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Indian Journal of Clinical and Experimental Ophthalmology

Journal homepage: [www.ijceo.org](http://www.ijceo.org)

## Original Research Article

## Visual outcome following cataract surgery in diabetic retinopathy patients

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## ARTICLE INFO

## Article history:

Received 18-10-2023

Accepted 28-02-2024

Available online 04-07-2024

## Keywords:

Diabetes Mellitus (DM)

Diabetic retinopathy (DR)

Clinically significant Macular Oedema (CSME)

## ABSTRACT

**Aim:** This study was conducted to find out the visual outcomes and factors that affect visual outcomes following cataract surgery in diabetic retinopathy patients.**Materials and Methods:** The study included 200 patients, 100 patients with diabetes but without diabetic retinopathy, and 100 patients with diabetic retinopathy for this study. The duration of diabetes will be equal in two groups. Ophthalmic examination included visual acuity, anterior segment, and fundus examination-stage of retinopathy pre and post-operative, evaluation 12 months postoperatively included visual acuity (VA), retinopathy progression, and macular edema incidence.**Results:** Postoperative visual acuity increased by 2 or more lines in patients. Progression of retinopathy occurred in 26.5% of eyes after cataract surgery and in 9.5% of non-operated fellow eyes. The most common complication during surgery was intraoperative miosis accounting for 12%. The most common long-term complication after surgery was cystoid macular edema. The most common complication following surgery was corneal edema (19%).**Conclusion:** Cataract surgery in diabetic patients results in a good visual outcome. However, duration of type 2 diabetes mellitus plays an important role in progression of cataract. Poor control of diabetes mellitus was associated with an earlier onset of diabetic retinopathy, as well as the progression of previously controlled retinopathy. Uncomplicated cataract surgery seems to exacerbate the progression of DR in patients with worse-controlled diabetes.This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.For reprints contact: [reprint@ipinnovative.com](mailto:reprint@ipinnovative.com)

## 1. Introduction

Diabetes mellitus is a common endocrine disorder characterized by hyperglycaemia as a main feature. Both genetic and environmental factors play vital roles in the causal pathway of diabetes.<sup>1</sup> The annual incidence of cataract blindness in India is about 3.8 million. About one-sixth of the world's total blind population, with visual acuity worse than 3/60, resides in India.<sup>2,3</sup> Studies indicate an increasing incidence of diabetes in developing countries. Individuals with diabetes mellitus have been found to be at a higher risk of developing

cataracts compared to non-diabetics.<sup>4</sup> Nearly two-thirds of the diabetic population shows evidence of cataract, and more than 20% of cataract surgeries are performed on diabetic patients.<sup>5</sup> Preoperatively, diabetic patients experience a higher occurrence of pigment dispersion and fibrinous reaction in the anterior chamber, leading to the formation of posterior synechiae, an increased risk of capsule rupture, and vitreous loss. Postoperatively, they are more prone to complications such as rubeosis, neovascular glaucoma, macular oedema, severe inflammation (iritis, uveitis, endophthalmitis), vitreous haemorrhage, synechiae to intraocular lens (IOL), retinal detachment, and corneal decompensation. Anterior segment complications like pigment dispersion, fibrinous reaction, posterior synechiae,

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pupillary block, and transient iridal vascular congestion can develop. Diabetics are also more susceptible to developing posterior capsule opacification postoperatively.<sup>6,7</sup>

## 2. Material and Methods

The study was conducted over one and half year. In this hospital based prospective study all patients who were admitted in the Ophthalmology ward for cataract surgery were selected for the study with the following inclusion and exclusion criteria. The study subject was divided in 2 groups – group 1 had patients with diabetes but without retinopathy and group 2 – had patients with diabetic retinopathy. Patients were followed up for 12 months.

### 2.1. Inclusion criteria

All patients of type 2 diabetic mellitus with all types of cataracts above the age of 45 years admitting for small incision cataract surgery were included in this study.

### 2.2. Exclusion criteria

Following were exclusion criteria:

1. Patients with other vision impairing conditions like glaucoma, corneal dystrophies,
2. Any Secondary cataract and Traumatic Cataract
3. Previous Intraocular Surgery
4. Previous ocular trauma, subluxation of the cataractous lens
5. Previous intraocular laser treatment.
6. Patients below the age of 45 years.
7. Patient with hypertensive retinopathy.
8. Any patient with ocular surface disorders including pterygium, corneal opacity, etc.
9. Patient with other fundal pathology excluding diabetic retinopathy.

The sample size was calculated as below:

$$\text{Sample size} = 4x P X Q / d^2$$

$$\text{Prevalence, } P = 30$$

$$Q = 100 - P = 70$$

$$\text{Allowable error, } d = 10$$

$$\text{Sample size} = 84$$

Considering 20% as the dropout rate, the sample size will be 100 patients with diabetes but without diabetic retinopathy and 100 patients with diabetic retinopathy for this study.

Sampling method- purposive sampling.

After obtaining informed consent from the participants, demographic information's were recorded, and preoperative complete ocular examination were done. The ophthalmic examination includes best corrected visual acuity with pinhole improvement, slit lamp anterior segment and fundus examination, and tonometry.

Post-operative follow-ups were done on days 1, 7, 3 weeks and the 6<sup>th</sup> weeks and whenever necessary. Progression of diabetic retinopathy was assessed after a 12-month follow-up.

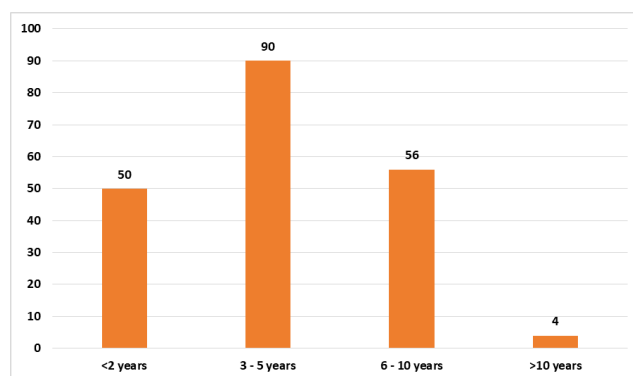
## 3. Results

Out of 200 patients 66(33%) were men and 134(67%) were women. The majority (47%) were in the age group 51-60 years and 30% belonged to the age group 61-70 years. Diabetes was present in 45% of the study population. The most common complication during surgery was intraoperative miosis accounting for 12%. The most common complication following surgery is corneal edema (19%). The most common long-term complication after surgery was Cystoid macular edema. In the operated eyes, there was a progression of mild NPDR to moderate NPDR in 11.5% and corresponding figures in the non-operated eyes at 5.5%. There was aggravation from moderate to severe NPDR in 7.5% of operated eyes and the corresponding figures in the non-operated eyes were 2.5%. There was aggravation from moderate to severe NPDR in 7.5% of operated eyes and the corresponding figures in the non-operated eyes were 2.5%.

**Table 1:** Comorbid conditions

Systemic association	No of patients	Percentage
Hypertension	32	16%
Anemia	24	12%
Nephropathy	24	12%
Ischemic heart disease	12	6%
Asthma	6	3%
Obesity	6	3%
Hypothyroid	2	1%

Table 1 showing comorbid conditions. The least common condition was hypothyroidism (1%) followed by obesity 3% and asthma (3%). Ischemic heart disease is found in 6% of study subjects.



**Figure 1:** Duration of diabetes

Figure 1 showing duration of diabetes. Longer duration of diabetes of more than 10 years was present in 2% of study population. 25% had diabetes for less than 2 years.

**Table 2:** Co morbid ocular manifestation

Disease	No of Patients	Percentage
POAG	4	2%
Phacomorphic glaucoma	4	2%
Uveitis	4	2%
ARMD	4	2%
Corneal opacity	2	1%
Iris coloboma	2	1%
Phacolytic glaucoma	2	1%
Macular hole	2	1%
HTN Retinopathy	2	1%
Ocular allergy	2	1%

**Table 3:** Intraoperative complications

Complication	No of patients	Percentage
Intraoperative Miosis	24	12%
Posterior capsule rent	5	2.5%
Zonulodialysis	4	2%
Vitreous loss	5	2.5%
Excessive pigment release	6	3%
Bleeding from iris	2	1%
SCH during anesthesia	2	1%
Iris tear	4	2%
Retained lens material	2	1%
Primary PCO	2	1%
Calcified anterior capsule	2	1%

The most common complication during surgery was intraoperative miosis accounting for 12%.

**Table 4:** Distribution of post-operative complications

Complications	No of patients	Percentage
Corneal edema	38	19%
Post-operative inflammation (iritis)	20	10%
Retained cortical material	6	3%
Raised IOP	8	4%
Iris Prolapse	4	2%
Hyphemia	2	1%
Wound leak	2	1%
IOL malposition	2	1%
Vitreous in wound	2	1%
Peri orbital bruise	2	1%
Reactivation choroiditis	2	1%
Supra choroidal hemorrhage	2	1%

The most common complication following surgery was corneal edema (19%)

**Table 5:** Long term complication

Complication	No of patients	Percentage
Cystoid macular edema	8	4%- (Aphakia 3% and pseudophakia -1%)
Recurrent uveitis	4	2%
Prolonged RIOP	4	2%
Cyst at wound site	2	1%
PCO	6	3%

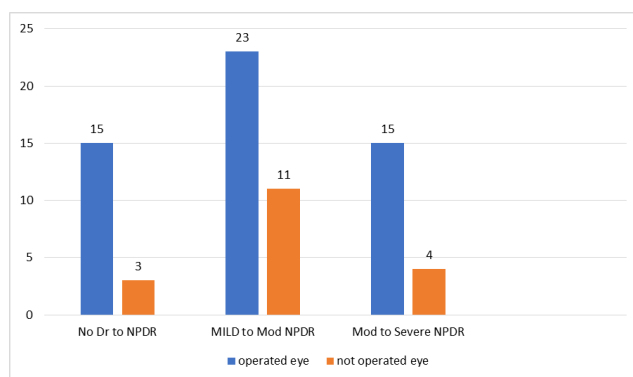
The most common long term complication after surgery was cystoid macular oedema.

**Table 6:** Visual acuity after surgery

Visual acuity	No of patients	Percentage
<6/60	32	16%
6/60- 6/36	58	29%
6/24 – 6/18	74	37%
6/12- 6/6	36	18%

**Table 7:** BCVA at 6 weeks

Visual acuity	No of patients	Percentage
<6/60	20	10%
6/60- 6/36	8	4%
6/24 – 6/18	34	17%
6/12- 6/6	136	68%
PL/PR negative	2	1%



**Figure 2:** Progression of DR in operated vs non-operated eye

#### 4. Discussion

This study involved 200 diabetic patients who underwent cataract surgery with 2 sub-groups of 100 patients with diabetic retinopathy and 100 patients with no diabetic retinopathy. Forty-seven percentage (47%) of the patients were between 51-60 years & nearly 30% were between 61-70 years. Of the 200 patients 66 were men and 134 were women.

In our study the major type is cortical cataract (80%), nuclear cataract (16%) and posterior subcapsular cataract (3%).

The beaver dam eyestudy findings suggested that cataract associated- due to increased glycosylated haemoglobin- Cortical cataract were more common than posterior subcapsular cataracts (PSCC) and nuclear cataract.<sup>8</sup>

In our study, the most common is hypertension (16% followed by Anaemia (2%) and nephropathy (12%). Ischemic heart disease (IHD) is found in 6% of study subjects. And the least common co-morbid condition is hypothyroidism (1% followed by obesity (3% and asthma (3%).

The majority (83%) were treated by Oral hypoglycaemic agents and insulin. Only 11% were treated with insulin.

A longer duration of diabetes of more than 10 years is present in 2% of study population. 25% had diabetes for less than 2 years. 45% had diabetes around 3-5 years and 28% around 6-10 years.

In our study, primary open angle glaucoma, phacomorphic glaucoma, uveitis are present in 2% of study population. Corneal opacity, Iris coloboma, Phacolytic Glaucoma, Macular Hole, and Hypertensive Retinopathy are other ocular co-morbidities.

In our study, the most common intra-operative complication is intra-operative miosis accounting for 12%. Kutschan A et al. found the most common intra-operative complication in diabetics was insufficient pupil dilation (25.2%).<sup>9</sup>

In our study the most common post-operative complication is corneal edema(19%) and postoperative iritis (10%). Kutschan et al. has found that anterior segment inflammation was the common postoperative complication.<sup>9</sup> Menchini et al. found increased ocular complications after surgery in patients with diabetic retinopathy.<sup>10</sup>

The most common long term complication after cataract surgery in our study is Cystoid macular edema & Posterior Capsular Opacification (After-cataract), Other complications were recurrent chronic uveitis, raised IOP & malposition of IOL.

In a study done by Pollock et al. it has been concluded that presence of diabetic retinopathy will definitely affect the prognosis in terms of prolongation of cystoids macular oedema. In a longitudinal study which involved 50 participants, the new occurrence of cystoid macular oedema is 22% among retinopathic patients and while none of the patient without retinopathy reported cystoid macular edema.<sup>11</sup>

After surgery: VA< 6/60 = (16%), VA 6/60-6/36 = (29%), VA 6/24 - 6/18 = (37%), VA 6/12-6/6 = (18%)

BCVA at six weeks:

VA< 6/60=(10%), VA 6/60-6/36 =(4%), VA 6/24 - 6/18=(17%), VA 6/12 - 6/6 = (68%)

After 12 months follow up progression of diabetic retinopathy was observed in eye with no DR preoperatively there was progression to NPDR in 7.5% of operated eye and 1.5% in non-operated eye. There was progression of mild to moderate NPDR in 11.5% of operated eye, whereas in non-operated eyes 5.5%. There was aggravation from moderate to severe NPDR in 7.5% of operated eye and in non-operated eye 2.5%. In our study 8 patients are treated with Anti-VEGF, focal and grid laser.

Study done by Robert A. Mitra, MD; Jesus L. Borrillo, MD Visual acuity improved in 117 eyes (78%) by 2 or more lines, with 6 to 10 months of follow-up. Retinopathy progression was seen in 37 eyes (25%).<sup>12</sup> Cheng et al.<sup>13</sup> in his study has found that visual outcome was good in the absence of retinopathy compared to retinopathic patients. Poor prognosis was associated with severity of retinopathy. For retinopathic patients cystoid macular edema is the most frequent complication. Borrillo et al. In a 6 month follow up period, a systematic review has shown the rate of progression of diabetic retinopathy as 25%.<sup>12</sup>

**Table 8:** Present study findings

<b>No Dr to NPDR</b>	7.5%	1.5%
<b>Mild to moderate</b>	11.5%	5.5%
<b>Moderate to severe</b>	7.5%	2.5%

### 5. Conclusion

Our study evaluated 200 diabetic patients who underwent cataract surgery with 2 (subgroups - I) with Diabetic retinopathy & 2) without Diabetic retinopathy. The typical Snow Flake Cataract is uncommon and Cortical Cataract being the most common type of Cataract in Diabetic Patients. Hypertension was a common association found in Diabetic patients. It is important to screen all diabetic patients annually, with dilated fundus examination to diagnose Diabetic retinopathy as early as possible. Strict glycemic control during the perioperative period helps to stabilize the retinal changes and influences the postoperative visual outcome. Duration of type 2 DM play an important role in progression of cataract. Also, poor control of diabetes mellitus is associated with an earlier onset of diabetic retinopathy, The most common post-operative complications were Cystoid macular edema and posterior capsular opacity (After-cataract). While post-operative uveitis, raised IOP, Corneal edema, etc. accounting to a smaller proportion. Pre-operative eyes with no evidence of diabetic retinopathy showed notably no change in post-operative fundus examination. In eyes with pre-operative non-proliferative diabetic retinopathy showed notably higher incidence of progression in post-operative fundus examination. After 1 year of cataract surgery, in both the study eye and the control eye, showed lighter incidence of progression of non - proliferative diabetic

retinopathy. The progression is very significance in pre-existing diabetic retinopathy status in patients with poor post-operative glycemic control and long-standing diabetes. Cataract surgery in diabetic patients can result in a good visual outcome with few postoperative complications which can be managed efficiently.

## 6. Source of Funding

None.

## 7. Conflict of Interest

None.

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**Cite this article:** Pramod M, Radhakrishnan B, Kumar S. Visual outcome following cataract surgery in diabetic retinopathy patients. *Indian J Clin Exp Ophthalmol* 2024;10(2):293-297.