J. Cardiovasc Disease Res., 2020; 11(2): 155 – 158
A Multifaceted Peer Reviewed Journal in the field of Cardiology
www.jcdronline.org | www.journalonweb.com/jcdr
P – ISSN: 0975 – 3583 Online: 0976 – 2833

Analysing Ocular Surface Disorders in Type 2 Diabetes Mellitus

[1]Dr. V. H. Karambellkar, [2]Dr. Dhwanit Sureshkumar Khetwani
[1]Professor and Head of Department of Ophthalmology Krishna Institute of Medical Sciences Karad - 415110, Maharashtra
[2]Department of Ophthalmology Krishna Institute of Medical Sciences Karad - 415110, Maharashtra

ABSTRACT

Diabetes mellitus is a type of diabetes, when we consume carbohydrates, our body converts it into a sugar named glucose and transfers it to the blood stream and then the pancreas making insulin, and glucose from your blood into the cells. It bring to disorders. If someone has diabetes and is not treated extensively for the very high amount glucose in the body, a disorder commonly known as high blood sugar. Tear film abnormality is a significant characteristic of diabetic surface diseases. These abnormalities are likely on account of poor quality and function of tears, combined with the subnormal ocular surface. Therefore, all diabetic patients especially those with evidence of retinopathy changes should undergo routine early examination and follow-up of tear function and ocular surface parameters.

Keywords: Diabetes, disorder, hyperglycemia, eye, tear film, mellitus

Correspondence:
V. H. Karambelkar
Professor and Head of Department of Ophthalmology
Krishna Institute of Medical Sciences
Karad, Maharashtra
Submitted: 25-04-2020
Revision: 27-05-2020
Accepted Date: 22-06-2020

DOI: 10.31838/jcdr.2020.11.02.24

INTRODUCTION

Diabetes mellitus is a set of metabolic disorders with hyperglycemia. The factors responsible for hyperglycemia are reduction in the insulin secretion, increased glucose production and decreased glucose use.[1] On the basis of the pathogenic process, Diabetes mellitus is classified into two categories as type 1 and type [2]. Both the types have abnormal glucose homeostasis as pathogenic processes. Diabetes mellitus may contribute to several problems in the eye, such as refractive errors, diabetic retinopathy, cataracts, diabetic keratopathy, and ocular surface disorders.[2] The ocular surface consists of the tear film, the epithelia of the cornea and conjunctiva. The diseases impairing the structure and function of ocular surface are called ocular surface diseases[3]. Diabetic patients frequently report of dry eye effects, such as itching and alien body sensations.[4] People of diabetic neurotrophic keratopathy show no signs or tend to experience dryness and epitheliopathy.[5] Moderate cases manifest of intermittent visual acuity loss attributable to tear film instability.[6] A combined cause of "chronic tear secretion deficiency, peripheral neuropathy and hyperglycemia leading to corneal epitheliopathy with complications as hyperosmolarity, punctuate keratopathy, recurrent erosions, persistent epithelial defects, neurotrophic keratopathy, wound healing delay, and higher risk of microbial keratitis." [7,8]

AIM AND OBJECTIVES

AIM

To study ocular surface disorders in type 2 diabetes mellitus.

OBJECTIVES

To study effects of diabetes melllitus on tear film composition and stability.
To establish an association between Tear Film dysfunction over diabetic control.

REVIEW OF LITERATURE

Type 1 Diabetes Mellitus

Type 1 Diabetes is defined by the inflammatory destruction of cells that contain insulin in the pancreas through CD4 + and CD8 + T cells and macrophages that invade the islets.[9]

Many characteristics define diabetes mellitus type 1 as an autoimmune disease:[10]
"The autoimmune demolition of pancreatic β-cells, leads to a deficiency of insulin secretion which results in the metabolic derangements associated with T1 DM. In addition to insulin secretion loss, the function of pancreatic α-cells is also abnormal and there is excessive secretion of glucagons in T1DM
patients.[11]

Type 2 Diabetes Mellitus

In type 2 diabetes these mechanisms break down, with the consequence that the two main pathological defects in this type are impaired insulin secretion through a dysfunction of the pancreatic β-cell, and impaired insulin action through insulin resistance.[12]"Insulin resistance and hyperinsulinemia eventually lead to impaired glucose tolerance"[13].

Effect of diabetes mellitus on ocular surface and tear film

In the last 2 decades, the complaints relating to ocular surface disease in diabetic patients is becoming more frequent and ocular surface diseases have been studied in detail in last 2 decades. Corneal and conjunctival epithelial alterations and epithelial defects are evidently observed during the intraocular surgeries and scarring of cornea is a potential cause of visual impairment.[14,15]
Clinical studies revealed "the clinical manifestations of diabetes mellitus, associated with lacrimal gland and ocular surfaces dysfunctions related to dry eye syndrome."[16-18]
Chronic Hyperglycaemia, Perepheral neuropathy and chronic tear deficiency leads to complications such as punctate keratopathy, recurrent erosions, delayed wound healing and increased risk of microbial keratitis. [19-23]

Definitions of Dry Eye

Dry eye occurs whenever there is insufficient tear production or activity, culminating in minimal film that is unstable and ophthalmic surface disease. This is an increasingly prevalent disease, especially in postmenopausal females and the elders.[24]

Blink Rate[25]

The measure of times an Eye Blinks in a minute is known as the Blink Rate. In this test the person is asked to sit relaxed on a chair and fix the gaze at one point. The blinking rate that is the number of time person is blinking in a span of 3 minutes is recorded. On an average a person blinks 10-12 times a minute. In diabetes, the Blink rate is decreased due to Perepheral Neuropathy and hence this leads to Dry Eye other investigations[25]

MATERIALS AND METHODS

Study Design

A cross-section study was undertaken to determine ocular surface disorder of type 2 diabetes mellitus in a tertiary treatment centre.

Study Period

The present study period was from October 2016 to May 2018. Based on the pilot test, the incidence of dry matter was calculated to be 66.67 per cent.10 Sample size was measured at 5 per cent of relevance with an acceptable variance of 7 per cent.

Criteria

All Type 1 Diabetic subjects. Any congenital lacrimal dysfunction. Patients on any drug treatment, Topical (Betaxolol, Olapatidine, Naphazoline, Miotics or Mydriatics, Ketorolac) or Systemic (Beta blockers anti-hypertensives, anti-histaminics , Anti-psycotics) which produces dry eye. Patient having under gone any ocular surgery (Cataract, Refractive surgery, pterygium excision). Patients undergone any Cosmetic Surgery. Patients with any other ocular disorder known to produce dry eye (Allergic eye disease, Vit A deficiency, Post Steven Johnsons, Vernal keratoconjuctivitis, Post ocular chemical burns). Systemic diseases associated with dry eye other than diabetes mellitus (RA , SLE , CVD, Thyroid disordes). Chronic Dacryocystitis cases.

OBSERVATION AND RESULTS

Table 1: Association of Dry Eye with relation to the Gender

Gender	No Dry Eye (%)	Dry Eye (%)	Subjects
Male	61	44 (41.90%)	105
Female	38	39 (50.64%)	77
Total	99	83	182

(X2=1.369 DF=1; P=0.2426 Statistically not significant)

As seen above -that females had more prevalence of dry eye (50.64%), with 39 out of 77 females having dry eye syndrome. On the other hand 41.90% males (44 out of 105 subjects) have dry eye syndrome. The Prevalence of dry eye is not significantly related to sex. (P>0.05)

Table 2: Association of Dry Eye with blood sugar control

Blood Sugar Control	Subjects	No Dry Eye	Dry Eye (%)
Controlled	74	47	27 (37.83)
Uncontrolled	108	52	56 (50.92)
Total	182	99	83 (100)

(X2=4.17; DF=1; P=0.04 Significant)

In the table above it is seen that the Dry Eye syndrome was related to the control of Diabetes, with (27 out of 74) 36.48% with controlled Diabetes having dry eye syndrome, and 51.85% (56 of 108 subjects) with poor metabolic control. This showed that dry eye was more prevalent in uncontrolled blood sugar level patients with statistical significance. (P<0.05)

Table 3: Distribution of patients according to blink rate

Blink rate	No. of Patients	Percentage
Normal (≥12/min)	76	41.76
Abnormal (<12/min)	106	58.24
Total	182	100

As seen in the above table isdistribution of patients according to blink rate of eye. It was seen that majority of patients had abnormal blink rate (58.24%) followed by normal blink rate (41.76%)

Table 4: Distribution of patients according to Tear Meniscus Height test

Tear Meniscus Height test	No. of Patients	Percentage
Normal (>0.25mm)	99	56.04
Abnormal (<0.25mm)	83	43.96
Total	182	100

As seen in the above table isdistribution of patients according to Tear Meniscus Height test of eye. It was seen that majority of patients had normal Tear Meniscus Height test (56.04%) followed by abnormal Tear Meniscus Height test (43.96%)

DISCUSSION

The current study was based on cross-sectional study conducted to assess ocular surface disorders in type 2 diabetes mellitus. The study was conducted in the Department of Ophthalmology, Krishna Hospital, Karad between October 2016 to May 2018. A total sample size of 182 patients with known case type 2 diabetes mellitus for above 5 years history was included in the study. The study was conducted after taking ethical clearance from the institute and informed consent from the patients. The data was collected from patients regarding demographic profile, detailed history, general physical examination, detailed ophthalmologic examination and relevant investigations like Tear film Break Up Time (TBUT), blink Rate etc were done.

Divya Kesarwani et al[27]observed mean age (years) in diabetic retinopathy group was 52.50 ± 4.76 years and diabetics without retinopathy group was 53.02 ± 5.55 years. In a study done by Ibtesam Nasimul Hasan et al[28] observedsmajority of the patients were between of 40-60 years of age. In a study by Clara Grazia Chisari et al[26]observed out of 45 patients affected by type 2 diabetes 27 were females and 18 males. The distribution of all the patients according to duration of diabetes showed that majority of patients were with 12-15 years duration (40.10%) followed by >15 years (31.87%). In a cohort study on 3722 patients, Moss et al[29] showed 18.1% of diabetics had dry eyes.94 Nepp et al[30] showed 43% of diabetics having dry eyes in his study. Hom and De Land[31] showed that 52.9% had self-reported clinically relevant dry eyes. The patient distribution according to blink rate of eye indicated that majority of patients had abnormal blink rate (58.24%) followed by normal blink rate (41.76%)It was observed that majority of patients had abnormal Schirmer test 1 (60.99%) followed by normal Schirmer test 1 (39.01%). In the present study females had more prevalence of dry eye (50.64%), with 39 out of 77 females having dry eye syndrome. On the other hand 41.90% males (44 out of 105 subjects) have dry eye syndrome. The Prevalence of dry eye is not significantly related to sex. (P>0.05)

CONCLUSION

Tear film abnormality is a specific feature of diabetic ocular surface diseases. These abnormalities are likely on account of poor quality and function of tears, combined with the subnormal ocular surface. Therefore,all diabetic patients especially those with evidence of retinopathy changes should undergo routine early examination and follow-up of tear function and ocular surface parameters. The results of this research reinforce the idea that diabetic patients had an elevated prevelance of dry eye syndrome. Diabetic retinopathy and dry eye tend to have a specific correlation. More research need to be performed to determine an etiological relation.

CONFLICT OF INTEREST

None

BIBLIOGRAPHY

1. WHO Expert Committee on Definition. Diagnosis and Classification of Diabetes Mellitus and its Complications, Geneva:1999;1-59.
2. Ronaldo M, Zierhut M .The ocular surface and tear film and their dysfunction in dry eye disease. Survophthalmol .2001;45(2):S203-10.
3. Abdel-Khaled LMR. Morphological changes in the human conjunctival epithelium in KCS. Br J ophthalmol 1978; 62:80-83.
4. BronAj. Eyelids, Conjunctiva and Lacrimal apparatus. Wolff's Anatomy of the eye and Orbit .London Chapman &Hall Mdical, 1997: pp 30-84.
5. Lemp MA, Foulhs GN. The Diagnosis and Management of Dry Eye Disease. In: Tasman W, Jaeger EA, eds. Duane's Ophthalmology. 2012 ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2012:vol 4; chap 14.6-97.
6. Seifart U, Stremp . The dry eye and diabetes mellitus Ophthalmology. 1994 Apr; 91(2):235-9.
7. LabbéA . Ocular surface investigations in dry eye . J Fr Ophtalmol. 2007 Jan; 30(1):7
8. Ahmed AM. History of diabetes mellitus. Saudi Med J 2002; 23: 373- 378.
9. Al Homsi MF, Lukic ML. An Update on the pathogenesis of Diabetes Mellitus, Department of Pathology and Medical Microbiology (Immunology Unit)Faculty of Medicine and Health Sciences, UAE University, Al Ain, United Arab Emirates.1992.
10. Hussain AN, Vincent MT. Type 1 Diabetes Mellitus.2007.
11. Cryer PE. Mechanisms of sympathoadrenal failure and hypoglycemia in diabetes. J Clin Invest 2006; 116: 1470-1473.
12. Holt RI. Diagnosis, epidemiology and pathogenesis of diabetes mellitus: an update for psychiatrists. Br J Psychiatry 2004; Suppl 47: S55-63.
13. American Diabetes Association Diagnosis and classification of diabetes mellitus. Diabetes Care 2010; 33 Suppl 1: S62-69.
14. Kenyon KR, Stark WJ, Stone DL. Corneal endothelial degeneration and fibrous proliferation after plana vitrectomy. Am J Ophthalmol. 1976;81(4): 486-90.
15. Friend J, Thoft RA. The diabetic cornea. Int Ophthalmol Clin. 1984;24(4): 111-23.
16. Ramos-Remus C, Suarez-Almazor M, Russell AS. Low tear production in patients with diabetes mellitus is not due to Sjögren's syndrome. Clin Exp Rheumatol. 1994;12(4):375-80.
17. Goebbels M. Tear secretion and tear film function in insulin dependent diabetics. Br J Ophthalmol. 2000;84(1):19-21.
18. Dogru M, Katakami C, Inoue M. Tear function and ocular surface changes in noninsulin-dependent diabetes mellitus. Ophthalmology. 2001;108(3):586-92.
19. Cousen P, Cackett P, Bennett H, Swa K, Dhillon B.

Tear production and corneal sensitivity in diabetes. J Diabetes Complications. 2007;21(6):371-3.
20. Lockwood A, Hope-Ross M, Chell P. Neurotrophic keratopathy and diabetes mellitus. Eye. 2006;20(7):837-9.
21. Seifart U, Strempel I. The dry eye and diabetes mellitus. Ophthalmologe. 1994; 91(2):235-9.
22. Rieger G. The importance of the precorneal tear film for the quality of optical imaging. Br J Ophthalmol. 1992;76(3):157-8.
23. 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.
24. Pflugfelder SC, Solomon A, Stern ME. The diagnosis and management of dry eye: a twenty-five-year review. Cornea 2000; 19:644-9.
25. Jones LT. The lacrimal secretory system and its treatment. Am J Ophthalmol 1966; 62:47-60.
26. Clara Grazia Chisari, EdoardoStagni, Marco Di Mauro et al. Risk Factors For Ocular Surface Disorders In Patients With Type 2 Diabetes Acta MedicaMediterranea, 2014, 30: 249-253.
27. Kesarwani D, Rizvi SW, Khan AA, Amitava AK, Vasenwala SM, Siddiqui Z. Tear film and ocular surface dysfunction in diabetes mellitus in an Indian population. Indian J Ophthalmol2017;65:301-4.
28. India IbtesamNasimul Hasan, Pratik Aggarwal, AkshataGurav, Nilay Patel Assessment of dry eye status in type 2 diabetic patients in tertiary health care hospital,IOSR J of Dent and Med Sci. 2014; Volume 13 (8): 06-11
29. Klein BE, Klein R, Moss SE: Incidence of cataract surgery in the Wisconsin Epidemiologic Study of Diabetic Retinopathy. Am J Ophthalmol 2001; 119:295–300.
30. 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.
31. Hom M, De Land P. Self-reported dry eyes and diabetic history. Optometry. 2006 Nov;77(11):554-8.

Cite this article: V. H. Karambelkar Analysing Ocular Surface Disorders in Type 2 Diabetes Mellitus. J. Cardiovascular Disease Res. 2020; 11 (2): 155 – 158