

Study to Evaluate and Compare Visual Outcome after Cataract Surgery in Diabetics with Non - Diabetic Patients in a Tertiary Care Center

Dr. Akash U Malvi ¹, Dr. N. T. Patil ², Dr. N. S. Arvikar ³

¹Junior Resident, Department of Ophthalmology, Dr Ulhas Patil Medical College and Hospital, Jalgaon, Maharashtra

²Lecturer, Department of Ophthalmology, Dr Ulhas Patil Medical College and Hospital, Jalgaon, Maharashtra

³Professor, Department of Ophthalmology, Dr Ulhas Patil Medical College and Hospital, Jalgaon, Maharashtra

Abstract: ***Aim:** The aim of this study is to evaluate and compare visual outcome after cataract surgery in diabetic with non - diabetic patients in a tertiary care hospital. **Material & Methods:** 1) Study type and design: Hospital based analytical prospective study. 2) Study area: The present study had been carried out in Dept. Of Ophthalmology, Dr Ulhas Patil Medical College and Hospital Jalgaon. 3) Study population: 50 cataract patients with diabetes mellitus (cases) and 50 non - diabetic cataract patients (controls). So total of 100 samples. 4) Study duration: 2 years from Jan 2021 to December 2022. **Results:** The mean preoperative best corrected visual acuity in the diabetic group was 0.99 ± 0.19 and in non - diabetic group was 0.96 ± 0.21 . The mean post - operative best corrected visual acuity in log MAR units in the diabetic group was 0.27 ± 0.14 and in the non - diabetic group was 0.25 ± 0.11 . The difference in pre and post op visual outcome was statistically significant ($p=0.001$). Post - operative visual acuity of 6/12 or better was achieved in 88% eyes in diabetics and 94% among non - diabetics.*

Keywords: Cataract, Diabetes, Cataract surgery, SICS, Diabetic retinopathy

1. Introduction

Epidemiological data suggests that there's an adding prevalence of diabetes mellitus in developing countries. By 2030, it's estimated that global frequency of diabetes would reach roughly 4.4 percentage. In the world, Diabetes mellitus is one of the most common systemic problems affecting a variety of people. Various threat factors for development of diabetes include population growth, aging, sedentary cultures, urbanization and an increased rotundity frequency.¹

Diabetes mellitus affects the function and morphology of the eye lens. Diabetes mellitus is a threat factor for development of cataract. Cataract is the alternate most common optical complication of diabetes mellitus after diabetic retinopathy. It's also noted that cataract develops at an earlier age in diabetics. In addition to cataract vision is affected in diabetics by other mechanisms too. Cataract is one of the leading causes of blindness encyclopedically, nearly 18 million people are affected. Roughly two third of the diabetic population shows substantiation of cataract. Cataracts do occur at an early age in diabetics compared to non - diabetics and 2 - 5 times more common in diabetic cases. So, cataract surgery in diabetics is frequently done at an early age. In India roughly 20 of all cataract surgery is done in diabetics.²

Diabetes causes microangiopathy which manifests as diabetic retinopathy, nephropathy and neuropathy. Newer studies have shown that retinal neurodegeneration also occurs along with or may antecede retinal vasculopathy. Diabetes not only affects the retina but also cornea, tear film and lens which lead to changes in the optic quality of the diabetic eye.³ In the age group 20 - 79 times roughly^{4,9}

million people around the world suffer from diabetes mellitus. In India the diabetic population is 72.9 million.⁴

In developing countries like India large proportion of cases with diabetes don't consult ophthalmologists unless the vision is grossly affected. They substantially present with advanced cataract. This precludes retinal assessment before cataract surgery with wrong visual outgrowth in cases of pre - existing retinal changes.⁵

Surgery is the treatment of choice for cataract. Intraoperative difficulties in diabetics include increased endothelial and iris color epithelial fragility, increased vascular leakage and inflammation, fibrin deposit, and increased vulnerability to operating microscope light injury. Postoperative problems may include increased threat of synechiae conformation and pupillary block, cystoid macular oedema, increased threat of vitreous hemorrhage and rapid - fire development of capsular thickening.⁶ Cataract surgery is known to increase the prevalence of diabetic retinopathy.⁷

Current surgical ways Small Incision cataract surgery (SICS) and phacoemulsification have an advantage over preliminarily followed cataract surgeries that they allow hastily recovery of vision and lower post - operative inflammation. The ultramodern ways of cataract surgery have bettered results.^{1,3, 14} Recent studies have reported favorable visual perceptivity after cataract surgery in diabetic patients.^{15 - 17} Cataract surgery in diabetes has good results, with high trustability and a slightly advanced rate of complications than non - diabetic cases. Causes for poor visual perceptivity after surgery are poor preoperative visual perceptivity, advanced stages of diabetic retinopathy and old age.¹⁸

The adding prevalence of diabetes in developing countries similar as India necessitates an assessment of the surgical outgrowth of diabetic cataract among the study population. An experimental, logical, prospective study was thus accepted to compare the postoperative complications and the visual outgrowth after cataract surgery in cases with Type - II Diabetes mellitus (DM) and those without DM operated at a rural medical college hospital.

Aim:

The aim of this study is to evaluate and compare visual outcome after cataract surgery in diabetic with non - diabetic patients in a tertiary care hospital.

Objectives:

- 1) To evaluate visual outcome after cataract surgery in diabetic patients.
- 2) To evaluate visual outcome after cataract surgery in non - diabetic patients
- 3) To compare visual outcomes after cataract surgery in diabetics with non-diabetic patients.
- 4) Assessment of post - operative complications after cataract surgery in diabetics with non - diabetics.

2. Material & Methods

- **Study type and design:** Hospital based analytical prospective study.
- **Study area:** The present study had been carried out in Ophthalmology department of a Tertiary care hospital.
- **Study population:** 50 cataract patients with diabetes mellitus (cases) and 50 non - diabetic cataract patients (controls). So total of 100 samples.
- **Study duration:** 2 years from Jan 2021 to December 2022.

Inclusion Criteria for Cases

- 1) Patients of 40 to 70 years of age
- 2) Patients with type 2 Diabetes mellitus (Cases)
- 3) Cataract irrespective of its morphology

Exclusion Criteria

- 1) Juvenile onset DM
- 2) Lens Induced Glaucoma
- 3) Pseudoexfoliation syndrome
- 4) Uveitis
- 5) Subluxated lens
- 6) Traumatic cataract
- 7) High degree of refractive error.
- 8) Patients with type I DM.
- 9) Glaucoma or any other ocular or systemic disorder that may affect the visual acuity.

100 patients were divided into two groups for comparison as we had to test the hypothesis that visual outcome after cataract surgery is better in non diabetics as compared to diabetics. Fifty cases of type 2 Diabetes mellitus belong to case group and the rest who did not have Diabetes mellitus comprised the control group. In the selected patients relevant history was recorded and detail ocular and systemic examination was done. In the history presence of diabetes, duration of diabetes, type of diabetes and treatment history was recorded. In all diabetics record of blood sugar and

HbA1c was obtained.

History of any other ocular or systemic illnesses or surgery was noted. Complete blood count, urine examination for sugar, albumin and pus cells, blood sugar level estimation, HIV and HbsAg testing was done pre operatively in all patients.

All surgeries were performed under peri - bulbar anesthesia with 4 ml of lignocaine hydro chloride 2% with 1: 200000 Adrenaline + 2ml of Bupivacaine 0.5%. In all patient's povidoneiodine 5% eye drops were instilled after anesthesia. Manual small incision cataract surgery with posterior chamber intraocular lens (PCIOL) implantation was performed in all patients.

Postoperatively antibiotic steroid eye drops (Chloramphenicol IP 4mg, Polymyxin B Sulphate BP 5000IU, Dexamethasone Sodium Phosphate IP 1mg, Phenylmercuric Nitrate IP 0.001% w/v) were instilled one hourly on first post operative day and subsequent frequency of instillation depended on ocular inflammation. When required oral anti - inflammatory drugs were prescribed. Patients were made aware about complications if any and advised to come for follow up as and when required.

Visual acuity testing and ocular examination on the first postoperative day and findings documented. Subsequent visual acuity recording and ocular examination findings were documented after one week and one month after surgery. The findings were subjected to analysis.

3. Observations & Results

The present hospital based analytical prospective study was carried out among 100 cataract patients, in which 50 patients were diabetic and remaining 50 patients were non - diabetic. Manual small incision cataract surgery with posterior chamber intraocular lens (PCIOL) implantation was performed in all patients and patients had been followed up for detecting complications. Observation which was found in the study is as follows,

Table 1: Age wise distribution of patients according to diabetics and non - diabetics group

Age (Yrs)	Diabetic	Non - Diabetic	Total
40 - 50	2 (66.67%)	1 (33.33%)	3 (100%)
51 - 60	16 (55.17%)	13 (44.83%)	29 (100%)
61 - 70	32 (47.06%)	36 (52.94%)	68 (100%)
Total	50 (50%)	50 (50%)	100 (100%)

Chi square value= 0.86, p Value=0.6, df= 2.

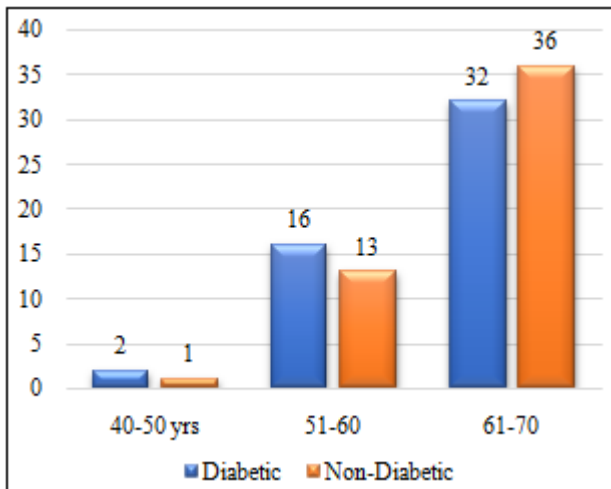


Figure 1: Age wise distribution of patients according to diabetics and non – diabetics group

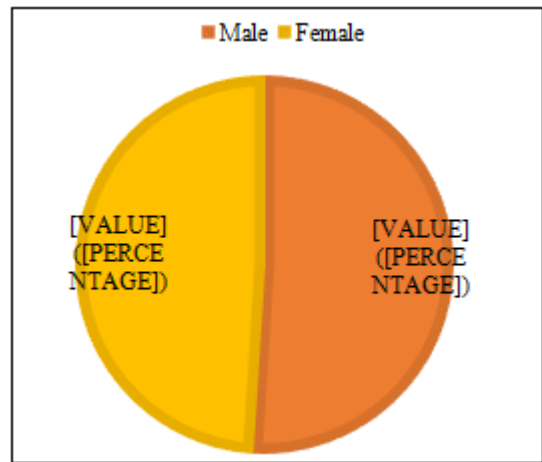


Figure 2: Gender wise distribution of patients (n=100)

Table no.1 and fig no.1 shows maximum number of patients belong to 61 - 70 years age group 68% (68 out of 100). Maximum number of diabetic and non - diabetic patients belongs to 61 - 70 years age group 64% (32 out of 50) and 72% (36 out of 50) respectively. Minimum number of patients belong to 40 - 50 years age group 3% (3 out of 100). Minimum number of diabetic and non - diabetic patients belongs to 40 - 50 years age group 64% (32 out of 50) and 72% (36 out of 50) respectively. The difference was not statistically significant (p Value>0.05).

Table 2: Mean age of patients.

Age (yrs)	DM		NDM	
	Mean	SD	Mean	SD
	62.5	5.3	62.66	5.4

The two tailed p Value= 0.8, Unpaired t test (t) = 0.14, df=98

Standard error of difference= 1.07

Mean age of diabetic cataract patients were 62.5± 5.3. Mean age of non - diabetic cataract patients were 62.66± 5.4. The difference was not statistically significant (p Value>0.05)

Table 3: Gender wise distribution of patients according to diabetics and non – diabetics group

Gender	Diabetic	Non - Diabetic	Total
Male	29 (56.86%)	22 (43.14%)	51 (100%)
Female	21 (42.86%)	28 (57.14%)	49 (100%)
Total	50 (50%)	50 (50%)	100 (100%)

Chi square value= 1.96, p Value=0.16, df= 1.

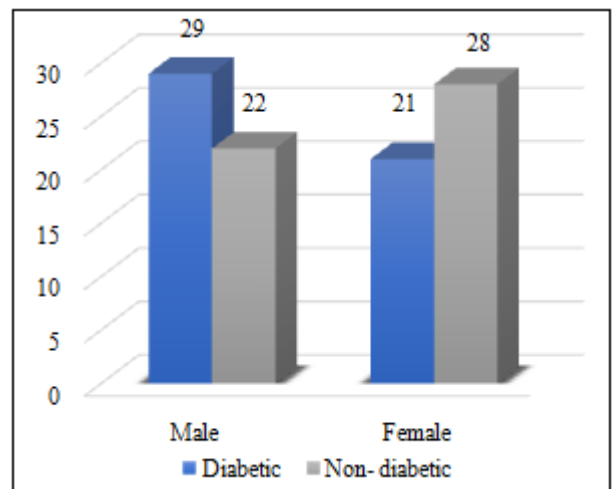


Figure 3: Gender wise distribution of patients according to diabetics and non – diabetics group (n=100)

Gender wise distribution of cataract patients shows that male and female were almost equal (51% - males and 49% females). Among diabetics, most of them were males 58% (29 out of 50) and among non - diabetics, most of the patients were females 56% (28 out of 50). The difference was not statistically significant (p Value>0.05).

Table 4: Distribution of patients according to Pre - op BCVA among cases and controls (n= 100)

Pre - op BCVA	Diabetic	Non - Diabetic	Total
<3/60	9 (47.36%)	10 (52.64%)	19 (100%)
6/60 - 6/36	38 (51.35%)	36 (48.65%)	74 (100%)
6/24 - 6/18	3 (42.86%)	4 (57.14%)	7 (100%)
Total	50 (50%)	50 (50%)	100 (100%)

Chi square value= 0.24, p Value=0.88, df= 2.

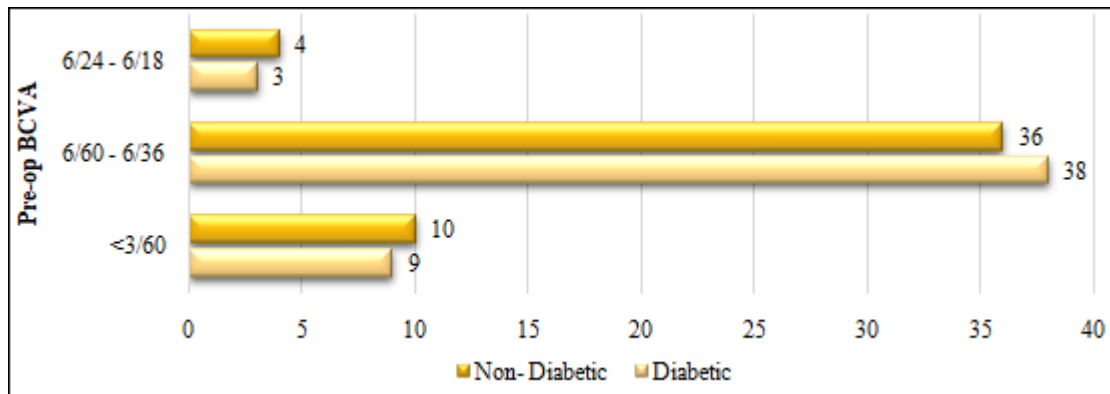


Figure 4: Distribution of patients according to Pre - op BCVA among cases and controls. (n= 100)

9 out of 50 (18%) in the diabetic group and 10 out of 50 (20%) in the non - diabetic group were having vision of less than counting fingers in 3 meters (<3/60). Almost all the patients 47 (94%) in diabetic group and 46 (92%) in non - diabetic group were having vision of less than 6/36. Only 3 out of 50 (6%) in diabetics and 4 out of 50 (8%) in non - diabetics had vision of 6/24 - 6/18 (measured by snellen visual acuity chart). The difference was not statistically significant (p Value>0.05).

The mean best corrected pre – operative visual acuity in both the groups was calculated in logMAR units. The mean preoperative best corrected visual acuity in the diabetic group was 0.99±0.19 and in non - diabetic group was 0.96±0.21. The two tailed p Value= 0.45, Unpaired t test (t) = 0.74, df=98. The p value (>0.05) was not statistically significant.

Table 5: Distribution of diabetic patients according to duration of diabetes mellitus (n= 50)

Duration of DM	Total no. of Diabetic pt (cases)
>1 year	3 (6%)
1 - 5 years	28 (56%)
6 - 10 years	15 (30%)
> 10 years	4 (8%)
Total	50 (100%)

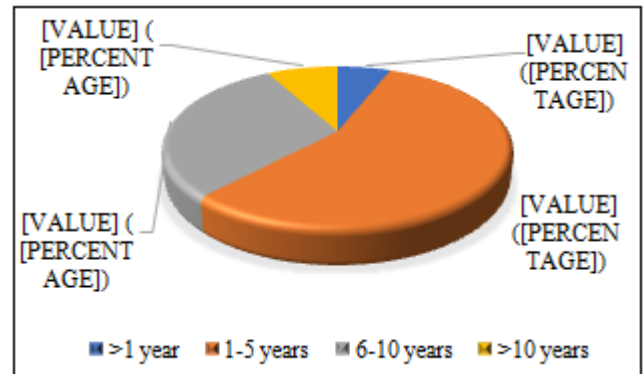


Figure 5: Distribution of diabetic patients according to duration of diabetes mellitus. (n= 50)

Most of the patients 28 (56%) were diagnosed with diabetes mellitus long back i. e., more than 10 years back, followed by 15 patients (30%) had been diagnosed between 6 to 10 years. Only 3 (6%) were diagnosed within last 1 year.

Table 6: Distribution of patients according to final visual outcome (POD 1 month) among cases and controls (n= 100)

POD 1 - month BCVA	Diabetic	Non - Diabetic	Total
<3/60	0	0	0
6/60 - 6/36	1 (100%)	0	1 (100%)
6/24 - 6/18	5 (66.67%)	3 (33.33%)	9 (100%)
6/12 - 6/9	40 (47.62%)	44 (52.38%)	84 (100%)
6/6	4 (57.14%)	3 (42.86%)	7 (100%)
Total	50 (50%)	50 (50%)	100 (100%)

Chi square value= 6.82, p Value= 0.03, df= 2.

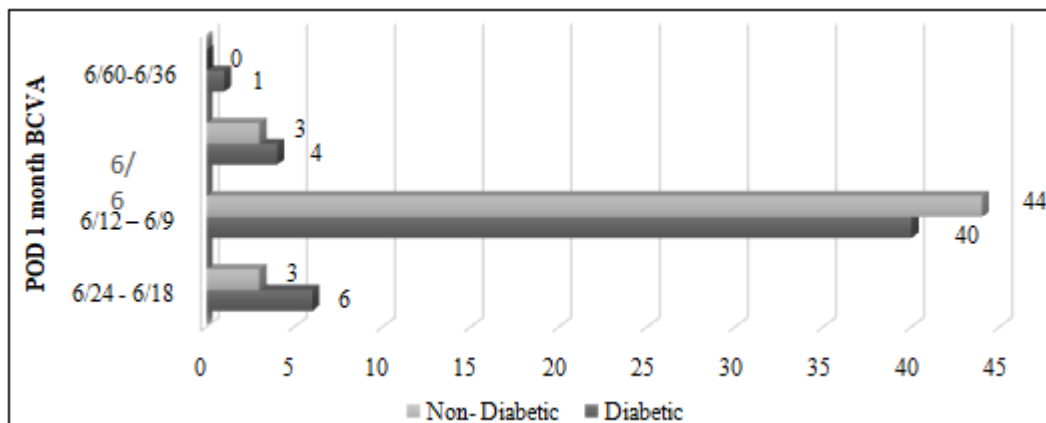


Figure 6: Distribution of study groups according to final visual outcome (POD 1 month) among cases and controls. (n= 100)

The final visual outcome was recorded using snellen’s visual acuity chart and the values were converted to log MAR units for statistical analysis. Majority of the patients 44 out of 50 (88%) in the diabetic group and 47 out of 50 (94%) in the non - diabetic group had visual acuity of 6/12 or better at the end of 4 weeks of follow up. Only 1 diabetic patient (2%) had visual acuity between 6/36 - 6/60. Not a single patient in the diabetic group and in the non - diabetic group had visual acuity less than 6/36.

The mean post - operative best corrected visual acuity in log MAR units in the diabetic group was 0.27±0.14 and in the non – diabetic group was 0.25±0.11. The two tailed p Value= 0.42, Unpaired t test (t) = 0.79, df=98. The p value (>0.05) was not statistically significant.

On comparing the pre - operative and post - operative visual

acuity in both the groups the p value (<0.001) was statistically significant

Table 7: Distribution of study groups based on complications (n=100)

Complications	Diabetic	Non - Diabetic	Total
Anterior chamber reaction (ACR)	8 (57.14%)	6 (42.86%)	14 (100%)
Corneal edema	7 (63.64%)	4 (36.36%)	11 (100%)
Pigment dispersion	4 (50%)	4 (50%)	8 (100%)
Striatekeratopathy	5 (62.5%)	3 (37.50%)	8 (100%)
Cystoidmacular edema	1 (100%)	0	1 (100%)
P. C. O	4 (57.14%)	3 (42.86%)	7 (100%)
Iris prolapse	1 (100%)	0	1 (100%)
Hyphema (immediate post - operative period)	2 (50%)	2 (50%)	4 (100%)

Chi square value= 3.24, p Value= 0.86, df= 7.

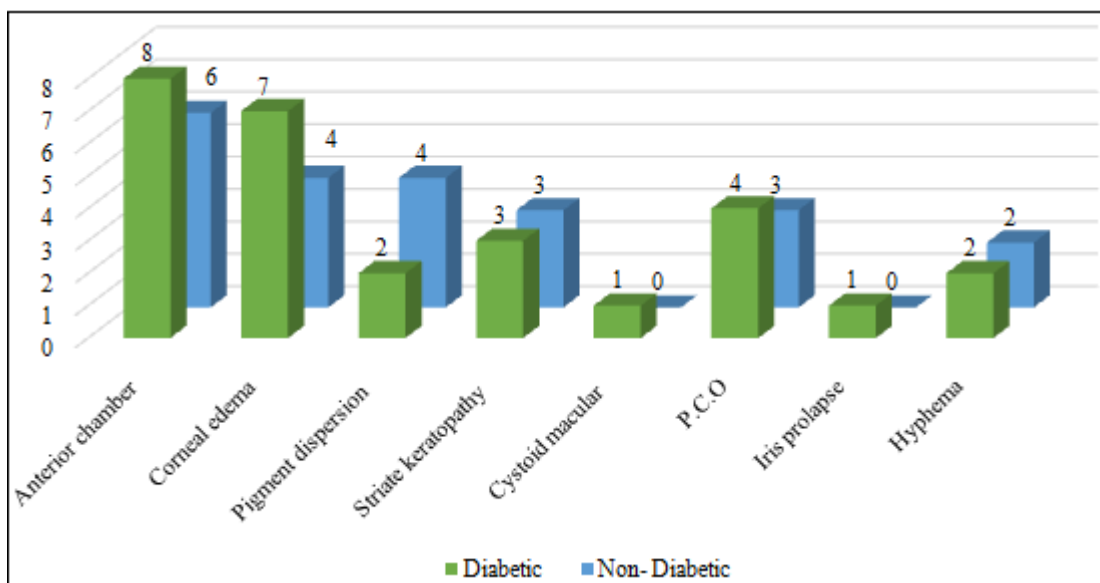


Figure 7: Distribution of study groups based on complications (n=100)

Most common complication at the end of 1 month was Anterior chamber reaction, which were observed in 14 eyes 14% (14 out of 100), followed by 11% Corneal edema (11 out of 100). Least found complication was Cystoid macular edema and iris prolapse 1% each (each 1 out of 100). Most

of the complications were found maximum in diabetic patients than non - diabetic patients expect pigment dispersion and Hyphema in which they were found equally in both diabetics and in non - diabetics i. e., 4 each in Pigment dispersion and 2 each in Hyphema.

Table 8: Association between complications (POD 1 month) and duration of Diabetes mellitus (n=50)

Complications	Duration of Diabetic mellitus				Total
	< 1 yr*	1 - 5 yrs*	5 - 10 yrs*	>10 yrs*	
Anterior chamber reaction (ACR)	0	7 (87.50%)	1 (12.50%)	0	8 (100%)
Corneal edema	0	4 (57.14%)	3 (42.85%)	0	7 (100%)
Pigment dispersion	0	0	4 (100%)	0	4 (100%)
Striatekeratopathy	0	0	4 (80%)	1 (20%)	5 (100%)
Cystoid macular edema	0	0	0	1 (100%)	1 (100%)
P. C. O	0	0	2 (50%)	2 (50%)	4 (100%)
Iris prolapse	0	1 (100%)	0	0	1 (100%)
Hyphema (immediate post - operative period)	0	0	1 (50%)	1 (50%)	2 (100%)

Note - 1 eye can have more than 1 type of complication.

*Columns combined for statistical purpose.

Chi square value= 19.2, p Value= 0.007, df= 7.

At the end of 1 month, most of the patients (87.50%) i. e., 7 out of 8 with complications like anterior chamber reaction and Corneal edema (57.14%) were observed in patients who

were diagnosed with DM 1 to 5 years ago. All patients with pigment dispersion were observed in patients who were diagnosed with DM 5 to 10 years ago. Striate keratopathy

was observed mostly (80%) in patients who were diagnosed with DM 5 to 10 years ago. All patients with cystoid macular edema was observed in patients who were diagnosed with DM 10 years ago. Posterior capsular opacification and Hyphema were observed equally in patients who were diagnosed with DM 5 to 10 and more than 10 years ago. No complication was found in patient with Diabetes mellitus duration of less than 1 year. The finding was highly statistically significant ($p < 0.01$).

4. Summary

This is a comparative case control study of visual outcomes following small incision cataract surgery with Posterior chamber intraocular lens implantation in diabetics and non - diabetics group. Overall, 100 patients were included in the study, 50 each in the diabetic and non - diabetic group. Demographic details, general and ophthalmic evaluation were done, which includes anterior and posterior segment examination and accurate biometry. All the observed values were noted. After explaining the procedure and visual prognosis in detail, duly signed consent was taken from all patients.

All patients underwent small incision cataract surgery at Ophthalmology department in a rural tertiary care centre and followed up for a period of 4 weeks. Of the 100 patients (50 diabetics and 50 non - diabetics), of which 49 were females and 51 were males. The most common age group of the patients was 60 - 70 years.

Mean age of diabetic cataract patients were 62.5 ± 5.3 years. Mean age of non - diabetic cataract patients were 62.66 ± 5.4 years. The mean preoperative best corrected visual acuity in the diabetic group was 0.99 ± 0.19 and in non - diabetic group was 0.96 ± 0.21 . The mean post - operative best corrected visual acuity in log MAR units in the diabetic group was 0.27 ± 0.14 and in the non - diabetic group was 0.25 ± 0.11 . The difference in pre and post op visual outcome was statistically significant ($p = 0.001$). Post - operative visual acuity of 6/12 or better was achieved in 88% eyes in diabetics and 94% among non - diabetics.

Most common post - operative complications were anterior chamber reaction followed by corneal edema. Least common were iris prolapse and cystoids macular edema. The incidence was higher in the diabetic group. Not a single patient was visually disabled and all were resolved during the course of follow up without any surgical intervention. The final visual outcome between the diabetic and non - diabetic group was statistically significant.

5. Conclusion

Small incision cataract surgery in diabetics without diabetic retinopathy have similar visual outcomes as compared with non - diabetics. Higher incidence of post - operative complications were observed among diabetics which can be conservatively managed.

6. Limitation of Study

Small sample size and shorter duration of follow up were the drawbacks of this study.

Source of Funding:

NONE

Conflict of Interest:

None

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