

## Study on Prevalence of Dry Eyes in Diabetic Patients: A Hospital Based Cross Sectional Study

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Received: 25-09-2023 / Revised: 28-10-2023 / Accepted: 30-11-2023

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Conflict of interest: Nil

### Abstract:

**Background:** Diabetes mellitus is one of the main causes of dry eye syndrome. A patient's risk of acquiring dry eye increases with the length of their diabetes. The blood sugar level in individuals with diabetes also contributes to the development of dry eye disease. It has been observed that patients with poor blood sugar regulation are more likely to develop dry eye illness. Studies on dry eyes in diabetes patients have not been conducted in large numbers in India. The purpose of this study was to determine the prevalence of dry eye in individuals with diabetes.

**Methods:** This hospital based prevalence study of hundred patients with type II diabetes was conducted in Department of Ophthalmology, Sri Krishna Medical College and Hospital from March 2018 to February 2019. A standard questionnaire was completed along with a thorough history of diabetes, slit lamp biomicroscopy, the Schirmers test, tear break up time, fluorescein staining, and Rose Bengal staining.

**Results:** In our study, 43 out of the patients with type II diabetes experienced dry eye. A noteworthy correlation has been seen between dry eye and both inadequate glycaemic management ( $p < 0.001$ ) and a longer duration of diabetes ( $p < 0.05$ ).

**Conclusion:** Maintaining adequate glycaemic management is crucial for lowering the incidence of dry eye. The evaluation of diabetic ocular disorders should include a thorough examination of dry eyes.

**Keywords:** Diabetes mellitus, Glycaemic control, Prevalence, Dry eye.

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### Introduction

A complex illness, type-II diabetes mellitus is typified by hyperglycemia brought on by either impaired insulin production or insulin resistance in peripheral organs. [1,2] Blindness can result from a multitude of ocular problems linked to diabetes mellitus. Diabetes retinopathy, cataract, refractory error, ptosis, neovascular glaucoma, and palsy of the cranial nerves are common eye problems in diabetes practitioners. [3]

Patients with diabetes have multiple corneal problems, such as chronic epithelial defects, corneal ulceration, and superficial punctate keratopathy. Tear film irregularities play a definite part in the alien body sensation complaints that many diabetes patients experience. [4] Tear film abnormalities in diabetics have been shown in a number of investigations, both qualitative and quantitative, but it is unclear exactly how these

abnormalities contribute to the development of dry eyes. Ocular surface examination is frequently disregarded in favor of retinopathy alone. According to a review of the literature, every second patient with diabetes mellitus had dry eye disease [6,7]. In a research by Manaviatet al. (2008), dry eye illness affected 54.3% of diabetic individuals. Diabetic individuals with dry eyes must first be diagnosed as soon as feasible in order to begin therapy. Studies on the frequency of ocular surface diseases and dry eyes in patients with diabetes are scarce in India.

We conducted this study to determine the prevalence of dry eye in individuals with type II diabetes mellitus and to investigate its relationship to glycaemic control and the length of the disease. The current study set out to determine how common dry eye was among type II diabetes

patients who visited the ophthalmology department. We also looked at the relationship between blood sugar levels and the length of diabetes as well as dry eye.

**Material and Methods**

From March 2018 to February 2019, a cross-sectional study was carried out in the Ophthalmology Department of Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar. Information gathered and examined for one hundred patients with type 2 diabetes who were seen in the outpatient department of ophthalmology. Individuals who were known to

create abnormalities on the ocular surface due to systemic or local pharmaceutical usage, chronic contact lens wearers, post-LASIK patients, or rheumatoid arthritis were not allowed to participate in the study.

The data analysis was done using statistical tools, specifically SYSTAT 8.0 and SPSS 17.0.

**Results:** As shown in Table 1, the most common symptoms reported in our study were burning sensation (61%), redness (55%), and watering (51%), in contrast to gritty feeling (46%), dry eyes (43%), stickiness (34%), eyes stuck (34%), and crusting (4%).

**Table 1: Response to dry eye questionnaire**

|                   |          | Frequency | Percentage |
|-------------------|----------|-----------|------------|
| Eye Feeling dry   | Negative | 57        | 57.0%      |
|                   | Positive | 43        | 43.0%      |
| Gritty Feeling    | Negative | 54        | 54.0%      |
|                   | Positive | 46        | 46.0%      |
| Burning Sensation | Negative | 39        | 39.0%      |
|                   | Positive | 61        | 61.0%      |
| Stickiness        | Negative | 66        | 66.0%      |
|                   | Positive | 34        | 34.0%      |
| Watering          | Negative | 49        | 49.0%      |
|                   | Positive | 51        | 51.0%      |
| Redness           | Negative | 45        | 45.0%      |
|                   | Positive | 55        | 55.0%      |
| Crusting          | Negative | 64        | 64.0%      |
|                   | Positive | 4         | 4.0%       |
| Eye Stuck         | Negative | 66        | 66.0%      |
|                   | Positive | 34        | 34.0%      |

36 patients in our study had TBUT values  $\leq 10$ , and 44 patients had Schirmers test values  $\leq 10$ . Table 2 shows that fluorescence staining was positive in 25 individuals and rose Bengal test abnormal in 36 patients.

**Table 2: Clinical test results of dry eye**

| Tests    | Tear Breakup time | Schirmers | Fluorescence staining | Rose bengal stain |
|----------|-------------------|-----------|-----------------------|-------------------|
| Normal   | 54                | 56        | 75                    | 64                |
| Abnormal | 36                | 44        | 25                    | 36                |

In our study of one hundred Type II diabetic individuals, the prevalence of dry eye was 43 percent. Table 3 shows that of the 43% of diabetes patients with dry eyes, 14% had mild dry eyes, 25% had moderate dry eyes, and 4% had severe dry eyes.

**Table 3: Prevalence of dry eye**

| Severity        | Dry eye |
|-----------------|---------|
| Mild            | 14      |
| Moderate        | 25      |
| Severe          | 4       |
| Normal patients | 57      |

At 95%, there is a correlation [P value  $< 0.05$ ] between duration and dry eye. Patients with type II diabetes for longer than six years are substantially more likely to have dry eye (Table 4).

**Table 4: Association of duration of diabetes with dry eye**

| Duration years | Dry Eye Grade |        |         |         | Chi square Test | P Value |
|----------------|---------------|--------|---------|---------|-----------------|---------|
|                | Normal        | Grade1 | Grade 2 | Grade 3 |                 |         |
| 1 – 5          | 43            | 6      | 6       | 0       | 24.218<br>2 DF  | 0.001** |
| 6 – 10         | 12            | 4      | 15      | 1       |                 |         |
| 11 – 20        | 2             | 4      | 4       | 3       |                 |         |
| Total          | 57            | 14     | 25      | 4       |                 |         |

At 95% [ $P < 0.05$ ], there is a correlation between HbA1c and dry eye. Table 5 shows that in our investigation, patients with diabetes who had a HbA1c of greater than 8 were more likely to experience dry eye.

**Table 5: Association of glycaemic control with dry eye**

| HbA1c     | Normal | Grade 1 | Grade 2 | Grade 3 | Chi square | P value |
|-----------|--------|---------|---------|---------|------------|---------|
| <5.6      | 27     | 0       | 2       | 0       | 44.760     | 0.001   |
| 5.6 – 7.0 | 21     | 2       | 5       | 0       |            |         |
| 7.1 – 8   | 4      | 4       | 2       | 1       |            |         |
| >8        | 5      | 10      | 16      | 3       |            |         |
| Total     | 57     | 14      | 25      | 4       |            |         |

## Discussion

Every practitioner is aware of the significant disparity that exists between the clinical tests available to evaluate dry eye and the subjective complaints of patients. In this investigation, we employed fluorescein and rose bengal stains in addition to a standard questionnaire to gather data on symptoms. Schirmer testing and tear breakup time (TBUT) were also performed. Patients with diabetes who had aberrant tear breakdown times or decreased Schirmer values were included in our research. A Canadian Dry Eye Epidemiology study found that 37% of diabetic individuals experienced symptoms related to dry eyes. According to Sahai Ansu et al., 18.4% of Indians suffered from dry eye. [9] There has been variation in the prevalence of dry eye in various research.

In our investigation, we found that 43% of diabetic patients had dry eyes. Several studies have revealed a link between diabetes patients and dry eyes. The prevalence of dry eyes reported in various studies are Seifart et al 70%, [10] Moss et al 18%, [11] Inoue et al 22.8%, [12] Beaver Dam eye study 19.8%, [13] Masoud et al 54.3% [14] and Nepp et al [15] 43% of diabetic patients.

Numerous studies have reported varying prevalence rates of dry eye, ranging from 18.1% to 70%, indicating significant variation. There is a significant variation in the prevalence of dry eye across research because there is no standard set for patient selection, standardized dry eye questionnaires, or objective diagnostics.

We found that 14% of individuals had mild dry eye, 25% had moderate dry eye, and 4% had severe dry eye. To rule out dry eye, diabetes for longer than six years should be taken into consideration. Thirty-one percent of individuals with dry eye in our study ( $p$ -value<0.05) had a history of diabetes that dated back more than six years. Long-term diabetes was found to be more closely associated with dry eye, according to Klein et al. [16]. Likewise, Tumaso et al. [17] found a relationship between the length of diabetes and the severity of dry eye.

In the Siefert et al. [10] trial, 54.1% of patients reported dry eye, and their HbA1c was higher than 8.5. Out of 43 patients in our study, 29 had

inadequate glycaemic control (HbA1c more than 8). In patients with type II diabetes, there was a significant correlation [ $p$  value 0.001] between poor glycaemic management and dry eye. According to Kaiserman and colleagues [18], diabetic individuals who want to prevent or manage dry eye condition should maintain appropriate blood sugar regulation. According to Schultz et al. [19], 47–64% of diabetic patients had corneal lesions such as corneal ulceration, delayed epithelium repair, and chronic epithelial defect. Patients with diabetes have structural and metabolic abnormalities in their conjunctiva and cornea, which play a significant role in the development of dry eye illness. Many studies have found a connection between dry eyes and other conditions. 47–67% of diabetes patients have a primary corneal lesion. It was discovered that the incidence of keratoepitheliopathy was 22.8% in patients with diabetes and 8.5% in patients without the disease. The development of diabetic keratoepitheliopathy, including superficial punctate keratopathy, recurrent corneal erosion, and peripheral epithelial defect, has been significantly influenced by anomalies in tear secretion. Nepp et al. [15] found a correlation between the severity of diabetes disease and the severity of keratoconjunctival sicca.

It is commonly known that blepharitis and meibomitis are factors in evaporative dry eyes. In the current investigation, meibomitis was found in 16 patients, 12 of them had dry eyes, and 9 patients had blepharitis, of which 3 had dry eyes. Patients with Type II diabetes were more likely to develop blepharitis. The three most common symptoms in the current study were burning (61%), redness (55%), and wetting (51%), with dry eyes accounting for 35%, 28%, and 29% of the reported cases, respectively. According to Goebbels M. et al., burning and a feeling of a foreign body are common complaints among diabetic patients with dry eyes. [20] Tear breakup time (TBUT) is a measure of the evaporative or deficient dry eye caused by tear film instability. In 36% of the cases in the current investigation, TBUT was positive for dry eye. For measuring dry eyes, the Schirmers test has been the most often used. In our research, 44% of patients had a Schirmers test result of  $\leq 10$  mm. This demonstrates that diabetes patients have lower Schirmer levels.

In this study, Rose Bengal and fluorescein stain were used to evaluate ocular surface injury. That was 36% and 25%, in that order. When compared to fluorescein staining, rose bengal staining revealed more positive cases of dry eye. Due to the Rose Bengal stain's affinity for devitalized and dead epithelial cells, a larger proportion of diabetics tested positive. [21,22] Fourteen out of the forty-three patients with dry eye had less corneal feeling. One possible cause is diabetic neuropathy of some kind. Yagi et al. have previously documented reduced corneal sensitivity. [23]

Individuals with diabetes are more likely than non-diabetics to get dry eye syndrome. As a result, dry eye should be taken into account when examining diabetic patients, particularly those with poor glycaemic control and longer-term diabetes mellitus.

### Conclusion

Type II diabetes mellitus has been demonstrated to be significantly associated with dry eye. Higher prevalence of dry eye was linked to poor glycaemic management. A patient's risk of acquiring dry eye increases with the length of their diabetes. The blood sugar level in individuals with diabetes also contributes to the development of dry eye disease. Therefore, while screening diabetes patients, especially those with poor glycaemic control and extended disease duration, dry eye should be taken into consideration. Good glycaemic control is crucial to lowering the prevalence of dry eye disease because it has been discovered that patients with poor blood sugar control are more likely to have dry eye disease. The evaluation of diabetic ocular disorders should include a thorough examination of dry eyes.

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