



Dry Eye Evaluation in Glaucoma

Meghna Verma, Satyendra Singh Sachan, Priti Yadav

¹ Faculty of Paramedical Sciences, Rama University, Mandhana, Kanpur, U.P., India npur

² Faculty of Paramedical Sciences, UPUMS, Saifai, Etawah

*Corresponding Author: Mrs. Meghna Verma

ABSTRACT

Aim and Objective: To evaluate the prevalence and severity of dry eye in patients diagnosed with glaucoma and to investigate the correlation between glaucoma severity and the presence and severity of dry eye symptoms.

Material and Methods: A prospective study of enrolled consecutive topically treated glaucoma patients. Sample size taken was 60. Patients who presented with ocular or systemic disorders that would affect the state of the ocular surface were not accepted. The tests for dry eye disease included the tear meniscus height (TMH), Schirmer I and II, and tear breakup time (TBUT).

Results and Discussion: Of the sixty individuals in our study, 40 had abnormal TMH in their left eye and 40 had abnormal TMH in their right eye. In the right eye, 49 participants demonstrated abnormal Schirmer I, while in the left eye, 44 subjects had abnormal Schirmer I. Since there exists 78% of samples having abnormal right eye and 68% in the left eye, our research leads us to conclude that anti-glaucoma medications alter the ocular surface, which in turn promotes dry eyes. These results suggest that, in order to reduce the negative effects of anti-glaucoma eye drops on the ocular surface, preservative-free regimens or tear substitutes should be used.

Conclusion: Patients using topical anti-glaucoma drugs containing preservatives have a higher risk of developing dry eye, accounting for 84.49% of cases.

Keywords: Dry eye, Glaucoma, Tear breakup time, Anti glaucoma drugs.

DOI Number: 10.48047/nq.2022.20.8.nq221158

NeuroQuantology 2022; 20(8): 11243-11247

11243

INTRODUCTION

The prevalent condition known as dry eye is characterized by insufficient production of tear film to lubricate the surface of the eyes¹. Tear film insufficiency visual abnormalities, and ocular pain are the primary symptoms of this elaborate disease². According to the DEWS (Dry Eye Workshop), there are two main reasons of dry eye: either greater evaporation from intrinsic or external factors, or decreased tear secretion. One of the several reasons of dry eye is the extended use of topical medications that have been stored, which can have a harmful effect on the surface of the eyes¹. Anti-glaucoma drug therapy is the main treatment for glaucoma, a progressive visual neuropathy³.

The association between glaucoma and dry eye may be caused by preservatives used in ocular hypotensive medications, including beta

adrenoblockers and benzalkonium chloride. Patients with glaucoma are therefore more likely to develop ocular surface disease (OSD) because they are typically treated with topical medications for an extended period of time⁵. The severity of dry eye depends on the concentration and frequency of exposure, and glaucoma medication can affect the surface of the eye by interfering with tear production. When anti glaucoma medication is started, ocular surface irritation may appear as soon as three months later. According to age, sex, and ocular hypotensive medication, the prevalence of dry eye in primary open angle glaucoma (POAG) can range from 11% to 100%⁶. Lifestyle modifications that comprise omega-3 fatty acid supplements can help reduce the symptoms of dry eyes in people with glaucoma.



As a result, we want to continue this research in our setup to ascertain how dry eye and glaucoma are related in the Agra district.

MATERIALS AND METHODS

This prospective study consists of 50 consecutive glaucoma patients, both sexes, who enrolled in a tertiary care hospital in Agra under the Department of Ophthalmology between May 2022 and May 2023. All patients were over 40 years of age, and after a year, they underwent a thorough examination for glaucoma and dry eye. This prospective study will comprise 50 patients who meet the inclusion criteria and a total of 88 eyes.

In order to evaluate each patient, a thorough history and ocular examination of both eyes will be taken, along with slit lamp bio-microscopy of the anterior segment and indirect ophthalmoscopy of the fundus after pupil dilatation using mydriatics (i.e. tropicamide). An applanation tonometer will be used to measure intraocular pressure, and the tear meniscus height (TMH), Schirmer test I, Schirmer test II, and TBUT (Tear break up time) will be used to evaluate abnormalities in the tear film.

The following were the inclusion criteria for the glaucoma patients:

- 1) Older than forty years old.
- 2) Glaucoma diagnosis; and
- 3) Using topical antiglaucoma medication.

The following exclusion criteria applied:

- 1) Using topical medications other than those that treat glaucoma
- 2) Infections of the eyes.
- 3) Abnormalities of the lids, include blepharitis, trichiasis, entropion, and ectropion.
- 4) Previous eye or lid surgery

Tear meniscus height was measured by slit lamp biomicroscopy. Following regular blinking, the reticule of the slit lamp's scale was used to

determine the lower meniscus height. A value of less than 6 mm appears to be abnormal. To measure tear break up time, an impregnated fluorescein strip was put in the inferior fornix and hydrated with non-preserved saline. After being instructed to blink three times, the patient was instructed to look straight ahead without blinking. Under wide beam illumination, the tear film will be examined using a cobalt blue filter and a slit lamp biomicroscope. TBUT is the measurement of the time interval between the last blink and the onset of the first corneal dry spot. A value of less than ten seconds will be considered unusual.

One of the main outcome variables was dry eye. Three secondary outcome variables were taken into consideration: tear meniscus height, Schirmer's test, and tear breakup time. Major explanatory variables included gender and age. For categorical variables, frequency and proportion were used in the descriptive analysis, and for quantitative variables, mean and standard deviation. Relevant diagrams, such as pie charts and bar charts, were also used to represent the data. Released in 2020 by BDSS Corp. Software for Co Guide Statistics, Version 1.0, India: BDSS corp.

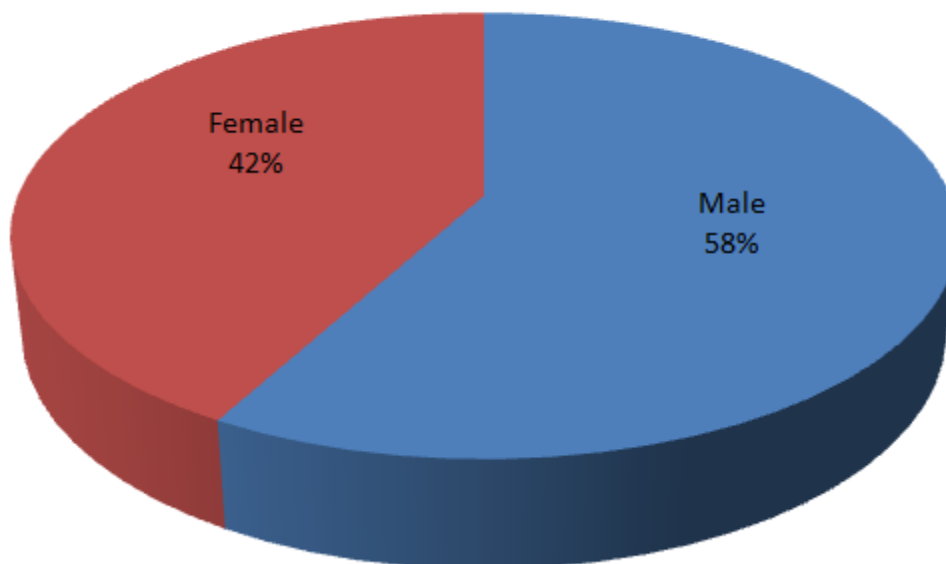
RESULT

The final analysis covered 50 participants in total. The study population's mean age was 62.78 ± 9.68 years. There were 29 (58%) males and 21 (42%) females in the study population (Figure 1). Of the 25 patients, the majority of them had POAG (23); 16 was PACG; 2 had secondary open angle glaucoma; 3 have secondary angle closure glaucoma; 10 suffered normal tension glaucoma; and 1 suffered neovascular glaucoma. Patients who underwent examinations were monitored on a regular basis for a year. The American Academy of Ophthalmology's Cornea/External Disease 2020–2021 BCSC Basic and Clinical Science Course is used to grade the severity of dry eye.

11244



Male- Female Ratio



11245

DISCUSSION

Four clinical tests were used in this study to evaluate dry eye disease in glaucoma patients using topical hypotensive drops: Schirmer's tests I and II, tear meniscus height, and tear break up time. The age ranged from 45 to 87 years old, with a mean \pm SD of 62.78 ± 9.68 . The majority of individuals in our study

have moderate dry eyes, which are followed by mild and severe dry eyes. The percentage of abnormal tests in the glaucoma group was higher than in the control group (corneal staining, 63% vs. 36%, $p = 0.004$; Schirmer, 39% vs. 25%, $p = 0.049$), according to a study by Ramli et al. that these data are compared with⁷.

Tear Meniscus Height (mm) in both eyes		
TMH	Right eye (48)	Left eye (40)
Abnormal (< 0.25mm)	31 (64.5 %)	30 (75 %)
Normal (> 0.25 mm)	17 (34.3 %)	10 (25 %)

Schirmer's Test I (mm) in Right eye		
Schirmer test - I	Frequency	Percentage
Normal	5	10.4 %



Mild dry eye	12	25 %
Moderate dry eye	27	56.2 %
Severe dry eye	4	8.3 %

Schirmer's Test I (mm) in Left eye		
Schirmer test - I	Frequency	Percentage
Normal	6	15 %
Mild dry eye	7	17.5 %
Moderate dry eye	23	57.5 %
Severe dry eye	4	10 %

Schirmer's Test II (mm) in Right eye		
Schirmer test - II	Frequency	Percentage
Normal	11	23 %
Abnormal	37	77 %

Schirmer's Test II (mm) in Left eye		
Schirmer test - II	Frequency	Percentage
Normal	8	20 %
Abnormal	32	80 %

11246

Age-related dry eye syndrome is caused by changes in the lacrimal glands associated with aging in healthy persons, such as periductal fibrosis, interacinar fibrosis, and acinar cell atrophy. These alterations interrupt tear dynamics⁸. Glaucoma is chronic disease require long term treatment with antiglaucoma medications. The mechanisms behind dry eye in glaucoma patients most likely involve a combination of increased tear evaporation from dysfunctional Meibomian glands and lacrimal glands and decreased tear production as a result of persistent irritation, which is made worse by topical anti-glaucoma drugs⁹. Benzalkonium chloride (BAK), an ammonium chemical that is the most widely used preservative in antiglaucoma drugs, alters the ocular surface by decreasing the stability of the precorneal tear layer and also reduces the density of goblet cells¹⁰.

A research by Camp et al. 11 also found that taking more glaucoma drugs made the dryness in the eyes worse, which decreased quality of life. Prolonged antiglaucoma medicine use causes corneal epithelium disruption and corneal sensitivity loss, which in turn causes tear film disruption and mucus,

aqueous, and lipid layer thinning¹². Quality of life (QOL) can be negatively impacted by ocular surface disorders in glaucoma patients by decreasing medication compliance¹³. These results can be explained by the possibility of increased adverse effects, which may depend on drug quantity and dose, on the ocular surface and the quality of the tear film caused by the drugs and/or their preservative (BAC)^{14,15}.

Therefore, we may conclude that anti-glaucoma medicine produces changes in the ocular surface that result in dry eye based on our findings and those study reports. These results suggest that, in order to reduce the negative effects of antiglaucoma eye drops on the ocular surface, preservative-free regimens or tear substitutes should be used. It's crucial to take DED examination into account while treating glaucoma because of the risks for DED associated with aging and ocular drugs.

CONCLUSION

The patients on topical antiglaucoma medications with preservatives are more prone to develop dry eye accounting for 84.49%.



REFERENCES

1. Baudouin C, Pisella PJ, Fillacier K, Goldschild M, Becquet F, Jean MDS, et al. Ocular surface inflammatory changes induced by topical antiglaucoma drugs: human and animal studies. *Ophthalmology*. 1999;106(3):556–63.
2. Maurya RP. Dry eye disease: An overview. *Indian J Clin Exp Ophthalmol*. 2018;4(4):433–4.
3. Actis AG, Rolle T. Ocular surface alterations and topical antiglaucomatous therapy: a review. *Open Ophthalmol J*. 2014;8:67– 72.
4. Kastelan S, Tomic M, Soldo K, Salopek-Rabatic J. How Ocular Surface Disease Impacts the Glaucoma Treatment Outcome. *Biomed Res Int*. 2013;2013:696328. doi:10.1155/2013/696328.
5. Wong ABC, Wang MTM, Liu K, Prime ZJ, Danesh-Meyer HV, Craig JP. Exploring topical anti-glaucoma medication effects on the ocular surface in the context of the current understanding of dry eye. *Ocul Surf*. 2018;16(3):289–93.
6. Brjeschii VV, Radhuan M. Glaucomul s,i Sindromul de Ochi Uscat. *Inf Oftalmol*. 2014;7(2):37–49.
7. Ramli N, Supramaniam G, Samsudin A, Juana A, Zahari M, Choo MM. Ocular surface disease in Glaucoma: effect of polypharmacy and preservatives. *Optom Vis Sci*. 2015;92(9):222–6.
8. 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.
9. Nijm LM, Benito-Llopis LD, Rossi GC, Vajaranant TS. Understanding the Dual Dilemma of Dry Eye and Glaucoma: An International Review. *Asia Pac J Ophthalmol (Phila)*. 2020;9(6):481– 90.
10. Erb C, Gast U, Schremmer D. German register for glaucoma patients with dry eye. I. Basic outcome with respect to dry eye. *Graefes Arch Clin Exp Ophthalmol*. 2008;246(11):1593–601.
11. Camp A, Wellik SR, Tzu JH, Feuer W, Arheart KL, Sastry A, et al. Dry eye specific quality of life in veterans using glaucoma drops. *Cont Lens Anterior Eye*. 2015;38(3):220–5.
12. Wong TT, Zhou L, Li J, Tong L, Zhao SZ, Li XR, et al. Proteomic profiling of inflammatory signaling molecules in the tears of patients on chronic glaucoma medication. *Invest Ophthalmol Vis Sci* . 2011;52(10):7385–91.
13. Stringham J, Ashkenazy N, Galor A, Wellik SR. Barriers to glaucoma medication compliance among veterans: dry eye symptoms and anxiety disorders. *Eye Contact Lens*. 2018;44(1):50–4.
14. Kaštelan S, Tomic M, Soldo KM, Salopek-Rabatic J. How ocular surface disease impacts the Glaucoma treatment outcome. *Biomed Res Int*. 2013;2013:696328. doi:10.1155/2013/696328.
15. Chen H, Lin C, Tsai Y, Kao C. Association between Glaucoma medication usage and dry eye in Taiwan. *Optom Vis Sci*. 2015;92(9):227–32

