



### ORIGINAL RESEARCH PAPER

#### OPTICAL COHERENCE TOMOGRAPHY- MACULA IN DIABETIC MACULAR EDEMA

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#### Abstract

Diabetic Retinopathy (DR) was the fifth most prevalent cause of preventable blindness and the fifth most common cause of moderate to severe vision impairment between 1990–2010. [1] Over one-third of the world's 285 million diabetics have indications of DR, and a third of these have vision-threatening diabetic retinopathy (VTDR), which is defined as severe non-proliferative DR or proliferative DR (PDR) or the presence of diabetic macular edema (DME)[2]. DME is becoming more common in the world, owing to increase in type 2 diabetes. DME can be assessed using intravenous fluorescein angiography (FA) and optical coherence tomography (OCT)- noninvasive imaging technique [3]. OCT is important for early diagnosis in asymptomatic patients, as well as controlling and monitoring DME, depending on which the treatment method can be changed. Spectral domain optical coherence tomography (SD-OCT), which produces high-resolution retinal pictures, has a good reproducibility in measuring retinal thickness [7]. Longitudinal retinal B-scans and coronal C-scans are produced using the OCT ophthalmoscope. As a result, it delivers information that traditional imaging techniques or fundus inspection cannot.

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#### Introduction & Pathophysiology:-

Diabetic retinopathy (DR) is a microvascular condition caused by the long-term effects of diabetes, which results in vision-threatening retinal degeneration and eventually blindness. The key to avoiding diabetic retinopathy-related blindness is early detection and appropriate treatments. [4]. Diabetic retinopathy (DR) is a serious consequence of diabetes mellitus (DM), and it is still the largest cause of vision loss in people of working age. [4,5]. Non-proliferative diabetic retinopathy (NPDR) and proliferative diabetic retinopathy (PDR) are the two stages of DR. Increased vascular permeability and capillary occlusion are two prominent observations in the retinal vasculature in NPDR, which characterizes the early stage of DR.

Diabetic macular edema (DME) is mostly caused by chronic hyperglycemia. DME affects 20% of individuals with younger onset diabetes over a 10-year period, compared to 40% of patients with older onset diabetes over a 10-year period. Diabetes Mellitus (DM) duration, poor treatment of DM with chronically increased hemoglobin A<sub>1c</sub> (HbA<sub>1c</sub>), hypertension, hyperlipidemia, kidney disease, and pioglitazone are all risk factors.

The specific pathophysiology of DME is unknown. Increased Vaso permeability is caused by the breakdown of the BRB, which can be caused by a variety of factors including altered glial cells, loss of pericytes, endothelial cell

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death, leukostasis in the retinal vasculature, poor function of the tight junctions in the retinal vasculature, activation of the AGE receptor, upregulation of the expression of vascular endothelial growth factor (VEGF) and protein kinase. Optical coherence tomography (OCT)-macula plays a critical role in early detection and monitoring of diabetic macular edema.

### Materials And Methods:-

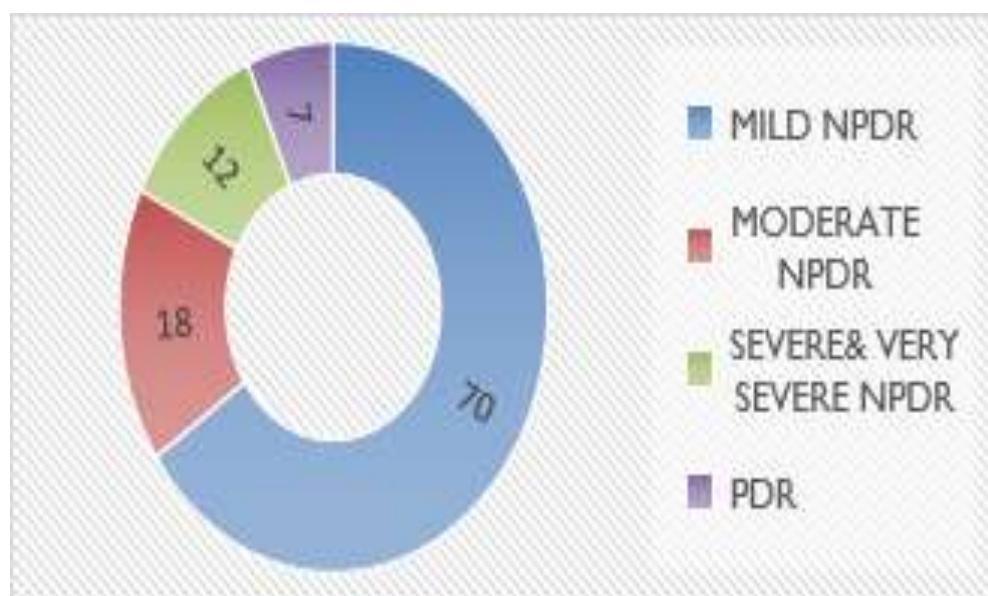
The data on diagnosed Patients of type II diabetes mellitus of either gender and age  $\geq 18$  at the Ophthalmology outpatient department of the tertiary care hospital between 2019-2022 was recruited. A total of 107 participants were recruited. This study was observational, cross sectional, non-interventional, descriptive, hospital-based study. A written informed consent document for the study was presented to those who satisfy the criteria. Those who agreed and signed the written informed consent were enrolled in the study. Detailed history, best corrected visual acuity (BCVA), Refraction, detailed Slit lamp examination for anterior segment to rule out media opacities, Fundus examination through dilated pupils via direct ophthalmoscope, binocular indirect ophthalmoscope and slit lamp biomicroscope using 90/78 Diopter lens were performed. Accordingly Optical coherence tomography to rule out macular edema and fluorescein angiography (FA) was advised.

### Results:-

A total of 107 patients of known case of diabetes mellitus type II were studied over a period of 2 years from 2020 to 2022. The age incidence in the maximum number of patients was between 50-59 years that is 38.31% and minimum number of patients was  $<30$  years that is 0. There was a higher number of male patients that was 64 and females were 43 and the male to female ratio is 3:

**Table No. 1:-** Distribution of patients according to type of retinopathy.

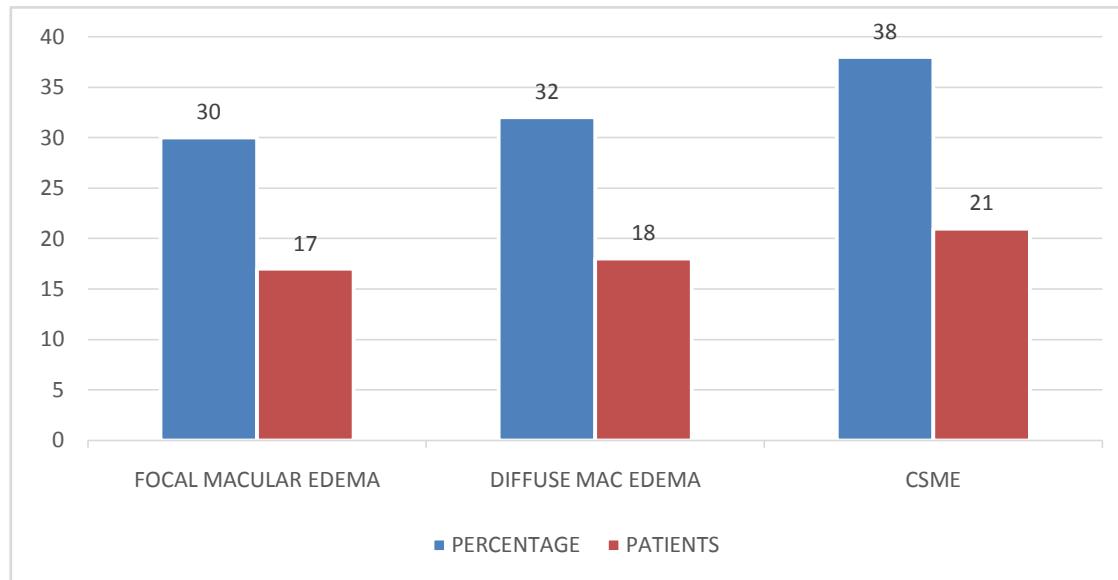
Type of retinopathy	NO. of Patients	Percentage
Mild NPDR	70	65.42
Moderate NPDR	18	16.60
Severe & very severe NPDR	12	11.44
PDR	7	6.54
Total	107	100



Maximum No. of cases had mild retinopathy comprising 65.42 % of total cases Proliferative diabetic retinopathy was seen in 7 patients comprising 6.54% of total cases.

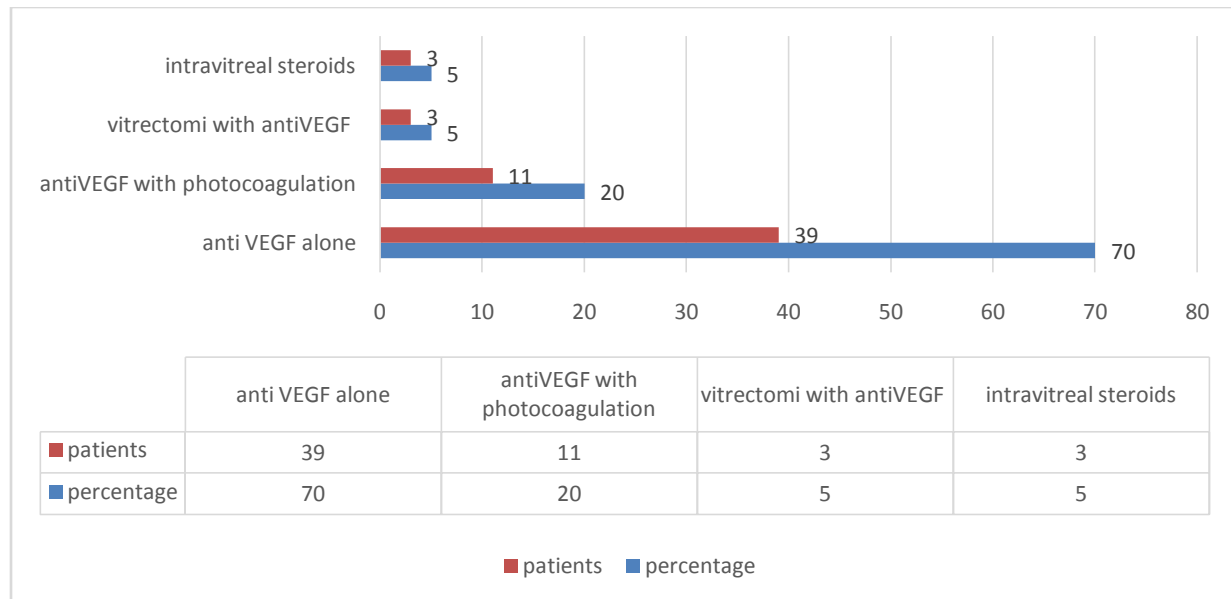
**Table No. 2:-** Distribution of Patients Showing Relation Between Maculopathy and Diabetic Retinopathy Severity.

Maculopathy	Npdr	Percentage	Pdr	Percentage
PRESENT	52	52	4	57.15
ABSENT	48	48	3	42.85
TOTAL	100	100	7	100

**Table No. 3:-** Distribution of Maculopathy in Diabetic Mellitus.

**As per Optical Coherence Tomography (OCT) findings** we found that 56 (52.33%) of the 107 patients had macular edema (fovea thickness above 200  $\mu\text{m}$  as OCT findings). Hee et al. considered that the normal thickness of the fovea was  $147 \pm 17 \mu\text{m}$  and it was abnormal above 185  $\mu\text{m}$ . There has not been a typical thickness in the diagnosis of macular edema. The mean thickness of our affected group was  $358.36 \pm 54.88 \mu\text{m}$  similar to the report of Hee.et.al. [8]. Lots of patients only have the central fovea light-reflecting disappearance. Hence, OCT is very important in the early diagnosis and follow-up of Macular edema. In our study, out of 56 patients, 70% of patients (39 patients) required treatment with anti-VEGF drugs alone, 20 % (11 patients) of them required anti-VEGF drugs along with laser photocoagulation (focal/grid), of the remaining 10% (6 patients) required vitrectomy with anti-VEGF drugs and intravitreal steroids depending on severity as shown in Table- 4

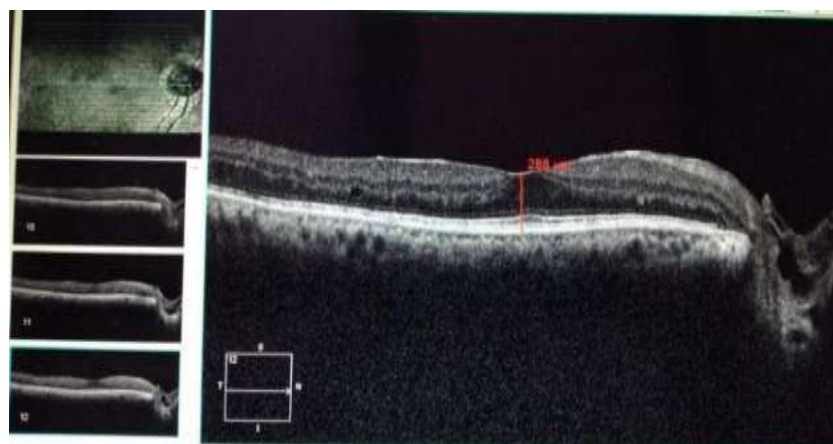
**Table No: -4**



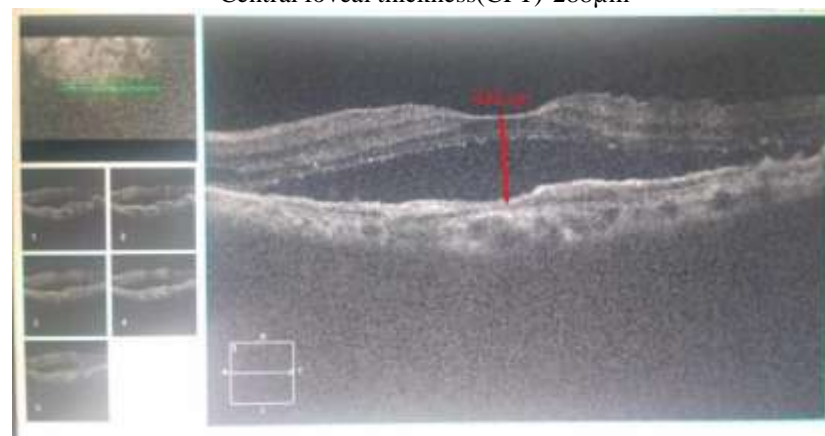
### Discussion:-

The purpose of our investigation was to obtain the information of DME in type 2 diabetes with DR to analyze the risk factors. This study was conducted on 107 patients with Type 2 Diabetes Mellitus. The participants of the study were aged from 31 to 69 years, with the mean age of 53.66 years and with standard deviation of  $\pm 10.13$  years. Number of males were 64 (60%) and the number of females was 43 (40%). The present hospital – based, cross-sectional study showed the following prevalence of diabetic maculopathy 52.33% (56 patients). Prevalence of CSME was found to be 38%. Overall, prevalence of Diabetic retinopathy and diabetic macular edema and CSME in hospital-based studies including present study was higher as compared to those in population based epidemiological studies. This observation may be attributed to the fact that there was a referral bias among the diabetic patients who were reported to tertiary care centers. Hence, with a larger number of diabetics and with higher diabetic ages reporting to the diabetic clinic, it is more likely that prevalence of complications may also be larger. Early DME might be detected by OCT, and visual function could be assessed. We also discovered a moderately positive connection between foveal thickness and DR ( $p = 0.0003$ ). Furthermore, there was no significant relationship between foveal thickness and posterior vitreous detachment ( $p = 0.472$ ).

Vitrectomy could potentially enhance the oxygen flow to the retina, which would help with macular edema absorption and visual acuity improvement. Some studies show that combining vitrectomy with inner limiting membrane peeling speeds up the resolution of ME and reduces recurrence. The results of vitrectomy with and without inner limiting membrane peeling, on the other hand, were quite different. Controlling system parameters such blood fat, blood sugar, and blood pressure was critical for individuals with DME in the community. Glycated hemoglobin was found to be a risk factor for DME, blood sugar was linked to the occurrence of DME, and blood fat was linked to visual acuity in several investigations<sup>[7-9]</sup>. Furthermore, it was discovered that the progression of illness and cholesterol had a statistical correlation with DME. For additional research, we'll need huge samples. Diabetics' quality of life has been damaged by DME all over the world. The fundamental problem is a lack of acknowledgement. A large-scale, well-organized epidemiologic survey as well as health education are desperately needed. For early DME, we should conduct an essential intervention study.



Central foveal thickness(CFT)-288μm



OCT macula of patient with severe NPDR with macular edema showing CFT 490 μm

### Conclusion:-

The oxygen theory of DME is the most thorough and widely accepted pathophysiologic model, and VEGF is the most important, but not the only, mediator in that pathway. The cornerstone of DME therapy is metabolic regulation of blood glucose, blood pressure, and serum lipids, and specialized ocular treatments are most effective when this foundation is established. First Anti-VEGF medication injections in a series are the first-line treatment for DME. In some situations, a focal/grid laser, intravitreal corticosteroid injections, and vitrectomy play a supporting role, depending on the severity of the condition. However, the importance of OCT in the treatment of DME cannot be overstated, since it allows the patient to be controlled appropriately and maintain their vision without further deterioration. However, more in-depth research in this area, such as OCT discoveries of macular edema based on thickness in DR alterations, is needed for patient care and, as a result, to maintain visual acuity.

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