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Original Article

A Cross-Sectional Study on Dry Eye Disease in Glaucoma Patients Attending a Tertiary Care Hospital in Eastern India

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ABSTRACT

Background: Dry eye disease is a multifactorial disease of ocular surface characterized by loss of homeostasis of the tear film leading to ocular discomfort, visual disturbances, ocular surface inflammation and damage. Ocular and systemic medications are important risk factors for Dry eye disease. Glaucoma, generally affecting people aged 40 and above are widely treated with topical hypotensive agents for long duration increasing the risk of Dry eye disease. Previous studies have shown correlation between anti glaucoma medications and Dry eye disease. This study aims to assess severity of dry eye disease among glaucoma patients on topical hypotensive medication. **Methods:** A cross-sectional study on 160 glaucoma patients and 160 controls were conducted in the Ophthalmology department of a Tertiary care centre in Eastern India. Institutional Ethical Committee approval and informed consent of participants were taken. OSDI questionnaire, Schirmer test and Tear film break up time of each participant were used for analysing data. **Results:** This study comprised participants of age group 61-70 yrs. Mild to severe levels of OSDI value was detected in122(76%) glaucoma patients and 106 (66%) controls. Abnormal Schirmer Test was found in 57 % of glaucoma patients and 52% of controls. Tear film break up time was abnormal in 79(49%) glaucoma patients and 72(45%) control with a p value of 0.02 which was found to be significant. **Conclusion:** Dry eye disease is highly prevelant in Glaucoma patients and often triggered or aggravated by long term usage of topical anti glaucoma drugs. Patient awareness may contribute to reduced non compliance of medications and ultimately improve prognosis and preservation of vision.

***Keywords**: Dry eye disease, glaucoma.*

INTRODUCTION

Dry eye disease (DED) is a multifactorial disease of the eye, characterized by failure to produce sufficient amount of tear film or to maintain its proper quality. DED causes symptoms of discomfort, visual disturbance and tear film instability with potential damage to the ocular surface[1] The prevalence of DED ranges from 5 to 50% globally.[2,3] It is more common among older age people and in women than men (8.8% vs 4.5%).[3]

Among the risk factors for DED are ocular and systemic medications.[4] Glaucoma, which mainly affects people age 40 and above, is commonly treated with either single or multiple eye drops.[5] Applying hypotensive eye drops over long period of time can lead to either initiate or exacerbate existing DED. Therefore, glaucoma patients have double risk to be affected by DED.

Studies have been using structured scoring format including ocular surface disease index (OSDI), standardized patient evaluation of eye dryness (SPEED), and dry eye questionnaire (DEQ-5) to quantify the severity of DED/OSD symptoms.[6] Clinical tests that have been used to assess the tear volume, and the extent of ocular surface epitheliopathy are Schirmer test and ocular surface staining using fluorescein, rose Bengal and lissamine green, respectively.[7]

The diagnosis of DED in glaucoma patients is often overlooked as the focus of management is on controlling IOP; even if, DED has impact on drug adherence and the quality of life. Therefore, the purpose of this study was to assess the signs , symptoms and severity of dry eye disease among glaucoma patients on topical hypotensive medications.

OBJECTIVE

- Primary objective- To observe the prevalence of Dry Eye Disease in glaucoma patients who were on topical anti glaucoma medication.
- Secondary objective- to Observe the distribution of different age groups and gender and residence in glaucoma patients

MATERIALS AND METHODS

A hospital based cross-sectional study was conducted at Glaucoma clinic and Eye OPD in Nil Ratan Sircar Medical College and Hospital, Kolkata from 01 January to 30 June 2024. The study was conducted after approval from the Institutional Ethics Committee.

Study Population

All glaucoma patients who received services and had come for follow up at the Glaucoma clinic and new ophthalmic patients, attending Eye OPD, who have come for care during the study period were included in the study population.

Sample Size Determination

It was calculated using the formula for cross-sectional studies (with comparison). Sample size came to be 160 for each group (glaucoma patients and control) after taking references from other studies.[8]
Minimum prevalence of DED has been taken as 39% for Glaucoma patients and 25% for control. The significance level was considered as 95% with the alpha error set at 5% and power of the study set at 80%.

Recruitment of Study Participants

All glaucoma patients who received services and had come for follow up at the Glaucoma clinic and new ophthalmic patients, attending Eye OPD, who have come for care during the study period were recruited in the study. Visual acuity and IOP were measured and screened for eligibility based on inclusion and exclusion criteria using history and ocular examinations under slit lamp and all previous medical documents. The selected participants were explained about the purpose of the study, the questionnaire and clinical tests and then proper informed consent was taken.

Inclusion Criteria for Glaucoma Patients

- Age above 40 years
- Patient diagnosed as having any type of glaucoma and on topical hypotensive medication(s) for 3 months and above

Inclusion Criteria for Control-

- Age above 40 years

Exclusion Criteria for Glaucoma Patient Group

- History of use of any topical medication other than hypotensive eye drops within previous 3 months
- Active or recent history of ocular infection
- Presence of –
  a) Ocular surface lesion or any abnormality
  b) Any lid abnormalities
  c) (Entropion, ectropion, trichiasis, lagophthalmos, blepharitis etc.)
- History of prior ocular surgery
- History of any auto immune disease Exclusion criteria for Control group-
- History of use of any topical medication within 3months before the study
- Other criteria same as Glaucoma patient group.

Data Collection and Analysis

The participants were given OSDI questionnaire and asked to fill it by themselves or by their accompanying person or with help from health staff present there. The questionnaire which was originally written in English was translated to local language, Bengali, for better understanding and also explained verbally where needed. The score was calculated out of the total questions answered by the participants, not by the total number of questions asked. Each question of OSDI is graded from 0 to 4; 0 indicating none of the time, 1 some of the time 2 half of the time, 3 most of the time, and 4 all of the time.

Data collection was done about their age and domicile status. For Glaucoma patients, information was gathered about number of drops used daily and their duration. Patient's old hospital documents were used for collecting information where participant was unable to give information. The patients then underwent the clinical tests in the following order.

Schirmer Test

Schirmer test 1 (without anaesthesia) was done in this study. Participant was asked to look up and the lower lid was drawn gently downward temporally. Rounded bend end of sterile Schirmer strip was hooked in the inferior fornix at the junction of temporal 1/3 and nasal 2/3 area of lower lid. Care was taken to avoid touching of cornea. After 5 minutes, the strip of the filter paper was removed and the amount of wet filter paper was measured and recorded in milimeters. Whole number rounded upto the next whole number were recorded where the tear front is at or greater than the half milimeters mark.

Tear Film Break Up Time (TBUT) Measurement

One drop of topical anesthesia was instilled and the patient was asked to close his/ her eyes. After 1 min the patient was instructed to look up to apply a fluorescein sodium ophthalmic strip into the inferior fornix, blink 5 times and then to hold the eyes open. The cornea was scanned with slit lamp microscope using a cobalt blue

filter at 10 X magnification. A dry area was indicated by the appearance of a black spot or line. The time in seconds between the last blink and the appearance of black spot was recorded using stopwatch as a tear film break-up-time.

Operational Definitions

OSDI questionnaire was graded as normal 0-12. Score of 13-32 was considered as mild to moderate DED and 33-100 as severe DED.

Schirmer test was considered normal if the wetting of strip paper was 10mm and above. Reading of 6-9mm was considered as mild to moderate disease and less than 5mm was considered as severe disease.

Normal TBUT was taken as 10seconds and more. Time of 5-9seconds was considered as mild to moderate disease and less than 5 seconds as severe disease.

Data Analysis

At the end of each day, collected data was reviewed and frequency, percentage, mean were used to summarise the demographic data, drug duration, no. of medication, OSDI score and clinical tests results.

P-value of less than 0.05 was considered as statistically significant.

RESULTS

160 glaucoma patients and 160 control were involved in the study. The data are summarised in below tables.

Characteristics	Glaucoma patients (no.)	Control (no.)
Age (years)		
41-50	32	28
51-60	40	48
61-70	53	59
71-80	27	19
Above 80	8	6
Gender		
Male	79	76
Female	81	84
Domicile status		
Urban	112	136
Rural	48	24

Table 1

The mean ± SD age was 62.2 ± 11.58 (range 41–87) years in the glaucoma patients and 61.4 ± 10.76 (range 40–90) years in the controls. Male to female ratio was similar in both groups.

Primary open angle glaucoma was the commonest diagnosis. Glaucoma patients, under study, were using 6 types of topical hypotensive medication, most of which were not preservative free.

The minimum and maximum frequency of drops per day were 1 and 5 respectively. Two types of drops per day was the most common regime found among glaucoma patient group.

Distribution of glaucoma patients on no.of hypotensive drops used per day	
Drops used per day	**No. of glaucoma patients**
One	24
Two	82
Three and more	54

Table 2

The mean ± SD of DED symptoms with OSDI score was 30.8 SD ± 22.9 (range 0– 86) in the control, and 36.1 ± 21.3 (range 0–100) in glaucoma patients. Mild to severe level of OSDI value was detected in 122 (76%) glaucoma patients and 107 (66%) controls. The level was severe in 69 (43%) glaucoma patients and 51 (32%) control participants.

The results of the clinical tests among the glaucoma and control participants; a paired sample t-test comparing the mean values of the two groups for each test was performed. The difference between the glaucoma and control participants with regard to TBUT was statistically significant. Tear film break up time was abnormal in 79 (49%) glaucoma patients and 72 (45%) control, p-value 0.02. while Schirmer test was abnormal in 91 (57%) of glaucoma patients and 83 (52%) control, p-value 0.24.

OSDI Score	Glaucoma patients	Control	
Normal	38	53	
Mild to moderate	53	56	
Severe	69	51	
Schirmer test result	**Glaucoma patients**	**Control**	**p-value**
Normal	69	77	0.24
Mild to moderate	26	23	
Severe	65	60	
TBUT value	**Glaucoma patients**	**Control**	**p-value**
Normal	81	88	0.02
Mild to moderate	29	33	
Severe	50	39	

Table 3

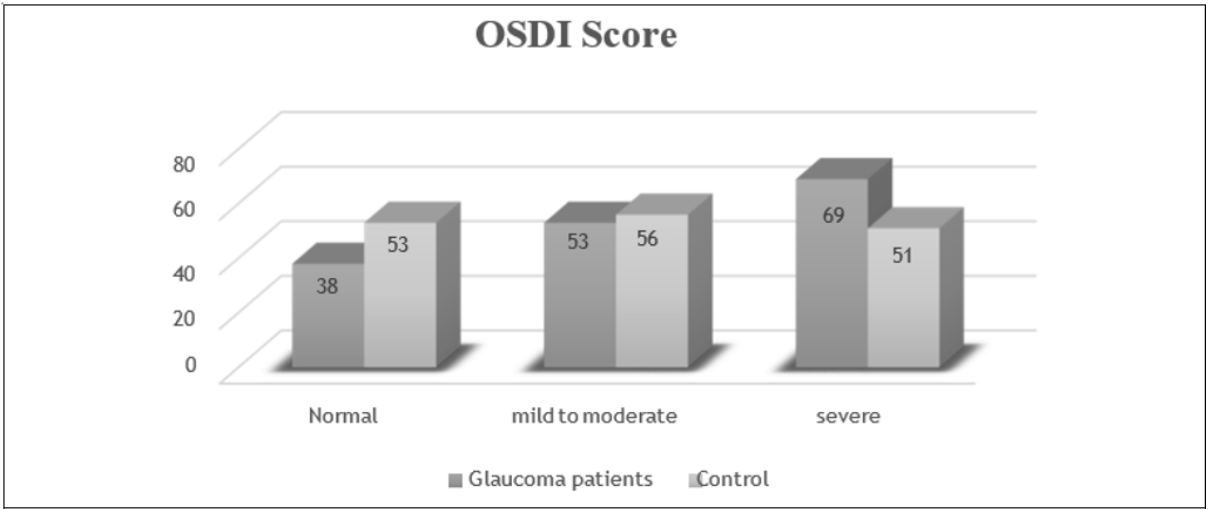

Figure 1

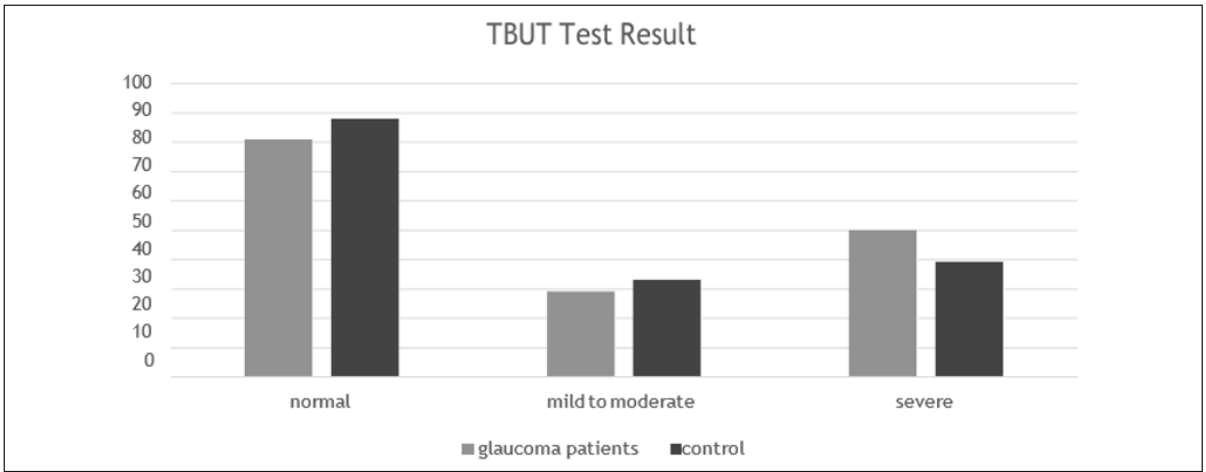

Figure 2

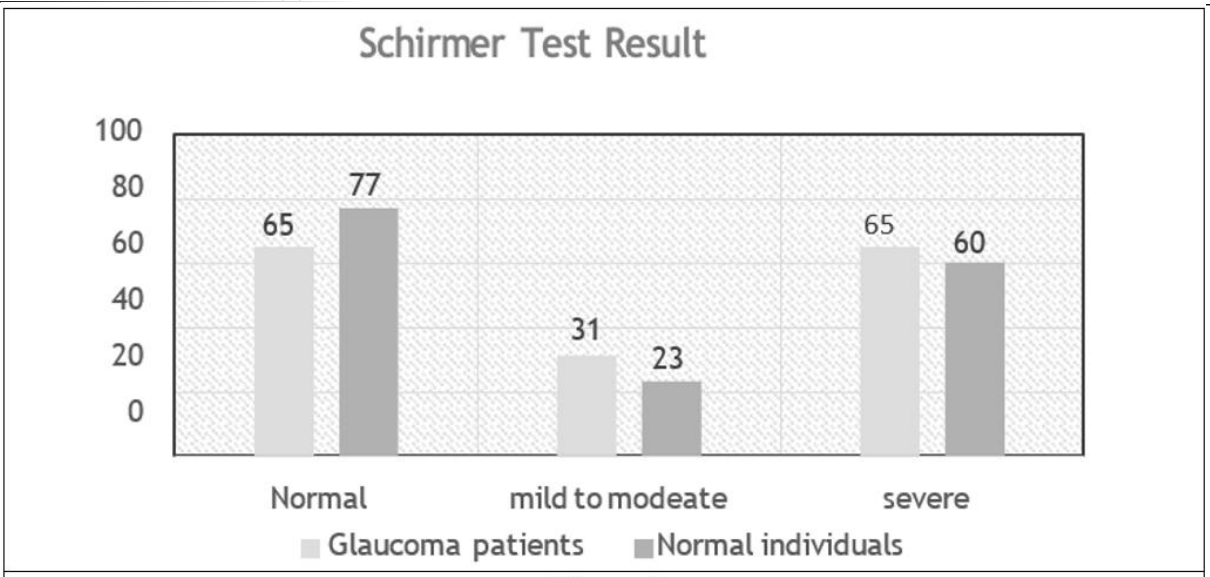

Figure 3

DISCUSSION

This study focuses on DED among glaucoma patients on topical hypotensive medication and controls using OSDI score and clinical tests (Schirmer test and TBUT).
The similarity in mean age, 62.2 ± 11.58 and 61.4 ± 10.76 years and female gender proportion, 81 (51%) and 84 (53%), in the glaucoma patients and controls, respectively, could help to balance the age and gender related ocular surface changes which are the leading risk factors for dry eye disease.[1-3]

In our study, abnormal OSDI score was found 76% of glaucoma patients and 66% of controls. Percentage in both the groups are higher in comparison with other studies[9] because the controls were new patients who had not received any ophthalmic attention at the hospital; thus, their response to the OSDI questionnaire might be exaggerated to get attention.

Glaucoma patients had more abnormal results in clinical tests than control. Abnormal TBUT value was noted in 49% of glaucoma patients and 42% of control. Abnormal Schirmer test result was found in 57% of glaucoma patients and 52% of control. All of these are in line with the other similar studies.

Glaucoma patients were on 6 different hypotensive eye drops, most of them had benzalkonium chloride (BAC) as preservative, which are additional risk factors for DED.[6,7] The more signs of ocular surface disease were noted in the glaucoma patients than the controls can be explained by the toxic effect of BAC preservative and active molecular effect of the medication(s) on the corneal epithelial cells. Vitamin A deficiency and higher environmental temperature are the additional risk factors for DED that has to be considered as the causes for the high clinical test results in our study.

Limitation of the study

Our study had some limitations-

1. Only two objective evaluations (Schirmer test and TBUT test) were performed. We should include other objective evaluations like corneal staining etc for better results.
2. We could have taken more robust statistical conclusions with a larger sample size.
3. Most of the participants were using drops with BAC as a preservative and the effect of preservative-free drugs was not seen in this study.

CONCLUSION

Dry eye disease in glaucoma patients, can be initiated, triggered or aggravated by usage of topical anti glaucoma drugs. Awareness and counselling of glaucoma patients should routinely be done in every follow up visit to improve compliance and avoid discontinuation of glaucoma medication, affecting treatment efficacy and quality of life.

All of these measures will improve prognosis of disease and ultimately help in preservation of the vision.

Conflict of interest -Nil

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