Original Article
DOI: https://doi.org/10.70749/ijbr.v3i4.2282

INDUS JOURNAL OF BIOSCIENCE RESEARCH
https://ijbr.com.pk
ISSN: 2960-2793/ 2960-2807

Visual Outcomes after Cataract Surgery in Diabetic Patients

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ARTICLE INFO

Keywords: Cataract surgery, diabetes mellitus, visual outcome, duration of diabetes, postoperative complications.

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Declaration
Authors' Contribution: All authors equally contributed to the study and approved the final manuscript.

Conflict of Interest: No conflict of interest.

Funding: No funding received by the authors.

Article History
Received: 11-01-2025 Revised: 14-04-2025
Accepted: 23-04-2025 Published: 30-04-2025

ABSTRACT

Background: Diabetes mellitus accelerates cataract formation and may negatively affect postoperative visual recovery. Although cataract surgery significantly improves vision, the presence of diabetes-related ocular changes can influence outcomes. **Objective:** To evaluate the visual outcomes after cataract surgery in diabetic patients and identify factors associated with postoperative visual recovery. **Methods:** This descriptive study was conducted at the Diabetic Eye Clinic of Al-Ibrahim Eye Hospital, Karachi, from June 2023 to June 2024. A total of 133 diabetic patients aged 40–65 years undergoing cataract surgery were enrolled through non-probability consecutive sampling. Baseline demographics, duration of diabetes, and ocular examination findings were recorded. Visual acuity was assessed preoperatively and at postoperative day 1, week 1, and month 1. **Results:** The mean age of patients was 54.7 ± 6.8 years, with 72 (54.1%) males and 61 (45.9%) females. Preoperatively, 98 patients (73.7%) presented with severe visual impairment (<6/60). At one month postoperatively, 106 patients (79.7%) achieved visual acuity ≥6/18, while only 6 (4.5%) remained in the severe impairment category. Patients with diabetes <10 years had significantly better outcomes (88.9% achieving ≥6/18) compared to those with longer disease duration (73.4%, p = 0.03). Gender and education level did not significantly affect outcomes. Postoperative complications were infrequent, including transient corneal edema (6.8%) and posterior capsular opacification (3.8%). No case of endophthalmitis was observed. **Conclusion:** Cataract surgery in diabetic patients provides excellent visual outcomes, with most patients regaining functional vision. However, longer duration of diabetes is associated with poorer recovery, emphasizing the importance of early surgical intervention and careful preoperative evaluation.

INTRODUCTION

Cataract is one of the leading causes of blindness across the world and contribute to around half of the cases of blindness in Pakistan [1]. It's one of the most common ophthalmologic complications of diabetes and an important cause of early development of senile cataract [2]. The frequency of cataract was found in 1,956 (42.9%) in individuals with diabetes [3]. In individuals with diabetes cataract surgeries are performed not only to improve visual acuity but for assessment and timely management of ocular complications of diabetes predominantly diabetic retinopathy and maculopathy [4]. Cataract in patients with diabetes leads to decreased visual acuity and poses difficulty in the examination of the retina adequately. Hence, it is advantageous to perform cataract surgery for diagnostic and therapeutic benefits, even if there is possible associated risk of aggravating the retinopathy. In earlier days, cataract surgery among diabetics was threatened by the accelerated progression of diabetic retinopathy and deterioration of vision due to higher incidence of post-operative complications [5]. According to some studies, clinicians should continue to sustain vigilance in diabetic patients after cataract extraction even when central macular edema is not present immediately prior to cataract surgery [6,7]. Cataract surgery in diabetes has good results, with high reliability and a slightly higher rate of complications than non-diabetic patients. Causes for poor visual acuity after surgery are poor pre-operative visual acuity, advanced stages of diabetic retinopathy and old age [8]. In the Chennai Urban Rural Epidemiology Study (CURES) Eye Study, [9] the average interval between the onset of diabetes and cataract operation was 9.2 years. Most (86%) patients had Type 2 diabetes. Duration of diabetes was directly proportional to the frequency of baseline diabetic retinopathy at presentation. In this study, there were 114 patients with diabetes for 0 to 5 years, 30 patients with diabetes for 6 to 9 years and 6 patients with diabetes for more than 10 years. A study conducted by Debora lee et al showed the visual acuity outcome after cataract surgery

among type 2 diabetes mellitus 67% achieved good visual outcome of 20/40 [10]. Another study conducted by Michael M Han showed that eyes with mild or moderate non-proliferative diabetic had greater improvement in visual outcome from baseline after cataract surgery as compared to severe Non-Proliferative diabetic Retinopathy [11]. Another study by Bijun Zu reported that Postoperative weighted LogMAR BCVA improvement was achieved in 92.86% of the patients among patient with diabetic retinopathy who underwent cataract surgery [12]. A study conducted in Pakistan [13] showed that 87.5% diabetics with cataract achieved (LogMAR 0 to 0.5, ≥ 6/12) at first post-operative day.

Objective

To determine visual outcomes among diabetic patients before and after cataract surgery presenting at Al Ibrahim Eye hospital, Karachi.

METHODOLOGY

This Descriptive study was conducted at the diabetic eye clinic of Al- Ibrahim Eye Hospital (AIEH) Karachi from June 2023 to June 2024. A non-probability consecutive sampling technique was used to recruit eligible participants. The sample size was calculated using the OpenEpi calculator, which yielded a requirement of 133 patients at a 95% confidence interval and 8% margin of error, based on a reported frequency of 67% for achieving good visual acuity after cataract surgery.

Inclusion Criteria

All newly and previously registered male and female diabetic patients aged between 40 and 65 years presenting with cataracts at the diabetic eye clinic of AIEH were considered eligible. Only those patients who underwent cataract surgery at AIEH and consented to participate in the study were included.

Exclusion Criteria

Patients younger than 40 years of age, or those with decreased vision due to ocular conditions other than cataracts, were excluded. Individuals who refused consent or were unable to participate due to mental challenges, uncooperative behavior, or other reasons were also excluded. Furthermore, patients lost to follow-up were not included in the final analysis.

Data Collection Procedure

Before data collection, approval of the synopsis was obtained from the College of Physicians and Surgeons Pakistan (CPSP), along with permission from the Ethical Review Board of the institution. Eligible diabetic patients presenting with cataracts at AIEH and meeting the inclusion criteria were approached for participation. Informed written consent was obtained from all participants. Data were collected using a structured proforma, which included demographic details (age, gender, occupation, level of education), systemic history, duration of diabetes mellitus, and ocular history. All patients underwent a comprehensive ocular examination by a qualified ophthalmologist. This included baseline assessment of visual acuity, manifest refraction, and slit-lamp examination of both the anterior and posterior segments. Visual acuity was documented preoperatively and at three postoperative intervals: on the first day, after the first week, and after one month. Postoperative follow-up examinations were conducted to assess surgical outcomes and monitor for complications. All collected information was kept strictly confidential.

Data Analysis

The data were analyzed using Statistical Package for the Social Sciences (SPSS) version 22.0. Quantitative variables such as age and duration of diabetes were presented as mean ± standard deviation (SD) or median with interquartile range (IQR), depending on data distribution. Normality of continuous variables was assessed using the Shapiro-Wilk test. Categorical variables, including gender, occupation, level of education, and visual outcomes (categorized as mild, moderate, and severe visual impairment), were summarized as frequencies and percentages. To control for potential effect modifiers such as age, gender, duration of diabetes, and level of education, stratification was applied. Post-stratification analysis was carried out using Chi-square test or Fisher's exact test where appropriate. A p-value of ≤ 0.05 was considered statistically significant.

RESULTS

A total of 133 diabetic patients undergoing cataract surgery were included in the study. The mean age was 54.7 ± 6.8 years. There was a slight predominance of males, with 72 patients (54.1%), while females comprised 61 patients (45.9%). The majority of patients, 79 (59.4%), had diabetes for more than 10 years, while 54 (40.6%) had a duration of less than 10 years. With respect to occupation, most were unemployed or housewives (85, 63.9%), while 48 (36.1%) were employed. Regarding educational status, 42 patients (31.6%) had no formal education, 39 (29.3%) had attained primary education, and 52 (39.1%) had secondary or higher education (Table 1).

Table 1

Baseline Demographic and Clinical Characteristics of Patients (N = 133)

Variable		Total (N=133)
Age, years (mean ± SD)		54.7 ± 6.8
Gender, n (%)	Male	72 (54.1)
	Female	61 (45.9)
Duration of diabetes, n (%)	< 10 years	54 (40.6)
	≥ 10 years	79 (59.4)
Occupation, n (%)	Employed	48 (36.1)
	Unemployed/Housewife	85 (63.9)
Education level, n (%)	No formal education	42 (31.6)
	Primary	39 (29.3)
	Secondary or higher	52 (39.1)

Preoperatively, most patients presented with poor vision: 98 patients (73.7%) had severe impairment (<6/60), while only 12 (9.0%) had normal or mild impairment. By the first postoperative day, 56 patients (42.1%) had achieved normal/mild impairment, and this proportion rose substantially to 91 (68.4%) by the first week. At one month, 106 patients (79.7%) had vision of ≥6/18, while only 6 patients (4.5%) remained with severe impairment. Moderate impairment decreased progressively from 23 patients (17.3%) preoperatively to 21 patients (15.8%) at one month (Table 2).

Table 2
Visual Acuity Outcomes at Different Time Intervals (N = 133)

Visual Acuity Category	Preoperative n (%)	Day 1 Post-op n (%)	Week 1 Post-op n (%)	Month 1 Post-op n (%)
Normal / Mild impairment (≥6/18)	12 (9.0)	56 (42.1)	91 (68.4)	106 (79.7)
Moderate impairment (6/18–6/60)	23 (17.3)	39 (29.3)	29 (21.8)	21 (15.8)
Severe impairment (<6/60)	98 (73.7)	38 (28.6)	13 (9.8)	6 (4.5)

When stratified by duration of diabetes, outcomes were significantly better in those with less than 10 years of disease. At one month, 48 of 54 patients (88.9%) with <10 years of diabetes achieved vision ≥6/18 compared with 58 of 79 patients (73.4%) with ≥10 years of disease (p = 0.03). Gender was not significantly associated with outcome: 59 males (81.9%) and 47 females (77.0%) achieved vision ≥6/18 (p = 0.46). Similarly, education level showed no significant impact, with good outcomes seen in 73.8% of those without formal education, 79.5% with primary education, and 84.6% with secondary or higher education (p = 0.28) (Table 3).

Table 3
Comparison of Final Visual Outcomes at 1 Month by Duration of Diabetes (N = 133)

Duration of Diabetes	≥6/18 (n=106) n (%)	<6/18 (n=27) n (%)	p-value
< 10 years (n=54)	48 (88.9)	6 (11.1)	
≥ 10 years (n=79)	58 (73.4)	21 (26.6)	0.03
Gender			
Male (n=72)	59 (81.9)	13 (18.1)	
Female (n=61)	47 (77.0)	14 (23.0)	0.46
Education Level			
No formal education (n=42)	31 (73.8)	11 (26.2)	
Primary (n=39)	31 (79.5)	8 (20.5)	
Secondary or higher (n=52)	44 (84.6)	8 (15.4)	0.28

Surgical complications were uncommon. The most frequent was transient corneal edema, reported in 9 patients (6.8%). Posterior capsular opacification occurred in 5 patients (3.8%) within the first month. No case of endophthalmitis was observed during the study period (Table 4).

Table 4
Postoperative Complications (N = 133)

Complication	Frequency n (%)
Transient corneal edema	9 (6.8)
Posterior capsular opacification	5 (3.8)
Endophthalmitis	0 (0.0)

DISCUSSION

This study demonstrated that cataract surgery significantly improved visual outcomes in diabetic patients, with nearly 80% of patients achieving a visual acuity of ≥6/18 one month postoperatively. The results confirm that phacoemulsification with intraocular lens implantation is an effective means of restoring vision in diabetic eyes, although outcomes are influenced by disease-related factors such as the duration of diabetes. Preoperatively, a large proportion of patients presented with severe visual impairment, which is consistent with the known tendency for diabetic patients to develop denser and earlier cataracts compared to the non-diabetic population. The substantial shift toward normal or only mild visual impairment by the first postoperative week, and its further improvement by one month, highlights the efficacy of modern cataract surgery in this group [14]. This finding aligns with previous research which has shown that diabetic patients can achieve comparable postoperative visual acuity to non-diabetic patients, provided there is no significant pre-existing macular pathology [15].

An important finding in the present study was the association between duration of diabetes and postoperative outcomes. Patients with diabetes for less than 10 years were significantly more likely to achieve good visual recovery compared to those with longer disease duration. This is plausible, as longer disease duration is often associated with cumulative microvascular damage, higher prevalence of diabetic retinopathy, and subtle macular changes, all of which may compromise visual recovery despite successful surgery [16]. Previous research has also identified longer duration of diabetes as a predictor of suboptimal visual outcomes. Gender and education level did not show significant associations with final visual acuity in this study. These findings suggest that biological and socioeconomic factors may play a lesser role compared to systemic and ocular disease factors in determining postoperative outcomes. This contrasts with some earlier reports where health literacy and compliance with follow-up were associated with better outcomes, but differences in study design, population, and follow-up intervals may explain the variation [17].

The rate of postoperative complications in this study was low. Transient corneal edema and posterior capsular opacification were the most frequent events, while no cases of endophthalmitis were reported [18]. These findings are consistent with global reports of cataract surgery safety, and they emphasize the benefits of meticulous surgical technique, strict sterilization protocols, and appropriate postoperative care. The study's results have important implications for clinical practice [19]. First, diabetic patients should be counseled preoperatively regarding the generally favorable prognosis of cataract surgery but also made aware that the duration of diabetes and presence of retinopathy may limit the extent of visual recovery. Second, preoperative retinal evaluation and timely management of macular edema or proliferative retinopathy remain essential to optimizing outcomes. Third, long-term follow-up is necessary to monitor for complications such as posterior capsular opacification and diabetic retinopathy progression [20].

Limitations

This study was limited by its single-center design and relatively short follow-up period of one month, which may underestimate long-term complications such as posterior capsular opacification and progression of diabetic retinopathy. Moreover, the absence of a non-diabetic control group precluded direct comparison of outcomes.

Finally, objective grading of retinopathy severity and its correlation with visual outcomes was not included, which could have provided further insights.

CONCLUSION

It is concluded that cataract surgery in diabetic patients leads to significant improvement in visual outcomes, with the majority achieving functional vision within one month of surgery. The duration of diabetes was identified as an important predictor, as patients with shorter disease duration showed better visual recovery compared to those with longer-standing diabetes. Gender and education level did not significantly influence outcomes. Postoperative complications were infrequent and manageable, underscoring the safety of modern cataract surgical techniques.

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