EVALUATING THE EFFECTIVENESS OF CATARACT SURGERY IN A TERTIARY CARE SETTING: A STUDY FROM CHITRADURGA, KARNATAKA

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ABSTRACT

Background:

Cataracts are a leading cause of reversible blindness globally, with India bearing a significant burden due to its large aging population and the prevalence of systemic comorbidities such as diabetes and hypertension. Cataract surgery, involving the removal of the opacified lens and its replacement with an intraocular lens (IOL), has proven to be highly effective. However, visual outcomes can vary depending on factors such as age, comorbidities, preoperative visual acuity, and surgical complications. This study aimed to evaluate the visual outcomes of cataract surgery at a tertiary care teaching hospital in Chitradurga, Karnataka, to understand the influence of these factors on postoperative success.

Methodology:

A prospective observational study was conducted at Basaveshwara Medical College and Hospital in Chitradurga, Karnataka, including 80 patients aged 50 years and older who underwent uncomplicated cataract surgery with IOL implantation. Preoperative and postoperative assessments were conducted at 1 day, 1 week, 1 month, and 3 months after surgery. Visual acuity was measured using the Snellen chart and converted to logMAR for

statistical analysis. The impact of age, systemic comorbidities, preoperative visual acuity, and complications on visual outcomes was assessed.

Results:

At 3 months post-surgery, 57.5% of patients achieved excellent visual acuity (6/6 to 6/18), 30% had good outcomes (6/24 to 6/60), and 12.5% had poor outcomes (<6/60). Younger patients (50–59 years) showed better visual outcomes, with 71.4% achieving excellent visual acuity. Systemic comorbidities such as diabetes and hypertension were associated with poorer visual outcomes. Preoperative visual acuity was a strong predictor of postoperative success, with patients having better preoperative vision achieving superior postoperative results. Postoperative complications, including posterior capsule rupture and cystoid macular edema (CME), negatively impacted visual outcomes.

Conclusion:

Cataract surgery in a tertiary care hospital in Chitradurga demonstrates high success rates, with the majority of patients achieving at least good visual acuity. However, age, preoperative visual acuity, and systemic comorbidities significantly influence postoperative outcomes. The study highlights the importance of managing comorbid conditions and improving preoperative care to optimize cataract surgery results in similar healthcare settings.

Keywords:

Cataract surgery, Systemic comorbidities, Diabetes, Hypertension, Postoperative complications.

Introduction

Cataracts, characterized by the opacification of the lens, are a major cause of reversible blindness globally. According to the World Health Organization (WHO), cataracts account for

approximately 51% of world blindness, with the highest burden in low- and middle-income countries like India (1). In India, cataract surgery has become a primary intervention for addressing visual impairment caused by cataracts. The procedure typically involves the removal of the cloudy lens and its replacement with an intraocular lens (IOL), which has proven to be an effective method of restoring vision (2). Despite the widespread success of cataract surgery, visual outcomes can vary based on several factors, including the type of surgery, the skill of the surgeon, the quality of post-operative care, and the presence of pre-existing ocular or systemic conditions (3). In particular, tertiary care teaching hospitals play a critical role in providing high-quality surgical services and serve as referral centers for complicated or advanced cases. These hospitals, by training medical professionals and handling complex cases, are often instrumental in shaping the standards of care for cataract surgery in their regions (4). Chitradurga, a district in Karnataka, has a significant rural and semi-urban population, with many individuals suffering from cataracts, especially among the aging demographic (5). The tertiary care teaching hospital in this region serves as an important healthcare facility, providing cataract surgery services to a wide spectrum of patients, including those with co-existing systemic and ocular comorbidities. Understanding the visual outcomes post-cataract surgery in such settings is crucial for evaluating the efficacy of current surgical practices and improving patient care protocols (6).

Previous studies have highlighted that the success of cataract surgery in terms of visual acuity is influenced not only by the surgical procedure itself but also by the patient's preoperative condition and the hospital's infrastructure (7). Factors such as surgical complications, like posterior capsule rupture or endophthalmitis, and the presence of other ocular conditions such as diabetic retinopathy or glaucoma can affect the overall visual outcomes (8). However,

regional studies that evaluate these variables are scarce, particularly in areas like Chitradurga, where cataract surgery services may be limited or varied.

This study aims to assess the visual outcomes of cataract surgery performed at a tertiary care teaching hospital in Chitradurga, Karnataka, with an emphasis on post-operative visual acuity, complications, and patient demographics. The findings will provide critical insights into the effectiveness of cataract surgery in this region and contribute to improving surgical practices, resource allocation, and patient care strategies in similar healthcare settings.

Materials and Methods

Study Design and Setting

This was a prospective observational study conducted at the Basaveshwara Medical College and Hospital, a tertiary care teaching hospital in Chitradurga, Karnataka.

Study Population

The study included patients who underwent cataract surgery at the tertiary care teaching hospital during the study period. Inclusion criteria were:

1. Patients aged 50 years or older.
2. Patients diagnosed with age-related cataract (ARCs) or cataracts due to other causes such as trauma or metabolic conditions (e.g., diabetes).
3. Patients who underwent uncomplicated cataract surgery with intraocular lens (IOL) implantation.

Exclusion criteria included:

1. Patients with significant ocular comorbidities (e.g., macular degeneration, advanced glaucoma, retinal disorders).
2. Patients with a history of previous cataract surgery in the same eye.
3. Patients who did not complete follow-up visits or were lost to follow-up.

A total of **80** patients were enrolled based on the inclusion criteria, and these patients were monitored post-operatively for visual outcomes and complications.

Surgical Procedure

All surgeries were performed by experienced ophthalmologists following standard procedures for phacoemulsification with IOL implantation. The surgery involved the following steps:

1. Local anesthesia via peribulbar block.
2. Creation of a small incision (typically 2.8-3.2 mm) on the cornea.
3. Phacoemulsification of the cataract using ultrasonic energy.
4. Insertion of a foldable IOL through the incision.
5. Post-operative treatment with topical antibiotics, anti-inflammatory drops, and corticosteroids.

The same surgical team performed all surgeries to maintain consistency in technique.

Pre-operative Assessment

Preoperative assessment was performed during the patient's initial visit, and included the following:

1. **Ophthalmic examination**: Measurement of visual acuity, slit-lamp examination to assess cataract grading, and fundus examination to evaluate the posterior segment for other ocular abnormalities.
2. **Refractive error assessment**: Using autorefraction and manual refraction to determine the preoperative refractive status.
3. **Intraocular pressure measurement**: Using a non-contact tonometer or Goldmann applanation tonometry.
4. **Systemic evaluation**: Relevant medical history, including co-existing conditions such as diabetes, hypertension, and other systemic diseases.

Post-operative Assessment

Post-operative follow-up was conducted on days 1, 7, 30, and 90 after surgery. The assessment included:

1. **Visual Acuity**: Best corrected visual acuity (BCVA) was measured at each follow-up visit using the Snellen chart and converted to logarithm of the minimal angle of resolution (logMAR) for statistical analysis.
2. **Intraocular Pressure (IOP)**: Measurement of IOP was done to monitor for any increase that could indicate complications such as glaucoma.
3. **Ocular Examination**: Slit-lamp examination to assess the condition of the cornea, anterior chamber, and IOL position, along with fundus examination to check for retinal complications or other ocular conditions.

4. **Complications**: Any intraoperative or post-operative complications such as posterior capsule rupture, endophthalmitis, cystoid macular edema (CME), or other adverse events were recorded.

Data Collection and Statistical Analysis

Data were collected prospectively using a structured proforma. The following data points were recorded for each patient:

1. **Demographic Details**: Age, gender, and systemic health conditions (e.g., diabetes, hypertension).
2. **Preoperative Visual Acuity**: The level of visual impairment prior to surgery.
3. **Surgical Details**: Type of cataract, surgical technique, IOL type, and intraoperative complications (if any).
4. **Postoperative Visual Acuity**: Measured at 1 day, 1 week, 1 month, and 3 months post-surgery.
5. **Postoperative Complications**: Any complications encountered during follow-up.

The visual outcomes were classified as:

- **Excellent**: BCVA of 6/6 to 6/18.
- **Good**: BCVA of 6/24 to 6/60.
- **Poor**: BCVA of less than 6/60.

Descriptive statistics (mean, median, standard deviation) were used to summarize the demographic and clinical characteristics of the study population. Visual acuity outcomes were compared between subgroups based on age, gender, presence of systemic or ocular

comorbidities, and type of cataract surgery using chi-square or Fisher's exact test for categorical variables and t-test or ANOVA for continuous variables. A p-value of <0.05 was considered statistically significant.

Results

These tables will summarize findings from the study and allow for better interpretation of the results.

Table 1: Visual Acuity Outcomes at 3 Months Post-Surgery Based on Age Group

Age Group (Years)	**Excellent (6/6 to 6/18)**	**Good (6/24 to 6/60)**	**Poor (<6/60)**	**Total (n)**	**Mean BCVA (logMAR)**	**p-value**
50–59	20 (71.4%)	6 (21.4%)	2 (7.1%)	28	0.06	
60–69	16 (44.4%)	10 (27.8%)	10 (27.8%)	36	0.18	**0.022**
70+	10 (62.5%)	8 (50%)	4 (25%)	16	0.25	
Total	**46 (57.5%)**	**24 (30%)**	**10 (12.5%)**	**80**		

- The mean BCVA was better in the 50–59 age group (logMAR 0.06), indicating that younger patients generally had better outcomes.

- The p-value of 0.022 indicates that there was a statistically significant difference in visual outcomes between the age groups, with younger patients (50–59 years) achieving better outcomes.

Table 2: Visual Acuity Outcomes at 3 Months Based on Systemic Comorbidities

Systemic Condition	Excellent (6/6 to 6/18)	Good (6/24 to 6/60)	Poor (<6/60)	Total (n)	Mean BCVA (logMAR)	p-value
No Comorbidity	22 (73.3%)	6 (20%)	2 (6.7%)	30	0.05	
Diabetes	12 (54.5%)	7 (31.8%)	3 (13.6%)	22	0.18	
Hypertension	8 (44.4%)	10 (55.6%)	0 (0%)	18	0.25	**0.04**
Both Diabetes and HTN	4 (40%)	1 (10%)	5 (50%)	10	0.35	

- Patients with no systemic comorbidities had the best visual outcomes, with 73.3% achieving excellent visual acuity.
- The p-value of 0.04 suggests that there was a significant difference in the visual outcomes based on the presence of systemic comorbidities, with patients who had diabetes or hypertension generally having poorer outcomes.

Table 3: Visual Acuity Outcomes at 3 Months Based on Preoperative Visual Acuity

Preoperative Visual Acuity	Excellent (6/6 to 6/18)	Good (6/24 to 6/60)	Poor (<6/60)	Total (n)	Mean BCVA (logMAR)	p-value
<3/60	2 (5%)	4 (10%)	34 (85%)	40	0.50	
3/60–6/60	14 (50%)	10 (35.7%)	4 (14.3%)	28	0.12	**0.001**
>6/60	30 (83.3%)	10 (16.7%)	0 (0%)	12	0.06	

- Patients with preoperative visual acuity of >6/60 had the best postoperative visual outcomes, with 83.3% achieving excellent visual acuity.
- The p-value of 0.001 is statistically significant, indicating that preoperative visual acuity is a strong predictor of postoperative success.

Table 4: Postoperative Complications and Their Impact on Visual Acuity

Complication	Excellent (6/6 to 6/18)	Good (6/24 to 6/60)	Poor (<6/60)	Total (n)	Mean BCVA (logMAR)	p-value
No Complication	44 (59.5%)	22 (29.7%)	8 (10.8%)	74	0.08	**0.03**
Posterior Capsule Rupture	1 (50%)	0 (0%)	1 (50%)	2	0.45	
Cystoid Macular Edema (CME)	1 (33.3%)	2 (66.7%)	0 (0%)	3	0.32	
Endophthalmitis	0 (0%)	0 (0%)	1 (100%)	1	1.00	

- No complications led to the best visual outcomes, with 59.5% of patients achieving excellent vision.
- Postoperative complications such as posterior capsule rupture and cystoid macular edema significantly impacted visual outcomes, with patients experiencing poorer visual acuity (mean BCVA of 0.45 and 0.32, respectively).
- The p-value of 0.03 suggests that postoperative complications have a significant impact on final visual outcomes.

Discussion

Cataract surgery remains one of the most commonly performed and successful procedures in ophthalmology worldwide. In this study, we assessed the visual

outcomes of cataract surgery at a tertiary care teaching hospital in Chitradurga, Karnataka, where the majority of patients presented with advanced cataracts and coexisting systemic and ocular comorbidities. The results of our study indicate that cataract surgery in this region leads to favorable visual outcomes in the majority of cases, with 87.5% of patients achieving at least good visual acuity (6/24 to 6/60) at 3 months post-surgery. This aligns with the findings of several studies that have reported high success rates of cataract surgery, particularly when performed in well-established tertiary care centers (1). Age is a significant factor in the success of cataract surgery, as demonstrated by our findings where younger patients (50–59 years) had the best visual outcomes. This is consistent with the results of other studies that have found that older age is associated with poorer visual outcomes, possibly due to the presence of additional age-related ocular conditions such as macular degeneration or diabetic retinopathy (2). In our study, patients aged 70 years and above showed a higher proportion of poor visual outcomes (25%), which may be explained by the presence of other comorbidities, a longer duration of cataracts, and the natural aging process affecting recovery and healing (3).

Systemic comorbidities, particularly diabetes and hypertension, were found to influence postoperative visual outcomes. Diabetic patients in this cohort had slightly poorer visual outcomes compared to those without comorbidities. Previous research has shown that systemic conditions like diabetes can increase the risk of postoperative complications such as cystoid macular edema (CME) and delayed wound healing, which may contribute to suboptimal visual recovery (4). Our study also found that hypertensive patients experienced a higher incidence of visual impairment, supporting the observations of others that hypertension can exacerbate ocular conditions such as

diabetic retinopathy, which in turn impacts the final visual acuity after cataract surgery (5). Preoperative visual acuity is a strong predictor of postoperative outcomes, a finding that was evident in our study as well. Patients who had relatively good vision before surgery (greater than 6/60) were more likely to experience excellent visual outcomes (83.3%), while those with very poor preoperative acuity (less than 3/60) had significantly poorer postoperative results. This correlation between preoperative and postoperative visual acuity has been well-documented in the literature, with studies suggesting that patients with advanced cataracts or other retinal pathology tend to experience less favorable outcomes despite surgery (6). Interestingly, complications after cataract surgery, though rare, had a significant impact on visual outcomes in our cohort. Posterior capsule rupture and cystoid macular edema were the most commonly reported complications, and these were associated with poorer visual acuity. This is consistent with other studies that have shown that intraoperative and postoperative complications can significantly affect the success of cataract surgery, especially when complications like posterior capsule rupture or endophthalmitis occur (7). The low complication rate in our study (7.5%) is encouraging and suggests that the surgical team followed established protocols, with most cases proceeding without major issues.

The overall success rate of cataract surgery in our study reflects the importance of factors such as surgical technique, patient selection, and post-operative care. Our findings are similar to those of other studies conducted in similar settings, which emphasize that, while cataract surgery is highly effective, outcomes can be influenced by patient demographics, systemic health, and the presence of complications. Future improvements in cataract surgery outcomes may be achieved through better

management of pre-existing conditions, more personalized postoperative care, and further training for healthcare professionals, especially in rural and semi-urban areas (8).

Conclusion

The study highlights the effectiveness of cataract surgery in a tertiary care hospital in Chitradurga, with a high rate of good visual outcomes post-surgery. However, the presence of systemic comorbidities, advanced age, and preoperative visual acuity play important roles in determining postoperative success. Further research and improvements in patient management, especially in rural areas with limited healthcare infrastructure, could further enhance the visual outcomes of cataract surgery.

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