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Fundus Findings in Patients of Diabetes Mellitus

Dr. Jitendra Kumar[1], Dr.Priyanka chanana[2], Dr. Vanshika khanna[3]

[1.] *Associate Professor & Head, Dept. of ophthalmology, MLB Medical College Jhansi, India.*
[2, 3] *Junior Resident, Dept. of ophthalmology, MLB Medical College Jhansi, India.*
Corresponding author: Dr. Jitendra Kumar

Abstract
Purpose - *To study the fundus findings in patients of diabetes mellitus.*
Methods- *This was a prospective observational study that involved 50 eyes of 25 patients with diabetes mellitus complaining of diminution of vision. Complete ophthalmic examination was done in diffuse light followed by direct opthalmoscopic examination and optical coherence tomography.*
Results-*There were 15 males and 10 females .Fundus findings in patients of diabetes mellitus include microaneurysms in all the patients followed by dot blot haemorrhages in 88% patients , flame shaped haemorrhages in 76% patients, cotton wool spots in 62% patients, venous beading in 55% patients ,maculopathy in 46% patients and neovascularization in 42% patients. Optical coherence tomography findings included diabetic macular edema, epiretinal membranes, vitreomacular or vitroretinal traction. .*
Conclusion-*All the patients with diabetic retinopathy had poor vision with fundus findings like intraretinal microaneurysms , dot blot haemorrhage , flame shaped haemorrhage, cotton wool spot , venous beading ,maculopathy and neovascularization .Optical coherence tomography findings included diabetic macular edema, epiretinal membranes, vitreomacular or vitroretinal traction.*
Keywords: *diabetic retinopathy, intraretinal microaneurysm , cotton wool spots, maculopathy, neovascularization*

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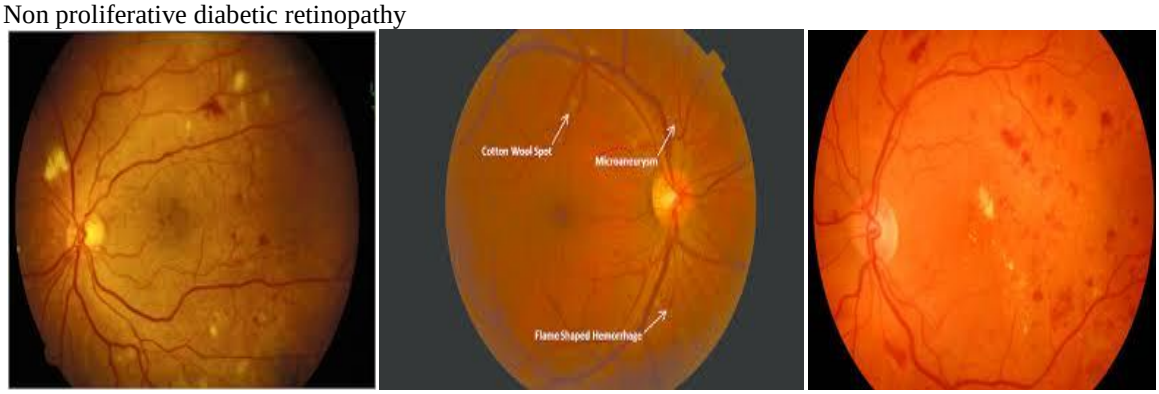
I. Introduction

Diabetes mellitus is a metabolic abnormality in which there is a failure to utilise glucose and hence a state of hyperglycaemia can occur. If hyperglycaemia continues uncontrolled over time, it will lead to significant and widespread pathological changes, including involvement of the retina, brain and kidney. Diabetic retinopathy is increasingly becoming a major cause of blindness throughout the world in the age group of 20–60 years [1,2,3]
Clinical classification is as follows:

- *Non-proliferative diabetic retinopathy*
- *Proliferative diabetic retinopathy.*

Non-Proliferative Diabetic Retinopathy (NPDR)
The lesions in the retina at this stage are within the retina and include micro-aneurysms, small ‘dot and blot’ haemorrhages, ‘splinter’ haemorrhages, intraretinal microvascular abnormalities (IRMA) and ‘cotton wool’ spots.
The presence of these lesions in various degrees determines whether the NPDR is ‘mild’, ‘moderate’, ‘severe’ and ‘very severe’.

Non proliferative diabetic retinopathy



1. Mild Non-Proliferative Diabetic Retinopathy
At least one microaneurysm, and also dot, blot or flame-shaped haemorrhages in all four fundus quadrants.
2. Moderate Non-Proliferative Diabetic Retinopathy
Intraretinal microaneurysms and dot and blot haemorrhages of greater severity, in one to three quadrants. Cotton wool spots, venous calibre changes including venous beading, and intraretinal microvascular abnormalities are present but mild.
3. Severe Non-Proliferative Diabetic Retinopathy
At least one of the following should be present: a) 'severe' haemorrhages and microaneurysms in all four quadrants of the fundus, b) venous beading, which is more marked in at least two quadrants, and c) intraretinal microvascular abnormalities, which are more severe in at least one quadrant.
4. Very Severe Non-Proliferative Diabetic Retinopathy
Two or more of the criteria for severe non-proliferative diabetic retinopathy, but without any proliferative diabetic retinopathy.

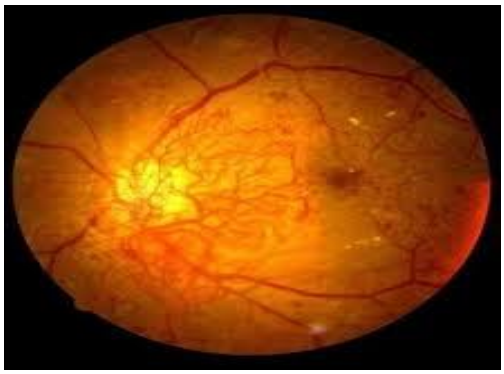
Diabetic maculopathy
Diabetic retinopathy situated in and around the macula is described as diabetic maculopathy, which can result in significant visual impairment. All these background diabetic retinal changes are due to pathology occurring at the microvascular level of the retina, including dilatation of the capillaries, destruction of the capillary walls and closure of the capillaries resulting in hypoxia and micro-infarcts.
The Early Treatment of Diabetic Retinopathy Study (ETDRS) classified patients who were given macular focal laser therapy, based on whether 'clinically significant macular oedema' was present or not[4,5,6] This was classified as:

- Retinal thickening at or within 500μ (one third of the diameter of the optic disc) at the centre of the macula
- Hard exudates at or within 500μ of the centre of the macula, if there is thickening of the adjacent retina
- An area of retinal thickening greater than one optic disc area in size, at least a part of which is within one disc diameter of the centre of the macula.

Proliferative Diabetic Retinopathy (PDR)
Micro-vascular pathology with capillary closure in the retina leads to hypoxia of tissue. The **hypoxia** leads to release of vaso-proliferative factors which stimulate new blood vessel formation to provide better oxygenation of retinal tissue. These new vessels growing on the retina are called *neovascularisation elsewhere (NVE)* and those on the optic disc are called *neovascularisation of the disc (NVD)*. These new vessels can bleed and produce haemorrhage into the vitreous.

Neovascularization elsewhere

Neovascularization of disc



Optical coherence tomography (OCT) has revolutionized our ability to visualize structural abnormalities in the retina. In comparison with older time-domain OCT (TD-OCT) technologies, spectral-domain OCT (SD-OCT) provides significantly better image resolution, allowing detailed images of retinal morphologic features to be obtained. Morphologic abnormalities associated with diabetic retinopathy, as identified with TD-OCT, include macular edema, epiretinal membranes, vitreomacular or vitroretinal traction. The main characteristics of macular oedema in OCT, apart from increased retinal thickness, include intraretinal spaces of reduced reflectivity, disintegration of the layered retinal structure, and usually also flattening of the central foveal depression. OCT tomograms can also reveal hard exudates and haemorrhages. They present as small hyperreflective deposits with posterior shadowing

II. Method And Material

This was a prospective observational study that involved 50 eyes of 25 patients with diabetic retinopathy complaining of diminution of vision. Patients were recruited from the OPD of MLB MEDICAL college, Jhansi ,Uttar Pradesh and were followed from 1st november 2019 - 31st april 2020 . It was performed under the Helsinki Declaration of 1975, as revised in 2000. The necessary permission from the Ethical and Research Committee was obtained for the study.

Inclusion criteria

1. All patients who presented to the OPD of MLB medical College Jhansi with the complaint of dimunition of vision and diagnosed case of diabetes mellitus were included.

Exclusion criteria

1.Patients with ocular systemic diseases(like hypertension) that could affect the retina.
2.Patients with other retinal disorders
3.Patients with recent intraocular surgery
4.Patients with the history of trauma
5.Patients with dense cataract
5.Mentally or physically unfit patients

All patients were subjected to a detailed history taking, refraction using Topcon autorefractometer and best corrected visual acuity (VA) measurement. All patients had complete ophthalmic examination including biomicroscopic slit lamp examination , fundus examination with 90D lens and fundusphotography and optical coherence tomography.

Optical coherence tomography examination was done through dilated pupils, OCT examination was done through a dilated pupil using commercially available Cirrus HD-OCT Model 4000 - Carl Zeiss Meditec, Inc., Dublin,California, USA or Spectralis OCT Heidelberg Engineering.

III. Results

A total of 50 eyes of 25 patients were studied. We included eyes with complaint of diminution of vision. There were 15 males and 10 females and 60% of the studied eyes were the right eyes.

All eyes had one or more features typical of diabetic retinopathy (like intraretinal microaneurysms , dot blot haemorrhage , flame shaped haemorrhage, cotton wool spot , venous beading ,maculopathy and neovascularization)

Table1:Fundus finding in patients of diabetes mellitus

Features	Total %
Intraretinal microaneurysm	100
Dot blot haemorrhage	88
Flame shaped haemorrhage	76
Cotton wool spots	62
Venous beading	55
Maculopathy	46
Neovascularization	42

Table2: Type of retinopathy in patients of diabetes mellitus

Type	no. of patients
Non proliferative retinopathy	
Mild	07
Moderate	04
Severe	06
Diabetic maculopathy	05
Proliferative retinopathy	03

Table3: Optical coherence tomography finding in patients of diabetic retinopathy

Features	Total %
Macular edema	67
Epiretinal membrane	51
Exudates	48
Haemorrhage	46
Vitreomacular traction	35
Vitreoretinal traction	32

IV. Discussion

Mohan et al [7] sconcluded that patients suffering from NIDDM of 25years duration, DR was detected in 52% of patients. Non proliferative diabetic retinopathy was seen 41.7 % and PDR in 10.3% of patients. Diabetic retinopathy (DR) is a Microvascular disease of Retina affecting 4 percent of the world's population, DR has been shown to be the cause of visual impairment in 86 percent of type 1 diabetic patients and in 33 per cent of type 2 diabetics In India. However this morbidity is largely preventable and treatable. In a study by Mohan Rema et al [8], the male to female ratio was 3: 2. A study conducted by Rema M and Pradeepa R, too showed a preponderance in men with a female to male ratio of 1:2. Study by khandekar et al [9] too showed that men are at higher risk of developing retinopathy. The prevention of diabetes by changing life style, modifying the risk factors and early diagnosis and treatment of diabetic retinopathy is essential in order to preserve working resources of the society. In a study by R Khandekar et al11 showed that the retinopathy rate was higher in age group 50-59 and 60-69 years. According to raman et al in study of risk factors diabetic retinopathy in rural India showed that systolic hypertension is a risk for developing diabetic retinopathy. The UKPDS showed that the incidence of retinopathy was associated with systolic blood pressure[10]. The common causes of diminution of vision in diabetic retinopathy are cataract, moderate NPDR, PDR with CSME, macular edema, vitreous hemorrhage, retinal detachment. Most common causes of diminution of vision in this study were cataract and macular edema. The Palakkad Eye Disease Survey reported in diabetics, cataract (27.8%) was the leading cause for visual disability. Patients on irregular treatment were more prone to the diabetic retinopathy changes and severity of the retinopathy changes. According to study by United kingdom prospective diabetes study, intensive control of diabetes and blood pressure slowed the progression of diabetic retinopathy and reduced the risk of other microvascular complications of diabetic retinopathy.

V. Conclusion

Individuals with diabetic retinopathy have feature like intra retinal microaneurysms, haemorrhages, exudates and neovascularization. The intensive control of hyperglycaemia and hypertension reduces the incidence and progression of diabetic retinopathy. Visual disability from diabetic retinopathy is largely preventable if managed with prevention of unhealthy food preferences, good glycaemia control, regular screening of retinal examination for early detection of retinopathy changes and timely intervention by laser. DR has become another common cause of visual dysfunction among the middle age group (40-60years) along with senile cataract and glaucoma. So early diagnosis and meticulous management is essential to prevent visual disability and diabetic retinopathy complications. OCT may be useful to document diabetic retinopathy and maculopathy severity and visual outcome. Periodic ophthalmic examination should be done and strict blood pressure and sugar monitoring and control should be done to control the progression of diabetic retinopathy.

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