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Adherence to Topical Glaucoma Medication and Its Determinants among Patients Attending a Tertiary Care Glaucoma Clinic in Eastern India

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ABSTRACT

Background: Glaucoma is a chronic, progressive optic neuropathy and a leading cause of irreversible blindness worldwide. Effective control of intraocular pressure largely depends on long-term adherence to topical antiglaucoma medications and correct eye-drop instillation technique. Poor adherence remains a major barrier to optimal disease control, particularly in resource-limited settings.

Methods: A hospital-based cross-sectional study was conducted among 180 patients with primary open-angle glaucoma attending a tertiary care Hospital in Koraput between September and November 2024. Medication adherence was assessed using the Morisky Medication Adherence Scale-8 (MMAS-8). Sociodemographic and clinical details were recorded using a structured pro forma. Eye-drop instillation technique was directly observed using sterile artificial tears. Data were analyzed using Jamovi, and associations were tested using the Chi-square test; $p<0.05$ was considered statistically significant.

Results: The mean age of participants was 61.1 ± 9.8 years, and 55.0% were female. Based on MMAS-8 scores, 82.2% of patients demonstrated low adherence, while 17.8% had medium or high adherence. Medication adherence was significantly associated with gender, educational status, prior instruction regarding drug use, and duration of treatment ($p<0.05$). Family history of glaucoma and the number of prescribed medications were not significantly associated with adherence. Among the 142 participants assessed for eye-drop instillation, only 43.7% demonstrated correct technique, while 56.3% used incorrect methods.

Conclusion: Poor adherence to topical glaucoma medication and incorrect eye-drop instillation are highly prevalent among glaucoma patients. Integrating structured patient education, routine adherence assessment, and hands-on training for eye-drop administration into clinical practice may improve adherence and reduce the risk of glaucoma-related vision loss.

Key-words: Glaucoma; Medication adherence; MMAS-8; Eye-drop instillation technique; Primary open-angle glaucoma; Patient education

INTRODUCTION

Glaucoma is a chronic, progressive optic neuropathy and a major global public health challenge, representing the second leading cause of blindness worldwide and the leading cause of irreversible blindness in India [1–3].

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It is characterized by progressive degeneration of retinal ganglion cells, leading to structural changes in the optic nerve head and corresponding visual field loss [2].

Elevated intraocular pressure (IOP), advancing age, and a positive family history are well-established risk factors for glaucoma [2]. In India, the burden of glaucoma is substantial, with estimates suggesting that by 2020, approximately 11 million individuals were affected by open-angle glaucoma (OAG) and nearly 5 million by closed-angle glaucoma (CAG) [3]. Despite the availability of effective treatments, glaucoma remains underdiagnosed and inadequately controlled in patients.

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Poor adherence to prescribed antiglaucoma medications is one of the most important modifiable factors influencing disease progression [4–9]. Adherence refers to the extent to which patients follow agreed-upon treatment recommendations, emphasizing patient participation in managing their condition rather than passive compliance [5,6]. Several determinants of poor adherence include the number of prescribed medications, dosing frequency, regimen complexity, side effects, and the quality of patient–provider communication [6,7].

Topical ocular hypotensive agents remain the first-line treatment for glaucoma. However, their effectiveness depends not only on adherence but also on correct eye-drop instillation technique [10–14]. Studies indicate that 25–90% of patients fail to use eye drops correctly, making improper technique a clinically significant barrier to effective disease control [9,12–14].

Given the irreversible nature of glaucomatous vision loss, understanding factors influencing medication adherence and proper eye-drop technique is crucial. This study was undertaken to assess adherence to topical glaucoma medications, evaluate eye-drop instillation practices, and identify determinants of adherence among patients attending a tertiary care glaucoma clinic.

MATERIALS AND METHODS

Place of the study- A hospital-based cross-sectional study was carried out among patients diagnosed with glaucoma attending a tertiary care teaching hospital in Koraput, Odisha. The study was conducted at the Glaucoma Clinic during routine follow-up visits over three months from October to December 2024.

Inclusion Criteria

- ✓ Adult patients (≥18 years) diagnosed with primary open-angle glaucoma (POAG).
- ✓ Patients who had been using one or more topical antiglaucoma medications in one or both eyes for a minimum duration of three months.

Exclusion Criteria

- ✓ Patients who had undergone laser or surgical intervention for glaucoma.
- ✓ Patients receiving postoperative topical medications such as corticosteroids or other anti-inflammatory agents in addition to glaucoma drugs.
- ✓ Patients who declined to provide informed consent.

Methodology- Based on findings from a previous study conducted in South India, which reported a 40% adherence rate to glaucoma medication, the calculated sample size was 170, rounded to 180 participants to account for potential non-response and ensure adequate representation.

Eligible patients attending the glaucoma clinic were enrolled using a systematic sampling technique until the required sample size was achieved. Data were collected using a pretested, predesigned, structured pro forma that included information on sociodemographic characteristics and glaucoma-related clinical details.

Medication adherence was evaluated using the Morisky Medication Adherence Scale–8 (MMAS-8). This validated tool consists of 8 items designed to assess specific medication-taking behaviors rather than adherence determinants. Responses to the first seven items were recorded as “yes” or “no,” while the final item was rated on a 5-point Likert scale. Based on the total score, adherence was categorized as high, medium, or low.

To evaluate the accuracy of eye-drop administration, participants were asked to instill sterile artificial tears in the same manner they would administer their glaucoma medication at home. The entire installation process was directly observed by the investigator and assessed against standard criteria, including drop accuracy, avoidance of contact between the bottle tip and ocular structures, and appropriate handling technique.

Statistical Analysis- Data were entered into Microsoft Excel and subsequently analyzed using Jamovi (version 2.6.44). Descriptive statistics were used to summarize the data. Associations between medication adherence and selected variables were analyzed using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 180 patients with primary open-angle glaucoma were included in the analysis. The mean age of participants was 61.1 ± 9.8 years. More than half of the participants (52.2%) were aged 60 or older. Females constituted 55.0%, while males accounted for 45.0% of the study population. A family history of glaucoma was reported by 32.8% of participants.

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Regarding the duration of topical intraocular pressure–lowering therapy, 29.4% had been on treatment for less than 1 year, while 70.6% had been on treatment for more than 1 year.

In terms of educational status, 11.1% were illiterate, 34.4% had primary education, 36.1% had secondary or higher secondary education, and 18.3% were graduates. More than half of the participants (57.8%) reported receiving prior instructions regarding eye-drop use. Based on socioeconomic classification, 11.1% belonged to the upper class, 35.6% to the upper-middle class, 22.8% to the middle class, 23.9% to the lower-middle class, and 6.7% to the lower class (Table 1).

Table 1: Sociodemographic Characteristics of Study Participants (N = 180)

Variable	Category	n (%)
Age (years)	≤60	86 (47.8)
	>60	94 (52.2)
Gender	Female	99 (55.0)
	Male	81 (45.0)
Family history of glaucoma	Yes	59 (32.8)
	No	121 (67.2)
Duration of topical therapy	<1 year	53 (29.4)
	>1 year	127 (70.6)
Education	Illiterate	20 (11.1)
	Primary	62 (34.4)
	Secondary/Higher secondary	65 (36.1)
	Graduate & above	33 (18.3)
Previous drop instruction	Yes	104 (57.8)
	No	76 (42.2)
Socioeconomic status	Upper	20 (11.1)
	Upper middle	64 (35.6)
	Middle	41 (22.8)
	Lower middle	43 (23.9)
	Lower	12 (6.7)

Based on MMAS-8 scoring, 148 participants (82.2%) exhibited low adherence, while 32 (17.8%) had medium or high adherence. There was no statistically significant association between age and adherence ($p = 0.18$). However, gender showed a significant association, with 36.4% of females demonstrating medium or high adherence compared to none of the males ($p<0.001$).

Educational status was strongly associated with adherence ($p = 0.001$). Participants with graduate-level education or higher showed substantially better adherence than those with lower levels of education. Family history of glaucoma did not significantly influence adherence ($p = 0.61$).

Participants who had received prior instruction on medication use demonstrated significantly better adherence compared to those who had not ($p<0.001$). Treatment duration also showed a significant association, with longer duration (>5 years) associated with improved adherence ($p<0.001$). The number of prescribed drugs did not show a statistically significant association with adherence ($p = 0.49$) (Table 2).

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Table 2: Factors Associated with Glaucoma Medication Adherence (N = 180)

Variable	Low adherence n (%)	Medium/ High adherence n (%)	χ^2 (p-value)
Age (years)			1.78 (0.18)
≤60	74 (86)	12 (14)	
>60	74 (78.7)	20 (21.3)	
Gender			31.9 (<0.001*)
Female	63 (63.6)	36 (36.4)	
Male	81 (100)	0	
Education			61.2 (0.001*)
Illiterate	20 (100)	0	
Primary	59 (95.2)	3 (4.8)	
Secondary	61 (93.8)	4 (6.2)	
Graduate+	8 (24.2)	25 (75.8)	
Instruction received			27.4 (<0.001*)
Yes	98 (94.2)	6 (5.8)	
No	50 (65.8)	26 (34.2)	
Duration of treatment			29.1 (<0.001*)
<1 year	53 (100)	0	
1–3 years	45 (100)	0	
3–5 years	30 (81.1)	7 (18.9)	
>5 years	20 (54.1)	17 (45.9)	
Number of drugs			0.47 (0.49)
Single	103 (82.4)	22 (17.6)	
Multiple	45 (80.4)	11 (19.6)	

**Statistically significant*

According to MMAS-8 scoring, 82.2% of participants had low adherence, 10.6% had medium adherence, and 7.2% demonstrated high adherence. Among the 142 participants observed during eye-drop instillation, only 62 (43.7%) performed the technique correctly, while 80 (56.3%) demonstrated incorrect instillation practices.

DISCUSSION

The present study highlights the substantial challenge of treatment adherence among patients with primary open-angle glaucoma, a chronic condition in which poor adherence can directly contribute to irreversible visual loss [14]. Medication adherence was assessed using the Morisky Medication Adherence Scale-8 (MMAS-8), which enabled systematic evaluation of patients' medication-taking behavior and the identification of factors associated with non-adherence [15].

In this study, a high proportion of participants (82.2%) demonstrated low adherence to topical antiglaucoma medications [16]. This prevalence is notably higher than that reported in studies from South India, where poor adherence ranged between 32% and 42% [16]. Differences in study population characteristics, health-care settings, literacy levels, and methods used to measure adherence may explain this variation. The high burden of low adherence observed in the present study underscores the magnitude of the problem in routine clinical practice [14].

Educational status emerged as a strong determinant of medication adherence. Participants with graduate-level education or higher showed significantly better adherence compared to illiterate participants and those with primary or secondary education [17]. Higher educational attainment may facilitate a better understanding of disease severity, the rationale for

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treatment, and the long-term consequences of non-adherence, thereby encouraging consistent medication use [17]. Similar associations between education and adherence have been reported in earlier studies [15].

Gender was also significantly associated with adherence. In the present study, a higher proportion of female participants demonstrated medium or high adherence than male participants, while none of the male participants achieved such levels [18]. This finding contrasts with some previous studies that reported no gender-based differences in adherence. Sociocultural factors, health-seeking behavior, and differences in health awareness between genders may contribute to this observation [18].

Another important finding was the strong association between prior instruction on medication use and better adherence. Participants who had received instructions regarding glaucoma medications demonstrated significantly higher adherence levels than those who had not [19]. This finding is consistent with previous research indicating that patient education and counseling play a crucial role in improving adherence [19]. Studies have shown that patients who receive adequate information about glaucoma and its treatment are more likely to follow prescribed regimens correctly and consistently [19].

The duration of treatment was also significantly associated with adherence. Patients who had been on treatment for longer durations, particularly more than five years, showed better adherence than those on shorter treatment durations [20]. This may reflect gradual adaptation to long-term therapy and improved acceptance of the chronic nature of glaucoma [20]. In contrast, family history of glaucoma and the number of prescribed medications did not significantly influence adherence in the present study [14].

In addition to adherence, the study evaluated the eye-drop instillation technique, a critical yet often overlooked component of effective glaucoma management. Among the participants observed, only 43.7% demonstrated correct drop instillation, while the majority used incorrect techniques [16]. This finding indicates a substantial gap in patients' practical skills related to medication administration. Comparable studies from India and other countries have reported similarly low rates of correct eye-drop instillation [16]. Evidence suggests that targeted educational interventions, including demonstrations and instructional videos, can significantly improve patients' proficiency in administering eye drops [19].

Overall, the findings suggest that poor adherence and incorrect drop instillation are multifactorial problems influenced by educational status, prior counseling, and treatment duration rather than by clinical factors alone [14–20].

LIMITATIONS

This study has certain limitations. As a cross-sectional design, it captures adherence behavior at a single point in time and does not allow assessment of changes in adherence over time. Medication adherence was assessed using a self-reported questionnaire, which may be subject to recall bias and social desirability bias. Additionally, the study was conducted at a single tertiary care center, which may limit the generalizability of the findings to other health-care settings.

CONCLUSIONS

The study demonstrates a high prevalence of poor adherence (82.2%) to topical glaucoma medications among patients attending a tertiary care center. Educational status, prior instruction on medication use, gender, and duration of treatment were significant determinants of adherence, while family history of glaucoma and the number of prescribed medications were not. A substantial proportion of patients also exhibited incorrect eye-drop instillation techniques, highlighting a critical gap in glaucoma management. Given the progressive and often asymptomatic nature of glaucoma, these findings emphasize the urgent need for structured patient education, regular counseling, and practical training on eye-drop administration as integral components of routine glaucoma care.

CLINICAL SIGNIFICANCE

This study has important clinical implications for glaucoma management. The high prevalence of poor medication adherence highlights the need for routine adherence assessment in glaucoma clinics. Incorporating structured counseling sessions, hands-on demonstration of eye-drop instillation, and patient-friendly educational materials may substantially improve adherence and treatment outcomes. Implementing reminder systems and periodic reinforcement of correct techniques during follow-up visits can help reduce the risk of disease progression and glaucoma-related vision loss.

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