

## EVALUATION OF DIABETIC AND NON-DIABETIC PATIENTS' MACULAR THICKNESS FOLLOWING CATARACT SURGERY. A PROSPECTIVE CASE-CONTROL STUDY.

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### ABSTRACT

#### Background:

Diabetes accelerates cataract development. After cataract surgery, optical tissue damage causes problems. Cystoid development causes macular oedema. Edoema thickens the macula and impairs the retinal blood barrier. Non-invasive optical coherence tomography investigates retinal layers. This approach evaluates macular and retinal thickness. Diabetic retinopathy increases macular thickness. This study assesses cataract surgery patients' macular thickness. Edoema is 30%+ thicker than baseline. The study includes diabetics and non-diabetics.

#### Method:

This was a prospective case-control study conducted at the Department of Ophthalmology, Pradyumna Bal Memorial Hospital, Kalinga Institute of Medical Sciences (PBMH-KIMS), KIIT University, Bhubaneswar, Odisha, India. All the subjects' baseline visual acuity, macular thickness, and macular anatomy or pathology were phacoemulsification documented. The participants underwent either manual SICS or Phacoemulsification cataract surgery. Visual acuity and macular thickness, along with morphological changes in the macula, were observed in all the patients on POD-1, post-operatively at 1 week and 4 weeks.

#### Results:

21.5% of the patients with diabetes developed macular oedema, and only 5% of the control participants developed macular oedema after the cataract surgery.

#### Conclusion:

The visual acuity of diabetic patients is severely affected after undergoing cataract surgery, irrespective of the modality of the surgery. The risk of developing macular oedema is greater in diabetic patients with retinopathy compared to non-diabetics.

#### Recommendation:

People with diabetic retinopathy who have advanced cataracts and need surgery or laser therapy to fix their vision should start diabetes treatment right away so that the shape of their macular cells does not change permanently.

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**Keywords:** Cataract surgery, Macular thickness, Diabetes

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### INTRODUCTION.

Diabetes is a lifestyle disorder that causes an increase often, in the inflammatory mediators in the body [1, 2]. Often diabetics experience cataracts at an earlier stage of life

compared to non-diabetics. Post-cataract surgery, certain complications occur due to the injury of the optical tissue. The effusion of fluid from the plexiform region causes cystoid spaces to form in the macular region [3].

The cystoid formed in the macular region causes oedema of the macular region. The condition is known as Irvine-Gass syndrome, but in regular patients, the condition resolves itself [3, 4]. However, in the case of diabetics, the inflammatory mediators worsen the prognosis, which can lead to loss of visual acuity and blindness [4]. Macular oedema increases the thickness of the macular region and disrupts the retinal blood barrier.

Optical coherence tomography is a non-invasive method of studying the retinal layers [5]. The retinal thickness and macular thickness can be determined using this technology. After cataract surgery, macular thickness was observed in all the cases, even though the procedure was successful and smooth [5, 6]. Usually, this condition is resolved, but when patients are suffering from diabetes, macular thickness will persist for a longer time. Diabetic retinopathy also increases the macular thickness [7]. A thickness greater than 30% from the baseline is considered oedema. This study aims to assess the macular thickness of patients after cataract surgery. This study includes diabetics as well as non-diabetics.

## METHOD.

### Study design:

A prospective observation case-control study was done at the Department of Ophthalmology, Pradyumna Bal Memorial Hospital, Kalinga Institute of Medical Sciences (PBMH-KIMS), KIIT University, Bhubaneswar, Odisha, India over a year.

### Participants:

The patients visiting the outpatient department for age-related cataracts. The study included patients within the age group of 50–70 who had age-related cataracts and underwent surgery for their removal. Patients who were diabetic as well as non-diabetic were included in the study. Patients suffering from an existing optical disorder or having had a recent injury, infection, or laser therapy in their eye were excluded from the study.

### Bias:

There was a chance that bias would arise when the study first started, but we avoided it by giving all participants the identical information and hiding the group allocation from the nurses who collected the data.

### Data Collection:

All the participants of the study were divided into three groups:

- A- patients with diabetes and macular thickness before the cataract surgery
- B- patients with diabetes but no macular thickness before the surgery and
- C- non-diabetic patients with cataracts.

The demographic information of the patients was taken, and diabetes was confirmed in groups A and B patients by testing blood glucose levels fasting and postprandial. The optical testing of the patients was performed before the surgery. Intraocular pressure was measured, fundus examination was done, and macular examination was performed by optical coherence tomography. All the participants underwent cataract surgery via the phacoemulsification method and small-incision cataract surgery. Patients followed up after a day, after a week, and after a month of the surgery. Similar optical tests were done, and the observations were noted.

### Statistical analysis:

The data obtained was subjected to statistical analysis; a chi-square test was performed on the optical test values, and comparisons were made between the three groups.

### Ethical consideration:

The institutional ethics committee approved this study.

## RESULTS.

The mean age of the diabetes patients with ME was  $57.78 \pm 5.4$  years, diabetes without ME was  $57.43 \pm 5.4$  years, and that of the control group was  $58.53 \pm 5.33$  years. There was no significant difference in mean age among the three groups (Table 1).

**Table 1: Group-wise mean age of the study population.**

Group	Mean age (in years)	SD
DM with ME (group A)	57.78	5.4
DM without ME (group B)	57.43	5.4
Control (group C)	58.53	5.33

Group A had a total of 36 participants with diabetes and macular oedema, group B had 65 participants with diabetes but no macular oedema, and Group C had non-diabetic patients undergoing cataract surgery. Best-corrected visual acuity was measured in all three groups, as a baseline and during the follow-up period. It was found that the visual acuity decreased significantly after surgery right from day one after the surgery.

Central subfield macular thickness was measured in micrometers in all three groups as a baseline and during the

follow-up period. It was found that the macular thickness increased significantly after the surgery in all three groups. Other OCT characteristics such as foveal dip, retinal pigmentation, and cystoid changes were observed at the baseline and during the follow-ups. The changes in the values of OCT characters were statistically significant for group B and group A.

The development of macular oedema in the patients of group B and the control group was compared. Table no. 2 illustrates the percentage of participants who developed macular oedema in group B compared to the control group.

**Table 2: Patients developing macular edema at 4 weeks after surgery.**

Patients developing macular edema	Diabetic patients without macular edema	Control	Total	p-value
Yes	14(21.5%)	2 (5.26%)	16(15.5%)	0.028
No	51 (78.5%)	36 (94.74%)	87 (84.5%)	
Total	65 (100%)	38 (100%)	103(100.0%)	

## DISCUSSION.

The present included patients from three categories, diabetics with macular oedema, diabetics without macular oedema, and non-diabetics. It was observed that diabetic patients developed cataracts early in life compared to non-diabetics. The changes in the visual acuity and macular thickness were determined before the surgery and postoperatively. The studies conducted in this domain showed variation in the findings depending on the mode of the surgery conducted and the follow-up period [5-7].

A study revealed that diabetic patients who followed up for 6 weeks after the surgery had persistent macular thickness and, in some patients, it lasted up to a year [8]. Another similar study with three categories of patients like this study showed that the macular thickness increased after cataract surgery in patients with diabetic retinopathy [9]. A study reported that the foveal area is the most affected among the whole macula [10]. A study also reported that the conduction of photocoagulation six months before the study

lessened the chances of macular oedema in patients with diabetic retinopathy [11].

In the present study, the visual acuity improved the day after cataract surgery in all three groups compared to the baseline.

This is due to the removal of cataracts. A week after surgery the visual acuity decreased in group A and group B. In the control group, the visual acuity improved after a week of the surgery. Similarly, the macular thickness increased linearly in group A and it continued after a month of the surgery. A significant number of patients from group B developed macular thickness compared to the control group.

The findings of the present study were similar to other studies conducted but some studies demonstrated contradictory findings [12, 13]. A study reported the development of macular oedema was not affected by diabetes [12]. In this study, it was found that the patients with diabetes were at a higher risk of developing macular oedema compared to the control group. Diabetic retinopathy worsens the prognosis of macular oedema.

## CONCLUSION.

The visual acuity of diabetic patients is severely affected after undergoing cataract surgery irrespective of the modality of the surgery. The risk of developing macular oedema is greater in diabetic patients with retinopathy compared to non-diabetics.

### **LIMITATION.**

Limited duration was a major limitation of this study which prevented us from obtaining macular edema progression or resolution after 6 months or 1 year post-operatively. Also, the modality of cataract operation was not considered.

### **RECOMMENDATION.**

If patients with diabetic retinopathy present with advanced cataracts and need cataract surgery for vision or treatment (laser therapy or surgery) they should be treated for diabetes mellitus effectively and immediately, to prevent permanent changes in macular morphology.

### **ACKNOWLEDGMENT.**

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### **LIST OF ABBREVIATION.**

OCT- Optical coherence tomography  
T2DM- Type 2 diabetes mellitus

### **SOURCE OF FUNDING.**

The study had no funding.

### **CONFLICT OF INTEREST.**

None

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