RESEARCH PAPER

ARTICLE

Causes of Subnormal vision in Patients with Mature Cataract following Small Incision Cataract Surgery at a Tertiary Care Hospital

Anbalagan Sanchanaa[1], Loganathan M[1*]

[1]*Department of Ophthalmology, Sri Venkateshwaraa Medical College Hospital and Research Centre, Ariyur, Puducherry*

Corresponding author: Loganathan M, log_smith@yahoo.com

ABSTRACT

Background: In India, mature cataracts continue to be a major cause of blindness, and because of socioeconomic obstacles, they frequently manifest later. Even though manual small incision cataract surgery (MSICS) is frequently used in environments with low resources, some individuals continue to have subnormal vision after surgery. The purpose of this study was to assess the reasons behind subnormal vision in mature cataracts after MSICS.

Materials and Methods: At a tertiary hospital in Pondicherry, India, 174 patients with mature cataracts undergoing MSICS participated in a prospective observational study. The population had delayed presentation (mean symptom duration 17.0 ± 5.4 months), with a mean age of 64.9 ± 7.7 years, 55.2% female, and 82.2% illiterate. 63% had systemic comorbidities (diabetes 46%, hypertension 17.2%). The posterior segment integrity was verified by Universal B-scan. In 91.4% of cases, MSICS with PCIOL implantation was carried out. Visual acuity, anterior/posterior segment alterations, and reasons for subnormal vision were recorded during postoperative evaluations at Day 1, Week 1, and Week 6.

Results: On day 1, 92% of patients had subnormal vision, primarily as a result of temporary inflammatory and corneal alterations, such as anterior chamber cells (62.5%), Descemet's folds (38.9%), and striate keratopathy (37.9%). By Week 1, corneal clarity had improved and inflammation had resolved, resulting in a drop in subnormal vision to 74.7%. At Week 6, 51.1% of patients had functional vision (≥6/12), but 33.3% continued to have subnormal vision because of refractive or structural factors, including astigmatism (24.7%), posterior capsule opacification (8%), residual Descemet's folds (15.5%), and retinal disease (9.2%).

Conclusion: MSICS significantly improves vision, and early postoperative obstacles are away after 4-6 weeks. Refractive errors, posterior capsule opacification, and retinal comorbidities that are revealed after surgery are the causes of persistent subnormal vision. Comorbidity diagnosis, refractive correction, and prolonged postoperative monitoring are necessary for the best results.

Keywords: Mature cataract, manual small incision cataract surgery (MSICS), subnormal vision, visual acuity

How to cite this article: Sanchanaa A, Loganathan M., Causes of Subnormal Vision in Patients with Mature Cataract following Small Incision Cataract Surgery at a Tertiary Care Hospital. Int J Drug Deliv Technol. 2026;16(77s): 1826-1840; DOI: 10.25258/ijddt.16.77s.208

INTRODUCTION

Cataract remains as an eminent reversible cause of blindness worldwide, imposing a staggering global burden that disproportionately affects the low and middle-income countries. This disparity may be attributed to socioeconomic barriers and inadequate healthcare infrastructure that often delay intervention until the cataract reaches an advanced stage that is characterized by total opacity and may be associated with structural abnormality [1, 2]. In India, a nation grappling with one of the highest rate of blindness due to cataract, estimated at around 7-8 million unoperated cases, of which mature cataract represents approximately 7-11% of blindness in rural and underserved populations These mature cataract might increase the complication rates, resulting in suboptimal visual outcomes. Small incision cataract surgery (SICS), with posterior chamber intraocular lens (PCIOL) implantation, has revolutionized high-volume cataract care in tertiary care hospitals, that promotes visual rehabilitation, cost-efficiency and reduced astigmatism when compared to traditional extra capsular cataract extraction [3,4].

Despite advances in cataract surgery, a concerning 15-40% of patients undergoing SICS for mature cataracts endure persistent subnormal vision, defined as best-corrected visual acuity <6/18. Despite, both perioperative and intraoperative hurdles, including the profound absence of red reflex obscuring pre-exiting posterior segment pathologies, zonular weakness from lens instability, shallow anterior chamber predisposing to endothelial injury, and hardness of nucleus risking posterior capsule rupture compared to immature cases. The postoperative sequelae such as corneal edema, cystoid macular edema, and accelerated posterior capsule opacification [5-7].

Due to pre-existing ocular comorbidities (age-related macular degeneration, glaucoma, optic atropy), intraoperative and postoperative surgical complications (vitreous loss, retained cortical fragments), and posterior segment sequelae of systemic diseases (systemic hypertension and diabetes), real-world tertiary data from high-burden regions show poor yields (only 50–75% good outcomes) [6,8].

Mature cataracts are associated with longer surgical backlogs and higher complication profiles, and there are less prospective, hospital-based studies to determine the cause of subnormal vision in mature cataract patients following SICS. This is especially evident in countries like India that have a diversified epidemiological environment.

In order to quantify prevalence, stratify prognostic determinants (demographic, anatomical, comorbid, and technical), and identify modifiable contributors like timely referral and prompt cataract surgery, the current study, carried out at a tertiary care hospital, examined the various causes of subnormal vision following SICS in patients with mature cataracts using thorough preoperative

assessments, intraoperative documentation, and longitudinal postoperative follow-ups.

AIM AND OBJECTIVES

- To find the various causes of subnormal vision in patients with mature cataract who underwent small incision cataract surgery.
- To assess the postoperative outcome of patients with mature cataract who underwent small incision cataract surgery
- To find out the posterior segment causes of subnormal postoperative vision in mature cataract patients.

MATERIALS AND METHODS

After receiving approval from the SRC and IEC, this prospective observational cohort study was conducted over an 18-month period in the Department of Ophthalmology in a tertiary care centre at Puducherry. Patients with mature cataracts between the ages of 40 and 80 who underwent Small Incision Cataract Surgery (SICS) and had postoperative visual acuity of less than 6/9 were included in the study cohort. The minimal sample size was determined to be 174 based on the results of Ahangar et al. (2014), which showed that 13% of patients receiving SICS had subnormal vision, and taking into account 80% statistical power, 95% confidence level, and 5% acceptable error [6]. Simple random sampling was used to choose the participants. It took around two hours each patient to complete the enrollment process, which included recording their history, doing a general and ocular checkup, and conducting pertinent investigations. Visual acuity measurement, fundus examination, refraction, and non-contact tonometry were all part of the postoperative evaluation at day one, one week, and six weeks. Patients with complex, traumatic, or congenital cataracts, as well as those who did not cooperate well during visual acuity testing, were omitted.

DATA COLLECTING METHOD

Simple random selection was used to select participants after they gave their informed consent in their mother tongue. Preoperative evaluation included history gathering, visual acuity (Snellen's chart), intraocular pressure (noncontact tonometry), slit lamp examination, and B scan ultrasonography. Demographic information was kept private. When necessary, multidisciplinary evaluations were carried out. Visual acuity tests, slit lamp biomicroscopy, fundus examination, and noncontact tonometry were used in postoperative follow-up on Day 1, Week 1, and Week 6 to evaluate anatomical and functional outcomes. Patients with severe, traumatic, or congenital cataracts, as well as those who did not cooperate well during visual acuity testing, were not allowed to participate.

STATISTICAL ANALYSIS

Microsoft Excel was used for data entry and SPSS version 21.0 was used for statistical analysis and data management. Cohort characteristics were described using descriptive statistics. Depending on the distribution, continuous variables were reported as mean ± standard deviation or median (interquartile range). The Shapiro-Wilk or Kolmogorov-Smirnov tests were used to determine normality, and histogram analysis was used as support. To show how the study population was distributed, categorical variables were displayed as absolute frequencies and percentages.

RESULTS

The cohort study included individuals in the later stages of life, with a mean age of 64.9 years (± 7.7). The participants spanned a wide age range, from 45.0 to 76.0 years. There was a notable female predominance, with females accounting for 55.2% (n=96) of the cases compared to males at 44.8% (n=78). The occupational data reveals that a majority of the patients are engaged in non-formal or domestic work. Housewives constituted the largest group at 55.2%, followed by farmers (21.3%) and daily wagers (14.4%). Shopkeepers represented the smallest portion of the cohort at 9.2%. Around 82.2% (n=143) of the patients had no formal education, while only small fractions had completed primary (8.6%) or secondary (9.2%) schooling.

The study included 174 patients, all of whom presented with mature cataracts (100%) and a primary complaint of diminution of vision (100%). Regarding laterality, there was a notable preponderance of left eye (LE) involvement, accounting for 61.5% (n=107) of the cases, compared to 38.5% (n=67) in the right eye (RE). The chronic nature of the condition is evidenced by the duration of symptoms, with patients experiencing visual impairment for an average of 17.0 ± 5.4 months, ranging from six months to two years.

Systemic health played a major role in the patient profile, as approximately 63% of the participants had underlying chronic conditions. Diabetes Mellitus (DM) was the most prevalent comorbidity, affecting 46.0% of the population, followed by hypertension at 17.2%.

All patients successfully underwent Manual Small Incision Cataract Surgery (MSICS). The vast majority (91.4%, n=159) received a standard Posterior Chamber Intraocular Lens (PCIOL), while a smaller subset (8.6%, n=15) was implanted with a 3-piece IOL (Figure 1).

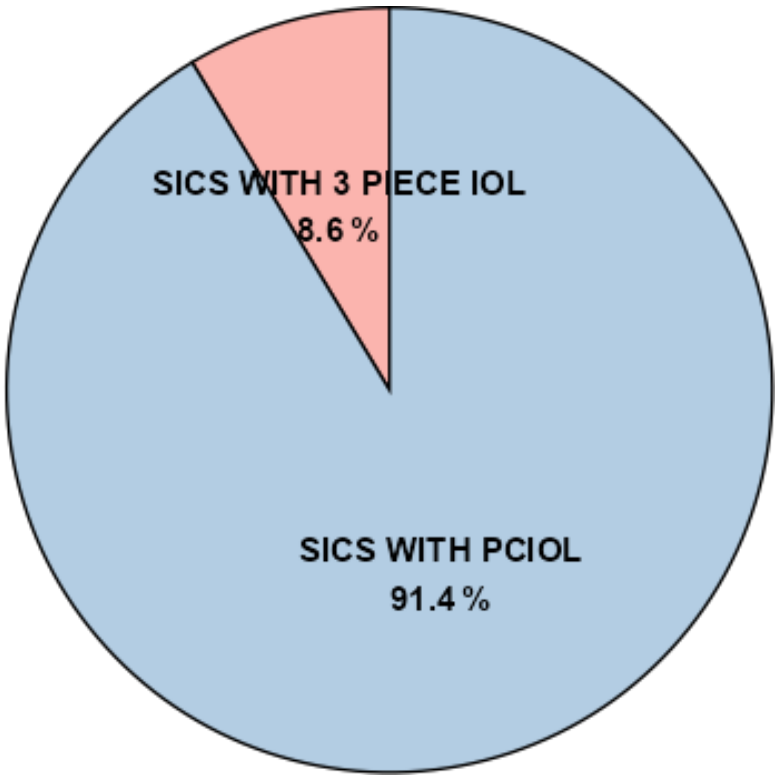

Figure 1: Surgery performed in study population

The baseline visual assessment of the 174 patients reveals a cohort with significant visual impairment, characteristic of advanced or mature cataract presentations in a tertiary care setting. In the right eye, approximately 38.5% of patients presented with profound visual loss, categorized as "Perception of Light" with accurate "Projection of Rays" (PL+ PR++++), highlighting the advanced stage of lenticular opacity at the time of clinical presentation. Only a small minority exhibited relatively preserved vision, with 23.6% achieving 6/9 and 14.9% reaching 6/12 with the aid of a pinhole (PH), representing lesser grading of cataract or pseudophakia. A notable segment (14.9%) showed moderate to severe impairment ranging from 6/18 to 6/60 (Table 1).

Table 1: Preoperative vision in Right Eye

Preop VA RE	n (%)
PL+ PR++++	67 (38.5%)
6/60 WITH PH 6/36	12 (6.9%)
6/24NIP	14 (8.0%)
6/18 WITH PH 6/9	14 (8.0%)
6/12 WITH PH6/9	26 (14.9%)
6/9 NIP	41 (23.6%)

The left eye demonstrated an even higher degree of visual morbidity compared to the right. Nearly 46.5% of patients were limited to "Perception of Light," with various degrees of ray projection accuracy (PR+++ to PR++++). Functional vision was significantly restricted; only 14.4% of the cohort maintained a visual acuity of 6/9, highlighting pseudophakia, while over 30% fell within the 6/18 to 6/60 range, representing lesser grading of cataract (Table 2).

Table 2: Preoperative vision in Left Eye

Preop VA LE	n (%)
PL+ PR++++	81 (46.6%)
6/60 NIP	26 (14.9%)
6/60 WITH PH 6/36	11 (6.3%)
6/24NIP	16 (9.2%)
6/18NIP	15 (8.6%)
6/9 NIP	25 (14.4%)

Eyelid examination showed that while 79.3% were normal, 6.3% of patients exhibited blepharitis bilaterally, and a significant portion (14.4%) presented with a benign mole on the right upper lid (Table 3). Evaluation of the conjunctiva identified Grade 1 nasal pterygium was noted in 6.3% of right eyes.

Furthermore, corneal assessment showed Arcus senilis in 35.1% of the cohort, a common finding consistent with the geriatric age profile of cataract patients (Table 4).

Table 3: Preoperative findings in lid in Right Eye and Left Eye

Parameters	n (%)
Preop Lid RE	
Blepharitis	11 (6.3%)
Mole in Upper Lid	25 (14.4%)
Normal	138 (79.3%)
Preop Lid LE	
Blepharitis	11 (6.3%)
Normal	163 (93.7%)

Table 4: Preoperative findings in conjunctiva in Right Eye and Left Eye

Preop Conjunctiva RE	n (%)
Nasal Pterygium- Grade 1	11 (6.3%)
Normal	163 (93.7%)
Preop Conjunctiva LE	
Normal	174 (100%)
Preop Cornea RE	
Arcus	61 (35.1%)
Clear	113 (64.9%)
Preop Cornea LE	
Arcus	61 (35.1%)
Clear	113 (64.9%)

Anterior Segment and Pupillary Dynamics

The anterior chamber was found to be of normal depth and devoid of abnormal contents (cells and flare) in 100% of the participants, effectively ruling out active preoperative uveitis. While the majority of patients exhibited a normal iris colour and pattern, 14.4% demonstrated atropic patches bilaterally.

Crucially, pupillary dynamics were optimal across the entire cohort (100%), with all patients presenting with 3mm, round, and regular pupils that reacted briskly to light, ensuring a predictable response to pharmacological mydriatics prior to surgery (Table 5).

Table 5: Anterior Segment and Pupillary Dynamics

Preop Anterior Chamber in Both Eyes	Overall n (%) (N=174)
Normal in Contents and Depth	174 (100.0%)
Preop Iris Both Eyes	
Atropic Patch+	25 (14.4%)
Normal Colour and Pattern	149 (85.6%)

Lenticular Status and Laterality

The distribution of lens pathology reveals a high prevalence of crystalline lens changes, with a primary focus on mature cataracts. Mature cataract was a predominantfinding in the left eye (LE) 67.8% (n=118), while the right eye (RE) showed a mature cataract in 38.5% (n=67) of cases. Notably, 46.6% of patients had already undergone surgery in the right eye (PCIOL+), compared to only 14.9% in the left eye (Table 6).

Table 6: Preoperative findings in lens of Right Eye and Left Eye

Preop Lens RE	n (%)
Mature Cataract	67 (38.5%)
SIMC	26 (14.9%)
PCIOL+	81 (46.6%)
Preop Lens LE	
Mature Cataract	118 (67.8%)
SIMC	31 (17.8%)
PCIOL+	25 (14.4%)

The presence of dense lenticular opacities significantly impeded the clinical visualisation of the posterior segment. Fundus view was obscured, for the pertaining eye with mature cataract, resulting in _No view‘ in 38.5% of right eye and 67.8% of left eye (Table 7).

Table 7: Posterior Segment Visualization and Media Clarity

Preop Fundus Media RE	n (%)
Clear	107 (61.5%)
No View	67 (38.5%)
Preop Fundus Media LE	
Clear	56 (32.2%)
No View	118 (67.8%)

The presence of dense lenticular opacities significantly impeded the clinical visualization of the posterior segment. Fundus view was obscured 44.8% of right eye and in 67.8% of left eyes (Table 8).

Table 8: Preoperative findings in disc of Right Eye and Left Eye

Preop Fundus Disc	n (%)	
	Right Eye	Left Eye
0.3:1	107 (61.5%)	56 (32.2%)
No View	67 (38.5%)	118 (67.8%)

Retinal and Macular Pathology Findings

Among the subset of patients with a clear fundus view, several significant vascular and macular abnormalities were identified, likely related to the high prevalence of systemic comorbidities like Diabetes Mellitus and Hypertension in the cohort.

Vascular Changes: Arteriolar attenuation was noted in 9.2% of left eyes, while 61.5% of right eyes with a viewable fundus showed vessels within normal limits (WNL).

Retinal Background: In patients where a viewable fundus was present, retinal background showed dot blot haemorrhages and micro aneurysms recorded in approximately 9% of both eyes.

Macular Health: Macular evaluation revealed a dull foveal reflex (FR) in 14.4% of patients bilaterally. Notably, hard exudates were identified in 9.2% of the left eyes where the fundus was visible (Table 9).

Table 9: Preoperative findings in Blood Vessels, Background and Macula of Eyes

Preop Fundus Blood Vessels RE	n (%)
WNL	107 (61.5%)
No view due to mature cataract	67 (38.5%)
Preop Fundus Blood Vessels LE	
WNL	40 (23.0%)
Arteriolar Attenutation+	16 (9.2%)
No view due to mature cataract	118 (67.8%)
Preop Fundus Background RE	
Normal	92 (52.9%)
Dot Blot Hemorhage	15 (8.6%)
No view due to mature cataract	67 (38.5%)
Preop Fundus Background LE	
Normal	40 (23.0%)
Microaneurysms, Dot Blot Hemorhages+	16 (9.2%)
No view due to mature cataract	118 (67.8%)
Preop Fundus Macula RE	
FR Dull	25 (14.4%)
FR+	82 (47.1%)
No view due to mature cataract	67 (38.5%)
Preop Fundus Macula LE	
FR+	15 (8.6%)
Dull	25 (14.4%)
Hard Exudates+	16 (9.2%)
No view due to mature cataract	118 (67.8%)

The assessment of the nasolacrimal duct via syringing demonstrated universal patency in both eyes for all the 174 participants was 100%. This finding is clinically significant as it confirms the absence of dacryocystitis or chronic lacrimal sac obstruction. Establishing a relatively sterile ocular surface.

The preoperative intraocular pressure was found to be within the normal physiological range for the entire cohort. In the right eye (RE), the mean IOP was 15.3 ± 2.5 mmHg, with a range of 11.0 to 19.0 mmHg. Similarly, the left eye (LE) demonstrated a mean

IOP of 14.5 ± 2.6 mmHg, ranging from 11.0 to 18.0 mmHg (Table 10).

Table 10: Preoperative findings of syringing and intraocular pressure

Preop Syringing RE	n (%)
PATENT	174 (100.0%)
Preop Syringing LE	
PATENT	174 (100.0%)
Preop IOP RE	mmHg
Mean (SD)	15.3 (± 2.5)
Range	11.0 - 19.0
Preop IOP LE	
Mean (SD)	14.5 (± 2.6)
Range	11.0 - 18.0

The longitudinal assessment of visual acuity (VA) in 174 patients highlights the progression of visual recovery from the immediate postoperative period to the final follow-up at six weeks. On the first postoperative day, visual recovery was largely limited, with nearly half of the patients (49.4%) had a visual aquity of 6/60 (NIP). Only 8.6% of the study population achieved a vision of 6/18. By the first postoperative week, a significant shift toward better acuity was observed. The proportion of patients with 6/60 vision dissipated, replaced by a surge in the 6/24 (32.2%) and 6/18 (28.7%) categories. During this interval, the emergence of patients achieving 6/12 with pinhole (6.9%) indicates a stabilization of vision.

By the sixth week, the cohort demonstrated substantial visual rehabilitation. The majority of patients transitioned into the higher functional brackets, with 32.2% reaching 6/18 and nearly half of the study population achieving 6/12 or better (23% at 6/12 and 21.8% at 6/9). This stage represents the "steady state" of visual outcome following Manual Small Incision Cataract Surgery (MSICS). However, a small subset (8.6%) remained at 6/60 (Table 11).

Table 11: Postoperative Visual Acuity on Day 1, Week 1 and Week 6 of the Operated Eye

	Overall (N=174)
Postop_Day1_VA	
6/60 NIP	86 (49.4%)
6/36 NIP	11 (6.3%)
6/24 NIP	25 (14.4%)
6/24 WITH PH 6/18	37 (21.3%)
6/18NIP	15 (8.6%)
Postop_Week1_VA	
6/36NIP	45 (25.9%)
6/24NIP	56 (32.2%)
6/24 WITH PH 6/18	11 (6.3%)
6/18 NIP	50 (28.7%)
6/18 WITH PH 6/12	12 (6.9%)
Postop_Week6_VA	
6/60NIP	15 (8.6%)
6/24 NIP	14 (8.0%)
6/18 NIP	56 (32.2%)
6/12 WITH PH 6/9	11 (6.3%)
6/12 NIP	40 (23.0%)
6/9 NIP	38 (21.8%)

Postoperative Ocular Adnexa and Conjunctival Evaluation

On the first postoperative day, 16.7% of patients exhibited mild lid edema, and 16.6% showed varying degrees of conjunctival congestion. However, these findings were transient; by the end of the first week, lid edema had completely subsided across the entire cohort (100% normal), and conjunctival congestion remained in only 8.6% of cases. By the sixth week, all patients demonstrated a normal conjunctival appearance. Corneal clarity, a critical factor for immediate postoperative vision, showed significant fluctuations during the follow-up period. Only 9.2% of corneas were classified as clear on Day 1. The majority of patients had Striate Keratopathy (SK+), which affected approximately 52.3% of the participants. Additionally,

Descemet‘s Membrane Folds (DMF) were observed in nearly 38% of patients. By the end of the first week, there was a notable shift toward recovery. While 17.8% of corneas had cleared completely, DMF remained the primary finding, present in

roughly 82% of patients in varying severities (ranging from "few" to more pronounced folds). By the sixth week, the majority of the cohort (63.8%) achieved corneal clarity. Persistent findings included corneal arcus (20.7%), which is a pre-existing degenerative change unrelated to surgery, and a small subset of patients (15.5%) who continued to exhibit a few DMF. These results highlight that while corneal edema and folds are the primary contributors to subnormal vision in the immediate aftermath of mature cataract surgery, they follow a predictable resolving course over six weeks (Table 12).

Table 12: Postoperative ocular adnexa on Day 1, Week 1 and Week 6 of the operated eye

	n (%)
Postop Day1 Lid	
MILD LID EDEMA	29 (16.7%)
NORMAL	145 (83.3%)
Postop Week1 Lid	
NORMAL	174 (100.0%)
Postop Week6 Lid	
NORMAL	174 (100.0%)
Postop Day1 Conjunctiva	
CONGESTION	15 (8.6%)
MILD CONGESTION	14 (8.0%)
NORMAL	145 (83.3%)
Postop Week1 Conjunctiva	
MILD CONGESTION	15 (8.6%)
NORMAL	159 (91.4%)
Postop Week6 Conjunctiva	
NORMAL	174 (100.0%)
Postop Day1 Cornea	
ARCUS, DMF	11 (6.3%)
ARCUS, SK	25 (14.4%)
SK+	66 (37.9%)
DMF	26 (14.9%)
FEW DMF	30 (17.2%)
CLEAR	16 (9.2%)
Postop Week1 Cornea	
ARCUS, DMF	36 (20.7%)
DMF	27 (15.5%)
FEW DMF	80 (46%)
CLEAR	31 (17.8%)
Postop Week6 Cornea	
FEW DMF	27 (15.5%)
ARCUS	36 (20.7%)
CLEAR	111 (63.8%)

The longitudinal assessment of the anterior chamber, iris, and pupillary response following Manual Small Incision Cataract Surgery (MSICS) revealed various outcomes. The longitudinal assessment of the anterior chamber (AC) following Manual Small Incision Cataract Surgery (MSICS) highlights a typical inflammatory trajectory and subsequent resolution. On the first postoperative day, only 19.5% of patients exhibited an AC with normal depth and contents. The majority presented with varying degrees of aqueous cells: 33.9% had 1+ cells, while a smaller subset (8.0%) demonstrated more significant 2+ cellular activity. Notably, 17.2% of cases had residual lens matter. By the first postoperative week, a significant clinical improvement was observed, with 91.4% of the cohort achieving a quiet anterior chamber with normal depth and contents. A small group with (1+ cells) remained in only 8.6% of cases, indicating that the initial inflammatory responses were largely transient and responsive to standard postoperative care. By the sixth week, the anterior chamber resolution was complete across the entire study population (100%) (Table 13).

Table 13: Postoperative anterior chamber on Day 1, Week 1 and Week 6 of the operated eye

	n (%)
Postop Day1 Anterior Chamber	
Residual Lens Matter+	30 (17.2%)
Formed, 2+ Cells	14 (8.0%)
Formed, 1+ Cells	59 (33.9%)
0.5 CELLS	37 (21.3%)
Normal Depth and Contents	34 (19.5%)
Postop Week1 Anterior Chamber	
Formed, 1+ Cells	15 (8.6%)
Normal Depth and Contents	159 (91.4%)
Postop Week6 Anterior Chamber	
Normal Depth and Contents	174 (100.0%)

On Day 1, 8.0% of patients displayed a "muddy" iris pattern and a corresponding irregular, sluggishly reacting pupil. While the iris color and pattern normalized completely by the first week, the sluggish pupillary reaction persisted in that same 8.0% of patients until the final six-week follow-up. By the conclusion of the study at week six, all patients (100%) demonstrated a normal iris pattern and a round, regular pupil with a brisk reaction to light (RTL) (Table 14).

Table 14: Postoperative iris and pupil on Day 1, Week 1 and Week 6 of the operated eye

	n (%)
Postop Day1 Iris	
Muddy	14 (8.0%)
Normal Colour and Pattern	160 (92.0%)
Postop Week1 Iris	
Normal Colour and Pattern	174 (100.0%)
Postop Week6 Iris	
Normal Colour and Pattern	174 (100.0%)
Postop Day1 Pupil	
3mm, round, regular, sluggishly reacting to light	14 (8.0%)
3mm, round, regular, reacting to light	160 (92.0%)
Postop Week1 Pupil	
3mm, round, regular, sluggishly reacting to light	14 (8.0%)
3mm, round, regular, reacting to light	160 (92.0%)
Postop Week6 Pupil	
3mm, round, regular and reacting to light	174 (100.0%)

Postoperative assessment of the lenticular status confirmed excellent surgical outcomes, with 91.4% (n=159) of patients having a stable intraocular lens (IOL) in situ on the first postoperative day. A small subset (8.6%) presented with iris pigments over the IOL. However, by the one-week follow-up, 100% of the cohort demonstrated a clear and well-positioned IOL. At the six-week interval, 92% maintained optimal IOL positioning, while 8.0% (n=14) of patients developed, Posterior Capsule Opacification (PCO).

The longitudinal monitoring of intraocular pressure revealed a stabilizing trend from the immediate postoperative period through the six-week follow-up. The mean IOP was 15.9 ± 5.2 mmHg, with a notably wide range of 10.0 to 30.0 mmHg. By the end of the first week, the mean IOP decreased and stabilized at 14.8 ± 1.7 mmHg, further settling to 14.6 ± 1.5 mmHg by the sixth week (Table 15).

Table 15: Postoperative lens and IOP on Day 1, week 1 and Week 6 of the operated eye

	n (%)
Postop Day1 Lens	
IOL IN SITU	159 (91.4%)
IOL IN SITU, IRIS PIGMENTS OVER IOL	15 (8.6%)
Postop Week1 Lens	
IOL IN SITU	174 (100.0%)
Postop Week6 Lens	
IOL IN SITU	160 (92.0%)
PCO	14 (8.0%)
Postop Day1 IOP mmHg	

	n (%)
Mean (SD)	15.9 (5.2)
Range	10.0 - 30.0
Postop Week1 IOP mmHg	
Mean (SD)	14.8 (1.7)
Range	11.0 - 18.0
Postop Week6 IOP mmHg	
Mean (SD)	14.6 (1.5)
Range	11.0 - 16.0

The longitudinal evaluation of posterior segment findings following Manual Small Incision Cataract Surgery (MSICS) provides critical insights into the anatomical recovery and the underlying pathologies that contribute to subnormal vision in mature cataract patients. On the first postoperative day, fundus visibility was compromised in approximately 34.5% of patients, characterized by hazy media that hindered a clear view of the optic disc. However, by the end of the first week, media clarity reached 100%, allowing for a definitive assessment of the optic disc, which consistently showed a physiologic cup-to-disc ratio of 0.3:1. By week six, a small subset (16.7%) developed secondary haziness, primarily due to the emergence of Posterior Capsule Opacification (PCO), which again partially obscured the disc and media. Initial evaluation of the retinal background and blood vessels on Day 1 was obscured in 25.9% of cases, due to anterior segment factors. As the media cleared by Week 1, 9.2% of the cohort exhibited arteriolar attenuation, microaneurysms, and dot-blot hemorrhages. These findings remained stable through the six-week follow-up, indicating that these are not surgical complications but rather pre-existing diabetic or hypertensive retinopathy changes that became visible only after the removal of the opaque mature lens. The macular assessment revealed significant findings regarding the functional potential of the study eyes. On Day 1, a positive foveal reflex (FR+) was visible in only 36.2% of patients. By Week 1 and persisting through Week 6, a normal foveal reflex was confirmed in 52.9% of the cohort. However, 37.9% of patients consistently exhibited a "dull" foveal reflex, and 9.2% presented with hard exudates in the macular area (Table 16).

Table 16: Postoperative posterior segment on Day 1, Week 1 and Week 6 of the operated eye

	n (%)
Postop Day1 Fundus Media	
CLEAR	114 (65.5%)
HAZY	60 (34.5%)
Postop Week1 Fundus Media	
CLEAR	174 (100.0%)
Postop Week6 Fundus Media	
CLEAR	160 (92.0%)
HAZY	14 (8.0%)
Postop Day1 Fundus Disc	
0.3:1	114 (65.5%)
HAZY	60 (34.5%)
Postop Week1 Fundus Disc	
0.3:1	174 (100.0%)
Postop Week6 Fundus Disc	
0.3:1	145 (83.3%)
HAZILY SEEN	29 (16.7%)
Postop Day1 Fundus Blood Vessels	
02:03:00	129 (74.1%)
HAZY	45 (25.9%)
Postop Week1 Fundus Blood Vessels	
2:3	158 (90.8%)
ARTERIOLAR ATTENUTATION+	16 (9.2%)
Postop Week6 Fundus Blood Vessels	
2:3	158 (90.8%)
ARTERIOLAR ATTENUTATION+	16 (9.2%)
Postop Day1 Fundus Background	
HAZY	45 (25.9%)
NORMAL	129 (74.1%)
Postop Week1 Fundus Background	
MICROANEURYSMS, DOT BLOT HEMORHAGES+	16 (9.2%)
NORMAL	158 (90.8%)

	n (%)
Postop Week6 Fundus Background	
MICROANEURYSMS, DOT BLOT HEMORHAGES+	16 (9.2%)
NORMAL	158 (90.8%)
Postop Day1 Fundus Macula	
HAZY	45 (25.9%)
DULL	66 (37.9%)
FR+	63 (36.2%)
Postop Week1 Fundus Macula	
HARD EXUDATES+	16 (9.2%)
DULL	66 (37.9%)
FR+	92 (52.9%)
Postop Week6 Fundus Macula	
HARD EXUDATES+	16 (9.2%)
DULL	66 (37.9%)
FR+	92 (52.9%)

The following analysis details the longitudinal visual recovery and the specific clinical factors contributing to subnormal vision in 174 patients following Manual Small Incision Cataract Surgery (MSICS). The study observed a significant improvement in visual acuity (VA) from the immediate postoperative period to the six-week follow-up. On Postoperative Day 1, a vast majority of the cohort (92%) exhibited subnormal vision. This proportion gradually declined to 74.7% by Week 1, eventually reaching 33.3% at Week 6. This trend indicates that while initial visual recovery is frequently delayed following mature cataract extraction, two-thirds of the patients achieve normal visual standards by the end of the 6 week period.

In the immediate aftermath of surgery (Day 1), corneal complications were the primary drivers of subnormal vision, with Striate Keratopathy (SK) and Descemet's Membrane Folds (DMF) affecting nearly 57% of patients. Other transient factors included inflammatory responses such as iridocyclitis (8%) and residual lens matter (8.6%). By the end of Week 1, persistent DMF remained the most prevalent cause of subnormal vision, identified in 48.9% of cases, though the emergence of residual astigmatism (8.6%) began to surface as corneal edema resolved.

At the Week 6 assessment, the etiology of subnormal vision shifted from surgical inflammation to refractive and structural issues. Astigmatism (both general and residual) was the leading cause, cumulatively affecting 24.7% of the participants. Refraction data confirmed this, with specific corrections such as -2.00 DC × 180° yielding a Best Corrected Visual Acuity (BCVA) of 6/9 in a subset of patients. Additionally, structural complications like Posterior Capsule Opacification (PCO) were responsible for reduced vision in 8% of the cohort. Throughout all follow-up intervals, Diabetic Retinopathy remained a fixed cause of subnormal vision in 9.2% of patients (Table 17).

Table 17: Postoperative refraction, vision and cause of subnormal vision on Day 1, Week 1 and Week 6 of the operated eye

Postop Day1 Refraction	
Not Done	174 (100.0%)
Postop Week1 Refraction	
-1.50 DC × 180°	15 (8.6%)
Not Done	159 (91.4%)
Postop Week6 Refraction	
-0.50 DS → BCVA 6/9	28 (16.1%)
-2.00 DC × 180° → BCVA 6/9	15 (8.6%)
Not Done	131 (75.3%)
Subnormal VA Day1	
Yes	160 (92.0%)
No	14 (8.0%)
Subnormal VA Week1	
Yes	130 (74.7%)
No	44 (25.3%)
Subnormal VA Week6	
Yes	58 (33.3%)
No	116 (66.7%)
Reason Cause Day1	
Diabetic Retinopathy Changes	16 (9.2%)
SK	77 (44.3%)
DMF	23 (13.2%)
Iridocyclitis	14 (8.0%)
Iris Pigments Over IOL	15 (8.6%)
Residual Lens Matter+	15 (8.6%)
NA	14 (8.0%)
Reason Cause Week1	
Resolving Inflammation	14 (8.0%)
Diabetic Retinopathy Changes	16 (9.2%)
DMF	60 (34.5%)
Few DMF	25 (14.4%)
Residual Astigmatism	15 (8.6%)
Nil	44 (25.3%)
Reason Cause Week6	
PCO	14 (8.0%)
Residual Astigmatism	43 (24.7%)
Diabetic Retinopathy Changes	16 (9.2%)
Few DMF	27 (15.5%)
Nil	30 (17.2%)
Clear	44 (25.3%)
Posterior Segment Cause Present	
Yes	16 (9.2%)
Nil	158 (90.8%)
Posterior Segment Cause Details	
Diabetic Retinopathy/Hypertensive Retonopathy	16 (9.2%)
Nil	158 (90.8%)

DISCUSSION

This prospective observational study evaluated visual outcomes and causes of subnormal vision in 174 patients undergoing manual small incision cataract surgery (MSICS) for mature cataracts at a tertiary care centre. The cohort, characterized by advanced age (mean 64.9 years), female predominance (55.2%), and high percentage of systemic comorbidity (particularly diabetes mellitus at 46%), presented with profound preoperative visual impairment and obscured posterior segment visualization. Postoperative assessment revealed early subnormal vision, primarily due to corneal pathology such as striate keratopathy (37.9%), Descemet's membrane folds (38.9%) and mild anterior chamber inflammation, which were mostly resolved by 6th week postoperatively, yielding functional vision (≥6/12) in 51.1% of cases.

However, residual astigmatism (24.7%), posterior capsule opacification (8%), and pre-existing diabetic retinopathy alterations (9.2%) were responsible for persisting subnormal vision in 33.3% of the research group at the final follow-up. The study's patient population is representative of the typical demographic trends observed in advanced cataract presentations in tertiary care facilities in developing nations. The population is

consistent with documented epidemiological trends, with a mean age of 64.9 ± 7.7 years (range 45-76 years) and a female preponderance of 55.2%. Delays in surgical intervention are caused by healthcare access inequities related to gender and advanced age. The employment profiles were dominated by housewives (55.2%), farmers (21.3%), and daily wagers (14.4%), with a startling 82.2% lacking formal schooling. These characteristics include prolonged symptom duration (mean 17.0 ± 5.4 months) and socioeconomic barriers to early eye care. In addition to explaining the high frequency of mature cataracts at presentation, these traits emphasize the necessity of focused community screening among marginalized senior populations in order to avert irreparable visual morbidity.

This cohort's preoperative ocular assessment showed significant visual impairment from mature cataracts, with 38.5% of mature cataracts in the right eye and 46.6% in the left, limiting vision to perception of light (PL). In 38.5–67.8% of instances, progressive lenticular opacification delayed presentation until posterior segment visualization was impaired. Instead of being the main causes of vision loss, anterior segment abnormalities such as arcus senilis (35.1%), grade 1 nasal pterygium (6.3%), blepharitis (6.3%), and bilateral atrophic iris patches (14.4%) were incidental age-related changes.

Universal B-scan confirmation of attached retina and anechoic vitreous (100%) was crucial for surgical clearance as dense opacities preclude direct fundus examination. It is crucial to evaluate posterior segment pathology to mainly rule out retinal detachment or vitreous hemorrhage prior to intervention in hard cataracts. These findings highlight how mature cataracts mask comorbidities, necessitating preoperative imaging to optimize postoperative visual potential and mitigate unexpected poor visual outcomes [9,10].

Systemic comorbidities were notably prevalent in this mature cataract cohort, with diabetes mellitus (DM) affecting 46% and hypertension (HTN) in 17.2%, collectively impacting 63% of patients—rates that mirror or exceed those reported in similar South Asian and global studies where DM prevalence among cataract patients ranges from 10-67% and HTN from 25-68% [2]. These conditions are clinically pivotal because they harbormicrovascularsequelae like diabetic retinopathy (DR) and hypertensive retinopathy, which is often concealed preoperatively by dense lenticular opacities, as evidenced by the obscured fundus view in 38.5-67.8% of cases here. Retinal abnormalities—microaneurysms, dot-blot hemorrhages (9.2%), arteriolar attenuation (9.2%), and macular hard exudates (9.2%)—consistently appeared as the media cleared after surgery, explaining the persistent subnormal vision in this subset and highlighting how cataract surgery reveals "hidden" retinopathy, a phenomenon associated with an increased risk of DR progression in diabetic eyes following lens extraction.

In order to maximize results and minimize unanticipated visual limits in patients with pre-existing ocular conditions, this interaction highlights the significance of thorough preoperative systemic screening, thorough B-scan imaging, and watchful postoperative retinal surveillance [11-13].

Early postoperative subnormal vision following MSICS for mature cataracts, as observed on Day 1 (92%) and Week 1 (74.7%), predominantly stemmed from transient corneal decompensation and anterior segment inflammation—manifesting as anterior chamber cells (62.5%), Descemet's membrane folds (38.9%), striate keratopathy (37.9%), mild lid edema (16.7%), conjunctival congestion (16.6%)—which are well-recognized sequelae of dense lens extraction. These findings align with reports by Koppe et al., who identified corneal edema and Descemet membrane folds as primary reasons of subnormal vision in pseudophakic patients post-cataract surgery, attributing them to factors during intraoperative irrigation and nucleus manipulation [14].

Similarly, Desai et al. emphasized that such changes, coupled with residual lens matter and iris pigments on IOL, reflect iatrogenic intraoperative trauma in mature cataract procedures compared to immature cataracts [15]. But, these changes resolve predictably with topical steroids and with time, as evidenced by near-complete corneal clarity and quiet anterior chambers by Week 6 in our series. This trajectory reinforces the efficacy of standard postoperative regimens in tackling these self-limiting factors, though it prompts discussion on endothelial-protective techniques like adequate use of viscoelastics and proper aspiration, to improve recovery in mature cataract cases [16, 17].

In the present study study, corneal decompensation and mild anterior segment inflammation, such as anterior chamber cells (62.5%), Descemet's membrane folds (38.9%), striate keratopathy (37.9%), lid edema (16.7%), and conjunctival congestion (16.6%), were the main causes of early postoperative subnormal vision on Day 1 (92%) and Week 1 (74.7%) following MSICS for mature cataracts. These closely resemble our transient residual lens matter (17.2%) and iris pigments on IOL (8.6%), as reported by Devika et al. in a prospective analysis of pseudophakic subnormal vision. They found that striate keratopathy (56%) and iridocyclitis (98%) were the dominant Day 1 culprits, frequently compounded by multiple factors in over two-thirds of cases [15].

Ward C et al. further corroborate this pattern in MSICS cohorts, noting early corneal haze and Descemet membrane folds as expected sequelae that resolve with conservative management, though more pronounced in mature cataracts due to prolonged and difficult irrigation [18]. By Week 6, the near-total resolution to corneal clarity (63.8%) and quiet chambers (100%) underscores the self-limiting nature of these changes, yet invites reflection on intraoperative strategies like viscoelastic optimization to hasten recovery and enhance patient counselling on expected visual outcomes and prognostic timelines [19, 20].

In this MSICS cohort for mature cataracts, the trajectory or visual recovery showed a strong, stepwise progression, with subnormal vision falling from 92% on Day 1 to 74.7% at Week 1 and stabilizing at 33.3% by Week 6. Additionally, as temporary corneal and inflammatory barriers cleared, there was a shift toward improved functional acuity (≥6/12 in 51.1%). This pattern is consistent with results published by Ward C et al., who found that within four weeks after MSICS, 98.1% of patients had good vision (6/6-6/18). They attributed the lower postoperative vision to corneal edema, which cleared fairly early [18]. Similarly, even in rural cohorts, 74–98% of MSICS patients achieved ≥6/18 BCVA by 2–8 weeks, according to Ehrlich J et al.59's analysis of a large series of MSICS patients, supporting the effectiveness of MSICS in resource-constrained settings despite a longer initial recovery. Jaiswal K et al. further contextualize this in mature cataracts, noting 80.4% reaching postoperative vision of 6/6-6/9 by typically 4-6 weeks [21].

Collectively, these trends validate MSICS as a high-yield intervention for advanced cataracts, though they require proper patient education on slower recovery to lower postoperative expectations from patients during early postoperative days.

The current study's progressive visual rehabilitation after MSICS—subnormal vision declining from 92% (Day 1) to 33.3% (Week 6), with 51.1% reaching ≥6/12—strongly aligns with previous research. In 105 South Indian patients, Ward C et al. found similarly good results, with 98.1% achieving ≥6/18 by four weeks and few problems (1.9% intraoperative), confirming MSICS as a safe, scalable alternative for dense mature cataracts [18].

In a similar vein, Nampradit et al. reported that 86.3% of 1281 patients who had MSICS had satisfactory eyesight (≥6/18) after a month of surgery [22]. Similar to our study, where late astigmatism is observed in 24.7% of patients, Priyanka et al. showed that MSICS produced 80% of the population with post-operative vision of ≥6/18 at three months, with higher medically

induced astigmatism (1.56D vs. 0.81D) but identical long-term function [23].

Comparisons with studies specific to mature cataract, such as Jaiswal K et al. 80.4% of mature cataract achieve a vision of ≥6/9 post-cataract surgery, further validating our trajectory [21]. Though our study‘s unmasked retinopathy (9.2%) parallels Gogate et al. emphasis on comorbidities limiting , a perfect post-operative vision, beyond surgical healing [24]. Overall, these alignments position MSICS as cost-effective for high-volume settings, with progressive PCO (8%) and pre-existing retinopathic changes underscoring the need for extended monitoring beyond six weeks.

These results have a number of practical therapeutic ramifications for the treatment of older cataract patients receiving MSICS, especially in tertiary settings with limited resources. In order to create reasonable expectations and improve compliance, preoperative counseling must first highlight the phased recovery—profound early subnormal vision resolving over 4-6 weeks—because delayed gratification can compromise satisfaction even though 66.7% of patients achieve normal vision by Week 6. Second, in order to preserve postoperative visual results, the discovery of diabetic retinopathy (9.2%) after surgery requires routine B-scan and OCT prior to surgery, fundoscopy when media clears, and quick vitreoretinal referral for hard exudates or hemorrhages. Third, superior functional vision could be achieved by treating residual astigmatism (24.7%) and PCO (8%) thru early refraction (preferably Week 4-6) and YAG capsulotomy planning, which is consistent with research supporting the use of toric IOLs or careful monitoring.

In the end, enhancing endothelium protection with dispersive viscoelastic and carefully regulated irrigation may lower Day 1 corneal decompensation (76.8%), accelerating visual recovery in patients with diabetes and the elderly. By implementing these strategies, MSICS's function in preventing blindness might be strengthened and chronic visual morbidity could be reduced in underprivileged
populations thru community-based screening.

STRENGTHS

Prospective observational design with standardized, serial assessments (Day 1, Week 1, Week 6) across multiple ocular parameters, enabling robust tracking of visual recovery dynamics. Large cohort (n=174) of mature cataract patients from a tertiary centre, enhancing statistical power and generalizability to similar high-burden settings. Comprehensive preoperative systemic screening and B-scan imaging ensured surgical safety and captured hidden comorbidities influencing outcomes.

LIMITATIONS

Single-centre study limits external validity to diverse populations or surgical techniques beyond MSICS. Short follow-up (6 weeks) precludes evaluation of further long-term complications like progressive PCO or late astigmatism stability. Lack of routine postoperative refraction in early visits and absence of endothelial cell counts may underestimate refractive and corneal contributions to subnormal vision.

CONCLUSION

Manual small incision cataract surgery proved effective for visual recovery in patients with mature cataracts, reducing subnormal vision from 92% on Day 1 to 33.3% by Week 6, with 51.1% achieving functional acuity (>6/12) despite early corneal decompensation and inflammation. Persistent limitations from astigmatism (24.7%), posterior capsule opacification (8%) and previously unrecognized diabetic retinopathy (9.2%) highlight the interaction of surgical healing, refractive correction and comorbidity management in determining final outcomes. These findings confirm the value of MSICS in high-volume settings while supporting improved preoperative retinal screening, patient education on recovery timelines and careful follow up to maximize outcomes and manage treatable posterior segment complications.

REFERENCES

1. Wan Z, Bai J, Wang W, Peng Q. Global, regional, and national burden of cataract among older adults from 1990 to 2021: a comprehensive analysis based on the global burden of disease study 2021. Front Med. 2025 Sep 4;12. doi:10.3389/fmed.2025.1679828
2. Lin L, Liang Y, Jiang G, Gan Q, Yang T, Liao P, et al. Global, regional, and national burden of cataract: A comprehensive analysis and projections from 1990 to 2021. PLoS One. 2025 Jun 23;20(6):e0326263. doi:10.1371/journal.pone.0326263 PubMed PMID: 40549768; PubMed Central PMCID: PMC12185006.
3. Singh S, Pardhan S, Kulothungan V, Swaminathan G, Ravichandran JS, Ganesan S, et al. The prevalence and risk factors for cataract in rural and urban India. Indian J Ophthalmol. 2019 Apr;67(4):477–83. doi:10.4103/ijo.IJO_1127_17 PubMed PMID: 30900578; PubMed Central PMCID: PMC6446631.
4. Vashist P, Talwar B, Gogoi M, Maraini G, Camparini M, Ravindran RD, et al. Prevalence of cataract in an older population in India: the India study of age-related eye disease. Ophthalmology. 2011 Feb;118(2):272-278.e1-2. doi:10.1016/j.ophtha.2010.05.020 PubMed PMID: 20801514; PubMed Central PMCID: PMC3146699.
5. Kumar J, Tiwari PK. Post Operative Visual Outcomes after Cataract Surgery in Tertiary Care Eye Hospital: Observational Study [Internet]. [cited 2026 Mar 29]. Available from: https://www.academia.edu/download/64656227/G1908013339.pdf
6. Ahangar A, Sufi AR, Nabi M, Rather MH. Causes of subnormal vision in patients following cataract surgery at a tertiary hospital in Kashmir. Int Ophthalmol. 2014 Oct;34(5):1083–90. doi:10.1007/s10792-014-9913-0
7. Addagarla SR. Post operative visual outcomes after cataract surgery in a teaching hospital. Indian Journal of Clinical and Experimental Ophthalmology. 2025 Jul 28;6(1):29–34. doi:10.18231/j.ijceo.2020.008
8. Ocular Risk Factors Affecting Intraoperative Complications In Mature Cataract Surgery | Semantic Scholar [Internet]. [cited 2026 Mar 29]. Available from: https://www.semanticscholar.org/paper/Ocular-Risk-Factors-Affecting-Intraoperative-In-C%C3%B6merter-Un/88886711cdef304173acc95853b3b3aa018cb0f4
9. Al-Abri M, Mal W, Al-Fadhil N. Cataract Surgery Complications: Vitreo-Retina Perspectives. In: Cataract - An Update on Clinical and Surgical Management [Internet]. IntechOpen; 2023 [cited 2026 Apr 18]. Available from: https://www.intechopen.com/chapters/1135815 doi:10.5772/intechopen.1001596
10. Preoperative assessment and biometry. In: Cataracts in adults: management [Internet]. National Institute for Health and Care Excellence (NICE); 2017 [cited 2026 Apr 18]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK536589/
11. Becker C, Schneider C, Aballéa S, Bailey C, Bourne R, Jick S, et al. Cataract in patients with diabetes mellitus—incidence rates in the UK and risk factors. Eye. 2018 Jun;32(6):1028–35. doi:10.1038/s41433-017-0003-1
12. Ivanescu A, Popescu S, Gaita L, Albai O, Braha A, Timar R. Risk Factors for Cataracts in Patients with Diabetes Mellitus. J Clin Med. 2024 Nov 21;13(23):7005. doi:10.3390/jcm13237005 PubMed PMID: 39685467; PubMed Central PMCID: PMC11641940.
13. Tham YC, Liu L, Rim TH, Zhang L, Majithia S, Chee ML, et al. Association of Cataract Surgery With Risk of

Diabetic Retinopathy Among Asian Participants in the Singapore Epidemiology of Eye Diseases Study. JAMA Netw Open. 2020 Jun 16;3(6):e208035. doi:10.1001/jamanetworkopen.2020.8035

14. Köppe MK, Khoramnia R, Auffarth GU, Augustin VA. Pseudophakic corneal edema caused by Descemet membrane detachment using high-resolution swept-source OCT imaging. GMS Ophthalmol Cases. 2024 Sep 23;14:Doc12. doi:10.3205/oc000244 PubMed PMID: 39385767; PubMed Central PMCID: PMC11462704.
15. Parameshwar D, Aroor CD, Kadri R, Kudva AA, Shetty A, Hegde S. A Prospective Study of Post Operative Subnormal Vision in Pseudophakics. European Journal of Cardiovascular Medicine. 2025 Apr 14;15:384–8. doi:10.61336/ejcm/25-04-71
16. Zhang R. Factors Affecting Early Postoperative Visual Acuity in Cataract Patients with High Myopia [Internet]. doi:10.23937/2378-346X/1410117
17. Tsegaw GW, Dea YC, Mengesha MM. Predictors of time to recovery from cataract surgery among cataract patients at Menelik II Comprehensive Specialized Hospital: a retrospective follow up study. BMC Ophthalmol. 2025 Apr 25;25:246. doi:10.1186/s12886-025-04053-4 PubMed PMID: 40281445; PubMed Central PMCID: PMC12023361.
18. Warad C, Tenagi A, Satarasi P, Goyal D, Mendpara R, Harakuni U, et al. Visual Outcome Following Manual Small Incision Cataract Surgery at a Tertiary Center in South India. Cureus. 13(12):e20687. doi:10.7759/cureus.20687 PubMed PMID: 35106227; PubMed Central PMCID: PMC8786263.
19. Aadil M, Kumari R. Day-1 Postoperative Complications Following Small Incision Cataract Surgery (SICS): An Institution-based Observational Study. Asian Journal of Research and Reports in Ophthalmology. 2026 Feb 9;9(1):35–42. doi:10.9734/ajrrop/2026/v9i1143
20. Sharma N, Singhal D, Nair SP, Sahay P, Sreeshankar S, Maharana PK. Corneal edema after phacoemulsification. Indian J Ophthalmol. 2017 Dec;65(12):1381–9. doi:10.4103/ijo.IJO_871_17 PubMed PMID: 29208818; PubMed Central PMCID: PMC5742966.
21. Jaiswal K, Rathi R, Jain A, Gaur A, Nema N. Visual Outcome and Complications in White Mature Cataracts after Phacoemulsification. Middle East Afr J Ophthalmol. 2024 Sep 13;30(3):129–35. doi:10.4103/meajo.meajo_100_23 PubMed PMID: 39444991; PubMed Central PMCID: PMC11495291
22. Nampradit K, Kongsap P. The visual outcomes and complications of manual small incision cataract surgery and phacoemulsification: long term results. Rom J Ophthalmol. 2021;65(1):31–7. doi:10.22336/rjo.2021.7 PubMed PMID: 33817431; PubMed Central PMCID: PMC7995515.
23. Priyanka, Khan K, Kishnani M, Dube M. To compare postoperative astigmatism and visual outcome following phacoemulsification versus Manual Small Incision Cataract Surgery (MSICS) seen at tertiary care center. J Clin Res Ophthalmol. 2022 Jan 7;9(1):001–4. doi:10.17352/2455-1414.000094
24. Gogate PM, Kulkarni SR, Krishnaiah S, Deshpande RD, Joshi SA, Palimkar A, et al. Safety and efficacy of phacoemulsification compared with manual small-incision cataract surgery by a randomized controlled clinical trial: six-week results. Ophthalmology. 2005 May;112(5):869–74. doi:10.1016/j.ophtha.2004.11.055 PubMed PMID: 15878068.