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Original Article

Opthalmology Section

Early Detection of Primary Open Angle Glaucoma: Is It Happening?

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ABSTRACT

Context (Background): Glaucoma is the second leading cause loss of vision in the world and it is aptly described as the silent thief of vision. The absence of symptoms leads to a delayed presentation and irreversible blindness. The present study was designed to determine the stage of glaucoma at the time of presentation.

Aim: To detect the proportion of cases which presented in different stages of glaucoma.

Settings & Design: A prospective, observational, non-interventional study was conducted in a medical college hospital.

Methods and Material: 50 newly detected cases of glaucoma [primary open angle glaucoma (POAG) and normal tension glaucoma (NTG)] were analyzed for the severity and the stage of glaucoma at the time of their presentation.

Statistical Analysis Used: The results of the study have been discussed in terms of the proportions and percentages. The statistical comparisons were done by using Pearson's chi square test.

Results: Of the 100 eyes which were studied, only 25% had mild, 40% had moderate and 35% had severe glaucoma at the time of the diagnosis. There was no statistically significant difference in the distribution of the different stages of glaucoma in the different age and sex groups. (Pearson's Chi square=4.909 p value=0.086). Only 1 case had a family history of glaucoma. Absolute glaucoma was more common in the females and in the 6th decade and it was seen in 7 eyes. 10% patients had bilateral blindness (legal blindness) and 18% had unilateral blindness. Up to 28% had blindness in at least one eye. 48% cases had undergone at least one eye check up in the past 5 years, either in a hospital, an optical shop or at an eye camp and yet, had not been diagnosed /suspected as having glaucoma.

Conclusion: This study concludes that late presentation of glaucoma cases, failure in detecting glaucoma during the previous eye check ups and the high prevalence of blindness which was caused by glaucoma, point out to an alarming situation which reflects an inherent weakness in the methodology for detecting the glaucoma cases. An increased awareness about the causes of blindness among the population and intensification of the present efforts is needed to bridge the gap. The shift of the spectrum of the detected cases to the left may help in increasing the years of sight and in improving the quality of life of glaucoma patients.

Key Words: Stages of glaucoma, Mild glaucoma, Moderate glaucoma, Severe glaucoma, Advanced glaucoma, Absolute glaucoma, Blindness, Glaucoma

INTRODUCTION

Glaucoma is the second leading cause of vision loss in the world [1] and as many as 11.2 million people in India are blind due to glaucoma [2]. Primary open angle glaucoma is estimated to affect 6.48 million persons [2]. It may be aptly described as "the silent thief of vision", which causes a bilateral, progressive loss of vision which is essentially painless. The absence of appreciable symptoms precludes its early presentation to the ophthalmologist. The optic nerve damage which is caused by glaucoma is irreversible and therefore, the delayed presentation adversely affects its management, thus leading to irreversible blindness. An early diagnosis of glaucoma is therefore crucial.

The age- and gender-adjusted prevalence of glaucoma in south India is 2.56% in people over the age of 40 years [3] and 92.6% were diagnosed for the first time. The high prevalence, the bilateral blinding nature and the high percentage of the undetected cases of glaucoma prompted the author to study the distribution of the severity of the cases of glaucoma at the time of their presentation. The present study was designed to determine the stage of glaucoma at the time of presentation. The study will help in evaluating the possible reasons for the delayed diagnosis of glaucoma and it will enable us to plan corrective measures.

METHODS

This prospective, observational study included 50 newly diagnosed successive cases of primary open angle glaucoma (including normal tension glaucoma), who attended the ophthalmic OPD of a medical college hospital (Yenepoya Medical College, Mangalore, India) during the year, 2005. The cases were aged more than 40 years and they belonged to either gender. The sample size was calculated by using the formula: Sample size = $t^2 \times p(1-p)/m^2$

Where t = confidence level at 95% (1.96), p = prevalence of glaucoma in south India= 2.6% (0.026), m = Allowable error of 5% (0.05) and the sample size = 40.5184, 50 patients were included in the study.

The diagnosis of glaucoma [4] was established after taking a complete ocular and systemic history with an emphasis on risk factors like family history of glaucoma, diabetes, myopia, etc. A detailed ocular examination was done, which included visual acuity and thorough anterior segment slit-lamp examination, which included

Goldmann Applanation Tonometry (corrected for central corneal thickness), gonioscopy, posterior segment evaluation by using slit lamp biomicroscopy and a +78 D lens and perimetry using 30-2 programme using Humphrey visual field analyzer.

Inclusion criteria

'Newly detected' cases of primary open angle glaucoma and normal tension glaucoma were included in the study. At least two of the following three criteria were required for the diagnosis of glaucoma in addition to open angles on gonioscopy:

1. Intra-ocular pressure > 21 mmHg with Goldman Applanation Tonometry after correction for central corneal thickness.
2. Typical glaucomatous cupping (with vertical cup: disc ratio > 0.5:1 or asymmetry of the vertical cup: disc ratio of > 0.2:1 between the two eyes)
3. Typical glaucomatous visual field defects as detected by 30-2 programme in automated perimetry on two occasions following Anderson's criteria [5].

Anderson's Criteria for the diagnosis of glaucomatous visual field defects:

1. The Glaucoma Hemifield Test is 'Outside normal limits'
2. 3 contiguous non-edge points on the pattern deviation plot within the Bjerrum's area have a probability of <5%, one of which has a probability of < 1%
3. Pattern standard deviation has a probability of < 5%

Exclusion criteria

1. Known cases of POAG and NTG
2. Secondary glaucoma
3. Primary angle closure glaucoma
4. POAG suspects where perimetry could not be done or with unreliable perimetry results
5. Ocular hypertension

Staging of glaucoma cases **[Table/Fig-1]:** The visual fields at the time of diagnosis of glaucoma were used for classification of the glaucoma into 3 stages. The eyes of the glaucoma cases were classified into three groups, following the criteria suggested by the Preferred Practice Patterns of the American Academy of Ophthalmology [4].

Ethics

This study was in accordance with the ethical standards of the Responsible Committee on Human Experimentation and with the Helsinki Declaration of 1975 which were revised in 2000 and it was reviewed and cleared by the institutional ethics committee. The cases were included after an informed written consent was taken from the patients and only non-identifiable data was used for the study.

Statistics

The results of the study have been discussed in terms of proportions and percentages. The statistical comparisons were done by using the Pearson's chi square test.

RESULTS [TABLE/FIG-2 & 3]

The groups were analyzed for age-sex distribution, risk factors, laterality and blindness and they were correlated statistically.

- **Demographic distribution of the newly detected glaucoma cases:** The prevalence of glaucoma in the present study was slightly higher in males than in females and in the older age group (>60 years), but this was not statistically significant (Pearson's Chi-square= 1.173; P-value=0.4246).
- **Distribution of the stages of glaucoma:** At the time of the diagnosis, among the 100 eyes, the proportion of cases with mild glaucoma was less as compared to that of cases with moderate and advanced glaucoma. However, there was no statistically significant difference in the distribution of different stages of glaucoma in the different age and sex groups. (Pearson's Chi square=4.909 p value=0.086).
- **Distribution of absolute blindness:** The prevalence of absolute glaucoma (defined as end stage glaucoma with not even perception of light) was more common in the 6th decade and in females more than in males. The fellow eyes of the patients with absolute glaucoma also had advanced disease (moderate glaucoma-3 and advanced glaucoma-4). There was no case of bilateral absolute glaucoma.
- **Distribution of blindness in the study group:** Legal blindness (WHO) was found to be more in females than in males. More males presented with unilateral blindness than the females.
- The proportion of the late presenters was high and the distribution was as in [Tables/Fig-2 & 3] and it included:
  - Moderate glaucoma
  - Severe glaucoma
  - Absolute glaucoma (complete blindness)
  - Bilateral blindness
  - Unilateral blindness
  - Total number of cases with at least one eye blind:

Mildglaucoma	GHT-' Within Normal Limits', 'Generalised Reduction in sensitivity' or 'Borderline' Other features of glaucoma-IOP > 21mmHg, CDR >0.5suggestive of glaucoma
Moderate glaucoma	Glaucomatous cupping, CDR > 0.5 Grey scale showing scotomasin one hemifield GHT-'Outside Normal Limits'
Severeglaucoma	Advanced glaucomatous cuppingGrey scale showing scotomas in both hemifields GHT-'Outside Normal Limits'

[Table/Fig-1]. Classification of eyes with Glaucoma

	<50 years		50-60 years		>60 years		Total		Total
	M	F	M	F	M	F	M	F	
MildGlaucoma	2	8	8	2	1	4	11	14	25
ModerateGlaucoma	6	3	6	5	15	5	27	13	40
Severe Glaucoma	4	1	2 (1)	13 (3)	10 (2)	5 (1)	16 (3)	19 (4)	35 (7)
Total	12	12	16	20	26	14	54	46	100
	24		36		40				

[Table/Fig-2]: Age-Sex distribution of the 100 eyes
M=Males F=Females The figures in parenthesis indicate the number of absolute blind eyes.

	Males	Females	Total
<50 years	1	0	1
50-60 years	2	3 (2)	5 (2)
> 60 years	3 (1)	2 (2)	5 (3)
Total	6 (1)	5 (4)	11 (5)

[Table/Fig-3]: Distribution of bilateral advanced glaucoma and blindness

- **Age-wise distribution of the different stages of glaucoma:** The older age groups had more advanced stages of the disease than the younger age groups. (Chi-square=1.3; P-value=0.5169) But, it was interesting to note that the youngest patient with bilateral advanced glaucoma was a 41 year old male and that the youngest patient with absolute glaucoma was a 50 years old female patient. Below the age of 50 years, a very high proportion of eyes had moderate glaucoma and severe glaucoma.
- **Gender-wise distribution of the stages of glaucoma:** Only 20% of the eyes in the male patients and 30% of the eyes in female patients had mild glaucoma. The severe glaucoma and absolute glaucoma were more common in the females. Legal blindness was more common in the female patients, whereas the unilateral blindness was more common in the male patients.
- **Prevalence of the risk factors of glaucoma:** 4 cases had a family history of glaucoma, which itself was a risk factor for glaucoma. There was an increasing but statistically not significant prevalence of the known risk factors like hypertension and diabetes in the severe glaucoma cases (Chi-square = 3.688 P-value = 0.7189). Only one patient had a family history of glaucoma and one had myopia.
- **Recent Eye check-up:** 48% cases had undergone at least one eye check up in the past 5 years, either in a hospital, at an optical shop or at an eye camp and yet, they were not diagnosed/suspected of having glaucoma. This means that 'the chance to detect' the cases was lost. This was despite the fact that 4% had a family history of glaucoma.

DISCUSSION

Several studies have indicated the prevalence of glaucoma, but there is a paucity of literature which have stated the stage of the disease at the time of the diagnosis. An advanced stage of the disease indicates the likelihood of adding another blind person to the burden of blindness. Therefore, it is not only important to know the prevalence of glaucoma in a population, but it is also imperative to know the stage at which a glaucoma case presents to the ophthalmologist. This is indicative of the magnitude of blindness today, as well as that of potential blindness in the near future. The detected cases indicate only the tip of the iceberg and it has been predicted that for every case of glaucoma which has been detected, there is another one which has remained undetected. The undetected mild stages are the cases which will be potentially blind after a decade or two if they are left untreated, contributing to blindness in the near future. In view of this, an analysis was made of the stage of glaucoma at the time of diagnosis in the present study.

The proportion of mild glaucoma was a mere 25%, suggesting that only a few cases are detected in their early stages. This indicates that the spectrum of different stages of glaucoma at the time of their diagnosis has a peak towards the right, with a tendency to detect the most cases in the advanced stages rather than early. This is an alarming situation which refers to an inherent weakness in the methodology for detecting the glaucoma cases.

Influence of age: Advanced disease was seen in the older age group, thus reflecting the natural course of the disease. However, 3 cases with bilateral advanced disease were found to be under the age of 50 years, indicating that the present system of glaucoma detection is failing to detect cases in younger individuals.

Influence of gender: Females had higher prevalence of severe disease, legal blindness and absolute glaucoma (p=0.086). This may be attributed to the cultural weaknesses in the society and to the lack of glaucoma awareness among the lower socio-economic classes and the rural community.

Recent Eye check-up: 48% cases had undergone at least one eye check up in the past 5 years either in a hospital, at an optical shop or at an eye camp and yet, they were not diagnosed /suspected of having glaucoma. This means that the 'the chance to detect' the cases was either lost or it was incomplete. This was despite the fact that 4% cases had a family history of glaucoma.

Implication of a delayed presentation: Advanced glaucoma and blindness which was caused by glaucoma were present in a considerable percentage of the total cases, thus indicating a late presentation of the cases at diagnosis. Also, the proportion of the moderate cases was more than that of mild glaucoma. This indicates that an early diagnosis of glaucoma which is important in its early management, was not made. These stages were common in the older patients, but not uncommon in the younger age group. This indicates that the screening for glaucoma should start at a younger age and not at 40 years of age, as is generally done, considering the fact that the glaucoma patients are otherwise asymptomatic. dvanced stages and blindness due to glaucoma were also more common in the female patients than in the males. This may only be explained by the social structure of the rural community.

Our hospital caters mainly to the neighbouring rural population. Their lower socio-economic status and the lack of awareness among them may have led to the late detection of the cases. The lack of health care facilities may not have been the reason, because of the presence of about 7 medical colleges and several private and government hospitals in and around the city. However, the failure of the screening programmes in reaching out to this population cannot be ruled out.

The hidden message is that the previous attempts have failed to detect these cases in their early stages. This demands a refinement of the present screening methods, lest we miss them again. This includes an enhancement of the screening programmes, widening of the age group which was screened, identification and follow up of the glaucoma suspects, coverage of the rural and remote areas, up-gradation of the screening tools to detect the very early cases and further research in this field. Not to mention, an increase the awareness of glaucoma and the blindness which ensues from it.

CONCLUSION

The late presentation of glaucoma cases indicates a general lethargy of the patients in presenting to the ophthalmologist without any factor which is significantly associated with their delayed presentation. To combat this lethargy, the present screening programmes are either insufficient or they are not very effective

in detecting all the cases and at an early stage. With the right application of the available infrastructure, it is possible to detect glaucoma at an early stage. The cases remain undetected, probably due to a gap between the facilities and the population. An increased awareness about the causes of blindness among the population and intensification of the present efforts is needed to bridge this gap. The shift of the spectrum of the detected cases to the left may help in increasing the years of sight and in improving the quality of life.

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