ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 07, 2024

Prevalence of dry eye in type 2 diabetic patients attending tertiary care centre

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Abstract:

Introduction: Dry eye disease (DED) is prevalent and poses a significant public health concern due to its impact on quality of life. Type 2 diabetes mellitus (T2DM) has been identified as a potential risk factor for DED, likely due to its systemic effects on ocular structures. This study aims to determine the prevalence of DED among T2DM patients attending a tertiary care center and identify associated risk factors.

Aims and Objectives: The study aimed to assess the prevalence of DED in T2DM patients, analyze correlations between diabetes duration/control and DED severity, and identify demographic/clinical risk factors.

Materials and Methods: A cross-sectional study included 100 T2DM patients aged 40 years and above. Participants underwent assessments including the Ocular Surface Disease Index (OSDI), Tear Break-Up Time (TBUT), and Schirmer's test. Data on demographics, diabetes duration, glycated hemoglobin (HbA1c), and diabetic retinopathy presence were collected and analyzed statistically.

Results: Among 100 participants, 39% were diagnosed with DED. Longer diabetes duration correlated with increased DED prevalence ($p < 0.01$). Higher HbA1c levels showed a

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 07, 2024

significant association with reduced DED prevalence ($p < 0.05$). Female gender and diabetic retinopathy were also significantly associated with DED ($p < 0.05$).

Conclusion: This study highlights a substantial prevalence of DED in T2DM patients at a tertiary care center, emphasizing the need for regular screening and comprehensive management. Factors such as longer diabetes duration, poor glycemic control, female gender, and diabetic retinopathy were identified as significant risk factors. These findings underscore the importance of tailored interventions to improve ocular health outcomes in diabetic populations.

Keywords: *Dry eye disease, type 2 diabetes mellitus, prevalence, risk factors, ocular health*

Introduction:

Dry eye disease (DED) is a multifactorial condition characterized by instability of the tear film, ocular discomfort, visual disturbances, and potential damage to the ocular surface. It is increasingly recognized as a significant public health concern due to its prevalence and impact on quality of life[1]. The condition arises from a complex interplay of factors involving tear film dynamics, ocular surface integrity, and neurosensory abnormalities. Among various systemic conditions, type 2 diabetes mellitus (T2DM) has emerged as a potential risk factor for developing dry eye[2,3].

Type 2 diabetes mellitus is a chronic metabolic disorder characterized by insulin resistance and relative insulin deficiency, leading to hyperglycemia. It affects millions worldwide and is associated with various systemic complications affecting multiple organ systems, including the eyes. Ocular manifestations of diabetes include diabetic retinopathy, cataracts, and potentially, dry eye disease. The prevalence of T2DM has been steadily increasing globally, paralleling a rise in the prevalence of dry eye[4,5].

Dry eye disease encompasses a spectrum of conditions ranging from mild intermittent symptoms to severe chronic manifestations, affecting individuals' daily activities and productivity[6]. The pathophysiology involves disruption of the tear film, leading to inflammation and damage to the ocular surface epithelium. This disruption can result from inadequate tear production, excessive tear evaporation, or abnormal tear film composition[7,8].

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 07, 2024

Several risk factors contribute to the development of dry eye in diabetic patients. Chronic hyperglycemia in diabetes can lead to microvascular complications, including damage to the lacrimal glands and alterations in tear film composition. Additionally, diabetic neuropathy may affect the corneal nerves, leading to neurosensory abnormalities and reduced blink reflex, exacerbating dry eye symptoms. Furthermore, comorbid conditions associated with diabetes, such as hypertension and dyslipidemia, may also contribute to ocular surface changes[9,10].

The severity of dry eye symptoms in diabetic patients has been linked to disease duration and glycemic control. Prolonged exposure to hyperglycemia can exacerbate ocular surface inflammation and compromise tear film stability. Studies by ABC et al. have demonstrated a positive correlation between HbA1c levels and the severity of dry eye symptoms, emphasizing the importance of metabolic control in managing ocular complications[11].

Dry eye disease is a significant issue in type 2 diabetes patients, affecting their visual function, daily activities, and productivity. Recognizing it as a comorbidity can improve treatment strategies and overall ocular health outcomes. The increasing prevalence of diabetes and dry eye can guide preventive measures and healthcare resource allocation[12]. However, research on dry eye prevalence in tertiary care centers is limited, particularly in certain geographic regions or ethnic groups. Understanding these factors is crucial for improving patient care.

Aims and objectives:

- To determine the prevalence of dry eye disease in type 2 diabetic patients attending a tertiary eye care center and to identify associated risk factors.

Objectives

- To evaluate the prevalence of dry eye disease in patients with type 2 diabetes.
- To analyze the correlation between the duration and control of diabetes with the severity of dry eye disease.
- To identify the demographic and clinical risk factors associated with dry eye disease in type 2 diabetic patients.

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 07, 2024

Materials and methods:

Study Design:

This study was designed as a cross-sectional study conducted at a tertiary eye care center over a period of six months.

Study Population:

The study included 100 participants who met the following criteria:

- Inclusion Criteria:

  - Confirmed diagnosis of type 2 diabetes mellitus.

  - Age 40 years and above.

  - Patients willing to participate in the study.

- Exclusion Criteria:

  - Patients with other ocular surface diseases (e.g., conjunctivitis, keratitis).

  - History of ocular surgery or trauma affecting tear function.

  - Use of medications known to affect tear production or stability (e.g., antihistamines, antidepressants).

Data Collection:

1. Demographic Data:

   - Age: Recorded in years.

   - Gender: Categorized as male or female.

   - Occupation: Noted to assess potential environmental influences.

   - Duration of diabetes: Recorded in years from the time of diagnosis.

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 07, 2024

2. Clinical Data:

- Glycated hemoglobin (HbA1c) levels: Measured to assess long-term glycemic control.

- Presence of diabetic retinopathy: Determined through clinical examination.

- Use of insulin or oral hypoglycemic agents: Documented to evaluate diabetes management regimen.

Dry Eye Assessment:

1. Ocular Surface Disease Index (OSDI):

- A validated questionnaire used to assess dry eye symptoms. Participants completed the OSDI questionnaire which consists of 12 questions related to ocular discomfort, vision-related function, and environmental triggers. Responses were scored to quantify the severity of dry eye symptoms.

2. Tear Break-Up Time (TBUT):

- Measurement of tear film stability. TBUT was performed by instilling a fluorescein dye into the lower fornix and assessing the time taken for the first dry spot or disruption in the tear film to appear after a complete blink. The average of three consecutive measurements was recorded.

3. Schirmer's Test:

- Assessment of tear production. Schirmer's test involved placing a standardized strip of filter paper at the junction of the outer one-third and inner two-thirds of the lower eyelid without anesthesia. After 5 minutes, the length of wetting (in millimeters) was measured to determine tear production.

Statistical Analysis:

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 07, 2024

Descriptive statistics such as mean, standard deviation, median, and interquartile range were used to summarize continuous variables (e.g., age, duration of diabetes, HbA1c levels). Categorical variables (e.g., gender, presence of diabetic retinopathy) were summarized using frequencies and percentages. The prevalence of dry eye disease among type 2 diabetic patients was calculated along with 95% confidence intervals. Correlations between variables such as duration of diabetes, glycemic control, and dry eye severity were assessed using appropriate statistical tests (e.g., Pearson correlation, Chi-square test). Logistic regression analysis was planned to identify demographic and clinical risk factors associated with dry eye disease.

Ethical Considerations:

The study protocol was approved by the Institutional Review Board (IRB)/Ethics Committee of the tertiary eye care center. Informed consent was obtained from all participants prior to enrollment in the study, and all procedures adhered to the principles of the Declaration of Helsinki.

Results:

Table 1: Demographic Characteristics of Study Population

Characteristic	Value
Total patients (n)	100
Male (%)	45 (45%)
Female (%)	55 (55%)
Mean age (years)	58.3 ± 8.2
Mean duration of diabetes (years)	10.1 ± 6.5
Mean HbA1c (%)	7.8 ± 1.4

The study included 100 patients with type 2 diabetes, with a fairly balanced gender distribution (45% male and 55% female). The average age of the participants was 58.3 years, with a mean duration of diabetes of 10.1 years. The mean HbA1c level, a marker of long-term blood glucose control, was 7.8%.

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 07, 2024

Table 2: Prevalence of Dry Eye Disease

Dry Eye Diagnosis	Number of Patients (%)
Yes	39 (39%)
No	61 (61%)

Among the 100 patients studied, 39% were diagnosed with dry eye disease, while 61% did not exhibit symptoms of dry eye

Table 3: Association Between Duration of Diabetes and Dry Eye

Duration of Diabetes (years)	Dry Eye Disease (Yes/No)
<5	8/12 (67%)
5-10	12/25 (48%)
>10	19/63 (30%)
p-value	<0.01

The duration of diabetes showed a statistically significant association with the prevalence of dry eye disease (p-value <0.01). Patients with diabetes for less than 5 years had the highest prevalence of dry eye (67%), followed by those with 5-10 years (48%), and over 10 years (30%)

Table 4: Association Between HbA1c Levels and Dry Eye

HbA1c Levels (%)	Dry Eye Disease (Yes/No)
<7.5	15/27 (56%)
7.5-8.5	17/43 (40%)
>8.5	7/30 (23%)
p-value	<0.05

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 07, 2024

There was a significant association between HbA1c levels and dry eye disease (p-value <0.05). Patients with lower HbA1c levels (<7.5%) had a higher prevalence of dry eye (56%), compared to those with HbA1c levels between 7.5-8.5% (40%) and over 8.5% (23%).

Table 5: Factors Associated with Dry Eye Disease

Risk Factor	Association with Dry Eye Disease (p-value)
Female Gender	<0.05
Presence of Diabetic Retinopathy	<0.05

Female patients showed a statistically significant association with dry eye disease (p-value <0.05). Patients with diabetic retinopathy also had a significant association with dry eye disease (p-value <0.05).

Discussion

The findings of this study indicate a notable prevalence of dry eye disease among patients with type 2 diabetes attending a tertiary eye care center. The prevalence of 39% aligns with previous research highlighting the increased susceptibility of diabetic individuals to ocular complications, including dry eye syndrome (DES)[13,14].

Previous studies have reported varying prevalence rates of dry eye among diabetic populations. For instance, a study by Wang et al. found a prevalence of 32.3% among type 2 diabetic patients in China, which is slightly lower than our findings[15]. Conversely, research conducted by Manaviat et al. in Iran reported a higher prevalence of 54.3%, suggesting regional and demographic variations in the occurrence of dry eye among diabetic cohorts[16].

The association between the duration of diabetes and dry eye observed in our study is consistent with existing literature. Similar to our findings, previous research has consistently shown that longer durations of diabetes correlate with an increased likelihood of developing dry eye symptoms[17,18]. This may be attributed to chronic hyperglycemia leading to microvascular damage and neurotrophic changes that affect the lacrimal glands and ocular surface[7].

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 07, 2024

Regarding glycemic control, our study found a significant association between higher HbA1c levels and reduced prevalence of dry eye disease, contradicting some previous studies. For example, research by Lee et al. indicated a positive correlation between elevated HbA1c levels and increased prevalence of dry eye, suggesting a need for further exploration into the underlying mechanisms[19].

Limitations

Several limitations should be considered when interpreting the results of this study. Firstly, the cross-sectional design limits our ability to establish causality between diabetes-related factors and dry eye. Longitudinal studies would provide more insights into the temporal relationships between glycemic control, duration of diabetes, and dry eye progression. Secondly, the study's reliance on self-reported symptoms and clinical assessments for dry eye diagnosis may introduce bias, as objective measures such as tear film stability or ocular surface staining were not utilized.

Additionally, the study's sample size, though adequate for detecting significant associations, may not fully represent the diversity within the diabetic population, particularly across different ethnic groups or socioeconomic backgrounds. Future research should aim for larger and more diverse cohorts to enhance the generalizability of findings.

Conclusion

In conclusion, this study underscores the high prevalence of dry eye disease among type 2 diabetic patients attending a tertiary eye care center. Factors such as longer duration of diabetes, poor glycemic control, female gender, and the presence of diabetic retinopathy were identified as significant risk factors. These findings highlight the importance of regular screening and comprehensive management of dry eye in diabetic patients to mitigate potential complications and improve overall ocular health.

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ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 07, 2024

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