ORIGINAL ARTICLE

A study into the state of dry eyes in diabetes mellitus patients

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ABSTRACT
Purpose: An investigation of the assessment of dry eye symptoms in individuals with diabetes mellitus. **Material & method**:A prospective research with 120 patients with diabetes mellitus who were over 30 years old was conducted. Along with an eye and systemic examination, a thorough history was obtained. The ETDRS classification system is used to classify changes in diabetic retinopathy. Fluorescein, Schirmer's test, TBUT, and OSDI of the ocular surface were used to assess the presence of dry eye, which was then categorised as mild, moderate, or severe. A positive result on one or more of the tests was used to make the diagnosis. **Results**: It was discovered that 50.9% of diabetics had dry eyes. Of them, 17.50 percent had mild dry eyes, 14.20 percent had moderate dry eyes, and 19.20 percent had severe dry eyes. In diabetics, the prevalence of dry eyes was 68.5% for a period of 6–8 years and 85% for a duration of more than 11 years. **Conclusion**: The severity of retinopathy and the length of diabetes were positively correlated statistically significantly with dry eye. Males and females experience a far higher incidence of dry eye.
Keywords – Schirmer test, ODSI, diabetic retinopathy, dry eye

Introduction

According to the 2007 Dry Eye Workshop (DEWS) Definition, dry eye is characterized as a multifactorial disease of the ocular surface and tear film that causes symptoms such as inflammation of the ocular surface, increased osmolarity of the tear film, and discomfort1. Decreased corneal sensitivity contributes to the development of dry eye syndrome (DES) by decreasing blink frequency, increasing evaporative tear loss, and decreasing reflow-induced lacrimal secretion.[2]

There are numerous ideas that attempt to explain the relationship between diabetes and dry eye. The feedback system that regulates tear secretion can be blocked by hyperglycemia and microvascular injury to the ocular nerves. When there is a disturbance in the innervation of the ocular surface, the lacrimal gland fails to release tears in the appropriate manner. Tear secretion is decreased by hyperglycemia because it causes inflammatory changes. Not only is inflammation a contributing factor to dry eye, but it also results from it. Aqueous deficient dry eyes or lacrimal insufficiency are caused by inflammation.[3]

Complications are decreased with early identification and treatment. The purpose of the research was to assess the degree of dry eye in patients with diabetes mellitus.

Aims Of The Study

To assess the state of dry eyes in individuals suffering from diabetes mellitus. To investigate the relationship between retinopathy and dry eyes in individuals with diabetes mellitus

Review Of Literature

In a research by Sahai *et al.*, 92 patients (18.4%) out of 500 had dry eye, with a higher

frequency in females.4 52.8% of diabetics and 9.3% of controls in a Seifart *et al*. study reported having dry eye symptoms. Kesarwani *et al*. 's study found that type 2 diabetes was associated with abnormal scores for schirmer's, TBUT, Rose Bengal staining, and impression cytology.. According to Him and DeLand, 52.9% of diabetics said they experienced dry eyes. Additionally, they discovered a correlation between the degree of DR and the severity of dry eye. According to a Hasan *et al*. study, diabetics (20%) were most likely to have mild dry eyes. Age, sex, and length of diabetes did not significantly correlate with the occurrence of dry eyes.[6]

Materials & Methods

A prospective study including 120 diabetes mellitus patients older than 30 who visited our outpatient and inpatient department between August 2021 and July 2022 was conducted.

Inclusion criteria:

- Patients with diabetes who attended OPD at the Regional Institute of Ophthalmology at GMCH for more than 30 years.
- Healthy volunteers have been selected to serve as age- and sex-matched non-diabetic controls.

Exclusion criteria:

- People taking systemic drugs known to induce dry eye, such as oral contraceptives, tricyclic antidepressants, antihistamines, and other drugs.
- Users of contact lenses.
- Individuals who have had ocular surgery (LASIK/intraocular).
- Dry eyes can also be a symptom of other systemic or local illnesses besides diabetes mellitus in patients.
- Smokers.

Methods:

All of the patients provided signed, informed permission. We received ethical clearance. The patient's age, sex, ocular symptoms, length of diabetes mellitus, and existence of other illnesses were all thoroughly recorded in the medical history. A thorough examination of the eyes and system was performed. We examined the dry eye condition and existence of diabetic retinopathy alterations in all patients with diabetes mellitus. The fluorescein staining pattern on the ocular surface, Schirmer's test, and TBUT were used to confirm the presence of dry eye. When testing in one or both eyes come back positive, the diagnosis is made.

Our study's grading scheme was used with few adjustments from the DEWS 20071 report, which was based on research by Thampi *et al*. and Hasan *et al*. (Table 1). After pupillary dilation, the fundus was evaluated using slit lamp biomicroscopy and indirect ophthalmoscopy with a 78D lens. DR's grade was determined using the ETDRS standards. The Chi square test and descriptive statistics were used to analyse all of the data.

Result:

Occurrence of dry eye in diabetics

Out of the 120 patients with diabetes in our study, 61 had been diagnosed with dry eye. Eleven patients (19.30%) out of the 57 individuals without retinopathy and fifty patients (77.4%) out of the 63 patients with retinopathy were found to have dry eye. Table 2

Age distribution:

The incidence of dry eye also witnessed a notable increase with age. 24 patients, or 60% of the group of 40 patients older than 60, had dry eyes. Out of 7 diabetic patients aged 30 to 40, 2 (28.57%) have dry eyes; of 31 diabetic cases aged 41 to 50, 14 (45.16%) have dry eyes; and of 42 diabetic cases aged 51 to 60, 21 (50%) have dry eyes. (Listing 3)

Sex distribution

64 men and 56 women were among the 120 consecutive patients that were a part of the study. Of the 56 female patients, 29 (51.7%) experienced symptoms of dry eye, and 32 patients (50%) of the 64 male patients had dry eye. Table 4

Dry eye among diabetics based on OSDI

According to the OSDI Questionnaire, 17.50% of patients reported having mild

symptoms, 14.20% reported having moderate symptoms, and 19.20% reported having severe symptoms. (Table 5).

Association of dry eye with duration of diabetes

There was a significant correlation ($p < 0.05$) found between the length of diabetes and the occurrence of dry eyes. Among diabetics, 24 cases (68.5%) with a duration of 6 to 10 years and 17 cases (85%) with a duration of more than 11 years experienced dry eye. (Table 6)

Severity of dry eye with stages of retinopathy

The majority of patients with dry eye disease, including those with no diabetic retinopathy cases (18%), mild cases (81.3%), moderate cases (23%) and severe cases (26%) as well as PDR cases (19.7%). The majority of dry eye instances in severe NPDR. Nevertheless, there was no statistically significant correlation discovered between dry eyes and retinopathy. (Table 7)

Table 1: Grading of dry eye

		Dry eye		Total	Chi-square statistic
		No	Yes		
Diabetic with No Retinopathy	N	46	11	57	43.20 (P=0.001)
	%	80.70 %	19.30 %	100.00 %	
Diabetic with Retinopathy	N	13	50	63	
	%	22.60 %	77.40 %	100.00 %	
Total	N	59	61	120	
	%	49.1%	50.9%	100.00 %	

Table 2: Occurrence of dry eye in diabetics

Grading of Dry Eye	TBUT (seconds)	Schirmer's 1 Test (wetting detected after 5 minutes; reading in millimetres)	Pattern of Fluorescein Staining
No dry eye	>10	≥ 10	Negative
Mild	8-10	6 – 9	<1 quadrant of staining of the cornea
Moderate	5 – 7	3 – 5	> 1 quadrant
Severe	< 5	≤ 2	diffuse staining of the cornea, frequently extending to the conjunctiva

Table 3: Age distribution of dry eye in diabetics

			Dry Eye		Total
			No	Yes	
	30-40 years	N	5	2	7
		%	71.43%	28.57%	100.00%

Age	**41-50 years**	**N**	**17**	**14**	**31**
		%	**54.84%**	**45.16%**	**100.00%**
	51-60 years	**N**	**21**	**21**	**42**
		%	**50.00%**	**50.00%**	**100.00%**
	Above 60 years	**N**	**16**	**24**	**40**
		%	**40.00%**	**60.00%**	**100.00%**
Total		**N**	**59**	**61**	**120**
		%	**49.17%**	**50.83%**	**100.00%**

Table 4: Dry eye prevalence by sex

			Dry eye		**Total**
			No	**Yes**	
GENDER	**MALE**	**N**	**32**	**32**	**64**
		%	**50%**	**50%**	**100.00 %**
	FEMALE	**N**	**27**	**29**	**56**
		%	**48.2%**	**51.7 %**	**100.00 %**
TOTAL		**N**	**59**	**61**	**120**
		%	**49.1%**	**50.8 %**	**100%**

Table 5: Relationship between dry eyes and the duration of diabetes

OSDI GRADING	**NO. OF PATIENT**	**PERCENTAGE**
Normal	**59**	**49.16**
Mild	**26**	**21.67**
Moderate	**22**	**18.33**
Severe	**13**	**10.83**
Total	**120**	**100**

		Dry eye		**Total**	**Chi-square statistics**
		No	**Yes**		
1-5years	**N**	**43**	**19**	**62**	**24.226 (p=.0001)**
	%	**69.35%**	**30.65%**	**100%**	
6-10 years	**N**	**11**	**24**	**35**	
	%	**31.43%**	**68.57%**	**100%**	
11-20 years	**N**	**3**	**17**	**20**	
	%	**15.00%**	**85.00%**	**100%**	
>20	**N**	**2**	**1**	**3**	

years	**%**	**66.67%**	**33.33%**	**100%**	
Total	**N**	**59**	**61**	**120**	
	%	**49.17%**	**50.83%**	**100%**	

Table 6: Connection between the length of diabetes and dry eyes

	Cases		**Dry eye**	
DR	**Frequency**	**Percent**	**Frequency**	**Percent**
NO DR	**57**	**47.5**	**11**	**18**
Mild NPDR	**17**	**14.2**	**8**	**13.1**
Moderate NPDR	**18**	**15**	**14**	**23**
Severe NPDR	**16**	**13.3**	**16**	**26.2**
PDR	**12**	**10**	**12**	**19.7**
Total	**120**	**100**	**61**	**100**

Table 7: Level of dry eye severity associated with retinopathy phases

Discussion

Given that India is regarded as the global centre for diabetes, it is crucial to practise effective glycemic control and routine monitoring. In our study, 50.9% of the diabetic cases that were looked at had dry eyes. According to Nepp *et al*, 43% had dry eyes.7 Seifart *et al.* discovered that out of 92 patients with diabetes, 52.8% exhibited symptoms of dry eyes. A significant correlation ($p < 0.05$) was found between the length of diabetes and the occurrence of dry eyes. Among diabetics with a duration of 6 to 10 years, 68.5% experienced dry eyes, but those with a duration of more than 11 years had 85% of occurrences. Fifty percent of patients who were male and twenty-nine percent of patients who were female experienced symptoms of dry eyes. The incidence among female patients in the current study was somewhat greater than that of male patients. A higher incidence of dry eyes (16.7% compared to 11.4% in men) was reported by Moss *et al.* among women with diabetes. The incidence of dry eye developed a strong correlation with age. Of the patients over sixty years old, sixty percent had dry eyes. Out of those with diabetes aged 51-60, 50% have dry eyes, compared to 28.57% in those aged 30-40, 45.16% in those aged 41-50, and 50% in those aged 51-60. Peak cases of dry eyes observed in patients of severe NPDR. Retinopathy and dry eyes did not, however, appear to be statistically significantly associated.

Conclusion

The results of this study demonstrate a strong correlation between dry eyes and diabetes mellitus. The length of diabetes and dry eyes were positively correlated in a statistically meaningful way. Dry eye occurs in slightly more women than in men. Those who test positive for dry eye should start treating their condition as soon as possible to avoid corneal problems. To avoid diabetic retinopathy and dry eyes, it's critical to closely monitor diabetic patients and maintain appropriate blood sugar control.

Potential Conflicts of Interest: None
Partnership and financial assistance: Nil

References

1. International Dry Eye Workshop Subcomittee. The definition and classification of dry eye disease: report of the definition and classification subcommittee of the International Dry Eye Workshop (DEWS - 2007). *Ocul Surf* 2007;5:75-92.
2. Achtsidis V, Eleftheriadou L, Kozanidou E, Voumvourakis K.I., Stamboulis E, Theodosiadis P.G., Tentolouris N. Dry Eye Syndrome in Subjects with Diabetes and Association with Neuropathy. *Diabetes Care* 2014;37(10):e210 –e211. DOI:

10.2337/dc14-0860.
3. Alves MC, Carvalheira JB, Modulo CM, Rocha EM. Tear film and ocular surface changes in diabetes mellitus. *Arq Bras Oftalmol* 2008;71(6):96-103
4. Sahai A, Malik P. Dry Eye: Prevalence and attributable risk factors in a hospital based population. *Ind Ophthalmol* 2005;53:87-91.
5. Seifart U, Strempel I. The dry eye and diabetes mellitus. *Ophthalmol* 94;91(2):235-239.
6. Hasan IN, Aggarwal P, Gurav A, Patel N. Assessment of dry eye status in type 2 diabetic patients in tertiary health care hospital, India. *IOSR J Dent Med Sci* 2014;13(8):06-11
7. J. Nepp, C Abela and I. Polzer. Is there a correlation between the severity of diabetic retinopathy and keratoconjunctivitis siccca?. *Cornea* 2000;487-491.
8. U. Seifart and I. Strempel, “The dry eye and diabetes mellitus,” Ophthalmologe, vol. 91, no. 2, pp. 235–239, 1994.
9. Moss SE, Klein BE. Incidence of dry eye in an older population. *Arch Ophthalmol* 2004;122:369-73