

Drug utilization, medication adherence and treatment satisfaction amongst glaucoma patients receiving care at secondary health facilities

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Abstract

Objectives: The objective of this study was to assess treatment satisfaction, medication adherence and drug utilization amongst glaucoma patients receiving care at secondary health facilities.

Methods: A cross-sectional study was conducted amongst glaucoma patients attending eye clinics of General Hospital Ilorin and Civil Service Hospital Ilorin in Kwara State, Nigeria from October 2020 to January 2021. Three hundred and eleven patients were enrolled in the study. Sampling was based on convenience as dictated by the inclusion and exclusion criteria. Ethical permission and informed consent were obtained before data collection. Validated instruments of Morisky Medication Adherence Scale and Treatment Satisfaction Questionnaire for Medication were used during the data collection process. Descriptive and Chi-square analyses were employed.

Key findings: Amongst the 311 patients studied 184(59.2%) were females with a mean age of 63.79 ± 14.89 years. Timolol eye drop was the drug of choice for monotherapy in (8.7%) of patients. Combination therapy of beta blockers and carbonic anhydrase inhibitors had the highest number (59.5%) of prescriptions. More than half (55.6%) of the patients were adherents. Participants reported being more satisfied with their anti-glaucoma therapy in the domain of global satisfaction (62.89 ± 21.85) followed by medication effectiveness (62.67 ± 20.78) and convenience (60.16 ± 15.79) while medication side effects had the least score (17.17 ± 11.09). There is a statistically significant relationship between patient satisfaction with treatment and medication adherence at $P = 0.001$.

Conclusions: Combination therapy was the most frequently utilized anti-glaucoma agent. Most of the patients adhered to their medications and were satisfied with the treatment received.

Keywords: adherence; drug utilization; glaucoma; patient satisfaction

Introduction

Glaucoma is a long-term, deteriorating illness and a leading reason for irremediable blindness globally.^[1] Glaucoma is projected to involve 80 million individuals globally by 2020 and 112 million in 2040.^[2] Amongst the African population regarding eye disease, the findings of the Nigeria Blindness Survey indicated that 1.1–1.4 million adults have glaucoma and most were ignorant of their disease condition. About 5% of adults above 40 years have glaucoma in Nigeria and 20% of those persons are blind.^[3] Previous studies reported a high prevalence of glaucoma (7.3%) in Southwestern Nigeria.^[4] In South-Eastern Nigeria, there was a high proportion of people with glaucoma (14.5%).^[5] A study conducted in North-Central Nigeria observed that poor knowledge of glaucoma has been demonstrated amongst the respondents. The authors concluded the need for the Federal Republic of Nigeria to increase efforts in enlightening the populace on glaucoma to avert preventable irreversible blindness.^[6] The prevalence of glaucoma was higher amongst people of the Ilorin community in North-Central, Nigeria.^[6] Pharmacotherapy of

glaucoma remains a problem for eye care services as a greater number of the populace are unknowledgeable of their status.

According to the NICE glaucoma guideline 2022, the first-line treatment of glaucoma usually begins with the use of a topical selective or non-selective blocker or a prostaglandin. Second-line drugs of choice include alpha-agonists and topical carbonic anhydrase inhibitors. Also, brimonidine is used as a first-line therapy in patients who have contraindications to beta blockers. When a single therapy is not sufficient to lower the intra-ocular pressure (IOP), a combined treatment is indicated. The combination therapy is also dependent upon the mechanism through which the components act to reduce IOP. Fixed combination drugs have the combined efficacy of two ocular hypotensive drugs. If a beta-blocker is used as an initial treatment, adding a topical carbonic anhydrase inhibitor can provide an additional reduction in IOP. Another combination comprises prostaglandin and a beta-blocker.^[7] Drug utilization research is of the essence for enhancing rational drug use, maximizing treatment efficacy, minimizing adverse effects, maintaining cost-effectiveness and

giving advice to physicians.^[8] Patient satisfaction with their therapy is an essential component in ensuring adherence to medications and collaboration with prescribers. Patient satisfaction was introduced for examining patient-reported results from glaucoma management.^[9] A study conducted in the Netherlands amongst a large number of subjects suggested that 80% of patients were satisfied or very satisfied with their therapy.^[10] Medication adherence requires coordination and encouragement in persons who may be asymptomatic and value no observed benefit of drug use. The nature of glaucoma as a protracted and initially asymptomatic disorder has been reported to influence medication non-adherence and subsequently poorer visual outcomes.^[11] There is a need for rationalizing drug therapy in glaucoma patients concerning increased adherence to the national essential medicine list and increasing prescription of drugs by generic names.^[12] The appropriate monitoring of IOP is attainable in most subjects if anti-glaucoma agents are instilled correctly, consistently and continuously. With the high incidence of glaucoma and the documented suboptimal adherence rates in some patients, approaches to evaluate and enhance adherence to glaucoma therapy continue to be of interest.^[13] Several studies have assessed adherence in patients, which have resulted in non-adherence levels for topical glaucoma medication varying from 12% to 60%.^[14] According to the European Glaucoma Society, a subject who complains about side effects is usually not adherent to therapy.^[13] The tolerability of the medication is the main issue in medication adherence.^[15]

To the best of our knowledge, no study has evaluated drug utilization, medication adherence and treatment satisfaction amongst glaucoma patients in Ilorin, part of North-Central Nigeria. Therefore, this study aimed to evaluate drug utilization, medication adherence and treatment satisfaction amongst glaucoma patients receiving care in secondary health facilities in North-Central Nigeria.

Methods

Study sites

The study was carried out amongst patients with glaucoma attending Eye Care Clinics at General Hospital Ilorin (GHI) and Civil Service Hospital Ilorin (CSHI). The hospitals are located in Ilorin, Kwara State in North-Central Nigeria. GHI is a secondary health care facility, comprising various departments including the general out-patient department, accident and emergency, male and female surgical wards and eye clinic amongst others with all cadres of health practitioners.^[16] CSHI is a secondary health facility that provides both in-patient and out-patient health care. CSHI comprises different sections to provide medical care for civil servants and the general public for several years.^[17]

Study design

This is a hospital-based, cross-sectional study conducted amongst glaucoma patients attending eye care clinics at GHI and CSHI from October 2020 to January 2021.

Sample size determination

Population size was determined by calculating the average number of glaucoma patients attending both clinics for a span of one year (2019–2020). A total of 1080 patients were obtained from the two facilities (480 in GHI and 600 in CSHI).

Based on the Cochrane formula for sample size calculation in smaller populations (<10,000), a sample size of 283 patients was obtained. Considering a 10% (28) attrition rate, the sample size calculated for this study was 311 patients. The proportion of sample size formula was used to calculate the number of patients in each study site as follows: 138 for study site 1 (GHI) and 173 for study site 2 (CSHI).

Sampling technique

Sampling was based on inclusion and exclusion criteria and the accessibility of subjects at the clinics. The consented patients were enrolled in the study whenever they visited the eye clinics for follow-up.

Exclusion and inclusion criteria

Included in the study were male and female out-patients with a medical diagnosis of glaucoma; patients with age 20 years and over; prescription containing at least one anti-glaucoma medication and in continuous use for at least six months; and patients who demonstrated the ability to understand and communicate verbally.

Patients with a history of hospitalization and surgery in the previous month; patients with medication administered by a caregiver; newly diagnosed glaucoma patients and those who decline to participate in the study were excluded.

Description of study instruments

- (i) Demographic Information Extraction Form: The form was designed to capture relevant patient information on socio-demographic data. The form contained six items namely; age, gender, marital status, educational qualification, religion and monthly income.
- (ii) Morisky Medication Adherence Scale (MMAS-8) form. This is a validated assessment tool utilized to assess adherence levels in patients with chronic conditions such as glaucoma. The Morisky Medication Adherence Scale was adapted, validated and used to determine adherence to glaucoma medication. The questionnaire used for this study presented the Morisky scale which consists of eight questions with dichotomous responses (yes/no), and the last with 5 answers are: 'never, hardly ever, sometimes, often and always' The questions as contained in the questionnaire include;
 - (1) Do you sometimes forget instilling your glaucoma medication? (1) Yes (2) No
 - (2) In the last two weeks, was there some day you forgot instilling your eye drops? (1) Yes (2) No
 - (3) Have you ever stopped instilling your glaucoma eye drops because you were feeling worse without telling your doctor? (1) Yes (2) No
 - (4) When you travel or leave home, do you sometimes forget to take your eye drops? (1) Yes (2) No
 - (5) Did you instil your eye drops yesterday? (1) Yes (2) No
 - (6) When you feel better and feel that your eye problem is controlled, do you sometimes avoid instilling your eye drops? (1) Yes (2) No
 - (7) Have you ever felt bothered by forgetting any dose, forgetting to instil your eye drops? (1) Yes (2) No
 - (8) How often do you forget instilling these eye drops? (1) Never (2) Hardly ever (3) Sometimes (4) Frequently (5) Always.

The scoring and interpretation response from the Morisky Medication Adherence Scale questionnaire shows that questions one to four score one point if it is No (negative). Question five is reversed, if the response is Yes (positive) the score is one. Questions six and seven are scored like questions one to four. Question 8, which is the last, scored: 1.0.

In addition to the scoring template of the 8-Item MMAS, a medication adherence level was deduced, where adherence scores of less than 7 were considered a low level of adherence; and adherence scores of 7 and 8 were considered moderate and high medication adherence levels, respectively.^[18]

(iii) Non-Adherence Extraction Form

Reasons for non-adherence form assesses factors that can predict non-adherence was designed based on previous reports of glaucoma medication adherence.^[19] The form contains six items. These include forgetfulness, travelling, running out of drugs, drug side effects, inconvenient dosing frequency and financial constraints.

(iv) The Treatment Satisfaction Questionnaire for Medication (TSQM) version 1.4: The TSQM has 14 questions divided into 4 subscales: effectiveness (items 1–3), side effects (items 4–8), convenience (items 9–11) and global satisfaction (items 12–14). The responses were measured on a Likert-type scale of five or seven points, except for question four in the side effects subscale which a yes/no question about the presence of side effects is asked. If the answer to this question is no (no side effects reported by the participant), other questions in the side effects subscale will not be asked (questions 5–8), and the total score for this subscale is automatically computed as the maximum of 100. The calculation for subscales ranges between 0 and 100. Patient with higher value shows that the patient has higher satisfaction with medication. Amongst the questions for TSQM, number 4 was used to measure drug side effects.

These instruments have been validated in earlier studies conducted in Nigeria.^[12, 20]

Data collection procedure

The patients' information was collected between October 2020 and January 2021. The objectives of the study were explained to each patient on the first contact. Patients were made to explain the study objectives after which they sign the informed consent forms. All patients were assured that their responses would be confidential and that they could withdraw from the study at any time they wished, without any consequences. An oral interview was conducted in a private room and each participant was given a copy of the questionnaire. All data were collected directly from the patients and there were no proxy respondents.

Data analysis

Inferential and descriptive statistics were used. *P* value was set at less than 0.05 for the level of significance. Categorical data were presented as frequencies and percentages.

Ethical statement

Ethical clearance to undertake the study was obtained from the Ethical Review Committee of Kwara State Ministry of Health, Ilorin (MOH/KS/EU/777/591 dated 24 November 2021). Permission to access the facility and patients was obtained from the management of the studied facilities.

Results

Socio-demographic characteristics

More than half of the patients were females (59.2%) with a considerable percentage between the ages of 41 and 60 years (46.7%) and 46.2% above 60 years. The majority (58.8%) of the patients were literate; amongst the literates, 10.4% of the patients had primary education, 34.2% had secondary level and 14.2% obtained higher educational degrees. Less than half (41.2%) of the studied patients had no formal education. These patients could not read or write. A considerable proportion of the participants was married (70.1%) and practiced Islam as their religion (60.8%). Regarding their monthly income, 72.3% of the patients earned between medium and high income, whereas a few patients (27.7%) received low income (Table 1).

A pattern of drug utilization

Monotherapy accounts for 8.7% of prescriptions in both eye clinics while combination therapy consisting of different classes of drugs accounts for most of the prescriptions. Timolol eye drop is the drug of choice amongst prescribers when monotherapy is considered. Combination therapy of two or more classes of anti-glaucoma medication was mostly prescribed in both

Table 1 Socio-demographic characteristics of the patients

Characteristics	Frequency (<i>n</i> = 311)	Percentage (%)
Gender		
Male	127	40.8
Female	184	59.2
Age		
20–40	22	7.1
41–60	145	46.6
>60	144	46.3
Educational qualifications		
No formal education	128	41.2
Primary education	32	10.4
Secondary education	107	34.2
Tertiary education	44	14.2
Religion		
Islam	189	60.8
Christianity	122	39.2
Marital status		
Single	4	1.3
Married	218	70.1
Divorced/widowed	89	28.6
Monthly income		
Low income	86	27.7
High/medium income	225	72.3

Table 2 Anti-glaucoma drug utilization in the studied facilities

Anti-glaucoma drug combination therapy	Frequency (<i>n</i> = 311)	Percentage (%)
B-blockers/CAIs (timolol/dorzalamide)	185	59.5
B-blockers (timolol)	27	8.7
B-blockers/CAIs/alpha adrenergic blockers (timolol/dorzalamide and brimonidine)	43	13.8
B-blockers/PGAs/alpha adrenergic blockers (timolol/travopost/brimonidine)	14	4.5
• CAIs/ PGAs (dorzolamide/travopost)	20	6.4
• B-blockers/CAIs/PGAs (timolol/ dorzolamide/latanoprost)	22	7.1

B-blockers: beta blockers; CAIs: carbonic anhydrase inhibitors; PGAs: prostaglandin analogues.

Table 3 Proportion of generic prescribing and side effects experienced amongst the patients

Parameters	Frequency (<i>n</i>)	Percentage (%)
Prescription type		
Generic	40	12.9
Branded	271	87.1
Anti-glaucoma side effects		
Discomfort	16	30.2
Burning sensation	34	64.1
Transient blurring vision	3	5.7

clinics. Combination therapy of beta blockers and carbonic anhydrase inhibitors had the highest number of prescriptions (59.5%) followed by beta blockers/carbonic anhydrase inhibitors/adrenergic blockers (13.8%) and the least (4.5%) was beta blockers/prostaglandin analogues/adrenergic blockers (Table 2).

Proportion of generic prescribing and side effects experienced amongst the patients

Almost all (87.1%) of the prescriptions were written in brand names as opposed to generic prescriptions. Prescriptions of branded duosopt/misopt were most common. Few patients (17.1%) experienced drug effects on the instillation of the topical medications to the eyes. Amongst these patients, (64.1%) had a burning sensation followed by stinging of the eyes (30.2%). (Table 3).

Patients' adherence to medication

Based on the scoring and interpretation of the Morisky Medication Adherence Scale questionnaire, 9.3% of patients had moderate adherence level and 46.3% had higher adherence level. Overall, more than half (55.6%) of the patients that participated in this study were adherents to their medications. While 44.4% of the patients had low adherence level and were considered non-adherents. (Table 4).

Patients' satisfaction with treatment

The mean scores of patient satisfaction with medication were based on four domains, namely Medication effectiveness, Side effects, Convenience, and Global satisfaction (Table 5).

Table 4 Measurement of patients' adherence to medication

Adherence level	(<i>n</i> = 311)	(%)
Moderate adherence (adherent)	29	9.3
Higher adherence (adherent)	144	46.3
Low adherence (Non-adherent)	138	44.4

Table 5 Mean scores of patients' satisfaction with treatment

Domains	Mean scores	Standard deviation
Medication effectiveness	62.67	20.78
Medication side effects	17.17	11.09
Convenience	60.16	15.79
Global satisfaction	62.89	21.85

Table 6 Association between patients satisfaction with drug therapy and medication adherence

Parameter studied	Chi-square value	<i>P</i> value
Medication effectiveness scores and adherence	16.99	0.009
Medication convenience scores and adherence	6.97	0.223
Global satisfaction scores and adherence	24.67	0.001

Participants reported being more satisfied with their anti-glaucoma medication therapy in the domain of global satisfaction (62.89 ± 21.85) followed by medication effectiveness (62.67 ± 20.78) and convenience (60.16 ± 15.79) while medication side effects had the least score (17.17 ± 11.09).

Association between patients' satisfaction with drug therapy and medication adherence

There was a statistically significant relationship between patients' satisfaction with medication's effectiveness and medication adherence ($P = 0.009$). A statistically significant relationship was also observed between patients' global satisfaction with treatment and medication adherence ($P = 0.001$). A significant association was not observed between patients' satisfaction with medication convenience and medication adherence ($P = 0.223$). This shows that the higher the patients' satisfaction with the medication effectiveness and the global satisfaction with the treatment given, the higher the adherence to the prescribed anti-glaucoma agents (Table 6).

Participants' reasons for non-adherence

The most common factor that contributed to non-adherence was financial difficulty (47.82%), followed by forgetfulness (29.01%) and medication side effects (11.59%) (Table 7).

Discussion

Combination therapy of anti-glaucoma drugs utilized in the studied facilities accounts for most of the prescriptions. The

Table 7 Participants' reasons for non-adherence

Reasons	(<i>n</i> = 138)	(%)
Forgetfulness	29	21.01
Travelling	8	5.79
Patient running out of stock of drugs	5	3.62
Medication side effects	16	11.59
Inconvenient dosing interval	14	10.14
Financial constraints	66	47.82

majority of the patients were adherents to their medications. Participants were more satisfied with their anti-glaucoma drugs. There was a statistically significant relationship between patients' satisfaction with medication's effectiveness and medication adherence. A statistically significant relationship was also observed between patients' global satisfaction with treatment and medication adherence.

Drug utilization, medication adherence and treatment satisfaction are essential in promoting rational evidence-based drug therapy that can consequently help to improve patient care and treatment.^[12]

Amongst the patients enrolled, about half were older than 60 years with an average age of 60 years. This is consistent with previous studies conducted in other countries where most of the patients were over the age of 60 years.^[1, 10, 21] This indicates an excessive burden of glaucoma amongst aged patients.^[22] A further study conducted in Nigeria reported similar results.^[23] Inconsistent with these findings was the study where most of the patients are below 60 years. This productive age group revealed that glaucoma can affect the productive age group of a nation thereby having a negative impact on the national economy. The majority of the patients were literates having at least a primary level of education.^[24] The educational level of the patients is expected to assist their understanding of the disease condition, thereby enhancing adherence to anti-glaucoma medication. This is in contrast to the previous studies in Ethiopia and other parts of Nigeria, where a majority of the participants were illiterates.^[25, 26] Also, most of the patients were between medium and higher-income earners. This is expected to allow the patients to be adherent to the medication regimen as it may influence positively the ability to purchase the medication. In our study, the females were predominant. This is consistent with the earlier study conducted in the US A where most glaucoma cases were found in women.^[27] In contrast, other studies from Nigeria and elsewhere reported a higher prevalence in men than women.^[24, 26] The higher prevalence found in females could be due to the vasodilator effect of oestrogen.^[28] Also, the study of Rotterdam found that premature menopause was associated with a higher risk of primary open-angle glaucoma.^[29]

IOP is the modifiable risk factor for the development and progression of glaucoma. Hence, reducing IOP has been the mainstay of glaucoma treatment and its lowering by 20–40% has been shown to delay or halt the progression of glaucoma.^[30, 31] Evaluation of drug utilization patterns is considered powerful means to find out the role of drugs in the public as well as to increase the therapeutic efficacy and the cost-effectiveness of therapy in medical practices.^[32] Combination therapy was mostly utilized in the management of glaucoma in the study sites. The combination of other classes of drugs

currently prescribed in glaucoma with beta blockers has an additional effect on IOP reduction.^[33] The combination of timolol and latanoprost results in an overall IOP reduction of 38%. Also, the combination of timolol and travoprost results in a reduction of 32–38%.^[33] Similar findings observed in Nigeria were fixed-dose combinations of latanoprost/timolol and dorzolamide/timolol.^[20] Combining anti-glaucoma agents of different classes with different mechanisms of action is associated with superior IOP-lowering efficacy compared to each of the components used alone.^[12] In this work, a combination of CAIs and beta blockers were mostly utilized. This was supported by the findings that topical CAIs are systemically safe with mild ocular adverse effects. Contrarily, Prostaglandin analogues (PGAs) are recommended as the first-choice treatment for primary open-angle glaucoma in other settings, because of their efficacy, limited systemic side effects, and once-daily dosing.^[12] Further study showed that prostaglandin analogues and beta blockers are currently the most frequently used agents.^[27] CAIs are used alone or in combination as an important component of the anti-glaucoma drugs armamentarium. Topical CAIs have also been demonstrated to alter biomarkers of ocular haemodynamics, which have relevance in glaucoma.^[34] The findings of this study and previous studies indicated the use of beta blockers as monotherapy or in combination. The rationale was based on minor local side effects that are short-lived and rare systemic side effects associated with beta blockers.^[27] Adrenergic blocker was least used as combination therapy and never use as monotherapy in this current study. Inconsistent with these findings was the study that showed brimonidine (adrenergic blocker) used as a monotherapy due to its lower rate of ocular allergic reaction and rare systemic.^[35]

The majority of the prescriptions were written in branded form as opposed to generic prescribing. However, this study accounts for a low percentage of generic prescriptions. Prescribing by trade or brand names negates the World Health Organization concept.^[36] Currently, in the USA, the utilization of generic medicines has grown considerably, driven by their substantially lower price compared to branded products. The utilization of generics has also increased in the medical treatment of glaucoma.^[37] In England, generic medicines represented 55.2% of prescriptions for glaucoma as compared to the 12.9% observed in this study.^[38]

In this study, participants reported being more satisfied with their anti-glaucoma medication therapy in the domain of global satisfaction followed by medication effectiveness and convenience while medication side effects had the least score. Higher global satisfaction, medication effectiveness and convenience were achieved because of low medication side effects experienced. Contrary to the findings of this study was the report of the work that the patient's satisfaction with the side effects profile of their medicines had the highest score.^[12] Furthermore, an earlier study found that the patients were satisfied with their treatment.^[39] Their results suggested that the main source of patient dissatisfaction with treatment is the inconvenience of the administration regimen. Also, patients who are unsatisfied with their treatment were more likely to discontinue their treatment within six months.^[39]

Adherence is a problem with glaucoma patients. The goal of glaucoma medication is to preserve visual function by lowering IOP to a level that is likely to prevent further optic nerve damage, but patients are unlikely to experience

the clinical benefits of their therapy if they do not adhere to their medication regimen.^[40] Several studies of adherence with glaucoma therapy regimens point out that adherence on average is suboptimal.^[41] The findings of the current study indicate significant relationships between medication effectiveness and global satisfaction with treatment and medication adherence. This shows that the higher the patients' satisfaction with their medication effectiveness and with the treatment given, the higher their adherence to their prescribed drugs. Adverse effects of drugs are a major cause of treatment dissatisfaction that may affect adherence resulting in therapeutic failure.^[34] In our study, most of the patients expressed confidence in the effectiveness of their prescribed drugs in treating their condition. Perceptions of efficacy are believed to be an important factor in boosting patient satisfaction with treatment.^[35] Our findings show that patients who were more satisfied with their treatment were more likely to be adherent to their medications. Previous studies on chronic disease conditions have demonstrated an association between treatment satisfaction and adherence to medication.^[42] To ensure optimum value from any treatment provided for individuals with glaucoma, patients' adherence to prescribed medication must be evaluated to optimize the information received.^[18] In this study, more than half (55.6%) of the patients were found to be adherent (took more than 75.0% of their doses). In line with the present research was a study conducted previously where 55.0% of patients were shown to be adherent to their medications.^[41] The major factor that contributed to non-adherence was financial constraint which was common amongst low-income earners. Also, the majority of the patients were elderly and received support from family members. Furthermore, the economic cost associated with a visual impairment from glaucoma is considerable as it affects the productivity of the individual and the nation as a whole.^[1] The prescription of branded drugs could contribute to non-adherence as some of the patients were low-income earners and many pharmaceutical branded products have unaffordable costs.^[42] Forgetfulness, travelling, inconvenience of time of instilling the eye drops and running out of anti-glaucoma drugs were also contributory factors. In the findings of a study conducted elsewhere, the majority of the patients had side effects and consequently reduced their treatment satisfaction.^[10] In this research work the non-adherence level amongst the patients was 44.4%. Earlier studies with a higher prevalence of non-adherents as compared to the current study were 51.6% in the United Kingdom, 60% in African American population and 67.5% in Ethiopia.^[43] Similar to the findings of this study was the prevalence of non-adherence of 36.8% in Nigeria.^[23] Also, another study reported financial constraints to be associated with income as being the major factor contributing to non-adherence amongst glaucoma patients.^[44] A study conducted by Glaucoma Adherence and Persistency Study identified cost, forgetfulness, fear or denial, lack of understanding about glaucoma, and regimen complexity as patients' barriers to medication adherence. The physicians' perspective of barriers to adherence were a lack of patient motivation to use drops, a lack of patient understanding about glaucoma, an inability to communicate the importance of adherence, and limited time spent with patients.^[45]

Limitations and strengths of the study

Inadequate documentation in the studied facilities was a major limitation of this study leading to difficulty in sample size determination. Also, the research was conducted in one region of Nigeria; therefore, the findings obtained cannot be generalized to the entire nation. Furthermore, the subjective methods used to capture patient information may lead to bias. The strength of this study was that the methodology could be replicated in hospitals in limited-resource countries as a model to promote patient care and treatment. Also, the majority of our results were consistent with previous studies in other regions.

Conclusion

Timolol was the most frequently utilized anti-glaucoma agent and most of the anti-glaucoma agents were used in combination. The majority of the patients adhered to their medications and were satisfied with the treatment received. There was a statistically significant positive relationship between patient satisfaction with treatment and medication adherence. Strengthening of the health-care system by the government is necessary to reduce the impact of the high cost of anti-glaucoma medications in patients which can improve adherence rates. This is to decrease the prevalence of low vision and blindness due to glaucoma.

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Conflict of Interest

The authors declare that there are no conflicts of interest with this study.

Authors' Contributions

All authors contributed to the study's conception and design. Study design, data collection and analysis were performed by S.I.B. and H.Y. The first draft of the manuscript was written by W.A.O. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Sample Data Availability Statements

The data and software code that support the findings of this study are available and attached as a separate file for submission to the editor. The data are not publicly available due to information that could compromise the privacy of research participants.

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