Original Article

# Frequency of Dry Eyes in Type 1 Diabetics at Sindh Institute of Ophthalmology and Visual Sciences

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**Purpose:** To Determine the Frequency of Dry Eyes in Type 1 Diabetics at Sindh Institute of Ophthalmology and Visual Sciences.

**Study Design: C**ross sectional study.

**Place and Durational of Study: A**t Sindh institute of Ophthalmology and visual sciences and for six months 1st January 2017 to 30th June 2017.

**Material and Methods:** Type 1 diabetics who were 30 to 70 years old with duration of disease less than 5 years were registered and sampling was done by non-probability convenience sampling. Schrimer test and tear film breakup time were performed to analyse dry eyes in type 1 diabetes. Data was recorded in proforma and results were assessed by using Statistical Program for Social Sciences (SPSS, version 16.0). The percentages, frequencies were collected and t test was applied.

**Results:** Out of one hundred diabetic patients, 71 (71%) had dry eye disease ($P < 0.001$). The mean age of the patients in this research was 50.97 years (range 30 - 70 years). Old aged Diabetics were having the high risk of dry eyes ($P < 0.001$). Gender was not found to be a risk factor of dry eyes in diabetics. Evaporative type dry eye disease was more prevalent than non-evaporative type due to ocular surface diseases.

**Conclusion:** Diabetics are at high risk for having dry eyes, so they should be

directed to have periodic ocular examination to prevent severe ocular surface complications leading to visual morbidity.

**Keywords:** Dry Eyes, Type 1 Diabetes Mellitus, Tear Film.

Diabetes mellitus is identified as an important risk factor for dry eyes. The reported prevalence of dry eye disease in diabetics is up to 54.3%[1]. Dry eye disease is also known as KCS. Kerato-Conjunctivitis-Sicca is a Latin word and it means dry conjunctiva and cornea. Dry eye disease can be caused by various factors[2]. Dry eye disease is almost always progressive and chronic. Dry eye disease also increases the risk of corneal infections, epithelial erosions and corneal vascularization in most of cases. There is very strong association between diabetes and dry eye disease. Severe form of dry eye disease can lead to superficial corneal punctate erosions, corneal epithelial defects and even infective keratitis that can cause corneal opacification to permanent corneal scaring. Diabetes is a well-known cause of visual morbidity in 20-74 years old patients characterized by hyperglycemia leading to associated micro and macrovascular complications. Worldwide more than 285 million people are affected by diabetes mellitus[3]. Dry eye syndrome is comparatively higher in patients, who have long standing diabetes[4]. Recently dry eyes are found to be very commonly reported problem in approximately 10-30% of population older than 30-40 years[4]. Such diabetic patients suffer from many complications of cornea which include superficial corneal punctate erosions, corneal ulceration and persistent infections. Diabetes can cause pathological events in the blood glucose that is ordinarily converted in to energy to fuel for various body functions[5]. Long duration and uncontrolled diabetes permits unusually abnormal levels of blood sugar to be accumulated in small and large blood vessels leading to pathology in macro and micro vessels that hampers flow of blood to different body organs[6]. This study was done to evaluate the correlation between glycated haemoglobin (HbA1C) and occurrence of dry eye syndrome. Increased glycated haemoglobin (HbA1C) values causes increased rate of dry eyes disease. Diabetic patients usually present with foreign body sensation and have below normal schrimer test results. Long duration and uncontrolled diabetes leads to pathological crisis in the microvasculature of the lacrimal gland that cause abnormal lubrication of eyes[7]. Diabetics also have decreased sensation of the cornea that is another factor for initiating ocular surface problems. Early diagnosis of dry eye syndrome in diabetics should be made to protect the diabetics from corneal complications[7,8]. The objective of the present study was to Assess and Determine the Frequency of Dry Eyes in Type 1 Diabetics at Sindh Institute of Ophthalmology and Visual Sciences Hyderabad.

## MATERIAL & METHODS

This was a Cross sectional study that was performed at the Sindh Institute of Ophthalmology and Visual Sciences. There were 100 Diabetic patients and 200 eyes included in the sample size in this study and the duration was six months.

Rao software was used to calculate the sample size. The confidence interval was 95% and response distribution was 50%. Sampling technique was non-probability convenience sampling. Patients included in the study had Insulin dependent diabetes mellitus, were 30 and 70 years old and duration of disease was not less than 5 years. The following patients were excluded from the study: Those who had used of topical medication within the past 6 months, had history of laser treatment on the cornea or other ocular surgical procedures, patients having any lid abnormality or previous ocular trauma and patients having corneal opacity.

There were 100 type 1 diabetic patients who were analysed for dry eye disease in the study having the age of ≥30 years visiting the outpatient department of SIOVS for various eye problems. Age, gender and duration of the diabetes were recorded for all the patients. The history of other diseases was reviewed by checking previous medical records and patient interview. Patients having type 1 diabetes were examined and analysed for dry eyes. Diabetics underwent a thorough ocular examination by the author. Two test were performed on each of these patients,

they were Tear Film Break up Time (TBUT) and schrimer test. These patients were assessed for having mild (Grade 1), moderate (Grade 2) and severe (Grade 3) dry eye disease. All the data was recorded in a specific pro forma. Slit lamp examination was performed in all these patients. Dry eye disease was suspected in patients having history of foreign body sensation, redness and excessive tearing. The condition was diagnosed by schrimer test and TBUT. Informed consent form was collected from all of the patients. In TBUT test, a break up time of tear film less than 10 sec with local anaesthetic was considered below normal. In schrimer test less than 06 mm of filter paper wetting after 5 minutes with local anaesthetic was considered below normal.

This Observational study was analysed by using SPSS version 16. P-value < 0.05 was reported significant using the t-test.

**RESULTS**

Dry eye disease was examined in right eyes of 100 patients in 30 – 40 year age group. Higher frequency of moderate and severe dry eye disease was found in 41 – 50 year age group. In 61 – 70 year age group more frequency of moderate dry eye disease found.

We examined dry eye disease in left eyes of 100 patients in 31-40 year age group. Higher frequency of moderate and severe dry eye disease was found in 41-50 year age group. In 51-60 year age group mild and moderate dry eye disease was more common. In 61-70 year age group mild dry eye disease was found to be more common. We found greater number of normal eyes in 51-60 years age group.

**Table 1:** Association of Age and grading of evaporative dry eyes in the right eye.

| | | Tear film break up time in R/E | | | | |
|---|---|---|---|---|---|---|
| | | Mild | Moderate | Severe | Normal | Total |
| Age | 30-40y | 1 | 4 | 4 | 8 | 17 |
| | 41-50y | 13 | 12 | 9 | 5 | 39 |
| | 51-60y | 12 | 5 | 3 | 16 | 36 |
| | 61-70y | 2 | 4 | 2 | 0 | 8 |
| Total | | 28 | 25 | 18 | 29 | 100 |

P < 0.001

**Table 2:** Association of Age and grading of evaporative dry eyes in the left eye.

| | | Tear film break up time in L/E | | | | Total |
|---|---|---|---|---|---|---|
| | | Mild | Moderate | Severe | Normal | |
| Age | 30 – 40 | 2 | 3 | 6 | 6 | 17 |
| | 41 – 50 | 13 | 12 | 8 | 6 | 39 |
| | 51 – 60 | 7 | 7 | 2 | 20 | 36 |
| | 61 – 70 | 4 | 0 | 3 | 1 | 8 |
| Total | | 26 | 22 | 19 | 33 | 100 |

P.00

**Table 3:** Results of non-evaporative dry eye disease (schirmer) in right eye.

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Schirmer in R/E | 0-5mm | 27 | 27.0 | 27.0 | 27.0 |
| | 6-30mm | 73 | 73.0 | 73.0 | 100.0 |
| | Total | 100 | 100.0 | 100.0 | |

**Table 4:** of non-evaporative (schirmer) dry eye disease in left eye.

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Schirmer In L/E | 0-5mm | 29 | 29.0 | 29.0 | 29.0 |
| | 6-30 mm | 71 | 71.0 | 71.0 | 100.0 |
| | Total | 100 | 100.0 | 100.0 | |

Schirmer test was checked in 200 right eyes of 100 diabetics. Abnormal test readings were found in the 27% of patients.

Schirmer test checked in left eyes of 100 diabetics. Abnormal readings were found in the 29% of patients and normal schirmer test values were found in the 71% of patients. This indicates the higher prevalence of dry eye disease.

**Table 5:** Descriptive statistics of duration and TBUT in R/E.

| | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|
| Duration | 100 | 16.24 | 5.091 | .509 |
| TBUTR/E | 100 | 7.20 | 5.512 | .551 |

P < 0.001

We compared the duration of type 1 diabetes with results of TBUT in right eyes. We found P value ≤ 0.001.

**Table 6:** Descriptive statistics of duration and TBUT in L/E.

| | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|
| Duration | 100 | 16.24 | 5.091 | .509 |
| TBUTL/E | 100 | 7.68 | 5.128 | .513 |

P < 0.001

We compared the duration of type 1 diabetes with values of TBUT in left eyes. We found P value < 0.001.

**Table 7:** Descriptive statistics of duration and schirmer test in R/E.

| | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|
| Duration | 100 | 16.24 | 5.091 | .509 |
| Schirmer R/E | 100 | 12.21 | 6.812 | .681 |

P < 0.001

We compared the duration of type 1 diabetes with values of schirmer test in right eyes. We found P value < 0.001.

**Table 8:** Descriptive statistics of duration and schirmer test in L/E.

| | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|
| Duration | `` | 16.24 | 5.091 | .509 |
| Schirmer L/E | 100 | 11.84 | 7.212 | .721 |

P < 0.001

When we compared duration of diabetes with schirmer test readings of left eyes in type 1 diabetes p value was < 0.001.

**Table 9:** Sex and TBUT in B/E.

| | | TBUT B/E | | | | |
|---|---|---|---|---|---|---|
| | | Mild | Moderate | Severe | Normal | Total |
| Sex | Male | 15 | 18 | 7 | 12 | 52 |
| | Female | 13 | 7 | 11 | 17 | 48 |
| Total | | 28 | 25 | 18 | 29 | 100 |

P < 0.001

In our study 40% males and 31% females had evaporative dry eye disease in both eyes.

## DISCUSSION

Diabetes mellitus is a very common generalized disorder affecting a multi systems of the body9,[10]. There is a strong association between dry eye disease and diabetes mellitus[11].

Very few studies are performed to see the association with type 1 diabetes. As this eye problem is very common and can trigger severe eye morbidity, dry eye disease should be checked in each diabetic patient coming in outpatient department to decrease the advanced complications that leads to blindness[12] Dry eyes is also a very common ocular surface pathology. It usually triggers and aggravates various eye diseases that leads to severe corneal complications and then finally to blindness[13].

Dry eye is classified into hyposecretory and evaporative dry eyes. Ocular surface diseases and meibomian gland dysfunction[14] Leads to evaporative dry eye disease non evaporative dry eye disease is well known disorder in female gender due to higher prevalence of autoimmune related pathology and old aged patients associated with age related lacrimal gland malfunction[15].

Analysis and treatment of dry eyes is not only for the examination of dry eyes but to decrease the almost all eye morbidities that lead several corneal complications. This research was performed to analyse the frequency of dry eyes in type 1 diabetics. There are several tests to analyse dry eye disease but and schirmer test and tear film breakup time are very important tests[16]. Evaporative dry eye disease is detected by below normal TBUT results and non-evaporative detected by below normal schrimer test values[17]. Evaporative dry eye disease is a most prevalent classification of dry eye disease. In this research total 200 eyes of 100 type 1 diabetics were seen, out of these patients 48 (48%) females 52 (52%) were males. In our diabetics, minimum age seen was 32y, maximum age recorded 70 year and mean age seen was 50.97 year. Two important tests performed on type 1 diabetics, these were schrimer test and TBUT and then their results were analysed to asses that how many number of diabetics were having dry eye disease. Analysis of over study described that minimum tear film break up time noticed 0Seconds, maximum was 19 seconds and Mean TBUT was 7.68 seconds in left eyes. The results of left eyes were comparable with right eyes. Minimum tear film break up time noticed 0s maximum observed 19s and Mean tear film break up time value observed noticed 7.68s in left eyes. Values of TBUT showed that a very large number of diabetics had below normal values. It shows many diabetics were having dry eye disease. These diabetics were also suffering from ocular surface diseases of eyes and poor hygiene of eye lids[18], so hygiene of eyelid should be regarded a cause of ocular surface problems and then leading to dry eyes. Other test performed was schirmer test denoting the secretions of accessory lacrimal glands. If the secretions of accessory lacrimal glands are disturbed then patient experience non evaporative dry eyes. Non-evaporative dry eye disease is prevalent in old aged diabetics due to age related malfunction of accessory lacrimal glands and female gender due to autoimmune multi system pathologies. This test is also considered as pillar of examination of dry eye disease. When schrimer test results were analysed they showed that minimum result was 0mm, maximum found 30mm and mean checked 12.21mm in right eyes. Again the results of left eyes were comparable with right eyes. Minimum value was 0mm, maximum value was 28mm and mean schirmer test value was 11.84mm in left eyes. Abnormal schirmer test readings were found in the right eyes of 27% patients and normal schirmer test values were found in the right eyes of 73% patients. Abnormal schirmer test readings were found in the left eyes of 29% patients and normal schirmer test values were found in the left eyes of 71% patients. In our study 71% patients had dry eye disease, seen by TBUT and schirmer test. This indicates the higher pre-valence of evaporative type of dry eyes than non-evaporative dry eyes.

Eyelid hygiene and ocular surface diseases are main culprits of evaporative type of dry eye disease. Prevention of evaporative type of dry eye disease can be done by taking some safe measures like face washing twice a day. In a study conducted by Marten Goebbels, on dysfunction of tear film in type 1 diabetes mellitus, mean TBUT was 10 seconds and 11 seconds in non-diabetic. They compared the results of dry eye tests done on diabetics and non-diabetics. They found significant lower schirmer test values in diabetics than in non-diabetics. They thought that decreased amount of reflex tearing in diabetics can be the cause of decreased schirmer test values. In their study the amount of aqueous tear secretion was measured by fluorophotometry and there was insignificant difference in-between the values of dry

eyes in diabetics and non-diabetics. [19] So according to them there is no difference in the secretion of tear film in diabetics and in patients without diabetes.

Old age was found to be strongly associated with occurrence of dry eye disease. Abnormal tear film break up time was maximal in 40 to 50 year age group. Age of our patients was divided into four groups and prevalence of dry eyes was seen in these groups. Almost all patients were having bilateral disease with little asymmetry, but both eyes of all patients were analysed. Dry eye disease was found in 9% right eyes of 31-40 y age group, 34% right eyes of 41-50 y age group, 20% right eyes of 51-60 y age group and 8% right eyes of 61-70 y age group. Then Left eyes of 100 patients were seen. DED was found in 11% of 31-40 year age group, in 33% of 41-50 year age group, in 16% of 51-60 year age group and in 7% of 61-70 year age group. P value was significant (P < .001) when association of dry eyes and age was analysed.

In a study conducted by paiShobha G on tear film function and tear secretion among diabetics[20], TBUT was found to be significantly reduced in diabetic group. Tear film break time was less then10 seconds in 30% of patience. The overall mean TBUT in diabetics was 9.8 ± 7.01 seconds they also found lower schirmer test values in diabetic group. The mean schirmer test result was 7.7 + 3.9 mm in diabetic group. According to them tear film break-up time is very valuable test when performed accurately.

Diabetics should be checked for occult ocular surface disturbance with detailed retina examination. In a study performed by Masoud Raza manaviat, it was noticed that, there was not a marked correlation between gender and prevalence of dry eye disease. There was percentage was 66.7% in 65-85 year old age and decreased prevalence in 27-41 year aged patients . Long history of diabetes is strongly associated with prevalence of dry eye disease. In this research the minimum duration of diabetes was 6y, maximum 30year and Mean duration was 16.24year.When association of dry eye disease and duration was assessed P value was found significant (P < 0.001).

As we have little discussed earlier about the relation of gender with dry eye disease[21]. In this research 48 females were included. We did not observe high prevalence of dry eyes in females than males. It was almost equal prevalence of dry eyes in females and males. So dry eye disease was not gender related.

In another cohort study performed on 3722 patients, having age range from 49-91 year, the frequency of dry eye disease was 14.4% in diabetic patients they found 8.4% in patients less than 60 years of age and 19% in patients having age older than 80 year. So the dry eyes and old age were strongly associated.

Saifart et al assessed 92 patients having both types of diabetes, having age from 7year-69year with a healthy subjects they observed dry eyes in 52.8% diabetics. In other research done on 140 diabetic patients, age range from 20-93 year, having dry eye disease were examined. They found the more prevalence of dry eye syndrome in these patients. 80% females were affected from dry eye disease. In a study conducted on 100 patients of type two diabetes. He compared the diabetics with normal subjects he found significant lower values of tear film break up time in diabetics.

In a research performed on 2414 patients, 322 subjects developed dry eye disease in a period of 5 year. Dry eye syndrome was studied in 30 Pakistani subjects, 10 females and 20 males having age range of 20 to 60 years. The visual acuity at the time of examination was 6/60 or less in 21 (70%) patients and 6/18 or above in nine (30%). Fifteen (50%) subjects were almost blind and other six (20%) patients were having poor prognosis. Only nine (30%) subjects had a chance of visual improvement.

## CONCLUSION

Old age and longer duration of type 1 diabetes mellitus are common risk factors in occurrence of dry eye disease. Gender is not a risk factor in progression of dry eyes. We observed high no of abnormal results in TBUT and less no of below normal results in schirmer test. So evaporative type of dry eye disease was more common due to ocular surface diseases than non-evaporative in our study.

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