

VISUAL ACUITY THRESHOLD FOR CATARACT SURGERY: A REAL-WORLD EXPERIENCE FROM A TERTIARY EYE CARE CENTER OF A LOW RESOURCE SETTING OF PUNJAB, PAKISTAN

Original Research

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ABSTRACT

Background: Cataract is the leading cause of preventable blindness worldwide. Over the years, cataract surgery has evolved significantly, aiming not only to restore optimal visual acuity but also to enhance the overall quality of vision.

Objective: To determine the visual acuity threshold for cataract surgery in a tertiary care center of Punjab Pakistan.

Methods: This retrospective study was conducted at Lahore General Hospital, Pakistan, involving 2,057 patients aged 40–80 years who underwent cataract surgery between January 2023 and December 2024. Data on demographics and visual acuity were collected, with visual impairment categorized as mild (6/9–6/18), moderate (6/24–6/36), or severe ($\leq 6/60$). Statistical analysis was performed using SPSS version 23.0, with results expressed as means ($\pm$ SD) for continuous variables and frequencies (%) for categorical variables. Pre- and post-operative visual acuity were compared using the chi-square test, with $p < 0.05$ considered statistically significant.

Results: The study analyzed 2,057 patients who underwent cataract surgery, with a mean age of 57.61 ± 13.07 years and a slightly higher proportion of females (52.1%). Preoperatively, 54.0% had severe visual impairment, which significantly improved after surgery, with 62.9% achieving normal best corrected visual acuity ($p < 0.01$). The majority (98.3%) had a normal posterior segment, while co-morbidities such as diabetes and hypertension were present in 22.2% and 21.8% of patients, respectively.

Conclusion: Patients in the Low- and middle-income countries present with severe visual impairment before cataract surgery affecting the final visual outcomes. This highlights the importance of community-based screening and awareness programs to detect and manage cataract at an early stage, particularly among underserved populations. It is high time to strengthen health education, improve access to eye care services, and address known barriers to early cataract surgery.

Keywords: Cataract, Visual Acuity, Best Corrected visual acuity, Low- and middle-income countries, Visual impairment.

INTRODUCTION

Cataract is the leading cause of preventable blindness worldwide¹. Over the years, cataract surgery has evolved significantly, aiming not only to restore optimal visual acuity but also to enhance the overall quality of vision. However, in resource constrained countries like Pakistan and other low- and middle-income countries (LMICs), the patients do not present early and the visual threshold for cataract surgery remains very high. This is different from the high-income countries where patients present even with 6/6 vision for surgery due to decreased quality of vision. This difference in presentation and threshold for surgery is attributed to resource constraints, gender inequality, patient presentation patterns, access to healthcare and varying health system priorities in the LMIC². This results in a wide range of cataract surgery rates across various countries 36 to 12800 per million population³. According to some reports, 3.7 million cases of cataract are operated in the USA and 7 million in Europe per year⁴. Advances in surgical procedures have lowered the threshold of visual acuity required for surgery in the developed countries but the same decrease in threshold is not observed in the LMIC⁵. The objective of this study was to determine the visual acuity threshold for cataract surgery in a tertiary health care center of Pakistan. This will help in optimizing resource allocation, clinical decision making, making policies and improving surgical services to the high threshold regions. It will also facilitate authorities in health planning and monitoring service delivery.

METHODS

This retrospective study was conducted at Lahore General Hospital, Lahore, Pakistan. Following approval from the hospital's Ethical Review Committee (ERC), medical records were reviewed for all patients aged 40 to 80 years who underwent cataract surgery—either phacoemulsification or conventional extracapsular cataract extraction—for pre-senile or senile cataract between January 2023 and December 2024. Patients with congenital cataracts or co-existing intraocular pathologies likely to affect visual outcomes were excluded. A total of 2,057 patients met the inclusion criteria. Informed consent was obtained for both the surgical procedure and the use of medical records exclusively for research purposes. Data collected included patient demographics (age, gender, name), as well as pre-operative and post-operative best corrected visual acuity (BCVA). The visual impairment was classified as mild (6/9 to 6/18), moderate (6/24 to 6/36) and severe ($\leq 6/60$) impairment of vision. SPSS version 23.0 was used for data analysis. The collected data was presented as mean and standard deviation for continuous variables such as age while for categorical variables such as gender, co-morbidities, pre-operative and post-operative visual acuity were presented as frequency and percentage. The comparison of pre- operative and post-operative visual acuity was tested by applying chi-square test keeping $p < 0.05$ as statistically significant.

RESULTS

The study included 2,057 patients, with a mean age of 57.61 ± 13.07 years. Of these, 985 (47.9%) were male and 1,072 (52.1%) were female. The demographic characteristics are presented in Table 1. A statistically significant improvement in postoperative visual acuity was observed. Uncorrected visual acuity of 6/6 was achieved by 1,294 patients (62.9%), as shown in Table 2. Table 3 presents the visual acuity status of the fellow eyes. Overall, 87.7% of patients attained a visual acuity of 6/18 or better postoperatively.

Table 1: Demographic characteristics of patients included in the study (n=2057)

Variables		Mean $\pm$ SD n(%)
Age (Years)		57.61 $\pm$ 13.07
Gender	Male	985 (47.9%)
	Female	1072 (52.1%)
Posterior Segment	Normal	2022 (98.3%)
	Drusen, NPDR, Peripheral retinal degeneration, grade 1 hypertensive changes	35 (1.7%)
Glaucoma		2 (0.1%)
Diabetes Mellitus		456 (22.2%)
Hypertension		448 (21.8%)

Asthma	2 (0.1%)
Hepatitis C	1 (0.05%)
Ischemic Heart Disease	5 (0.2%)
Tuberculosis	1 (0.05%)

Table 2: Comparison of Pre-Operative and Post-Operative Visual Acuity of operated eyes (n=2057)

Variable		Preoperative Visual Acuity of operated Eye n(%)	Postoperatively Visual Acuity n(%)	p-value
Visual Acuity of Eye	Mild Impairment	480 (23.3%)	510 (24.8%)	<0.01
	Moderate Impairment	466 (22.7%)	186 (9.0%)	
	Severe Impairment	1110 (54.0%)	67 (3.3%)	
	Normal	1 (0.05%)	1294 (62.9%)	

Table 3: Visual acuity of the fellow eyes (n=2057)

Variable		n	%
Visual Acuity of the fellow eye	Mild Impairment	593	28.8
	Moderate Impairment	471	22.9
	Severe Impairment	991	48.2
	Normal	2	0.1

DISCUSSION

Our study found that 54% of patients presented severe visual impairment (VI) at the time of cataract surgery, which significantly improved postoperatively. In contrast, a study from China reported a much lower prevalence of severe VI (0.9%) and moderate VI 5.4%⁶. This disparity may reflect differing thresholds for cataract surgery, which can be influenced by socio-economic and healthcare access inequalities, even within the same country. For instance, studies from Pakistan and Nigeria have shown that cataract-related blindness is more prevalent among socially disadvantaged groups—particularly women, rural populations, and the illiterate⁷. Illiterate women residing in rural areas were identified as the most underserved, highlighting the need for targeted and equity-focused eye care interventions. This pattern is not unique to Pakistan; similar findings have been reported in other low- and middle-income countries (LMICs), where the threshold for cataract surgery tends to be higher among marginalized populations⁸. A recent study from Iraq, for example, reported that among 6,650 cataract surgery patients, 875 (13.15%) had mild, 175 (2.63%) had moderate, and 5,250 (78.95%) had severe VI at presentation⁹. While these figures are higher than those observed in our study, they highlight the ongoing need to improve equitable access to timely cataract surgery.

There is no universally accepted visual acuity threshold for cataract surgery. In our study, one patient with 6/6 visual acuity in the affected eye underwent surgery due to significant night glare that impaired their ability to drive at night. Earlier recommendations that suggested a surgical indication at visual acuity worse than 6/12 are no longer considered adequate¹⁰. Non-visual acuity-based symptoms such as glare, reduced contrast sensitivity, diplopia, and impaired depth perception are now recognized as valid indications for cataract surgery¹¹. However, such patients are few in the LMICs (0.05% in this study). It is important to note that patients undergoing surgery at higher levels of visual function may carry a higher risk of suboptimal postoperative visual outcomes. These may result from refractive surprises, intraocular inflammation, cystoid macular edema, or pre-existing ocular comorbidities¹².

Variations in the indications and thresholds for cataract surgery are influenced by multiple factors. In high-income countries (HICs), higher levels of education and greater health awareness contribute to evolving expectations regarding cataract surgery. In these settings, the emphasis is increasingly shifting from mere improvement in visual acuity to enhancement of overall visual quality and functional vision¹³. Understanding the current real-world visual outcomes of cataract surgery is crucial for informing future strategies in cataract care and provides valuable insights for both clinicians and policymakers. Significant disparities exist in both the volume and quality of cataract surgeries across and even within countries. These differences are largely driven by socioeconomic conditions, availability of healthcare resources, and variability in clinical practice patterns^{14,15}.

The results of our study demonstrated a significant improvement in visual acuity following cataract surgery, with 87.7% of patients achieving postoperative visual acuity better than 6/18. A study from China similarly reported that patients with good preoperative visual acuity can still benefit from cataract surgery when performed at earlier stages, highlighting the value of timely intervention¹⁶. In our patients, the majority of patients presented with advanced cataracts, suggesting that while the prevalence of cataract remains high, early detection is lacking. This delay in presentation may limit opportunities for optimal visual rehabilitation, including BCVA. As such, the implementation of community-based screening programs is increasingly essential to facilitate earlier diagnosis and intervention¹⁷.

Although the male-to-female ratio in our study was nearly balanced, a slightly higher proportion of female patients was observed. This finding aligns with the notion that targeted screening initiatives may help reach individuals particularly women and those in underserved communities, who may not actively seek care in hospital settings¹⁸. Prior to surgery, 54% of patients were classified as having severe visual impairment; postoperatively, 62.9% achieved normal visual acuity and BCVA. These outcomes are consistent with findings from similar studies, supporting the effectiveness of cataract surgery in restoring vision. Well-documented barriers to accessing cataract services and leading to severe impairment include limited transportation, low awareness levels, financial hardship, and lack of familial or social support, all of which continue to hinder timely care in many settings^{19,20}. Addressing these challenges through policy, outreach, and infrastructure development remains critical to improving cataract surgical uptake and outcomes. A substantial majority of adults in LMIC do not access eye care services, with blindness emerging as a key factor influencing service utilization. To enhance the uptake of eye care in this community and similar rural settings, it is vital to implement health education initiatives, raise awareness about the benefits of early intervention, and establish community-based eye care programs²¹.

Although this study presents a large sample from a LMIC, its retrospective design is a limitation due to selection bias and lack of control over quality and completeness of data. We relied on available medical records which lack certain variables, such as visual function reported by the patients. Being a single center study, generalizability of the findings to other settings, especially rural or primary care facilities cannot be achieved. Postoperative follow-up was not standard affecting the visual outcomes. Additionally, the study did not stratify results based on pre-existing ocular comorbidities, surgical technique variability, or surgeon experience—all of which could influence outcomes. Further studies focusing on the income level, socioeconomic status, education level, and distance to the health care facility can be done for further discourse on cataract surgery in LMIC.

CONCLUSION

Patients in the LMIC present with severe VI before cataract surgery affecting the final visual outcomes. This highlights the importance of community-based screening and awareness programs to detect and manage cataract at an early stage, particularly among underserved populations. It is high time to strengthen health education, improve access to eye care services, and address known barriers to early cataract surgery.

AUTHOR'S CONTRIBUTION:

Author	Contribution
Tayyaba Gul malik	Conceptualization, Methodology, Formal Analysis, Writing - Original Draft
Farah Zafar	Methodology, Formal Analysis, Writing, Results - Original Draft
Iqra Khalid	Formal Analysis, Data collection, Writing - Original Draft
Arooj Amjad	Resources provision; supervision of fieldwork; writing support; ethics & compliance oversight; final approval

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