Dry Eye in Diabetes Mellitus and Its Relationship with Diabetic Retinopathy

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ABSTRACT

Introduction: Diabetes is quickly emerging as biggest health related Catastrophes the world has ever witnessed. It is often associated with several significant ocular conditions such as diabetic retinopathy, refractive changes, cataract, glaucoma and macular oedema, however one of the most common yet least studied ocular complication associated with Diabetes is Dry Eye and it's management varies with severity and etiology of Dry Eye.

Materials & Methods: A cross sectional observational study done on 100 Patients with adult onset Diabetes Mellitus visiting Ophthalmology, Out Patient Department in National Institute of Medical Sciences & Research and Hospital, Jaipur. Detailed ocular and diabetic history recorded and clinical examination with slit-lamp for anterior segment was done. Schirmer's test (SchT), tear breakup time (TBUT), and tear meniscus height (TMH) test were performed, and results noted.

Results: In this study, 100 diabetic patients participated, of which 20 were Type I and 80 were Type II DM. Dry eye prevalence was maximum in patients who were 50 years of age (53.6%) and above. It was more common in females (60.9%) compared to males (39.1%). SchT showed 15% and 82.5% of Type I and Type II diabetics had dry eye. The TBUT was found to be ≤10 s in 65% of Type II DM. 49% of Type II diabetics had thin TMH. Moderate non-proliferative diabetic retinopathy (NPDR) (33%) was significantly more common in diabetic patients with dry eyes. There were no patients with very severe NPDR. A statistically significant ($P \leq 0.001$) association was found between diabetic retinopathy and dry eye.

Conclusion: We concluded that significant correlation was found between dry eye and diabetic retinopathy. Hence, examination of dry eye should be integral part of assessment of diabetic disease as early detection will help to prevent further progression.

Keywords: Dry Eye Syndrome, Diabetes Mellitus, Tear Break-Up Time (BUT), Tear Meniscus Height (TMH).

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INTRODUCTION

Diabetic mellitus is a clinical syndrome characterized by hyperglycemia caused by absolute or relative deficiency of insulin. Dry Eye Syndrome (DES) is a major tear deficiency disorder which causes discomfort, visual disturbances and tear film instability with potential damage to the ocular surface.[1] DM has been identified as a risk factor for DES and which is further complicated by recurrent epithelial erosions, epithelial defects, and corneal ulcers. The prevalence of DES in Diabetes is around 54%.[2] Hence, it is important to make early diagnosis of the disease.[3] The reported prevalence of DES in diabetics is 15–33% in those over 65 years of age and increases with age and is 50% more common in women than in men.[4]

The incidence of dry eye is correlated with the level of glycated hemoglobin: the higher the level of glycated hemoglobin, the higher the incidence of dry eye.[5]

In a hospital-based study, 54% of those with diabetes had DES and there was a significant correlation between DES and the duration of diabetes. This suggests that examination for dry eye should be an integral part of the ocular examination in patients with Diabetes.[6]

Tear break-up time (BUT) and Schirmer's test values were significantly decreased in the PDR group compared to the non-DR group while corneal fluorescein staining scores, positive rate of rose Bengal staining, the surface regularity index, and the surface asymmetry index were increased. The concentrations of lactoferrin and tear-specific prealbumin were decreased in the DR group.[7]

The presence of retinopathy in diabetes is often accompanied by other complications including nephropathy and neuropathy. However, the relationship between diabetic retinopathy and ocular surface disorders has not been well described in the literature. Therefore by doing early detection of dry eye in diabetic patient decreases the percentage of patients suffering from Dry eye and its relationship with stages of diabetic retinopathy.

MATERIALS & METHODS

All patients presenting with DM was subjected to complete ophthalmologic examination and brief general systemic examination.

Ophthalmic examination by assessing the corneal sensation, visual acuity with Snellens chart, detailed anterior segment examination with slit-lamp to know the condition of eyelid, meibomian gland, conjunctival surface, and cornea. Tear film evaluation was done in the following order. Tear meniscus height (TMH) were recorded as normal or low under slit lamp; precorneal tear film were observed for debris.

Inclusion Criteria

- Both male and female patients with adult onset Diabetes Mellitus.
- All patients willing to take part in the study and sign consent form.

Exclusion Criteria

- Patients who have undergone ocular surgery in the past 6 months
- Patients who wear contact lens.
- Patients who are on local or systemic medication (antihistamine, glaucoma medications etc) which are known to cause dry eye.
- Patient with other ocular surface disease and systemic disease (Thyroid disease, Sjogren's syndrome, psoriasis etc) which are known to cause dry eye other than Diabetes Mellitus.
- Keratorefractive procedures (LASIK, LASEK, PRK) within one year prior to enrollment, trauma, incomplete lid closure, entropion, ectropion, nasolacrimal drainage obstruction, punctual plugs placement, or cauterization; ocular allergy, glaucoma, pregnancy or lactation.
- Patients having extensive corneal / conjunctival pathology.

Statistical Method

Descriptive and inferential statistical analysis was carried out in this study. Chi-square/Fisher exact test was used to find the significance of study parameters on categorical scale between two or more groups.

RESULTS

The present study showed that the moderate & severe non proliferative diabetic retinopathy was significantly higher in type II DM as compare to type I DM in fundus findings (P<0.001***) (table 1). Dry eye syndrome was occurred most commonly in type II DM (P<0.001***) (table 2).

No statistically significant gender wise distribution of patients among groups (P=0.244) (table 3). Thin Tear meniscus height (TMH) (P<0.001***), SchT findings (P<0.001***) & TBUT findings (P<0.001***) was significant among groups in our study. (table 4,5,6).

Table 1: Fundus findings of patients studied

Fundus findings	Type of DM		Total (%)
	Type I (%)	Type II (%)	
0-No retinopathy	17 (85)	16 (20)	33 (33)
1-Mild NPDR	3 (15)	12 (15)	15 (15)
2-Moderate NPDR	0 (0)	33 (41.3)	33 (33)
3-Sever NPDR	0 (0)	16 (20)	16 (16)
4-PDR	0 (0)	3 (3.8)	3 (3)
Total	20 (100)	80 (100)	100 (100

Table 2: Dry eye distribution of patients studied in DM

Dry eye	Type of DM		Total (%)
	Type I (%)	Type II (%)	
No dry eye	16 (80)	13 (16.25)	29 (29)
Dry eye	4 (20)	67 (83.25)	71 (71)
Total	20 (100)	80 (100)	100 (100)

Table 3: Gender distribution of patients studied according to incidence of dry eye

Gender	Type of DM		Total (%)
	Type I (%)	Type II (%)	
Female	15 (48.4)	42 (60.9)	57 (57)
Male	16 (51.6)	27 (39.1)	43 (43)
Total	31 (100)	69 (100)	100 (100)

Table 4: TMH levels of patients studied

TMH levels	Type of DM		Total (%)
	Type I (%)	Type II (%)	
Absent	0 (0)	13 (16.3)	13 (13)
Normal	20 (100)	18 (22.5)	38 (38)
Thin	0 (0)	49 (61.3)	49 (49)
Total	20 (100)	80 (100)	100 (100)

Table 5: SchT findings

SchT	Type of DM		Total (%)
	Type I (%)	Type II (%)	
0 normal	17 (85)	14 (17.5)	31 (31)
1 mild	3 (15)	15 (18.8)	18 (18)
2 moderate	0 (0)	32 (40)	32 (32)
3 sever	0 (0)	19 (23.8)	19 (19)
Total	20 (100)	80 (100)	100 (100)

Table 6: TBUT findings

TBUT	Type of DM		Total (%)
	Type I (%)	Type II (%)	
Low	0 (0)	65 (81.3)	65 (65)
Normal	20 (100)	15 (18.8)	35 (35)
Total	20 (100)	80 (100)	100 (100)

DISCUSSION

In the present study, the prevalence of dry eyes was found to be 71%. In Type 1 diabetes, it was 20%, and in Type II, it was 83.25%. Seifart and Strempel[5] found 57% of dry eye in Type I and 70% in Type II. In the beaver dam eye study, the ageing effect was significant after 65 years of age. Kaiserman et al.[8] have reported that the prevalence of dry eye increases with age. Therefore, in the present study, higher prevalence of dry eye in age group 51-60 could be because of DM.

Lee et al.[9], in a population study in Indonesia, showed the prevalence of dry eye was 1.4 times higher for men than women.

Moss et al.[10], reported a higher incidence of dry eyes in diabetic women 16.7% compared with 11.4% in men. In the present study, 60.9% of dry eye in diabetic patients were females and 39% were males, but the prevalence of dry eyes was not statistically associated with sex when both Type I and Type II combined. Comparable findings were reported by Seifart and Strempel[5], Nepp et al.[7], showed that the severity of keratoconjunctivitis sicca (KCS) correlate with the severity of diabetic retinopathy.

In the present study, TBUT was found to be ≤10 s in 65%. Tear film breakup time is supposed to be a diagnostic technique in detecting mucin deficient dry eye. SK Chopra et al.[11] found the mean value of TBUT to be 9.67 s in the Indian populations.

A study done by Whitcher19 found a scanty or absent tear meniscus is an indication of aqueous tear deficiency. In this study, TMH was thin in 49% and absent in 13%.

Devi RSU et al.[12] study showed the SchT was shown to be incapable of detecting meibomian gland disease. However, a low Schirmer result (62.5%) was significantly associated with dry eye symptoms in this elderly Chinese population. The total tears secretion measured by Schirmer I was ≤10 mm in 19%.

CONCLUSION

DM and dry eyes appear to have common association. Statistically significant correlation was found between dry eye and diabetic retinopathy. Hence, examination of dry eye should be integral part of assessment of diabetic disease as early detection will help to prevent further progression.

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