Tear Film Instability in type 1 diabetics

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ABSTRACT

Purpose: To assess the influence of type 1 diabetes on tear film and to quantify the vision problems and glycosylated hemoglobin link to diabetes mellitus in this study.

Methodology: This cross sectional study was conducted after obtaining ethical approval. Patients who were known to have diabetes mellitus for at least 5 years were included in study while those diagnosed with diabetes mellitus for less than 5 years were excluded. A self-designed Performa was used to gather the data that mainly included history of ocular and systemic disease, age, duration of diabetes, level of HbA1c test result, medications. Tear film was assessed with Schirmer strips instilled in both eye for five minutes with eyes closed. Later it was viewed using fluorescence strips after the topical anesthetic was given then studied using the cobalt blue filter on slit-lamps. When it came to entering and analyzing the data, we used IBM Spss version.

Results: Patients with value of moderate HbA1c with percentage of 52.3% were higher than both mild and high values. There was significant relationship between HbA1c value and dry eye according to tear break-up time test with values severe are more than both who has values moderate and mild.

Conclusion: Type 1 diabetes mellitus and dry eyes are shown to be closely linked in this research. Tear producing layer is affected by the incidence of disease and the higher HbA1c level.

Key Words: Dry eye, Schirmer test, Tear film, Diabetes Mellitus.

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INTRODUCTION

Chronic dry eye syndrome is a multifactorial illness that affects both tear production and the area of the eye and may lead to ocular surface damage.[1] The tear film becomes more corrosive and the retinal surface becomes more irritated as a consequence.[2] A large number of dry-eye sufferers, especially in developing

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countries, are not diagnosed or treated, which severely affects their condition of life when it comes to their vision, particularly in the developing world. Hyperglycemia caused by insulin production, insulin action, or both is the hallmark of diabetes mellitus, a group of diabetic complications.[3] Influential public health illness. More than half of the world's 38.2 million inhabitants live in Africa, and this number is expected to rise.[4]

Patients with diabetes are more probable to create dry eye illness because their corneal epithelial is more vulnerable to injury and infection (DED). There is a higher risk of wound healing irregularly and of corneal ulcers in persons with diabetes.[5] Patients with diabetes have lower corneal sensitivity and less tear production, according to previous studies.[6] Studies have revealed that diabetics are more prone than the overall population do suffer from dry eyes, and there are various reasons for this.[7] According to the International Diabetes Federation or more half of diabetics have dry eye. Dry eye in diabetics may be caused by neuropathy, metabolic inefficiency, or a malfunctioning of the tear glands.[8] People with this condition have an increased risk of developing corneal disease.[9]

Ocular surface alterations were also linked to illness duration, poor glucose management, peripheral neuropathy and retinopathy.[10] It's been a long time since the Schirmer test and the tear meniscus height measure were replaced by qualitative tear breakup time (TBUT) and quantitative tear breakdown time (TBUT).[11] Patients with dry eye illness may feel more ocular pain at the end of the day because of decreased and imperfect blinking and greater tear film disintegration during normal visual activities.[12] Normal blink rates range from 17 per minute at rest to around 26/min when speaking and 4.5 per minute while reading.

There are several factors that contribute to dry eye illness, which is also termed as keratoconjunctivitis sicca, or dry eye syndrome.[13] When it comes to the most frequent eye issue, dry eye illness is anywhere between 5 percent and 50 percent common.[14] Asian ethnic groups have a higher frequency and more severe symptoms of dry eye disease than Caucasians.[15] If you have a high amount of glycosylated hemoglobin, you're more likely to suffer from dry eye disease than someone with a low level of glycosylated haemoglobin.[16]

Individuals visual comfort, eyesight, quality of life, job efficiency, and financial burden may all be adversely affected by dry eye disease, which has a significant effect on medical and society.[17]

Difficulty focusing due to fluctuating vision, foreign body feelings, photophobia and dry eyes are among the most common side effects.[18]

METHODOLOGY

A hospital based cross-sectional study was conducted through convenient sampling technique to obtain the relationship between Hba1C value and tear film instability. Those patients were selected based on principles that they had Diabetes more than 5 years and have Hba1c values range was categorized low less than 6.5% mild, moderate 6.5% to less than 9% and high more than 9% as severe.

At the consent was obtained from subjects beginning of examination, well informed. Firstly, all patient's ocular history and family history was taken. Performa was used to assess the medical history of patients who had asthenopic symptoms. Snellen chart was utilized at 6meter distance to determine the visual acuity of patients.

The duration of diabetes mellitus, insulin use, and a recent HbA1c antibody test from patients are then gathered (within one week of recruitment). To be cautious, a Schirmer I exam with topical anesthesia was performed 30 minutes after the ophthalmoscopy examination to verify that the results were not impacted by the results of any earlier exams. To test the sclera sac of each eye, a 0.5 percent fluorescein strips wetted with sterilized water was injected. With the use of a stopwatch, the time gap between the last complete blink and a bunch of black patches on the corneal was measured and recorded. It was deemed odd for values to fall below 10 seconds.

In order to analyze the data, SPSS 25.0 was

employed. Categorical variables were represented as percentages and proportions in the final report. For continuous data, the mean and standard deviation were used to characterize it (SD). Eta square values were used to compute the average relationship size impact.

RESULT

A total of 172 patients took part in the research, with a gender split of 113 men and 59 women, ranging in age from 30 to 60. Type 1 diabetes was present in each patient for an average of more than five years for those who took part in the research.

Table -1: Glycosylated Hemoglobin Levels

		Frequency	Percent	Cumulative Percent
Valid	less than 6.5%	33	19.2	19.2
	6.5% to less than 9%	90	52.3	71.5
	more than 9%	49	28.5	100.0
	Total	172	100.0	

Table -2: Normal Tear film Parameters

		Frequency	Percent	Cumulative Percent
Valid	equal to 10mm (normal)	52	30.2	30.2
	equal to 5mm(moderate)	39	22.7	52.9
	less than 5mm(dry eye)	81	47.1	100.0
	Total	172	100.0	

Table -3: Tear Film Instability

		Frequency	Percent	Cumulative Percent
Valid	10 sec(mild)	25	14.5	14.5
	5 to 10sec (moderate)	69	40.1	54.7
	less than (severe dry eye)	78	45.3	100.0
	Total	172	100.0	

Table -4: Comparison Between Percentages of Hba1c, Schirmer's Test, Tbut

Measure	HbA1c	Schirmer test	TBUT
Mild	19.2%	30.2%	14.5%
Moderate	52.3%	22.7%	40.1%
Severe	28.5%	47.1%	45.3%

DISCUSSION

There is a condition known as dry eye that arises when not enough tears are generated to moisten the outer layer of the eye. It is observed that patients with diabetes mellitus often complain of itching, Irritation and dry eyes. This specific research was conducted to find the co-relation between dry eyes and diabetes. And whether or not the intensity of dry eye condition is linked to HbA1c levels or diabetes duration.

Manaviat MR et al have also showed a link between diabetes and tear film instability. But their study claims that dry eye is more common in older and female diabetic patients. In contrast, our study shows no Gender or age disparity[4,19]. Our study shows that dry eye is directly co-related with duration of diabetes and level of HbA1c. Whereas, a study conducted by Rehman A in 2018 studied the consequence of blood glucose level on tear break-up time test. His study claims that tear break-up time test was not significantly associated to the random blood glucose level and it does not affect the break-up time of the tear film.[20] In Contrast to this study, our study shows a direct relation between HbA1c tests and tear break-up time. The level of HbA1c is directly co-related to the amount of dryness experienced by the patients.

This study shows the co-relation between diabetes mellitus type 1 and dry eye. This research aimed to illustrate that patients with high blood glucose level (> 5.7) for more than 5 years demonstrate the signs of dry eye which causes ocular discomfort to the patient.

The frequency of HbA1c value in patients with less than 6.5 mmHg, 6.5-9 mmHg and more than 9mmHg is 19.2%, 52.3% and 28.5% respectively. This signifies that number of patients that lies in the group of 6.5 to 9 mmHg have moderate dry eyes. Comparison between the frequencies of Schirmer strip test and tear break up time test specifies that patients that lies in the group of less that 5mm wettability are greater in number with the percentage of 47 %. However, the frequency of tear break-up time test indicates that prevalence of patients with less than 5 secs of tear break are also greater in number and percentage i.e. 45.3 %. Siefert U et al also found significant relation between dry eye syndrome and the level of HbA1c. The total of 52.8 % of all diabetic subjects complained of dry eye symptoms.[5] Results of TBUT showed that 94.2 % patients have moderate dry eye.

As compered to our study which signified that 45.3 % subjects had TBUT values less 5 sec.

Hence, this implies a significant relation between diabetes type 1 and dry eye. The Respective study conducted by the students of university of Lahore shows that patients with greater level of HbA1c and longer duration of diabetes have severe dry eyes than those with controlled Diabetes mellitus and less value of HbA1c. Tear film and ocular surface assessment must be included in routine check-up for all diabetic patients, since all above mentioned previous studies and the study conducted by university of Lahore optometry students uncovers that dry eye syndrome is an important and real life challenge faced by most of the diabetes mellitus patients. Further treatment is selected according to the level of dryness by the ophthalmologist.

The study had a short duration. Study was carried out only in specific center and the sample size was limited. The impact could be more effective if the sample size was bigger and the data was collected from multiple centers and areas.

CONCLUSION:

There is a substantial correlation between dry eyes with glycosylated hemoglobin (HbA1c). This study revealed no indication of gender disparities of dry eye; a significant correlation was established among dry eye and glycated hemoglobin for further studies.

Conflict of Interest: None to declare

Ethical Approval: The study was approved by the Institutional Review Board / Ethical Review Board No. REC-UOL-199-01-2024.

Author Contributions: Ansa Andleeb: Concept, Design, Data Collection.

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