

A Study on Screening of Glaucoma among Patients Attending Tertiary Eye Care Hospital at One of the Cities of Western India

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Abstract:


Introduction : Glaucoma is the leading cause of irreversible visual loss in world and also in India. Because of the relatively asymptomatic initial phase of the disease, it is often detected by chance and is frequently associated with extensive and irreversible damage at the time of diagnosis. **Objectives:** To screen for Glaucoma among patients eligible as per inclusion criteria, to classify the glaucoma cases according to clinical presentation and to correlate the occurrence of glaucoma with different variables. **Method:** The present study was conducted at one of the tertiary care hospitals of Ahmedabad city during celebration of "World Glaucoma Week - 2021". Total 1421 patients were offered opportunistic screening after oral informed consent during 6-12 March 2021, who attended the institute. After applying exclusion criteria, 945 were found eligible who underwent a comprehensive ophthalmic examination like visual acuity, intra-ocular pressure measurement, gonioscopy, optical disc and visual field examinations were carried out as per standard protocols. Sociodemographic details, any relevant ophthalmic history pertaining to glaucoma and systemic illnesses were also assessed. The data were entered and analyzed in MS excel. **Results:** The incidence of newly diagnosed cases of glaucoma among opportunistic screened cohort was 36.71% (n=347). Of total newly diagnosed, the presentation as per clinical classification was as follows: Primary open angle glaucoma (POAG) - 202 (58.21%), Primary angle closure glaucoma (PACG) - 77 (22.19%), Primary angle closure suspect (PACS) - 41 (11.82%), Ocular hypertension (OHT) - 6 (1.73%), Normal tension glaucoma (NTG) - 10 (2.88%), Secondary glaucoma - 9 (7.09%) and Congenital glaucoma - 2 (0.58%). In yield, 25 (19.68%) were \leq 40 years and 36 (28.35%) had positive family history of glaucoma. **Conclusion:** Presence of stand-alone Diabetes and Hypertension or presence of both accompanying - all three conditions were found to be statistically significant determinant for occurrence of particular variety of Glaucoma. There was highly significant statistical association between cup-disc ratio level at the time of presentation and clinical variety of glaucoma.

Keywords: Glaucoma, Incidence, Screening, World Glaucoma Week.

Introduction:

The word glaucoma originally meant 'clouded' in Greek; as such, it may have referred either to a mature cataract or to corneal edema that might

result from chronic elevated pressure. Glaucoma is defined as a disturbance of the structural or functional integrity of the optic nerve that can usually be arrested or diminished by adequate

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lowering of IOP.^[1] The two most common forms of the disease are Primary Open Angle Glaucoma (POAG) and Primary Angle Closure Glaucoma (PACG), with variable patterns of disease prevalence in different ethnic groups.^[2]

Globally, at least 2.2 billion people have a near or distance vision impairment. In at least 1 billion or almost half of these cases, vision impairment could have been prevented or has yet to be addressed. This 1 billion people include those with moderate or severe distance vision impairment or blindness due to unaddressed refractive error (88.4 million), cataract (94 million), glaucoma (7.7 million), corneal opacities (4.2 million), diabetic retinopathy (3.9 million), and trachoma (2 million), as well as near vision impairment caused by unaddressed presbyopia (826 million).^[3] Vision impairment severely impacts quality of life among adult populations. Adults with vision impairment often have lower rates of workforce participation and productivity and higher rates of depression and anxiety. In the case of older adults, vision impairment can contribute to social isolation, difficulty walking, a higher risk of falls and fractures, and a greater likelihood of early entry into nursing or care homes.^[4]

Glaucoma is the fourth leading cause of preventable blindness globally. Although there is a decline in the overall prevalence of blindness in India, blindness and visual impairment (VI) continues to be a major public health problem and there are significant disparities in the prevalence and its causes across different regions in the country.^[5]

Considering the above facts and paucity of region-specific data pertinent to glaucoma in the western region of India, especially in Gujarat province, the current research was planned especially during celebration of 'World Glaucoma week' during March 6-12, 2021 at one of the tertiary care hospitals in Ahmedabad. The study was planned with following objectives: To screen for Glaucoma among patients eligible as per inclusion criteria, to

classify the glaucoma cases according to clinical presentation and to correlate the occurrence of glaucoma with different variables.

Method:

The present study was conducted at one of the tertiary eye care hospitals of Ahmedabad city during the celebration of "World Glaucoma Week - 2021" after obtaining necessary approval from appropriate institutional authorities. Every year, the duration of 6-12 March is being celebrated as "World Glaucoma Week" worldwide. Total 1421 patients who attended the institute were offered opportunistic screening after oral informed consent during period mentioned above. After applying exclusion criteria, 945 were found eligible who comprise the final study cohort. The selected participants underwent a comprehensive ophthalmic examination like visual acuity check by Snellen chart, Intra Ocular Pressure measurement by Goldmann applanation tonometry, Anterior segment examination by slit lamp biomicroscopy (to rule out pigment dispersion, pseudo exfoliation and other secondary causes of glaucoma), Gonioscopy by one mirror Goldmann gonio lens (Shaffer grading system) and Optic disc examination by slit lamp biomicroscopy 60D lens. Staging of glaucomatous damage was done based on cup disc ratio into early (≤ 0.6), moderate (0.7-0.8) and advanced (> 0.8).^[6]

All glaucoma suspects were then subjected to Visual field analysis using Humphrey's visual field analyzer, optical coherence tomography (OCT) and Diurnal variation of intraocular pressure (DVT). Those undergoing contact procedures were tested for COVID-19.

Socio-demographic details, any relevant ophthalmic history pertaining to glaucoma (like any ocular surgery, trauma, history of steroid intake or medication which can lead to glaucoma) and systemic illnesses were also assessed. The data were entered and analyzed in MS excel.

The following definitions were used to classify persons into specific diagnostic categories:^[7]

Primary open angle glaucoma (POAG): Anterior chamber angles open and normal appearing by gonioscopy, typical features of glaucomatous optic disc and visual field defects corresponding to the optic disc changes.

Ocular hypertension(OHT): Intraocular pressure ≥ 21 mmHg without evidence of optic nerve damage or visual field abnormalities characteristic of glaucoma; open and normal-appearing anterior chamber angle by gonioscopy.

Normal tension glaucoma(NTG): Intraocular pressure ≤ 21 mmHg with evidence of optic nerve damage or visual field abnormalities characteristic of glaucoma; open and normal-appearing anterior chamber angle by gonioscopy.

Primary angle closure suspect(PACS): Greater than 270° of iridotrabecular contact, absence of PAS, normal IOP, disc and visual fields.

Primary angle closure (PAC): Greater than 270° of iridotrabecular contact, either elevated IOP and/or PAS, normal disc and visual fields

Primary angle closure glaucoma (PACG): Greater than 270° of iridotrabecular contact–Elevated IOP plus optic nerve and visual field damage.

Secondary glaucoma: Glaucomatous optic nerve damage and/or visual field abnormalities suggestive of glaucoma coupled with ocular disorders that contribute to a secondary elevation in IOP such as neovascularization, trauma, cataract and uveitis.

Inclusion & Exclusion criteria:

All adult patients visiting tertiary eye care centre at study site during “World Glaucoma Week”, i.e., 6-12 March, 2021 and were willing to take part in the screening programme by oral informed consent were included in the study. All patients with signs and symptoms of COVID 19 were subjected to rapid antigen test and if found positive, excluded from the study.

Results:

The incidence of newly diagnosed cases of glaucoma among opportunistic screened cohort was 36.71% (n=347 out of 945 eligible study participants were diagnosed to have glaucoma). Of total newly diagnosed, the presentation as per clinical classification was as follows: Primary open angle glaucoma (POAG) - 202 (58.21%), Primary angle closure glaucoma (PACG) - 77 (22.19%), Primary angle closure suspect (PACS) - 41 (11.82%), Ocular hypertension (OHT) - 6 (1.73%), Normal tension glaucoma (NTG) - 10 (2.88%), Secondary glaucoma - 9 (7.09%) and Congenital glaucoma - 2 (0.58%).(Table 1)

POAG was found to be maximum in 50-60 years of age group whereas both Angle closure glaucoma and secondary angle glaucoma was found more common in 40-50 years of age group.

At the time of diagnosis, 95 (47.03%) cases of POAG and 48(62.34%) cases of PACG were in the early stage of disease whereas 23 (11%) of POAG and 4 (5%) of PACG were in the advanced stage of the disease. POAG being asymptomatic in the initial stage usually presents late as compared to PACG. Thus, relatively more cases of PACG were in the early stage as compared to POAG in present study. Also, both cases of congenital glaucoma were in advanced stage at the time of diagnosis. (Figure 2)

As shown in Table 2, the association between early, moderate and advance stage of cup-disc ratio were evaluated for their association with clinical variety of glaucoma. The same revealed that there was highly significant statistical association between cup-disc ratio level at the time of presentation and clinical variety of glaucoma. ($\chi^2 = 69.927$ with P value ≤ 0.001) (Table 2)

On analyzing the effect of selected systemic illness like diabetes mellitus and hypertension on occurrence of specific variety of glaucoma (i.e., POAG and PACG), it was found that presence of stand-alone Diabetes and stand-alone Hypertension or presence

Table 1: Distribution of clinical varieties of glaucoma among study participants (n=347)

Clinical classification of Glaucoma	Frequency (Percentage)
Primary open angle glaucoma (POAG)	202 (58.21)
Primary angle closure glaucoma (PACG)	77 (22.19)
Primary angle closure suspect (PACS)	41(11.82)
Ocular hypertension (OHT)	6 (1.73)
Normal tension glaucoma (NTG)	10 (2.88)
Secondary Glaucoma	9 (2.59)
Congenital Glaucoma	2 (0.58)
Total	347 (100)

Figure 1: Age-wise distribution of study participants for various types of glaucoma

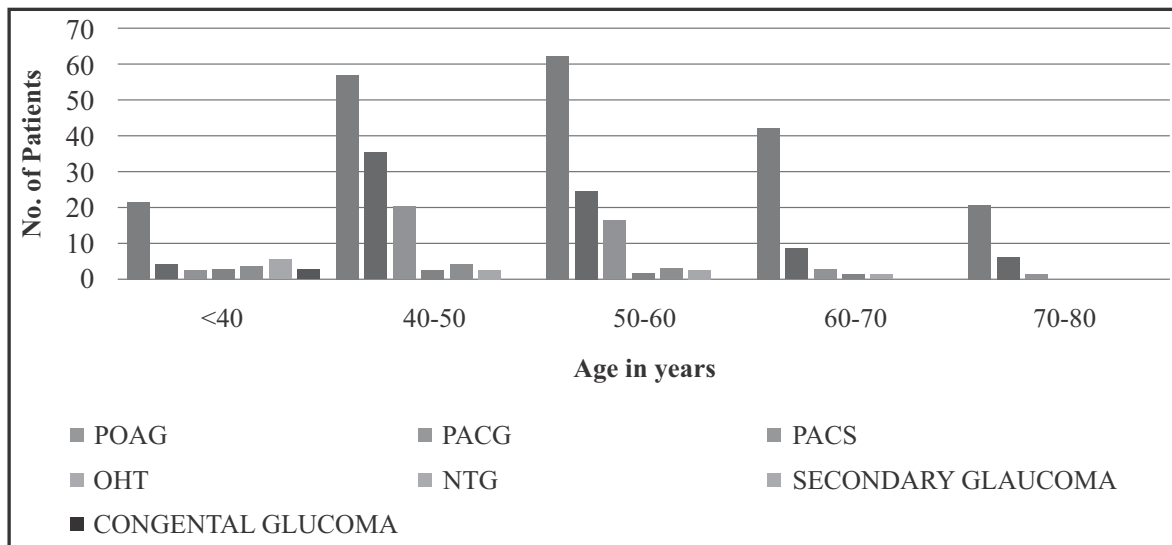


Figure 2: Distribution of Cup-Disc Ratio (CDR) among various types of glaucoma

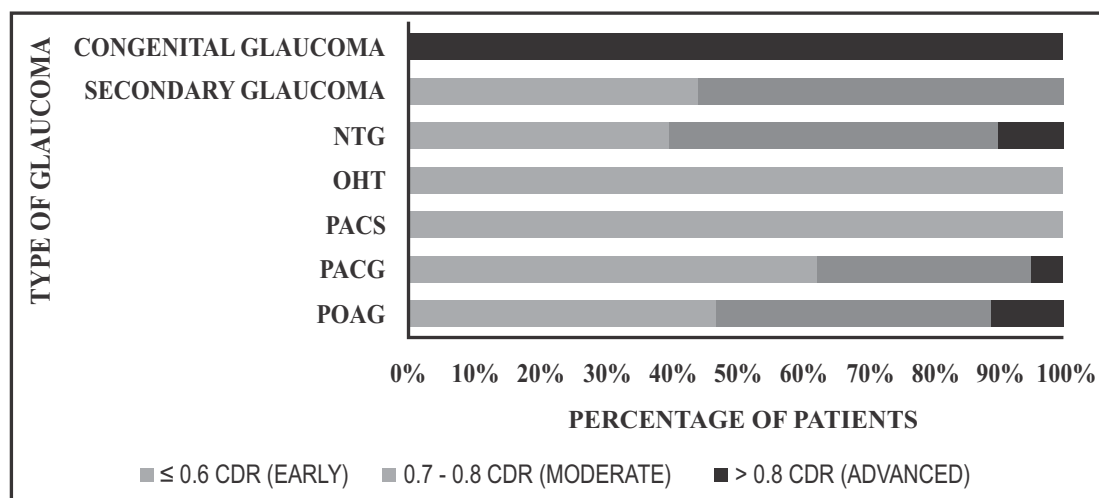


Table 2: Distribution of CDR among clinical varieties of glaucoma

Cup-Disc Ratio (CDR)	POAG	PACG	PACS	OHT	NTG	Secondary Glaucoma	Congenital Glaucoma	Chi-Square Value (P Value)
≤0.6 (early)	95	48	41	6	4	4	0	69.927 (<0.0001)
0.7- 0.8 (moderate)	84	25	0	0	5	5	0	
> 0.8 (advanced)	23	4	0	0	1	0	2	
Total	202	77	41	6	10	9	2	

Table 3: Association of clinical variety (POAG and PACG) with selected systemic illnesses

Selected Systemic illnesses	POAG (n=202)	PACG (n=77)	Total	Z proportion test (p value)
	Frequency (%)	Frequency (%)	Frequency (%)	
Only Diabetes Mellitus (DM)	11 (68.75)	5 (31.25)	16	2.121 (0.034)
Only Hypertension (HTN)	33 (73.33)	12 (26.67)	45	4.427 (<0.0001)
Both (DM + HTN) Present	6 (75)	2(25)	8	2 (0.046)

Table 4: Association of clinical variety (POAG and PACG) with selected demographic variables (n=279)

Selected Demographic Variable	POAG	PACG	Total	χ ² test (p value)
	Frequency (%)	Frequency (%)	Frequency	
Gender				
Male	122(74.85)	41(25.15)	161	47.622(<0.0001)
Female	80(68.96)	36(31.04)	116	
Family history of glaucoma				
Present	31 (86.11)	05 (13.89)	36	3.888 (0.048)
Absent	171(70.37)	72(29.63)	243	

of both accompanying - all three conditions were found to be statistically significant determinant for occurrence of particular variety of Glaucoma. Of total Hypertensive patients (n=45), 33 developed POAG while 12 developed PACG, which was found highly statistically significant (p<0.0001) compared to other two variables studied. (Table 3)

On assessing the Association of clinical variety (POAG and PACG) with selected demographic variables, i.e., gender and family history of glaucoma, it was found that both variables were statistically significantly associated. Gender has highly statistical significant role (p< 0.0001) and positive family

history has statistically significant role in occurrence of particular clinical variety of glaucoma. (Table 4)

Discussion:

There are approximately 11.2 million persons aged 40 years and older with glaucoma in India. Primary open angle glaucoma is estimated to affect 6.48 million persons. The estimated number with primary angle-closure glaucoma is 2.54 million. Those with any form of primary angle-closure disease could comprise 27.6 million persons. Most of those with disease are undetected and there exist major challenges in detecting and treating those with disease. In the light of the existing manpower and

resource constraints, the present study evaluate options for improving case detection rates in the country.^[8]

The proportion of newly diagnosed glaucoma in our study population was 36.71% of which POAG was the most common subtype followed by PACG and PACS. This is probably explained by the fact that all patients visiting tertiary eye care centre were examined without any age limit and more males turned up for the screening program as compared to females. Of the newly diagnosed cases of glaucoma, total no of PACG and PACS cases were 77 (22.19%) and 41(11.81%), respectively which can be explained by the comprehensive examination protocol that included gonioscopy for all subjects. POAG being asymptomatic in the initial stage usually presents late as compared to PACG, hence 47.03% of POAG and 62.34% of PACG were in the early stage of disease at the time of diagnosis while 11% of POAG and 5% of PACG had advanced glaucomatous disc damage. This is almost comparable to a study conducted by KT Daba et al in Ethiopia in 2020, where the proportion of newly diagnosed glaucoma was 10.2% with POAG being most common and 40% of POAG and 66% of PACG were in the early stage of the disease.^[9]

According to the study conducted by A Jacob et al in 1998, the prevalence of PACG was found to be several times that of POAG.^[10] However their study included younger age group in the study population and also significantly more number of females responded to the study which might be the cause of PACG being more prevalent than POAG in their study. In a study conducted by A Raychaudhuri et al in 2005, the ratio of POAG to PACG was 10:1.^[2] The same for our study was found to be 2.6:1.

In a study conducted by R Ramakrishnan et al in 2003, persons with 40 years or more were examined and the age group with majority of POAG cases was found to be 40-49 years.^[7] The age group with majority of POAG cases was noted to be 51-60 years in our study.

Findings of current study revealed that 39 (11.23%) patients were ≤ 40 years of age of which 21 (6.05%) had presented with POAG variety. Positive family history of glaucoma was found in 36 (10.37%) patients – 31(8.9%) POAG and 5(1.44%) PACG.

Limitations of the study:

The role of systemic illness like Diabetes and Hypertension and selected demographic variables like gender and family history of glaucoma were statistically evaluated for POAG and PACG only due to comparatively very small sample size with positive details in other varieties of glaucoma as revealed in studied cohort and mentioned in Table 1. The same was not acquiescent to analyze statistically, the results in context to POAG and PACG are presented only. Further study with larger sample size to include sufficient proportion of other varieties could be carried out with long term follow up of the patients.

Conclusion:

The proportion of primary open angle glaucoma is more in our study population. A changing trend towards younger age group (≤ 40 yrs) being affected in Primary open angle glaucoma is seen. The burden of undiagnosed primary angle closure glaucoma can be reduced by comprehensive eye examination. Such glaucoma screening camps at institutional level should be promoted for early diagnosis and intervention to prevent irreversible blindness.

Declaration:

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Conflict of Interest: Nil

References:

1. Stamper, Robert L., Marc F. Lieberman, Michael V. Drake, and Bernard Becker. 2009. *Becker-Shaffer's diagnosis and therapy of the glaucomas*. [Edinburgh]: Mosby/Elsevier
2. Raychaudhuri A, Lahiri SK, Bandyopadhyay M, et al A population based survey of the prevalence and types of glaucoma in rural West Bengal: the West Bengal Glaucoma Study *British Journal of Ophthalmology* 2005;89:1559-1564
3. *Blindness and Vision impairment*: available at <https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment>: last accessed on April 10, 2022

4. Vision Loss Expert Group of the Global Burden of Disease Study. Causes of blindness and vision impairment in 2020 and trends over 30 years: evaluating the prevalence of avoidable blindness in relation to "VISION 2020: the Right to Sight". *Lancet Global Health* 2020. doi.org/10.1016/S2214-109X(20)30489-7
5. Murthy GV, Gupta SK, Bachani D, Jose R, John N. Current estimates of blindness in India *Br J Ophthalmol*. 2005;89:257-60
6. Sihota R, Angmo D, Ramaswamy D, Dada T. Simplifying "target" intraocular pressure for different stages of primary open-angle glaucoma and primary angle-closure glaucoma. *Indian J. Ophthalmol*. 2018, 66, 495-505.
7. Ramakrishnan R, Nirmalan PK, Krishnadas R, et al. Glaucoma in a rural population of southern India: the Aravind comprehensive eye survey [published correction appears in *Ophthalmology*. 2004 Feb;111(2):331]. *Ophthalmology*. 2003;110(8):1484-1490.
8. George R, Ve RS, Vijaya L. Glaucoma in India: estimated burden of disease. *J Glaucoma*. 2010 Aug;19(6):391-7. doi: 10.1097/IJG.0b013e3181c4ac5b. PMID: 20711029
9. Daba KT, Gessesse GW, Sori SB. Proportion of Glaucoma among Voluntary People Coming for Glaucoma Screening Program at Jimma University Department of Ophthalmology, Jimma, Ethiopia. *Ethiop J Health Sci*. 2020;30(1):13-22.
10. Jacob A, Thomas R, Koshi S P, Braganza A, Muliyl J. Prevalence of primary glaucoma in an urban South Indian population. *Indian J Ophthalmol* 1998;46:81-6