

Table 5: *Pattern of visual impairment in glaucoma patients according to type of glaucoma.*

Grading of Visual Acuity	Frequency of patients with various types of Glaucoma								Total
	POAG	**PACG**	**NVG**	**PEXG**	**2°Glaucomas*** **[other than NVG and PEXG]**	**Glaucoma Suspect**	**NTG**	**Unclassified**	
Both Eyes VA > 3/60	119	67	7	30	18	26	8	36	311
One Eye VA < 3/60	113	77	22	40	37	10	2	24	325
Both Eyes VA < 3/60	29	28	10	18	11	5	3	28	132
Un cooperative	7	5	2	2	8	3	0	5	32
Total	268	177	41	90	74	44	13	93	800

coma, diabetic retinopathy and age related macular degeneration) still remains a major challenge for ophthalmologists [2]. Grant and Burke, in their paper "Why do some people go blind from glaucoma?" found that almost 30% of people who go blind from glaucoma were already blind in both eyes at the time of initial presentation [5]. Most of the blind patients were aware of their deteriorating vision for months, or even years, before they presented to hospitals to seek medical ad-vice. In another report by Sinclair, who investigated registrations for blindness due to glaucoma between 1990 and 1999, a considerable number of patients (23%) at their first appointment were found to be eligible for registration as blind.[6]

Table 6: *Pattern of structural damage in glaucoma patients.*

Grading of Cup Disc Ratio	Frequency	Percent
Both CDR < 0.8	182	22.8%
One CDR > 0.8	277	34.6%
Both CDR > 0.8	264	33.0%
Fundus view hazy / un-cooperative patients	77	9.6%
Total	800	100.0%

Our hospital based study in the Pakistani population shows that 16.5% patients with glaucoma are blind while 40.6% patients have unilateral blindness at the time of initial presentation. The reason for slightly less percentage of blind patients than the other two studies is that we have followed the WHO criteria of blindness (VA<3/60 in the better eye) while the other two studies have followed American criteria of legal blindness (VA<6/60 in the better eye). However the

Table 7: *Pattern of visual impairment in patients according to glaucomatous damage.*

Grading of Visual Acuity	Frequency of patients with various levels of glaucomatous damage				Total
	Both CDR < 0.8	**One CDR > 0.8**	**Both CDR > 0.8**	**Hazy Fundus view/un-cooperative**	
Both Eyes VA > 3/60	140	85	80	6	311
One Eye VA < 3/60	29	164	102	30	325
Both Eyes VA < 3/60	6	22	76	28	132
Un-cooperative	7	6	6	13	32
Total	182	277	264	77	800

statistics recorded in a study in Africa are more alarming. Following the WHO criteria of blindness they registered 29% of the patients of primary open angle glaucoma as blind at the first presentation to the hospital [7]. One reason for this high percentage of blind patients might be due to the fact that economic conditions and health service provision in Africa are quite different from Asian and European countries. A glaucoma survey in Mongolia showed that 91% of the patients were not aware that they had glaucoma, and in a similar survey in Singapore this figure was 21%. This clearly shows that the economic and health care conditions definitely affect the population burden of the disease [8].

Frequency of blindness was slightly higher in women as compared to men however the association was weak. In a population based survey on the Pakistani population crude estimates of the prevalence of blindness were similar between men and women (3.4% vs. 3.5%) however after adjusting for age the prevalence was found to be more in women in every age category except those aged 30 to 39 years [9].

Our study has shown that unilateral and bilateral blindness were significantly related to illiteracy and increasing age. These results match with the population based survey on blindness in Pakistan in which blindness prevalence

increased from 0.4% in those aged 30 to 39 years to 15.7% in persons 70 years or more. The majority of the bilaterally blind subjects (87.2%) were aged 50 or older and the prevalence of blindness in this age group was 7.0% [9]. Prevalence of blindness was also found to be more in illiterate subjects in this survey. Similarly surveys in South Asia have shown that illiterate subjects were significantly more likely to have visual impairment. Subjects with primary level schooling were 60% less likely to present with a visual acuity of <6/60 than were subjects who had never attended school, and subjects who had a higher education were even less likely to have severe visual impairment (OR, 0.3; 95% CI, 0.2–0.4).[10]

The percentage of patients with severe glaucomatous damage to optic nerves (CDR>0.8 in both eyes) is quite high (33%) in our study. Comparatively much higher figures have been reported in the African patients. 70% of the African patients had a cup: disc ratio of 0.8 or worse in the better eye at the time of initial presentation [7]. The reasons for this higher damage in the African population as already been described may be the strict socioeconomic and health care conditions which lead to lack of awareness about the disease. Anyhow the statistics of glaucomatous structural damage in our population are also alarming.

Conclusion

This study provides us food for thought regarding the intensification of efforts for combating the morbidity related to glaucoma. Targeted screening, breaking down barriers to access and a campaign to create awareness among the people regarding importance of regular eye examinations may be effective in reducing the number of patients going blind from glaucoma. Using the available data from the health surveys, improving community awareness, regular eye checks permitting earlier case detection, and early treatment of glaucoma are the fields which need our attention to avoid of what should be preventable visual disability. Government should provide the eye care centers with proper diagnostic tools for early detection of glaucoma. Efforts need to be made to train general physicians and ophthalmic personnel in the recognition of this disease. In short a combined effort by governments, NGOs, ophthalmologists and primary health care providers can be helpful to prevent the world from glaucoma related blindness.

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