ORIGINAL RESEARCH PAPER
Volume-9 | Issue-5 | May-2020 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

EVALUATION OF DRY EYE STATUS IN DIABETES MELLITUS PATIENTS AND IT'S RELATIONSHIP WITH DIABETIC RETINOPATHY

Ophthalmology

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ABSTRACT

Introduction: Diabetic mellitus is a clinical syndrome characterized by hyperglycemia caused by absolute or relative deficiency of insulin. The term diabetes was 1st coined by Arashes Cappodocia (81-133 AD). Later, the word mellitus was added by Thomas Willis in 1675. Clinical features similar to diabetes mellitus (DM) were described 3000 years ago by the ancient Egyptians. Diabetes is one of the leading cause of blindness in age group of 40-70-year

Materials and Methods: It is a prospective study consisting of 180 diabetic patients who attended Ophthalmology Department of MGM Medical College and Hospital (MGMMCH), Jamshedpur, Jharkhand. Type I and Type II DM of either sex were screened for dry eye and diabetic retinopathy over a period of 18 months. Detailed ocular and diabetic history was recorded and clinical examination with slit-lamp for anterior and posterior segment of eye was done. For assessment of dry eye status Schirmer's test (SchT), tear-film breakup time (TBUT), and tear meniscus height (TMH) test were performed, and results noted. The stage of diabetic retinopathy was determined using direct and indirect ophthalmoscopy.

Results: In this study, 180 diabetic patients participated, of which 50 were Type I and 130 were Type II DM. Dry eye prevalence was maximum in patients aged 50 years and above (53.6%) . It was more common in females (60.9%) compared to males (39.1%). SchT showed 15% and 72.5% of Type I and Type II diabetics respectively had dry eye. The TBUT was found to be ≤10 s in 65% of Type II DM. 49% of Type II diabetics had low TMH. Moderate non-proliferative diabetic retinopathy (NPDR) (33%) was significantly more common in diabetic patients with dry eyes compared to diabetic patients without dry eyes. There were no patients with very severe NPDR. Statistically significant ($P \leq 0.001$) association was found between diabetic retinopathy and dry eye.

Conclusion: DM and dry eyes appear to have common association. Statistically significant correlation was found between dry eye and diabetic retinopathy. Hence, examination of dry eye should be integral part of assessment of diabetic disease as early detection will help to prevent further progression

KEYWORDS

Diabetes mellitus, Diabetic retinopathy, Dry eye, Schirmer's test, Tear breakup time, Tear meniscus height.

INTRODUCTION

Diabetic mellitus is a clinical syndrome characterized by hyperglycemia caused by absolute or relative deficiency of insulin. The term diabetes was 1st coined by Arashes Cappodocia (81-133AD). Later, the word mellitus was added by Thomas Willis in 1675. Clinical features similar to diabetes mellitus (DM) were described 3000 years ago by the ancient Egyptians. Diabetes is one of the leading causes of blindness in 40-70-year-old person. DM is associated with ocular complications such as chronic inflammation of the eyelid, acute orbital infection , hordeolum, cataract, refractive error, neovascular glaucoma, diabetic retinopathy, and palsy of oculomotor nerve. Nearly 47-64% of diabetic patients have primary corneal lesions, during their lifetime like epithelial fragility , persistent epithelial defect, recurrent corneal erosion, delayed epithelial healing. Many diabetic patients complain of typical dry eye symptoms, such as burning and foreign body sensation. The mechanism responsible for dry eye in DM is unclear, but autonomic dysfunction may be responsible. Dry eye is defined as a clinical condition characterized by deficient tear production or excessive tear evaporation resulting in ocular discomfort. It characterized by ocular irritation resulting from an alteration of tear film. The present study was undertaken to find out the association of dry eye with DM as its early detection would prevent further progression.

MATERIAL AND METHODS

Study Design: A prospective study consisting of 180 diabetic patients was undertaken to investigate prevalence of dry eyes in patients of diabetes mellitus and to investigate the relationship of diabetic retinopathy with incidence of dry eyes.

Source of data: This was a hospital based clinical study comprising 180 diabetic patients who presented to the Department of Ophthalmology, MGM Medical College & Hospital, Jamshedpur, Jharkhand.

INCLUSION CRITERIA

Patients of either sex, in age group 40-70 years, diagnosed to have diabetes mellitus (by endocrinologists/ as per ADA criteria) of any duration.

EXCLUSION CRITERIA

1. Patients with systemic diseases and local ocular disease/surface abnormalities as assessed by history and clinical examination, other than diabetes mellitus, which are known to cause dry eyes/ocular surface abnormalities.
2. Patients who were chronic contact lens wearer.
3. Patients who have had undergone ocular surgeries in the past.
4. Patients on local or systemic medications, which are known to cause dry eyes/ocular surface disorders.

Method O F Data Collection

History

After taking informed consent, detailed history regarding patients name, age, sex, occupation, address, presenting symptoms, duration, progression, and associated conditions were recorded. Detailed history regarding diabetes such as type of diabetes, duration, type of treatment, overall control in the past three months (based on sugar levels, Hb A1c values if available), FBS and PPBS levels were recorded.

Presence of a symptom from the dry eye questionnaire was further graded as rarely (at least once in 3–4 months), sometimes (once in 2–4 weeks), often (at least once a week), or all the time. Presence of one or more symptoms often or all the time was taken as positive.

Examination

A brief general and systemic examination was carried.

Ocular examination included recording visual acuity with snellen's chart (in patients with visual acuity less than 6/60, acuity was recorded as counting fingers at particular distance or hand movements or perception of light and projection of rays). Detailed anterior segment examination was done under slit lamp. Condition of lids, meibomian glands, conjunctival surface (dryness, wrinkling, sheen) and corneal

surface was noted.Meibomian gland status was graded[16] as follows
Grade 0-no disease
Grade 1-plugging with translucent serous secretion when compressing the lid margin Grade 2-plugging with viscous or waxy white secretion when compressing the lid margin
Grade 3- plugging with no secretion when compressing the lid margin.

Cornea was evaluated in detail for its sheen, surface (superficial punctate keratitis SPK/mucous plaques/filamentary keratis). Sensation was recorded after schirmers I test with a fine moist cotton wisp and graded as normal, reduced or absent.

Tear film evaluation was done in the following order.
Tear meniscus height was recorded as normal or low (under slit lamp, thin beam) Precorneal tear film was observed for presence of debris (mucous/oil droplets/debris)

Tear film break up time measurement
No anesthesia was used. A dry fluorescein strip was touched to the inferior fornix with the patient looking up. The cornea was scanned under low slit lamp magnification using a blue cobalt filter light. The patient was instructed to blink once or twice and then stare straight ahead without blinking. The time of appearance of the first dry spot formation (small black spots within the cobalt blue field) from the last blink measures the tear film BUT. Values <10 seconds were taken as abnormal. Fluorescein staining of cornea was graded from 0-3.

0-no staining of corneal epithelial surface.
1 – mild staining occupying < 1/3 of corneal epithelial surface.
2 – moderate staining occupying < ½ of corneal epithelial surface.
3 – severe staining of > ½ of the corneal epithelial surface.

Schirmers test I (basal and reflex tearing)
It was performed by placing a precut strip of filter paper (ContaCare Pvt. Ltd., Baroda) in the inferior cul-de-sac; Patient was asked to blink normally, and the amount of wetting of the paper strip after 5 minutes was measured. Wetting of ≤10 mm was taken as abnormal.

The basal secretion test was performed following the instillation of topical anesthetic (4% xylocaine drops) and the placement of a thin strip of filter paper in the inferior cul-de-sac. Measurement of less than 5 mm was taken as abnormal, 5-10 mm as equivocal.

Rose Bengal stain
This was carried out at the end, a moistened strip of rose Bengal (Conta Care Pvt. Ltd., Baroda) was applied to the inferior cul-de-sac, under no anesthesia. Van Bijsterveld scoring system was used to grade the staining of cornea and conjunctiva, based on a scale of 0-3 in 3 areas: nasal conjunctiva, temporal conjunctiva, and cornea. With this system, the maximum possible score is 9, a score of 3.5 or greater was considered positive for KCS.

Dry eye was defined as having one more symptoms(often or all the time present) along with one or more positive clinical findings (based on slit lamp examination) and one or more positive clinical tests(tear break up time of ≤10 seconds, schirmer test score ≤ 10mm, with anesthesia ≤5mm, fluorescein score of ≥1, rose bengal stain score of ≥3.5. Asymptomatic patients with positive signs or positive tests were also considered in the diagnosis.

Dry eye was graded into three types-mild, moderate, and severe. Mild dry eye can be defined in patients who have a Schirmer test of less than 10 mm in 5 minutes, T BUT less than 10 seconds and less than one quadrant of staining of the cornea.

Moderate dry eye can be defined in a Schirmer test of 5 to 10 mm in 5 minutes, TBUT of 5 to 10 seconds with punctuate staining of more than one quadrant of the corneal epithelium.

Severe dry eye was defined as diffuse punctuate or confluent staining (with fluorescein and rose bengal) of the corneal epithelium, often with filaments and diffuse punctae or confluent staining of the conjuctival epithelium. The Schirmer values in these patients was less than 5 mm in 5 minutes and T BUT less than 5 seconds.

Intraocular pressure [Goldman Applanation Tonometry] was recorded as routine.

Detailed fundus examination [under mydriasis] was done using Indirect ophthalmoscopy and 90 D Slit lamp examination. Retinopathy if present was classified as

Non Proliferative Diabetic Retinopathy (NPDR)
Mild- NPDR, Moderate-NPDR, Severe- NPDR
Proliferative Diabetic Retinopathy (PDR)
Early PDR, High risk PDR

Statistical Analysis :
Chi-square and Fisher Exact test has been used to find the significance of Association of various symptoms, signs, risk factors etc with the prevalence of dry eyes. Odds Ratio (OR) has been used to find the strength of relationship between symptoms, signs, risk factors with prevalence of dry eyes. Student t test has been used to find significance of difference of FBS and PPBS between dry eyes and No dry eyes. The Diagnostic statistics namely, sensitivity, specificity, PV, NPV, Accuracy and Kappa have been used to find the diagnostic values of the screening tests.

RESULTS
Detailed diabetic history was recorded. Symptoms of dry eye were assessed using an eight item validated questionnaire. Presence of one or more of the eight dry eye symptoms often or all the time were analysed. Assessment of anterior segment via slit lamp biomicroscopy was done. The examinations for dry eyes included Schirmer's test, Tear break-up time, Fluorescein and Rose bengal staining. Fundus was examined by ophthalmoscopy and grade of retinopathy, if present was recorded.

Diagnosis of dry eye was made if one or more clinical tests were positive with or without symptoms. For statistical analysis Chi-square and Fisher Exact test were used to find the significance of Association of various symptoms, signs, risk factors etc with the prevalence of dry eyes. Odds Ratio (OR) was used to find the strength of relationship between symptoms, signs , risk factors with prevalence of dry eyes. Student t test was used to find significance of difference of FBS and PPBS between dry eyes and No dry eyes. The Diagnostic statistics namely, sensitivity, specificity, PPV, NPV, Accuracy and Kappa were used to find the diagnostic values of the screening tests.

Of the 180 diabetic patients who participated in this study, 50 (27.7%) were type I diabetes and 130 (72.3%) were type II diabetes.

The mean age of type I group was 44.20 ± 3.65 years and 55.74 ± 10.59 years in type II group. The overall mean age was 53.74 ± 10.59yrs. 56% were males in type I group, and 60% in type II. The mean FBS values were 177.02±64.35 and 141.24±62.59, and PPBS values were 236.74±69.07 and 200.87±85.71 in type I and type II patients respectively.

Sixty five (36%) diabetic patients had dry eye. The prevalence of dry eye in type I DM was 32% and prevalence in type II DM was 38%. Dry eye prevalence was maximum in those above 50 years of age (57%). A 2.65 fold increase was found in the odds for dry eye in those with >10 years of diabetic duration, 1.91 fold to poor glycemic control, 1.20 to laser treatment and 1.63 to hypertension. Symptoms were prevalent in 29.3% patients. Reduced corneal sensation (16.7%) and mebomitis (10.7%) were major attributable risk factors. Ocular surface damage was predominantly superficial punctate keratitis(13.3%).

The tearfilm break up time was found to be ≤10 sec. in 32% (58 /180). The total tear secretion was(measured by schirmer I) ≤10 mm in 22% (40/180). Basal secretion(measured by schirmer with anaesthesia) was ≤5 mm was in 19.3%(35/180), Rose Bengal Staining score was ≥3.5 in 24.6%, fluorescein grade ≥1 was seen in 20%. Higher prevalence of abnormal TBUT was seen in many asymptomatic type I patients.

Retinopathy was seen in 10% of type I DM patients, 41% had retinopathy in type II DM group. Statistically significant correlation was not found between diabetic retinopathy and dry eyes (p>0.05).

CONCLUSION
Diabetes and dry eyes appears to be a common association.
Predominantly, milder grade of dry eye was seen in type I diabetics and mild to moderate in type II diabetes patients.

Higher prevalence was observed in those above 50 years of age in type II diabetics.

Higher prevalence of asymptomatic tear film instability was noted in type I patients.

Corneal hypoesthesia was strongly associated with dry eyes.
A 2.65 fold increase was found in the odds for dry eye in those with >10 years of diabetic duration, 1.91 fold to glycemic control, 1.20 to laser treatment and 1.63 to hypertension.

Minimal ocular surface damage was seen in type I diabetics.
Superficial punctate keratitis was the commonest corneal pathology in type II diabetic dry eye.

Although the prevalence of dry eye was more common in patients of DM (both type I and type II) having diabetic retinopathy compared to patients of DM (both type I and type II) without any signs of diabetic retinopathy, the difference was not found to be statistically significant (P>0.05).

Reduction in the modifiable risk factors of dry eye is essential to reduce its prevalence. Examination for dry eyes should be an integral part of the assessment of diabetic eye disease.

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