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RESEARCH ARTICLES

Postoperative Visual Acuity Outcomes After Cataract Surgery: A Comparison Between Patients Aged <60 and ≥60 Years

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Abstract: Cataract is one of the leading causes of visual impairment that can be effectively managed through surgery. Assessment of visual acuity on the first postoperative day is crucial for evaluating early visual outcomes and detecting potential early postoperative complications. Age is hypothesized to influence visual outcomes due to the higher prevalence of ocular anatomical changes. This study aims to assess whether age influences the early visual outcome following cataract surgery. This study employed an observational analytical design with a cross-sectional approach, involving 654 patients who underwent cataract surgery. Subjects were divided into two age-based groups: <60 years and ≥60 years. Visual acuity was assessed preoperatively and on the first postoperative day (POD-1) using the LogMAR units. The <60 years age group demonstrated an improvement in visual acuity from 1.61±0.50 LogMAR to 0.42±0.37 LogMAR on the first postoperative day. The ≥60 years age group showed an improvement from 1.57±0.52 LogMAR to 0.50±0.41 LogMAR. A statistically significant difference was observed between the two age groups (p=0.022). Age influences early visual outcomes on the first postoperative day following cataract surgery. Patients aged <60 years exhibited slightly superior visual results compared to those aged ≥60 years.

Keywords: Age, cataract surgery, first postoperative day, LogMAR, visual acuity

INTRODUCTION

Cataract is a leading cause of visual impairment that can be effectively managed through surgical intervention. Cataract surgery aims to remove lens opacity and replace it with an intraocular lens, thereby improving patients' visual acuity. Numerous recent studies indicate that cataract surgery

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generally yields significant improvement in visual acuity across community-based populations, tertiary hospitals, rural eye centers, and healthcare facilities in developing countries.[1,2,3,4] Han et al., through a population-based systematic review, demonstrated a notable improvement in postoperative visual outcomes following cataract surgery, although variations exist in outcomes across regions and healthcare systems.[1] The study by Rathi and Khanna also revealed that cataract surgery performed within rural eye center networks can achi eve favorable visual outcomes, provided that service systems, patient selection, and follow-up are structured.[2]

Postoperative visual acuity assessment serves as a crucial indicator for evaluating the success of cataract surgery. Visual acuity is frequently expressed in LogMAR units, as this is more suitable for statistical analysis compared to direct Snellen chart recording. Lower LogMAR values denote superior visual acuity. Evaluation on the first postoperative day holds clinical significance for assessing early visual recovery and detecting nascent disturbances such as corneal edema, anterior chamber inflammation, elevated intraocular pressure, or intraoperative complications manifesting post-surgery. Andrews et al. observed a correlation between longer resident surgical duration and a reduction in early visual acuity on postoperative day 1.[5] Concurrently, Lecumberri et al. assessed the utility of the BOOST Cataract app as a predictive tool for cataract surgery outcomes, based on early postoperative evaluation.[6]

Age is posited as a factor influencing visual acuity outcomes following cataract surgery. Elderly patients tend to exhibit anatomical and physiological ocular changes, including higher lens nucleus density, reduced corneal endothelial reserve, zonular weakness, and an increased prevalence of ocular comorbidities. Ben-Eli et al. reported that advancing age is associated with variations in risks, complications, and postoperative outcomes of cataract surgery.[7] Conversely, Nemet et al. indicated that advanced age does not invariably constitute an independent risk factor for intraoperative complications or poor visual outcomes in high-risk cataract surgery.[8]

Beyond age, postoperative visual outcomes are also influenced by ocular comorbidities and postoperative complications. Jemeberie et al. observed that unfavorable visual outcomes after cataract surgery can be attributed to factors such as central corneal opacity, glaucoma, pseudoexfoliation, age-related macular degeneration, and striate keratopathy.[9] Zheng also demonstrated that postoperative corneal edema represents a significant condition warranting attention, given its potential impact on early visual recovery following cataract surgery.[10] In cases of mature white cataracts, Jaiswal et al. reported that phacoemulsification surgery still confers visual improvement, although

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complications such as corneal edema and anterior chamber reaction may yet occur in the early postoperative period.[11]

Service factors, surgical technique, operator experience, and the patient's systemic condition also contribute to determining the outcomes of cataract surgery. Mohammed et al. indicated that visual outcomes of cataract surgery are affected by various clinical and perioperative factors.[12] Lin et al. reported the presence of systemic predisposing factors for severe complications following cataract surgery.[13] Meanwhile, Ahsan et al. and Junejo et al. underscored the importance of auditing postoperative visual outcomes as integral to efforts aimed at maintaining the quality of cataract surgical services.[14,15]

Assessment of cataract surgery outcomes also necessitates consideration of specific conditions such as high myopia, macular changes, humanistic outcomes, and patient quality of life. Zhao et al., in a meta-analysis concerning high myopia patients in Asia, demonstrated that cataract surgery effectively improves visual acuity, yet it carries notable risks of complications.[16] Liang et al. compared femtosecond laser-assisted cataract surgery and conventional phacoemulsification in cataract patients with high myopia, while Chen et al. indicated that cataract surgery also holds significant value from the perspective of cost-utility and humanistic outcomes.[17,18] Salowi et al. reported an improving trend in postoperative visual outcomes of cataract surgery in a Malaysian national survey, whereas Hecht et al. emphasized that cataract surgery outcomes should not solely be evaluated based on best-corrected visual acuity, but also include visual quality, visual function, and quality of life.[19,20]

Based on the foregoing discussion, age can be considered one factor influencing early visual outcomes following cataract surgery; however, its interpretation necessitates consideration of the clinical effect size and other factors such as ocular comorbidities, surgical complications, corneal status, surgical technique, and quality of service. Consequently, this study aims to compare the first-day postoperative visual acuity outcomes between patients aged <60 years and ≥60 years, utilizing LogMAR units.

METHOD

This study constitutes an analytical observational investigation employing a cross-sectional approach, utilizing patient medical record data from Citra Medika Deli Serdang Hospital. The study population comprised all individuals diagnosed with cataracts who underwent surgical intervention during the 2023-2025 period.

The study sample consisted of cataract patients who underwent phacoemulsification with intraocular lens implantation, exhibited no retinal anomalies, and attended a follow-up examination on the first postoperative day.

Sample selection was conducted using the total sampling technique. The overall sample size for this investigation comprised

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654 participants, stratified into two categories: 217 participants aged <60 years and 437 participants aged ≥60 years. All collected data underwent statistical processing and analysis utilizing SPSS software.

RESULT

Table 1. Study demographics

	Total (N=654)	Age <60 years (n=217)	Age ≥60 years (n=437)
Average age (SD)	61.96 (8.38)	53.05 (6.55)	66.39 (4.97)
Gender			
Male (%)	272 (41.6)	97 (44.7)	175 (40.0)
Female (%)	382 (58.4)	120 (55.3)	262 (60.0)
Average Visual Acuity (logMAR)			
pre-OP (SD)	1.58 (0.51)	1.61 (0.50)	1.57 (0.52)
POD-1 (SD)	0.47 (0.40)	0.42 (0.37)	0.50 (0.41)

This study indicates that both age groups experienced an improvement in visual acuity on the first postoperative day following cataract surgery. The <60 years age group demonstrated improvement from 1.61±0.50 LogMAR to 0.42±0.37 LogMAR, whereas the ≥60 years age group showed improvement from 1.57±0.52 LogMAR to 0.50±0.41 LogMAR. These findings suggest that cataract surgery confers early visual improvement in both age cohorts.

The improvement in visual acuity observed in this study aligns with various recent investigations. Han et al. reported that cataract surgery generally yields substantial visual improvement in population-based studies.[1] Rathi and Khanna also demonstrated that cataract surgery in rural eye centers is capable of achieving favorable visual outcomes on a large scale.[2] Similar results were reported by Muthusamy et al. at a tertiary hospital in Sri Lanka and Gelalcha et al. at Jimma Medical Center, indicating that cataract surgery consistently provides significant visual benefits across diverse healthcare contexts.[3,4]

Table 2. Average Visual Acuity (logMAR) POD-1

	Age <60 years (n=217)	Age ≥60 years (n=437)	p-value
POD-1 (SD)	0.42 (0.37)	0.50 (0.41)	0.022

In this study, the <60 years age group exhibited a marginally superior mean first-day postoperative visual acuity compared to the ≥60 years age group. This difference was statistically significant, using an independent samples t-test, with a p-value of 0.022. This finding supports the study by Ben-Eli et al., which suggests that age can influence cataract surgery outcomes.[7] Conversely, these results should be juxtaposed with the research by Nemet et al., who indicated that advanced age does not always constitute a direct risk factor for intraoperative complications or poor visual outcomes in high-risk cataract surgery patients.[8] Thus, age can be regarded as a prognostic factor, but not the sole determinant of surgical success.

Although the difference between the two groups was statistically significant, the mean postoperative visual acuity difference

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was only 0.08 LogMAR. Clinically, this difference is relatively minor. This suggests that while age does exert an influence on early visual outcomes, its effect size on first-day postoperative visual acuity is not substantial. Consequently, the interpretation of research findings should extend beyond focusing solely on p-values to also consider the clinical significance of the observed visual acuity difference.

The modest difference between age groups may be attributable to biological and clinical factors. In patients aged ≥60 years, the aging process can be accompanied by reduced corneal endothelial cell density, increased lens nuclear hardness, zonular weakness, and an elevated risk of concomitant ocular diseases. Jemeberie et al. reported that poor visual outcomes following cataract surgery are associated with factors such as central corneal opacity, glaucoma, pseudoexfoliation, age-related macular degeneration, and striate keratopathy.[9] Zheng also indicated that postoperative corneal edema is a significant factor influencing visual recovery after cataract surgery.[10]

Visual outcomes on the first postoperative day do not necessarily reflect the definitive outcome of cataract surgery. During the early period, visual acuity can still be affected by corneal edema, inflammation, residual drug effects, transient astigmatism, elevated intraocular pressure, and initial adaptation to the intraocular lens. Jaiswal et al. reported that in mature white cataracts, visual improvement remains achievable, yet early complications such as corneal edema and anterior chamber reaction may still be observed.[11] Andrews et al. also demonstrated that operative factors, including surgical duration, can influence visual outcomes on postoperative day 1.[5] Therefore, first-day results should be interpreted as early outcomes rather than definitive visual results.

The findings of this study also underscore the importance of comprehensive preoperative evaluation, particularly in patients aged ≥60 years. Assessment of the retina, cornea, optic nerve, intraocular pressure, cataract grade, and systemic diseases such as diabetes mellitus is imperative to estimate the visual prognosis. Mohammed et al. reported that cataract surgery outcomes are influenced by clinical factors, operator proficiency, intraoperative complications, and postoperative complications.[12] Lin et al. also indicated that certain systemic conditions can predispose patients to severe complications following cataract surgery.[13]

In addition to individual patient evaluation, periodic quality audits of services are also essential. Ahsan et al., through a ten-year observational study, demonstrated that monitoring visual outcomes can assess the quality of cataract surgical services.[14] Junejo et al. further emphasized that postoperative visual acuity auditing represents a critical approach for improving outcomes and sustaining service quality.[15] Within the context of this research,

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the evaluation of first-day postoperative visual acuity can serve as an initial indicator for assessing the performance of cataract surgical services, although it must be complemented by subsequent follow-up.

In patient cohorts presenting with specific conditions, the interpretation of visual outcomes warrants greater circumspection. Zhao et al. demonstrated that for high myopia patients in Asia, cataract surgery effectively improves vision but is accompanied by heightened risks of complications that require careful consideration.[16] Liang et al. further indicated that for cataracts associated with high myopia, variations in surgical techniques can yield differential impacts on macular changes and visual outcomes.[17] This underscores that age is not the sole factor requiring analysis; refractive status, retinal condition, and surgical technique can also influence the final outcome.

Beyond visual acuity, the success of cataract surgery can also be evaluated from functional and humanistic perspectives. Chen et al. demonstrated that cataract surgery offers benefits in terms of cost-utility, visual acuity improvement, and humanistic outcomes.[18] Salowi et al. reported an improving trend in postoperative visual outcomes of cataract surgery in the population aged ≥50 years in Malaysia.[19] Hecht et al. also emphasized that cataract surgery outcomes are not exclusively confined to best-corrected visual acuity but encompass visual quality, visual function, patient satisfaction, and impact on quality of life. Therefore, subsequent research should not merely assess LogMAR values but also incorporate parameters such as quality of life and postoperative patient satisfaction.[20]

In this investigation, age ≥60 years was associated with marginally lower early visual outcomes compared to age <60 years. Nevertheless, both groups consistently demonstrated substantial visual improvement relative to their preoperative status. Thus, advanced age should not serve as a rationale to defer or decline cataract surgery when clinical indications are unambiguous. Instead, age can be utilized as a risk stratification factor for patient education, surgical planning, and scheduling of postoperative follow-up.

A limitation of this study is the absence of data regarding the number of patients in each age group, surgical technique employed, cataract grade, concomitant ocular diseases, systemic diseases, intraoperative complications, and postoperative complications. Furthermore, this study exclusively assessed visual acuity on the first postoperative day, thus precluding definitive visual outcomes. Subsequent research is advised to conduct follow-up examinations at one week, one month, and three months postoperatively, and to incorporate confounding variables such as diabetes mellitus, glaucoma, macular degeneration, corneal edema, pseudoexfoliation, high myopia, surgical technique, and operator experience.

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CONCLUSION

Based on the findings of a study involving 654 post-cataract surgery patients, it can be concluded that visual acuity improved on the first postoperative day in both age groups (<60 years and ≥60 years). A statistically significant difference was observed between the two age groups (p=0.022).

Patients aged <60 years demonstrated slightly superior first-postoperative-day visual acuity outcomes compared to patients aged ≥60 years. However, the mean difference in postoperative visual acuity between the two groups was merely 0.08 LogMAR, indicating that the clinical significance was relatively minor. Consequently, age influences early visual outcomes following cataract surgery; however, advanced age does not constitute a primary impediment to achieving improved visual acuity post-surgery. Cataract surgery continues to offer substantial visual benefits in both age groups.

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