



## Original Research Article

# PROSPECTIVE STUDY OF PREDICTORS OF EARLY POOR VISUAL RECOVERY AFTER UNCOMPLICATED CATARACT SURGERY

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### ABSTRACT

**Background:** Cataract is one of the leading causes of visual impairment worldwide, and cataract surgery is among the most commonly performed ophthalmic procedures for visual rehabilitation. Although most patients achieve satisfactory visual outcome after uncomplicated cataract surgery, a proportion of patients experience delayed or poor visual recovery in the early postoperative period. Identification of factors associated with early poor visual recovery is important for better preoperative counseling, risk stratification, and postoperative management. The aim is to study the predictors of early poor visual recovery after uncomplicated cataract surgery at a tertiary care hospital.

**Materials and Methods:** This prospective observational study was conducted among 105 patients who underwent uncomplicated cataract surgery at a tertiary care hospital. Adult patients with age-related cataract undergoing elective cataract extraction with intraocular lens implantation were included. Patients with ocular comorbidities likely to affect visual outcome, traumatic or complicated cataract, previous intraocular surgery, and intraoperative or immediate postoperative complications were excluded. Preoperative evaluation included demographic details, systemic comorbidities, visual acuity assessment, cataract grading, pupil dilatation status, and detailed ocular examination. Early postoperative visual outcome was assessed and patients were categorized into good visual recovery and poor visual recovery groups.

**Results:** Out of 105 patients, 84 (80.00%) achieved good early visual recovery, while 21 (20.00%) had poor early visual recovery. Age showed a significant association with poor visual recovery ( $p=0.041$ ), and patients aged more than 70 years were at higher risk. Diabetes mellitus was significantly associated with poor recovery ( $p=0.018$ ). Among ocular factors, preoperative visual acuity worse than 6/60 ( $p=0.009$ ), Grade IV cataract ( $p=0.032$ ), and poor pupil dilatation ( $p=0.021$ ) were significantly associated with early poor visual recovery. Among postoperative factors, corneal edema ( $p=0.004$ ), anterior chamber reaction ( $p=0.031$ ), and Descemet's folds ( $p=0.015$ ) showed significant association. On multivariable logistic regression, postoperative corneal edema (AOR=4.21), preoperative visual acuity <6/60 (AOR=3.85), diabetes mellitus (AOR=3.12), poor pupil dilatation (AOR=2.94), Grade IV cataract (AOR=2.67), and age >70 years (AOR=2.41) were identified as independent predictors.

**Conclusion:** Early poor visual recovery after uncomplicated cataract surgery is influenced by multiple patient-related, ocular, and postoperative factors. Advanced age, diabetes mellitus, poor preoperative visual acuity, dense cataract, poor pupil dilatation, and postoperative corneal edema were important predictors. Recognition of these factors may help in improving perioperative planning, early postoperative care, and visual outcomes.

**Keywords:** Cataract surgery; Early visual recovery; Poor visual outcome; Predictors; Corneal edema.

## INTRODUCTION

Cataract is the leading cause of reversible blindness and one of the most important causes of visual impairment worldwide. Although it is treatable with surgery, the burden of cataract continues to increase because of population ageing, longer life expectancy, and unequal access to timely ophthalmic care. In recent years, global estimates have shown that cataract remains responsible for a substantial proportion of blindness and moderate to severe vision impairment, particularly in low- and middle-income countries where service delivery and postoperative quality may vary widely.<sup>[1]</sup> The public health significance of cataract therefore extends beyond the presence of lens opacity itself and includes the need to ensure effective surgical care with good visual rehabilitation. In a country such as India, where the demand for cataract surgery is high and tertiary care centers manage a large surgical workload, understanding the determinants of postoperative visual recovery is highly relevant to both patient care and health system performance. Modern cataract surgery is one of the most successful procedures in medicine. With advances in phacoemulsification, intraocular lens implantation, viscoelastic use, microscope-assisted microsurgery, and perioperative care, the expectations from cataract surgery have changed considerably. The aim is no longer limited to removal of the opaque lens; instead, the procedure is expected to restore useful vision quickly, improve functional independence, and enhance quality of life.<sup>[2]</sup> Contemporary literature emphasizes that cataract surgery should be individualized according to ocular status, patient needs, and appropriate intraocular lens selection, while maintaining a strong focus on safety and refractive predictability.<sup>[3]</sup> As a result, postoperative assessment is increasingly centered not only on final visual outcome but also on the speed of recovery, because delayed improvement in the early postoperative period may negatively affect patient confidence and satisfaction even when the eventual result is acceptable. The concept of “early visual recovery” has become particularly important in present-day ophthalmic practice. In high-volume hospitals, many patients expect visual improvement almost immediately after surgery, and day-1 or early follow-up vision often shapes their perception of surgical success. However, some patients continue to experience suboptimal vision in the immediate postoperative period despite having undergone uncomplicated surgery. This delayed recovery may be due to transient corneal edema, postoperative inflammation, Descemet’s folds, tear film disturbance, residual refractive error, pre-existing systemic disease, dense cataract, or other subtle ocular factors that do not necessarily represent surgical complications. Therefore, studying predictors of early poor visual recovery is important because it helps clinicians distinguish expected transient delay from signs that warrant closer

observation or intervention. It also helps improve preoperative counseling, especially in patients who may not achieve rapid visual improvement despite technically uneventful surgery.<sup>[4]</sup> The quality dimension of cataract services has gained increasing attention in recent years. Merely increasing the number of surgeries is not sufficient unless those surgeries result in useful postoperative vision. Indian data on effective cataract surgical coverage have highlighted this issue by demonstrating a difference between cataract surgical coverage and effective cataract surgical coverage, indicating that access to surgery and quality of visual outcome are not always equivalent.<sup>[5]</sup> In addition, systematic review evidence from population-based studies has shown considerable inequality in postoperative visual outcomes across settings, with better results generally reported in better-resourced systems and poorer results in areas with limited postoperative quality control. Among the various determinants of early postoperative vision, corneal status plays a major role. Even after uneventful surgery, minor endothelial stress can lead to transient corneal edema, which can increase corneal thickness, reduce optical clarity, and temporarily impair vision.<sup>[6]</sup>

## MATERIALS AND METHODS

This prospective observational study was conducted at a tertiary care hospital among 105 patients undergoing uncomplicated cataract surgery. The study included adult patients diagnosed with age-related cataract who were scheduled for elective cataract extraction with intraocular lens implantation and were willing to participate. Only those patients in whom surgery was completed without any intraoperative complications were included for analysis. Patients with traumatic cataract, complicated cataract, congenital cataract, pre-existing corneal opacity, glaucoma, retinal pathology, optic nerve disease, uveitis, amblyopia, significant diabetic retinopathy, previous intraocular surgery, or any other ocular comorbidity likely to affect postoperative visual outcome were excluded. Patients who developed intraoperative or immediate postoperative complications were also excluded from the final analysis.

All enrolled patients underwent detailed preoperative evaluation using a structured proforma. Demographic and clinical details including age, sex, laterality of eye, educational status, and relevant systemic comorbidities such as diabetes mellitus and hypertension were recorded. A comprehensive ophthalmic examination was carried out in all patients. This included measurement of preoperative uncorrected visual acuity and best corrected visual acuity, slit-lamp examination of the anterior segment, grading of cataract morphology and density, intraocular pressure measurement, lacrimal sac patency assessment where indicated, keratometry, axial length measurement, and posterior segment

evaluation by direct or indirect ophthalmoscopy after pupillary dilatation. In cases where fundus visualization was not possible due to dense cataract, B-scan ultrasonography was performed to rule out posterior segment pathology. Routine pre-anesthetic and systemic fitness assessments were completed as per hospital protocol.

The exposure variables assessed as possible predictors of early poor visual recovery included patient-related, ocular, and surgical factors. Patient-related variables included age, sex, presence of diabetes mellitus, hypertension, and other systemic illnesses. Ocular variables included preoperative visual acuity, cataract grade, type of cataract, pupil dilatation status, ocular surface condition, corneal clarity, anterior chamber depth, and biometry parameters. Surgical variables included type of cataract surgery performed, surgeon experience level, incision site, intraocular lens implantation details, and operative notes confirming absence of complications. These variables were selected based on their possible influence on immediate postoperative visual outcome.

All surgeries were performed under standard aseptic precautions by trained ophthalmic surgeons using routine institutional surgical protocols for uncomplicated cataract surgery. Perioperative care, including preoperative preparation, anesthesia technique, surgical steps, and postoperative medications, was standardized as far as possible across patients. Postoperative examination was performed according to institutional follow-up protocol, and visual outcome was assessed during the early postoperative period. Uncorrected visual acuity was recorded at follow-up using a standard Snellen chart under uniform testing conditions. Detailed slit-lamp examination was also carried out to identify causes of suboptimal early vision such as corneal edema, anterior chamber reaction, Descemet's folds, residual refractive error, or other transient postoperative factors.

The primary outcome measure was early poor visual recovery after uncomplicated cataract surgery. Early poor visual recovery was defined as postoperative visual acuity worse than the predetermined satisfactory visual threshold during the early postoperative assessment despite an uncomplicated surgery. Patients were accordingly categorized into good visual recovery and poor visual recovery groups. The association between preoperative and intraoperative predictors and early postoperative visual outcome was then analyzed.

Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 27.0. Quantitative variables were expressed as mean and standard deviation or median and interquartile range depending on the distribution of data, while qualitative variables were expressed as frequency and percentage. The normality of continuous variables was assessed before applying inferential statistics. For comparison between groups, the independent t-test or Mann-Whitney U test was

used for continuous variables, and the chi-square test or Fisher's exact test was used for categorical variables, as appropriate. Variables showing significant association on univariate analysis were further entered into multivariable logistic regression analysis to identify independent predictors of early poor visual recovery after uncomplicated cataract surgery. Odds ratios with 95% confidence intervals were calculated. A p-value of less than 0.05 was considered statistically significant.

## RESULTS

A total of 105 patients who underwent uncomplicated cataract surgery were included in the present study. The postoperative visual outcome assessment showed that 84 patients (80.00%) achieved good early visual recovery, whereas 21 patients (20.00%) experienced early poor visual recovery during the early postoperative period.

[Table 1] Demographic characteristics of study participants

[Table 1] presents the demographic and clinical characteristics of the study population. The majority of patients belonged to the 61–70 years age group, accounting for 38 patients (36.19%), followed by the 51–60 years group with 30 patients (28.57%), and patients aged above 70 years constituting 25 patients (23.81%). The least number of patients were observed in the 40–50 years age group (12 patients; 11.43%). Regarding gender distribution, 56 patients (53.33%) were male, while 49 patients (46.67%) were female, suggesting a slightly higher proportion of males undergoing cataract surgery in the present study. With respect to laterality of the operated eye, 58 patients (55.24%) underwent surgery in the right eye, whereas 47 patients (44.76%) had surgery in the left eye. Among the systemic comorbidities, diabetes mellitus was present in 28 patients (26.67%), while the remaining 77 patients (73.33%) did not have diabetes. Similarly, hypertension was observed in 34 patients (32.38%), whereas 71 patients (67.62%) were non-hypertensive.

[Table 2] Early postoperative visual outcome

[Table 2] illustrates the distribution of early postoperative visual outcomes among the study participants. Out of the total 105 patients, 84 patients (80.00%) achieved good visual recovery, while 21 patients (20.00%) had poor early visual recovery following uncomplicated cataract surgery.

[Table 3] Association between demographic factors and early poor visual recovery

[Table 3] demonstrates the relationship between demographic factors and early postoperative visual outcome. Age showed a statistically significant association with early poor visual recovery ( $p = 0.041$ ). Among patients aged above 70 years, a higher proportion experienced poor visual recovery (8 patients; 38.10%) compared to younger age groups. Similarly, patients in the 61–70 years age group also contributed substantially to the poor recovery group

(8 patients; 38.10%). Gender did not show a statistically significant association with visual outcome ( $p = 0.482$ ). Among those with good recovery, 46 patients (54.76%) were male, while 38 patients (45.24%) were female. In the poor recovery group, 10 patients (47.62%) were male and 11 patients (52.38%) were female, indicating that visual recovery was not significantly influenced by gender. Diabetes mellitus demonstrated a statistically significant association with early poor visual recovery ( $p = 0.018$ ). Among diabetic patients, 11 patients (52.38%) experienced poor visual recovery, compared to only 10 patients (47.62%) among non-diabetic individuals. Hypertension, however, did not show a statistically significant association with early visual recovery ( $p = 0.109$ ), although a slightly higher proportion of hypertensive patients were present in the poor recovery group.

[Table 4] Association between ocular factors and early poor visual recovery

[Table 4] describes the relationship between preoperative ocular factors and early postoperative visual outcome. Preoperative visual acuity showed a significant association with visual outcome ( $p = 0.009$ ). Among patients with preoperative visual acuity worse than 6/60, 14 patients (66.67%) experienced poor visual recovery, compared to 7 patients (33.33%) with visual acuity of 6/60 or better. Cataract grade also demonstrated a statistically significant association with visual outcome ( $p = 0.032$ ). Patients with Grade IV cataract showed a higher proportion of poor visual recovery (12 patients; 57.14%) compared to those with Grade II–III cataracts (9 patients; 42.86%). Similarly, pupil dilatation status showed a significant association with early visual recovery ( $p = 0.021$ ). Among patients with poor pupil dilatation, 8 patients (38.10%) experienced poor visual recovery, compared to 13 patients (61.90%) among those with adequate dilatation, indicating that inadequate pupil dilatation may contribute to suboptimal early postoperative vision. Corneal clarity did not show a statistically significant association with visual outcome ( $p = 0.067$ ), although patients with mild corneal haze appeared to have slightly higher rates of poor visual recovery.

[Table 5] Postoperative factors associated with early poor visual recovery

[Table 5] presents the association between postoperative clinical findings and early visual

recovery. Postoperative corneal edema showed a strong statistically significant association with poor visual recovery ( $p = 0.004$ ). Among patients with corneal edema, 9 patients (42.86%) experienced poor visual recovery, compared to 12 patients (57.14%) without edema, indicating that corneal edema is an important factor contributing to delayed visual improvement. Anterior chamber reaction was also significantly associated with poor visual recovery ( $p = 0.031$ ). Among patients who developed anterior chamber reaction, 7 patients (33.33%) showed poor visual recovery, compared to 14 patients (66.67%) among those without inflammation. Similarly, Descemet's folds were significantly associated with early poor visual recovery ( $p = 0.015$ ). Among patients with Descemet's folds, 6 patients (28.57%) experienced poor visual recovery, suggesting that corneal structural changes in the early postoperative period may influence visual outcomes.

[Table 6] Multivariable logistic regression analysis

Multivariable logistic regression analysis was performed to identify independent predictors of early poor visual recovery after uncomplicated cataract surgery. The analysis revealed that postoperative corneal edema was the strongest predictor of early poor visual recovery (AOR = 4.21;  $p = 0.003$ ), indicating that patients with corneal edema were more than four times more likely to experience poor visual recovery compared to those without edema. Preoperative visual acuity worse than 6/60 also emerged as a significant predictor (AOR = 3.85;  $p = 0.004$ ), suggesting that patients with poorer baseline vision were approximately four times more likely to have delayed visual improvement. Diabetes mellitus was another significant independent predictor (AOR = 3.12;  $p = 0.012$ ), indicating that diabetic patients had a higher risk of poor early postoperative visual recovery. Additionally, poor pupil dilatation (AOR = 2.94;  $p = 0.024$ ) and Grade IV cataract (AOR = 2.67;  $p = 0.029$ ) were also found to be significant predictors. Age greater than 70 years showed a statistically significant association with poor visual recovery (AOR = 2.41;  $p = 0.044$ ), indicating that older patients were at higher risk of delayed postoperative visual improvement. Although anterior chamber reaction showed an increased odds ratio (AOR = 2.36), it did not reach statistical significance in the multivariable model ( $p = 0.074$ ).

**Table 1: Demographic characteristics of study participants (n = 105)**

Variable	Frequency (n)	Percentage (%)
Age group (years)		
40–50	12	11.43
51–60	30	28.57
61–70	38	36.19
>70	25	23.81
Gender		
Male	56	53.33
Female	49	46.67
Laterality of operated eye		
Right eye	58	55.24
Left eye	47	44.76

Diabetes mellitus		
Present	28	26.67
Absent	77	73.33
Hypertension		
Present	34	32.38
Absent	71	67.62

**Table 2: Early postoperative visual outcome among study participants (n = 105)**

Visual outcome	Frequency (n)	Percentage (%)
Good visual recovery	84	80.00
Poor visual recovery	21	20.00

**Table 3: Association between demographic factors and early poor visual recovery**

Variable	Good recovery n (%)	Poor recovery n (%)	p-value
Age group			0.041*
40–50	11 (13.10)	1 (4.76)	
51–60	26 (30.95)	4 (19.05)	
61–70	30 (35.71)	8 (38.10)	
>70	17 (20.24)	8 (38.10)	
Gender			0.482
Male	46 (54.76)	10 (47.62)	
Female	38 (45.24)	11 (52.38)	
Diabetes mellitus			0.018*
Present	17 (20.24)	11 (52.38)	
Absent	67 (79.76)	10 (47.62)	
Hypertension			0.109
Present	24 (28.57)	10 (47.62)	
Absent	60 (71.43)	11 (52.38)	

\*Statistically significant (p < 0.05)

**Table 4: Association between ocular factors and early poor visual recovery**

Ocular parameter	Good recovery n (%)	Poor recovery n (%)	p-value
Preoperative visual acuity			0.009*
≥6/60	52 (61.90)	7 (33.33)	
<6/60	32 (38.10)	14 (66.67)	
Cataract grade			0.032*
Grade II–III	58 (69.05)	9 (42.86)	
Grade IV	26 (30.95)	12 (57.14)	
Pupil dilatation			0.021*
Adequate	70 (83.33)	13 (61.90)	
Poor	14 (16.67)	8 (38.10)	
Corneal clarity			0.067
Clear cornea	75 (89.29)	16 (76.19)	
Mild corneal haze	9 (10.71)	5 (23.81)	

\*Statistically significant (p < 0.05)

**Table 5: Postoperative factors associated with early poor visual recovery**

Postoperative finding	Good recovery n (%)	Poor recovery n (%)	p-value
Corneal edema			0.004*
Present	9 (10.71)	9 (42.86)	
Absent	75 (89.29)	12 (57.14)	
Anterior chamber reaction			0.031*
Present	11 (13.10)	7 (33.33)	
Absent	73 (86.90)	14 (66.67)	
Descemet's folds			0.015*
Present	8 (9.52)	6 (28.57)	
Absent	76 (90.48)	15 (71.43)	

\*Statistically significant (p < 0.05)

**Table 6: Multivariable logistic regression analysis for predictors of early poor visual recovery after uncomplicated cataract surgery**

Variable	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p-value
Age >70 years	2.41	1.02 – 5.68	0.044*
Diabetes mellitus	3.12	1.28 – 7.59	0.012*
Preoperative visual acuity <6/60	3.85	1.54 – 9.63	0.004*
Grade IV cataract	2.67	1.10 – 6.45	0.029*
Poor pupil dilatation	2.94	1.15 – 7.48	0.024*
Postoperative corneal edema	4.21	1.63 – 10.87	0.003*
Anterior chamber reaction	2.36	0.91 – 6.12	0.074

\*Statistically significant (p < 0.05)

## DISCUSSION

In the present study, 84 of 105 patients (80.00%) achieved good early visual recovery and 21 patients (20.00%) had early poor visual recovery after uncomplicated cataract surgery. This overall pattern indicates that most patients improved visually in the immediate postoperative period, but the proportion with suboptimal early recovery remained clinically relevant. Our good-outcome proportion was higher than that reported by Markos et al (2020),<sup>[7]</sup> who found good best-corrected visual outcome in 215 of 314 eyes (68.50%) and poor outcome in 36 eyes (11.50%) at 6–8 weeks. The better good-outcome rate in the present study may be related to exclusion of eyes with overt ocular comorbidity and inclusion of only uncomplicated surgeries, whereas the persistence of 20.00% poor early recovery in our series likely reflects the effect of transient postoperative factors that are more prominent in the early period than at final follow-up. The demographic profile of the present study showed that most patients were elderly, with the largest proportion in the 61–70 year group (36.19%), followed by those older than 70 years (23.81%), and there was a slight male predominance (53.33%). This general age clustering is expected because age-related cataract accumulates in older adults. A comparable age-linked surgical profile was seen by Thapa et al (2011),<sup>[8]</sup> in Nepal, where cataract surgery was evaluated in adults aged 40 years and above, and postoperative best-corrected visual acuity of  $\geq 6/18$  was achieved in 72.40% of eyes while 8.00% remained  $< 6/60$ . Although their study was population-based and ours was hospital-based, both studies reinforce that cataract surgery largely serves an elderly population, and that visual outcome assessment must always be interpreted in the context of age-related ocular vulnerability. Age emerged as a significant determinant of poor early visual recovery in our study ( $p=0.041$ ), and patients aged  $>70$  years contributed 38.10% of the poor-recovery group; on multivariable analysis, age  $>70$  years remained an independent predictor (AOR 2.41,  $p=0.044$ ). This agrees with Schein et al (1995),<sup>[9]</sup> who studied 552 first-eye cataract surgeries and found that age  $\geq 75$  years independently increased the likelihood of failure to improve on at least one outcome measure, with an odds ratio of 3.57. The similarity suggests that advanced age continues to adversely influence visual recovery even when surgery itself is uncomplicated, probably because older patients are more likely to have denser nuclei, lower endothelial reserve, subtle macular dysfunction, and slower neurovisual adaptation. Gender was not significantly associated with visual outcome in our study ( $p=0.482$ ), and hypertension was also not significant ( $p=0.109$ ), despite a somewhat higher proportion of hypertensive patients in the poor-recovery group. This pattern is in line with Lee et al,<sup>[10]</sup> (2022) in the ACCORD cohort of 1,136 diabetic eyes, where 762 eyes (67.10%)

achieved good postoperative visual outcome and age, sex, blood pressure, lipid levels, diabetes duration, and HbA1c were not significantly associated with outcome. Their findings support our observation that broad demographic or systemic variables such as sex and hypertension alone may be weaker predictors of early postoperative vision than eye-specific clinical factors. Diabetes mellitus showed a significant association with early poor visual recovery in the present study ( $p=0.018$ ), and 11 of 21 patients in the poor-recovery group (52.38%) were diabetic. Diabetes also remained an independent predictor on regression analysis (AOR 3.12,  $p=0.012$ ). This is consistent with Chancellor et al,<sup>[11]</sup> (2021) who analyzed 179,159 eyes and found that mean postoperative visual acuity was worse in diabetic than nondiabetic eyes (logMAR 0.23 vs 0.13; approximately Snellen 20/30 vs 20/25,  $p<0.0001$ ), and that the proportion achieving a gain of at least 3 Snellen lines was lower in diabetics (56.60% vs 63.50%,  $p<0.0001$ ). The agreement between the two studies suggests that even in the absence of major intraoperative complications, diabetes reduces the probability of rapid visual rehabilitation. Preoperative visual acuity was another important determinant in our series. Among patients with preoperative vision  $< 6/60$ , 14 of 21 poor outcomes (66.67%) occurred in this subgroup, and poor baseline acuity independently predicted early poor recovery on regression (AOR 3.85,  $p=0.004$ ). This finding parallels Modjtahedi et al,<sup>[12]</sup> (2019) who evaluated 103,920 cataract surgeries and showed that patients with preoperative vision worse than about 20/32 were more likely to achieve meaningful postoperative visual gain, while preoperative vision  $< 74.7$  letters was significantly associated with larger letter gain. Although their outcome metric emphasized magnitude of gain and ours emphasized early poor recovery, both studies confirm that preoperative visual status is a central predictor of postoperative visual trajectory. Cataract grade was significantly associated with poor early visual recovery in our study ( $p=0.032$ ), with Grade IV cataract accounting for 57.14% of poor recoveries compared with 42.86% in Grade II–III cataracts. This relationship is biologically plausible and is supported by Ursell et al,<sup>[13]</sup> (1997) who studied 101 routine phacoemulsification cases and found that postoperative flare was related to nuclear colour ( $p=0.038$ ), while cumulative delivered energy increased with nuclear colour ( $p=0.031$ ) and opacity ( $p=0.022$ ). Thus, denser cataracts require more phaco energy and are associated with greater postoperative barrier disruption and inflammation, which likely explains why our Grade IV cataracts showed slower early visual rehabilitation. Pupil dilatation also significantly influenced postoperative vision in the present study ( $p=0.021$ ). Poor dilatation was present in 38.10% of the poor-recovery group and remained an independent predictor on logistic regression (AOR 2.94,  $p=0.024$ ). A similar trend was reported by Balal et al,<sup>[14]</sup> (2021)

who reviewed 20,175 cataract operations and found 1,426 small-pupil cases; importantly, the large-pupil group achieved a significantly greater gain in visual acuity than the small-pupil group ( $p < 0.05$ ). Their large database experience supports our finding that inadequate mydriasis is not merely a technical inconvenience but a clinically relevant risk factor for slower visual recovery, likely because of greater iris manipulation, more difficult nucleus management, and increased postoperative inflammation. Among postoperative variables, corneal edema showed the strongest univariate association with poor early visual recovery in our study ( $p = 0.004$ ): 9 of 21 poor-recovery patients (42.86%) had corneal edema, and on multivariable analysis it emerged as the strongest independent predictor (AOR 4.21,  $p = 0.003$ ). This is highly comparable with Shakya et al,<sup>[15]</sup> (2013) who specifically evaluated 96 eyes after phacoemulsification and emphasized that corneal edema delays early visual recovery in diabetic patients. In their series, 33 eyes belonged to diabetics and 63 to nondiabetics, underscoring that endothelial stress and postoperative edema are especially important in metabolically vulnerable eyes. Our findings therefore reinforce corneal edema as the main immediate reversible cause of poor early visual performance after otherwise uncomplicated cataract surgery. Anterior chamber reaction and Descemet's folds were also significantly associated with early poor visual recovery in our study, with anterior chamber reaction present in 33.33% and Descemet's folds in 28.57% of poor-outcome cases. These observations are supported by Do et al,<sup>[16]</sup> (2015) who studied 150 uncomplicated phacoemulsification cases and found transient corneal edema in 17 eyes (11.30%); diabetes mellitus was significantly associated with transient corneal edema (OR 4.04,  $p = 0.011$ ), and transient corneal edema itself strongly predicted pseudophakic cystoid macular edema (OR 6.71,  $p = 0.003$ ). Because Descemet's folds and mild anterior chamber inflammation usually reflect early surgical trauma and postoperative inflammatory response, their association with poor vision in our study is clinically plausible and consistent with the concept that early corneal and inflammatory changes mediate delayed visual recovery. The regression model in the present study showed that postoperative corneal edema (AOR 4.21), preoperative visual acuity  $< 6/60$  (AOR 3.85), diabetes mellitus (AOR 3.12), poor pupil dilatation (AOR 2.94), Grade IV cataract (AOR 2.67), and age  $> 70$  years (AOR 2.41) were independent predictors of early poor visual recovery, whereas anterior chamber reaction lost significance after adjustment ( $p = 0.074$ ). This overall pattern is consistent with Lundberg et al,<sup>[17]</sup> (2005) who demonstrated in a prospective series of 30 patients that day-1 central corneal swelling strongly correlated with endothelial cell loss at 3 months ( $R^2 = 0.785$ ,  $p < 0.001$ ). Their work supports the central message of our regression analysis: early postoperative corneal status is not simply an associated finding, but a biologically meaningful

marker of surgical stress and subsequent visual recovery.

## CONCLUSION

This prospective study concludes that early poor visual recovery after uncomplicated cataract surgery is influenced by multiple preoperative and postoperative factors. Advanced age, diabetes mellitus, poor preoperative visual acuity, higher cataract grade, poor pupil dilatation, and postoperative corneal edema were significant predictors of delayed visual improvement. Among these, postoperative corneal edema emerged as the strongest independent predictor. Careful preoperative risk assessment and early identification of modifiable postoperative factors can help improve visual outcomes and patient satisfaction after cataract surgery.

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