THE SPECTRUM OF OCULAR CHANGES IN DIABETES: INSIGHTS FROM A TERTIARY CARE CENTRE

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ABSTRACT

Background: *Diabetes mellitus (DM) and its ocular complications are a major public health problem and a leading cause of preventable blindness worldwide. Diabetic retinopathy has been extensively studied, anterior segment and ocular surface manifestations remain under-recognized. This study aimed to evaluate the spectrum of ocular changes associated with DM in both anterior and posterior segments with demographic and disease-related factors.*

Methods: *A hospital-based, observational cross-sectional study was conducted on 50 diabetic patients aged >18 years attending a tertiary care ophthalmology department over one year. All participants underwent comprehensive ocular evaluation including slit-lamp biomicroscopy, tonometry, and fundus examination. Diabetic retinopathy was graded according to the ETDRS classification. Associations with age, gender, type and duration of diabetes were studied.*

Results: *Of the 50 patients, 60% were males and 40% were females. Cataract was the most common anterior segment manifestation, observed in 66% of patients, followed by poor pupillary response to mydriatics were noted in 24%, conjunctivitis 18% and dry eye disease 12%. Diabetic retinopathy was the most prevalent posterior segment finding, predominantly in the non-proliferative form, with very mild NPDR being the most frequent grade 28%. The prevalence of retinopathy showed a strong positive correlation with duration of diabetes, increasing from approximately 55% in patients with ≤5 years of disease to 100% in those with >20 years duration.*[4,5,7,814,15,16]

Conclusion: *Diabetes mellitus produces a broad spectrum of ocular morbidity involving both anterior and posterior segments of the eye. Cataract and non-proliferative diabetic retinopathy remain the most frequent manifestations. Longer duration of diabetes emerged as the strongest predictor for retinopathy. These findings highlight the importance of structured and periodic ophthalmic screening, particularly in elderly patients and those with long-standing diabetes, for early detection and prevention of vision-threatening complications.*

INTRODUCTION

The eyes are often indicators of systemic disease and are particularly vulnerable to the pathophysiological changes that occur as a result of diabetes. With the increasing population of patients with diabetes mellitus, there is need for further evaluation of the occurrence of ocular manifestations of diabetes in anterior and posterior segment of the eye.

Ocular complications of DM are currently one of the major causes of blindness in developed countries, among which diabetic retinopathy is relatively well studied. DM causes ocular surface manifestations in the cornea, conjunctiva, and lacrimal glands too.[12]

DM is associated with progressive damage to corneal nerves and epithelial cells, which increases the risk of anterior segment disorders including dry eye disease, corneal erosion, persistent epithelial defects, and even sight-threatening corneal ulcer.[8]

This study aims to identify the most commonly occurring ocular manifestations of diabetes mellitus in the eye as a whole.

AIM

1) To study the occurrence of various ocular manifestations of Diabetes at a tertiary care centre
2) To study the association of clinical manifestations with known risk factors (like age, gender, type and duration of diabetes) at a tertiary care centre

METHODOLOGY

An observational, descriptive, cross-sectional, and Hospital Based Study was carried out after taking informed consent from 50 willing participants over a duration of 1 year (January 2024- January 2025). Patients having diabetes mellitus of either type 1 or type 2, aged more than 18 years, attending the Ophthalmology outpatient department or referred to the tertiary care centre, and willing to give informed consent for routine ophthalmic examination were included in the study. Those with associated co-morbidities such as hypertension, heart disease, thyroid disorders, and connective tissue diseases were excluded (to avoid a mixed fundus picture).

Data was collected from all the selected patients using a structured proforma meeting the objectives of the study by means of a detailed personal interview with the patient's symptoms ,medical history and type of diabetes after informed consent. Patients fulfilling the inclusion criteria were included in the study. The patient's duration of diabetes was recorded. Visual acuity , torchlight and slit lamp biomicroscopy along with fundus examination was carried out in all cases. According to clinical presentation and provisional diagnosis, patients were evaluated for dry eye, glaucoma (POAG) and dacryocystitis using Schirmer's test, tonometry and OCT, sac syringing respectively. If signs of Diabetic Retinopathy were present on Ophthalmoscopy, they were graded according to the ETDRS protocol. [8]

RESULTS

Fig 1: Age distribution with respect to gender

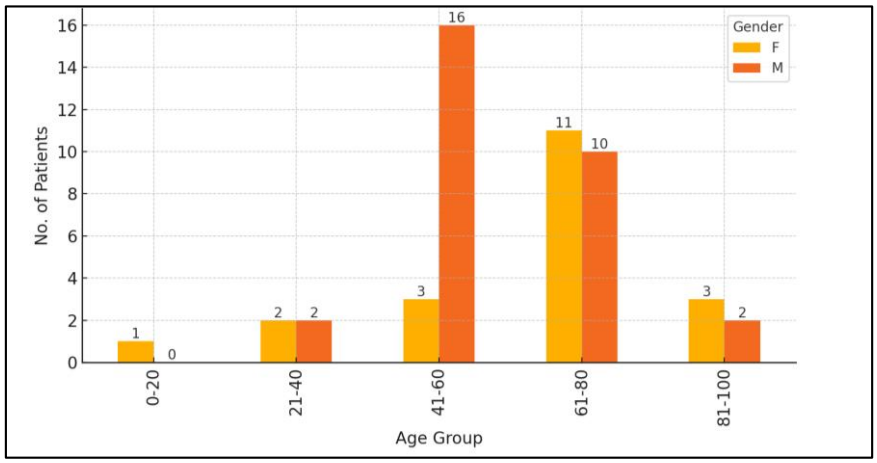
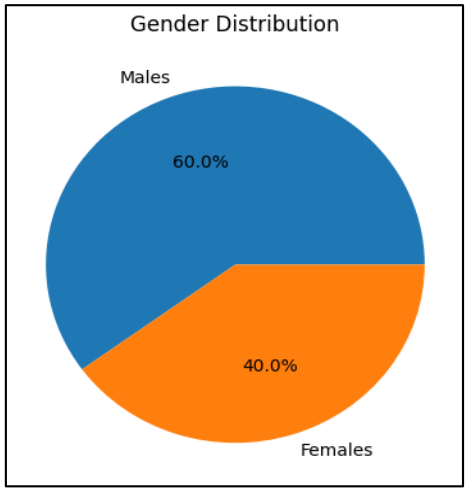


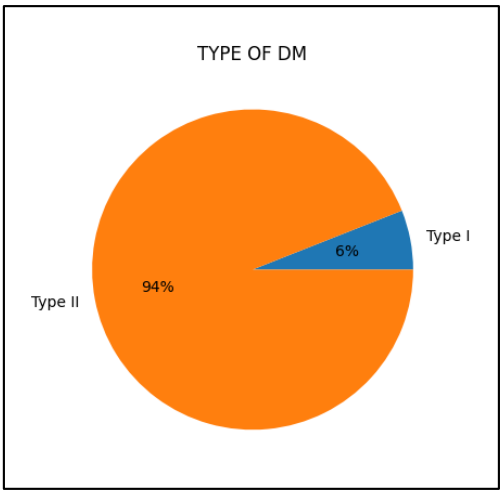
Fig 1 shows the study population most commonly affected was elderly diabetics 45 patients (90%)

Fig 2:Gender distribution



The study population showed a male predominance, with 30 (60%) males and 20 (40%) females.

FIG 3: Type of DM



Type I DM was observed in 3 patients (6%) while Type II DM in 47 patients (94%)

Table 1: Type 2 diabetics seen in study

Age/Sex	Diabetic age	Anterior segment	Posterior segment
27/ M	2 months	-	-
19 /F	12 years	-	-
21/F	16 years	-	-

No ocular manifestation were seen in any of the 3 type I DM patients

Table 2: Distribution of Ocular Involvement in the Study Population

Category	Number of Patients	Percentage (%)
Only anterior segment manifestations	12	24%
Only posterior segment manifestations	7	14%
Both anterior & posterior manifestations	27	54%
No ocular manifestation	4	8%
Total	50	100%

More than half of the patients (54%) demonstrated combined anterior and posterior segment involvement, while isolated anterior and posterior segment manifestations were observed in 24% and 14% of patients respectively. Only 8% of patients had no detectable ocular involvement at the time of evaluation.

Table 3: Anterior segment manifestations

Structure	Ocular manifestation	Total	%
1. Orbit	Orbital cellulitis	1	2%
2. Lid	Xanthelasma Blepharitis	4 1	8% 2%
3. Conjunctiva	Conjunctivitis	9	18%
4. Cornea	Dry eye Keratitis Reduced sensations	6 1 1	12% 2% 2%
5. Anterior chamber	Glaucoma	1	2%
6. Iris	Ectropion uvea Iridocyclitis	1 1	2% 2%
7. Pupil	Delayed response to mydriatics Poor dilation	12 8	24% 16%
8. Lens	Cataract	33	66%

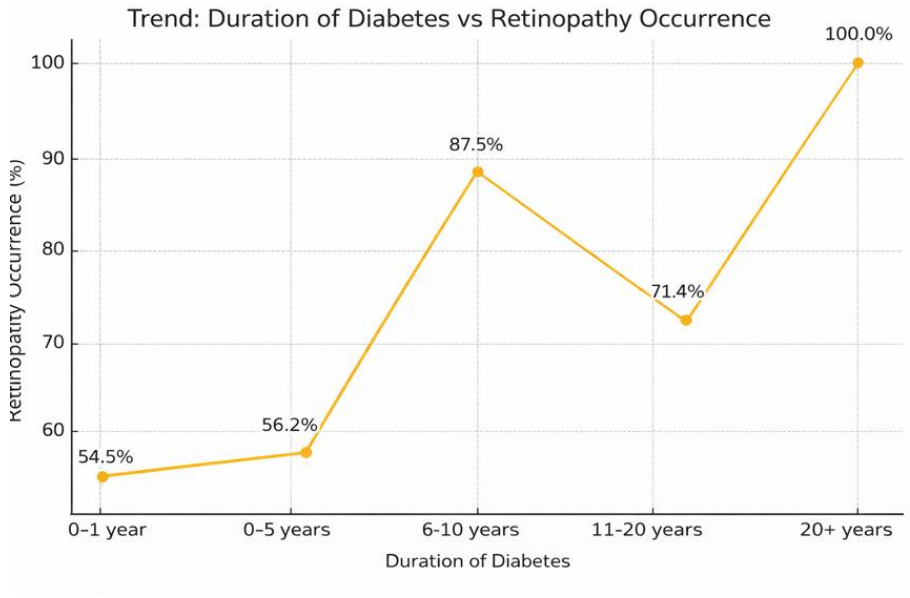
Of the anterior segment findings, cataract was the most commonly seen, occurring in 66% of patients followed by delayed response to mydriatics (24%).[7] Conjunctivitis was seen in 9 patients, 6 of whom had bacterial conjunctivitis, 2 had viral conjunctivitis and 1 patient of allergic conjunctivitis were noted.

Table 2: Posterior segment manifestations

Structure	Ocular Manifestation	Total	%
1. Vitreous	Asteroid hyalosis Fibrovascular proliferation	3 1	6% 2%
2. Retinopathy	<u>Non proliferative</u> Very mild Mild Moderate Severe <u>Proliferative</u>	 14 12 8 1 2	 28% 24% 16% 2% 4%
3. Macula	Maculopathy	4	8%
4. Optic disc	Neovascularization at disc (NVD)	2	4%

Non proliferative diabetic retinopathy was the most commonly occurring posterior segment manifestation, very mild NPDR was seen most frequently (28%)

Fig 3: Duration of Diabetes vs retinopathy occurrence



The figure depicts the duration of diabetes against the occurrence of retinopathy

- ~55% in ≤5 years
- ~88% in 6–10 years
- 100% in >20 years

DISCUSSION

Diabetes mellitus is a major public health challenge and is well recognized for its progressive microvascular and neurodegenerative ocular complications. The present hospital-based cross-sectional study evaluated the spectrum of anterior and posterior segment manifestations among 50 diabetic patients attending a tertiary care centre, thereby highlighting the substantial burden of ocular morbidity associated with the disease.

A male predominance (60%) was observed in the study population. Similar trends have been reported in several hospital-based Indian and international studies. Watkinson and Seewoodhary and Han et al. documented comparable findings and attributed them to differences in health-seeking behaviour, occupational exposure, lifestyle factors, and better access of males to tertiary care facilities.

Three patients of type 1 DM were identified, none of whom had any diabetic ocular manifestations. This could be due to early detection of DM with regular supervised treatment, even in a rural area. A higher sample size and a different study design would be required to fully comment on our findings with respect to patients of type 1 DM.

More than half of the patients (54%) in the present study demonstrated combined anterior and posterior segment involvement, indicating that diabetes commonly affects the eye as a whole rather than isolated ocular structures. Isolated anterior and posterior segment manifestations were observed in 24% and 14% of patients respectively, while only 8% showed no ocular involvement. Similar patterns of ocular involvement have been reported by Moss et al and Klein et al.[16,17]

Cataract was the most common anterior segment manifestation (66%) in the present study, consistent with earlier reports documenting cataract prevalence ranging from 50–70% among diabetic patients. Chronic hyperglycaemia promotes sorbitol accumulation within the lens through activation of the polyol pathway, resulting in osmotic stress, oxidative injury, and accelerated cataractogenesis.

We observed dry eye disease in 12% and conjunctivitis in 18% which were comparable to the findings of Manaviat et al., Dogru et al., Kaji et al. and Han et al.

We came across pupillary abnormalities such as delayed response to mydriatics and poor dilation in 22% of patients reflecting diabetic autonomic neuropathy. [8,7,11,12,13]

Chronic hyperglycaemia is known to impair the blood–aqueous barrier, induce oxidative stress, and cause microvascular ischemia of the iris and ciliary body, thereby predisposing diabetic patients to anterior uveitis. In the present study, iridocyclitis was observed in 2% of patients, representing a relatively infrequent yet clinically significant anterior segment manifestation in diabetes mellitus, similar to those seen in a study done by Bonfioli et al. [18]

There were 2% of patients with POAG in our study who were previously diagnosed and on treatment, further supporting the association between diabetes mellitus and glaucoma due to microvascular compromise of the optic nerve head, increased oxidative stress, and impaired autoregulation of ocular blood flow. Population-based studies such as the Blue Mountains Eye Study and Beaver Dam Eye Study have reported diabetes as an independent risk factor for glaucoma.[19]

Diabetic retinopathy was the most prevalent posterior segment complication in our study, predominantly in the non-proliferative form, with very mild NPDR being the most frequent grade. This pattern is consistent with reports by Moreno et al. and the Diabetes Control and Complications Trial, which demonstrated that early NPDR constitutes the bulk of retinopathy detected during screening. The predominance of early-stage retinopathy in the present cohort suggests relatively timely detection and highlights the potential for its early treatment to prevent progression. In this study, Maculopathy (8%) and NVD (4%), represent advanced microvascular compromise and remain important contributors to irreversible visual loss. [4,5,14,15,16]

A strong positive correlation was observed between the duration of diabetes and the occurrence of diabetic retinopathy. The prevalence of retinopathy increased sharply from approximately 55% in patients with ≤5 years of diabetes to near-universal involvement in those with disease duration exceeding 20 years. This trend closely parallels findings from the Diabetes Control and Complications Trial and other epidemiological studies, reinforcing the concept that duration related glycaemic insult is the principal determinant of retinopathy progression.[5]

CONCLUSION

This study highlights the substantial burden of ocular morbidity among patients with diabetes mellitus, with a clear predominance of both anterior and posterior segment involvement.

Cataract and non proliferative diabetic retinopathy, remains the most frequent anterior and posterior segment finding respectively.

The study demonstrates that higher occurrence of diabetic retinopathy is seen with longer duration of diabetes, of 5 or more years.

Routine, structured ophthalmic screening programs in diabetic patients, particularly elderly patients and those with long-standing diabetes, are essential for early detection, appropriate counselling for timely treatment, and prevention of avoidable visual impairment and blindness.

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