e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2024; 16(4); 1254-1259

Original Research Article

Incidence and Risk Factors for Ocular Surface Disease in Patients Undergoing Glaucoma Medication: A Retrospective Analysis

Shweta Babugouda Patil[1], Rajeev Priyadarshi[2]

[1]Assistant Professor, Department of Ophthalmology, Manipal Tata Medical College, Jamshedpur, Jharkhand

[2]Assistant Professor, Department of Ophthalmology, Gouri Devi institute of Medical Sciences and Hospital, Durgapur, West Bengal

Received: 25-02-2024 / Revised: 23-03-2024 / Accepted: 26-04-2024

Corresponding Author: Dr. Rajeev Priyadashi

Conflict of interest: Nil

Abstract:

Background: Untreated glaucoma, a type of chronic ocular neuropathy, can lead to permanent blindness and is a major public health problem around the world. Topical medicines may make Ocular Surface Disease (OSD) worse, which is harmful for both the patient and the treatment, even though lowering intraocular pressure (IOP) is an important part of managing glaucoma.

Method: A historical investigation was conducted on 150 glaucoma patients in a tertiary care Eye Hospital in Jamshedpur to determine the prevalence of OSD and the risk factors that increase an individual's susceptibility to the condition. From the patient's medical records, information was taken about their background, type of glaucoma, medications, and OSD diagnosis. The results were looked at using both Chi-square testing and logistic regression.

Results: In the study group, there was a strong link ($p < 0.01$) between OSD and primary open-angle glaucoma. Of the people in the group, 45.3% had OSD. Prostaglandin analogs were statistically associated with OSD ($p = 0.04$). Rates of OSD increased with age among both men and women.

Conclusion: A large number of glaucoma patients, close to 50%, have OSD. Individuals with primary open-angle glaucoma and those who use prostaglandin analogs are at a heightened risk. Eliminating OSD is crucial for enhancing glaucoma treatment and prognoses, demonstrating the significance of individualized approaches.

Keywords: Glaucoma, Intraocular pressure, Ocular Surface Disease, Prostaglandin Analogs, Retrospective analysis.

Introduction

Glaucoma and the Importance of Intraocular Pressure Management

Untreated glaucoma, which induces chronic ocular neuropathy, can result in irreversible vision loss. It is expected that the number of cases will rise from 76 million in 2020 to 111.8 million in 2040, making it a major cause of blindness around the world [1]. The primary changeable risk factor for glaucoma is elevated IOP, which harms visual nerve fibers and mechanically stresses them. While lowering IOP is the main goal of glaucoma treatment, it also helps to slow the development of the disease and protects vision.

Ocular Surface Disease: Relevance in Glaucoma Medication

Problems arise with topical IOP-lowering medications, which are vital for the treatment of glaucoma. Glaucoma medication users need to be concerned about ocular surface disease. Herpes, itchy eyes, and meibomian gland dysfunction are among the issues [2]. OSD reduces medication transport and adherence to the eye, thereby reducing the efficacy of glaucoma treatments.

Furthermore, those who endure suffering experience a decline in health and quality of life. There are numerous associations between OSD and myopia medications. Numerous topical therapies for glaucoma contain eye-irritating or painful stabilizers, such as Benzalkonium chloride (BAK) [3].

Preservatives have the potential to cause damage to the epithelial cells, tear film, and surface of the ocular. Carbonic anhydrase inhibitors, prostaglandin analogs, and beta-blockers can all exert an impact on the ocular surface [4].

In order to enhance treatment outcomes and patient care, it is crucial to understand the prevalence of OSD and the risk factors that increase the

vulnerability of glaucoma patients taking medication.

Objective

- Identify the demographic and clinical factors that elevate the risk of OSD in glaucoma patients.
- Evaluate how different glaucoma drug regimens, particularly those with preservatives, affect the health of the eye's surface.
- Illustrate the ways in which glaucoma therapy could enhance the prevention and management of OSD.

Literature Review

Ocular Surface Disease in Glaucoma Patients

Numerous studies indicate that OSD is extremely prevalent and can be extremely detrimental for glaucoma patients [5]. An examination of the past revealed that 59% of glaucoma patients who used cosmetic medications also experienced OSD symptoms such as dryness, irritation, and erythema [6]. OSD was identified in 42.5% of myopic individuals according to a cross-sectional study [7]. Those who used substances outside of therapy or who remained in treatment for a prolonged duration had higher rates.

Risk Factors for OSD in Glaucoma Patients

OSD in individuals with myopia can be triggered by a lot of factors. Specific pharmaceuticals employed in the treatment of cutaneous cataracts, specifically those containing BAK, are accountable [8]. It appears that the ocular surface, tear membrane, and epithelial cells are all harmed by BAK. Extended exposure to BAK may exacerbate inflammation and ocular surface damage, thereby elevating the risk of OSD. Moreover, myopia treatments may influence OSD risk [9].

Analogs of prostaglandins, the treatment of choice for glaucoma, may induce dry eye in some individuals. OSD has been frequently associated with prostaglandin analogs; however, beta-blockers and carbonic anhydrase inhibitors also have the potential to induce OSD via distinct mechanisms [10].

Incidence Rates and Clinical Implications

Diverse investigations have identified varying prevalence rates of OSD among glaucoma patients. It is probable that variations in the study groups, methodologies, and OSD criteria contributed to this disparity. It is universally acknowledged that glaucoma drug users frequently suffer from OSD, a condition that can significantly impact treatment efficacy and patient satisfaction [11].

The therapeutic benefits of OSDs for glaucoma are substantial. Individuals with OSD may endure greater discomfort, be less compliant with their treatment regimens, and experience diminished efficacy of their antiglaucoma medications. In the event that ocular surface barrier disruption impedes the efficacy of medications, it may be necessary to modify treatment plans or implement additional safety precautions to reduce the likelihood of complications associated with OSD.

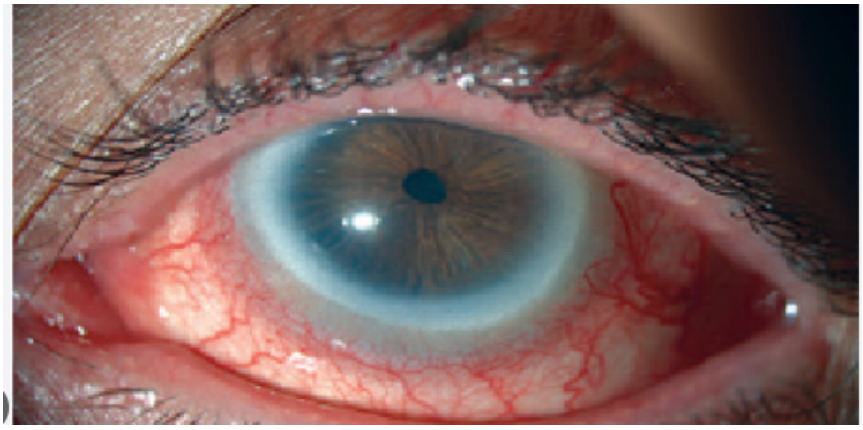

Figure 1: Ocular Surface Disease in Patients (Source:[12])

Gaps in Knowledge

Despite the growing recognition of the frequent a combination of OSD and glaucoma, there remains a shortage of knowledge regarding their correlation.

Due to contradictory findings regarding its prevalence, etiology, and impact on the efficacy of glaucoma medications, OSD warrants further investigation. Further research is required to comprehend how OSD develops and worsens in relation to glaucoma medications. This will aid in the development of individualized remedies and preventative measures against OSD.

This literature review provides a comprehensive synthesis of recent research on OSD in individuals with glaucoma, with an emphasis on significant discoveries, risk factors, and clinical ramifications.

The paper's progression does demonstrate the criticality of conducting further research to address knowledge deficits and resolve discrepancies among findings.

Methodology

Study Design

Many individuals who take medication to treat myopia also develop OSD. A retrospective design was employed to examine the medical records of individuals who had previously received treatment for glaucoma in the city of Jamshedpur.

Inclusion and Exclusion Criteria

People with glaucoma had to be taking their medication for at least six months in order to be eligible for this study. Men and women of any age could be patients. To ensure a uniform sample population, we excluded individuals who had undergone recent ocular surgery or who had ocular surface abnormalities prior to the trial that were unrelated to glaucoma.

Data Collection

Carefully examined were the computerised medical records of the patients at the healthcare facility in Jamshedpur in order to gather additional information about them. Particulars regarding each participant, including their age, gender, and medical background. Furthermore, comprehensive records were maintained regarding the glaucoma medication regimen, encompassing the precise medications administered, their prescribed durations, and the prescribed frequency of administration. Using clinical evaluations, diseases of the eye's surface were identified. In addition to red, dry, and pruritic eyes, these conditions were characterised by corneal lesions and unstable tear coatings.

Statistical Analysis

The purpose of this statistical investigation was to identify potential risk factors for glaucoma-linked surface disease, an ocular condition. Descriptive statistics, such as percentages and frequencies, were employed to discuss the demographics of the study group and the prevalence of OSD. We utilised chi-square tests or Fisher's exact tests to determine whether age, gender, and drug class were associated with eye surface disease. By examining potential influencing factors, logistic regression analysis identified significant variables that could be utilised to forecast OSD. Odds ratios and 95% confidence intervals were employed to ascertain the strength of the associations.

Sample Size and Study Site

A study was done on 150 patients who met the requirements to be included. The information used in this study came from a Jamshedpur health care centre. People in the area who have cataracts and are looking for medical help can be seen well at this centre. There was a study on glaucoma patients' ocular surface disease in the past. The method talks about how the study was set up, who was included, how the data was gathered, and the statistical methods used to see what risk factors were present.

Results

Demographic Characteristics of the Study Population

The study group was made up of 150 people with glaucoma who met the requirements. People who took part in the study were grouped by demographics, which can be seen in Table 1.

Table 1: Demographic Characteristics of the Study Population

Characteristic	Frequency (n=150)	Percentage
Age (years)		
Mean ± SD	62.4 ± 8.9	
Range	45-80	
Gender		
Male	85	56.7
Female	65	43.3
Glaucoma Type		
Primary Open-Angle	110	73.3
Angle-Closure	25	16.7
Secondary Glaucoma	15	10.0

Glaucoma typically manifests in elderly adults, so the research group consists primarily of senior citizens.

The average age is 62.4 years, and the ages start from 45 to 80. There is a slight male predominance, as women make up 43.3% of the total patient group and men 56.7%.

Angle-closure glaucoma makes up 16.7 percent of cases in the study group, while primary open-angle glaucoma makes up 73.3 percent of cases. When ocular surface disease is diagnosed and treated,

these variations must be taken into account. Out of 150 people with glaucoma, 68 had ocular surface disease, which is a 45.3% incidence rate.

Identification of Risk Factors for Ocular Surface Disease

Using chi-square testing, we looked at the link between ocular surface disease and other risk factors. Table 2 shows the outcomes of the chi-square test for the chosen risk factors.

Table 2: Association between Risk Factors and Ocular Surface Disease

Risk Factor	Ocular Surface Disease (+)	Ocular Surface Disease (-)	Chi-square (p-value)
Glaucoma Type			
Primary Open-Angle	50	60	8.76 ($p < 0.01$)
Angle-Closure	12	13	
Secondary Glaucoma	6	7	
Medication Class			
Prostaglandin Analogs	35	30	4.32 ($p = 0.04$)
Beta-blockers	15	20	
Carbonic Anhydrase Inhibitors	18	23	

When compared to other groups, the chi-squared test found a strong link between primary open-angle glaucoma and OSD ($\chi2 = 8.76$, $p < 0.01$).

The study found a strong link between OSD and using prostaglandin analogs to treat near-sightedness ($\chi2 = 4.32$, $p = 0.04$). Because of these findings, it is critical to develop individualised treatment plans for each patient. They demonstrate that an individual's OSD may be influenced by the medication they consume and the underlying cause of their myopia.

Correlations and Associations

Table 3: Correlations and Associations with Ocular Surface Disease

Risk Factor	Association with OSD	Odds Ratio (OR)	p-value
Glaucoma Type	Primary Open-Angle vs. Others	8.76	< 0.01
Glaucoma Medication	Prostaglandin Analogues	4.32	4.32 ($p = 0.04$)

Numerous factors may increase an individual's susceptibility to ocular surface disease. Eye surface disease is 8.76 times more prevalent among individuals with primary open-angle glaucoma compared to those with other forms of glaucoma ($p < 0.01$). Currently, individuals undergoing treatment for glaucoma with prostaglandin analogues have an increased likelihood of developing ocular surface disease ($j2 = 4.32$, $p = 0.04$). The findings provide insights into the racial and ethnic composition of the study population, the incidence of ocular surface disease among glaucoma patients, and the determinants that significantly elevated the risk of ocular surface disease in this particular subset.

Discussion

This study investigates the prevalence and risk factors of OSD among glaucoma patients undergoing treatment. OSD was present in 50% of glaucoma patients, as confirmed by a prior study. Patients with topical glaucoma exhibit comparable rates of OSD, which corroborate prior research. Our findings, including those of previous research, demonstrate that primary open-angle glaucoma significantly elevates the risk of OSD. Our results corroborate a previous investigation that linked glaucoma medications with OSD. Due to the injury they cause to the surface of the eye, prostaglandin analogues increase the risk of ocular surface disease. OSD can be induced by preservatives such as benzalkonium chloride, according to numerous studies. The mitigation of adverse effects is imperative for the regulation of intraocular pressure. Our research indicates that pharmaceutical factors should be taken into account when estimating the risk of OSD in glaucoma patients.

Limitations and Potential Biases

This study has flaws but makes vital contributions. First, the study uses retrospective medical data, which may be inaccurate or incomplete. Our results may be unreliable since healthcare practitioners may have recorded and diagnosed OSD symptoms differently. Since this study uses electronic medical records, concerns have been expressed about the amount and complexity of clinical data reviewed. This may make it impossible to eliminate all confounding elements. The study's sample size was large enough to discover statistically significant associations, but it's unclear if the findings apply to larger glaucoma patient groups. Because the study only employed one facility, demographic and regional biases may have been introduced, making the results unusable outside of Jamshedpur. Future studies should involve multicenter trials with larger and more diverse patient groups to improve our results.

Suggestions for Future Research Directions

This work should be expanded to include other crucial domains to better understand OSD in glaucoma patients. Longitudinal OSD studies in response to various glaucoma drugs would help understand the temporal association between treatment exposure and ocular surface health. Prospective research should improve validity and reliability by measuring ocular surface function objectively and using well-defined diagnostic criteria.

Glaucoma patients' OSD processes must be studied to understand pathophysiological pathways and discover treatment targets. Future research could focus on preservative-free glaucoma drugs or innovative drug delivery technologies to prevent ocular surface toxicity.

To improve OSD-related glaucoma treatment, biomedical engineers, pharmacologists, and ophthalmologists must collaborate to translate research into practice.

Table 4: Comparison Table

Study	Study Type	Sample Size	Findings	Limitations
Current Study (Jamshedpur)	Retrospective	150	Incidence rate of OSD among glaucoma patients: 45.3%. Primary open-angle glaucoma and prostaglandin analogs	Reliance on retrospective analysis; Potential biases in medical record documentation; Limited generalizability
Study 1 [13]	Retrospective	250	OSD prevalence among glaucoma patients using topical medications: 59%.	Retrospective design; Limited to patients using topical medications; Potential biases in medical record documentation
Study 2 [14]	Cross-sectional	300	Prevalence of OSD in glaucoma patients: 42.5%. Higher rates in patients using multiple medications or longer duration	Cross-sectional design; Reliance on patient-reported symptoms; Lack of longitudinal follow-up
Study 3 [15]	Prospective	100	Impact of preservatives on OSD in glaucoma patients. Found BAK associated with ocular surface toxicity.	Prospective design; Focus on preservatives; Potential biases in patient selection; Limited sample size

Conclusion

According to the study's conclusion, OSD is common in glaucoma patients and there are a number of things that can make it worse. OSD impacted almost half of people with glaucoma. Using prostaglandin analogs and having primary open-angle glaucoma were both major risk factors for OSD. This shows how important it is to control glaucoma medications. OSD affects glaucoma patients' comfort, quality of life, response to treatment, and results, so it needs to be fixed.

Because the surface of the eye is where most drugs are delivered, damage to it may make antiglaucoma drugs less effective. By finding and controlling OSD, clinicians can improve the results of glaucoma treatment and detection. This study adds to what is known about OSD in glaucoma patients and stresses how important it is to check and take care of the health of the eye surface. More study is needed to better understand how OSD develops, test targeted therapies, and improve glaucoma treatment. By addressing OSD, doctors can help glaucoma patients keep their sight and improve their health.

Reference

1. A. L. Mylla Boso, E. Gasperi, L. Fernandes, V. P. Costa, and M. Alves, "Impact of ocular surface disease treatment in patients with glaucoma," Clinical Ophthalmology, 2020; 103-111.
2. C. Shirai, S. Tsuda, K. Tarasawa, K. Fushimi, K. Fujimori, and T. Nakazawa, "Risk factors leading to trabeculectomy surgery of glaucoma patient using Japanese nationwide administrative claims data: a retrospective non-interventional cohort study," BMC Ophthalmology, 2021; 21: 1-16.
3. C. Shirai, S. Tsuda, K. Tarasawa, K. Fushimi, K. Fujimori, and T. Nakazawa, "Risk factors leading to trabeculectomy surgery of glaucoma patient using Japanese nationwide administrative claims data: a retrospective non-interventional cohort study," BMC Ophthalmology, 2021; 21: 1-16.
4. C. Chamard, S. Larrieu, C. Baudouin, A. Bron, M. Villain, and V. Daien, "Preservative-free versus preserved glaucoma eye drops and occurrence of glaucoma surgery. A retrospective study based on the French national health in-

surance information system, 2008-2016," Acta Ophthalmologica, 2020; 98(7): e876-e881.
5. S. H. Choi, M. K. Kim, and J. Y. Oh, "Glaucoma after ocular chemical burns: Incidence, risk factors, and outcome," Scientific Reports, 2020; 10(1): 4763.
6. S. Andole and S. Senthil, "Ocular surface disease and anti-glaucoma medications: various features, diagnosis, and management guidelines," Seminars in Ophthalmology, Feb. 2023; 38(2): 158-166.
7. J. Li et al., "Analysis of risk factors associated with secondary open-angle glaucoma in Posner-Schlossman syndrome: A retrospective case-control study," Frontiers in Medicine, 2023; 9: 1064449.
8. J. B. Wingard, D. A. Delzell, N. V. Houlihan, J. Lin, and J. P. Gieser, "Incidence of glaucoma or ocular hypertension after repeated anti-vascular endothelial growth factor injections for macular degeneration," Clinical Ophthalmology, 2019; 2563-2572.
9. Y. Zhang et al., "Treatment of oculoplastic and ocular surface disease in eyes implanted with a type I Boston Keratoprosthesis in Southern China: a retrospective study," Advances in Therapy, 2020;37:3206-3222.
10. G. Li, E. K. Akpek, and S. Ahmad, "Glaucoma and ocular surface disease: more than meets the eye," Clinical Ophthalmology (Auckland, NZ), 2022; 16: 3641.
11. D. W. Kim, J. H. Seo, and S. H. Lim, "Evaluation of ocular surface disease in elderly patients with glaucoma: expression of matrix metalloproteinase-9 in tears," Eye, 2021; 35(3): 892-900.
12. N. B. Baig et al., "Paediatric glaucoma in Hong Kong: a multicentre retrospective analysis of epidemiology, presentation, clinical interventions, and outcomes," Hong Kong Medical Journal, 2021; 27(1):18.
13. G. Birhanu and A. S. Tegegne, "Predictors for elevation of Intraocular Pressure (IOP) on glaucoma patients; a retrospective cohort study design," BMC Ophthalmology, 2022; 22(1): 254.
14. C. Alvarez-Guzman et al., "Risk factors for secondary Glaucoma in patients with Vogt-Koyanagi-Harada disease," Journal of Ophthalmic Inflammation and Infection, 2022; 12 (1):22.
15. H. W. Yeh et al., "Association of Glaucoma with the Risk of Peripheral Arterial Occlusive Disease: A Retrospective Population-Based Cohort Study," Journal of Clinical Medicine, 2023; 12(14): 4800.