International Journal Dental and Medical Sciences Research
Volume 3, Issue 5, Sep-Oct 2021 pp 676-683 www.ijdmsrjournal.com ISSN: 2582-6018

To Find Out Frequency of Dry Eye Disease inDiabetes and Its Correlation Between Hba1c Levels Among Patients Attending District Hospital Ratlam Attached to Government Medical College Ratlam.

Dr. Gourav chanderiya[1], Dr. Rishendra singh sisodiya[2], Dr. Madhubala Gubrele[3]
[1]*Senior resident,Department of ophthalmology GMC Ratlam, India*
[2]*Associate professor Head of ophthalmology department GMC Ratlam*
[3]*Assistant professor department of ophthalmology GMC Ratlam*
Corresponding Author:Dr. Gourav cahnderiya[1]

Submitted: 15-09-2021 Revised: 25-09-2021 Accepted: 28-09-2021

ABSTRACT: Purpose: To determine the frequency of dry eye disease in patients with type 2 diabetes mellitus and to find out any correlation between HbA1c levels and dry eye disease.
Method: This cross- sectional study evaluates 100 diabetic individuals with age range from 40 to 65 years. The diabetic state was determined either by the history of -medication for diabetes or an abnormal random blood sugar level of >200 mg/dl or HbA1C of >6.5% or fasting blood sugar of >126 mg/dl. After obtaining ethical clearance and ensuring informed consent, participants are evaluated. A detailed history was taken regarding, past medical history, systemic diseases, auto immune disorders, ocular history, duration of diabetes mellitus, use of insulin and a recent HbA1c report and demographic data. Anterior segment evaluation was done under slit lamp.
Results: The prevalence of dry eye in this study was 41%and this was higher among female patients 26(63%), than males 15(36.5%), with 59% patients classified as normal. There was an increase in the prevalence of dry eye with increasing age as well as with specific age group. There was no significant association between dry eye and some characteristics including the tear break-up time, Schirmer's test, and Hb A1c among the patients with Chi square analysis.
Conclusion: Patients with type 2 diabetes mellitus should be screened for dry eye disease and probably treated long-term for the prevention of ocular surface damage.

KEYWORDS: Dry eye disease, type 2 diabetes mellitus, HbA1c.

I. INTRODUCTION

Dry eye is defined as a multifactorial disease of the tears and ocular surface resulting in symptoms of discomfort, visual disturbance, and tear film instability with potential damage to the ocular surface. It is accompanied by increased osmolarity of the tear film and inflammation of the ocular surface [1]. dry eye is a fairly common ocular surface disorder which significantly affects the quality of life of patients. Many patients with dry eye remain undiagnosed and untreated especially in developing countries [2]. This study aimed to determine the prevalence, and relationship between dry eye and glycosylated haemoglobin (HbA1c) among patients with diabetes mellitus. Diabetes mellitus is defined as a group of metabolic diseases characterized by hyperglycaemia resulting from defects in insulin secretion, insulin action or both [3]. It is a disease of public health importance affecting 38.2 million people worldwide with half of this population living in Africa, and it is reported to be on the increase [4]. Peripheral neuropathy, nephropathy, and retinopathy are well known major complications of diabetes mellitus while other ocular complications include dry eye, cataract, glaucoma, and recurrent corneal lesions [5, 6]. Diabetes mellitus can lead to dry eye through a variety of mechanisms [7, 8] and studies [9-12] had reported a high rate of dry eye among patients with diabetes mellitus. Prevalence of dry eye in patients with diabetes has been reported to range between 27.7%-54.3% [13-16]. The mechanism of dry eye in diabetes include diabetic neuropathy, metabolic dysfunction, or lacrimal gland dysfunction [6, 17, 18]. The vision-related quality of life in patients with dry eye is affected with symptoms ranging from mild transient irritation to persistent dryness, burning, itching, redness, pain, ocular fatigue, blurred vision and reduced contrast sensitivity which often affect daily activities such as reading, watching television and driving [19-21].

International Journal Dental and Medical Sciences Research
Volume 3, Issue 5, Sep-Oct 2021 pp 676-683 www.ijdmsrjournal.com ISSN: 2582-6018

II. METHOD AND MATERIAL

This is a cross‑sectional study, that evaluates 200 eyes of 100 diabetic individuals. The age range is from 40 to 65 years. The diabetic state was determined either by the history of -medication for diabetes or an abnormal random blood sugar level of >200 mg/dl or HbA1C of >6.5% or fasting blood sugar of >126 mg/dl. Patients with pterygium, thyroid eye disease, on medications such as antihistamines and tricyclic antidepressants and postocular or refractive surgery are excluded from the study. After obtaining ethical clearance and ensuring informed consent, participants are evaluated. A detailed history was taken regarding, past medical history, systemic diseases, auto immune disorders, ocular history, duration of diabetes mellitus, use of insulin and a recent HbA1c report and demographic data. Anterior segment evaluation was done under slit lamp. Visual acuity was recorded with or without glasses. After thorough examination of the fundus with 78 D, the selectedare evaluated by using Schemer's test I, tear film break-up time [TBUT], corneal and conjunctival staining. The diagnosis was confirmed by positive results of one or both the tests (TBUT or Schirmer's test). Then Patient's discomfort and visual disturbances were graded, by using ocular surface disease index (OSDI) questionnaire. Ocular Surface Disease Index (OSDI) questionnaire consists of 12 questions on "symptomswithin the past week" Symptoms of dry eye are ocular discomfort, like soreness, itchiness, redness, blurred vision gritty sensation which decreases with blinking, and excessive tearing and graded accordingly 0 to 100 from least severe to most severe. The score above 12 is considered as abnormal. The score more than 33 is considered as severe dry eye, between 23-32 as moderate dry eye and scores between 13 and 22 are considered as mild dry eye.

Corneal staining of the eye by an unquantified method is done, wherein a strip of commercially marketed sodium fluorescein containing 1 mg fluorescein is moistened with a drop of saline, any excess saline was shaken off and the strip is applied to the inferior palpebral surface. The staining pattern is evaluated within 2 min at the slit lamp with ×16 magnification. Meibomian gland function is assessed by examining the meibum expressed from the glands for volume and viscosity.8 Firm digital pressure was applied over the middle and nasal one‑ third of the upper and lower eyelid with the lid compressed against the globe until a dome of lipid was expressed from the orifice. Meibomian gland dysfunction was graded based on the presence of all three of the following criteria: MG expression scale; symptoms and corneal staining. All examinations are performed by a single observer (s) to exclude subjective bias.

III. OBSERVATION

One hundred patients participated in the study of which thirty-one were males, (M: F = 1: 2.2) and the mean age was 60.5 years. The mean age for the males was 55 ± 10 years and 52.7 ± 9.4 years for the females. All the patients in the study had type 2 diabetes mellitus with a mean duration of 9.8 ± 7.3 years (Table 1). 70 patients were on oral medications only while 11 were on treatment with insulin (Table 1). Glycosylated haemoglobin < 6.5% was observed in 55% patients while ≥ 9% was noted in 15% patients. The mean value for HbA1c was 7.1% (Table 1). The most common symptoms of dry eye among all the patients was "foreign body sensation28(68.2%) and "blurred vision" 22(53.6%), while the most common environmental trigger was "discomfort in windy conditions" 18 (44%) and the least common was (44%), and the

least common was "discomfort in low humidity and in air-conditioned areas" (2 to 5%). These symptoms were not exclusive as some patients experienced more than one symptom (Table 2). The prevalence of dry eye in this study was 41% and this was higher among female patients 26(63%), than males 15(36.5%), with 59% patients classified as normal (Table 3). There was an increase in the prevalence of dry eye with increasing age as well as with specific age group (Table 4). There was no significant association between dry eye and some characteristics including the tear break-up time, Schirmer's test, and Hb A1c among the patients with Chi square analysis (Table 5). Also, there was no significant correlation between dry eye andglycosylated haemoglobin (p = 0.297), dry eye and age (p = 0.275), and, dry eye and duration of diabetes mellitus (p = 0.561) among the patients.

International Journal Dental and Medical Sciences Research
Volume 3, Issue 5, Sep-Oct 2021 pp 676-683 www.ijdmsrjournal.com ISSN: 2582-6018

Table 1.

Duration of diabetes mellitus	No. of patients	Percentage (%)
0- 6months	5	5
> 6months-1year	5	5
> 1year-5years	30	30
> 5years-10years	20	20
> 10years-20years	10	10
> 20years	30	30
Total	100	100
Treatment type		
Oral medication	70	70
Insulin	11	11
Oral medication + Insulin	18	18
Diet only	1	1
Total	100	100
HbA1c value		
Less than 6.5%	55	55
6.5% to less than 9.0%	30	30
Greater than 9.0%	15	15
Total	100	100

Table 2.

Dry eye symptoms (n=41)	Frequency	Percentage (%)
Gritty sensation	28	68.2
Blurred vision	22	53.6
Discomfort in Windy conditions	18	44
Light sensitivity	15	36.5
Painful eyes	12	29
Poor vision	11	26.8
Limitation in Driving	10	24

Limitation in Reading	**5**	**12**
Limitation in Watching TV	**8**	**19.5**
Discomfort in Low humidity areas	**2**	**4.8**
Limitation in Computer/ ATM use	**4**	**9.7**
Discomfort in Air conditioned areas	**1**	**2.4**

Table 3.

OSDI	Dry eye disease grade	No. of patients	Percentage (%)
0-12	**Normal**	**72**	**72**
13-22	**Mild**	**17**	**17**
23-32	**Moderate**	**6**	**6**
33-100	**Severe**	**5**	**5**
Total		**100**	**100**

Table 4.

Age group (years)	No. of patients	No. with dry eye (%)	% of total
<40	**6**	**0 (0.0)**	**0**
40-49	**10**	**2 (20)**	**2**
50-59	**32**	**15 (46.8)**	**15**
60-69	**27**	**16 (59.2)**	**16**
70-79	**17**	**6 (35.2)**	**6**
≥80	**8**	**2 (25.0)**	**2**
Total	**100**	**41**	**41**

Table 5.

Characteristics	Dry eye		P-value
	Present N (%)	Absent N (%)	

Age (years)			**0.275**
34-59	**17(35%)**	**31(64.5%)**	
≥ 60	**24(46.1%)**	**28(53.8%)**	
Gender			**0.314**
Male	**15(48.3%)**	**16(51.6%)**	
Female	**26(37.6%)**	**43(62.3%)**	
Years of diabetes			**0.561**
≤ 10	**26(43.3%)**	**34(56.6%)**	
> 10	**15(37.5%)**	**25(62.5%)**	
Insulin use			**0.961**
Yes	**12(41.4%)**	**17(58.6%)**	
No	**29(40.8%)**	**42(59.1%)**	
HbA1c value (%)			**0.297**
< 6.5	**20(36.3%)**	**35(63.6%)**	
≥ 6.5	**21(46.6%)**	**24(53.3%)**	
Tear break up time			**0.689**
≤ 10s	**32(42.1%)**	**44(57.8%)**	
> 10s	**9(37.5%)**	**15(62.5%)**	
Schirmer's test			**0.573**
≤ 5mm	**19(44.1%)**	**24(55.8%)**	
> 5mm	**22(38.5%)**	**35(61.4%)**	

IV. DISCUSSION

The prevalence of dry eye in this study was 41% (95% CI), which is higher than findings of Kaiserman et al. [10] (20.6%) and the Beaver Dam study [22, 23] (18.1%). Fuerst et al. [13] however, reported a prevalence of 52%, and this may be attributed to the longer duration of diabetes (mean duration, 11.4 years [13] vs 9.8 years, present study) and racial differences among the studied participants. Longer duration of diabetes mellitus has been documented to correlate with increase in the prevalence of dry eye among the patients [14]. Dry eye was more common among females (26%), than males (15%), but this was not statistically significant.Kaisermann et al. [10] and Fuerst et al. [13] also noted no significant difference in dry eye symptoms between sexes, and higher frequencies were found in females. Studies [22, 25] have shown that dry eye is more common among females in the normal population because of hormonal changes associated with menopause, however, in diabetics no gender predilection for dry eye has been observed and it was postulated that the association between female gender and dry eye is neutralised in the patients by the disease [10]. The prevalence of dry eye increased with age in this study, though, the association was not statistically significant (p = 0.275).This is similar to previous reports, [10, 13, 16] and has been attributed to the reduction in tear flow and volume, increased osmolarity, decreased tear film stability as well as alteration in the meibomian lipid composition of tears [31] with age. The duration of diabetes mellitus did not correlate with dry eye in this study (p = 0.561) similar to findings by Najafi et al. [16] but in contrast with the findings of Manaviat et al. [14]. Microvascular damage of the lacrimal gland with impairment of lacrimal gland function that has been implicated in the aetiopathogenesis of dry eye is

known to correlate positively with a longer duration of diabetes mellitus [24]. Fuerst et al. [13] on the other hand, reported fewer dry eye symptoms among patients with longer duration of diabetes which they attributed to a possible reduction in corneal sensation. There was no statistically significant correlation between dry eye and HbA1c level in this study ($p = 0.297$). This is similar to reports of Fuerst et al. [13] and Sagdik et al. [32] but in contrast to findings in some studies [10, 12, 14, 16] where HbA1c had a significant positive correlation with dry eye. The overall fair glycemic control in our patients (mean HbA1c = 7.2 %) might have accounted for the lack of correlation in this study. Poor glycemic control is associated with microvascular complications of the lacrimal gland which impair lacrimal gland function causing dry eye among diabetics [24]. Treatment of diabetes with insulin was not statistically associated with dry eye in this study, ($p = 0.961$). This is similar to previous studies [12, 13, 16] which reported no association between the type of treatment for diabetes and dry eye, thus, suggesting that insulin therapy does not affect the severity of dry eye among patients with diabetes mellitus. The most common symptom of dry eye was "gritty sensation", followed by "blurred vision" and "discomfort in windy conditions", similar to the study by Manaviat et al. [14]. These symptoms resulted from the disturbance in the quantity and quality of the pre-corneal tear film resulting in ocular surface inflammation [19, 27-29]. Schirmer test score was abnormal in 44.1% of patients with dry eye while tear break up time was abnormal in 42.1% with neither test having any significant association with dry eye symptoms. Manaviat et al. [14] reported 11.5% of their patients had both abnormal tear break up time and Schirmer's test score with no significant association with subjective symptoms of dry eye. The lack of association between symptoms and signs of dry eye among patients with the disease has been documented [30]. However, decreased basal tear secretion indicated by abnormal Schirmer's test score has been reported in patients with diabetes mellitus, [6, 17] and this had been attributed to the microvasculature damage of the lacrimal glands and autonomic neuropathy leading to lacrimal gland dysfunction [31]. Limitations to this study include the absence of patients with type 1 diabetes mellitus such that associations between dry eye and type 1 diabetes mellitus could not be assessed. More studies involving control groups will be helpful in evaluating further the relationship between dry eye and diabetes.

V. CONCLUSION

In conclusion, dry eye is fairly common among patients with type 2 diabetes mellitus with most of the affected patients experiencing the mild form of the disease. No significant correlation was noted between dry eye and glycosylated haemoglobin (HbA1c).

REFERENCES

[1]. No authors listed The definition and classification of dry eye disease: report of the Definition and Classification Subcommittee of the International Dry Eye WorkShop. Ocul Surf. 2007;5(2):75–92. [PubMed] [Google Scholar]

[2]. Bekibele CO, Baiyeroju AM, Ajaiyeoba A, Akang EEU, Ajayi BGK. Case control study of dry eye and related ocular surface abnormalities in Ibadan, Nigeria. Int Ophthalmol. 2010;30(1):7–13. [PubMed] [Google Scholar]

[3]. American Diabetes Association Diagnosis and classification of diabetes mellitus. Diabetes Care. 2008;31(Supplement 1):S55–S60. [PubMed] [Google Scholar]

[4]. International Diabetes Federation . Promoting diabetes care, prevention and a cure worldwide. fifth edition. Diabetes Atlas; Accessed 09 October 2017. [Google Scholar]

[5]. Rehany U, Ishii Y, Lahav M, Rumelt S. Ultrastructural changes in corneas of diabetic patients: an electron-microscopy study. Cornea. 2000;19(4):534–8. [PubMed] [Google Scholar]

[6]. Inoue K, Kato S, Ohara C, Numaga J, Amano S, Oshika T. Ocular and systemic factors relevant to diabetic keratoepitheliopathy. Cornea. 2001;20(8):798–801. [PubMed] [Google Scholar]

[7]. Alves Mde C, Carvalheira JB, Modulo CM, Rocha EM. Tear film and ocular surface changes in diabetes mellitus. Arq Bras Oftalmol. 2008;71(6):96–103. [PubMed] [Google Scholar]

[8]. Goebbels M. Tear secretion and tear film function in insulin dependent diabetics. Br J Ophthalmol. 2000;84(1):19–21. [PMC free article] [PubMed] [Google Scholar]

[9]. Hom M, De Land P. Self-reported dry eyes and diabetic history. Optometry. 2006;77(11):554–8. [PubMed] [Google Scholar]

[10]. Kaiserman IN, Kaiserman N, Nakar S, Vinker S. Dry eye in diabetic patients. Am J

Ophthalmol. 2005;139:498–503. [PubMed] [Google Scholar]
[11]. Seifart U, Strempel I. Trockenes Auge und Diabetes mellitus [The dry eye and diabetes mellitus] Der Ophthalmologe. 1994;91(2):235. [PubMed] [Google Scholar]
[12]. Nepp J, Abela C, Polzer I, Derbolav A, Wedrich A. Is there a correlation between the severity of diabetic retinopathy and keratoconjunctivitis sicca? Cornea. 2000;19(4):487–91. [PubMed] [Google Scholar]
[13]. Fuerst N, Langelier N, Massaro-Giordano M, Pistilli M, Stasi K, Burns C, Cardillo S, Bunya VY. Tear osmolarity and dry eye symptoms in diabetics. Clin Ophthalmol. 2014;8:507–15. [PMC free article] [PubMed] [Google Scholar]
[14]. Manaviat MR, Rashidi M, Afkhami-Ardekani M, Shoja MR. Prevalence of dry eye syndrome and diabetic retinopathy in type 2 diabetic patients. BMC Ophthalmol. 2008;8(1):10–13. [PMC free article] [PubMed] [Google Scholar]
[15]. Yu L, Chen X, Qin G, Xie H, Lv P. Tear film function in type 2 diabetic patients with retinopathy. Ophthalmologica. 2008;222(4): 284–91. [PubMed] [Google Scholar]
[16]. Najafi L, Malek M, Valojerdi AE, Aghili R, Khamseh ME, Fallah AE, et al. Dry eye and its correlation to diabetes microvascular complications in people with type 2 diabetes mellitus. J Diabetes Complications. 2013;27(5):459–62. [PubMed] [Google Scholar]
[17]. Dogru M, Katakami C, Inoue M. Tear function and ocular surface changes in noninsulin-dependent diabetes mellitus. Ophthalmology. 2001;108(3):586–92. [PubMed] [Google Scholar]
[18]. Grus FH, Sabuncuo P, Dick HB, Augustin AJ, Pfeiffer N. Changes in the tear proteins of diabetic patients. BMC Ophthalmol. 2002;2(1):4–9. [PMC free article] [PubMed] [Google Scholar]
[19]. Schiffman RM, Christianson MD, Jacobsen G, Hirsch JD, Reis BL. Reliability and validity of the Ocular Surface Disease Index. Arch Ophthalmol. 2000;118:615–21. [PubMed] [Google Scholar]
[20]. Miljanovic B, Dana R, Sullivan DA, Schaumberg DA. Impact of dry eye syndrome on vision-related quality of life. Am J Ophthalmol. 2007;143(4):409–15. [PMC free article] [PubMed] [Google Scholar]
[21]. Begley CG, Caffery B, Chalmers RL, Mitchell GL. Use of the dry eye questionnaire to measure symptoms of ocular irritation in patients with aqueous tear deficient dry eye. Cornea. 2002;21(7):664–70. [PubMed] [Google Scholar] 24. Moss SE, Klein R, Klein BE. Prevalence of and risk factors for dry eye syndrome. Arch Ophthalmol. 2000;118:1264–8. [PubMed] [Google Scholar]
[22]. Moss SE, Klein R, Klein BE. Prevalence of and risk factors for dry eye syndrome. Arch Ophthalmol. 2000;118:1264–8. [PubMed] [Google Scholar]
[23]. Moss SE, Klein R, Klein BE. Incidence of dry eye in an older population. Arch Ophthalmol. 2004;122(3):369–73. [PubMed] [Google Scholar]
[24]. Diabetes Complications Trial Research Group The relationship of glycemic exposure (HbA1c) to the risk of development and progression of retinopathy in the Diabetes Control and Complications Trial. Diabetes. 1995;44(8):968–83. [PubMed] [Google Scholar]
[25]. McCarty CA, Bansal AK, Livingston PM, Stanislavsky YL, Taylor HR. The epidemiology of dry eye in Melbourne, Australia. Ophthalmology. 1998;105:1114–9. [PubMed] [Google Scholar]
[26]. Sullivan BD, Evans JE, Dana MR, Sullivan DA. Influence of aging on the polar and neutral lipid profiles in human meibomian gland secretions. Arch Ophthalmol. 2006;124(9):1286–92. [PubMed] [Google Scholar]
[27]. Stern ME, Beuerman RW, Fox RI, Gao J, Mircheff AK, Pflugfelder SC. The pathology of dry eye: the interaction between the ocular surface and lacrimal glands. Cornea. 1998;17(6):584–9. [PubMed] [Google Scholar]
[28]. Goto E, Yagi Y, Matsumoto Y, Tsubota K. Impaired functional visual acuity of dry eye patients. Am J Ophthalmol. 2002;33:181–6. [PubMed] [Google Scholar]
[29]. Tutt R, Bradley A, Begley C, Thibos LN. Optical and visual impact of tear break-up in human eyes. Invest Ophthalmol Vis Sci. 2000;41:4117–23. [PubMed] [Google Scholar]
[30]. Nichols KK, Nichols JJ, Mitchell GL. The lack of association between signs and symptoms in patients with dry eye

disease. Cornea. 2004;23(8):76270. [PubMed] [Google Scholar]

[31]. Rahman A, Yahya K, Ahmed T, Sharif-Ul-Hasan K. Diagnostic value of tear films tests in type 2 diabetes. JPak Med Ass. 2007;57(12):577–80. [PubMed] [Google Scholar]

[32]. Sagdik HM, Ugurbas SH, Can M, Tetikoglu M,Ugurbas E, Ugurbas SC, Alpay A, Uçar F. Tearfilm osmolarity in patients with diabetes mellitus. Ophthalmic Res. 2013;50(1):1–5. [PubMed] [Google Scholar]