

Ocular Manifestations of Diabetes: A Cross-Sectional Study

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ABSTRACT

Purpose: To describe the ocular manifestations of diabetes mellitus in patients of a tertiary care hospital of Pakistan.

Study Design: Cross-sectional study.

Place and Duration of Study: Ophthalmology Department, DHQ Teaching Hospital, Gujranwala from 1st October, 2022 to 31st December 2022 (3 months).

Methods: After taking informed consent and approval from ethical review committee, a self-designed questionnaire was used to collect data which included biodata, type, duration and control of diabetes, associated comorbidities and treatment. Visual acuity and intraocular pressure was measured. Anterior segment examination was performed on slit-lamp bio microscope and posterior segment examination was done with the help of Volk 90D lens after pupillary dilatation with Tropicamide 1% eye drops. All findings were saved on excel spreadsheets and analyzed through Statistical Package for Social Sciences (SPSS) version 25.

Results: Out of total 500 patients, 208 (41.6%) were male and 292 (58.4%) were female. Ages ranged from 35 to 77 years with mean age of 55.7 years. Type II diabetes was present in 467 (93.4%) patients and only 147 (29.4%) patients had good glycemic control. Most common anterior segment finding was cataract in 321 (64.2%) patients followed by dry eye and posterior blepharitis in 300 (60.0%), delayed pupillary response in 103 (20.6%) patients. In posterior segment, most common finding was Non-proliferative Diabetic Retinopathy (NPDR) in 90 (18%) patients.

Conclusion: Cataract and non-proliferative diabetic retinopathy are the commonest manifestations of diabetes.

Key Words: Diabetes Mellitus, Cataract, Dry Eye syndrome, Diabetic Retinopathy.

How to Cite this Article: Ahmad M, Hameed Z, Malik IQ, Iqbal AH, Choudhary TA. Ocular Manifestations of Diabetes: A Cross-Sectional Study. Pak J Ophthalmol. 2023, **39 (2)**: 149-153.

Doi: 10.36351/pjo.v39i2.1570

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Received: January 08, 2023

Accepted: March 03, 2023

INTRODUCTION

Diabetes Mellitus is the most common metabolic disorder characterized by chronic hyperglycemia and peripheral insulin resistance.¹ Diabetes has two major types, a lesser common type 1 in about 5 – 10% and a more common type 2 in 90 – 95% patients.² Global

prevalence of type 2 diabetes is 25% in people above 65 years of age.³ The pooled prevalence of diabetes in Pakistan was 13.7% in a meta-analysis.⁴

Diabetic eye disease is a fairly common group of disorders in patients with both controlled and uncontrolled diabetes. According to a meta-analysis, prevalence of diabetic eye disease was 6.4 million in Europe.⁵ Diabetes virtually affects every structure of the eye from eyelids to ocular motor nerves but previous studies were more focused on diabetic retinopathy.⁶ These include warts, dermatochalasis, chalazion, stye, xanthalesmas, orbital cellulitis and ocular motor nerve palsies including oculomotor nerve, trochlear nerve, abducent nerve and facial nerve

(most common).⁷

Conjunctival diseases include tortuous vessels, pingueculae and pterygia.⁸ Lesions involving cornea (diabetic keratopathy) include reduced corneal sensitivity characterized by the progressive loss of nerve fibers (leading to reduced blink rate, tear film instability and dry eye), recurrent corneal erosions, superficial punctate keratitis, delayed epithelial healing.^{9,10}

Diabetes results in development of cataract either directly or accelerates the rate of senile cataract formation. Rate of posterior sub-capsular cataract and cortical cataract formation is believed to be three to five times more common in diabetic population as compared to normal.¹¹ Patients diagnosed with diabetes are more likely to develop open-angle glaucoma compared with patients without diabetes.¹² Posterior segment findings are more common than anterior segment findings in diabetic patients. Diabetic retinopathy is the most frequently studied ocular finding in diabetic patients.¹³

This study was designed to appraise ocular manifestations of diabetes other than diabetic retinopathy in a tertiary care hospital of Pakistan.

METHODS

This cross-sectional study was conducted in the department of ophthalmology, DHQ Teaching Hospital, Gujranwala from October 2022 to December 2022. After taking informed consent and approval from ethical review committee of the hospital, 500 patients with diagnosis of diabetes mellitus were included in this study. The sample size was estimated using 95% confidence interval and 80% power of test using WHO sample size calculator. Non-probability purposive sampling technique was followed. All of these cases were recorded by a single observer. Diagnosis of diabetes was made on proper history as well as laboratory investigations including fasting and random blood sugar levels and glycosylated hemoglobin (HBA1c) level. Medical specialists/diabetologists were approached whenever necessary.

A detailed questionnaire was used to obtain information regarding patient biodata including age, gender, type, duration and control of diabetes, associated comorbidities, type and treatment being taken. Glycemic control was defined on basis of HBA1c level with good control labelled when HBA1c was less than 7%. Visual acuity of all patients was

recorded on illuminated Snellen chart at 6 meter distance. Intraocular pressure (IOP) was measured through Goldmann Applanation Tonometer (GAT). Anterior segment examination was performed directly on slit-lamp biomicroscope and posterior segment examination was done with the help of Volk 90D lens after time-measured pupillary dilatation with Tropicamide 1% eye drops.

All the findings were taken into account based on international classifications/ criteria. Findings were noted, saved on excel spreadsheets and analyzed using Statistical Package for Social Sciences (SPSS) version 25.

RESULTS

Five hundred patients were included in this study, 208 (41.6%) were males and 292 (58.4%) were females. Male to female ratio was 1:1.4. Their ages ranged from 35 years to 77 years with mean age of 55.7 years. Patients were divided into different age groups as shown in figure 1.

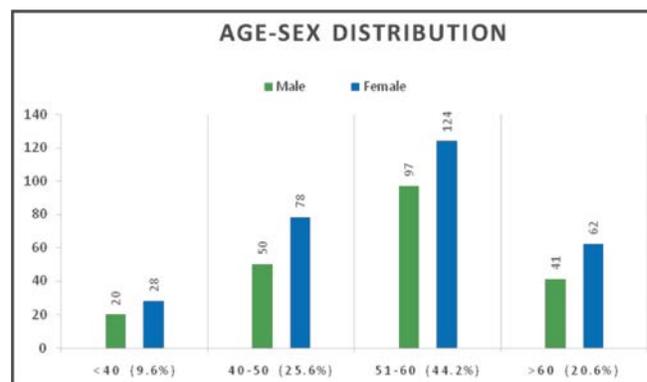


Figure 1: Age-Sex Distribution of Diabetic Patients.

Out of 500, 467 (93.4%) patients had type II diabetes while only 33 (6.6%) patients had type I diabetes. Family history of diabetes was positive in 267 (53.4%) patients while 315 (63.0%) patients had associated hypertension. Out of 500, 248 (49.6%) patients had diabetes diagnosed within last 5 years while 252 (50.4%) had history of more than 5 years. Only 147 (29.4%) patients had good glycemic control. There were 149 (29.8%) patients who were taking Insulin as only treatment, 180 (36.0%) were on oral hypoglycemic (OHG) agents only, 80 (16.0%) were on combined Insulin and OHGs while 91 (18.2%) patients were not on any systemic treatment for diabetes. Visual acuity details are described in figure 2.

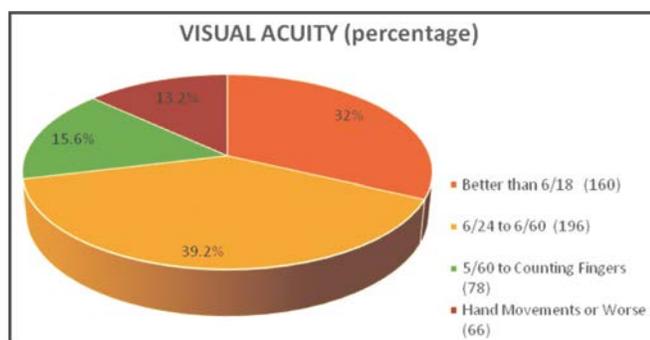


Figure 2: Visual Acuity in Different Groups.

Table 1: Anterior Segment Findings in Diabetic Patients.

Anterior Ocular Findings	Number (n)	Percentage (%)
Ocular Motor Nerve Palsies	20	4.0
Warts / Poliosis	23	4.6
Dermatochalasis	40	8.0
Stye /Chalazion	43	8.6
Dry Eye and Blepharitis	300	60.0
Orbital Cellulitis	4	0.8
Reduced Corneal Sensitivity	69	13.8
Tortuous Conjunctival Vessels	57	11.4
Pterygium	81	16.2
Pinguecula	7	1.4
Iris Atrophy	39	7.8
NVIs / NVGs	7	1.4
Delayed Pupillary Response	103	20.6
Cataract	321	64.2
Glaucoma	50	10.0

Table 2: Posterior Segment Findings in Diabetic Patients.

Posterior Segment Findings	Number (n)	Percentage (%)
Non-proliferative Diabetic Retinopathy	90	18.0
Proliferative Diabetic Retinopathy	43	8.6
Diabetic Macular Edema	78	15.6
Advanced Diabetic Eye Disease	23	4.6
Central Retinal Artery Occlusion	3	0.6
Central Retinal Vein Occlusion	17	3.4
Branch Retinal Vessel Occlusion	20	4.0
Miscellaneous / Other Findings	54	10.8

DISCUSSION

Diabetes Mellitus is the most common metabolic disorder in the world. With its various microvascular and macrovascular complications, it virtually affects every organ system of human body with few systems more prone to damage than others.^{14,15} Duration of diabetes is very important in development of its complications. A lot of studies indicate that by the

time a patient develops diabetic retinopathy, diabetic nephropathy is already in worsened condition.¹⁶ In comparison of all other organ systems of body, diabetes affects every structure of eye as well.

Our study of 500 individuals had mean age of 55.7 years and female predominance with male to female ratio of 1:1.4. Adeoti et al, conducted a very similar study on 181 patients with a similar mean age of 57.5 years but showed a male predominance with male to female ratio of 1.2:1.¹⁷ He also showed positive family history in 33.1% and associated hypertension in 40.9% as compared to 53.4% and 63.0% in our study respectively.

In our study, ocular motor nerve palsies were present in 4% and facial nerve palsy was more common. Adeoti et al, also showed facial nerve palsy as most common finding in diabetic patients. Dry eye disease was second most common anterior segment finding in our study present in 60% population. The Beaver Dam Eye Study reported that diabetic patients between 43 and 86 years of age had 19.8% incidence of dry eyes.¹⁸ However, our study stated a much higher frequency than that.

Reduced corneal sensitivity was found out to be in 13.8% patients in our study. Zhang et al, attributed this decreased sensitivity to impaired corneal neurons involving both myelinated A- δ and unmyelinated C fibres.¹⁹ Shih et al, postulated that loss of corneal sensation also reduced lacrimal tear production hence contributing to worsening of dry eye.²⁰

One study demonstrated that velocity of pupillary dilatation reduced with increasing severity of diabetic retinopathy, more prominent in proliferative diabetic retinopathy groups.²¹ Although we did not compare pupillary responses with retinopathy but our study showed delayed pupillary response in 20.6%. Similarly, we noticed neovascular glaucoma in 1.4% and previous studies showed a range of 1 to 17%.²²

Snowflake cataracts are strongly associated with uncontrolled type I diabetes mellitus. However, posterior subcapsular cataract was more common in our study. The underlying mechanisms of cataract formation in diabetic patients can be attributed to oxidative stress, non-enzymatic glycation of lens proteins and some poorly understood autoimmune mechanisms. The Beaver Dam Eye Study and Blue Mountain Eye Study estimated that risk of cataract formation increases upto five times in diabetics than normal population.²³

Diabetic retinopathy is the most frequently researched ocular finding in patients diagnosed with diabetes mellitus. Our study showed frequency of diabetic retinopathy (both non-proliferative and proliferative) as 26.6%. In one systematic review, a very similar pooled prevalence was noted at 28.78% (range 10.6% to 91.3% from 19 studies) in Pakistani population.²⁴ Same study reported vision threatening diabetic conditions like diabetic macular edema in 28.2% (range 4% to 46.3% from 19 studies) whereas we noted macular edema in 15.6% people.

Retinal vascular occlusion was noted in 40 patients (8%) in our study. A previous meta-analysis showed a significant association between diabetes mellitus and retinal vein occlusion (odds ratio = 1.68 with 95% confidence interval 1.43-1.99). Similarly, other vascular disorders were also increased with poor glycemic control.²⁵

This study is limited by its small sample size, smaller duration and single center setup. In order to obtain a more reliable idea of prevalence of diabetic eye disorders in our population, we need to conduct a large, multicenter study of longer duration so that proper awareness and subsequent treatment plans can be advocated accordingly.

CONCLUSION

Diabetes Mellitus adversely affects all the structures of eye. Cataract is the most commonly seen ocular finding in diabetic patients followed by dry eye disease while NPDR is the most common posterior segment finding. Primary eye care physicians must familiarize themselves with these findings as most of these are preventable or treatable with proper strategies.

Funding

No funding was provided for this study.

Conflict of Interest

Authors declared no conflict of interest.

Ethical Approval

The study was approved by the Institutional review board/Ethical review board (Admn. 463/GMC).

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Authors' Designation and Contribution

Mougees Ahmad; Senior Registrar: *Concepts, Design, Data acquisition, Data analysis, Manuscript review.*

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