



## Research Article

### TO INVESTIGATE THE CLINICAL CHARACTERISTICS AND RISK FACTORS OF LENS-INDUCED GLAUCOMA IN HOSPITALS

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#### ABSTRACT

**BACKGROUND:** In India's rural areas, lens-induced glaucoma (LIG) is a prevalent occurrence. Clinically, it has been known for a long time that different types of glaucoma can develop in conjunction with cataract development. Cataracts are a significant secondary glaucoma cause in the developing world. Secondary open-angle glaucoma includes phaco-lytic glaucoma and lens particle glaucoma. The iridocorneal angle is open, and lens proteins have blocked the trabecular meshwork. Secondary angle-closure glaucoma includes phacomorphic glaucoma and lens displacement glaucoma. Screening and early detection of glaucoma are crucial to begin early treatment and slow down its advancement because it frequently progresses undiagnosed until the optic nerve is irreparably injured, resulting in varied degrees of permanent visual loss.

**AIM:** The purpose of this study was to investigate the clinical characteristics and risk factors of lens-induced glaucoma in hospitals, as well as the demographics of LIG patients.

**MATERIAL AND METHOD:** The department of ophthalmology conducted this prospective investigation. This research was carried out in a hospital's outpatient department of ophthalmology. This was carried out repeatedly until the intended sample size of 100 instances was reached. The evaluation of the open-angle glaucoma patients involved taking a thorough medical history, which included the patient's name, age/gender, address, presenting complaints, past medical history, and systemic illnesses such as diabetes mellitus, hypertension, cardiovascular disease, asthma, use of eye or oral steroids, ocular disease, or ocular sclerosis. Informed consent was taken from the patients who satisfy the inclusion criteria.

**RESULTS:** One hundred cases of secondary glaucoma were included in the current study. In the current study, out of 100 eyes, 31% had visual acuities between 6/60 and 6/18, and another 30% had vision between 5/60 and PL+. 18% lacked PL. Visual acuity was within the normal range in 21% of patients. In the current study, there were 18 instances of lens-induced glaucoma, of which 10 (61.1%) had phaco-morphic glaucoma, followed by 6 (27.8) cases of phaco-lytic glaucoma, one case of traumatic lens-induced glaucoma, and one case of pseudo-exfoliative glaucoma. 18% of instances of secondary glaucoma caused by steroids and 16% by lenses, respectively, were found to have lens-induced glaucoma.

**CONCLUSION:** In order to explain the clinical profile of LIG, the current report is a cross-sectional study of 100 patients of secondary glaucoma. Pupil, developed lens, and anterior chamber depth of  $<1/4$  CT with pseudo exfoliation The most frequent findings in the anterior segment were PACD. The most frequent findings in a fundus examination included disc hemorrhage, peripapillary atrophy, bayoneting, and bearing of circum-linear blood vessels. Superior Scotoma (SS) and Superior Arcuate Scotoma (SAS) are frequent observations in the perimetry. Grade 3 findings on gonioscopy are frequently found in patients of secondary glaucoma.

**KEYWORDS:** Lens-induced Glaucoma, Neovascularization, Risk factors and Secondary open-angle glaucoma

#### INTRODUCTION:

A number of eye disorders can induce glaucoma, which is a chronic, progressive

optic neuropathy that damages the optic nerve and impairs vision while also raising

intraocular pressure. Raised intraocular pressure is the most frequent risk factor.<sup>1</sup> “Raised intraocular pressure is a major risk factor for glaucoma, a group of eye diseases with a multifactorial etiology that are characterized by an acquired loss of retinal ganglion cells, progressive optic neuropathy with morphological abnormalities in the optic nerve head, and visual field defects. It is, in essence, a pressure-sensitive optic neuropathy and, after cataracts, is the second-leading cause of blindness globally.<sup>2</sup> Research is continually being done because of the mystery behind glaucoma. According to reports, open-angle glaucoma is more common in Africa than narrow-angle glaucoma is in Asia.<sup>3</sup>

Two categories exist for glaucoma. Primary glaucoma is not linked to other ocular or systemic illnesses and is genetically influenced. A category of conditions known as secondary glaucomas occur when an additional ocular or systemic disease causes the intraocular pressure to rise.<sup>4</sup> Raising IOP, which damages the optic nerve and impairs eyesight. An eye injury, inflammation, certain medications like steroids, advanced cases of cataract or diabetes, and angle-closure or open-angle secondary glaucoma can occur in one or both eyes. Treatment options depend on the underlying cause and may include medications, laser surgery, or traditional surgery.<sup>5</sup>

The major cause of irreversible visual loss and the second-largest cause of global blindness, after cataracts, is glaucoma. Glaucoma is thought to cause blindness in 4.5 million people worldwide, and by 2020, that number is expected to climb to 11.2 million. Twelve million instances of glaucoma, or around one-fifth of all cases worldwide, are thought to exist in India.<sup>6</sup>

Primary open-angle glaucoma (POAG) and secondary open-angle glaucoma are the two

categories used to classify OAG. Open-angle glaucoma that develops as a result of other diseases, such as neovascular glaucoma, pigmentary glaucoma, pseudo-exfoliation glaucoma, etc. IOP lowering to a point where no additional damage is anticipated is the mainstay of glaucoma treatment. Therefore, glaucoma is a major public health issue in our nation and calls on the medical community to make an effort to lessen the suffering brought on by the condition. Although uncommon in affluent nations, this treatable disease is nonetheless common in poorer nations because of a substantial cataract backlog, inadequate health knowledge, low socioeconomic level, and dread of the procedure. Cataract removal is the only effective treatment for lens-induced glaucoma.<sup>7</sup> The length of time between the beginning of symptoms and the start of treatment, as well as the existence of optic atrophy, uveitis, and corneal edema, are the main factors influencing the outcome after surgery in lens-induced glaucoma.<sup>8</sup>

A greater therapy response depends on early identification. The iris really blocks the eye's drainage angle in secondary angle closure glaucoma. Lens-induced glaucoma and neovascular glaucoma are examples of secondary angle closure glaucoma. The natural drainage angle is restricted in secondary angle closure glaucoma either due to the underlying disorder or due to its creation. There is no actual physical restriction of the eyes' drainage angle in open-angle glaucoma. Pigment dispersion, induced, and traumatic glaucoma all fall under the category of secondary open-angle glaucoma. One of the most important causes of ocular blindness in our culture is secondary glaucoma.<sup>9</sup> With this context, a hospital-based study was done to examine the clinical profile and risk factors for lens-

induced glaucoma among patients who visited the ophthalmology OPD.

### **MATERIAL AND METHODS**

The department of ophthalmology conducted this prospective investigation. This research was carried out in a hospital's outpatient department of ophthalmology. This was carried out repeatedly until the intended sample size of 100 instances was reached. The evaluation of the open-angle glaucoma patients involved taking a thorough medical history, which included the patient's name, age/gender, address, presenting complaints, past medical history, and systemic illnesses such as diabetes mellitus, hypertension, cardiovascular disease, asthma, use of eye or oral steroids, ocular disease, or ocular sclerosis. The patients who meet the inclusion criteria gave their informed consent. All of the participating patients received an informational sheet, and the tests that would be conducted on them were explained in the regional tongue.

#### **Inclusion criteria**

- Patients of age above 40 years
- Patients with suspected glaucomatous disc changes.
- Patients with intraocular pressure > 21 mm Hg
- Patients with successive Automated Perimetry are suggestive of glaucomatous field defects.
- The patient has already been diagnosed and is on treatment for glaucoma.
- Patients with open anterior chamber angle.

#### **Exclusion criteria**

- Patients are not willing to enroll.
- Anterior segment pathology precluding the visualization of angle e.g. any corneal opacity, iridocyclitis, etc.
- Patients suffering from other segment pathologies such as macular edema, Age-

related macular degeneration, Retinitis pigmentosa, and Vitreous hemorrhage.

- Patients with angle closure glaucoma.

#### **Data Collection tool**

To gather and record the necessary data from each case, a semi-structured questionnaire was created. Five pilot tests were conducted on the performa to determine its viability. After the questionnaire had undergone the necessary adjustments, the final performa was created.

Ocular examinations include measuring visual acuity (unaided and best corrected), examining the anterior segment with a slit lamp biomicroscope, measuring intraocular pressure with a goldman applanation tonometer, evaluating the optic disc's size, shape, and color with a slit lamp biomicroscope with a +90D lens, looking for focal thinning or notching of the neuro-retinal rim, and checking for acquired cataracts.

Shaffer's categorization was used to grade the angles during gonioscopy, which was performed using a Goldmann three mirror non-indentation gonioscope. Zeiss Clarus 500 fundus cameras were used specifically for fundus photography. Spectral domain optical coherence tomography was used to measure the thickness of the retinal nerve fiber layer. On the Humphrey field analyzer, visual fields are performed utilizing a 30-2 testing technique under conventional SITA methodology.

The pupil was examined without dilation to look for any peripheral iridectomy, any pseudo-exfoliative material on the pupillary edge, any nodules, and any relative afferent pathway defects. The lens was graded for cataracts throughout the examination. A 90D lens was used to examine the patient's fundus in stereoscopic vision. For fundus inspection, both direct and indirect

ophthalmoscopy are used. Applanation Goldman's tonometer was used to assess intraocular pressure. A 4-mirror gonioscopy was used during the gonioscopy in order to see the angle. Zeiss automated perimeter was used to do the perimetry for the visual field assessment. As and when necessary, a B-Scan was performed in the afflicted eye.

**STATISTICAL ANALYSIS**

Data were entered in an excel sheet and analyzed using the software Epi-info, quantitative variables were expressed in terms of means, standard deviations (Sds), and qualitative in terms of proportion and percentage (%).

**RESULT: -**

The present study was conducted among 100 cases of secondary glaucoma.

**Table 1: Distribution of Cases according to BCVA**

BCVA	Cases	Percentage
6/12-6/6	21	21.0
6/60 - 6/18	31	31.0
5/60 & PL+	30	30.0
No PL	18	18.0

In Table No.1 the present study out of 100 eyes, 31% of cases had visual acuity ranging from 6/60 - 6/18 and another 30% had visual acuity ranging from 5/60 & PL+. 18% had no PL. In 21% of cases, visual acuity was within the normal range.

**Table 2: Finding of Fundus examination in cases of secondary glaucoma**

Fundus		Cases	Percentage
Neuro retinal rim	Inferior and superior	36	36.0
	Inferior, Superior, and Nasal	48	48.0
	Inferior, Superior, Nasal, and Temporal	16	16.0
C:D	<0.5	35	35.0
	>0.5	65	65.0
The bearing of circum linear blood vessels	Present	53	53.0
	Absent	47	47.0
Lamellar dot sign	Present	40	40.0
	Absent	60	60.0
Bayoneting	Present	54	54.0
	Absent	46	46.0
Disc hemorrhage	Present	58	58.0
	Absent	42	42.0
Peripapillary atrophy	Present	62	62.0
	Absent	38	38.0
Hypertensive retinopathy (n=24)	Present	12	50.0%
	Absent	12	50.0%
Proliferative Diabetic Retinopathy (n=18)	NVD	4	27.8%
	NVE	5	22.2%
Any other finding in the retina	CRVO	1	1.0%
	BRVO	0	0.0%

Table No.2 Inferior, Nasal thinning was there in 36% and Inferior, Nasal, and Superior thinning in 48% of cases in Neuro retinal ream examination, C:D was <0.5 in 35%, Bearing of blood vessels was present in 53%, Lamellar dot sign was present in 40%, Bayoneting was present in 54%, Disc hemorrhage was present in 58%,

Peripapillary atrophy was present in 62%. Among the 24 cases of hypertension, hypertensive retinopathy was present in 12 (50%) cases. Out of 18 cases of diabetes, NVD was present in 4 (27.8%) cases and NVE in 22.2% of cases. In one case CRVO was found.

**Table 3: Various types of Lenses Induced Glaucoma**

Lens Induced Glaucoma	Cases	Percentage
Phaco-morphic glaucoma	10	61.1
Phaco-lytic glaucoma	6	27.8
Traumatic	1	5.6
Pseudo exfoliation	1	5.6
Lens Particle	0	0.0
Phaco-anaphy lactic	0	0.0
Total	18	100.0

Table No. 3 Lens-induced Glaucoma in the present study out of 18 cases, 10 (61.1%) were having Phaco-morphic glaucoma followed by Phaco-lytic glaucoma in 6 cases (27.8) and one case of traumatic Lens Induced Glaucoma and one case of Pseudo exfoliative Glaucoma. Lens-induced glaucoma was found in 18% of cases and steroid-induced secondary glaucoma was found in 16% of cases.

#### DISCUSSION

In India, LIGs are a regular occurrence, which is not surprising given that the incidence of cataract cases much outweighs the total number of procedures now carried out. Despite the fact that these are clinically unique entities, they have some things in common, including the fact that they are lens-induced, that cataract surgery is a cure for them, that the optic nerve function is compromised as a result of the increase in intraocular pressure, and that they all have a guarded prognosis.<sup>10</sup> This clinical investigation was conducted to describe the

various glaucomatous symptoms, identify risk variables, and assess their effects on postoperative visual acuity and IOP after extracapsular cataract excision.

**Inatani M et al 2000<sup>11</sup>** elucidated the clinical characteristics of secondary glaucoma associated with subluxation of the crystalline lens. The 14 eyes of 13 patients with uncontrolled intraocular pressure (IOP) and lens subluxation were included in this retrospective analysis. The subluxated lens was removed surgically. In three eyes, angle-closure brought on by a subluxated lens was complex. Despite having deep anterior chambers and wide-open angles, the remaining 11 eyes had uncontrolled IOP rise. IOP was well controlled (lower than 21 mm Hg) in all 14 eyes a mean of 14.1 months  $\pm$ 13.7(SD) following cataract surgery. At the last test, the mean IOP was 15.4 $\pm$  2.2 mm Hg. Transient vitreous hemorrhage in 5 eyes, choroidal detachment in 2, and retinal tears in 1 eye were among the complications.

Lens-induced glaucoma is referred to as glaucoma in which the lens contributes to the condition either by size, location, or by inducing inflammation. Elevated intraocular pressure and inflammation are frequently brought on by crystalline lens abnormalities. The treatment for lens-induced glaucoma is mostly surgical in the majority of cases. However, to return inflammation and IOP to normal, rigorous medical therapy is first tried.

**Kumar VS et al 2018**<sup>12</sup> assessed the visual outcome following medical and surgical management of lens-induced glaucoma and studied the intraocular pressure control pre- and post-operatively from 2015 to 2016. Changes in intraocular pressure and BCVA are two of the primary outcome indicators. After surgery, the majority of patients (91%) had BCVAs better than 6/60. In virtually all patients, the post-operative IOP was brought down to normal. Good visual results were achieved with early presentation, a mild increase in preoperative IOP, and early therapy. **Dr. Kanhei Charan Tudu et. al. 2017**<sup>13</sup> found that in the glaucoma study group, out of 108 patients hypertension was the more common risk factor i.e., it was present in 64 patients (60.95%) than diabetes which was present in 34 patients (31.48%) followed by family history in 7 (6.8%) and hypothyroidism in 3 patients (2.7%) **Michel et al. 2004**<sup>14</sup> in blue mountain eye study concluded that Hypertension, particularly if poorly controlled, appears related to a modestly increased risk of OAG, independent of the effect of BP on IOP and other glaucoma risk factors

**Perum V et al. 2017**<sup>15</sup> studied the visual outcome of Phaco-lytic glaucoma, a common cause of ocular morbidity. Thirty patients from an urban and rural tertiary care hospital participated in the study. Treatment was given to 30 eyes of patients with

clinically determined phacolytic glaucoma. Visual acuity and intraocular pressure (IOP) were measured both before and after surgery. Following the management of intraocular pressure and inflammation, small incision cataract surgery with posterior chamber intraocular lens implantation (IOL) was performed. There were difficulties after the operation. Inexpensive statistical techniques were used to analyze the data. **Yaakub A et al. 2014**<sup>16</sup> determined the clinical presentations, management, and outcome of lens-induced glaucoma (LIG) at Hospital University Sains Malaysia from January 2003 to December 2008. Patients with LIG were included, whereas those who had glaucoma or other underlying causes of glaucoma were excluded. The demographic information, clinical manifestations, management, and result were noted and examined. The average age was 70.2 years, and 22 out of the 57.9% of those affected were women. The leading cause of LIG was phaco-morphic glaucoma (73.7%), which was followed by phaco-lytic glaucoma (21.1%). Out of the 50.0% of patients who underwent ECCE with PCIOL implantation, 73.7% had no post-operative need for pressure-lowering medication.

All individuals who are over 40 should be screened for open-angle glaucoma because age is the main risk factor for both kinds of the condition. More people had primary open-angle glaucoma than secondary open-angle glaucoma. The most frequent causes of secondary open-angle glaucoma were pseudo-phakic and aphakic glaucoma. Women were less impacted than men. The patient's reduced vision was their most frequent initial complaint. Patients with risk factors for POAG, such as hypertension, diabetes mellitus, myopia, family history, and coronary artery disease, may be considered "high-risk patients" and hence

need to be evaluated more frequently to monitor the condition's progression.

**CONCLUSION:**

In order to explain the clinical profile of LIG, the current report is a cross-sectional study of 100 patients of secondary glaucoma. Pupil, developed lens, and anterior chamber depth of <1/4 CT with pseudo exfoliation The most frequent findings in the anterior segment were PACD. The most frequent findings in a fundus examination included disc hemorrhage, peripapillary atrophy, bayoneting, and bearing of circum-linear blood vessels. Superior Scotoma (SS) and Superior Arcuate Scotoma (SAS) are frequent observations in the perimetry. Grade 3 findings on gonioscopy are frequently found in patients of secondary glaucoma. To diagnose glaucomatous damage and track the evolution of glaucoma, it is necessary to evaluate the optic disc as well as the visual field. This is because structural alterations significantly correspond with functional changes. The primary healthcare system should also send individuals to specialists for additional care who have risk factors to stop glaucoma progression and for further management as early detection and treatment can avoid vision loss due to glaucoma.

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