

Assessing Various Ocular Manifestations among Patients with Type-2 Diabetes Mellitus in a Tertiary Care Hospital of North India: A Cross-Sectional Study

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Abstract: ***Introduction:** Diabetes Mellitus along with its complications are becoming world's most significant cause of morbidity and mortality. Diabetic eye disease is becoming an increasing problem among developing countries due to longer life expectancy and a higher incidence of Diabetes. The main objective of the study was to assess various ocular manifestations among patients with Type-2 Diabetes Mellitus in a tertiary care hospital of Himachal Pradesh (H. P.). **Materials and methods:** This was an institutional based study with cross-sectional study design. The study was carried out in Diabetes Mellitus patients for duration of one year between the period of July 2021 to June 2022, attending Ophthalmology, Medicine OPD and patients admitted in the Medicine ward. The data was entered into Microsoft Excel Workbook 2019 and exported into SPSS 24 for statistical analysis. **Results:** Diabetic Retinopathy (DR) was the most common ocular manifestation found in our study followed by Diabetic Macular Edema (DME) and Cataract. Mild Diabetic Retinopathy was found among 9.6%, very severe among 7.7% and Proliferative Diabetic Retinopathy (PDR) among 9.6% of the study participants. **Conclusion:** Early detection of Diabetes by regular screening, adequate management by appropriate drugs and timely investigations (blood and ocular testing) followed by regular monitoring can prevent and reduce the prevalence and incidence of ocular complications occurring due to Diabetes.*

Keywords: Hyperglycemia, Diabetic Retinopathy, Diabetic Macular Edema, Non-proliferative DR (NPDR), Proliferative DR (PDR), Complication

1. Introduction

Diabetes Mellitus is the most common metabolic disorder of the world. Diabetes Mellitus along with its complications are becoming world's most significant cause of morbidity and mortality. According to International Diabetes Federation, it affects more than 240 million people worldwide and this number is expected to reach roughly 370 million by 2030⁽¹⁾. Ocular manifestations associated with Diabetes mellitus are progressive and rapidly becoming the most significant cause of morbidity and are preventable with early detection and timely treatment⁽²⁾.

Diabetes Mellitus (DM) is a metabolic disorder characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both. Chronic hyperglycemia of Diabetes is associated with long term damage, dysfunction and failure of various organs viz eyes, kidneys, nerves, heart and blood vessels⁽³⁾. There is a steep rise in the prevalence of Type-2 Diabetes worldwide, which is extremely pronounced in Asian countries, and is particularly dramatic in India. This gave India the dubious distinction of the "Diabetes capital of the world". Indian diabetic patients tend to have pronounced insulin resistance,

higher waist circumference despite lower body mass index as well as lower adiponectin and higher inflammatory markers⁽⁴⁾.

The chronic complications of Diabetes are broadly divided into microvascular and macrovascular, with the former having much higher prevalence than the latter⁽⁵⁾. Microvascular complications include neuropathy, nephropathy and retinopathy while macrovascular complications consist of cardiovascular disease, stroke and peripheral artery disease (PAD)⁽⁵⁾. Diabetic eye disease is becoming an increasing problem among developing countries due to longer life expectancy and a higher incidence of Diabetes. Indians have a several-fold higher prevalence of Diabetes for all age groups compared with European populations⁽¹⁾.

Ocular manifestations of Diabetes Mellitus include retinopathy, cataract, dry eye and neuro-ophthalmic disorders⁽⁶⁾. Diabetic retinopathy (DR) is the leading cause of blindness in working age population and can develop without any serious symptoms⁽⁴⁾.

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There is already a paucity of published literature regarding ocular manifestations among diabetics in our area, thus the present cross-sectional study had been framed with an objective to assess various ocular manifestations among patients with Type-2 Diabetes Mellitus in a tertiary care hospital of Himachal Pradesh (H. P.). The resultant findings from the current study may help in providing valuable inputs for improvement in prevention and management of ocular complications of Diabetes.

2. Materials and Methods

Study design and study period: This was an institutional based study with cross-sectional study design. The study was carried out in Diabetes Mellitus patients for duration of one year between the period of July 2021 to June 2022, attending Ophthalmology, Medicine OPD and patients admitted in the Medicine ward. The study was conducted at Dr Rajendra Prasad Government Medical College (Dr RPGMC) Kangra at Tanda, District Kangra, Himachal Pradesh (H. P.).

Study population: All patients with Type-2 DM who visited Dr RPGMC Tanda.

Inclusion criteria: Both genders with age > 18 years, patients of Diabetes Mellitus who gave their consent for participation in the study.

Exclusion criteria: Age <18 years, opacities of the ocular media and significant limitation of pupillary dilation, patients with GDM and those who did not give consent to participate.

Case Definition: Patients with Diabetes Mellitus were classified according to ADA criteria⁽⁷⁾.

Methodology: After getting informed consent from the patients, demographic information (name, age, gender etc) and history of duration of diabetes along with FBS and HbA1c levels was recorded. History of any vision loss and any treatment for ocular diseases that a patient was currently receiving or had undergone in the past were recorded. This was followed by complete ocular examination of the patient as per self designed proforma, visual acuity was recorded by using Snellen's chart and Jaeger's chart, color vision was noted using Ishihara pseudochromatic plates, external eye examination and intraocular pressure measurement by using Schiottz tonometer/ non-contact tonometer was done. Complete anterior segment examination was done with slit lamp biomicroscope (Haag Street BM900) for any media opacity, lens for evidence of cataract, pseudophakia, aphakia and any anterior segment pathology. Posterior segment examination was done with indirect ophthalmoscopy (with 20 D aspheric lens) after obtaining mydriasis by instilling one drop of 1.0% tropicamide and/or with Haag Streit BM 900 slit lamp biomicroscope by using +90 D aspheric volk lens. Fundus photography was done by Fundus camera (Zeiss VISUCAM NM/FA). Central macular thickness was

obtained by Optical coherence tomography (Optovue Inc. Co., RTVue 100 model, Fremont, CA).

Statistical analysis: The data was entered into Microsoft Excel Workbook 2019 and exported into SPSS 24 for statistical analysis. Quantitative data was expressed as mean and standard deviation. Qualitative data was expressed as frequency and percentage and compared using Chi square test. P <0.05 was considered statistically significant.

Ethical approval: The study was conducted after approval from Institutional Protocol Review Board and Institutional ethics committee Dr RPGMC, Tanda.

3. Results

In our study, out of 52 patients examined, the mean age of study subjects was found to be 55.8±8.8 years, male to female ratio was 1: 1 and the mean duration of Diabetes was 11.1±6.0 years (Table 1).

Table 1: Distribution of study participants based on sociodemographic profile (n=52).

Characteristic	N (%)
Age (YR):	
UPTO 40	4 (7.5)
41 and above	48 (92.5)
Gender: Male	26 (50.0)
Female	26 (50.0)
Duration of DM (YR)	
<10	28 (52.8)
10 And Above	24 (47.2)

The mean FBS was found to be 180.42±43.50 mg/dl and mean HbA1c was 8.72±2.47%. 50% of the study participants had normal lens, Pseudophakia was found among 11.5% and Cataract among 38.5% of the study participants (Figure 1). On fundus examination, only 9.6% of the study participants had not developed Diabetic Retinopathy yet. Mild Diabetic Detinopathy was found among 9.6%, very severe among 7.7% and Proliferative Diabetic Retinopathy (PDR) among 9.6% of the study participants (Figure 2).

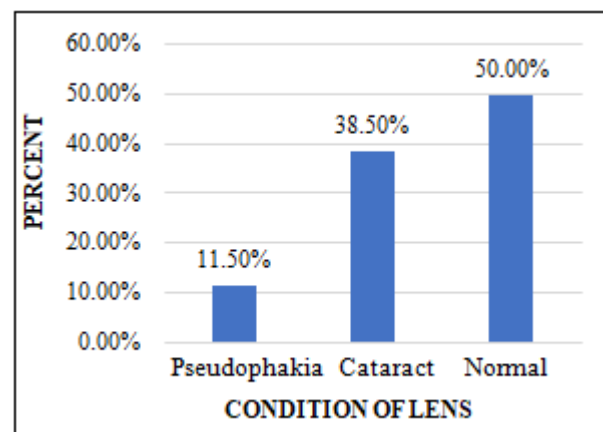


Figure 1: Distribution of study participants based on the condition of lens

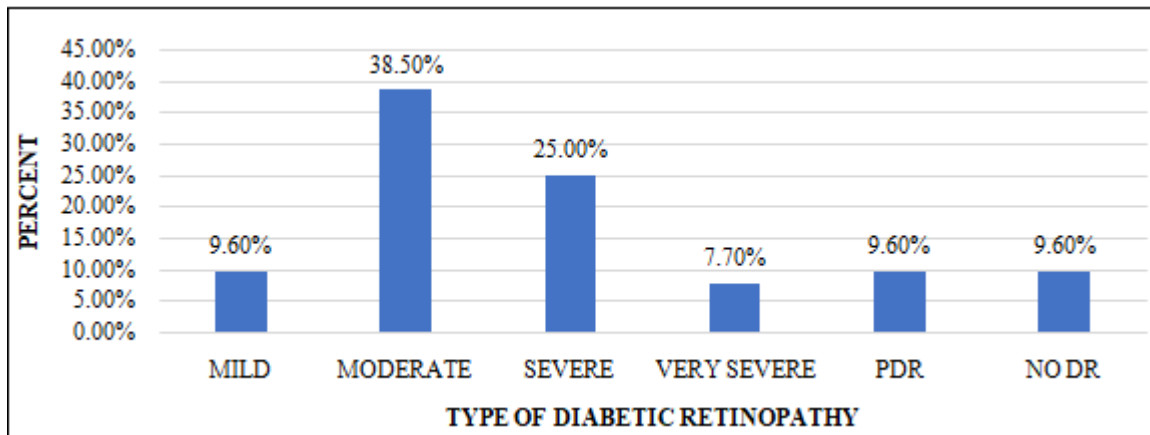


Figure 2: Distribution of study participants based on presence of Diabetic Retinopathy (DR)

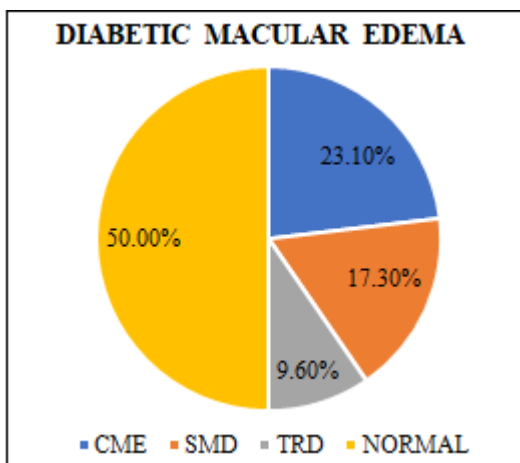


Figure 3: Distribution of study participants based on Diabetic Macular Edema (DME)

Diabetic Macular Edema was found to be present among 50% of the study participants and Cystoid Macular Edema (CME) was most commonly found followed by Serous Macular Detachment (SMD) and Tractional Retinal Detachment (TRD) (Figure 3).

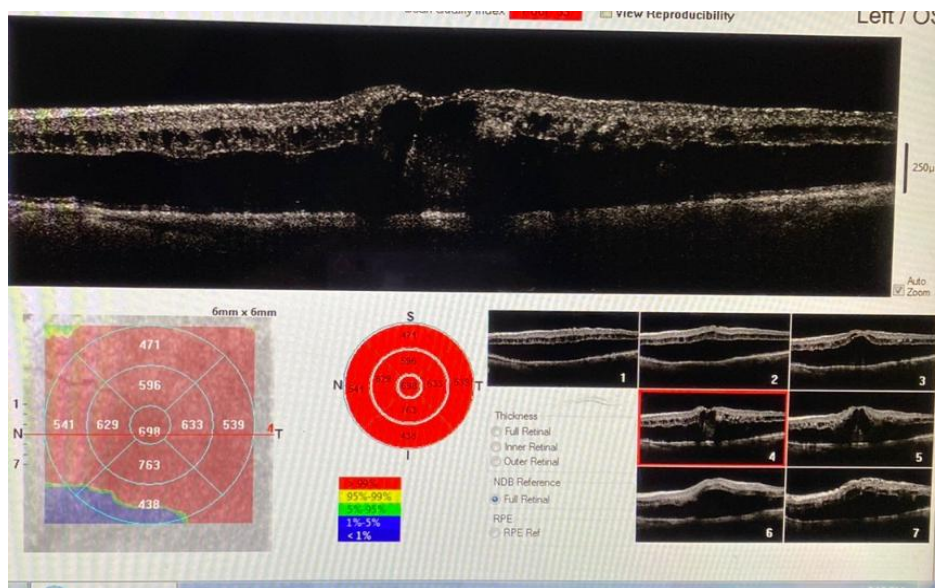


Image 1: This picture of OCT is showing cystoid diabetic macular edema.

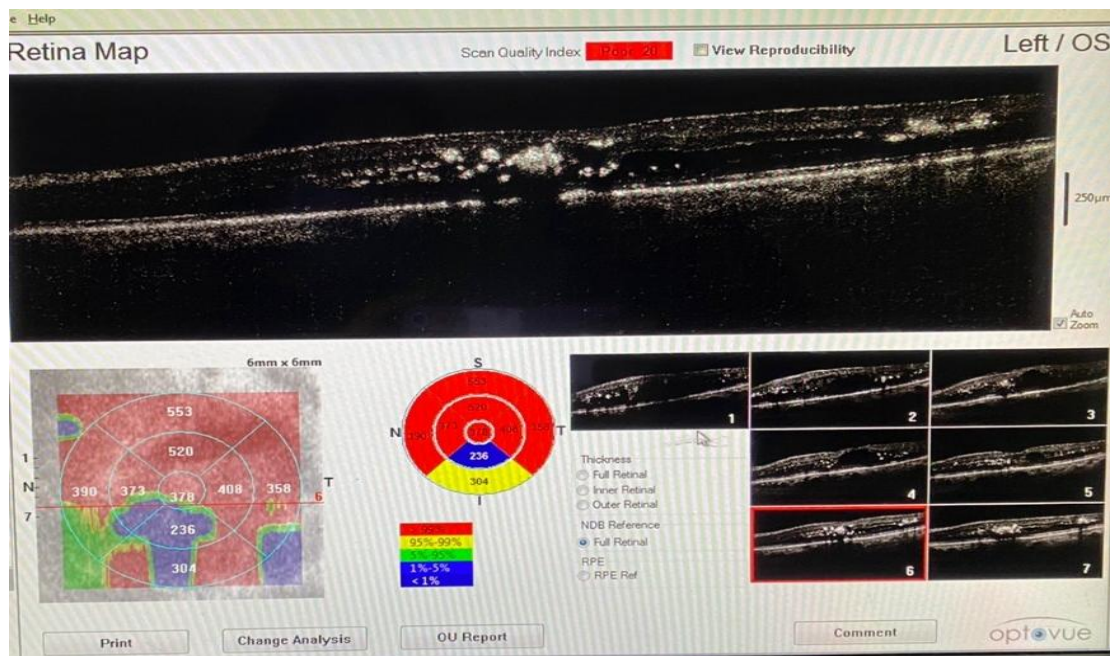


Image 2: OCT showing diabetic macular edema with hard exudates as hyperreflective dots

Diabetic Retinopathy (DR) was the most common ocular manifestation found in our study followed by Diabetic Macular Edema (DME) and Cataract (Figure 4).

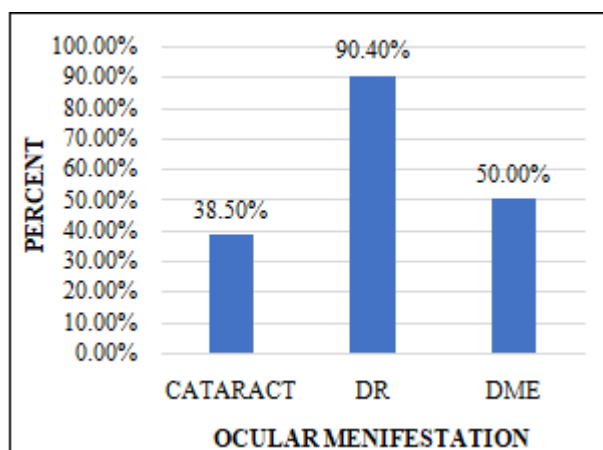


Figure 4: Distribution of various ocular manifestations among the study participants

None of the study participant was found to have stye, chalazion, blephritis and corneal ulcer. No patient in our study had any evidence of neurophthalmic complications because of Diabetes. We did not observe glaucoma and dry eye in our study subjects.

4. Discussion

DR is a progressive blinding disease that affects 4.2 million people worldwide, making it a leading cause of blindness; and this number is expected to continue to increase⁽⁸⁾. DR can be divided into two types, non-proliferative DR (NPDR) and proliferative DR (PDR). Progression of NPDR can be prevented by tight blood glucose control⁽⁹⁾. The etiology of DR is complex and not completely understood. However, the mechanisms likely involve vascular, neuronal and immunological systems⁽¹⁰⁾. Retinal vessels are particularly

susceptible to the microvascular changes that are associated with hyperglycemia⁽¹¹⁾.

In our study, Diabetic Retinopathy (DR) was the most common ocular manifestation found in 90.4% followed by Diabetic Macular Edema (DME) in 50% and Cataract in 38.5% of the study participants. Whereas in a study conducted by Saravade SS et al⁽¹⁾ Diabetic Retinopathy was the most common ocular manifestation occurring in subjects (46.6%) followed by Macular edema in 30.9 %, Primary open angle glaucoma in 2.6%, neovascular glaucoma in 1.2%, Recurrent stye in 1.2% and extraocular muscle palsy in 1% of the patients in this study. In contrast to this, in a study by Sivaraman G et al⁽²⁾. Cataract was the most common manifestation in 42.2% patients followed by Diabetic Retinopathy in 31.4%, Vascular occlusion in 4.2%, Glaucoma in 8.6%, Lid lesions in 5.4%, Keratitis in 4.2% and Ophthalmoplegia in 1.4% patients. The main reason for such a high prevalence of Diabetic Retinopathy in our study might be that the all the patients were known diabetics with longer duration of disease, majority already had poor glycemic control and altered renal function at the time of enrolling into the study. Moreover the study was done in a tertiary care hospital where almost all the patients who reach present with high severity and major complications of disease.

In our study, a positive association has been found between Diabetic Retinopathy and increasing levels of HbA1c (p value<0.0001) and duration of Diabetes (p value<0.0001). Whereas in a study conducted by Saravade SS et al⁽¹⁾, a significant correlation was found between duration of Diabetes and associated ocular manifestation. The most notable manifestation seen with increased duration of Diabetes was NPDR (seen in 48 % subjects with Diabetes for 6-10 year duration). Increased incidence of Retinopathy with increase in duration of Diabetes (type 1 and type 2) was noted in studies conducted by Klein et al⁽¹²⁾ and Yanko et al⁽¹³⁾.

In our study, no association was found between any ocular manifestation and age of Diabetic patient. Similarly, no significant correlation was found between age of the Diabetic subject and the associated ocular manifestations in a study by Saravade Set al⁽¹⁾.

In our study, 9.6% had mild DR, 38.5% had moderate DR, 25.0% had severe DR, 7.7% had very severe DR and 9.6% had PDR. Whereas in a study conducted by Saravade SS et al⁽¹⁾, 37.6% patients had NPDR with fundus findings like multiple microaneurysms, dot blot haemorrhages, hard exudates, cotton wool spots and venous dilatation with loop formation. 8% patients had PDR with fundus findings like microaneurysms, dot and large blot haemorrhages, hard exudates with NVD and NVE. Patients had advanced Diabetic eye disease with findings like Retinal Detachment and Vitreous Haemorrhage. 26.7% patients had mild NPDR, 39.3% patients had moderate NPDR, 16.7 % patients had severe NPDR and PDR was present in 17.5 % cases.

One of the major limitations of our study was smaller sample size; hence the findings cannot be generalized. Prospective study design with adequate sample size should be carried out for the reliable estimates and countrywide external validity.

5. Conclusion

Diabetic Retinopathy (DR) was present in 90.4%, Diabetic Macular Edema (DME) in 50% and Cataract in 38.5% of the study participants. A positive association had been found between Diabetic Retinopathy and duration of Diabetes and increasing levels of HbA1c. Early detection of Diabetes by regular screening, adequate management by appropriate drugs and timely investigations (blood and ocular testing) followed by regular monitoring can prevent and reduce the prevalence and incidence of ocular complications occurring due to Diabetes.

Conflicts of Interest: None declared

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