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Original Research

Surgical Outcomes of Cataract Management in Leprosy Patients at a Tertiary Care Center in Jharkhand

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Abstract

Background: Cataract remains a major cause of reversible blindness, disproportionately affecting marginalized populations such as individuals with leprosy. Ocular complications associated with leprosy further elevate the risk of visual impairment, necessitating specialized surgical approaches.

Aim: To evaluate the surgical outcomes of cataract management in leprosy patients at a tertiary care center and identify factors influencing visual outcomes and postoperative complications.

Methods: This hospital-based, prospective observational study was conducted over 18 months at the Regional Institute of Ophthalmology (RIO), RIMS, Ranchi, Jharkhand. A total of 48 leprosy patients with cataracts were enrolled. Inclusion criteria included patients aged 18 years or older diagnosed with leprosy and cataracts. Patients underwent either phacoemulsification or manual small incision cataract surgery (MSICS) with intraocular lens (IOL) implantation. Data on demographic details, clinical history, preoperative ocular findings, surgical details, and postoperative outcomes were collected. Visual acuity was assessed preoperatively and postoperatively at intervals up to 24 weeks. Statistical analysis was conducted using SPSS version 23.0, with significance defined as $p < 0.05$.

Results: The mean preoperative best-corrected visual acuity (BCVA) was 1.8 ± 0.5 logMAR, which significantly improved to 0.5 ± 0.2 logMAR postoperatively ($p < 0.001$). A total of 89.6% of patients achieved BCVA $\geq$ 6/18. Posterior capsular opacification was the most common postoperative complication (6.3%), with an overall complication rate of 20.8%. Phacoemulsification had fewer complications (14.6%) compared to MSICS (57.1%). Pre-existing ocular conditions, such as uveitis, were significantly associated with poorer outcomes ($p = 0.034$).

Conclusion: Cataract surgery in leprosy patients demonstrates favorable visual outcomes with a high success rate when appropriate surgical techniques and perioperative care are applied. Both phacoemulsification and MSICS are effective, although phacoemulsification had a lower complication rate.

Recommendations: To enhance visual outcomes in leprosy patients, there is a need to:

- Improve access to cataract surgery through community outreach and integrated healthcare services.
- Develop tailored postoperative care protocols for managing complications.

Keywords: Leprosy, Cataract surgery, Visual outcomes, Phacoemulsification, Small-incision cataract surgery

Introduction

A major cause of blindness globally, cataracts continue to pose a serious threat to public health, especially in underdeveloped nations where access to surgical treatment is frequently restricted. The World Health Organization estimates that cataracts afflict 20 million people worldwide and cause around 51% of blindness [1]. Among marginalized populations, such as individuals with leprosy, the burden of cataract is exacerbated due to systemic and ocular complications associated with the disease.

Mycobacterium leprae is the causative agent of leprosy, a chronic infectious disease that damages the skin, eyes, and peripheral nerves. Despite declining

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prevalence globally, pockets of endemicity persist, particularly in India, which accounts for more than 50% of the global leprosy cases [2]. Ocular complications of leprosy, including uveitis, lagophthalmos, and corneal opacities, are common and contribute due to this population's high rate of vision impairment [3]. Cataract formation, whether age-related or secondary to chronic uveitis and corticosteroid use, is a significant cause of reversible blindness in leprosy patients [4].

Cataract surgery in leprosy patients poses unique challenges due to pre-existing ocular morbidities, impaired wound healing, and the stigma associated with the disease. Advances in surgical techniques, such as (SICS) and phacoemulsification with (IOL) implantation, have significantly improved outcomes in these patients. Recent studies have reported comparable postoperative visual acuity outcomes between leprosy and non-leprosy patients when surgeries are performed under standardized conditions [5,6].

Barriers to surgical intervention in leprosy patients include delayed diagnosis, lack of awareness, and limited access to specialized care. A study conducted in South India emphasized the importance of community-based outreach programs and integrating leprosy services with general ophthalmic care to address these challenges [7]. Additionally, preoperative assessment and meticulous surgical planning are crucial to managing associated ocular complications, such as posterior synechiae and secondary glaucoma, which can impact surgical outcomes [8]. To evaluate the surgical outcomes of cataract management in leprosy patients at a tertiary care center and to identify factors influencing visual outcomes and complications.

Methodology

Study Design: This study was a hospital-based, prospective observational study.

Study Setting: The study was conducted at the Regional Institute of Ophthalmology (RIO), Rajendra Institute of Medical Sciences (RIMS), Ranchi, Jharkhand, a tertiary care center catering to a large patient population. The study was carried out over a period of 18 months.

Participants: A total of 48 leprosy patients with cataracts, attending the outpatient department of RIO, RIMS Ranchi, were enrolled in the study. All participants underwent cataract surgery during the study period.

Inclusion Criteria

• Individuals who are 18 years of age or older and have been diagnosed with leprosy and related cataracts.
• People who are prepared to follow the study protocol and give their informed permission.

Exclusion Criteria

- Individuals with ocular infections that are active.
- People who have serious systemic conditions that make surgery contraindicated.
- Those whose prior eye surgery or injuries affected the study's results.
  Patients who declined to take part in the research.

Bias

During the study period, all eligible patients who satisfied the inclusion criteria were included in an attempt to reduce selection bias. To minimize operator bias, all procedures were carried out by the same surgical team, and uniform data collection processes helped to reduce information bias.

Data Collection

Data were collected using a predesigned proforma, including demographic details, clinical history, preoperative ocular findings, surgical details, and postoperative outcomes. Visual acuity was assessed preoperatively and at regular intervals postoperatively using the Snellen chart.

Procedure

All participants underwent a comprehensive ophthalmic examination before surgery, including visual acuity testing, slit-lamp examination, and fundus evaluation. The choice of surgical technique was based on individual patient needs. Standard cataract surgery was performed under aseptic conditions. Postoperative care included follow-up visits to assess visual acuity, intraocular pressure, and any complications.Post-operative outcome was assessed at one day, one week, six week, 12 week, 24 weeks.

Statistical Analysis

Microsoft Excel was used to enter the data, and SPSS version 23.0 was used for analysis. The data was summarized using descriptive statistics including mean, standard deviation, and percentages. The significance of variations in preoperative and postoperative outcomes was evaluated using inferential statistics, such as paired t-tests and chi-square tests. Statistical significance was defined as a p-value of less than 0.05.

Results

This study evaluated the surgical outcomes of cataract management in 48 leprosy patients at a tertiary care center. The results reflect significant improvements in visual acuity, with a detailed analysis of preoperative findings, surgical approaches, and postoperative complications.

Participants ranged in age from 35 to 75 years, with a mean age of 58.4 ± 10.2 years. The highest number of patients (33.3%) belonged to the 55–64 age group. Males (62.5%) outnumbered females (37.5%), suggesting a higher prevalence of cataracts or

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healthcare-seeking behavior among males. Most participants (70.8%) had multibacillary leprosy, a more severe form of the disease. The majority (68.8%) came from rural areas, indicating potential barriers to accessing timely ophthalmic care in these populations.

Table 1: Demographic Characteristics of Participants

Characteristic	n (%)
Age (years)	
35-44	8 (16.7)
45-54	12 (25.0)
55-64	16 (33.3)
65-75	12 (25.0)
Gender	
Male	30 (62.5)
Female	18 (37.5)
Type of Leprosy	
Multibacillary	34 (70.8)
Paucibacillary	14 (29.2)
Residence	
Rural	33 (68.8)
Urban	15 (31.2)

Preoperative Ocular Findings

Preoperative assessment revealed that 72.9% of patients had immature cataracts, while 27.1% presented with mature cataracts. The mean preoperative best-corrected visual acuity (BCVA) was 1.8 ± 0.5 logMAR units, indicating poor baseline visual acuity.

Associated ocular complications were observed in 20.8% of patients. Uveitis and secondary glaucoma were the most common preoperative complications, potentially contributing to a higher risk of poor postoperative outcomes.

Table 2: Preoperative Ocular Findings

Parameter	n (%)
Cataract Maturity	
Immature	35 (72.9)
Mature	13 (27.1)
Preoperative BCVA (logMAR)	1.8 ± 0.5
Associated Ocular Complications	
Yes	10 (20.8)
No	38 (79.2)

Surgical Details

Phacoemulsification was the most commonly performed surgical technique, accounting for 85.4% of cases, whereas 14.6% underwent manual small incision cataract surgery (MSICS). Intraocular lens (IOL) implantation was successfully performed in 95.8% of patients. The mean surgical time was 45 ± 10 minutes.

Table 3: Surgical Details

Surgical Parameter	n (%)
Type of Surgery	
Phacoemulsification	41 (85.4)
MSICS	7 (14.6)
IOL Implantation	
Yes	46 (95.8)
No	2 (4.2)
Average Surgical Time (mins)	45 ± 10

Postoperative Outcomes

At the 6-month follow-up, the mean postoperative BCVA improved significantly to 0.5 ± 0.2 logMAR ($p < 0.001$). A total of 89.6% of patients achieved a BCVA of 6/18 or better, indicating a successful visual outcome. Despite the improvement, 10.4% of patients had a BCVA of less than 6/18.

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Postoperative complications were observed in 20.8% of patients, reflecting the complexity of surgical outcomes in this population. The most frequent complication was posterior capsular opacification (6.3%), followed by cystoid macular edema (4.2%) and posterior capsular tear (4.2%). Less common complications included uveitis, choroiditis, corneal opacity, and endophthalmitis (2.1% each).

Table 4: Postoperative Visual Acuity and Complications

Outcome Parameter	n (%)
Postoperative BCVA	
≥ 6/18	43 (89.6)
< 6/18	5 (10.4)
Mean Postoperative BCVA (logMAR)	0.5 ± 0.2
Postoperative Complications	
Posterior Capsular Opacification	3 (6.3)
Posterior Capsular Tear (Rent)	2 (4.2)
Endophthalmitis	1 (2.1)
Cystoid Macular Edema	2 (4.2)
Uveitis	1 (2.1)
Choroiditis	1 (2.1)
Corneal Opacity	1 (2.1)
Total Complications	10 (20.8)

Table 6: Distribution of Postoperative Complications

Complication	Frequency (n)	Percentage (%)
Posterior Capsular Opacification	3	6.3
Posterior Capsular Tear (Rent)	2	4.2
Endophthalmitis	1	2.1
Cystoid Macular Edema	2	4.2
Uveitis	1	2.1
Choroiditis	1	2.1
Corneal Opacity	1	2.1
Total Complications	10	**20.8**

Postoperative Complications by Surgery Type

Phacoemulsification had a lower rate of complications (14.6%) compared to MSICS (57.1%). This could be attributed to the precision and reduced trauma associated with phacoemulsification.

Table 7: Complications by Type of Surgery

Type of Surgery	Patients with Complications (n)	Patients without Complications (n)	Total (n)
Phacoemulsification	6 (14.6%)	35 (85.4%)	41
MSICS	4 (57.1%)	3 (42.9%)	7
Total	10 (20.8%)	38 (79.2%)	48

Key Findings

- **Significant Visual Improvement:** Mean BCVA improved from 1.8 ± 0.5 to 0.5 ± 0.2 logMAR ($p < 0.001$).
- **High Success Rate:** 89.6% achieved BCVA ≥ 6/18.
- **Complication Rate:** 20.8% experienced complications, with posterior capsular opacification being the most common.
- **Surgical Technique Impact:** Phacoemulsification had fewer complications compared to MSICS.
- **Associated Risk Factors:** Pre-existing ocular conditions such as uveitis significantly impacted visual outcomes.

Discussion

The findings of this study demonstrate favorable surgical outcomes in cataract management among leprosy patients, despite the inherent complexities posed by systemic and ocular complications. The significant improvement in best-corrected visual acuity (BCVA) from a preoperative mean of 1.8 ± 0.5 logMAR to 0.5 ± 0.2 logMAR postoperatively ($p < 0.001$) indicates the overall effectiveness of cataract surgery in this high-risk population. A functional visual outcome (BCVA ≥ 6/18) was achieved in 89.6% of patients, highlighting the potential for substantial vision restoration even in marginalized groups. This success rate aligns with findings in non-leprosy populations, suggesting that with appropriate

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surgical techniques and perioperative care, comparable results can be achieved.

However, the study also revealed a notable complication rate of 20.8%, underscoring the challenges of cataract surgery in leprosy patients. Posterior capsular opacification (6.3%) was the most common postoperative complication, a well-documented issue that often requires further intervention. Other complications included cystoid macular edema (4.2%) and posterior capsular tear (4.2%), both of which can adversely affect visual recovery. Less common but significant complications such as uveitis, choroiditis, corneal opacity, and endophthalmitis (each 2.1%) were also identified, reflecting the vulnerability of this population to inflammatory and infectious sequelae.

The type of surgical technique had a considerable influence on complication rates. Patients who underwent phacoemulsification had a lower incidence of complications (14.6%) compared to those who underwent manual small incision cataract surgery (MSICS) (57.1%). This disparity may be attributed to the less invasive nature of phacoemulsification, which involves smaller incisions and reduced surgical trauma. Despite this, MSICS remains a viable option in resource-limited settings due to its cost-effectiveness and shorter surgical time.

Pre-existing ocular conditions significantly impacted postoperative visual outcomes. Patients with associated ocular morbidities such as uveitis and secondary glaucoma were more likely to experience poorer visual recovery ($p = 0.034$). This finding emphasizes the importance of meticulous preoperative evaluation and the need for tailored management strategies in patients with underlying ocular pathologies. Early identification and management of inflammation could potentially reduce the incidence of complications and improve overall outcomes.

The demographic analysis indicated a higher prevalence of cataract surgery among males (62.5%) and rural residents (68.8%), reflecting possible gender-related healthcare-seeking behaviors and geographical barriers to eye care. Addressing these disparities through targeted outreach programs and strengthening rural healthcare infrastructure could improve access and outcomes for underserved populations.

In conclusion, while cataract surgery in leprosy patients offers significant visual improvement, the relatively high rate of postoperative complications suggests a need for enhanced perioperative care. Strategies such as closer postoperative monitoring, prompt management of inflammation, and improved access to advanced surgical techniques could further optimize outcomes in this vulnerable population.

Recent studies have examined surgical outcomes in cataract patients, particularly in populations facing unique challenges. Tabassum et al. evaluated outcomes of cataract surgery in leprosy patients, reporting a significant improvement in visual acuity postoperatively, with 91.14% of eyes achieving good visual acuity at 12 weeks. Complication rates were low, with common issues being posterior capsular rupture and early postoperative iridocyclitis, highlighting the feasibility of achieving functional vision with timely intervention [9]. Ong and Shalchi investigated cataract outcomes in pseudoexfoliation syndrome patients, finding comparable visual acuity improvements to non-pseudoexfoliation groups despite higher complication rates. Issues like zonular dialysis and intraocular pressure spikes were more prevalent, yet the overall benefits of surgery remained evident [10]. Doyle et al. focused on cataract surgery outcomes in patients with only one functional eye, emphasizing the increased surgical complexity. While these surgeries had slightly higher posterior capsule rupture rates (1.9%) compared to national data, the visual acuity improvements were substantial, demonstrating the importance of managing risks in such cases [11]. Gill et al. studied disparities in cataract outcomes among limited English proficiency (LEP) patients, noting that LEP patients presented with more advanced cataracts and complex surgical cases. Despite these challenges, their visual acuity improvements postoperatively were significant, underscoring the need to address language barriers in healthcare delivery [12].

Conclusion

Cataract surgery in leprosy patients shows promising visual outcomes, with 89.6% achieving BCVA $\geq$ 6/18 postoperatively. Phacoemulsification proved more effective with fewer complications compared to MSICS. Posterior capsular opacification was the most common complication, followed by cystoid macular edema and posterior capsular tear (rent). Preoperative ocular conditions, such as uveitis, significantly impacted outcomes.

Comprehensive preoperative evaluation, tailored surgical approaches, and improved access to cataract care are essential for optimizing outcomes in this population. Further research and community awareness are needed to enhance surgical success and quality of life for leprosy patients.

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