

A Clinical Study of Meibomian Gland Dysfunction in Patients with Diabetes in Bundelkhand region

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Abstract

Purpose: The purpose of this cross sectional study was to study the frequency of meibomian gland dysfunction (MGD) in patients of diabetes mellitus.

Methods: This was across sectional study conducted in patients visiting the outdoor unit of Department of Ophthalmology, Maharani Lakshmi Bai Medical College Jhansi between February 2017 and April 2017. 100 patients of diabetes mellitus (Random blood sugar >200mg/dl or patients with history of diabetes) were assessed for MGD by noting the symptoms and slit lamp examination and determining the meibomian gland expression scale for volume and viscosity, and ocular surface staining with Lissamine green, and Fluorescein sodium. All the subjects were graded for the severity of MGD.

Results: 59% of the patients out of 100 diabetic patients had MGD. The most common symptom was burning (49%), followed by dryness (24%), 7% had conjunctival injection, 5% had corneal erosions, 24% had mucus debris, 54% had dry eye which was statistically significant ($p=0.001$), 50% males and 76% females had the disease which was not statistically significant.

Conclusions: The prevalence of Meibomian gland disease in the diabetic population was 56% which is more than the general population prevalence. Apart from other disorders diabetics are also more prone for ocular surface diseases like Meibomian gland disease. MGD is an important pre-disposer for severe diseases like Dry eye in this subgroup of patients which can lead to complications like conjunctival keratinisations, corneal erosions and perforations. Careful examination of these patients for ocular surface disease and prompt treatment is required.

Keywords: Dry Eye, Meibomian Gland Dysfunction, Meibomian Gland Expression Scale

I. Introduction

Meibomian glands are modified sebaceous glands that line the upper and lower eyelids in a single row. They are embedded in the tarsal plate in a single line with 20 to 40 with a median number of 30 in the upper lid. In the lower lid they are about 20-30 with a median of about 26 glands. Their secretory products contain a complex mixture of lipids and proteins and are termed as meibum. Meibum is liquid at room temperature. The secreted lipid is stored in the duct system that terminates in the orifices with a muscular cuff that open onto the lids. Meibum is released on the ocular surface in small amounts with each blink forming a casual reservoir with about 30 times more lipid than needed for each blink. With every down phase of the blink, lipid is squeezed out of the meibomian glands and is compressed into the lid margins. On the up phase of the blink, the lipid rapidly spreads upwards over the aqueous layer, suggesting that the lower eyelid reservoir is the major contributor for spreading of the lipid.

Dry eye has been defined in "The Report of the International Dry Eye Workshop" as a multifactorial disease of the tears and ocular surface that result in symptoms of discomfort, visual disturbance, and tear film instability with potential damage to the ocular surface. It is accompanied by an increased osmolarity of the tear film and inflammation of the ocular surface. Evaluation of dry eye is primarily based on the aqueous component of the tear film and includes tests such as tear film breakup time and Schirmer's tests. However, the evaporative component of dry eye is generally ignored. The problem becomes compounded if the patient is a diabetic, as dry eye is 50% more common in diabetics compared to nondiabetics. The prevalence of diabetes is estimated at 12–15% in India and more individuals are bound to seek medical help for diabetes-related ocular problems such as dry eye.

The term meibomian gland dysfunction (MGD) was first coined by Gutgesell *et al.* in 1982. It was defined by the Tear Film and Ocular Surface Society in 2011 in the International workshop on MGD as "a chronic, diffuse abnormality of the meibomian glands (MG), commonly characterized by terminal duct obstruction and/or qualitative/quantitative changes in the glandular secretion." The ocular surface is covered by the precorneal tear film that is a mixture of mucin, aqueous, and lipids produced by various structures. The lipid layer stabilizes the tear film and reduces the evaporation of tears. In MG disease, there is blockage of the orifice and stasis of the oil within the gland resulting in decreased secretion and abnormal composition of the tear film lipid layer. These factors lead to increased tear evaporation and tear osmolarity and inflammation in and around

the gland and the adjacent ocular surface. The resultant scarring and hyperkeratosis further aggravates the ductal stenosis and leads to MG dropout. Associated abnormal bacterial colonization further exacerbates the condition by changing lipid secretions and causing inflammation. However, MG dropout is not synonymous with MGD. There is a complex relationship between dry eye due to aqueous layer deficiency and dry eye due to MGD. Decreased tear production results in retention and accumulation of inflammatory products along the lid margin, which can lead to hyperkeratinization, stenosis of the ducts and MGD. This in turn can lead to increased evaporation of tears resulting in surface inflammation that may be communicated by the neural feedback loop from the ocular surface to the lacrimal gland. The resultant decreased lacrimal gland function further exacerbates the dry eye. Thus, MGD and dry eye disease due to aqueous layer deficiency are closely interrelated with nearly indistinguishable symptoms

II. Materials And Method

Inclusion Criteria: All diabetic patients irrespective of age, sex, duration of diabetes

Exclusion criteria: Patients with pterygium, thyroid eye disease, on medications such as antihistamines and tricyclic antidepressants and postocular or refractive surgery were excluded from the study.

Method

This was a cross-sectional, case-controlled study that evaluated 100 diabetic patients. 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. A detailed history was elicited for symptoms of ocular surface irritation such as foreign body sensation, grittiness, dryness, burning, teary eyes, and itching. Patients with frequent and persistent symptoms were classified grade 2 or higher on the MGD grading system. A general physical examination and detailed ophthalmic examination were performed. The expressed secretion was evaluated in terms of quality and expressibility, based on this the Meibomian gland status was graded as follows(6)

Grade 0 - No disease.

Grade 1 - Plugging with translucent serous secretion when compressing the lid margins

Grade 2 - Plugging with viscous or waxy white secretion when compressing the lid margin. (paste like secretion).

Grade 3 - Plugging with no secretion when compressing the lid margin.

Tear film examined for froth and mucus debris.

Conjunctival surface was seen for injection more so in the inferior third of the exposed interpalpebral area.

Cornea was evaluated in detail for its sheen, surface (superficial punctate erosions, mucus plaques/filamentary Keratitis) more in the inferior third of the cornea using fluorescein staining.

Dry eye evaluation was also done using TBUT (Tear film break up time) and Schirmer's test.

All examinations were performed by a single observer (s) to exclude subjective bias.

Statistical Methods Used: The data after coding was entered on excel spread sheet, it was further processed & analysed using spss statistical software version 17.0. The mean standard deviation and proportions were computed based on type of data. The test of significance used was chi-square test based on qualitative & quantitative data respectively. A p value of <0.05 was considered significant & <0.01 as highly significant.

III. Figures And Tables

Table 1

SYMPTOMS	N	PERCENT
Dryness	14	24
Grittiness	6	10
Burning	29	49
Sticky	2	3
Redness	2	3
Crusting	1	2
Stuck in morning	1	2
Watering	4	7
Total	59	100

Table 1 Shows the Frequency of the Symptoms, Burning and Dryness were the most common symptoms

Table 2

Meibomian gland disease in eye	FREQUENCY	PERCENT
Grade 0	26	44
Grade I	20	34
Grade II	7	12
Grade III	6	10
Total	59	100

Table 2 Shows the Frequency of the Meibomian Gland Disease, 59 Patients out of 100 Diabetics had Meibomian Gland Disease.

Table 3

CONJUNCTIVA	FREQUENCY	PERCENT
Normal	55	93
Congested	4	7
Total	59	100

Table 3 Shows the Frequency of the Conjunctival Disease, 7% had Conjunctival Congestion

Table 4

CORNEA	FREQUENCY	PERCENT
Normal	56	95
SPE	3	5
Total	59	100

Table 4 Shows the Frequency of the Corneal Disease, 5% had Superficial Punctate Erosions.

Table 5

TEAR FILM	FREQUENCY	PERCENT
Normal	45	76
Mucus	14	24
Total	59	100

Table 5 Shows Frequency of the Tear Film Abnormalities, 14(24%) had Mucus Debris.

Table 6

MEIBOMIAN GLAND DISEASE	PATIENTS WITH DRYE EYE	PATIENTS WITHOUT DRYE EYE	TOTAL
Present	32(54%)	27(46%)	59
Absent	07(17%)	34(83%)	41
Total	39	61	100

Table 6 Shows the Frequency of Dry Eye in Patients with Meibomian Gland Disease.

Pearson chi square test = value-17.05, df=1, p<0.01

This table shows that out of 39 patients with dry eye 32 patients had meibomian gland disease. This was statistically significant. (p<0.01)

Table 7

GENDER	NO OF SUBJECTS	PATIENTS WITH MEIBOMIAN GLAND DISEASE	PERCENTAGE
Males	66	33	50
Females	34	26	76
Total	100	59	

Table 7 shows the Frequency of the Disease in Males and Females, 50% Males and 76% Females had Meibomian Gland Disease.

Pearson chi square test - value is 0.11, the result is not statistically significant

IV. Discussion

On the basis of the quality and quantity of the produced and delivered meibum, two basic forms of MGD has been proposed –hypersecretory and obstructive form. In Hypersecretory form there is excessive meibomian excretion of oil at the orifices in the absence of inflammation. Examination of the eyelid usually reveals dilated meibomian glands full of secretions that are easily expressed. There is frequently excessive foam in the tear film. The main complaint is burning. Obstructive Meibomian gland disease is characterized by

thicker than normal meibomian secretion, low meibum excreta volume and high meibomian gland dropout. The predominant lid margin findings are hyperemia and thickening and irregularity of contour of the posterior lid margin. Meibomian secretions often are more turbid and solidified and inflammation surrounds the orifices with resultant pouting of the orifices. There may be tear film debris, tear film foam, punctate epithelial erosions in the interpalpebral zone and lower third of the cornea. Patients have high rate of tear evaporation and evaporative dry eye. The clinical symptoms include irritation, chalazia, foreign body sensation, matting and crusting. The keystones for the treatment of MGD include topical antibiotics (erythromycin, tobramycin, or bacitracin) tear substitutes, lid hygiene (melting of the secretion by warm compression, lid massage, lid scrubbing) and systemic tetracycline or its derivatives.

MGD is more associated with certain systemic diseases like hyperlipidemia, skin diseases, and certain drugs like 5 flurouracil, vitamin A, contact lens wear and diabetes. This study showed that the prevalence of MGD in diabetic patients is 59 which is more than the general population (38.9%). The lid flora is important in the development of meibomian gland dysfunction. The normal eyelids are colonized by *S.aureus*, and *S.epidermidis* about 10-95% of the time respectively. The bacteria commonly isolated from eye lids of patients with meibomian gland disease (*Staphylococcus aureus*, *propionibacteriumacne*, *corny bacterium*) produce lipases, cholesterylesterases, lipopolysaccharides that can alter the composition of meibomian lipids. The changes in lipid composition may, in turn, enhance the growth of other local bacteria. Only rarely do genuine bacterial infections play a role. Further evidence for the influence of local bacteria, is that Meibomian Gland Disease often responds favourably to topical and systemic antibiotics.(7) Diabetic patients maybe at an increased risk for opportunistic colonization of the eyelids, resulting in blepharitic presentations.(8) These developments lead to a compromised tear film lipid layer with increased evaporation, decreased tear breakup time and increased osmolarity. This hyperosmolarity causes ocular surface damage which further causes increased evaporation and further meibomian gland disease. Thus it is a vicious cycle with dry eye being the end result. Hor et al in 1990,(9) estimated the prevalence of Meibomian gland disease in general population is 38.9% with the prevalence increasing with age. Among groups of dry eye patients, the prevalence of Meibomian gland disease is high. Ocular surface abnormalities during the course of diabetes mellitus have been documented in recent years. Studies by Seifart and Stempel show that 57% of type 1 diabetics, and 70% of type 2 diabetics have proven dry eye disease. They also found that higher the Hb1AC values, greater the severity of dry eye disease. The likely reason for the increased prevalence of dry eye in diabetics as compared to healthy subjects is the associated autonomic dysfunction seen in them. According to Ghasemi H et al 2008(10) diabetes may be a possible predisposer for blepharitis. Patients with blepharitis present with typical symptoms of eye irritation. The most common symptom in this study was burning (49%) and dryness (24%). In most cases, symptoms are worse in the morning, possibly because almost no tears are produced during night so the toxic products of the inflammation are not washed away from the ocular surface. 7% of the patients had conjunctival congestion. Conjunctival injection is seen in the early phase of the disease, more in the inferior third of the interpalpebral area. Corneal changes include punctate erosions, infiltrates and keratitis. In this study 5% had punctate erosions. 24% had mucus debris in the tear film 32 patients that is 54% of the patients with MGD had dry eye which shows that MGD is a very important predisposer for dry eye in diabetic patients. Meibomian glands have androgen and estrogen receptors. The ratio of androgen and estrogen receptor is critical for controlling lipid synthesis so androgen deficiency is associated with Meibomian Gland Disease. In this study 50% males and 76% females showed Meibomian Gland Disease. Though more females showed the disease but this was not statistically significant.

V. Conclusion

This study showed the prevalence of MGD as 59% in diabetic patients which is more than the general population(38%). Apart from other ocular manifestations ocular surface disorders like MGD is also more common in these patients. MGD is a predisposer for severe diseases like Dry eye which can lead to complications like conjunctival keratinisations, corneal erosions and perforations. Careful examination of these patients for ocular surface disease and prompt treatment with systemic antibiotics, lid hygiene and liberal use of tear substitutes should be done to relieve the patient of the symptoms and also to prevent other associated complications. Type 1 diabetic patients were not involved in this study and also other more diagnostic tests for MGD like meibography and meibometry were not used which is a drawback of this study.

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