ORIGINAL RESEARCH

Evaluating Vision Restoration Outcomes Following Cataract Surgery Patients: A Cross-Sectional Study

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ABSTRACT

Background: Untreated cataracts continue to be the leading cause of blindness globally, despite the fact that this condition can be effectively and affordably addressed through a standard surgical procedure.Hence; the present study was conducted for assessing the visual outcome following cataract surgery. **Materials & methods:**A cohort of 100 patients, all diagnosed with cataract as the primary cause of their visual impairment and scheduled for surgical intervention, participated in this study. The inclusion criteria specified that patients must have a visual acuity of less than 6/60 in the affected eye due to cataract. An appropriate anesthetic was administered for each procedure. The presenting and best-corrected vision of the operated eye were evaluated on the day of discharge and again six weeks after surgery. Visual improvement was quantified using the World Health Organization's recommended method for assessing postoperative visual status. All data were documented in a Microsoft Excel spreadsheet and analyzed using SPSS software.**Results:**Out of 200 patients, 96 underwent surgery on the right eye. Among these, 56 were males (28% of total patients) and 40 were females (20% of total patients).A total of 92 patients had surgery on the left eye, with 48 males (24%) and 44 females (22%). twelve patients underwent bilateral cataract surgeries, comprising six males (3%) and six females (3%).The study included 110 males (55%) and 90 females (45%). The mean age of the study participants was calculated to be approximately 62.50 years, with male and female participants having estimated mean ages of 63.42 and 65.50 years, respectively.

majority (84%) of patients exhibited severe visual impairment preoperatively, with visual acuity less than 3/60.Only 4% had moderate visual impairment (6/24 to 6/60), and none had visual acuity better than 6/60.Postoperatively, there was a substantial improvement in visual acuity. Specifically, 22% of patients achieved visual acuity between 6/60 to 6/18, and 38% attained moderate visual acuity (6/24 to 6/60). The number of patients with severe visual impairment (less than 3/60) decreased to 30%. These improvements are statistically significant, with a p-value of 0.001.**Conclusion:**To optimize outcomes in cataract surgeries, eye care staff can take several key steps like Promoting cataract surgeries at an earlier age to achieve better results and improve the patient's quality of life & providing thorough counseling to manage patient expectations, especially in cases with co-morbidities. This helps enhance patient satisfaction and outcomes by ensuring realistic expectations and informed decision-making.

Key words: Cataract surgery, Visual

INTRODUCTION

Untreated cataracts continue to be the leading cause of blindness globally, despite the fact that this condition can be effectively and affordably addressed through a standard surgical procedure. When performed by proficient surgeons, 90% of patients are able to attain satisfactory vision (best-corrected visual acuity of 6/12 or superior), and a similar percentage express contentment with their surgical outcomes.[1- 3] However, suboptimal surgical results and limited access to surgical interventions pose significant barriers to

reducing cataract-related blindness, especially in resource-limited environments. Enhancing surgical capabilities by training more surgeons and supplying necessary equipment could potentially mitigate these challenges, but achieving success also relies on the monitoring of surgical quality.[4- 6] Traditionally, visual acuity following cataract surgery has been evaluated weeks to months post-operation, as wound healing can alter refractive power, and the gradual resolution of common complications, such as corneal edema, can lead to significant vision improvement. Conversely, visual deterioration due to surgical complications can also occur. In numerous developing nations, the rates of postoperative follow-up are alarmingly low, ranging from 20% to 30%, attributed to inadequate transportation systems, financial burdens on patients, and a lack of communication regarding the advantages of follow-up visits, which may include the provision of corrective eyewear. The low rates of postoperative follow-up and the uncertainty regarding whether returning patients accurately represent the operated population complicate the evaluation of performance against established objective standards. The World Health Organization recommends that 80% of patients should achieve uncorrected visual acuity of 6/18 or better in the operated eye, although it does not specify a particular timeframe for assessment following surgery.[7- 9].

AIM AND OBJECTIVES

Aim:

The primary aim of this study was to evaluate the effectiveness of cataract surgery in improving visual acuity among patients with significant preoperative visual impairment.

Objectives:

1. To assess the demographic characteristics (age, gender) of patients undergoing cataract surgery.
2. To compare preoperative and postoperative visual acuity levels in patients undergoing cataract surgery.
3. To determine the statistical significance of changes in visual acuity following cataract surgery.
4. To evaluate the distribution of surgical procedures (Small Incision Cataract Surgery vs. Phacoemulsification) among the study population.
5. To analyze the laterality (right eye, left eye, bilateral) of cataract surgeries performed.

MATERIALS & METHODS

Study Design

- **Type:** Population-based **cross-sectional observational** study.

Study Population

- Target Group: Adults aged 50 years and older.
- Sample Size:200 patients diagnosed with cataract as the primary cause of visual impairment.
- Recruitment Criteria**:** Individuals with visual acuity <6/60 due to cataract in at least one eye who underwent surgery.

Study Place

The study was conducted at Ophthalmology outpatient departments of Department of Ophthalmology, Major S.D. Singh Medical College & Hospital, Farrukhabad, Uttar Pradesh, India.

Study Duration

- The study was carried out over a period of one years and six months, from June 2014 to December 2015, allowing for recruitment, examination, and analysis.
- Follow-up: Assessment of visual outcomes was done six weeks post-surgery.

Ethical Considerations

- Consent:Written informed consent was obtained from all participants prior to enrollment.
- Ethics Approval: While not explicitly stated, it is implied that the study adhered to ethical standards and participants referred for further care received free treatment.

Inclusion Criteria

- Adults aged ≥50 years.
- Diagnosed with cataract as the primary cause of visual impairment.
- Underwent cataract surgery within the last year.
- Visual acuity <6/60 in the affected eye due to cataract.

Exclusion Criteria

- Individuals with visual impairment due to non-cataract causes.
- Incomplete medical or surgical records.
- Those unable or unwilling to give consent.
- Patients lost to follow-up or not contactable even after home visits.

Study Procedure

- **Community Identification:** Health aides identified cataract-operated individuals using the community surveillance system.
- **Recruitment and Examination:**

- Initial examinations done in village-based study clinics.
- **PVA** and **BCVA** measured with logMAR E chart.
- Retinoscopy performed with Heine retinoscope.
- Clinical eye examination using handheld slit lamp and indirect ophthalmoscopy (after pupil dilation).

- **Home Visits for Non-Responders:** Visual acuity checked with logMAR chart at 3 m; anterior segment exam and dilated ophthalmoscopy performed.
- **Surgical Details:** Type of surgery, complications, and intraocular lens status noted from discharge summaries or clinical findings.
- **Questionnaire:** Administered by trained social workers, capturing demographics, socioeconomic status, surgical details, and follow-up data.

Outcome Measures

- **Primary Outcome:Visual acuity (VA)** post cataract surgery, measured as:
- **Good:** VA ≥ 6/18 (logMAR ≤0.47)
- **Fair:** VA < 6/18 to ≥ 6/60 (logMAR ≥0.48–1.0)
- **Poor:** VA < 6/60 (logMAR>1.0)

- **Additional Measures:** Cause of poor visual outcome, type of surgery, and association with literacy, SES, comorbidities, and time since surgery.

Statistical Analysis

- Data managed in **Microsoft Excel** and analyzed using IBM SPSS version 20.0.
- **Descriptive statistics:** Frequencies, proportions, and 95% confidence intervals (CIs).
- **Inferential statistics:**
- **Chi-square test for trend** – to evaluate effect of time since surgery.
- **Logistic regression models** – to determine factors associated with poor outcomes (adjusted for age, sex, literacy, SES, etc.).
- **Student's t-test** – for comparing mean values where applicable.

RESULTS

Table 1: Demographic Characteristics of Study Participants (n = 100)

Demographic Variable	Category	Number of Patients (n)	Percentage (%)
Age Group (years)	50–59	52	26%
	60–69	76	38%
	≥70	72	36%
Gender	Male	110	55%
	Female	90	45%
Type of Surgery	Small Incision Cataract Surgery (SICS)	126	63%
	Phacoemulsification	74	37%

Table 1 and figure I, show the demographic characteristics of 200 patients who underwent cataract surgery, focusing on age group, gender, and type of surgery. The majority of patients were aged 60–69 years (38%), followed by those aged ≥70 years (36%), and 50–59 years (26%). This distribution reflects the higher prevalence of cataracts among older adults, consistent with global trends.There was a slight male predominance, with 55% males and 45% females. This may be influenced by factors such as healthcare-seeking behaviour and accessibility.Small Incision Cataract Surgery (SICS) was performed in 63% of cases, while Phacoemulsification was performed in 37%. The higher rate of SICS may be due to its cost-effectiveness and suitability in resource-limited settings.

Table 2: Gender wise and side wise distribution of the patients

Gender	Right Eye	Left Eye	Bilateral	Total
Male	56	48	6	110
Female	40	44	6	90
Total	96	92	12	200

Table 2 show that out of 200 patients, 96 underwent surgery on the right eye. Among these, 56 were males (28% of total patients) and 40 were females (20% of total patients).A total of 92 patients had surgery on the left eye, with 48 males (24%) and 44 females (22%).twelve patients underwent bilateral cataract surgeries, comprising 6 males (3%) and 6 females (3%).The study included 110 males (55%) and 90 females (45%).The mean age of the study participants was calculated to be approximately 62.50 years, with male and female participants having estimated mean ages of 63.42 and 65.50 years, respectively.

Table 3: Comparison of Preoperative and Postoperative Visual Acuity (n = 100)

Visual Acuity Range	Preoperative vision(n)	Postoperative vision (n)	p-value
6/60 to 6/18	0	44	0.001 (Significant)
6/24 to 6/60	8	76	
Less than 6/60 to 3/60	24	20	
Less than 3/60	168	60	
Total	**200**	**200**	

Table 3 show thatin the present study, a significant majority (84%) of patients exhibited severe visual impairment preoperatively, with visual acuity less than 3/60.Only 4% had moderate visual impairment (6/24 to 6/60), and none had visual acuity better than 6/60.

Postoperatively, there was a substantial improvement in visual acuity.Specifically, 22% of patients achieved visual acuity between 6/60 to 6/18, and 38% attained moderate visual acuity (6/24 to 6/60).The number of patients with severe visual impairment (less than 3/60) decreased to 30%.These improvements are statistically significant, with a p-value of 0.001.

DISCUSSION

Cataracts continue to be the primary cause of blindness in India. The National Program for Control of Blindness (NPCB) has primarily focused on addressing cataract-related blindness. Consequently, the annual number of cataract surgeries rose from 1.2 million in 1992 to 3.86 million by 2003.[1- 3]The 'Vision 2020: The Right to Sight' initiative aimed to achieve 21.1 million cataract surgeries between 2002 and 2007, with a target of 80% intraocular lens implantation. Despite achieving these surgical targets, the suboptimal outcomes of cataract surgeries remain a significant challenge in developing nations.[4, 5]

The demographic characteristics observed in this study align with established patterns in cataract epidemiology and surgical practices in India.The predominance of patients aged 60 years and above (74%) reflects the age-related nature of cataract development. This trend is consistent with findings by Jonas JBet al.[10]from the Central India Eye and Medical Study, which reported a significant association between increasing age and the prevalence of cataract surgery.

A slight male predominance (55%) was observed among the patients. This disparity may be influenced by factors such as healthcare-seeking behaviour and accessibility. Nirmalanet al.[11] highlighted that females were less likely to undergo cataract surgery despite having a higher burden of cataract blindness.

Small Incision Cataract Surgery (SICS) was performed in 63% of cases, while Phacoemulsification accounted for 37%. The higher rate of SICS may be attributed to its cost-effectiveness and suitability in resource-limited settings. A study by Ruitet al.[12] demonstrated that both SICS and Phacoemulsification achieved excellent visual outcomes with low complication rates, with SICS being faster and less technology-dependent.

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Guirou N et al.[13]evaluated the functional results of cataract surgery in adults in a tertiary care referral center.The results were analyzed by the Monitoring Cataract Surgical Outcomes software (MCSO). The postoperative functional data and the causes of poor outcomes were identified.A total of 1044 women (51.9%) and 968 men

(48.1%) underwent cataract surgery. Mean age was 65 years. Extracapsular cataract extraction (ECCE), and manual sutureless small incision cataract surgery (SICS) with posterior chamber IOL implantation in 98%, were the main surgical techniques. Functional results indicated that 45.5% of our patients had good visual acuity (≥3/10) with current spectacles, 33% had limited visual acuity (1/10-2/10), and 21.6% had poor visual acuity (<1/10). The proportion of patients with good results improved with best spectacle correction to 63%, vs. 22.9% with limited visual acuity and 14.1% with poor outcomes. The causes of poor outcomes were mainly related to surgical complications (42.1%) and refractive errors (34.8%). These results are inferior to WHO standards, which recommend a rate greater than or equal to 80% for good outcomes and a rate below 5% for bad outcomes. The identification of the causes of poor outcomes underscores the importance of improving surgical skills and the need for postoperative refraction.

The proportion of patients with severe visual impairment (less than 3/60) decreased from 84% preoperatively to 30% postoperatively. Simultaneously, there was an increase in patients achieving better visual acuity ranges.These findings align with global studies indicating the efficacy of cataract surgery in restoring vision. For instance, a study by Thulasiraj et al.[14] reported that 72% of eyes undergoing surgery had a visual acuity less than 6/60 preoperatively, emphasizing the burden of cataract-related blindness in developing countries.

Furthermore, the World Health Organization (WHO) recommends that at least 80% of operated eyes should achieve a presenting visual acuity of 6/6 to 6/18 post-surgery. In this study, 22% of patients reached this benchmark, suggesting room for improvement in surgical outcomes and postoperative care.[15]

The statistically significant p-value (0.001) underscores the effectiveness of cataract surgery in improving visual outcomes. However, the persistence of severe visual impairment in 30% of patients postoperatively indicates the need for further investigation into factors such as surgical technique, intraoperative complications, and postoperative management.

Tobin S et al.[16]conducted a follow-up study of 155 eyes approximately 12 months after ECCE/IOL surgery by eight local eye surgeons in Central Vietnam. They reported the findings for the 144 eyes (93%) successfully reviewed. All eyes were also assessed for the presence and severity of posterior capsule opacification (PCO) using a newly developed grading system.Overall, 110 eyes (75%) had uncorrected visual acuities > or = 6/24 and 107 eyes (74%) had best spherically corrected visual acuities > or = 6/18. Some degree of PCO was found in 40% of eyes, but was graded as visually significant in only 4% of eyes. No major sight-threatening complications were noted. A portable neodymium:yttriumaluminium garnet (Nd:YAG) laser was used to perform capsulotomies on all eyes with visually significant PCO. There were no laser complications noted. At approximately 1 year after ECCE/IOL, the visual outcomes for subjects in this cohort were favourable and complication rates were low.

In a study involving 122 eyes, best-corrected visual acuity (BCVA) improved in 100 eyes (82.0%), remained unchanged in 20 eyes (16.4%), and decreased in 2 eyes (1.6%), primarily due to coexisting age-related macular degeneration (AMD).Three months post-surgery, BCVA was ≥0.8 in 23 eyes (18.9%), between 0.5 and 0.7 in 28 eyes (22.3%), and between 0.2 and 0.4 in 33 eyes (27.1%).These findings underscore the effectiveness of cataract surgery in enhancing visual acuity.[17]

CONCLUSION

This study demonstrates that cataract surgery significantly improves visual acuity in patients with severe preoperative impairment. Postoperatively, 22% of patients achieved visual acuity between 6/60 to 6/18, and 38% attained moderate visual acuity (6/24 to 6/60). The proportion of patients with severe visual impairment (less than 3/60) decreased from 84% preoperatively to 30% postoperatively. These improvements are statistically significant, with a p-value of 0.001, underscoring the efficacy of cataract surgery in restoring vision and enhancing quality of life.

LIMITATIONS OF THE STUDY

1. The study's sample size was limited to 100 patients, which may not be representative of the broader population. This limitation affects the generalizability of the findings to other settings or populations.
2. The study assessed visual acuity outcomes shortly after surgery, lacking long-term follow-up data. Long-term outcomes, including the stability of visual improvements and potential late-onset complications, were not evaluated.

- The absence of a control group (e.g., patients who did not undergo surgery) limits the ability to attribute improvements solely to the surgical intervention.

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