

Primary glaucoma (POAG&PACG) and its associated factors - A hospital based cross sectional analytical study in Jammu

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Abstract

Background- Glaucoma is second most common cause of blindness worldwide. And among primary and secondary glaucoma, it is the secondary glaucoma cases which is largely self-reported as it presents with pain and ocular discomfort as major symptoms. However it is primary glaucoma which are often remain underreported due to lack of awareness and insidious onset in nature. Considering the fact, this study is undertaken to determine the hospital based prevalence of primary glaucoma in adult patients more than 40 years and to find out socio-demographic distribution of primary glaucoma, which can provide useful background information to plan community based epidemiological survey on primary glaucoma as next step to our study.

Methods- A hospital based cross sectional analytical study was carried out in all adult patients more than 40 years of age who presented with symptom suggestive of glaucoma such as diminution of vision, headache, eye ache, coloured halos, pain, redness in eye, family

history of glaucoma and patient who come for routine examination or other with complaints showing sign of glaucoma in eye OPD of ASCOMS and hospital (Jammu) for period of one year, from July 2019 to June 2020. These patients will be further evaluated for IOP value, gonioscopy, optic disc finding and visual field.

Results- The prevalence of primary glaucoma is 1.52% in this hospital based study. The prevalence of POAG (1.07%) is found to be more than PACG (0.44%). The maximum cases were seen in age group of 61-70 years with male preponderance. The maximum number of cases (62.10%) of primary glaucoma was from urban background and also the literacy rate was higher in these cases.

Conclusion- Glaucoma prevalence and age distribution was found to be similar to studies conducted in other parts of India. Most common type of glaucoma was found to be POAG in this study. And a significant number of cases were diagnosed as accidental finding. We need more awareness programs for primary

glaucoma in this region and regular screening especially among elderly population.

Keywords- Primary open angle glaucoma (POAG), Primary angle closure glaucoma (PACG), Intraocular pressure (IOP)

Introduction

Glaucoma is the second most common cause of blindness worldwide [1]. More than (90% of cases of glaucoma remain undiagnosed in community. And its prevalence increases with age.

Glaucoma is a term used to describe a group of diseases of eyes characterised by progressive and irreversible damage of the optic nerve which in turn results in irreversible visual loss.

Asian accounted for approximately half of total cases of glaucoma worldwide, with studies showing the prevalence of glaucoma between 0.94% to 4.73% among them [2,3]. With rapid increase in aging population, the prevalence is expected to increase.

The estimated prevalence of glaucoma cases in India is reported to be 11.9 million [4]. The rate is not same at every place, with varying prevalence among different population and sub groups. These rates have been derived from population based studies, and only a few have been done among north Indian population.

The availability of population based data from India is relatively recent as compared to western countries. While excellent Indian population based glaucoma studies are available from south India, such epidemiological valid data from north India are very few especially from our region.

And among the primary and the secondary glaucoma, the mean prevalence of secondary glaucoma is 18% of the mean prevalence of primary glaucoma in world [5]. Quigley estimated that 6 million people in world have

secondary glaucoma compared with 67million with primary glaucoma [5].

Individual with secondary glaucoma tend to report promptly to the ophthalmologist since there is often marked reduction in vision, apart from pain and ocular discomfort. As a consequence these cases are largely self-reported.

However it is the primary glaucoma which are often remain underreported due to lack of awareness and insidious onset in nature. Considering the fact, this study is undertaken.

The aim of current study is to determine the hospital based prevalence of primary glaucoma in adult patients more than 40 years attending eye OPD, to find out distribution of socio-demographic factors, risk factors and ophthalmic findings in primary glaucoma and their association with different types of primary glaucoma (PACG & POAG). This can provide useful background information to plan community based epidemiological survey on primary glaucoma as next step to our study and also help to plan to initiate better control and treatment measures.

Material and method

A hospital based cross sectional analytical study was carried out among all the adult patients more than 40 years of age who attended the eye OPD of ASCOMS medical college and hospital(Jammu) for one year period, from July 2019 to June 2020 . The study was conducted after taking permission from institutional ethical committee of ASCOMS, Jammu. During the study period all the patients aged 40 years and above were invited for the study and those who gave written consent were included.

A semi structured, pretested Proforma with standardised questionnaire consisting of complaint related to eye,

ocular trauma in past, family history of glaucoma, along with socio-demographic variable was used as a data collection tool. All the study subjects were ensured anonymity and privacy. .

Inclusion criteria-

The sample under study included patients who presented with symptoms suggestive of glaucoma such as diminution of vision , headache , eyeache , coloured halos , pain , redness in eye , family history of glaucoma and patients who came for routine examination or other complaints showing signs of glaucoma. These patients were further evaluated for IOP value, gonioscopy , optic disc findings and visual field status.

Sample also included all the patients of primary glaucoma initially worked up at other eye hospital and clinics, and who were attended our hospital eye OPD.

Exclusion criteria

1. The patients having symptoms and signs suggestive of secondary glaucoma such as history of ocular trauma and surgery in past, sign of past ocular inflammation and uveitis like old KP'S and pigment on lens surface, ectropion uveae and neovessels on iris and retina , distorted angle structure on gonioscopy.
2. Patients with raised IOP without any optic disc and visual field changes.
3. Patients on long term steroid (both topically and orally) for other diseases.

All sample patients were subjected to a set protocol of examination which included-

- Visual acuity using Snellen's distant test type and refraction was done.
- Slit-lamp bio microscopy

- IOP recording was done with Goldman applanation tonometer and IOP was corrected for CCT. The upper limit was taken as 21 mmHg.
 - Optic disc was evaluated by dilated stereoscopic optic disc examination using Volk 90D lens along with Slit-lamp. The normal cup-disc ratio was taken as 0.3:1 or less. The significant glaucomatous changes were recorded as- i) vertical cup-disc ratio > 0.5:1 in either eye. ii) asymmetry of cup-disc ratio of >0.2 between two eyes. iii) pallor and thinning of the neuro-retinal rim. iv) other disc changes such as notching of neuro-retinal rim, splinter peripapillary haemorrhages ,wedge defects of nerve fiber layer and peripapillary atrophy in association with other finding.
 - Anterior chamber angle was assessed with an indirect four mirror gonioscens. And the depth of anterior chamber was graded according to Shaffer's System of angle grading.
 - Visual field assessment was done by static perimetry using Humphrey field analyser. Perimetry was performed using SITA standard 30-2 program. And for glaucomatous field defect Anderson criteria was used which include a cluster of 3 or more non-edge points in location typical of glaucoma, all of which are depressed on pattern deviation plot at $p < 5\%$ level and one of which is depressed at $p < 1\%$ level on consecutive field. If an advanced field defect precluded a successful 30-2 examination, the macular program or a 10-2 program was used.
- For the purpose of this study, the Primary Open Angle Glaucoma (POAG), also referred to as chronic simple glaucoma was defined as bilateral disease of adult onset characterised by an IOP > 21 mmHg at some stage, an open anterior chamber angle, and glaucomatous optic

nerve damage with characteristic visual field loss as damage process and absence of sign of secondary glaucoma [6].

The Primary Angle Closure Glaucoma (PACG) included the all stages in natural history of the disease, that is- a) primary angle- closure suspect b) primary angle-closure and c)primary angle- closure glaucoma [7].

Statistical Analysis: The Data collected was coded and entered in Microsoft Excel. Qualitative variables were presented as percentages. Mean ± SD was calculated for quantitative variables. Chi square test was applied to find the association between categorical variables and p < 0.5 was considered to be statistically significant

Observation and Results

There were total 6240 patients more than 40 years of age who attended the eye OPD in duration of one year (from July 2019 to June 2020) , out of which 95 patients were diagnosed as a case of primary glaucoma after undergoing all the evaluation and examination which were discussed in method and material section.

So, we found prevalence of primary glaucoma as 1.52% among patients more than 40 years of age attending eye OPD in this hospital based study. Among 95 patients, 67(1.07%) were primary open angle glaucoma (POAG) cases and 28(0.44%) were primary angle closure glaucoma (PACG) cases respectively.

Table 1: Socio-demographic profile of primary glaucoma and its associations

Variable	POAG (n=67) No (%)	PACG (n=28) No (%)	Total (n=95) No (%)	X ²	p
Age group in years				7.90	0.04*
41-50	9 (13.43)	8 (28.57)	17 (17.89)		
51-60	16 (23.88)	9 (32.14)	25 (26.31)		
61-70	37 (55.22)	7 (25.00)	44 (46.31)		
>71	5 (7.46)	4 (14.28)	9 (9.47)		
Gender				1.49	0.22
Male	47 (70.14)	16 (57.14)	63(66.31)		
Female	20 (29.85)	12(42.85)	32 (33.68)		
Education				0.11	0.94
Illiterate	14 (20.89)	06 (21.42)	20(21.05)		
Upto graduation	19 (28.35)	07 (25.00)	26(27.36)		
Graduate & above	34 (50.74)	15 (53.57)	49(51.57)		
Occupation				1.66	0.64
farmer/skilled worker	20 (29.85)	06 (21.42)	26(27.36)		
Labourers /unskilled	05 (7.46)	04 (14.28)	9 (9.47)		
worker Service class /	28 (41.79)	11 (39.28)	39(41.04)		
business	14 (20.89)	07 (25.00)	21(22.10)		
Others / housewives					

Residence					
urban	41(61.19)	18(64.28)	59(62.10)	0.08	0.77
rural	26(38.80)	10 (35.71)	36(37.89)		

*P<0.05- statistically significant

When analysed for different type of primary glaucoma, it was observed that POAG was more common than PACG and maximum number of cases(55.22 %) occurred in sixth decade while maximum number of PACG cases (32.14 %) were observed in fifth decade (table 1). This difference in age group distribution of two types of glaucoma was found to be statistically significant (p<0.04).

Overall cases of primary glaucoma were found more in male patients as compared to female patients. The male: female ratio of POAG was 2.35:1 and of PACG was 1.33:1. It was observed that maximum number of cases

(62.10%) of primary glaucoma was from urban background and also the literacy rate was higher in these cases (78.94%). The maximum number of cases (41.04%) of primary glaucoma belonged to service/business class followed by farmer/skilled workers (27.36%). The least number of cases (9.47%) belonged to labour/unskilled workers. The difference in other socio demographic variables among POAG and PACG was not found to be statistically significant (gender, education, occupation and residence; p= 0.22, 0.94, 0.64 and 0.77 respectively)

Table 2: Distribution of common systemic and ocular risk factor in primary glaucoma and its association with POAG and PACG

Risk Factor	POAG (n=67) No(%)	PACG (n=28) No(%)	Total (n=95) No (%)	X ²	p
Myopia	21(31.34)	2 (7.14)	23(24.21)	6.30	0.01*
Hypermetropia	1 (1.49)	7 (25.00)	8 (8.42)	14.15	0.00*
Diabetes	19 (28.35)	3 (10.71)	22 (23.15)	3.45	0.06
Hypertension	7 (10.44)	9 (32.14)	16 (16.84)	6.63	0.00*
Smoking	10 (14.12)	2 (7.14)	12 (12.63)	1.08	0.29
Family History	3 (4.47)	1 (3.57)	4 (4.21)	0.04	0.84

*P<0.05- statistically significant

Myopia which is a known association of POAG was present in 31.34% of cases followed by diabetes which was present in 28.35% of cases. One case of POAG has past history of CRVO. PACG was seen more associated with presence of hypertension i.e. 32.14%. It was observed that 25% of PACG patients were hypermetropic while only 2 patients were found to be myopic(were in their seventh decade). Family history of glaucoma was not found very significant in our study.

Fewer patients with smoking habit were observed in both type of primary glaucoma and all of them were male. Myopia, Diabetes mellitus, H/o smoking and family history were found to be more common in POAG cases and hypermetropia and hypertension were more common among PACG cases. There was a statistically significant association between type of glaucoma and risk factors like Myopia (p=0.01), hypermetropia (p=0.00) and hypertension (p=0.00).

Table 3: Clinical presentation among cases of POAG and PACG.

Symptoms	POAG (n=67) No (%)	PACG (n=28) No (%)	Total (n=95) No (%)
Reduced vision	25 (37.30)	13 (47.42)	38 (40.00)
Headache	15 (22.38)	9 (32.14)	24 (25.26)
Eye ache	6 (8.95)	8 (28.57)	14 (14.73)
Coloured halos	0 (0.00)	3 (10.71)	3 (3.15)
Frequent change of glasses	4 (5.97)	0 (0.00)	4 (4.21)
Asymptomatic	18 (26.86)	9 (32.14)	27(28.42)

On observing clinical presentation, we found that maximum cases in both type of primary glaucoma presented with complaint of reduced vision followed by headache and eye ache respectively. But at same time

significant number of cases in both POAG (26.86%) and PACG (32.14%) were asymptomatic on presentation and diagnosis was made on the basis of presence of signs and a thorough examination (table3).

Table 4: Distribution of patients based on ophthalmic examination and its association with POAG & PACG.

Ophthalmic examination	POAG (n=67) No(%)	PACG (n=28) No (%)	Total (n=95) No (%)	X ²	p
IOP range					
<20	3 (4.47)	5 (17.85)	8(8.42)	9.72	0.02*
21-30	35 (52.23)	9(32.14)	44(46.31)		
31-40	17 (25.37)	4 (14.28)	21(22.10)		
>40	12(17.91)	10 (35.71)	22 (23.15)		
Angle depth (shaffer's system)					
Slit angle	0(0.00)	5(17.85)	5 (5.26)	-	-
Grade 0	0(0.00)	9(32.14)	9 (9.47)		
Grade 1	0(0.00)	12(42.85)	12 (12.63)		
Grade 2	0(0.00)	2(7.14)	2 (2.10)		
Grade 3	25(37.31)	0(0.00)	25(26.31)		
Grade 4	42(62.68)	0(0.00)	42(44.21)		
Disc findings					
C:D ratio > 0.5	32 (47.76)	10(35.71)	42 (44.21)	1.16	0.28
Asymmetric C:D ratio>0.2	6 (8.95)	5(17.85)	11 (11.57)	1.52	0.21
Thinning and pallor of NRR	19 (28.35)	12(42.85)	31 (32.63)	1.88	0.16
Notching of NRR	13 (19.40)	1 (3.57)	14 (14.73)	3.93	0.04*

NFL defect	7 (10.44)	2 (7.14)	9(9.47)	0.25	0.61
Peripapillary atrophy	11 (16.41)	3(10.71)	14 (14.73)	0.51	0.47
Optic atrophy	2 (2.98)	1 (3.57)	3(3.15)	0.02	0.88

*P<0.05- statistically significant

Mean IOP was 31.45±9.45mmHg. It was observed that in maximum number of cases of POAG (52.23%) and PACG (35.71%) IOP was in range of 21-30 mmHg and >40 mmHg resp. This difference in IOP among two groups was found to be statistically significant (p=0.021). It is important to note that, 3(4.47%) cases of POAG and 5 (17.85%) cases of PACG had IOP below 20mmHg . The angle was found open in all cases of POAG while in case of PACG the maximum number of eyes had either grade1 or grade0. Five cases had PAS in 1or2 quadrants. The disc findings in both type of primary glaucoma were consistent with glaucomatous disc changes. Maximum number of cases had C:D ratio >0.5:1 in both type of primary glaucoma. 19.40% POAG cases and 3.57% PACG cases had notching of NRR and this difference was found to be statistically significant (p=0.04). Optic atrophy was seen in 3 cases, all of them were in their seventies and from rural background (Table 4).

Discussion

As glaucoma is the second leading cause of preventable blindness, and its primary glaucoma which usually presented in late stages due to its insidious nature, so in this study we focus our interest in knowing the various clinical and socio-demographic profile of primary glaucoma in a hospital based study.

And we found the hospital based prevalence of primary glaucoma as 1.52% in our study. The other studies from various parts of India reported prevalence of 2.3-4.7% [3,8,9]. While many studies have been done in south and

east India, very few are reported from north India. A community based study from Agra although very old, reported a prevalence of glaucoma as 4.2% while an OPD based study from Kashmir also reported a prevalence of 4% [14, 15]. Lower prevalence rate in our study can be attributed to general lack of awareness in population and late presentation.

In this study POAG 1.07%(1.01-1.8, 95%CI) was found to be more prevalent than PACG 0.44%(0.09-0.56, 95%CI) as seen in most studies among Indian subcontinent which documented that POAG is the predominant subtype with prevalence of POAG varying from 1.26-4.325% and of PACG in 0.15-1.11% among various Indian sub population[3,4,8,9,10,11,12,13]. Majority of POAG cases (37.31%) in this study belong to the age group of 61-70 while maximum PACG cases (35.71%) belong to the age group of 51-60. Sharma et al reported most common age group>60(16). Shihota et al, reported that the angle closure glaucoma occur maximally in the age group of 50-59 years [17].

In present study majority of POAG cases were males (70.14%). Sharma et al, Das et al also reported a male preponderance [12,14]. ACES noted an increased association with male gender while no gender association was noted in both CGS and APEDS [14,16,19]. There was no significant difference between male and female gender seen for prevalence of PACG in our study which contradicts Sharma et al, Das et al who reported a male preponderance[16,18],while some other

previous studies shows female association with PACG [19,20].

In our study we find that more cases of PACG had history of hypertension which was inconsistent with previous studies [21-29]. Hypertension, diabetes and cardiovascular disorder are the most common systemic diseases seen in glaucoma subject [30]. The effect of BP on glaucoma remains a matter of debate as some studies have indicated that hypertension is associated with glaucoma especially POAG [22,23,26,28,29]. However some have found that hypertension was a protective factor reducing the risk of developing glaucoma [21,22,24,27]. Similarly many epidemiological studies have investigated the relationship between open angle glaucoma and diabetes mellitus [31-36] and some of them also provide evidence of positive association [31,33,35,36]. We also found similar association. But relationship between glaucoma and diabetes mellitus is complex because different type of glaucoma may attribute to different pathogenic mechanisms. We reached to an understanding that the influence of systemic risk factors like hypertension and diabetes on the primary glaucoma needs further investigation. Smoking can be a risk factor for primary glaucoma since it produces ischemia and oxidative stress, as a consequence the progression of disease accelerates but we found no association of smoking with primary glaucoma in our study.

Reduced vision was most common complaint in patients of primary glaucoma followed by headache and eye ache. Das et al also reported similar finding [37]. Shehota et al also reported that diminution of vision was most common presenting complaint in cases of PACG. Coloured halos as a complaint was seen in only 4 cases of PACG, out of which 3 presented as acute attacks [38].

We found a higher mean IOP in our study as compared to previous studies which can have adverse effect in the progression of the disease. Quek et al. reported that higher mean IOP and a history of acute attack in Chinese eye having PACG led to poor visual outcome at 10 years [39]. The mean IOP also influences the set up of target pressure [The target IOP is a IOP range at which the clinician decides that the progressive disease is unlikely to affect the patient's quality of life (QOL). Beside the target IOP can be explained as the upper limit of stable range of measured IOPs deemed likely to retard further optic nerve damage][40]. An Indian Study recorded progression in just 2.3% of POAG and PACG eyes with advanced glaucoma over 5years when the target IOP was 12-14 mmHg [41]. The pattern of disc changes in both type of primary glaucoma was similar. C. Supawavej et al. also reported a finding that the pattern of glaucomatous nerve damage is not different in primary chronic angle glaucoma as compared to primary open angle glaucoma eyes [42].

Conclusion

We found the hospital based prevalence of primary glaucoma as 1.52% in our study. The maximum cases were seen in age group of 60-70 for first time with moderate to severe visual and visual field loss and a significant number of cases were diagnosed as accidental finding. We need more awareness programs for primary glaucoma in this region and regular screening especially among elderly population. More population based studies are needed to further establish the association of systemic risk factors (hypertension, diabetes, smoking) with primary glaucoma.

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