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Post Surgical Outcome in Patients with Lens Induced Glaucoma in a Tertiary Care Centre.

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Abstract

Background: In underdeveloped nations, LIG (Lens-Induced Glaucoma), which frequently results from neglected advanced cataracts, is a significant cause of avoidable blindness. Delayed presentation often leads to raised IOP (Intraocular Pressure), pain, corneal edema, and poor visual acuity. Early diagnosis and timely cataract surgery are essential for preserving vision and controlling IOP. The purpose of this study was to assess the clinical characteristics and post-operative results of patients in a tertiary care facility who had lens-induced glaucoma. ***Methods:*** From April 2024 to December 2025, this prospective observational study was carried out at the People's College of Medical Sciences and Research Center in Bhopal. There were sixty patients with a diagnosis of lens-induced glaucoma. A thorough clinical examination was carried out, which included measurements of intraocular pressure, slit lamp examination, and visual acuity. When possible, patients underwent Small Incision Cataract Surgery (SICS) with intraocular lens implantation after being initially treated medically for IOP management. In order to evaluate visual acuity, IOP management, and complications, postoperative follow-up was conducted on days 1, 7, and 30. ***Results:*** Phacomorphic glaucoma was the most common subtype (91.7%), followed by phacolytic glaucoma (8.3%). The mean age of patients was 69.7 ± 9.8 years, with female predominance. Most patients presented with pain, redness, and severe diminution of vision along with markedly elevated preoperative IOP. Significant reduction in IOP was observed after surgery, with most patients achieving near-normal levels postoperatively. Visual acuity improved substantially in the majority of patients. Early presentation and prompt surgical intervention were associated with better visual outcomes, whereas delayed presentation, prolonged symptoms, corneal edema, and optic nerve damage resulted in poor prognosis. ***Conclusion:*** Lens induced glaucoma is a preventable cause of visual morbidity. Early diagnosis and timely cataract surgery provide effective IOP control and good visual recovery in most patients.

Keywords: Lens Induced Glaucoma, Phacomorphic Glaucoma, Cataract Surgery, Intraocular Pressure, Visual Outcome, Small Incision Cataract Surgery.

INTRODUCTION

Nearly 62.6% of blindness cases in India are caused by cataracts, which continue to be the most common cause of blindness.[1] Approximately 217 million individuals worldwide have moderate to severe visual impairment, and 36 million are blind. Of these, over 89% live in low- and middle-income countries, and 55% are women. There are around 8.8 million blind people and 47.7 million people with moderate to severe visual impairment in India alone. The most frequent preventable cause of blindness in poor nations is senile cataract.[2] LIG (Lens Induced Glaucoma), a secondary glaucoma marked by elevated intraocular pressure due to lens disease, is one of the significant consequences of untreated cataract.[1] Open-angle or angle-closure mechanisms can cause lens-induced glaucoma, which is a diverse collection of illnesses.[1]

While phacolytic glaucoma is caused by lens protein leakage that blocks the trabecular meshwork, phacomorphic and phacotopic glaucoma are secondary angle-closure glaucomas. Other types linked to restriction of aqueous outflow and elevated intraocular pressure include lens-induced uveitis and lens particle glaucoma.[1,3]

Even though cataract surgery services are available in India, a number of socioeconomic obstacles still prevent patients from receiving timely care, especially in rural areas.[1] Early cataract surgery and LIG prevention have become more widely known thanks to the NPCB (National Programme for Control of Blindness), government and commercial hospitals, and non-governmental organisations.[2]

Cataract extraction remains the definitive treatment for lens induced glaucoma. SICS (Small Incision Cataract Surgery) is considered a cost-effective and efficient surgical technique with favorable postoperative outcomes, even in advanced cases.[3] Previous studies have demonstrated that early surgical intervention results in better visual prognosis and effective intraocular pressure control.[4] The final outcome largely depends on the duration of symptoms before treatment and the presence of corneal edema, inflammation, and optic nerve damage at presentation.[3]

AIMS AND OBJECTIVES

The present study was conducted to evaluate the post-surgical outcome in patients with lens induced glaucoma undergoing cataract surgery at a tertiary care centre, with special emphasis on studying the various modes of clinical presentation, assessing the factors influencing the final visual outcome, and analyzing the postoperative visual and intraocular pressure outcomes following surgical management of lens induced glaucoma.

MATERIALS AND METHODS

Study Design

From April 1, 2024, to December 31, 2025, this prospective observational study was carried out in the Department of Ophthalmology at People's College of Medical Sciences and Research Center, Bhopal. Patients with lens-induced glaucoma who were admitted to People's Hospital's Ophthalmology OPD (Out-Patient Department) for surgical treatment were included in the study. Following cataract surgery, patients who met the inclusion criteria and gave informed consent were enrolled and their post-surgical outcomes assessed.

Inclusion and Exclusion Criteria

Regardless of gender, the study included patients with phacomorphic glaucoma, phacolytic glaucoma, lens particle glaucoma, and glaucoma owing to ectopia lentis who gave written informed consent for surgery. The study excluded individuals with primary open-angle glaucoma, primary angle-closure glaucoma associated with cataracts, other types of secondary glaucoma, patients with severe posterior segment disease, and patients who did not give their consent.

Sample Size Calculation

Considering a prevalence of lens-induced glaucoma to be approximately 1.5% among cataract cases, the sample size was calculated using the formula

$N = Z^2 \times p \times q / L^2$

Where:

- $p = 0.015$
- $q = 1 - p = 0.985$
- L (allowable error) = 0.035
- Z = 1.96 (for 95% confidence interval)

The calculated sample size was approximately 48.8 (~50cases).

However, as this was a hospital-based, time-bound prospective study, all consecutive patients fulfilling the inclusion criteria during the study period were included. Therefore, a total of 60 cases of lens-induced glaucoma were enrolled in the study.

Data Collection Procedure

All patients who met the inclusion criteria and were diagnosed with lens-induced glaucoma had a thorough clinical and demographic evaluation after giving their informed consent. Age, sex, duration of symptoms, presenting symptoms, and related systemic disorders were all noted. Snellen's chart and BCVA (Best Corrected Visual Acuity) were used to assess visual acuity; Goldmann applanation tonometry was used to measure intraocular pressure; gonioscopy was used to assess angles; and direct and indirect ophthalmoscopy and slit-lamp biomicroscopy with a +90D lens were used to evaluate the posterior segment. B-scan ultrasonography was used to rule out posterior segment pathology in situations where fundus visualisation was not feasible. Before having Small Incision Cataract Surgery (SICS) with intraocular lens implantation whenever possible, all patients received the proper preoperative medical care to decrease intraocular pressure and reduce inflammation. In order to evaluate visual acuity, intraocular pressure, anterior chamber reactivity, corneal clarity,

intraocular lens status, posterior segment findings, and surgical complications, postoperative follow-up was carried out on days 1, 7, and 30.

Statistical Analysis

The SPSS (Statistical Package for Social Sciences) program, version 25.0, was used to analyse all of the data that had been gathered and entered into a Microsoft Excel spreadsheet. The findings were presented as percentages for categorical variables and as mean ± SD (Standard Deviation) for continuous variables. The unpaired t-test was used to compare continuous variables, while the chi-square test was used to analyse categorical variables. Statistical significance was defined as a p-value of less than 0.05.

RESULTS

Table 1. Distribution of Cases According to Type of Lens-Induced Glaucoma

Type of Lens-Induced Glaucoma	Number of Cases	Percentage
Phacomorphic glaucoma	55	91.7%
Phacolytic glaucoma	5	8.3%
Total	**60**	**100%**

Table 1 illustrates the distribution of lens-induced glaucoma among the study population. Phacomorphic glaucoma was the predominant subtype, accounting for 91.7% of cases, whereas phacolytic glaucoma constituted only 8.3% of cases.

Table 2. Age-Wise Distribution of Patients

Age Group (in years)	Phacomorphic n (%)	Phacolytic n (%)	Total n (%)
51–60	11 (20.0%)	0 (0%)	11 (18.3%)
61–70	23 (41.8%)	1 (20.0%)	24 (40.0%)
71–80	18 (32.7%)	1 (20.0%)	19 (31.7%)
81–90	3 (5.5%)	2 (40.0%)	5 (8.3%)
>90	0 (0%)	1 (20.0%)	1 (1.7%)
Total	**55**	**5**	**60**
Chi-square = 19.34, p = 0.0007 (Significant)			

Table 2 shows the age-wise distribution of patients with lens-induced glaucoma. The majority of patients belonged to the 61–70 years age group, followed by 71–80 years. A statistically significant association was observed between age and type of glaucoma, indicating that phacolytic glaucoma occurred more commonly in older patients.

Table 3. Gender-Wise Distribution of Patients

Gender	Total n (%)	Phacomorphic n (%)	Phacolytic n (%)
Female	41 (68.3%)	37 (67.3%)	4 (80.0%)
Male	19 (31.7%)	18 (32.7%)	1 (20.0%)
Total	**60 (100%)**	**55 (100%)**	**5 (100%)**
Chi-square = 0.34, p = 0.56 (Not Significant)			

Table 3 demonstrates the gender-wise distribution of cases. Females constituted the majority of patients in both glaucoma groups. However, no statistically significant association was found between gender and type of lens-induced glaucoma.

Table 4. Distribution According to Residence and Literacy Status

Variable	Category	Number of Cases	Percentage
Residence	Rural	41	68.3%
	Urban	19	31.7%
Literacy Status	Illiterate	40	66.7%
	Below High School	13	21.7%
	Above High School	7	11.7%

Table 4 depicts the sociodemographic profile of patients. Most patients belonged to rural areas and were illiterate. These findings indicate that lower literacy and rural residence may contribute to delayed healthcare-seeking behavior and increased occurrence of lens-induced glaucoma.

Table 5. Distribution According to Duration of Symptoms

Duration of Symptoms	Phacomorphic n (%)	Phacolytic n (%)	Total n (%)
1–10 days	45 (81.8%)	0 (0%)	45 (75%)
11–20 days	8 (14.5%)	1 (20%)	9 (15%)
21–30 days	2 (3.6%)	2 (40%)	4 (6.7%)
>30 days	0 (0%)	2 (40%)	2 (3.3%)
Total	**55**	**5**	**60**
Chi-square = 34.9, p = 0.001 (Significant)			

Table 5 shows the duration of symptoms before presentation. Most phacomorphic glaucoma patients presented within 10 days, whereas phacolytic glaucoma patients showed delayed presentation. The association between symptom duration and type of glaucoma was statistically significant.

Table 6. Visual Acuity and Intraocular Pressure at Presentation

Parameter	Category	Number of Cases (%)
Visual Acuity	HM with accurate PR	9 (15.0%)
	PL with accurate PR	49 (81.7%)
	PL with defective PR	2 (3.3%)
IOP (mmHg)	31–40	9 (15%)
	41–50	21 (35%)
	>50	30 (50%)

Table 6 summarizes the visual acuity and intraocular pressure at presentation. Most patients presented with markedly reduced vision and significantly elevated intraocular pressure, indicating advanced disease at the time of presentation.

Table 7. Post-Operative BCVA on Day 30

BCVA Category	Phacomorphic n (%)	Phacolytic n (%)	Total n (%)
6/6–6/12	8 (13.3%)	0 (0%)	8 (13.3%)
6/18–6/60	47 (78.3%)	1 (1.7%)	48 (80%)
<6/60–3/60	0 (0%)	1 (1.7%)	1 (1.7%)
<3/60–PL+	0 (0%)	3 (5%)	3 (5%)
No PL	0	0	0

Table 7 demonstrates postoperative visual outcomes at day 30. Most patients achieved moderate visual recovery (6/18-6/60), while good visual outcome was observed only in phacomorphic glaucoma cases. Poor visual outcomes were predominantly seen among phacolytic glaucoma patients.

Table 8. Relationship between Duration of Symptoms and Postoperative Visual Outcome

Duration of Symptoms	Good Vision (6/6–6/12)	Moderate Vision (6/18–6/60)	Poor Vision (<6/60)	Total
1–10 days	8	37	0	45
11–20 days	0	8	1	9
21–30 days	0	2	2	4
>30 days	0	0	2	2
Chi-square = 34.9, p = 0.001 (Significant)				

Table 8 highlights the relationship between duration of symptoms and postoperative visual outcome. Patients presenting early had significantly better visual recovery, whereas delayed presentation was strongly associated with poor visual prognosis.

DISCUSSION

Lens-induced glaucoma continues to be an important cause of preventable visual morbidity in developing countries due to delayed cataract surgery and poor awareness regarding ocular complications. Cataract extraction remains the definitive management, and timely intervention plays a major role in determining postoperative visual outcome.

In the present study, phacomorphic glaucoma was the predominant type of LIG, accounting for 91.7% of cases, while phacolytic glaucoma constituted only 8.3%. Similar observations were reported by Pradhan et al.[5] Papaconstantinou et al.[6] and Pandey et al.[7] who also found phacomorphic glaucoma to be the commonest subtype.
The majority of patients belonged to the elderly age group, with most cases occurring between 61 and 70 years. Female predominance was observed in the present study, similar to findings reported by Tyagi et al.[2] Ayub et al.[4] and Magdumet al.[3] Advanced age, delayed cataract surgery, poor accessibility to eye care services, and socioeconomic barriers contribute significantly to the development of LIG in elderly individuals.[3]

Most patients in the present study were from rural areas and had low literacy status. Similar findings were reported by Kulkarni et al.,[8] Rijal et al.[9] and Vaidyanathan et al.[10] Lack of awareness regarding cataract surgery and delayed healthcare-seeking behavior in rural populations are important factors responsible for neglected cataracts progressing to lens-induced glaucoma. Visual acuity at presentation was markedly poor in most patients, with the majority having perception of light with accurate projection of rays. Similar observations were reported by Pradhan et al.[5] Rijal et al.[9] Jarwalet al.[11] and Tyagi et al.[2] Poor presenting vision reflects delayed presentation and advanced disease at the time of diagnosis.

Anterior chamber depth differed significantly between phacomorphic and phacolytic glaucoma. Most phacomorphic cases had shallow anterior chambers, whereas all phacolytic cases had deep anterior chambers. Similar findings were described by Pradhan et al., Rijal et al., and Sharanabasamma et al.[1] reflecting the distinct pathophysiological mechanisms of the two conditions.

In the present study, mature cataract was predominantly associated with phacomorphic glaucoma, whereas all phacolytic cases were associated with hypermature cataract. Similar observations were reported by Pradhan et al.[5] Rijal et al.[9] and Shrestha et al.[12] These findings are consistent with the established pathophysiology of lens-induced glaucoma.[13,14]

The mean intraocular pressure (IOP) at presentation was markedly elevated, especially in phacomorphic glaucoma. Similar findings were reported by Pradhan et al.[5] Rijal et al.[9] Ayub et al.[4] and Tyagi et al.[2] Elevated IOP is a characteristic feature of LIG and is primarily responsible for optic nerve damage and poor visual prognosis.[14]

Every patient in this study had SICS (Short Incision Cataract Surgery), and when possible, posterior chamber intraocular lenses were implanted. Similar surgical management was reported by Sharanabasamma et al.[1] Tyagi et al.[2] Ayub et al.[4] SICS remains an effective and practical surgical technique for managing LIG in developing countries.

Postoperative visual recovery improved gradually over time. On postoperative day 30, the majority of patients achieved BCVA between 6/18–6/60, while a smaller proportion attained good visual acuity (6/6–6/12). Similar postoperative visual outcomes were observed by Ayub et al.[4] Pandey et al.[7] and Makkena Mani Shankar et al.[15]

A statistically significant association was observed between increasing age and poorer postoperative visual outcome. Similar findings were reported by, Papaconstantinou et al.[6] .Elderly patients are more likely to present late and have prolonged elevated IOP, optic nerve damage, and reduced corneal endothelial reserve.

Anterior chamber inflammation was more severe in phacolytic glaucoma compared to phacomorphic glaucoma at presentation. However, postoperative inflammation gradually resolved in both groups by day 30. Similar observations were reported by Bhanumurthy et al.[16] The intense inflammatory response in phacolytic glaucoma is due to leakage of lens proteins into the anterior chamber. The present study demonstrated a highly significant association between higher preoperative IOP and poorer postoperative visual outcome. Patients presenting with lower IOP had better visual recovery, whereas those with very high IOP showed comparatively poorer visual prognosis. Similar observations were reported by Chandrashekar et al.[17] and Tyagi et al.[2] Prolonged elevation of IOP can cause irreversible optic nerve damage and corneal endothelial dysfunction. Duration of symptoms was another major prognostic factor. Patients presenting early had significantly better visual outcomes compared to those presenting late. Similar findings were reported by Sharanabasamma et al.[1] Shrestha et al.[12] Ayubet al.[4] and Pandey et al.[7] Delayed presentation leads to sustained elevation of IOP and irreversible glaucomatous optic neuropathy.

Postoperative IOP control was satisfactory in the majority of patients. Most achieved normal IOP levels by postoperative day 30, with only a few requiring additional antiglaucoma medications. Similar findings were observed by Chandrashekar et al.[17] and Bhanumurthy et al.[16] confirming that cataract extraction alone is effective in controlling IOP in most cases of LIG.

A significant association was also found between prolonged duration of symptoms and optic disc changes. Patients presenting after prolonged periods showed a higher incidence of glaucomatous optic nerve damage. Similar observations were reported by Pradhan et al.[5] and Rijal et al.[9] These findings emphasize the importance of early diagnosis and prompt surgical intervention in preventing irreversible visual loss in lens-induced glaucoma.

LIMITATIONS

The current study has some limitations, although it offers insightful information about the clinical profile and post-surgical outcomes of lens-induced glaucoma. The study's very small sample size of 60 patients may have limited the findings statistical power and potential to be applied to a larger population. In addition, the postoperative follow-up period was limited to 30 days, which was insufficient to assess long-term visual outcomes, sustained intraocular pressure control, and the occurrence of late postoperative complications. For a more thorough assessment of surgical outcomes in lens-induced glaucoma, bigger sample sizes and longer follow-up periods are advised.

CONCLUSION

Lens-induced glaucoma remains a significant yet preventable cause of visual morbidity, particularly among elderly patients from rural and socioeconomically disadvantaged populations. Phacomorphic glaucoma was the most common subtype observed in the present study. Small incision cataract surgery proved to be an effective and definitive treatment modality, resulting in significant reduction of intraocular pressure and improvement in visual acuity in most patients. However, delayed presentation, prolonged duration of symptoms, high preoperative intraocular pressure, corneal edema, and optic nerve damage were associated with poorer visual outcomes. Early diagnosis, increased public awareness, improved accessibility to eye care services, and timely cataract surgery are essential for preventing lens-induced glaucoma and reducing avoidable blindness.

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