

# Dry Eye Syndrome in Patients with Type II Diabetes Mellitus

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## Abstract

**Introduction:** Keratoconjunctivitis sicca, commonly referred to as dry eye syndrome (DES), is one of the most frequently encountered conditions, with diabetes mellitus (DM) being identified as its major causal factor. Poor glycemic control leads to dryness in the anterior segment of the eye.

**Methods:** An observational study was conducted on patients more than 41 years. After informed consent was obtained and a detailed explanation of the present study, an initial clinical evaluation was performed with anamnesis and a complete ophthalmologic examination. Patients above the age of 41 who did not have any condition other than Type II DM that could influence dry eye and corneal sensitivity were taken up for the study. The specific evaluation included a history of symptoms related to dry eye using the 5-Item Dry Eye Questionnaire, and then tear film evaluation, tear film breaks up time, fluorescein and lissamine green staining, and Schirmer I test and corneal sensitivity testing with a Cochet-Bonnet esthesiometer.

**Results:** The prevalence of dry eye among people with diabetes was 46.0% for mild symptoms, 65.2% for moderate symptoms, and 8.7% for severe symptoms. There was a significant association with age and duration of diabetes but not with retinopathy.

**Conclusion:** A periodic evaluation of the ocular surface is essential for patients with DM, in addition to retinopathy screening, as they may be asymptomatic but have a severe dry eye disease, which can lead to further ocular surface complications.

**Key words:** Corneal sensation, Corneal sensitivity, Diabetes, Dry eye, Retinopathy

## INTRODUCTION

The global prevalence of diabetes mellitus (DM) in 2013 was 8.3%. In India, the prevalence was reported 2.1% in the urban population and 1.5% in the rural population whose age was 40 years or more.<sup>[1]</sup> The prevalence of diabetes was 5% in urban and 2.8% in rural areas in 2007. The refractive changes, cataracts, nerve palsies, retinopathy, glaucoma, and macular edema were the common ocular morbidities arising from diabetes.<sup>[2]</sup> Etiopathogenesis of dry eye in diabetes can be explained in terms of the factors related to peripheral neuropathy secondary to hyperglycemia, insulin insufficiency, inflammation, autonomic dysfunction, and

altered enzyme aldose reductase activity.<sup>[3]</sup> The severity of dry eye is dependent on the duration, control, and grade of diabetic retinopathy.<sup>[1]</sup> With increasing cases of diabetes, there is an unmet need to understand the epidemiology of the disease in the Indian population.

## MATERIALS AND METHODS

The patients who were diagnosed to have Type II diabetes (as per ADA criteria) of any duration and age 41 years or more were included in this study. The study was performed with the help of a suitable proforma which included all relevant information. All cases were studied according to the parameters stated above. Patient records included detailed history, proper ocular examinations, and investigations such as fasting blood sugar (FBS), postprandial blood sugar, and glycosylated hemoglobin estimation (HbA1c). In addition, detailed history regarding diabetes such as type of diabetes, duration, treatment, and overall control in the past 3 months was recorded. Dry eye patient was diagnosed

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with the help of slit-lamp examination, Schirmer's test, tear film break-up time, and Rose Bengal staining technique. A brief general and systemic examination was carried out. The ocular examination included recording visual acuity with Snellen's chart. Detailed anterior segment examination was done under a slit lamp. Condition of lids, conjunctival surface (dryness, wrinkling, and sheen), and corneal surface were noted. Tear film evaluation was done by recording the tear meniscus height presence of debris (mucous/oil droplets/debris) with the help of a slit lamp. Gradation of dry eye was done by the following standard protocol: Measurements of  $\leq 10$  mm were positive. Readings  $>10$  mm were considered negative. An additive score of 4 or more in the eye constituted a positive test. Less than this value was regarded as a negative test. Dry eye was graded into three categories: Mild, moderate, and severe. Mild dry eye was defined in patients with Schirmer's test of 6–10 mm in 5 min, Moderate dry eye was defined as a Schirmer's test of 3–5 mm in 5 min. Severe dry eye was defined as a Schirmer's test of  $\leq 2$  mm in 5 min. Detailed fundus examination was done under direct, indirect ophthalmoscopy, and +90 D examination to rule out any diabetic retinopathic changes present or not.

## RESULTS

A total number of 50 diabetic patients who attended the Outpatient Department were included in this study. Overall, 18% of patients belonged to the 41–50 age group, 48% belonged to 51–60, and 34% belonged to the  $>61$  years of age category. The study was male preponderant (64%). There was no significant sex difference noticed in dry eye patients. The baseline characteristics are summarized in Table 1. In brief, 86% patients had  $>10$  years of diabetes, 14% were diabetic for  $>11$  years. Within this patient cohort, 46% had dry eye, of which 26.1% had mild, 65.2% had moderate, and 8.7% had severe dry syndrome [Figures 1 and 2]

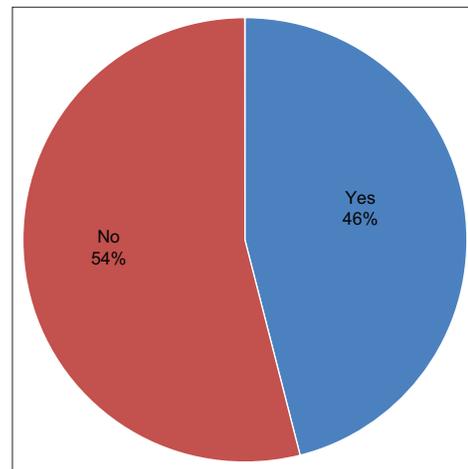
## DISCUSSION

The present study showed that the prevalence of dry eye was 46% associated with Type II DM. Most of them (26.1%) had mild form. Hasan *et al.*<sup>[4]</sup> corroborated with the present study (20% mild form) showed 19.8%, 70%, and 43% dry eye with Type II diabetes patients, respectively. This wide variation (18–70%) of prevalence was seen in the above studies, whereas the prevalence of dry eye in the present study was in the middle position. This difference might result from the variation of sample size, study design, and other associated factors such as duration, stage, and treatment of diabetes.<sup>[5–7]</sup> The present study showed no significant difference in dry eye prevalence among males

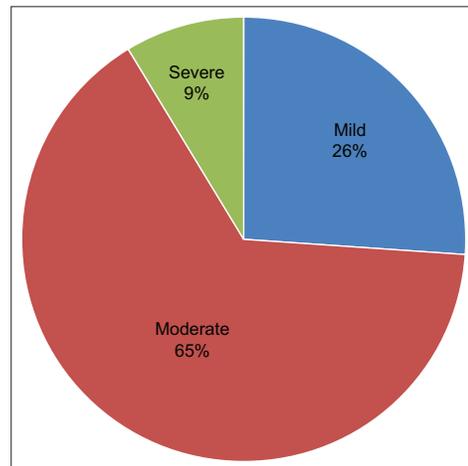
**Table 1: Baseline characteristics**

Patients characteristics	Frequency	Percentage
Age group		
41–50	9	18.0%
51–60	24	48.0%
$>61$	17	34.0%
Gender		
Male	32	64.0%
Female	18	36.0%
Duration of Diabetes		
$<10$	43	86.0%
$>11$	7	14.0%
Comorbid		
HT	17	34.0%
IHD	4	8.0%
CTD	1	2.0%
Smoking		
Yes	16	32.0%
No	34	68.0%
Alcohol		
Yes	19	38.0%
No	31	62.0%

HT: hypertensive, IHD: Ischemic heart disease, CTD: Comparative toxicogenomic database



**Figure 1: Distribution of Dry eyes in study patients**



**Figure 2: Distribution of Severity of Dry eyes in study patients**

and females. However, Moss.<sup>[5]</sup> showed a 16.7% incidence of dry eyes in diabetic women compared to 11.4% in diabetic men.

This study showed that patients with dry eye were increased with increasing age. The most of the patients had (42%) dry eye in the 40–70 years age group. Kaiserman *et al.*<sup>[6]</sup> reported that the prevalence of dry eye increases with age. Schultz *et al.* suggested that increased evaporation and tear film osmolarity with age are the more important determinant for dry eyes. In addition, they suggested that autonomic dysfunction may be another cause of the prevalence of dry eyes with an increase in age.

Duration of diabetes appeared to influence the prevalence of dry eye significantly. Duration of diabetes more than 10 years had a strong association with dry eye, which was statistically significant.

Kaiserman *et al.* reported that good blood sugar regulation was important for preventing and controlling DES among diabetic patients. The present study showed that the state of control of diabetes was highly statistically significant in association with dry eye state in the study population. Patients with poor glycemic control (HbA1c  $\geq 8\%$ ) were found to have a higher degree of dry eye. FBS value, however, did not show any such significant association of dry eye in Type II diabetes.<sup>[6]</sup>

Nepp *et al.* showed that the severity of DES correlates with the severity of diabetic retinopathy.<sup>[7]</sup>

### Limitations of the Study

A large sample size and long-term follow-up of dry eye patients are essential for assessing the significant association with Type II DM and diabetic retinopathy, which our study did not have.

### CONCLUSION

A periodic evaluation of the ocular surface is vital for patients with DM, in addition to retinopathy screening, as they may be asymptomatic but have a severe dry eye disease, which can lead to further ocular surface complications.

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