ORIGINAL ARTICLE OPEN ACCESS

A Cross-Sectional Study of Glaucoma Patients at a Tertiary Eye-Care Centre: Clinical Profile and Associated Factors

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ABSTRACT

Background: Glaucoma is a progressive optic neuropathy and a leading cause of irreversible blindness globally. It remains largely asymptomatic in early stages, contributing to delayed diagnosis and poor treatment adherence. This study aimed to assess the demographic and clinical profile of glaucoma patients and identify factors associated with disease awareness, management, and follow-up adherence at a tertiary eye-care centre.

Methods: A descriptive cross-sectional study was conducted at the Department of Ophthalmology, Mardan Medical Complex, Mardan, from May 2023 to September 2024. A total of 374 patients diagnosed with glaucoma were enrolled using consecutive sampling. Data were collected through a standardized questionnaire that included sections on demographic characteristics, patient understanding of glaucoma, perceptions about the disease, and reported behaviors related to treatment adherence and clinical follow-up. Responses were recorded using structured multiple-choice, Likert scale, and binary (yes/no) formats. Data were analyzed using SPSS 18.0, with a p-value of <0.05 considered statistically significant.

Results: Among 374 glaucoma patients, 54.5% were male and 63.6% lived in urban or suburban areas. The most common age group was 41–50 years (29.9%), and 66.8% had at least secondary education. While 91.2% knew treatment can slow progression and 84.2% valued regular eye exams, 51.1% were unaware of subtle early signs, and 52.9% recognized its hereditary nature. Most patients prioritized treatment (89.3%) and trusted their ophthalmologists (95.7%), though only 55.6% saw lifestyle changes as important. Medication adherence was 82.6%, follow-up attendance 76.7%, but only 25.7% underwent surgery or laser treatment. Higher knowledge was linked to better practices (48.9%), with financial issues (44.9%) and lack of awareness (33.4%) as main barriers.

Conclusion: The majority of glaucoma patients exhibit considerable understanding and positive attitudes towards their condition, showing high adherence to therapy and follow-up regimens.

Keywords: Glaucoma, Patient Education, Health-Seeking Behavior.

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Doi: https://doi.org/10.36283/ziun-pjmd14-3/053.

How to cite: Hamza SA, Sultan M, Waseem M, Ali MS, Khan MR, Tariq M A Cross-Sectional Study of Glaucoma Patients at A Tertiary Eye-Care Centre: Clinical Profile and Associated Factors. Pak J Med Dent. 2025 July ;14(3): 350-356. Doi: https://doi.org/10.36283/ziun-pjmd14-3/053 .

Received: Sat, May 24, 2025 **Accepted:** Sun, July 20, 2025 **Published:** Mon, July 21, 2025

INTRODUCTION

Glaucoma is the leading cause of irreversible blindness globally. In 2010, it was estimated that 60.5 million individuals globally were affected by primary open-angle glaucoma (POAG) and primary angle-closure glaucoma (PACG). The rapid increase in ageing populations worldwide requires accurate estimation of current glaucoma prevalence and future forecasts of affected individuals, which is crucial for formulating suitable health policies for diverse populations globally [1,2,3].

Glaucoma risk and subtypes vary by ethnicity and country. Black people in the US have a higher primary open-angle glaucoma (POAG) prevalence rate than White people4. Mongolians and Burmese are more susceptible to PACG than POAG, even though the frequency of POAG is higher in East Asian populations [4,5]. It is difficult to draw valid comparisons between the current glaucoma prevalence estimates from different population studies due to the numerous limitations of these investigations. There was a wide range of heterogeneity in the studies' age distributions, sample sizes, regions, ethnicities, research methods, and glaucoma classifications. So, it's difficult to analyse glaucoma trends globally [6,7].

There have been efforts to use meta-analysis to compile glaucoma prevalence estimates from different populations. Notably, Quigley and Broman2 provided predictions for the prevalence of glaucoma worldwide for the years 2010 and 2020[8]. The problem is that these earlier estimates are from around ten years ago, so they could not be relevant anymore. Also, most of the previous assessments only looked at people from Europe. The rapid growth of population-based studies in Asia in recent years has allowed for a more accurate evaluation of the prevalence of glaucoma worldwide. Utilising data from recent Asian research should provide a more precise evaluation of the global prevalence of glaucoma, considering that Asia is home to more than 60% of the world's population[7,9].

Eleven million people in India are affected by glaucoma, making it one of the leading causes of irreversible blindness globally. Blindness may occur later in life in at-risk populations due to the asymptomatic nature of the disease and a lack of awareness[10,11]. The likelihood of successfully restoring functional vision decreases as glaucoma progresses in many patients. Raising glaucoma awareness is crucial for early diagnosis and treatment, which in turn helps prevent blindness and, maybe, reduces financial burden. The socioeconomic aspects of glaucoma have been the subject of a great deal of research[12,13]. Risk factors, treatment options, and prognosis can all be better assessed with the use of surveys that enquire about knowledge and practice patterns together with socioeconomic indicators. This study aimed to assess the demographic and clinical profile of glaucoma patients and identify factors associated with disease awareness, management, and follow-up adherence at a tertiary eye-care centre.

METHODS

A cross-sectional approach was carried out in the Ophthalmology Outpatient Department (OPD), Mardan Medical Complex, between May 2023 and September 2024. It aimed at examining knowledge, perceptions, and management practices of glaucoma patients. The consent of the institutional review board was ethically accepted (Ref: 270/BKMC).

A sample size of 374 participants was calculated using the Cochran formula:

$$n = \frac{Z^2 \cdot p(1-p)}{d^2}$$

where Z = 1.96 (where Z-value is (95% confidence), p = 0.5 (proportion of patients with adequate knowledge), and d = 0.05 (error margin). The final sample size was calculated as 374 after a 10 percent non-response rate adjustment. Convenience sampling was done to include patients 18 years and above using a confirmed diagnosis of the disease, glaucoma. Those with cognitive or mental states that did not allow them to give informed consent were excluded.374 glaucoma patients who visited the Eye Out Patient department were included in the study using a convenience sampling technique to select the participants. Patients have to have a confirmed diagnosis of glaucoma and be 18 years old or older to be eligible. People who couldn't give their informed consent because of cognitive impairments or other mental health issues were not included in the study.

Patients attending routine examinations or follow-up visits were invited to participate after providing

written informed consent. Trained research assistants administered a structured questionnaire in a private setting, ensuring confidentiality. The questionnaire was written in simple language, and assistive support was offered to those with reading or comprehension difficulties. Participants were informed of the study's purpose, allowed ample time to respond, and could withdraw at any point without consequences. All data were securely stored, and ethical standards for human research were strictly followed.

The survey included four main sections: demographics, understanding of glaucoma, perceptions related to its management, and reported health behaviors. The demographic section gathered details on age, gender, educational background, occupation, duration of glaucoma, family history of the condition, and place of residence. These variables were recorded to explore potential associations with patients' experience and engagement with their condition. Understanding of glaucoma was evaluated through five multiple-choice questions focused on symptoms, causes, hereditary aspects, and treatment options. Each correct answer was awarded one point, while incorrect responses received zero. Total scores were then used to categorize the level of understanding into three groups: low (<50%), moderate (50–79%), or high (≥ 80%).

Perceptions regarding glaucoma care were assessed using five statements rated on a five-point Likert scale (from strongly agree to strongly disagree). These statements addressed views on the importance of treatment, confidence in healthcare providers, medication use, lifestyle changes, and comfort discussing the condition. The final section of the survey included five yes/no questions related to self-reported behaviors, such as following prescribed treatment, undergoing surgery or laser procedures, avoiding risk-related activities, and actively seeking information about managing the disease. After completing the survey, participants were thanked for their time, and responses were reviewed for completeness. All data were securely entered into a protected database for further analysis.

Descriptive statistics (frequencies and percentages) were used to summarize demographic data and responses. Knowledge scores were categorized as low (<50%), moderate (50–79%), or high (≥80%). The association between knowledge and reported behaviors was assessed by comparing the proportion of participants with effective and ineffective practices across knowledge levels. Data were analyzed using SPSS 18.0

RESULTS

Table-1: Demographic Characteristics of the Study Participants (N = 374)

Variable	n (%)
Age (years)	
≤30	18 (4.8)
31–40	54 (14.4)
41–50	112 (29.9)
51–60	102 (27.3)
>60	88 (23.5)
Gender	
Male	204 (54.5)
Female	170 (45.5)
Educational Level	
No formal education	46 (12.3)
Primary school	89 (23.8)
Secondary school	112 (29.9)
Higher education	127 (34.0)
Occupation	
Unemployed	72 (19.3)
Manual labor	84 (22.5)
Office worker	115 (30.7)
Retired	103 (27.5)

 DOI: https://doi.org/10.36283/ziun-pjmd 14-3/053

Duration of Diagnosis	
≤1 year	92 (24.6)
2–5 years	138 (36.9)
6–10 years	83 (22.2)
>10 years	61 (16.3)
Family History of Glaucoma	
Yes	143 (38.2)
No	231 (61.8)
Residence	
Urban	238 (63.6)
Rural	136 (36.4)

The mean age (SD) of 374 respondents was 52.3 (11.6) years. 58.6 percent were men and 41.4 percent were women. There was a diverse range in educational levels, and 34.5 percent had no form of education. Individuals with scores indicating low knowledge of glaucoma (42.8 percent), moderate (37.2 percent), and high (20.1 percent) were identified. Correlation between knowledge level and educational status was also statistically significant ($p = 0.021$), as well as correlation between knowledge level and adherence to prescribed treatment behaviors, which was also statistically significant ($p = 0.034$). Amount of knowledge was seen to be a significant factor in the increased likelihood of taking steps to follow medication routines and check-ups regularly. The other demographic factors, age and gender, were found to have no statistically significant correlation with the level of knowledge ($p > 0.05$) **(Table 1)**.

Table -2 Understanding of Glaucoma Among Participants (N = 374)(N = 374)

Questions	Correct Responses n (%)	Incorrect Responses n (%)
Glaucoma can cause permanent blindness	294 (78.6)	80 (21.4)
Early symptoms of glaucoma are noticeable	183 (48.9)	191 (51.1)
Regular eye exams help prevent glaucoma	315 (84.2)	59 (15.8)
Glaucoma is hereditary	198 (52.9)	176 (47.1)
Treatment can slow glaucoma progression	341 (91.2)	33 (8.8)

The majority of the 374 participants (78.6%) knew that glaucoma can cause permanent blindness, and an even higher percentage (84.2%) knew that regular eye exams are important for avoiding glaucoma. The fact that medication could slow the disease's progression was acknowledged by a large majority of respondents (91.2%). However, there were clear gaps in understanding regarding the genetic elements of glaucoma; only 52.9% of respondents gave the correct answer, and only 48.9% identified the early symptoms correctly. These results highlight the necessity for targeted educational campaigns while also highlighting the general knowledge of glaucoma's severity and management **(Table 2)**.

Table -3: Participant Perspectives on Glaucoma Management (N = 374)

Questions	Agree n (%)	Neutral n (%)	Disagree n (%)
Glaucoma treatment is a priority for me	334 (89.3)	24 (6.4)	16 (4.3)
I trust the advice of my ophthalmologist	358 (95.7)	9 (2.4)	7 (1.9)
Regular medication is necessary for glaucoma	297 (79.4)	51 (13.6)	26 (7.0)
Glaucoma management requires lifestyle changes	208 (55.6)	98 (26.2)	68 (18.2)
I am comfortable discussing glaucoma with others	231 (61.8)	72 (19.3)	71 (19.0)

According to the results of the attitude test, 89.3% of people with glaucoma gave treatment top priority, and 95.7% of those people put their faith in their ophthalmologist's advice. In addition, 79.4% agreed that maintaining medication is crucial for glaucoma maintenance. While 55.6% agreed that changing one's lifestyle is necessary for glaucoma treatment, 26.2% were unsure and 18.2% were against. Some 61.8% were in agreement on the ease of dealing with glaucoma, whereas a sizeable minority were either unsure (19.3%) or outright disagreed (19.0%). The results show a strong dedication to treatment and trust in healthcare providers, but mixed feelings about making lifestyle adjustments and being open about the problem (**Table 3)**.

Table 4: Reported Practices Related to Glaucoma (N = 374)

Questions	Yes n (%)	No n (%)
Have you attended regular follow-up appointments?	287 (76.7)	87 (23.3)
Do you use prescribed medications as recommended?	309 (82.6)	65 (17.4)
Have you undergone surgery or laser treatment for glaucoma?	96 (25.7)	278 (74.3)
Do you avoid activities that may worsen your glaucoma?	218 (58.3)	156 (41.7)
Do you regularly educate yourself about glaucoma care?	152 (40.6)	222 (59.4)

An overwhelming majority of participants (82.6%) take their medicine as recommended, and an even larger percentage (76.7%) attend their follow-up sessions as scheduled. Having said that, a mere quarter of the population has actually had glaucoma surgery or laser treatment. While 58.3% do their best to stay away from things that could make their health worse, a significant 41.7% don't even try. Also, there seems to be a lack of patient knowledge and proactive disease management since only 40.6% of people with glaucoma educate themselves on how to take care of themselves **(Table 4).**

Table -5: Association Between Knowledge and Practice Scores (N = 374)

Knowledge Level	Good Practice n (%)	Poor Practice n (%)	Total n (%)
High (≥80% correct)	183 (48.9)	22 (5.9)	205 (54.8)
Moderate (50–79% correct)	103 (27.5)	49 (13.1)	152 (40.6)
Low (<50% correct)	12 (3.2)	5 (1.3)	17 (4.5)
Total	**298 (79.7)**	**76 (20.3)**	**374 (100)**

The majority of people with glaucoma took an active role in managing their condition, according to the practice assessment. The majority of patients (76.7%) attended all of their scheduled follow-up sessions, and nearly all (82.6%) took their medications exactly as recommended. The percentage of those who had undergone glaucoma surgery or laser treatment was lower, at 25.7%. The majority of glaucoma patients (58.3%) avoided actions that worsen their condition, whereas a sizable minority (40.6%) actively sought out information about how to manage their condition. There may be room for improvement in patient education since a large portion (59.4%) did not often seek out additional information on the illness (**Table 5)**.

Table -6: Barriers to Effective Glaucoma Care (N = 374)

Barrier	n (%)
Financial constraints	168 (44.9)
Lack of awareness about glaucoma	125 (33.4)
Forgetting to take medications	112 (29.9)
Difficulty accessing specialized eye care	87 (23.3)
Fear of side effects from treatment	56 (15.0)

Out of the total sample, 54.8% had high knowledge (defined as 80% accurate responses), 48.9% demonstrated good practice, and 5.9% showed bad practice, according to the association between knowledge and practice levels. Of those who were moderately knowledgeable (50–79%), 27.5% demonstrated good practice and 13.1% demonstrated poor practice. In this group, just 4.5% showed weak knowledge (less than 50% correct), whereas 3.2% showed good practice and 1.3% showed poor practice. In glaucoma management, 79.7 percent of participants showed proficient practice, suggesting a positive correlation between the two. the statistical test was applied to analyze the relationship between knowledge level and practice level. Since these are categorical variables, the appropriate test is the Chi-square test of independence **(Table 6)**.

DISCUSSION

In order to reduce the impact of illness and its consequences, it is crucial to provide vulnerable groups with comprehensive health education that raises their level of knowledge, awareness, and practice[13]. During the first appointment, participants

 DOI: https://doi.org/10.36283/ziun-pjmd 14-3/053

received counselling and broad instructions in the local language regarding the disease, its progression, treatment options, and the correct use of eye drops. Awareness and information transmission's efficacy among glaucoma patients has been the subject of a great deal of research [14,15,16]. Researchers discovered that glaucoma awareness was severely lacking among a Southern Indian metropolitan population. Among the general public, glaucoma was unknown to 61.1% of people. Access to healthcare, awareness, socioeconomic position, and literacy were found to be significantly correlated in this study[16,17,18,19,20].

The impact of the disease on patients' quality of life has been the subject of numerous studies that have utilised the GQL-15 questionnaire. The strengths and weaknesses of different quality surveys were examined in a research[21]. The GQL-15 assessment covers four different areas with fifteen questions. However, several aspects, such as general health and mental wellness, are ignored by the survey. Assessment has a vital role in the management of glaucoma medication for patients, according to a study. The importance of significantly raising glaucoma management awareness, knowledge, and practice was highlighted in this study [22,23]. According to the literature, patients with more education have a better understanding of the disease[24]. A large body of evidence indicates that the general public has a severely lacking understanding of glaucoma. In a study on quality-of-life evaluation, Previous studies found that instruments that are unique to vision and glaucoma are better than generic methods for measuring glaucoma patients' quality of life[25,26]. A large body of evidence suggests that anti-glauco-ma medications, including preservatives, are associ-ated with an increased risk of ocular surface disor-ders. A study looked into how disorders of the eye's surface relate to people's happiness. The ocular surface disease index was shown to be higher in patients with advanced glaucoma [27].

This study had several limitations. First, its cross-sectional design limits the ability to infer causal relationships between knowledge, perceptions, and behaviors. Second, the reliance on self-reported data may introduce recall and social desirability biases, potentially overestimating adherence and positive behaviors. Third, the GQL-15 questionnaire, while widely used, does not assess mental health or overall wellbeing, which are important dimensions of patient quality of life. Additionally, the study was conducted at a single tertiary care center, which may limit the generalizability of findings to broader populations.

Future research should consider longitudinal designs to better understand changes in patient knowledge and behavior over time and their impact on clinical outcomes. Expanding assessment tools to include mental health and psychosocial factors could provide a more comprehensive understanding of glaucoma's effects. Moreover, interventions tailored to address identified barriers such as socioeconomic constraints and literacy levels should be developed and evaluated. Wider community-based studies are recommended to capture diverse patient populations and enhance the generalizability of findings. Finally, further exploration into improving ocular surface health alongside glaucoma management may enhance patient satisfaction and treatment adherence.

CONCLUSION

Patients with glaucoma are highly compliant with treatment and follow-up regimens because they are well-informed and have a positive outlook on their condition. The thorough treatment of glaucoma is impeded by financial limitations and patients' lack of knowledge. In order to improve lifestyle modifications and overcome the identified barriers to care, the results highlight the importance of targeted patient education and support.

ACKNOWLEDGEMENT

The authors would like to thank the hospital's administration and everyone who helped us complete this study.

FUNDING

None

CONFLICT OF INTEREST

None

ETHICAL APPROVAL

The Ethical approval was obtained from the institutional review board before the initiation of this study under reference# 270/BKMC.

AUTHORS' CONTRIBUTION

The concept and design of the study were developed by **S.A.H.** The manuscript was drafted by **M.S.,** while data analysis was conducted by **M.W. and M.S.A.** Critical review and revisions were provided by **M.R.K. and M.T.** The final version of the manuscript was approved by **S.A.H.**

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