

Prevalence of Dry Eye in Diabetic Patients in Rural Population

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ABSTRACT

BACKGROUND

Diabetes mellitus has been diagnosed as a risk factor for dry eye in several studies including large population studies. It has been suggested that the association may be due to diabetic sensory or autonomic neuropathy or due to the occurrence of microvascular changes in lacrimal gland. The main aim of this study was to study the prevalence of dry eye in diabetics and its association with duration of diabetes, Meibomian Gland Disease (MGD), and HbA1c levels in rural population.

METHODS

This is a hospital-based comparative cross-sectional study conducted in a rural area. 80 (40 diabetics + 40 non-diabetics) patients were enrolled in the study. All patients underwent complete ophthalmic examination including OSDI score, TBUT, Schirmer's test, ocular surface staining and blood tests like RBS, HbA1c.

RESULTS

80 patients satisfied the inclusion criteria and were enrolled in the study. As the age increased, the occurrence of dry eye also increased significantly with p value of 0.784 in our study. Among 66 female patients, 29 patients (80.6%) and among 14 male patients, 7 patients (19.4%) had dry eye symptoms. 60% of diabetic and 30% of non-diabetic patients had symptomatic dry eye. We also found significant association between the HbA1c levels and dry eye ($p < 0.001$). Significant reduction in TBUT and Schirmer's test values in diabetic patients with poor metabolic control was found.

CONCLUSIONS

Dry eye is a very common condition with high prevalence among elderly diabetics of rural population in our study. Significant association was noted between dry eye disease and the duration of diabetes, RBS level, HbA1c level, and MGD in diabetes patients of rural population. Hence, we advocate OSDI (Ocular Surface Disease Index) scoring, Schirmer's test and tear film break up time, ocular surface staining, examination of lid for MGD to be routinely done for diabetic patients and especially those with symptoms.

KEYWORDS

TBUT- Tear Film Breakup Time, OSDI- Ocular Surface Disease Index, MGD- Meibomian Gland Dysfunction

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BACKGROUND

Diabetes Mellitus has topped the leading health related catastrophes the world has ever witnessed.¹ Each year, more than 6 million people develop diabetes. By 2040, the prevalence of diabetics globally would raise to 642 million.² India leads the world in diabetic population and estimated to have 62.4 million people with diabetes and 77.2 million with prediabetes.³ It is predicted that by 2030, in India, DM may affect up to 79.4 million. Hence WHO has labelled India as the diabetic capital of the world.⁴

Diabetes mellitus has been diagnosed as a risk factor for dry eye in several studies including large population studies. Higher the HbA1c, higher will be the rate of dry eye syndrome. It has been suggested that the association may be due to diabetic sensory or autonomic neuropathy or due to the occurrence of microvascular changes in lacrimal gland. The corneal complications caused by hyperglycaemia include superficial punctate keratopathy, trophic ulcers, persistent epithelial defects and recurrent corneal erosion.⁵ The four core inter-related mechanism responsible for dry eye are tear instability, tear hyperosmolarity, inflammation and ocular surface damage. It is associated with symptoms such as stinging, foreign body sensation, watering, redness and may cause serious irritation to the interpalpebral ocular surface particularly the cornea.⁶ Close monitoring of diabetic patients as well as glycaemic control is important for the prevention of dry eye syndrome. Early diagnosis of dry eye syndrome in diabetic patients is important for improving the ocular surface and quality of vision.⁷

We wanted to study the prevalence of dry eye in diabetics versus nondiabetics in rural population and evaluate the association between HbA1c level, RBS, duration of diabetes, and MGD with dry eye in rural population.

METHODS

This was a hospital-based comparative cross-sectional study which included patients posted for cataract surgery in Minto ophthalmic Hospital and Regional Institute of Ophthalmology from rural population. The study was done spanning over a period of 18 months from November 2017 to May 2019. A convenient sample of 40 patients with type II diabetes and 40 matched controls were chosen.

Inclusion Criteria

1. Patients willing to give written informed consent for the study.
2. Patients with Type II diabetes (diagnosed as per ADA criteria) and non-diabetics admitted for cataract surgery.

Exclusion Criteria

1. Patients not willing to give written informed consent.
2. Pre-existing ocular diseases like disorders of cornea, conjunctiva, sclera, chemical burns and radiation.

3. Patients on topical /systemic ocular medication like anti glaucoma medication, antihistamines anticholinergic and antidepressants.
4. Contact lens users.
5. Patients who have undergone corneal refractive surgeries or have ocular allergies.
6. Patients who have connective tissue disorder.

Methodology

Of all those who satisfied inclusion and exclusion criteria detailed history of each patient regarding the age, sex, occupation and presenting symptoms, duration, progression and associated conditions were obtained and all patients underwent complete ocular examination including dry eye examination and RBS, HbA1c levels were obtained. Ocular surface disease index (OSDI) questionnaire was used to score the dry eye symptoms. It consisted of 12 questions which were grouped under 3 subsets: visual disturbance, visual function and environmental triggers. Score of maximum 4 was given for each question based on the severity of the symptom and subtotal for each subset calculated. The subtotal scores were added to get the total score and the OSDI was calculated using the formula $OSDI = (\text{total score}) \times 25$ the whole divided by the number of questions answered. Using the OSDI score the patients were categorized as normal (0-12), mild dry eye (13-22), moderate dry eye (23-32) and severe dry eye (33-100).

Ocular examination included recording best corrected visual acuity and detailed anterior segment examination under slit lamp. The dry eye was detected by measuring tear film breakup time (TBUT), ocular surface dye staining pattern with fluorescein and Schirmer's test. TBUT test was performed by staining the tear film using a fluorescein impregnated strip without using topical anaesthesia and asking the subjects to blink three times and then cease blinking until instructed. The tear film was observed using a slit lamp with blue cobalt filter. The time interval between the last blink and the appearance of the first random corneal dry spot in the tear film was measured. A value <10 seconds was considered abnormal. TBUT results graded as >10 secs – normal, 6-10 secs – mild to moderate, and <6 secs – severe.

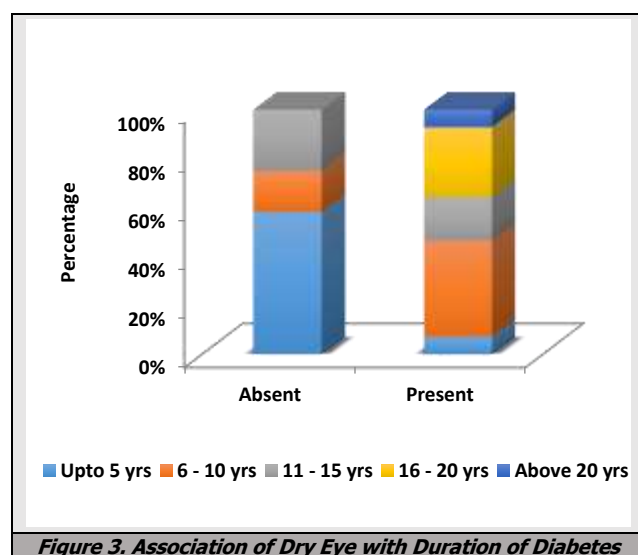
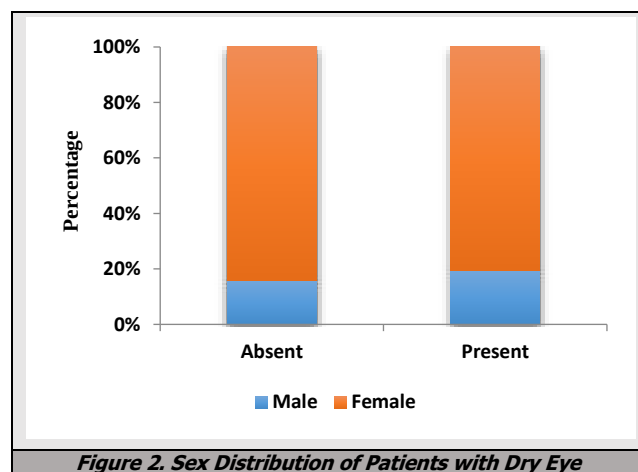
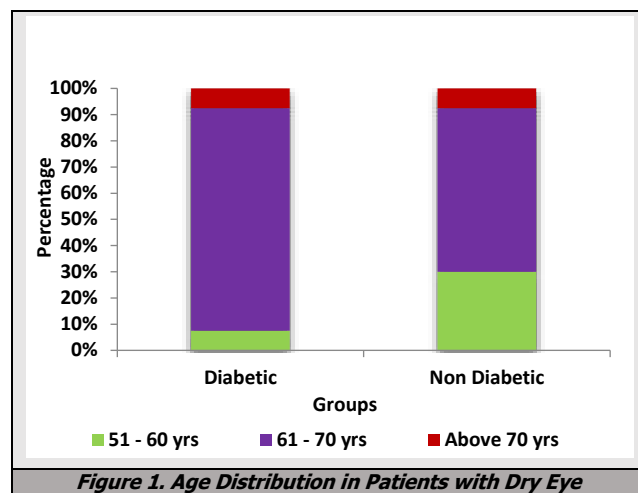
Ocular surface staining was evaluated by staining the cornea with fluorescein. The staining area was graded using the Oxford Scheme on a numerical scale of 0–5 for the entire ocular surface based on comparison to the standard panel, with 0 representing equal to or less than panel A, 1 representing equal to or less than panel B but greater than panel A, 2 representing equal to or less than panel C but greater than panel B, 3 representing equal to or less than panel D but greater than panel C, 4 Representing equal to less than panel E but greater than panel C, and 5 Representing greater than panel E. The severity was graded based on the score as 0-1 as normal, 2 as mild, 3- moderate and >4 as severe.

Schirmer's test was performed without topical anaesthesia using standardized Whatman filter paper 41. The strips were placed in the lower fornix away from the

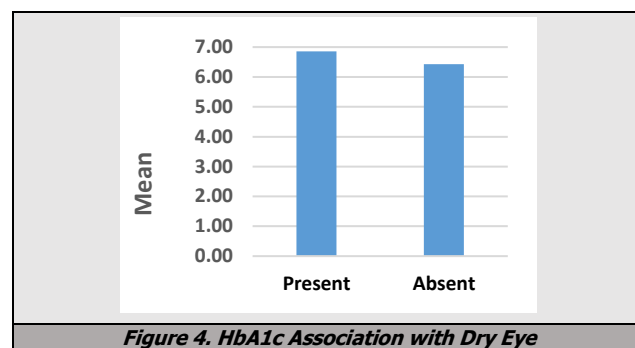
cornea and left in place for 5 min with the patient opened eyes. The wetting distance was measured in millimeters, and a reading <10 mm was considered abnormal.

RESULTS

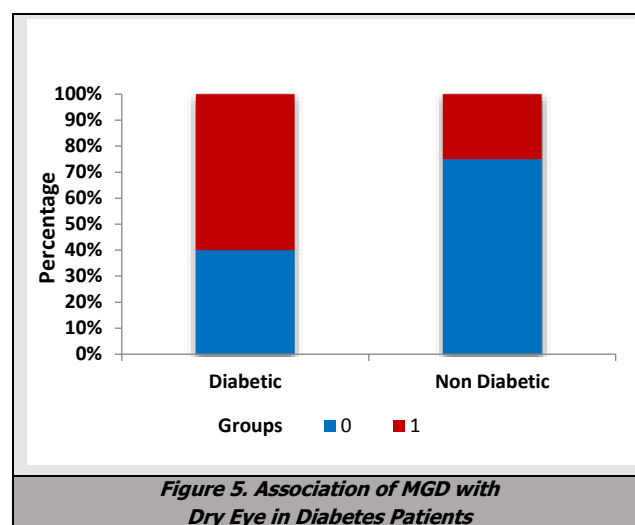
In our study, the mean age of patient with dry eye is 66 years. As the age increased occurrence of dry eye also increased significantly with p value of 0.034.



In our study there was a female sex preponderance for dry eye. Of the 80 consecutive patients included in the study, 66 were female and 14 were male. Among 66 female patients 29 patients had dry eye, among 14 male patients 7 patients had dry eye. In our comparative study, significant association between duration of diabetes and dry eye was observed. 90% of dry eye occurs with duration more than 6 years.



The mean HbA1c value of diabetics with dry eye was 6.85. In our study there was significant association between high HbA1c value in diabetes and dry eye with p value <0.001



Significant association between MGD and diabetes was observed ($p < 0.05$). 60% of diabetic patient had MGD whereas only 25% of non-diabetic patient had MGD. Among 34 patients with MGD, 26 patients had dry eye showing significant association of MGD with dry eye.

DISCUSSION

Diabetes is one of the most common leading causes of blindness in 20–74-year old persons. Cataract and retinopathy are well-known as ocular complications of diabetes. Recently, problems involving the ocular surface, dry eyes in particular, have been reported in diabetic patients. These patients suffer from a variety of corneal complications including superficial punctate keratopathy, trophic ulceration, and persistent epithelial defect. Dry eye

is an important contributor to these problems. In study conducted by Manaviat et al with 200 subjects, the mean age of patient was 54.16. But in our study, the mean age of patients with dry eye was 66.66 years. Dry eye was more prevalent in patients aged over 50 years showing a significant association between the age and dry eye.⁸

Of the 80 consecutive patients included in the study, 66 were female and 14 were male. Among 66 female patients, 29 patients (80.6%) had dry eye and among 14 male patients, 7 patients (19.4%) had dry eye symptoms. There was a slightly higher preponderance among female patients in our study which could be attributed to thinner lipid layer of the tear film of the females. Similar to the study conducted by Manaviat et al, who found that 54% of 199 diabetic subjects had dry eye symptoms,⁹ our study found 60% of diabetic and 30% of nondiabetic had symptomatic dry eye. Mild dry eye is found to be in 50% of diabetic patient and 30% of nondiabetic patient. Moderate dry eye is found in only diabetic patient (10%) with no cases in non-diabetic.

We also found a significant association between dry eye disease and the duration of diabetes in our study similar to Manaviat et al study. Longer the duration of diabetes, higher was the prevalence of dry eye disease. 90% of dry eye occurs with duration more than 6 years. Results from our study showed a significant difference in TBUT values between diabetic and non-diabetic patients which is in contrast to Olaniyan et al. study who did study with 189 samples in Nigeria and found no significant association between TBUT and diabetes.⁹ A study by Kamelet al also noted significantly reduced TBUT and Schirmer test values in diabetic patients with poor metabolic control similar to our study.¹⁰ Prevalence of dry eye in our study is very high. It might be due to aging, dry weather in rural population, poor glycaemic control and high prevalence of neurological disorder in type 2 diabetic patients.

CONCLUSIONS

Dry eye is a very common condition with high prevalence among elderly diabetics in rural population. Evaluation of diabetic patients using the OSDI questionnaire in rural population can be helpful in identifying dry eye in early stages. Significant association was noted between dry eye disease and the duration of diabetes, RBS level, and HbA1c level in diabetes patients of rural population. Significant reduction in TBUT and Schirmer's test was found in diabetic

patients compared to non-diabetic patients. A positive correlation was found between presence of MGD and dry eye in patients with diabetes mellitus, as diabetes causes more release of free fatty acids which in turn causing meibomitis. Our findings support the suggestion that diabetic subjects have an elevated frequency of dry eye. These abnormalities can result in severe complications. Diabetic patients should be examined for tear film and conjunctival surface disorder along with routine fundus examination. Hence, we advocate OSDI scoring, Schirmer's test, tear film break up time, ocular surface staining, and examination of lid for MGD.

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