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Original Article

A Hospital Based Clinical Study on Primary Open Angle Glaucoma

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Abstract

Background: Primary open angle glaucoma (POAG) is defined as a chronic optic neuropathy with its characteristic optic disc changes and corresponding visual field defects resulting from increased intraocular pressure (IOP) which is the only treatable risk factor. It is one of the irreversible causes of blindness in the world and hence requires early diagnosis which is not a simple task.

Aim of the Study: The aim of the study was to conduct a clinical study on POAG and the associated risk factors in a hospital based set up.

Materials and Methods: A total of 64 adult patients aged above 45 years with subjects aged 40 years with complaints of raised intraocular pressure were included in the study. Complete ophthalmic examination was done. Diagnosis of POAG established according to the International Society of Geographical and Epidemiologic Ophthalmology classification.

Observations and Results: Among 64 patients 31 (48.43%) were males and 33 (51.56%) were females with a male to female ratio of 1:1.06. The mean age was 54.84 ± 3.10. The mean body mass index was 25.66. Family history was positive in 43/64 (67.18%) patients. 43/64 (32.80%) patients were from urban areas and 21/64 were from rural areas. Hypertension was present in 48.43% of the patients. The mean IOP was 14.79 ± 3.60 mmHg. The mean central corneal thickness (CCT) was 502.80 ± 35.30 μm. The mean vertical cup-to-disc ratio (VCDR) was 0.38 ± 0.16 with odds ratio of 0.7 and 95% confidence interval (CI) was 0.3–0.9. The lens opacities measured with Lens Opacities Classification System II system; Category II were 10/64 (15.62%) patients, and Category III in 24 (37.50%), and Category III in 30 (46.87%) patients.

Conclusions: The prevalence of POAG in this population was 1.62%. The prevalence was more in 50–60 years age group. The risk factors were raised IOP, hypertension, urbanization, and increasing age. The values of CCT, VCDR, and depth of anterior chamber, angle between iris and trabeculae and lens opacities help in the categorization of POAG and assessing the prognosis.

Key words: Anterior synechiae, Goniometry, Intraocular pressure, Primary open angle glaucoma, Optic disc

INTRODUCTION

Glaucoma is the second most leading cause of visual loss in the world.[1] Scientific studies undertaken in South India showed various prevalence rates of primary open-angle glaucoma (POAG).[2-4] The Vellore eye survey[2] reported a prevalence of 0.41% for POAG in the 30–60 years age group, whereas the Andhra Pradesh eye diseases study[3] estimated the prevalence of POAG in the urban population to be 2.56% in those aged 40 years and older. The International Society of Geographical and Epidemiologic Ophthalmology suggested a new classification for the diagnosis of glaucoma on the grounds of both structural and functional evidence of glaucomatous optic neuropathy.[5] The three types described are (1) primary angle closure suspect (PACS): Eye where >180° of posterior trabecular meshwork is not visible on gonioscopy; (2) PAC: PACS with peripheral anterior synechiae (PAS); and (3) PAC glaucoma (PACG): PACS with glaucoma as defined above. The Vellore study PACG as acute or chronic[2] and was appositional (with raised IOP) or synechiae (with PAS). Glaucomatous disc or visual fields were not mandatory for the diagnosis of angle closure glaucoma.[2] Review of the western literature showed the risk factors associated with glaucoma were

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high intraocular pressure (IOP), low blood pressure, low ocular perfusion pressure, narrow anterior chamber angles, thin corneas, pseudoexfoliation, a low body mass index (BMI), and myopia. These factors were examined in separate investigations so that interdependencies between some of the parameters could not be addressed. Most of these studies were performed in urbanized regions.[6-9] The present study is a prospective clinical study on POAG and the associated risk factors in a hospital based set up.

Type of Study

This was a prospective cross-sectional study.

Study Period

The study was from April 2004 to March 2006.

Institute of Study

This study was conducted at Government General Hospital attached to Kurnool Medical College, Kurnool, Andhra Pradesh.

MATERIALS AND METHODS

Among the outpatients attending the Department of Ophthalmology, Kurnool Medical College Hospital, 64 patients with diminished vision, raised IOP and altered visual fields were selected randomly to include in this study. An Institutional Ethical Committee clearance was obtained before commencing the study, and an Institutional Ethical Committee approved consent form was used for the study.

Inclusion Criteria

(1) Patients aged above 40 years, (2) patients with visual disturbances and headache, (3) patients with raised IOP, (4) patients with abnormal visual fields, and (5) patients with hypertension were included.

Exclusion Criteria

(1) Patients below 40 years, (2) patients with a history of ocular surgery, (3) patients with acute symptoms of glaucoma, and (4) patients with closed angle glaucoma were excluded. All the patients were elicited of history about the impairment of vision. Demographic data of the patients were collected. All the patients were subjected to total ophthalmological examination including slit lamp examination, visual acuity; intraocular pressure measurement, corneal pachymetry, streak retinoscopy, and subjective refraction were conducted. Refraction data are based on subjective refraction values. Emmetropia was defined as a spherical equivalent between −0.50 DS and +0.50 DS. Myopia was defined as spherical equivalent <−0.50 DS and hyperopia as spherical equivalent >+0.50 DS. Visual fields with no depressed points to any level of sensitivity were considered to be normal. The central corneal thickness (CCT) was measured with the ultrasonic pachymeter before any contact procedure or pupillary dilation. Slit lamp biomicroscopy was performed, and peripheral anterior chamber depth was graded according to the Van Herick system.[10] IOP was recorded with a Goldmann applanation tonometer with the patient under topical anesthesia induced by xylocaine 4%. Gonioscopy was performed on all subjects in dim ambient illumination with a shortened slit that does not fall on the pupil. The angle was graded according to the Shaffer system.[8] Grading of lens opacification was performed at the slit lamp using the Lens Opacities Classification System II (LOCS II)[11] with a minimum pupillary dilation of 6 mm. Stereoscopic evaluation of the optic nerve head was performed with a +78-D lens at the slit lamp. The vertical and horizontal cup-to-disc ratios (CDRs) were measured and recorded. The presence of any notching, splinter hemorrhages, and peripapillary atrophy was documented. A detailed retinal examination was performed using a binocular indirect ophthalmoscope and a +20-D lens. A provisional diagnosis of suspected glaucoma was made when the subject had one or more of the following conditions: IOP ≥21 mmHg in either eye; vertical CDR (VCDR) ≥0.7 in either eye or CDR asymmetry ≥0.2; and focal thinning, notching, or a splinter hemorrhage. All the data collected were analyzed using standard statistical methods.

OBSERVATIONS AND RESULTS

Among the 64 patients, 31 (48.43%) were males and 33 (51.56%) were females with a male to female ratio of 1:1.06. Patients aged above 40 years were included. The youngest patient was 40-year-old and the eldest was 73 with a mean age of 54.84 ± 3.10. The mean BMI, the presence of family history, distribution between urban and rural background, and history of hypertension are shown in Table 1. The mean basal metabolic rate was 25.66 which were higher than the standards of the age groups. Family history of glaucoma was observed in 43/64 (67.18%) of the total patients in the study. 43/64 (32.80%) patients were living in urban areas and 21/64 were living in rural areas. Hypertension was present in 48.43% of the patients [Table 1]. The most common age group in the study with POAG was 50–60 years 23/64 (35.93%), followed by 19/64 (29.68%) in the 40–50 years age group [Table 1].

Table 2 summarizes the distribution of glaucoma cases according to the gender with odds ratio and 95% of confidence of intervals values. The mean IOP was 14.79 ± 3.60 mmHg, with the 97.5th and 99.5th percentiles being 21 and 26 mmHg, respectively. The IOP values observed in

Table 1: Demographic data and clinical history (*n*-64)

Age groups	Males-31 number and %	Females-33 number and %	Mean BMI	Family history	Urban	Rural	Hypertension
40–50–19	09	10	24.14	11/19	13/19	06/19	08/19
50–60–23	11	12	27.05	19/23	16/23	07/23	13/23
60–70–15	08	07	26.38	09/15	09/15	06/15	07/15
>70–07	03	04	25.10	04/07	05/07	02/07	03/07
Percentage			25.66	67.18%	67.18	32.80	48.43

Table 2: The incidence of multiple risk factors for POAG in the study (*n*-64)

Variable	Number	Odds ratio	95% CI
Age in years			
40–50	19	1.00	
50–60	23	2.56	1.10–4.96
60–70	15	4.25	1.86–7.98
>70	07	5.18	2.24–9.54
Gender			
Male	31	1.00	
Female	33	0.98	0.53–1.42
IOP	14.79±3.60	1.00	21–26
CCT	502.8±35.3 μm	1.16	0.95–1.60
Emmetropia	05		
Myopia	44	0.68	0.40–1.16
Hypermetropia	20	1.00	
Hypertension			
Present	31	1.04	0.65–1.84
Absent	33	1.00	
Mean VCDR	0.38±0.16	0.7	0.3–0.9
Anterior chamber depth Van Herick grading			
Grade 3	37 (57.81%)		
Grade 4	27 (42.18%)	-	-
Shaffer grading			
Angle between iris and trabecular mesh		-	-
20–30°	16 (19.04%)		
30–40°	27 (42.18%)		
45°	21 (32.81%)		
LOCS II categories			
II	10 (15.62%)	-	-
III	24 (37.50%)		
IV	30 (46.87%)		

POAG: Primary open angle glaucoma, IOP: Intraocular pressure, CCT: Central corneal thickness, CI: Confidence interval, VCDR: Vertical cup-to-disc ratio, LOCS II: Lens Opacities Classification System II

these patients was found to be higher than normal standard values for that age group. The mean CCT was 502.80 ± 35.30 μm in the study group patients. The values of IOP and CCT were correlated and found that in patients with higher IOP the thickness of cornea was higher irrespective of the age groups. 5/64 patients were emmetropic, 44/64 were myopic, and 20/64 were hypermetropic patients in this study. Hypertension was present in 31/64 patients in the study. 31/64 (48.43%) patients were myopic and 20/64 (31.25%) patients were hypermetropic [Table 2]. The mean VCDR was 0.38 ± 0.16 with an odds ratio of 0.7 and 95% CI was 0.3–0.9. Van Herick grading of anterior chamber depth grading was Grade 3 in 37/64 (57.81%) and Grade 4 in 27/64 (42.18%) patients. Shaffer grading of the angle between iris and trabeculae was 20–30° in 16/64 (25.00%) patients, 30–40° in 27 (42.18%) patients, and 45° in 21/64 (32.81%) patients [Table 2]. Lens opacities were measured using LOC II system and Category II was found in 10/64 (15.62%) patients, Category II in 24 (37.50%), and Category IV in 30 (46.87%) patients.

DISCUSSION

In this study, the prevalence of POAG was 2.38% among all the ophthalmic patients attending the tertiary teaching hospital where this study was conducted. Out of 64 patients POAG, 96.34% of the patients were not diagnosed before attending the hospital but had IOP of ≤22 mmHg at the examination. The overall rates of high IOP associated with POAG were similar to the studies conducted by Dandona *et al.*[3] and Ramakrishnan *et al.*[4] The rates of angle closure are similar to those reported by investigators from India who used a Goldmann two-mirror lens for classification.[2] Review of literature shows the prevalence of POAG among the black races ranges from 4.2% to 8.8%.[12,13] In white race populations, the prevalence rates were 1.1–3%.[14-16] Prevalence for East Asia varies from 0.5% to 2.3%.[17] The reported prevalence of POAG in India is between 0.41% and 2.56%.[2-4] This study and other studies[3,4] have shown that most people with POAG could have a presenting IOP ≤21 mmHg. Different criteria were used in different studies to diagnose glaucoma. Dandona *et al.*[3] used a combination of disc changes, IOP ≥22 mmHg, and IOP asymmetry of 6 mmHg as the criteria for advising the participant to undergo visual field examination. The inclusion of pseudoexfoliation glaucoma along with POAG in this study may explain the higher prevalence of glaucoma. In this study, the mean VCDR was 0.38 ± 0.16. In the study by Dandona *et al.* a visual field defect that corresponded to disc findings (a CDR of ≥0.8, asymmetry >0.2, or thinnest neuroretinal rim width of 0.2) was used for diagnosis in 70.3% of their cases. Results from several studies have shown that the prevalence of POAG increases with age [16,17] In this study, the most common age group in the study with POAG was 50–60 years 23/64 (35.93%), followed by 19/64 (29.68%) in the 40–50 years age. Some studies have shown a higher prevalence of POAG in men.[4,18] Other studies have shown no gender difference

in POAG prevalence.[3,15] In this study, even though the incidence of POAG was more in women but it was not statistically significant. The rate of undiagnosed POAG in the study by Dandona *et al.*[3] was 92.6%. In this study, the number patients with undiagnosed POAG were 96.34%. This may be due to the lack of facilities for comprehensive ophthalmic examination for the Indian population or to the widespread use of inappropriate eye examination techniques. In the present study, 46/64 (71.87%) of the patients presented with IOP of >21 mmHg, possibly because of taking only a single reading while recording the IOP measurement for the analysis. Although a presenting IOP >21 mmHg is associated with a higher risk of the development of glaucoma, the remaining patients with POAG had IOPs of <21 mmHg. The rate of prevalence of POAG still increased with increasing IOP, however, and the mean IOP of subjects with POAG was more than that of the overall study population. These findings are similar to the other study reports.[3,4] Our results reconfirm that the diagnosis of POAG cannot be based only on the level of IOP, but higher IOP is an important risk factor for POAG. In this study, the prevalence of blindness due to POAG was found to be lower than that in the other two studies.[3,4] None of the patients in the present study presented with total blindness. 8/64 patients had a vision <2/40; because visual field testing was not possible in these subjects and they did not have total glaucomatous optic atrophy. Some studies have shown diabetes as a risk factor for POAG.[19,20] The Baltimore eye survey[21] 26 has shown no relationship between diabetes and POAG. In this study, none of the patients had diabetes mellitus. Some studies have shown an association between systemic hypertension and POAG[21,22] whereas others have not.[23] In this study, 31/64 (48.43%) patients of POAG presented with a diagnosis of hypertension. Myopia was observed in 44/64 patients with refractory error <−0.5 spherical equivalent. Patients with POAG in the Rotterdam Study 30 were reported to have significantly thinner CCT than were the control subjects. In the Barbados eye studies, 31 the participants with POAG had thinner corneas (520.6 ± 37.7 μm) than those classified having no glaucoma (530.0 ± 37.7 μm). In this study, the mean CCT in subjects with POAG was 502.8 ± 35.3 μm and not significantly different from that of the normal study population. Within the POAG group, however, subjects with an IOP >21 mmHg had thicker corneas than did the subjects with an IOP ≤21 mmHg, but the difference was not statistically significant. The mean VCDR in subjects with POAG with IOP ≤21 mmHg was 0.48 ± 0.16, and in those with IOP >21 mmHg was 0.71 ± 016. When we compared our distribution of VCDR with other studies in which used normal suprathreshold visual fields were used to derive the distribution of VCDR, we found a similar pattern.[24,25]

CONCLUSIONS

The prevalence of POAG in this population was 1.62%. The prevalence was more in 50–60 years age group. The risk factors were raised IOP, hypertension, urbanization, and increasing age. The values of CCT, VCDR, and depth of anterior chamber, angle between iris and trabeculae and lens opacities help in the categorization of POAG and assessing the prognosis.

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