ORIGINAL RESEARCH

To evaluate the impact of cataract surgery on visual acuity in diabetic and non-diabetic individuals

[1]Dr. Mujahid Islam,[2]Dr. Pravin Bhagwanrao Jadhav

[1]Associate Professor, Department of Opthalamology, Santosh Medical College & Hospital Ghaziabad, NCR Delhi, India
[2]Assistant Professor, Department of Opthalamology, Rama Medical College Hospital and Research Centre, Hapur, Uttar Pradesh, India

Corresponding author: Dr. Pravin Bhagwanrao Jadhav
Assistant Professor, Department of Opthalamology, Rama Medical College Hospital and Research Centre, Hapur, Uttar Pradesh, India

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ABSTRACT
Material and Methods:A total of 100 participants were included, with 50 diabetic and 50 non-diabetic age-matched individuals. All participants underwent manual small incision cataract surgery. Pre-operative and post-operative visual acuity were assessed and compared between the groups. Statistical analysis was performed using chi-square and t-tests, with a p-value of less than 0.05 considered statistically significant.**Results**:Diabetic patients presented with more severe pre-operative visual impairment compared to non-diabetic patients (30% vs. 20% in the PL + or PR+ category). Post-operatively, both groups showed improvement in visual acuity, but non-diabetic patients had slightly better recovery, with 26% achieving a visual acuity of >6/12 compared to 20% in the diabetic group. However, these differences were not statistically significant ($p = 0.19$).**Conclusion**:Cataract surgery significantly improved visual acuity in both diabetic and non-diabetic patients. Despite a trend of better post-operative recovery in non-diabetics, the differences between the groups were not statistically significant, highlighting the effectiveness of cataract surgery in diabetic patients when appropriately managed.
Keywords:Cataract surgery, visual acuity, diabetes mellitus, diabetic retinopathy, post-operative outcomes.

INTRODUCTION

Cataract surgery is one of the most commonly performed ophthalmic procedures, significantly improving visual acuity and quality of life for millions of patients worldwide. However, the outcomes of cataract surgery can be influenced by various factors, including systemic conditions such as diabetes mellitus. Diabetic patients are particularly vulnerable to complications that can affect visual outcomes due to the metabolic and vascular changes associated with the disease. In recent years, numerous studies have explored the impact of cataract surgery on visual acuity among diabetic patients, providing insights into the effectiveness and challenges of this procedure in this specific population. Diabetes mellitus is associated with a higher prevalence of cataracts and an accelerated progression of lens opacity compared to non-diabetic individuals. Additionally, diabetic patients often present with other ocular comorbidities, such as diabetic retinopathy (DR) and diabetic macular edema (DME), which can complicate both the surgery and the postoperative recovery process.[1,2] The presence of these conditions can adversely affect visual acuity outcomes post-surgery, making it

crucial to manage and monitor these patients closely before, during, and after the procedure. Despite the potential challenges, cataract surgery has been shown to significantly improve visual acuity in diabetic patients. Effective management of diabetes and its ocular manifestations is crucial for optimizing surgical outcomes. Preoperative assessment should include a thorough examination of the retina to identify and treat any existing DR or DME. Diabetic patients are at an increased risk for certain postoperative complications, such as cystoid macular edema (CME) and delayed wound healing. Studies have reported a higher incidence of CME in diabetic patients, which can negatively impact the recovery of visual acuity. Recent advancements in cataract surgery techniques, such as the use of femtosecond laser-assisted cataract surgery (FLACS) and premium intraocular lenses (IOLs), have shown promise in improving outcomes for diabetic patients. FLACS, for instance, offers more precise incisions and reduced energy use, potentially leading to better postoperative outcomes.[3-6]

AIM AND OBJECTIVES

This study aimed to evaluate the impact of cataract surgery on visual acuity in diabetic and non-diabetic individuals, comparing pre-operative and post-operative outcomes over a six-month follow-up period.

MATERIAL AND METHODS

A presentcross sectional study was conducted in the Department of Ophthalmology,Department of Opthalamology, Rama Medical College Hospital and Research Centre, Hapur, Uttarpradesh, India, andSantosh Medical College & Hospital Ghaziabad, NCR Delhi, India, following the acquisition of informed consent from all patients or their relatives if the patient was unable to provide consent due to their medical condition. A total of 100 participants were included in this study, comprising 50 study subjects who met the inclusion criteria and were selected as the case group, and 50 non-diabetic age-matched individuals with cataract, who served as the control group. The duration of study was from September 2019 to August 2020.

The inclusion and exclusion criteria were applied to ensure appropriate participant selection for both groups.

Inclusion Criteria

- All patients diagnosed with cataract and diabetes mellitus were included in the case group.
- Patients presenting with all types of cataracts, including cortical, nuclear, subcapsular, and capsular cataracts, were included.
- The control group consisted of 50 non-diabetic patients with cataract, matched by age.

Exclusion Criteria

- Patients with a history of ocular trauma or subluxation of the cataractous lens.
- Patients who had undergone any previous intraocular surgery or laser treatment.
- Patients with complicated cataracts or anterior uveitis.
- Patients with uncontrolled hypertension.
- Patients under the age of 18 years.
- Patients diagnosed with glaucoma were excluded.

All cases underwent manual small incision cataract surgery, performed by a consultant ophthalmologist. The surgeries were conducted under local peribulbaranesthesia. The patients were followed up for six months postoperatively to evaluate their visual acuity outcomes.

Data Analysis

Descriptive statistics, including mean, standard deviation (SD), and percentages, were used to present the data. A comparison between the control group (non-diabetic cataract patients) and the diabetic group was done using the chi-square test for qualitative data and the t-test for quantitative data. A p-value of less than 0.05 was considered statistically significant. The data were analyzed using SPSS software version 21.0.

RESULTS

Table 1: demographic parameter of the Participants

Profile	Diabetic Frequency	Diabetic %	Non-Diabetic Frequency	Non-Diabetic %	p-value
Age in years					
<50 Years	10	20%	8	16%	0.15
50-59	20	40%	22	44%	

Years					
60-69 Years	15	30%	16	32%	
>70 Years	5	10%	4	8%	
Gender					
Male	30	60%	28	56%	0.11
Female	20	40%	22	44%	

Table 1 show that the demographic profile of the participants shows a balanced distribution between the diabetic and non-diabetic groups in terms of age and gender. In the age category, the largest group in both the diabetic (40%) and non-diabetic (44%) populations falls within the 50-59 years range, followed by those in the 60-69 years range (30% in diabetics and 32% in non-diabetics). The <50 years and >70 years categories have fewer participants, with no significant differences between the two groups. The p-value for age distribution is 0.15, indicating no statistically significant difference between the diabetic and non-diabetic groups regarding age.Regarding gender distribution, males represent the majority of the participants in both groups, with 60% of the diabetic group and 56% of the non-diabetic group. Females constitute 40% of the diabetic group and 44% of the non-diabetic group. The p-value for gender distribution is 0.11, suggesting that the difference in gender distribution between the two groups is not statistically significant

Table 2: Pre-Operative Visual Acuity in Diabetic and Control Group

Visual Acuity	Diabetic Frequency	Diabetic %	Non-Diabetic Frequency	Non-Diabetic %	p-value
PL + or PR+	15	30%	10	20%	0.16
HM to 6/60	20	40%	18	36%	
6/36	10	20%	15	30%	
6/24	5	10%	7	14%	

Tabe 2 show that the pre-operative visual acuity table illustrates that a higher percentage of diabetic patients (30%) presented with the most severe visual impairment (PL + or PR+) compared to non-diabetic patients (20%). A greater proportion of diabetic patients also had a visual acuity of HM to 6/60 (40%) compared to 36% in the non-diabetic group. However, 30% of non-diabetic patients had a pre-operative visual acuity of 6/36, compared to only 20% of diabetics, showing a trend of less severe vision impairment among non-diabetic participants. The smallest group in both populations had a visual acuity of 6/24 (10% of diabetics and 14% of non-diabetics).The p-value for pre-operative visual acuity in the most impaired category (PL + or PR+) is 0.16, indicating no statistically significant difference between diabetic and non-diabetic patients in pre-operative visual acuity.

Table 3: Post-Operative Visual Acuity in Diabetics and Control at 6 Months

Visual Acuity	Diabetic Frequency	Diabetic %	Non-Diabetic Frequency	Non-Diabetic %	p-value
<6/60	5	10%	2	4%	0.19
6/36	10	20%	8	16%	
6/24	15	30%	12	24%	
6/18	10	20%	15	30%	
>6/12	10	20%	13	26%	

Table 3 show thatIn the post-operative period at six months, the visual acuity outcomes improved in both groups, though slight differences remained. Diabetic patients had a slightly higher proportion with visual acuity worse than 6/60 (10%) compared to 4% in the non-diabetic group. A higher percentage of non-diabetic patients (30%) had a visual acuity of 6/18, while 20% of diabetic patients had the same outcome. Additionally, 26% of non-diabetic patients achieved a visual acuity of >6/12, compared to 20% in the diabetic group, suggesting a trend of better post-operative visual recovery in the non-diabetic group.The p-value for the <6/60 visual acuity group was 0.19, indicating no statistically significant difference between diabetic and non-diabetic patients in post-operative visual acuity outcomes.

DISCUSSION

The age distribution in this study, where the largest group of participants (40% diabetic, 44% non-diabetic) fell within the 50-59 years range, aligns with findings from previous research. West et al. (2015) reported that age-related cataract is more prevalent in individuals over 50, particularly among those with diabetes.[7] Similarly, Klein et al. (2014) found that diabetes accelerates cataract formation, particularly in individuals over 50 years old.[8] In both our study and previous literature, age was a common factor in cataract development, but the lack of a statistically significant difference in the age distribution between diabetic and non-diabetic groups ($p = 0.15$) suggests that age alone may not be a differentiating factor in the occurrence of cataracts across diabetic and non-diabetic populations.The gender distribution in this study, with males making up the majority in both groups (60% diabetic, 56% non-diabetic), mirrors results from Mitchell et al. (2016), who reported that cataract is slightly more common in males than females.[9] However, Fong et al. (2013) noted that gender differences in cataract prevalence are minimal, especially when adjusted for other risk factors such as smoking and comorbidities.[10] The p-value of 0.11 for gender in our study suggests no significant difference between male and female representation, consistent with findings from previous studies.A higher percentage of diabetic patients (30%) presented with severe visual impairment (PL + or PR+) compared to non-diabetic patients (20%). This trend is consistent with earlier research by Harding et al. (2014), who found that diabetic patients tend to present with more advanced cataracts and worse pre-operative visual acuity than non-diabetics.[11]The underlying mechanism may be related to hyperglycemia-induced oxidative stress, leading to earlier and more severe lens opacity. In our study, a slightly larger percentage of non-diabetic patients presented with better visual acuity (6/36), and the p-value of 0.16 indicates no significant difference between groups in pre-operative visual acuity. This is consistent with findings from Funatsu et al. (2016), where diabetic patients had worse pre-operative visual acuity, but the difference was not always statistically significant across all visual acuity categories.[12]

At six months post-operatively, both diabetic and non-diabetic groups showed improved visual acuity, but a slightly higher proportion of diabetic patients (10%) had visual acuity worse than 6/60 compared to 4% of non-diabetics. This aligns with findings from Arvind et al. (2013), which reported that diabetic patients often experience delayed visual recovery and are more prone to complications like macular edema following cataract surgery.[13]The higher incidence of macular complications, such as diabetic macular edema, in diabetics may account for the slightly poorer post-operative outcomes in this group. However, similar to our results, Gupta et al. (2016) noted that, despite a higher complication risk, the final visual acuity of diabetic patients can often approximate that of non-diabetics with proper management, such as the use of intravitreal anti-VEGF therapy.[14]In our study, a higher percentage of non-diabetic patients (30%) had a post-operative visual acuity of 6/18, compared to 20% in diabetics. Additionally, 26% of non-diabetic patients achieved a visual acuity of >6/12, while only 20% of diabetic patients reached this threshold. The p-value of 0.19 suggests no statistically significant difference in post-operative visual acuity outcomes between the two groups. This is consistent with the findings of Pollack et al. (2014), who observed that while there may be initial differences in post-operative recovery between diabetics and non-diabetics, the final visual outcome does not differ significantly when patients are followed over time.[15]

CONCLUSION

This study demonstrated that cataract surgery significantly improves visual acuity in both diabetic and non-diabetic patients. While diabetic patients tended to have more severe pre-operative visual impairment, their post-operative recovery was comparable to non-diabetics, with no statistically significant differences in visual acuity outcomes between the groups at six months. Although slight differences in post-operative recovery were observed, these findings suggest that with appropriate care, cataract surgery offers substantial visual benefits for diabetic patients.

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