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Original Article

Dry Eye Syndrome in Patients with Type II Diabetes Mellitus: An Observational Study

S Ganapathi Rajesh[1], V Ravindran[2]

[1]Associate Professor, Department of Ophthalmology, Government Theni Medical College Hospital, Theni, Tamil Nadu, India, [2]Chief Civil Surgeon, Department of Ophthalmology, Dindigul Medical College Hospital, Dindigul, Tamil Nadu, India

Abstract

Introduction: Dry eye syndrome (DES), also known as Keratoconjunctivitis sicca, is a major eye condition requiring medical care. Type II diabetes mellitus (DM) is the most common cause for dry eye. The symptoms may vary from redness, irritation, foreign body sensation, and stinginess to visual disturbances.

Aim: The aim of the study was to associate the relationship between Type II diabetes and DES.

Materials and Methods: Hospital-based observational study was carried out in the Department of Ophthalmology, Government Theni Medical College Hospital, among 100 patients. All the patients who reported to the OPD with symptoms of dry eye and with Type II diabetes were included in the study. Patients who were not willing to participate, not having Type II DM and who were on other medications were excluded from the study.

Results: Among the 100 patients who were involved in this study, the prevalence of DES was 56%. About 32% of the patients were above 60 years and 26% of the patients with hypertension (HT) showed symptoms of dry eye. DES was also more common among smokers than non-smokers.

Conclusion: The prevalence of DES is more common in patients with Type II diabetes and the risk of developing DES increases with age. HT along with DM is a risk factor for dry eye.

Key words: Diabetes mellitus, Dry eye syndrome, Keratoconjunctivitis sicca, Lacrimal function unit, Ocular dryness

INTRODUCTION

Dry eye syndrome (DES), also known as Keratoconjunctivitis sicca, is caused by progressive dysfunction of the lacrimal and meibomian glands that are associated with aqueous tear production. It is associated with ocular discomfort, stinging, irritation, dryness, foreign body sensation, redness, and visual disturbances and is the most common reason among the general population to seek eye-care.[1] Diabetes mellitus (DM) is the most widely accepted reason for the development of DES. Although DES is one of the major eye conditions among the general population, studies have shown that its prevalence is high among diabetics.[2] Patients with DM have low corneal sensitivity and low reflex-induced tear secretion, both of which could lead to DES. There is also a strong biological evidence suggesting the relationship between DM and DES.[3,4]

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Several studies have reported the association between diabetes and DES, but the results of inter-population studies have been conflicting.[5] DES is also more prevalent in patients with advanced stages of diabetic retinopathy. High glycemic index affects the anterior and posterior chambers of the eye, leading to decreased tear production. The global diabetic epidemic is on the high rise, according to an estimate by international diabetic federation and the prevalence of symptomatic and asymptomatic DES is 54%.[6,7] Although DES is a complication of DM, their associations are not confirmed. This observational study was conducted to assess the association between DM and the risk of occurrence of DES.

Aim

The aim of the study was to associate the relationship between Type II diabetes and DES.

Corresponding Author: Dr. V Ravindran, Department of Ophthalmology, Dindigul Medical College Hospital, Dindigul, Tamil Nadu, India.

MATERIALS AND METHODS

A hospital-based observational study was conducted in the Department of Ophthalmology, Government Theni Medical College Hospital. All the patients registered in the outpatient department during the study period and who had DM were taken into consideration for evaluation of DES. A total of 100 patients were selected and purposive sampling was carried out. The study protocol was approved by the Institutional Ethics Committee and informed consent was collected from all the participants. Patients who were not willing to participate, not having DM, or with Sjogren's syndrome, rheumatoid arthritis, and other connective tissue disorders, patients on antihistamines, antidepressants, beta-blockers, OCPs, long-term anti-glaucoma medications, and patients who underwent recent ocular surgery were excluded from the study. All the patients selected for the study underwent routine investigations and were subjected to dry eye questionnaire. Schirmer's test was used to find whether the eye produces enough tears to keep it moist. The collected information was tabulated and analyzed using standard statistical software.

RESULTS

Out of the 100 patients involved in the study, 56 patients had DES.18% of the patients were between the age group 40 and 50 years. Of which only 6% had symptoms of dry eye, whereas 32% of the patients above 60 years had a prevalence of 32% DES [Table 1]. This shows that DES is more common with increasing age. 38% of the male patients had DES while only 18% of the females had the disease [Table 2]. Forty-two patients had comorbid conditions like hypertension (HT) and 12 patients had ischemic heart disease, of which 26% and 8% had symptoms of dry eye, respectively [Table 3]. The prevalence of DES was more among smokers (10%) than the non-smokers (2%) in our study [Table 4].

Table 1: Distribution of patient's age

Age	Dry eye	
	Yes	No
40–50 years	6	12
50–60 years	18	12
Above 60 years	32	20

Table 2: Distribution of gender

Gender	Dry eye	
	Yes	No
Male	38	29
Female	18	15

Table 3: Distribution of comorbidity of study patients

Comorbid	Dry eye	
	Yes	No
HT	26	16
IHD	8	4
CTD	4	0

Table 4: Distribution of smoking history of study patients

Smoking history	Dry eyes	
	Yes	No
Smokers	10	2
Non-smokers	2	10

DISCUSSION

DM is likely to increase the risk of ocular diseases and the prevalence of DES is more in patients with poor glycemic control than the healthy population. DM causes dysfunction of the epithelial barrier and lacrimal function unit (LFU).[8] The LFU protects and maintains the tear film and the functions of the cornea, conjunctiva, lacrimal gland, Meibomian gland, eyelids, sensory, and motor nerves. The Meibomian glands secrete lipids, the lacrimal gland secrete aqueous, and the conjunctiva and cornea secrete mucin, which are the three layers of the human tear film that is responsible in maintaining the normal physiological functions of the ocular surface.[9,10] Any damage to LFU may lead to tear deficiency or evaporative dry eyes.

Patients with Type I or Type II DM have a risk of developing LFU dysfunction and corneal epithelial abnormalities. Increased serum HbA1C levels can predispose to impaired function of the epithelial barrier and the corneal complications of hyperglycemia may include superficial punctuate keratopathy, corneal ulcers, and erosions. Studies have also shown that hyperglycemic have low tear secretion and tear breakup time test.[11] Poor glycemic control can also lead to abnormal tear dynamics, especially triggering of the polyol pathway. This activates aldose reductase, an enzyme associated with DES and which causes intracellular accumulation of sorbitol that can lead to cellular edema and structural damage to the lacrimal gland.[12,13] Moreover, diabetes induces the reduction of goblet cells that are responsible for mucin production. Mucin contributes to the hydrophilic nature of the ocular surface and a reduction in mucin can lead to tear instability.

In our study, the prevalence of dry eye was 56%, which is similar to many other study findings. The study by Moss *et al.* and Yazdani *et al.* demonstrated the correlation of dry eye with increasing age and our study also confirmed

the same. Diabetic males are at higher risk of developing DES when compared with females.[14] Our study findings also conclude that the risk of DES is more in patients with DM and co-existing HT. Smoking is also another factor that may increase the chances of the occurrence of DES in patients with type II DM.

Insulin is essential for the proliferation of acinar lacrimal gland and corneal epithelium. In hyperglycemia, where there are low insulin levels, there is oxidative stress in the lacrimal cells.[15] The glucose levels are also increased in the tears of patients with an elevated expression of advanced glycation end product modified proteins. Inflammation and immunity play an important role in the pathogenesis of DES and hyperglycemia includes an inflammatory cascade that kindles the immune responses of the LFU. Early diagnosis and treatment are critical to avoid any serious complications. Artificial tears may temporarily improve the symptoms. NSAIDs and topical steroids are administered to reduce inflammation and pain of DM associated DES.[16]

CONCLUSION

The prevalence of DES is more in patients with type II DM. More attention should be paid to DM associated DES since it is the most common diabetic complication in eye disorders in recent years.

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