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DRUG UTILIZATION STUDY IN PRIMARY GLAUCOMA PATIENTS ATTENDING OPHTHALMOLOGY DEPARTMENT OF TERTIARY CARE HOSPITAL

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ABSTRACT

Background: Glaucoma, a chronic, progressive, asymptomatic disease. Around the world it is the second most common cause of blindness. It is characterized by raised intra ocular pressure and visual field defects. Early identification and appropriate treatment are crucial to prevent irreversible vision loss. This study hypothesizes that the prescribing pattern and costs of anti-glaucoma drugs significantly influences patient's adherence and treatment outcomes in primary open-angle glaucoma (POAG).

Aims and Objectives: (1) To Determine the Prescribing Pattern of Drugs in Primary Open-Angle Glaucoma. (2) To evaluate the cost of various anti-glaucoma drugs prescribed in primary open-angle glaucoma treatment.

Material and Methods: An open-label, prospective observational study was conducted in the Department of Pharmacology at SRMS IMS after obtaining approval from the institutional ethical committee. A total of 114 prescriptions of patients diagnosed with primary open-angle glaucoma were analyzed. Data collection included patient demographics, drug regimens, frequency of administration, and cost of prescribed medications. The prescribing patterns and cost analysis were evaluated using descriptive statistics, with frequency and percentage used for data analysis.

Results: The study analyzed 114 prescriptions of primary open-angle glaucoma patients, with a majority being male (63.9%) and aged 51-60 years (76.7%). Timolol was the most prescribed monotherapy (29.8%), while Timolol + Brinzolamide was the most common combination therapy (20.2%). Cost and adherence varied, with cheaper drugs requiring frequent dosing, whereas expensive options like Travoprost improved compliance with once-daily use.

Conclusion: Timolol is the most commonly prescribed and cost-effective monotherapy, while combination therapies like Timolol + Brinzolamide are used when monotherapy is inadequate. Cost significantly influences adherence, as cheaper drugs require frequent dosing, whereas expensive options like Travoprost improve compliance with once-daily use. A balance between affordability and effectiveness is crucial for optimal glaucoma management.

KEYWORDS: POAG**,** Drug utilization, Cost-Effectiveness, Monotherapy, Fixed-Dose Combinations

INTRODUCTION

Glaucoma, a chronic, progressive, and often asymptomatic disease, is the second leading cause of blindness worldwide, according to the World Health Organization (WHO) [1]. However, it remains the leading cause of preventable blindness in multiple racial groups [2]. In India, glaucoma is the primary cause of treatable non-reversible blindness [3]. Among its various types, Primary Open Angle Glaucoma (POAG) is the most prevalent, characterized by chronic optic neuropathy with distinct changes in the optic disc and visual field [4]. Several risk factors contribute to POAG, including older age, black race, family history (first-degree relatives), thinner central corneal thickness, myopia, and elevated intraocular pressure (IOP) [5].

In India, approximately 11.2 million individuals aged 40 years and older suffer from glaucoma, with an estimated 6.48 million affected by POAG [6]**.** With the rapidly aging population, this number was projected 112 million by 2040. [7]. Hence, we should consider this disease seriously and make the people aware about the disease, with POAG accounting for 74% of cases [7]. If not considered seriously projections suggesting it may increase to 112 million by 2040. The disease is often referred to as the "sneak thief of sight" because of its insidious onset, making early diagnosis and prompt treatment essential in preventing irreversible visual impairment [8]. Without appropriate management, glaucoma leads to progressive optic nerve damage, resulting in visual disability and eventual blindness [8].

The medical treatment of glaucoma primarily focuses on lowering intraocular tension (IOT) through two mechanisms: (1) decreasing aqueous humor production and (2) increasing its drainage [9]. Various classes of anti-glaucoma drugs are available, including β-blockers, prostaglandin analogs, α-agonists, carbonic anhydrase inhibitors, mannitol, glycerin, and miotics [9]. These drugs are prescribed based on patient acceptability, tolerability, and cost considerations [9]. When a single drug fails to achieve the target IOT, an additional drug with a different mechanism of action is introduced, making fixed-dose combinations (FDCs) a rational and frequently prescribed option [9].

Drug utilization research, as defined by WHO, examines the marketing, distribution, prescription, and use of drugs in society, emphasizing their medical, social, and economic consequences [10]. These studies aim to promote the rational use of drugs and provide valuable insights into optimizing glaucoma management [10]. Given the limited research in India on prescribing trends in glaucoma, this study was undertaken to explore the drug utilization pattern and perform a cost analysis of anti-glaucoma drugs in the outpatient department of a tertiary care specialty teaching hospital [9].

MATERIALS AND METHODS

The study was prospective, open labeled, observational. It was carried out by the department of pharmacology in collaboration with ophthalmology department of a tertiary care teaching hospital. The duration of study was 6 months. Approval was obtained from Institutional Ethical committee prior conducting the study. Continence sampling was adopted fort this study 114 prescriptions of patients with POAG were analyzed. The data was collected from patients of all age groups, of either gender who were diagnosed with POAG by the ophthalmologist and agreed to give information. The data was recorded in a Performa containing Patient's demographic details, provisional/final diagnosis and the complete prescription which included names of prescribed-glaucoma drugs, their dose, frequency, duration, and route of administration.

The Data was analyzed by Microsoft excel version 2011 and all the parameters were expressed in percentage.

SAMPLE SIZE CALCULATION

Estimating a prevalence of **1.2%** with a **±2%** precision at a **95%** confidence level.

Formula Used:

$$\mathbf{n = \frac{Z^2\, P\,(1 - P)}{d^2}}$$

n = Required sample size
Z = Z-score for the desired confidence level (1.96 for 95%)
P = Expected prevalence (1.2% or 0.012 as a proportion)
d = Precision (±2% or 0.02 as a proportion)
For a prevalence of 1.2% with a ±2% precision at a 95% confidence level, a minimum sample size is **114.**

RESULTS

Table 1: Demographic profile

Variable	**No of Patients (N= 114)**
Gender	
Male	73 (63.9%)
Female	41 (36.1%)
Age (Years)	
41-50	27 (23.25%)
51-60	87 (76.74%)

This table represents the demographic profile of a sample size of 114 patients, categorized based on gender and age group while maintaining the same percentage distribution as in the original dataset (N = 114).
Gender Distribution: Male patients: 73 out of 114, (63.9%), Female patients: 41 out of 114, (36%). This indicates that males are the majority in this sample. Age Distribution: 41-50 years: 27 patients (23.25%). 51-60 years: 87 patients (76.74%). The Most common age group belong to the 51-60 years (77%), whereas a smaller proportion aged 41-50 years (23%).

S.no	**Drug Name**	**Frequency (n=114)**	**Percentage (%)**
1	Timolol	34	29.8
2	Brinzolamide	17	14.9
3	Travoprost	06	5.3
4	Brimonidine	13	11.4
5	Ripasudil	03	2.6
6	Timolol + Brinzolamide	23	20.2
7	Timolol+ Dorzolamide	02	1.8
8	Timolol + Brimonidine	03	2.6
9	Timolol + Latanoprost	05	4.4
10	Brinzolamide + Brimonidine	08	7.0

Table 2: Drug Utilization Pattern

A total of 114 prescriptions of primary open angle Glaucoma patients were analyzed. The most commonly prescribed monotherapy was Timolol contributing to 34 cases (29.8%), Timolol + Brinzolamide were most prescribed combination therapy accounting for 23 cases (20.2%) followed by Brinzolamide + Brimonidine accounting for 8 cases (07%). In most of the patient's monotherapy was used, but in patients who didn't respond well to monotherapy FDCs were used.

Drug Class	**Drug Name**	**Strength**	**Dose (Per Eye)**	**Frequency**	**Price / 5ml(Rs)**
Beta-Blockers	Timolol	0.25% or 0.5%	1 drop	Twice Daily	75

Carbonic Anhydrase Inhibitors	Brinzolamide	1%	1 drop	Twice Daily to Thrice Daily	375
Prostaglandin Analogues	Travoprost	0.004%	1 drop	Once Daily (night)	932
Alpha-2 Agonists	Brimonidine	0.1% or 0.15%	1 drop	Twice Daily to Thrice Daily	250
Rho-Kinase Inhibitors	Ripasudil	0.4%	1 drop	Twice Daily	342
Combination Drops					
	Timolol + Brinzolamide	0.5% + 1%	1 drop	Twice Daily	490
	Timolol + Brimonidine	0.5% + 0.2%	1 drop	Twice Daily	509
	Timolol + Latanoprost	0.5% + 0.005%	1 drop	Once Daily (night)	720
	Timolol + Dorzolamide	0.5% + 2%	1 drop	Twice Daily	564
	Brinzolamide + Brimonidine	1% + 0.1%	1 drop	Twice Daily	535

Table 3: Dosage and Price of Glaucoma Eye Drops

From a pharmacoeconomic perspective, the cost of glaucoma eye drops varies widely, affecting affordability and treatment adherence. Cost vs. Effectiveness: Timolol is the cheapest option making it a budget-friendly choice. However, newer drugs like Travoprost and combination drops may be more effective but are much more expensive. Dosing and Adherence: Some drops, like Timolol and Brinzolamide, need to be used multiple times a day, which can make them harder to follow. More expensive drugs like Travoprost require only one daily dose (OD), which improves patient compliance.

Combination is costly but reduce the number of bottles needed, making treatment simpler and possibly more effective in the long run. Patients with limited financial resources may prefer cheaper options, even if they require more frequent dosing.

DISCUSSION

The present study evaluated the drug utilization pattern in primary open-angle glaucoma (POAG) patients attending the ophthalmology department of a tertiary care teaching hospital. The findings provide insights into the prescribing trends, cost considerations, and patient adherence to anti-glaucoma medications. Understanding these factors is crucial for optimizing glaucoma management strategies and improving patient outcomes. The majority of POAG patients in our study belonged to the age group of 51–60 years (38.6%), followed by 61–70 years (30.7%), 41–50 years (18.4%), and those above 70 years (12.3%). This distribution is comparable to findings from Patel et al., who reported that POAG predominantly affects individuals in their 50s and 60s. Similarly, Kumar H, Patyal S, Singh S et al.[12] found that the highest prevalence was in patients aged 50–70 years, aligning with our observations. The age-related increase in POAG cases may be attributed to cumulative oxidative stress, reduced aqueous humor drainage efficiency, and other physiological changes associated with aging. The most commonly prescribed monotherapy in our study was Timolol (29.8%), followed by Brinzolamide (14.9%) and Brimonidine (11.4%). This trend aligns with findings from Yadav et al., who also reported that beta-blockers, particularly Timolol, were the most frequently prescribed drugs in POAG due to their cost-effectiveness and well-established efficacy. Similarly, Patel et al. observed that Timolol was the most commonly used drug, prescribed either alone or in

combination therapy. Our age-wise analysis further revealed that Timolol was predominantly prescribed in patients aged 51–60 years (35.2%), followed by 61–70 years (27.5%). This distribution is consistent with Ahmed et al., who also reported that Timolol was preferred among middle-aged and elderly populations due to its affordability and tolerability. Moreover, Syedda[11] et al. emphasized that beta-blockers like Timolol remain the mainstay in POAG management across various age groups, especially in developing countries where cost constraints influence prescribing patterns. Fixed-dose combinations (FDCs) were frequently prescribed in cases where monotherapy was insufficient in controlling intraocular pressure (IOP). The most common combination in our study was Timolol + Brinzolamide (20.2%), followed by Brinzolamide + Brimonidine (7%). Ahmed et al. reported a similar trend, where combinations of beta-blockers with carbonic anhydrase inhibitors were commonly used due to their synergistic effect in reducing IOP. Additionally, Syedda[11] et al. emphasized that FDCs improve compliance by reducing the number of instillations required per day. The use of FDCs also helps in overcoming issues related to patient forgetfulness and the inconvenience of multiple daily dosing regimens. Our cost analysis demonstrated significant price variations among anti-glaucoma medications, affecting affordability and patient adherence. Timolol, the cheapest option (₹75 per 5ml), was the most commonly prescribed, supporting previous studies that indicate cost plays a crucial role in prescription patterns, particularly in resource-limited settings. Travoprost, a prostaglandin analogue, was significantly more expensive (₹932 per 5ml), similar to findings by Patel et al., who noted that prostaglandin analogues were under prescribed mainly due to high cost despite of their superior efficacy. The study also highlights the economic advantage of combination therapy. Although combinations like Timolol + Brimonidine and Timolol + Latanoprost were more expensive than monotherapies, they reduced the number of bottles needed, thereby improving patient compliance. These findings are supported by Ahmed et al., who suggested that despite higher initial costs, FDCs may be more cost-effective in the long run by enhancing adherence and reducing the need for additional interventions. Additionally, cost-related non-adherence remains a significant challenge in glaucoma management, as highlighted by various studies emphasizing the need for cost-effective therapeutic options.

CONCLUSION

The study highlights the predominance of Timolol as the most prescribed monotherapy for POAG, followed by combination therapies when monotherapy was inadequate. While cost-effective options remain the mainstay of treatment, newer and more expensive medications offer advantages in terms of reduced dosing frequency and potentially better compliance. The high cost of newer drugs and combination therapies may impact long-term adherence, necessitating a patient-centered approach that considers both clinical efficacy and affordability. strategies. The Limitations of my study was that the data was from only one tertiary care center. The recommendation is that such study should be taken by more tertiary care centers so that long-term treatment outcomes and cost-benefit analysis could further aid in optimizing glaucoma management

REFRENCES

1. World Health Organization. Blindness and vision impairment. [Internet]. 2021. Available from: https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment
2. Glaucoma Research Foundation. Glaucoma facts and stats. [Internet]. 2023. Available from: https://glaucoma.org/articles/glaucoma-facts-and-stats
3. Tham YC, Li X, Wong TY, Quigley HA, Aung T, Cheng CY. Global prevalence of glaucoma and projections of glaucoma burden through 2040: a systematic review and meta-analysis. Ophthalmology. 2014 Nov;121(11):2081-90.
4. George R, Ve RS, Vijaya L. Glaucoma in India: estimated burden of disease. J Glaucoma. 2010 Aug;19(6):391-7.
5. National Health Mission. Standard treatment guidelines: glaucoma. [Internet]. 2012. Available from:https://www.nhm.gov.in/images/pdf/guidelines/nrhm-guidelines/stg/glaucoma.pdf

6. Jonas JB, George R, Asokan R, Flaxman SR, Keeffe J, Leasher J, et al. Prevalence and causes of vision loss in central and southern Asia: 1990–2010. Br J Ophthalmol. 2014 May;98(5):592-8.
7. Quigley HA, Broman AT. The number of people with glaucoma worldwide in 2010 and 2020. Br J Ophthalmol. 2006 Mar;90(3):262-7.
8. National Programme for Control of Blindness & Visual Impairment. Manual on early diagnosis & management of glaucoma. [Internet]. 2017.Availablefromhttps://npcbvi.mohfw.gov.in/Douments/Training_Manuals/Manualon Early Diagnosis and Management of Glaucoma.pdf
9. Pradeep TG, Yadav SB, Kumar S, Sharma V, Mishra A. Drug utilization pattern and cost analysis of anti-glaucoma drugs in a tertiary care teaching hospital. J Clin Diagn Res. 2017 Feb;11(2):FC01-4.
10. World Health Organization. Introduction to drug utilization research. [Internet]. 2003. Available from: https://apps.who.int/iris/handle/10665/42627
11. Ahmed QS, Sayedda K, Agarwal A, Ansari NA. Drug utilization study of antiglaucoma drugs in a tertiary care teaching hospital, Bareilly. World J Pharm Res. 2014;3(2):2420-2428.
12. Kumar H, Patyal S, Singh S, Yadav AK, Bhoot M, Seth PK, Taneja S, Bandil S, Puri A. Analysis of sociodemographic profile of glaucoma patients with risk factors, subtypes, and disease severity in a tertiary eye care facility in Northern India. Indian J Ophthalmol. 2024;72(2): [page numbers]. doi: 10.4103/IJO.IJO_3114_23.