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RESEARCH ARTICLE

"PREVALENCE OF DRY EYE IN PATIENTS ON ANTIGLAUCOMA MEDICATION AND EFFECT WITH DURATION OF THERAPY"

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Abstract

Introduction: Anti-glaucoma drug therapy is the most effective initial treatment for glaucoma, an ocular neuropathy that progresses over time. Chronic or long duration of use of antiglaucoma medications may result in changes to the ocular surface, including altered tear breakup times, decreased tear output, and corneal and conjunctival epithelium alterations .

Aim: To study prevalence of dry eyes in patients using topical anti glaucoma medications.

Methodology: This was a prospective observational study at the Department of Ophthalmology, JNU Medical College, Jaipur, Rajasthan, India July 2022- June 2023 on 150 patients using anti-glaucoma medication for more than 6 months were taken.

Results: The prevalance of dry eye among study subjects at 3 months, 6 months and 12 months of follow up was 24%, 52.7% and 60.7% respectively in both the eyes.

Conclusion: Glaucoma affects large population worldwide, and long-term use of anti-glaucoma medications can negatively impact the surface of eye and may affect the patients vision. Understanding the pathogenesis of OSD and identifying its risk factors will improve patient care along with strategies to diagnose and treat and maintain homeostasis of ocular surface.

Introduction:-

A class of ocular neuropathies known as glaucomas is defined as the gradual degenerative changes of the retinal ganglion cells. They are the neurons of central nervous system, with cell bodies present in the inner retina and axons present in the optic nerve. The optic disc's distinctive appearance, cupping, and vision loss are caused by the degeneration of these nerves.[1]

Glaucoma is the most common cause of permanent blindness in the world, affecting over 70 million people globally and resulting in 10% of cases in bilateral blindness.[2]

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It is highly likely that the number of people actually affected by glaucoma is far larger than the number of people who are diagnosed to have it as it can remain undetected until it is of an higher severity. According to population-level surveys, only between 10% and 50% of glaucoma patients are aware that they have the condition. [3,4]

Open-angle and angle-closure are the two main types of glaucomas. Open-angle glaucoma accounts for over 80% of instances in the US, while a dissimilar percentage of patients have significant visual loss because of angle-closure glaucoma. [5] Angle-closure and open-angle glaucoma are both possible main conditions. Trauma, inflammation, tumors, or disorders such as pigment dispersion or pseudoexfoliation and peculiar drugs like corticosteroids can lead to secondary glaucoma.[6]

Anti-glaucoma drug therapy is the most effective initial treatment for glaucoma, an ocular neuropathy that progresses over time. Long-term topical medication therapy is necessary for glaucoma patients in order to reduce intraocular pressure. Beta blockers, carbonic anhydrase inhibitors , prostaglandin analogs, and alpha agonists are among the topical medications. Chronic or long duration of use of these medications may result in changes to the ocular surface, including altered tear breakup times, decreased tear output, and corneal and conjunctival epithelium alterations. In glaucoma patients, the active components and preservatives in these drugs can result in structural alterations to the meibomian gland as well as long-term irritation of the ocular surface.[7]

One of the major prevalent condition impacting the general public is dry eye syndrome, which can result in issues ranging in severity from moderately irritating to incapacitating. The state of the front of the eye following a breakdown in the tear film, the natural coating of tears that covers the front of the eye, is referred to as dry eye syndrome. Normally, this layer of tears is uniform and stable, protecting the cornea and conjunctiva from harm if they are continuously exposed to the air. It also contributes significantly to the eye's focusing power because of the interface between the tear film and the air. Unhealthy tear films degrade in various locations on the cornea and conjunctiva, resulting in unstable and sporadically shifting vision in addition to irritated symptoms. [8]

Ocular surface disease (OSD) associated with glaucoma is a common, complex, and visually prominent ocular co-morbidity. Nonetheless, G-OSD's contribution to the continuing , successful handling of glaucoma is usually overlooked. The ophthalmic community is only now starting to pay attention to the notable impact of a deteriorated ocular surface on ocular structures and the impact on quality of life (QOL), despite the well-known dire consequences of unseemly high intraocular pressure (IOP) and permanent blindness associated with glaucoma. [9]

All one needs to do is look at the utility score of dry eye syndrome (DES) to understand how it affects people in the "real world." Utility scores measure the number of years a patient will forfeit before passing away in order to avoid a particular disease. The utility scores for angina and dialysis are similar to those for moderate to severe DES. [10]

It should be mentioned that the high prevalence of mood disorders, anxiety, and depression that both DES and glaucoma are linked to is more evidence of this. Additionally, the significant economic, social, and public health cost of these diseases is increased when people with glaucoma also experience symptoms of dry eyes. [11]

According to a recent article, there was a large economic burden associated with significant dry eye illness, which affected 39% of glaucoma patients in Australia. Furthermore, it is often known that a loss in productivity at work occurs when dry eye becomes severe. [12]”

These two major ocular comorbidities are widely prevalent, as evidenced by a thorough assessment of the literature, which also highlights the significance of early detection and treatment. The purpose of this study is to evaluate the alterations in the tear film in individuals utilizing various topical anti-glaucoma medications using the Schirmer's test, Tear Breakup Time, and Rose Bengal staining.

Aims and Objective:-

To study prevalence of dry eyes in patients using topical anti glaucoma medications.

Materials and Methods:-

This was a prospective observational study at the Department of Ophthalmology, JNU Medical College, Jaipur, Rajasthan, India July 2022- June 2023 on 150 patients using anti-glaucoma medication for more than 6 months were taken.

Results:-

Table 1:- Age distribution of study subjects.

Age group (years)	Number of patients	Percentage
40-49 years	74	49.3
50-59 years	42	28
60-69 years	34	22.7
Total	150	100
Mean ± SD	52.15± 9.34 years	

Graph 1.

In present study the mean age ± SD of age of patients was 52.15 ± 9.34 years.

In present study out of 150 patients 74 patients (49.3%) belonged to 40-49 years age group, 42 patients (28%) belonged to 50-59 years, and 34 patients(22.7%) belonged to 60-69 years.

Table 2:- Gender distribution of study subjects.

Gender	Number of patient	Percentage
Male	94	62.7
Female	56	37.3
Total	150	100

Graph 2

In present study out of 150 patients of glaucoma 56(37.3%) were females and 94(62.7%) were males

Table 3:- Distribution of study subjects according to anti glaucoma drugs.

Anti glaucoma drugs	Number of patients	Percentage
Alpha-2 Agonist (Brimonidine)	18	12
Beta Blockers (Timolol)	26	17.3
Carbonic Anhydrase Inhibitor (Dorzolamide)	13	8.7
PG Analogues (Travoprost)	37	24.6
RHO-Kinase (Netarsudil)	13	8.7
Beta Blockers (Timolol)+ Alpha-2 Agonist (Brimonidine)	25	16.7
Beta Blockers (Timolol)+Carbonic Anhydrase Inhibitor (Dorzolamide)	18	12
Total	150	100

Graph 3

Out of 150 patients 18 patients were on Alpha-2 Agonist (Brimonidine), 26 patients were on Beta Blockers (Timolol) , 13 patients were on Carbonic Anhydrase Inhibitor (Dorzolamide) , 37 patients were on PG Analogues (Travoprost) , 13 patients were on on RHO-Kinase (Netarsudil) , 25 patients were on Beta Blockers (Timolol)+ Alpha-2 Agonist (Brimonidine) and 18 patients were on Beta Blockers (Timolol)+Carbonic Anhydrase Inhibitor (Dorzolamide).

Table 4:- Prevalance of dry eye among study subjects.

Time	Right eye (N=150)		Left eye (N=150)	
	N	%	N	%
3 month	36	24	36	24.0
6 month	79	52.7	79	52.7
12 month	91	60.7	91	60.7

Graph 4
Above table and graph shows that prevalance of dry eye among study subjects at 3 months, 6 months and 12 months of follow up was 24%, 52.7% and 60.7% respectively in both the eyes.

Table 5:- Prevalance of dry eye in relation to anti glaucoma drugs.

Anti glaucoma drugs	3 month		6 month		12 month	
	Number of patients	%	Number of patients	%	Number of patients	%
Alpha-2 Agonist (N=18)	6	33.3	6	33.3	6	33.3
Beta Blockers (N=26)	6	23.1	18	69.2	18	69.2
Carbonic Anhydrase Inhibitor (N=13)	0	0.0	6	46.2	6	46.2
PG Analogues (N=37)	0	0.0	6	16.2	12	32.4
RHO-Kinase (N=13)	0	0.0	0	0.0	6	46.2
Beta Blockers + Alpha-2 Agonist (N=25)	12	48.0	25	100.0	25	100.0
Beta Blockers +Carbonic Anhydrase Inhibitor (N=18)	12	66.7	18	100.0	18	100.0
P value	**<0.001 (S)**		**<0.001 (S)**		**<0.001 (S)**	

Graph 5
Above table and graph showing the prevalance of dry eye among study subjects at 3 months, 6 months and 12 months of follow up in both the eyes in different drug groups.

Table 6:- Change in OSD score from Baseline to 12 months.

Time	OSD (mean ± SD)	P value
Baseline	5.92 ± 0.57	
3 month	8.92 ± 0.91	**<0.001 (S)**
6 month	11.57 ± 1.56	
12 month	14.19 ± 1.81	

Graph 6
The mean OSD at baseline, 3 months, 6 months, and 12 months was 5.92 ± 0.57, 8.92 ± 0.91,11.57 ± 1.56 and 14.19 ± 1.81 respectively.

Discussion:-

Glaucoma treatment requires lifetime monitoring. Medical management is the first line of treatment in Primary Open-Angle Glaucoma (POAG). The most prevalent form of treatment for glaucoma is topical antiglaucoma medications, which are used often for extended periods of time and at different dosages. Along with treatment, these medications may cause adverse effects such allergic reactions, OSD, tear film abnormalities, corneal epitheliopathy, punctate epitheliopathy, medically resistant herpetic keratitis, chronic inflammation, and impaired wound healing.[13]

OSD may cause glaucoma treatment to be ineffective due to non compliance, resulting in irreversible damage to eyes. Relatively few studies have been performed in past to evaluate the changes in tear film in patients who are using topical anti glaucoma medication and to study severity of dry eye in patients using topical anti glaucoma medication. The present study was conducted on 150 patients on Anti glaucoma drugs visting in Opthamology OPD, JNU Medical College and Hospital, Jaipur, Rajasthan, India.

In present study the mean age of the study population was 52.15 ± 9.34 years. In a similar study **Batra R, et al.** in their study reported that the mean age was 47.01 ± 11.43 years. [14] In a similar study **Saini et al.** reported the mean age of their study patients were 49.42 ± 16.98 (range, 22-75) years. [15] **Zulfiqar, et al.**in their study found that the mean age of the patients was 50.76 ± 15.67 years which is comparable with our results.[16]

In present study out of 150 patients of glaucoma 56(37.3%) were females and 94(62.7%) were males. **Batra R, et al.** in their study found that the male patients were 62.4%and female patients were 537.6 %) having male to female ratio was 1.6:1 which is comparable with present study.[14] **Sahlu and Giorgis, et al.** in their study found that the reported the male to female ratio was 1.12 : 1.[17]
The most important component of OSD is dry eye syndrome. Various factors leads to dry eye and ocular surface that is related with distress, visual disturbance and have a potential to harm the ocular surface. In present study prevalance of dry eye among study subjects at 3 months, 6 months and 12 months of follow up was 24%, 52.7% and 60.7% respectively in both the eyes which demonstrates that incidence of dry eyes increases with increased duration of anti-glaucoma drugs.

Batra R, et al. in their study found that the prevalance of dry eyes increases with increased duration of anti-glaucoma drugs which is consistent with results of present study.[14] The most frequent adverse effect of anti-glaucoma medications is dry eye, the severity of which varies depending on the kind and length of topical anti-glaucoma treatment used. It is imperative to attend to the disease's propensity, which can vary from minor dry eye to ocular discomfort that interferes with daily activities.[18]

In present study it was found that combination therapy leads to higher increase in prevalance of dry eye as compared to monotherapy of anti-glaucoma medications. **Tachkov K et al.** in their study found that combination therapy leads to higher increase in incidence of dry eye as compared to monotherapy of anti-glaucoma medications which is consistent with results of present study.[19] Considering that dry eye syndrome is a consequence of glaucoma , especially with regard to treatment selection the doctor should be on the side of caution when prescribing medicine , specially for elderly patients. Future cost savings from preventing the onset of dry eye might be beneficial if the condition worsens.

In present study mean OSD at baseline, 3 months, 6 months, and 12 months was 5.92 ± 0.57, 8.92 ± 0.91,11.57 ± 1.56 and 14.19 ± 1.81 which indicates that OSD score increased with increased duration of anti-glaucoma treatment. **Batra R, et al.** in their study reported that the mean OSD score increased with increased duration of anti-glaucoma treatment which is consistent with results of present study.[14] **Aydin Kurna S, et al.** in their study reported that the mean OSD score increased with increased duration of anti-glaucoma treatment which is consistent with results of present study.[20] **Sahlu M, et al.** in their study reported that the mean OSD score increased with increased duration of anti-glaucoma treatment which is consistent with results of present study.[17]

Conclusion:-

Glaucoma affects large population worldwide, and long-term use of anti-glaucoma medications can negatively impact the surface of eye and may affect the patients vision. Understanding the pathogenesis of OSD and identifying its risk factors will improve patient care along with strategies to diagnose and treat and maintain homeostasis of ocular surface. Treatment of glaucoma, a chronic, vision-impairing disease, requires constant monitoring and close monitoring. Good management of OSD improves long-term visual outcomes and also compliance of patients, quality of life and patient satisfaction is improved.

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