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RESEARCH ARTICLE
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"PREVALENCE OF DIABETIC MACULAR EDEMA IN DIABETIC PATIENTS WHO UNDERWENT CATARACT SURGERY AS DETERMINED BY OPTICAL COHERENCE TOMOGRAPHY."

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Abstract:
Introduction: The purpose of this study is to evaluate the prevalence of diabetic macular edema in diabetic patients who underwent cataract surgery and to analyze the postoperative development of diabetic macular edema in these eyes.
Methodology: This is an interventional cross-sectional study. This study includes 75 patients with diabetes mellitus who underwent cataract surgery and without OCT changes in retinal thickness and morphology and, underwent a complete ophthalmic evaluation, fundus examination, and optical coherence tomography to detect the presence of diabetic macular edema. These examinations were executed baseline (preoperative), 7-10 days postoperative, one, three, and six months postop.
Results: The present study, consisting of 75 individuals, shows that the largest portion of the sample falls within the 66-70 age group accounting for 21.3%, the sample ranges from 35-70 years old with an average mean age of 54.37, gender distribution shows a slightly higher presentation of males at 54.7% than females 45.3%. The present study indicates the prevalence of Diabetic Macular Edema (DME) in diabetics is 13.3% (10)
Conclusion: According to the results of this study, diabetic macular edema (DME) is quite common among diabetic individuals who underwent cataract surgery. This was determined by objective assessments utilizing optical coherence tomography. Incorporating OCT into the routine care protocol for diabetic patients undergoing cataract surgery may enhance visual outcomes and diminish the likelihood of post-surgical complications such as diabetic macular edema.

Keywords: Diabetic macular edema, Ocular Coherence Tomography

Introduction

Globally, diabetes mellitus is currently reaching epidemic proportions. By 2025, it's expected to have an impact on roughly 300 million individuals. Consequently, there will inevitably a rise in the difficulties associated with persistent diabetes.[1] Numerous visual problems including glaucoma, cataracts, diabetic retinopathy, and ocular surface diseases, can result from diabetes mellitus.[2]

A cataract is characterized as a loss of transparency in the lens, which results in changes to its refractive qualities and increased light scattering, which can lead to treatable blindness or blurred vision. Surgery is the viable treatment option for cataracts because no preventative or therapeutic medications have been licensed yet.[3]

Individuals with diabetes experience cataract formation more frequently and at a younger age than patients without the disease. The primary risk factors include inadequate metabolic management and diabetes for a prolonged period. Since phacoemulsification was introduced, diabetic patients undergoing cataract surgery have experienced improved outcomes. The primary risk factors for the advancement of retinopathy are the length of the procedure and its intricacy. Other common causes of postoperative visual impairment in the general population include the development of DME, pseudophakic macular edema, CME, or Irvine-Gass syndrome.[4]

In individuals with diabetes mellitus, diabetic macular edema (DME) continues to be the most frequent cause of visual loss. When intraretinal fluid builds up because of the retinal vasculature's hyperpermeability, DME appears as retinal thickening. Diabetes's microvascular alterations cause vascular incompetence, which results in edema. A hypoxic state increases VEGF, which increases edema. [5]

The primary treatment for diabetic macular edema (DME) before the development of anti- vascular endothelial growth factors (anti-VEGF) injections and optical coherence tomography (OCT) was macular laser. Fundus photographs (FP), slit-lamp bio- microscopy, and fundus fluorescein angiography (FA) were the mainstays of DME diagnosis and management. Anti-VEGF medications have emerged as the first line of treatment for DME within the past 15 years. A common non-invasive optical imaging technique for evaluating the retinal structure is optical coherence tomography (OCT), which may detect, locate, and measure the severity of DME. It is more sensitive than a fundus examination.[6]

AIM AND OBJECTIVES

Aim

To evaluate the prevalence of Diabetic Macular Edema (DME) in diabetic patients who underwent cataract surgery.

Objectives

1) To study the prevalence of Diabetic Macular Edema in diabetic patients who underwent cataract surgery.
2) To analyze the post-operative development of Diabetic Macular Edema in these eyes.

METHODOLOGY

It is an Interventional Cross-sectional Study. The study duration is six months from the date of approval of the Scientific and Ethical Committee. A pre-validated, pre-designed, semi-structured questionnaire was used to collect data. Written informed consent will be obtained from all the patients participating in the study. This study included 75 patients with diabetes mellitus who underwent cataract surgery and without OCT changes in retinal thickness and morphology, underwent a complete ophthalmic evaluation, general and ophthalmic history, slit-lamp examination, Best Corrected Visual Acuity measurement by Snellen chart, fundus examination, optical coherence tomography (OCT) to detect the presence of diabetic macular edema. These examinations were executed preoperative (baseline), 7-10 days postoperative, one, three, and six months postop. Assessment of Visual acuity, OCT to monitor changes in macular thickness (MT) and

presence/severity of diabetic macular edema and any post-operative complications, documentation of additional treatment administered was done.

Inclusion criteria & Exclusion criteria:

- Patient who has given written informed consent, and with confirmed diagnosis of Diabetes Mellitus of age between 35 – 70 years. Patient with a normal study on baseline ocular coherence tomography.

Exclusion criteria:

- Patients with other ocular diseases that confound the diagnosis of diabetic macular edema, Patients with macular edema due to non-diabetic causes, Patients with previous intraocular surgeries, and Immunocompromised patients.

Data Collection:

Data was collected by administering a pre-tested, pre-designed, and semi-structured questionnaire. The procedure is explained to them before data collection after establishing enough rapport and trust with the study population. The informant/ Informant's Guardian was asked to sign an informed consent before participating in the study.

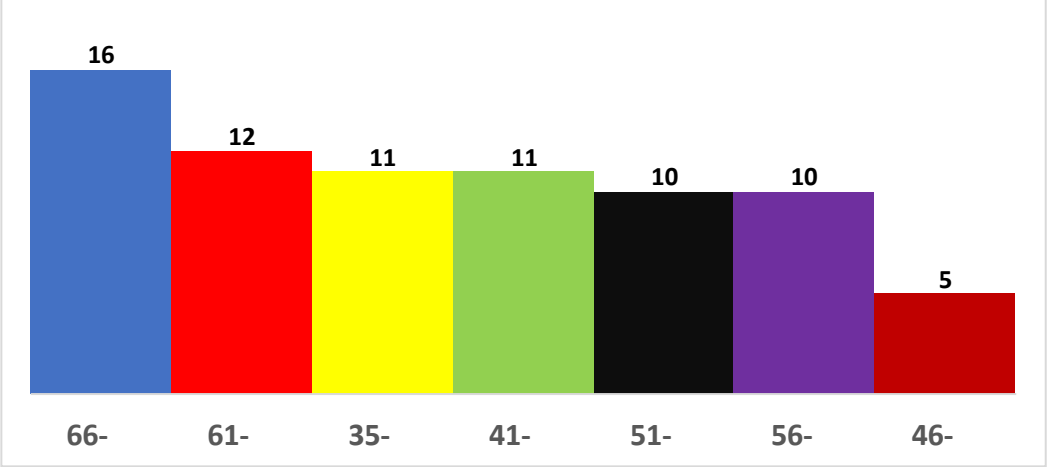
Statistical analysis:

Data will be entered into MS Excel 2020 and statistical analysis will be conducted using SPSS 23. Descriptive statistics such as mean, standard deviation, and proportions will be calculated for continuous variables. The chi-square test will be utilized to determine whether there is a significant association between two categorical variables.

RESULTS:

Distribution Of Study Subjects Based on AGE (n=75)

AGE RANGE	FREQUENCY	PERCENT (%)
35-40	11	14.7
41-45	11	14.7
46-50	5	6.7
51-55	10	13.3
56-60	10	13.3
61-65	12	16.0
66-70	16	21.3
Total	75	100.0



In the present study, the largest portion of the sample falls within the 66-70 age group, accounting for 21.3%. This is followed by the 61-65 age group, which makes up 16% of the total. The 35-40 and 41-45 age ranges each represent 14.7% of the population. Similarly, the 51-55 and 56-60 age groups contribute 13.3% each. The smallest segment is the 46-50 age group, with only 6.7%. Overall, the data highlights a greater concentration of individuals in the older age categories, especially those over 61.

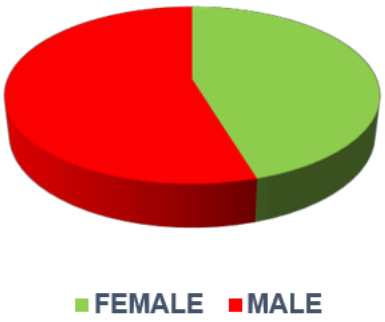
Distribution Of Study Subjects Based on Descriptive Statistics (n=75)

AGE								
Range	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**	**Std. Error**	**Variance**	**Median**	**Mode**
35	35	70	54.373	10.96	1.26	120.15	56	66

This study, reveals that the sample ranges from 35 to 70 years old, with an average (mean) age of 54.37. The standard deviation of 10.96 indicates a moderate spread of ages around the mean, suggesting some variability in the sample. The standard error is 1.26, reflecting the precision of the mean estimate. The variance, calculated at 120.15, further emphasizes the distribution's spread. Overall, the data suggests a diverse age range with a central tendency leaning towards the mid-50s.

Distribution Of Study Subjects Based on GENDER (n=75)

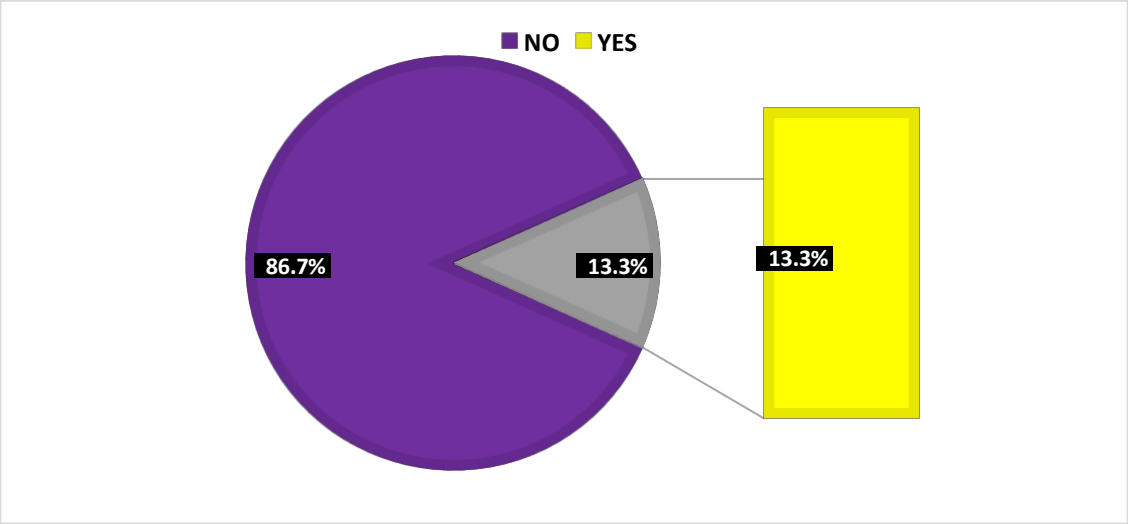
GENDER	Frequency	Percent (%)
FEMALE	34	45.3
MALE	41	54.7
Total	75	100.0



The present study reveals that the gender distribution of the sample, consisting of 75 individuals, shows a slightly higher representation of males at 54.7%, while females make up 45.3%. Although the difference is not substantial, it indicates a modest male majority in the sample.

Distribution Of Study Subjects Based on Diabetic Macular Edema (n=75)

Diabetic Macular Edema (DME)	Frequency	Percent
NO	65	86.7
YES	10	13.3
Total	75	100.0



The present study indicates the prevalence of Diabetic Macular Edema (DME) is 10 (**13.3%**).

Distribution Of Study Subjects Based on Gender and Diabetic Macular Edema (n=75)

GENDER	DME		Total	Chi-square P Value
	NO	YES		
FEMALE	30	4	34	
MALE	35	6	41	0.132
TOTAL	65	10	75	0.71

In this study, among the 34 females in the sample, 4 (11.8%) had DME, while 30 (88.2%) did not. For the 41 males, 6 (14.6%) were found to have DME, with the remaining 35 (85.4%) unaffected. Overall, out of 75 individuals, 10 (13.3%) had DME, and 65 (86.7%) did not. The chi-square test, with a p-value of 0.71, indicates no statistically significant relationship between gender and the occurrence of DME. Since the p-value is higher than the standard significance threshold of 0.05, the data suggests that gender does not play a significant role in the likelihood of developing DME in this sample.

Distribution Of Study Subjects Based on AGE Range and Diabetic Macular Edema (n=75)

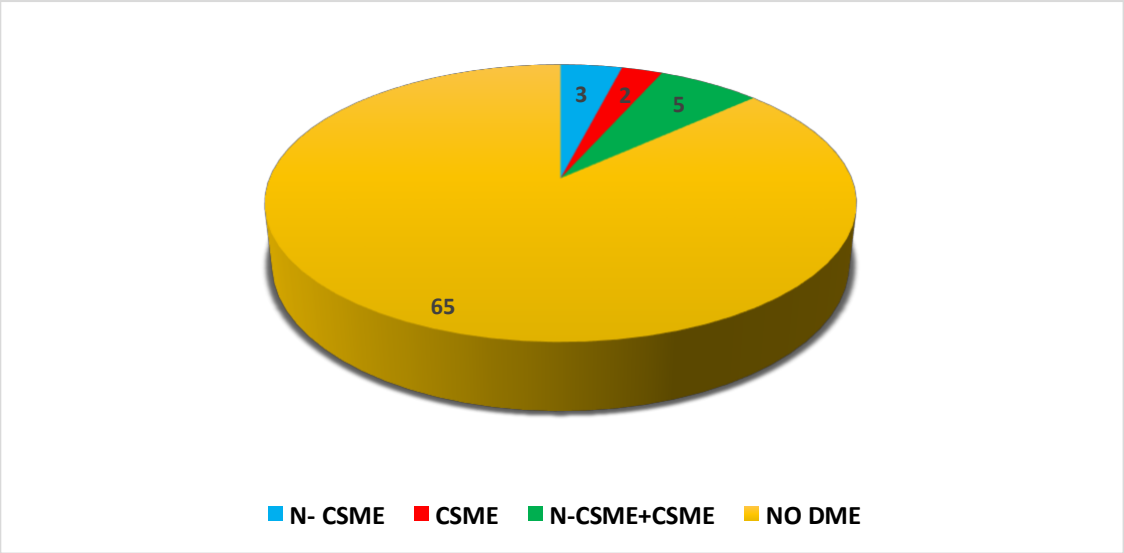
AGE RANGE	DME		TOTAL
	NO	YES	
35-40	11	0	11
41-45	11	0	11
46-50	5	0	5
51-55	10	0	10
56-60	9	1	10
61-65	10	2	12
66-70	9	7	16
TOTAL	65	10	75

In this study, the above data represents the distribution of DME cases across different age ranges in a sample of 75 individuals. Among the 35-40, 41-45, 46-50, and 51-55 age groups, no cases of DME were reported, representing 0% of DME cases for these age ranges. In the 56-60 group, 1 out of 10 individuals (10%) had DME. The 61-65 age range shows 2 cases of DME out of 12 individuals, accounting for 16.7%. The highest occurrence is in the 66-70 age group, where 7 out of 16 individuals (43.8%) were affected. Overall, 13.3% of the total sample (10 out of 75) had DME, while 86.7% did not. The data suggests that the likelihood of developing DME increases with age, with the highest

prevalence observed in the oldest age group.

Distribution Of Study Subjects Based on Grading of Diabetic Macular Edema (n=75)

DME GRADING	FREQUENCY	PERCENTAGE (%)
N- CSME	3	4
CSME	2	2.6
N-CSME+CSME	5	6.7
NO DME	65	86.7
TOTAL	75	100



In this study of Diabetic Macular Edema (DME) cases among 75 individuals, the majority, 86.7% (65 cases), did not exhibit DME at the end of three months. Among those affected, 4% (3) had non-clinically significant macular edema (N-CSME), while 2.6% (2) were diagnosed with clinically significant macular edema (CSME). Additionally, 6.7% (5) presented both N-CSME and CSME.

Distribution Of Study Subjects Based on Preoperative and Postoperative OCT values (n=75)

Variable	Minimum Value	Maximum Value	Mean	Standard Deviation
Central subfield thickness				
Preoperative	118	326	240	32.5
Post-operative				
First month	125	443	255	49.5
Second month	122	464	267	57.2
Third month	123	457	269	60.9
Inner subfield thickness				
Preoperative	232	496	314	34.9
Post-operative				
First month	241	509	326	46
Second month	242	516	335	49
Third month	236	516	339	50.3
Outer subfield thickness				
Preoperative	200	495	293.6	33.5
Post-operative				
First month	237	489	301.03	36.8
Second month	233	506	306.9	39.6
Third month	240	526	311.7	40.7

In this study, of diabetic macular edema cases among 75 individuals, the preoperative mean ± SD of central subfield thickness was found to be 240 ± 32.5, and postoperative mean ± SD was found to be more in the third month in comparison to the first and second month 269 ± 60.9. The preoperative Inner subfield thickness mean ± SD was found to be 314 ± 34.9 and the third-month postoperative mean ± SD was slightly higher than the first and second month i.e; 339 ± 50.3 and the outer subfield thickness preoperative mean ± SD was 293.6 ± 33.5 and the postoperative third-month mean ± SD 311.7 ± 40.7 which is higher when compared to the first and second month.

Discussion

One of the most prevalent explanations for vision loss following cataract surgery is macular edema (ME). 1-3 It has been reported that diabetes patients have a higher incidence of ME following cataract surgery. Although the precise cause of this phenomenon is still unknown, several studies have attempted to identify the risk factors for post-operative ME in diabetic eyes. D. Squirrell et al. in their study revealed that there was no difference between operated and non-operated eyes in the development of retinopathy or maculopathy following uncomplicated phacoemulsification cataract surgery in patients with type 2 diabetes.7 According to Baker et al., a history of DME treatment and pre-operative macular status may be linked to an elevated risk. It is still difficult to accurately predict postoperative macular status before surgery. 8 despite these efforts. But now that optical coherence tomography is available, we can better measure the macula's qualitative and quantitative characteristics and investigate the connection between macular status before and after cataract surgery in diabetic patients. According to prospective cohort research by Stephen J. Kim et al., diabetic eyes showed increased center point thickness on OCT following cataract surgery, which was linked to limited visual recovery at three months and vision loss at one month. 9 The risk of postoperative DME at one year varied depending on the preoperative retinopathy grade, according to real-world data from the UK DR Electronic Medical Records Users Group, which tracked 4,850 eyes without diabetic macular edema (DME) before cataract surgery for two years: 1.0% for no DR, 5.4% for mild NPDR, 10% for moderate NPDR, 13.1% for severe NPDR, and 4.9% for PDR.10 Chen X.Y. et al. evaluated the quantitative changes in the macula following cataract surgery in 60 patients with diabetes in 92 eyes. At one and three-month follow-up, the central subfield mean thickness increased from 21 μm to 25.5 μm, respectively ($P < 0.01$) 11 the inner and outer rings' average thicknesses increased from
14.2 μm and 9.5 μm after one month to 18.2 μm and 12.9 μm at three months. It was found that pre-existing DME predisposes to centrally involved macular edema after cataract surgery because centrally involved macular edema developed in 12 eyes at 3 months, with 4 eyes having pre-existing central involvement and 8 eyes having pre- existing non-central involvement. This study shows that individuals with more advanced stages of diabetic retinopathy have a higher chance of acquiring diabetic macular edema (DME) following cataract surgery prior to the procedure. Before cataract surgery, OCT is advised for patients with diabetic retinopathy in order to detect non-central macular edema and monitor its progression. This allows for the implementation of appropriate preventative treatments to avoid the early onset of declining visual acuity. It implies that more research is necessary to examine the possible advantages of treating patients with non-central macular edema with anti-VEGF medication in addition to cataract surgery. Additionally, it could evaluate the development of central macular edema and work to stop the decline in visual acuity. This research could offer important insights regarding improving the postoperative results of diabetic retinopathy patients having cataract surgery by optimizing treatment approaches.

Limitations

The sample size was small and the follow-up period was brief. The evaluation of risk factors and the development of retinopathy with a centrally involved macular edema incidence needs long-term follow-up.

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Conflicts of interest
There are no conflicts of interest

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