



PREVALENCE OF PRIMARY OPEN ANGLE GLAUCOMA IN PATIENTS WHO UNDERWENT CATARACT SURGERY UNDER DISTRICT BLINDNESS CONTROL PROGRAM (DBCS) IN A TERTIARY CARE CENTRE IN TAMIL NADU

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Abstract

Background: Primary Open-Angle Glaucoma (POAG) is a leading cause of irreversible blindness, often detected incidentally during routine or cataract evaluations. Opportunistic screening among cataract surgery candidates can aid in early diagnosis and prevention of vision loss.

Objectives: To determine the prevalence of POAG among patients who underwent cataract surgery under the District Blindness Control Society (DBCS) program.

Methods: A cross-sectional study was conducted among 2,078 patients who underwent cataract surgery under the DBCS category. Comprehensive ophthalmic evaluation including intraocular pressure (IOP), optic disc assessment, and gonioscopy was performed. The Chi-square test was used to assess associations between POAG and selected variables.

Results: Out of 2078 participants, 88 (4.23%) were diagnosed with POAG. The majority were aged 61–70 years (51.1%), followed by those above 70 years (29.6%). POAG prevalence increased significantly with age ($\chi^2 = 46.27$, $p < 0.001$) and was slightly higher in males (60.2%). A strong association was found between POAG and elevated IOP ($\chi^2 = 79.85$, $p < 0.001$) and higher cup–disc ratio (CDR) ($\chi^2 = 85.40$, $p < 0.001$). All POAG cases had open angles on gonioscopy.

Conclusion: The prevalence of POAG among cataract surgery patients was 4.23%. Advancing age and higher CDR were significant risk factors. Incorporating glaucoma screening into routine preoperative evaluation for cataract surgery, particularly in elderly patients, is recommended for early detection and management.

Keywords: Primary open-angle glaucoma, Cataract surgery, Cup–disc ratio, Intraocular pressure, Screening.

INTRODUCTION

Globally, glaucoma and cataracts are the two main causes of blindness; glaucoma is responsible for the majority of irreversible vision loss (1,2). Early identification is crucial because Primary Open Angle Glaucoma (POAG), a chronic optic neuropathy, frequently goes undiagnosed until the patient experiences a considerable loss of visual field (3). Over 11 million adults over 40 in India have glaucoma, and approximately 6.5 million have POAG (4).

In rural locations where ophthalmic services are few, screening for glaucoma in individuals receiving cataract surgery presents a strategic opportunity for early identification. Large-scale cataract surgeries for marginalised communities are made possible by the District Blindness Control Society (DBCS) program, which is part of the National Programme for Control of Blindness and Visual Impairment (NPCBVI). A reduction in avoidable blindness can be achieved by including glaucoma screening into this framework to assist detect undiagnosed POAG (5).

Previous Indian studies have reported a variable prevalence of POAG among cataract patients, ranging from 1.37% to 3.8%, underscoring the need for continued surveillance in community-based programs (3,4,6). This study aims to determine the prevalence of Primary Open Angle Glaucoma in patients who underwent cataract surgery under the DBCS category, emphasizing the value of comprehensive preoperative screening in blindness prevention.

MATERIALS AND METHODS

To determine the prevalence of Primary Open Angle Glaucoma (POAG), a cross-sectional, hospital-based observational study was carried out among patients who underwent cataract surgery in tertiary care centre camps spanning five districts in Tamil Nadu as part of the District Blindness Control Society (DBCS) program between April 1, 2024, and March 31, 2025. Institutional Ethics Committee approval was obtained prior to commencement of the study. Informed consent was obtained from all participants. The study included patients aged 40 years and above who are selected for cataract surgery under the DBCS program. Patients with secondary glaucoma (neovascular, uveitic, traumatic, or pseudoexfoliation types) or ocular pathologies interfering with optic disc or visual field assessment were excluded.

The study sample size, based on an expected prevalence of 1.37%, a 95% confidence level, and an absolute precision of 0.5%, was calculated to be 2078 participants (3). Each patient underwent gonioscopy to assess whether angles are open or closed. As per Shaffer's grading, grade 2 and above is taken as open angle (7). Noncontact tonometry [on the day of surgery] to record intraocular pressure (IOP) and applanation tonometry on the day after finishing camp and arriving hospital in due course of evaluation to record intraocular pressure. Normal IOP ranges from 10 to 20 mmHg and more than 20 mmHg considered as glaucoma. Fundus evaluation done by 90D lens. Normal cupping will be 0.3 and neuroretinal rim will be intact. Presence of cup disc ratio asymmetry and neuroretinal rim thinning like polar notching is suggestive of glaucoma. Up to 0.75 cupping, IOP range between 20 to 25 mmHg started on antiglaucoma medication coming down to less than 22 mmHg on the day of surgery will be taken for temporal section cataract surgery. Superior meridian is left untouched during surgery to preserve for future filtering glaucoma surgery at 12 o'clock meridian.

Data were recorded in a structured proforma and analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). The prevalence of POAG was expressed as a proportion of the total study population. Continuous variables were summarized as mean $\pm$ standard deviation (SD), and categorical variables as frequencies and percentages. Associations between categorical variables were assessed using the Chi-square (χ^2) test, with a p-value < 0.05 considered statistically significant.

RESULTS

Out of a total of 2,078 patients who underwent cataract surgery under the District Blindness Control Society (DBCS) category, 88 patients were diagnosed with Primary Open Angle Glaucoma (POAG), yielding a prevalence of 4.23%. The distribution of POAG cases according to demographic and clinical characteristics is shown in Table 1. The majority of patients with POAG were in the 61–70 years age group (51.1%), followed by those aged above 70 years (29.6%), indicating that the prevalence of POAG increased with advancing age. The condition was slightly more common among males (60.2%) compared to females (39.8%). Among the 88 patients diagnosed with POAG, 45.5% achieved intraocular pressure (IOP) control within the normal range (≤ 20 mmHg) following treatment, while 54.5% continued to have elevated IOP levels (>20 mmHg) despite therapy. On gonioscopic evaluation, all POAG eyes exhibited open angles, consistent with the diagnostic definition of the disease.

A comparative analysis between POAG and non-POAG participants was performed using the Chi-square test, and the results are presented in Table 3. A statistically significant association was observed between age and the presence of POAG ($\chi^2 = 46.27$, $p < .001$), with the proportion of POAG increasing notably among older individuals. Participants aged over 70 years had the highest proportion of POAG (8.3%), whereas only 1.0% of those aged 40–50 years were affected. Intraocular pressure was also significantly associated with POAG ($\chi^2 = 79.85$, $p < .001$), with 28.9% of patients having IOP > 20 mmHg compared to only 2.1% among those with normal IOP. Conversely, gender did not show a statistically significant association with POAG ($p = 0.146$). All patients diagnosed with POAG had open angles on gonioscopy, confirming the nature of the disease as primary open-angle glaucoma.

Similarly, there was a statistically significant correlation between POAG and cup – disc ratio (CDR) ($\chi^2 = 85.40$, $p < 0.001$). The prevalence of POAG was significantly higher in participants with CDR values above 0.7 (15.2%) than in those with CDR ≤ 0.7 (1.8%).

Figure1: Prevalence of Primary Open Angle Glaucoma among cataract patients

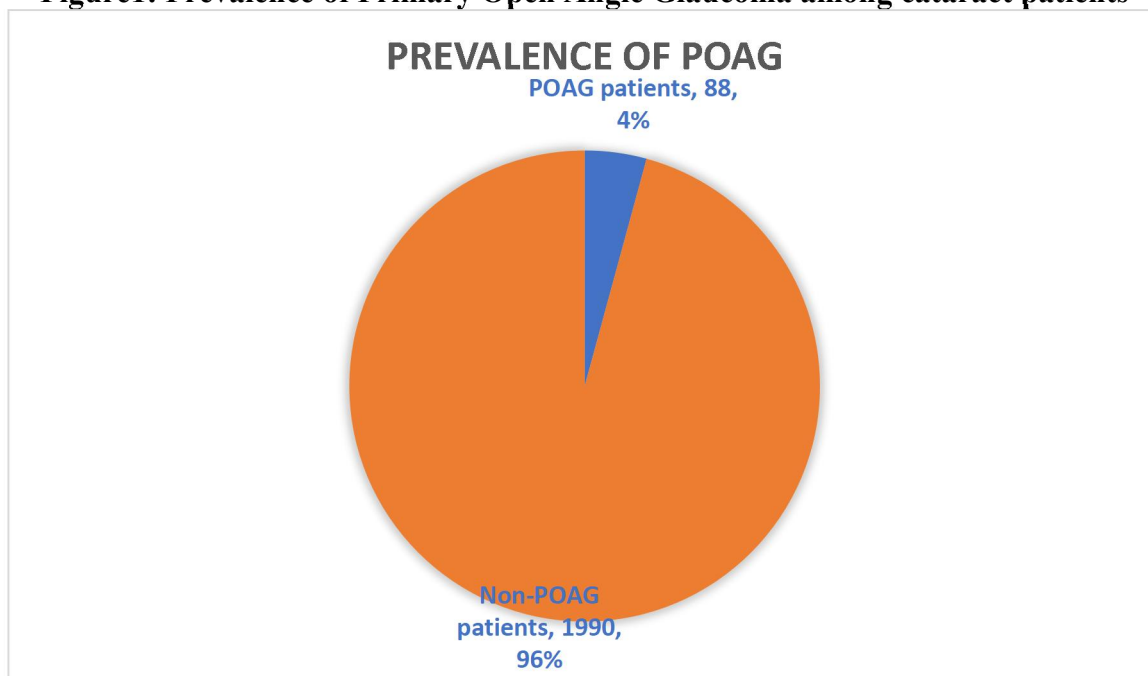


Table 1: Distribution of Primary Open Angle Glaucoma (POAG) Cases by Demographic and Clinical Characteristics (n = 88)

Variables	Frequency n (%)
Age group (years) (Mean $\pm$ SD: 65.9 $\pm$ 7.8 years)	
40–50	4 (4.5)

51–60	13 (14.8)
61–70	45 (51.1)
>70	26 (29.6)
Gender	
Male	53 (60.2)
Female	35 (39.8)
Intraocular Pressure (IOP) (Mean ± SD: 23.7 ± 2.0 mmHg)	
≤20 mmHg	40 (45.5)
>20 mmHg	48 (54.5)
Cup Disc Ratio (CDR) (Mean ± SD: 0.72 ± 0.12 mmHg)	
≤ 0.7	12 (13.6)
> 0.7	76 (86.4)

Table 2: Comparison of demographic and clinical variables between POAG patents and Non-POAG Participants (N = 2,078)

Variable	Category	POAG n (%)	Non-POAG n (%)	χ^2	p value
Age group (years)	40–50	4 (1.0)	412 (99.0)	46.27	< .001 **
	51–60	13 (2.1)	610 (97.9)		
	61–70	45 (6.2)	682 (93.8)		
	> 70	26 (8.3)	286 (91.7)		
Gender	Male	53 (4.9)	1,028 (95.1)	2.11	0.146
	Female	35 (3.5)	962 (96.5)		
Intraocular Pressure (IOP)	≤ 20 mmHg	40 (2.1)	1,872 (97.9)	79.85	< .001 **
	> 20 mmHg	48 (28.9)	118 (71.1)		
Cup Disc Ratio (CDR)	≤ 0.7	12 (1.8)	1,632 (98.2)	85.4	< .001 **
	> 0.7	76 (15.2)	428 (84.8)		

Chi square test used. p value <0.05 considered as significant.

DISCUSSION

According to this hospital-based study, 4.23% of patients who underwent cataract surgery under the District Blindness Control Society (DBCS) program had Primary Open-Angle Glaucoma (POAG). A significant community-based study that discovered a somewhat higher frequency of POAG was the Hooghly River Glaucoma Study (HRGS), which discovered that the prevalence of POAG was 1.45% in Eastern India's rural population and 2.10% in its urban population (1). Compared to Aravind Comprehensive Eye Survey (ACES) and Central India Eye and Medical Study (CIEMS), our study showed higher prevalence (5,9). Our cohort may have a higher prevalence since our study had more senior cataract patients, a group with higher cumulative ocular comorbidities and age-related optic nerve susceptibility.

There was a significant correlation between POAG prevalence and age ($\chi^2 = 46.27$, $p < .001$). This finding is consistent with other Indian studies and international data suggesting age is a major risk factor for glaucoma progression (1, 2, 3, 9). Age-related structural and vascular changes in the trabecular meshwork and optic nerve head result in decreased aqueous outflow and increased vulnerability to optic neuropathy. Priyambada et al. (2023) emphasized the importance of missed screening opportunities in older adults and found that the elderly cataract group had a greater frequency of POAG, with rates increasing from 1.5% pre-COVID to 2.2% post-COVID (4).

The mean intraocular pressure (IOP) among POAG patients was 23.7 ± 2.0 , which was comparable to the Ngo FS et al study (24.5 ± 3.3) and the Gazzard et al study (29.9 ± 7.2) (11,12). Additionally, our study revealed a statistically significant correlation between POAG and intraocular pressure (23.7 ± 2.0) (IOP) ($\chi^2 = 79.85$, $p < 0.001$). The IOP was greater than 20 mmHg in over half (54.5%) of the glaucoma patients, which is consistent with findings from a large registry-based study by Gim et al. (2025), which looked at over 1.9 million patients who had cataract surgery and found that having high postoperative IOP nearly doubled the risk of developing POAG (hazard ratio = 1.87; 95% CI: 1.79–1.94; $P < 0.001$) (10). Regardless of age, sex, or ethnicity, their findings support the idea that persistent or postoperative IOP elevation is a risk factor for POAG. This emphasizes how crucial it is for community screening programs to regularly check intraocular pressure and treat ocular hypertension in patients who are candidates for cataract surgery.

There was no statistically significant difference of POAG among men and women which was consistent with Beaver Dam Eye Study, Andhra Pradesh Eye Disease Study and HRGS, whereas Rotterdam study and Framingham study showed higher prevalence of POAG among men (11,12,13). All of the glaucoma cases in our series were of the open-angle variety, which is consistent with the sickness description and other studies that indicate open-angle glaucoma is more prevalent in patients having cataract surgery (1,3).

The current investigation found a strong correlation between primary open-angle glaucoma (POAG) and cup–disc ratio (CDR) ($\chi^2 = 85.40$, $p < 0.001$), with a significantly greater prevalence of POAG (86.4%) among patients who had $CDR > 0.7$. The results are in line with those of Gupta V et al., who found that POAG had a higher mean CDR (0.61 ± 0.14) than primary angle-closure glaucoma (0.53 ± 0.13) [2], and Priyambada S et al., who found that the mean vertical CDR values of post-COVID glaucoma patients were significantly higher (0.38 ± 0.09) than those of pre-COVID cases (0.37 ± 0.08) [3]. Primary open-angle glaucoma (POAG) was much more likely to occur in those with greater cup–disc ratios (CDR). A $CDR \geq 0.7$ had a considerable predictive value for glaucoma, with a likelihood ratio of 14 (95% CI: 5.3–39) (13). In line with earlier research highlighting CDR as a trustworthy signal of glaucomatous damage, this highlights the significance of optic disc evaluation as a crucial diagnostic tool for POAG (3,12). A key factor in the early diagnosis and risk assessment of glaucoma is the optic disc assessment, which is confirmed by the high link between raised CDR and POAG, which signals progressive optic nerve head injury and retinal ganglion cell loss.

CONCLUSION

The study found that among patients who underwent cataract surgery as part of the District Blindness Control Society (DBCS) program, the prevalence of Primary Open-Angle Glaucoma (POAG) was 4.23%. While there was no significant correlation between gender and POAG, increasing age and greater cup–disc ratio (CDR) values were identified as risk factors. Over 50% of POAG patients maintained high intraocular pressure (IOP) after therapy, highlighting the necessity of consistent monitoring and tailored care.

RECOMMENDATIONS

Preoperative examination for all cataract surgery candidates should include routine glaucoma screening, especially for those with a high CDR or those over 60. To guarantee early diagnosis of POAG, emphasis should be placed on comprehensive eye exams that include gonioscopy, optic disc evaluation, and IOP measurement. Improving community knowledge of glaucoma and fortifying referral and follow-up procedures within DBCS programs could greatly help reduce undetected and uncontrolled cases, saving irreparable visual loss.

CONFLICT OF INTEREST: Nil

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