

Original article:

**Evaluation of Prevalence of Dry Eyes Among Type 2 Diabetic Patients:
An Institutional Based Study**

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ABSTRACT

Background: Diabetes and its complications are a major cause of morbidity and mortality. Dry eye is a tear film disorder caused by tear deficiency or excessive evaporation, and is associated with ocular discomfort, dryness, scratchiness, burning, soreness, and grittiness. Hence, the present study was conducted for assessing the prevalence of dry eyes among type 2 diabetic patients.

Materials & Methods: A total of 100 patients with presence of type 2 diabetes were enrolled. Complete demographic details were obtained. A Performa was made and detailed clinical details of all the patients were recorded separately. All the patients included in the present study fulfilled the ADA criteria of classification of diabetes. Dry eyes were suspected on the basis of a history of ocular discomfort, including soreness, gritty sensation, itchiness, redness, blurred vision that improves with blinking and excessive tearing. All the results were recorded on a Microsoft excel sheet followed by statistical analysis using SPSS software.

Results: Mean age of the patients was 53.12 years. Majority proportion of patients were males. Overall prevalence of dry eyes was 52 percent among subjects with type 2 diabetes mellitus. Mean FBS levels among patients with and without dry eyes were 183.3 mg/dL and 134.2 mg/dL respectively.

Conclusion: Present study results should give motivation toward building up a more systematic and targeted approach toward this issue as dry eye is not just a burden on ocular health, but it is great economic burden too.

Keywords: Dry eyes, Diabetes.

INTRODUCTION

Diabetes and its complications are a major cause of morbidity and mortality in the United States and contribute substantially to health care costs. Although we have already seen an epidemic of diabetes in the United States over the past 2 decades, we can expect a continued rise in the incidence of diabetes as the population ages, a continued increase in adult obesity rates, and an increase in the population of minority groups that are at high risk for diabetes.^{1, 2} In addition, rising childhood obesity rates and the increasing diagnosis of type 2 (formerly “adult-onset” diabetes) among children and young adults have become an increasingly serious health crisis, which will result in more people having and managing diabetes for most of their lives. Although 90% to 95% of the diabetes burden in the United States is due to type 2 diabetes, an understanding of the different types of

diabetes and their impact on health is warranted.³⁻⁴

In diabetes, the postprandial phase is characterized by a rapid and large increase in blood glucose levels, and the possibility that the postprandial "hyperglycemic spikes" may be relevant to the onset of cardiovascular complications has recently received much attention.⁵⁻⁷ High reactivity of ROS determines chemical changes in virtually all cellular components, leading to lipid peroxidation. Production of ROS and disturbed capacity of antioxidant defense in diabetic subjects have been reported. It has been suggested that enhanced production of free radicals and oxidative stress is central event to the development of diabetic complications. This suggestion has been supported by demonstration of increased levels of indicators of oxidative stress in diabetic individuals suffering from complications. Therefore, it seems reasonable that antioxidants can play an important role in the improvement of diabetes.⁸⁻¹⁰

Dry eye is a tear film disorder caused by tear deficiency or excessive evaporation, and is associated with ocular discomfort, dryness, scratchiness, burning, soreness, and grittiness. Objective signs of ocular surface damage include tear film instability and tear hyperosmolarity. In recent years, there has been growing evidence that inflammation and apoptosis of the ocular surface has a key role in the development of dry eye. In addition, inflammatory cytokines such as interleukin (IL)-1 α , IL-8, and tumor necrosis factor- α , and immune-activation marker expression, such as HLA-DR, intracellular adhesion molecule-1, and CD11 a, are increased in dry eyes. This chronic inflammatory environment is partly responsible for the characteristic conjunctival epithelium pathologic alterations, such as squamous metaplasia and goblet cell loss.¹¹⁻¹⁴ Hence; the present study was conducted for assessing the prevalence of dry eyes among type 2 diabetic patients.

MATERIALS & METHODS

The present study was conducted in the Department of Ophthalmology, Santosh Medical College & Hospital, Ghaziabad, Uttar Pradesh (India) to assess the prevalence of dry eyes among type 2 diabetic patients. A total of 100 patients with presence of type 2 diabetes were enrolled. Complete demographic details were obtained. A Performa was made and detailed clinical details of all the patients were recorded separately. All the patients included in the present study fulfilled the ADA criteria of classification of diabetes. Clinical data of all patients which included sex, age, duration of diabetes as well as a history of other diseases, were obtained. Exclusion criteria for the present study included patients with presence of any other systemic illness. Dry eyes were suspected on the basis of a history of ocular discomfort, including soreness, gritty sensation, itchiness, redness, blurred vision that improves with blinking and excessive tearing. The condition was confirmed by ocular surface dye staining pattern with fluorescein, tear film break up time (TBUT) (value 15s) and Schirmer test (value 15 mm in 5 min), according to American Academy of Ophthalmology by a specialist. Diagnosis was established by positivity in one or more of the tests (TBUT or Schirmer test). All the results were recorded on a Microsoft excel sheet followed by statistical analysis using SPSS software.

RESULTS

48 percent of the patients belonged to the age group of 51 to 60 years. 20 and 15 percent of the patients belonged to the age group of 40 to 50 years and 61 to 70 years. The mean age of the patients was 53.12 years.

Majority proportion of patients were males. Overall prevalence of dry eyes was 52 percent among subjects with type 2 diabetes mellitus. Mean FBS levels among patients with and without dry eyes were 183.3 mg/dL and 134.2 mg/dL respectively.

Table 1: Overall Prevalence of dry eyes

Dry eyes	Number of patients	Percentage of patients
Absent	48	48
Present	52	52

Table 2: Association of glycemetic control with dry eyes

Glycemetic control	Patients with dry eyes	Patients without dry eyes
FBS (mg/dl)	183.3	134.2
p-value	0.001 (Significant)	

DISCUSSION

The burden of diabetes on the health care system mandates efforts to more optimally treat those with the disease and to prevent its development in those at risk. Early and intensive intervention in patients with diabetes reduces the risk of microvascular and macrovascular complications and disease progression. Current challenges in diabetes management include: (1) optimizing the use of currently available therapies to ensure adequate glycemetic, blood pressure, and lipid control and to reduce complications; (2) educating patients on diabetes self-management; (3) improving patient adherence to lifestyle and pharmacologic interventions; (4) reducing barriers to the early use of insulin; and (5) improving the delivery of health care to people with chronic conditions.⁸⁻¹⁰

Several mechanisms have been proposed, including increased non-esterified fatty acids, inflammatory cytokines, adipokines, and mitochondrial dysfunction for insulin resistance, and glucotoxicity, lipotoxicity, and amyloid formation for beta-cell dysfunction. Moreover, the disease has a strong genetic component, but only a handful of genes have been identified so far: genes for calpain 10, potassium inward-rectifier 6.2, peroxisome proliferator-activated receptor gamma, insulin receptor substrate-1, and others.¹¹⁻¹³ Complaints from patients with dry eyes include burning sensations, grittiness, itching, fatigue, blurred vision, and, surprisingly, watery eyes, which result from increased reflex tear secretion. Over time, there is eye surface deterioration and ulceration, leading to small, red-appearing eyes with crusts in the ciliae, debris in the tear film, meibomitis, mucus strands adhering to the corneal surfaces, reduced light reflectivity, and irregular blinking.¹⁴⁻¹⁶

In the present study, 48 percent of the patients belonged to the age group of 51 to 60 years. 20 and 15 percent of the patients belonged to the age group of 40 to 50 years and 61 to 70 years. The mean age of the patients was 53.12 years. Majority proportion of patients were males. Overall prevalence of dry eyes was 52 percent among subjects with type 2 diabetes mellitus. Mean FBS levels among patients with and without dry eyes were 183.3 mg/dL and 134.2 mg/dL respectively. Comparing the values, significant results were obtained. In a previous study conducted by Sahai A et al, authors studied the prevalence of dry eye in a hospital-based population and evaluated the various risk factors attributable to dry eye. 500 patients above 20 years of age were screened

randomly for dry eye. Ninety-two (18.4%) patients had dry eye. Dry eye prevalence was maximum in those above 70 years of age (36.1%) followed by the age group 31-40 years (20%). It was significantly higher in females (22.8%) than in males (14.9%), more common in rural residents (19.6%) than in urban (17.5%) and highest among farmers/labourers (25.3%). It was 15.6% in those with corrected and 25.3% in those with uncorrected refractive errors. They concluded that dry eye is an under-diagnosed ocular disorder. Reduction in the modifiable risk factors of dry eye is essential to reduce its prevalence.¹⁵ Rahman A et al conducted a study on 200 eyes of 100 patients (48 males, 52 females) who presented with complaints of redness and burning sensation and were aged between 45 to 75 years. Out of these 100 patients 46 had type 2 diabetes (30 males and 16 females) and 54 patients were nondiabetics (18 males, 36 were females). The ocular surface disease in diabetes characterised by disorder of tear film could be confirmed by tear film tests. It was of more diagnostic value among patients with diabetes, as compared to tear film tests. Neither duration of diabetes nor stage of retinopathy correlates with tear film dysfunction.¹⁶

In a similar study conducted by Yu L et al, authors investigated whether diabetes mellitus is correlated with tear film dysfunction. A dry-eye questionnaire was used. Compared with the control group and nonproliferative diabetic retinopathy (NPDR) group, in the proliferative diabetic retinopathy (PDR) group, the BUT and the value of the Schirmer I test were reduced significantly; corneal fluorescein staining scores, the positive rate of rose Bengal staining and the surface regularity index (SRI) and surface asymmetry index (SAI) were higher; concentrations of lactoferrin and tear-specific prealbumin were lower. In diabetic patients, the SRI and SAI were positively correlated with fluorescein staining scores, and the dry-eye symptoms were significantly related to an abnormal BUT and Schirmer I test. They concluded that the declined tear film function is severer in the patients with PDR than in those with NPDR. Besides the traditional methods, tear SDS-PAGE and TMS corneal topographic indices contribute to the discovery of tear film dysfunction in diabetic patients.¹⁷ Manaviat MR assessed the prevalence of dry eye syndrome and diabetic retinopathy (DR) in type 2 diabetic patients and their contributing factors. 199 type 2 diabetic patients were selected. All Subjects were assessed by questionnaire about other diseases and drugs. Dry eye syndrome was assessed with Tear break up time tests and Schirmer. All the subjects underwent indirect ophthalmoscopy and retinal color photograph. Of 199 subjects, 108 patients (54.3%) suffer from dry eye syndrome. Although dry eye syndrome was more common in older and female patients, this association was not significant. But there was a significant association between dry eye syndrome and duration of diabetes ($P = 0.01$). Dry eye syndrome was more frequent in diabetic patients with DR ($P = 0.02$). DR was found in 140 patients (70.35%), which included 34 patients (17.1%) with mild non proliferative DR (NPDR), 34 patients (17.1%) with moderate NPDR, 22 patients (11.1%) with severe NPDR and 25 patients (25.1%) with proliferative DR (PDR). There was significant relation between age, sex and duration of diabetes and DR. In their study the prevalence of dry eye syndrome was 54.3%. Diabetes and dry eyes appear to have a common association.¹⁸

CONCLUSION

Present study results should give motivation toward building up a more systematic and targeted approach toward this issue as dry eye is not just a burden on ocular health, but it is great economic burden too.

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