BMC Ophthalmology

RESEARCH Open Access

Glaucoma medication non-adherence rate and associated barriers among glaucoma patients in Hawassa, Ethiopia

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Abstract

Background The estimated number peoples aged 40 to 80 years affected with glaucoma were 76.0 million in 2020 and 111.8 in 2040 globally. The estimated number peoples aged 40 to 80 years affected with glaucoma were 76.0 million in 2020 and 111.8 in 2040. This study identified glaucoma medication non-adherence rates and associated barriers among patients with glaucoma attending Hawassa University Comprehensive Specialized Hospital.

Methods A prospective cross-sectional study was conducted on 340 patients diagnosed with glaucoma who were administered ocular hypotensive medication at least for one week before current visit and those who were diagnosed and prescribed the medication, currently presented to the hospital as new attendant. A systematic random sampling technique was used to select study participants. Data was collected using a validated questionnaire by interviewing patients and reviewing their medical charts from May 01 to November 30, 2022. The collected data checked for completeness, entered to SPSS 22. Descriptive and binary logistic regression analysis were done using the software. The findings were presented using tables and Pie-charts. A p-value ≤ 0.05 was used to indicate statistical significance.

Results About 340 patients participated in this study with response rate of 90%. More than half of them (59.4%) were male. Mean age of the study participants was 60.2 ± 3.17SD years. The majority came from rural areas (186 (54.71%). Approximately 62.4% of them were with bilateral glaucoma while 47.10% were at advanced stage at least in one eye. The glaucoma non-adherence rate was 54.71% (95% CI; 50.90–58.50). Forgetfulness (AOR 28.32 (95% CI;14.80–54.16), difficulty with schedule AOR 2.52 (95% CI;1.009–6.29), believing eye drops were not effective AOR 6.35 (95% CI;1.17–34.49) and poor self-efficacy AOR 10.96 (95% CI;1.26–95.57) were barriers significantly associated with non-adherence.

Conclusion and recommendation The nonadherence rate to glaucoma medication among patients with glaucoma attending Hawassa University comprehensive hospital was high (54.71%). Forgetfulness, difficulty with schedule, belief that the drug was not effective and poor self-efficacy were barriers associated with glaucoma medication non-adherence. Health workers better to properly council and inform the patients about the disease nature, goal of treatment, danger of nonadherence to administered medication and mechanism to increase their adherence such as setting reminder.

Keywords Glaucoma medication non- adherence, Barriers to glaucoma adherence, Ethiopia

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Introduction

Glaucoma is the leading cause of non-restorable blindness worldwide [1]. It is a more public health challenge than cataract due to constant loss of productivity as a result of its irreversible sight loss compounded by lifelong unnecessary hospital and medication costs [2]. Its burden is increasing over time. Globally, approximately 57.5 million people suffered primary open angle glaucoma(POAG) in 2015 [3]. The estimated number of people aged between 40 and 80 years affected with glaucoma were 76.0 million in 2020 and 111.8 million in 2040 [4].

The prevalence of glaucoma blindness is higher in Africa than in other regions of the world accounting for about 15% of blindness. The prevalence of glaucoma [5] blindness is high probably due to a higher prevalence of the disease and inadequate control [5].

Glaucoma is commonly treated with ocular hypotensive medication. The primary goal of glaucoma treatment is to control progression and prevent early blindness while not restoring lost visual function. Delaying the occurrence of blindness is important to maintain productivity which saves economy of one's nation. During clinical practice, a number of patients show rapid disease progression while they are being treated which could be due to poor treatment adherence.

Glaucoma medication non-adherence is a problem in both developing and developed nations. The problem is worse in sub-Saharan countries because of poor awareness of the disease's nature and treatment [5–8]. In developed nation like USA-poor glaucoma medication adherence rates of up to 29% have been reported [9, 10]. In South Korea, it was 27.% [11] and poor in Africa [12]; mostly around 50–60% most studies [12, 13]. In Ethiopia, a significant number of patients were non adherent to glaucoma medications. The prevalence of glaucoma medication adherence in Ethiopia ranges from 32.5 to 61.4% [14–17]. From the reviewed literature, commonly reported barriers to glaucoma medication adherence were decreased self-efficacy [18–21], difficulty in instilling drops [18, 19, 22, 23], forgetfulness [18, 19, 22, 23], difficulties with the medication schedule [18, 19, 22, 23], side effects [19, 20, 22, 23], medication cost [19, 22–24], mistrust physician [22, 23], belief that glaucoma medication mitigates vision loss [23], and patient health literacy [20]. Although some studies [14–17] on glaucoma medication adherence are available in Ethiopia, there is no study that identified specific barrier or groups of barriers significantly associated with glaucoma medication non-adherence in Ethiopia, particularly in Hawassa. Therefore, this study aimed to identify the glaucoma non-adherence rate and associated barriers among patients with glaucoma attending Hawassa University comprehensive specialized hospital (HUCSH). It is important to plan community-oriented measures to increase adherence to glaucoma medication and reduce the burden of blindness due to glaucoma.

Objectives of the study

General objective

To determine glaucoma medication non-adherence rates and associated barriers among patients with glaucoma attending Hawassa University comprehensive specialized hospital.

Methods

Study design, study area, and period

A hospital-based cross -sectional study was conducted at HUCSH, which is located in Hawassa city, around 275 Km South of Addis Ababa, Ethiopia. The study was conducted from May 01 to November 30, 2022.

Study population

All patients with glaucoma treated with ocular hypotensive medication during follow-up presented at HUCSH Ophthalmic OPD during the data collection period.

Inclusion and exclusion criteria

All selected patients with glaucoma on follow-up at the HUSCH during the data collection period were included in the study. All patients with glaucoma who were treated surgically, mentally incompetent, or unable to communicate were excluded from the study.

Sample size determination

$$n = \frac{\left(Z_{\alpha/2}\right)^2 P\left(1-P\right)}{d^2}$$

By taking proportion (P) glaucoma medication non-adherence study at Bahir Dar Felege Hiwot specialized Hospital 56. % [11] for sample size calculation, the calculated sample size was 378.

Sampling technique

From pattern glaucoma patient flow to the hospital the estimated number of eligible patients with glaucoma attending the hospital was 1896. Daily, approximately 12 eligible glaucoma patients would visit the clinic. A systematic random sampling technique with a sampling fraction K=5(1896/378) was used. Order patients medical charts arrival to the glaucoma clinic was used as sampling frame. The first study participant was selected using the lottery method from the first five patients with glaucoma who visited the glaucoma clinic on the starting day of data collection. Then every 5th glaucoma patient on ocular hypotensive medication was selected.

Table 1 Socio-demographic characteristics of study participant ($n=340$)

Variable	Frequency	Percentage
Age		
≤ 40	32	9.41
41–50	77	22.65
51–60	125	36.76
>60	106	31.18
Sex		
Male	202	59.4
Female	138	40.6
Residence		
Urban	154	45.3
Rural	186	54.7
Marital status		
Single	16	4.7
Married	248	72.9
Widowed	74	21.8
Divorced	2	0.6
Educational status		
No formal education	156	45.9
Primary	92	27.1
Secondary	32	9.4
College or higher	60	17.6
Occupation		
Household (wife)	90	26.5
Governmental	36	10.6
Farmer	86	25.3
Merchant	56	16.5
Retired	48	14.1
Another	24	7
Distance from hospital (hr.)		
<1 h	59	17.35
1–2 h.	61	17.94
2–3 h.	142	41.77
>3 h.	78	22.94
Pattern of glaucoma		
Type		
POAG	220	64.70
PEXG	104	30.60
Others(NTG, NVG etc.)	14	4.70
stage of glaucoma		
Mild	50	14.70
Moderate	130	38.20
Advanced	160	47.10
Laterality		
Unilateral	128	37.60
Bilateral	212	62.40

Operation definition

The medication adherence rate was calculated based on Martin.et al. [25], using the following formula:

$$\begin{aligned} &medication\ adherence\ rate\ (\%)\ =\ 100 \\ &\times \frac{(Daily\ total\ number\ of\ prescription\ \times\ 7days) - number\ of\ prescription\ doses\ that\ was\ missed\ during\ last\ week}{weekly\ total\ doses\ of\ precription\ for\ eye\ drops} \end{aligned}$$

Adherence: Patients with a glaucoma who scored medication adherence rate ≥ 80% was considered adherent and scored < 80% considered non adherent [25].

Data collection and quality control

The structured questionnaire containing socio-demographic, list of possible barriers, drug adherence questions and pattern of glaucoma. Data about pattern of glaucoma was reviewed from the patients chart while other information were obtained interviewing patients. The questionnaire was pretested for reliability and validity in 5% of the total sample size of glaucoma patients attending Yirgalem hospital and was assessed for its clarity, completeness and reliability. Its reliability was assessed by computing Cronbach alpha which was 0.76. The questionnaire was translated to a local language by a language expert for data collection and then retranslated to English after data collection. The data was collected interviewing study participants using the structured questionnaire, and reviewing their medical charts.

Data processing and analysis

The collected data were checked for completeness and incomplete data were excluded from the analysis and considered non-respondents because they were not provided full data. The complete data entered in to SPSS 22. Descriptive analysis and binary logistic regression were performed; the findings are presented in text, tables, and a pie chart. Covariates with a P-value of less than 0.05 in the multivariable logistic regression were considered statistically significant.

Results

Approximately 340 patients participated in this study, and the response rate was 90%. More than half of them were male (59.4).Mean age of the study participants was 60.2 ± 3.17SD years. The majority came from rural areas (186 (54.7%). About 156 (45.9%) had no formal education. A greater proportion of study participants were housewives of 90(26.5%), followed by farmers of 86(25.3%). More than half (64.71%) of the participants traveled two hours or more to the hospital (Table 1).

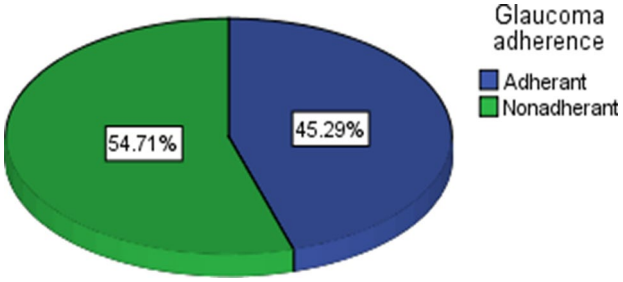

Fig. 1 Proportion of adherence to glaucoma medication among patients with glaucoma attending HUCSH

Table 2 Showing number barriers and glaucoma adherence

	Adherent *n*(%)	Non-adherent *n* (%)	Total *n* (%)
Not selected	53(96.36)	2(3.64)	55(16.17)
Selected one barrier	48(52.17)	44(47.83)	92(27.06)
Selected two or more barriers	53(27.46)	140(72.54)	193(56.77)
Total	154(45.29)	186(54.71)	340(100)

Glaucoma medication nonadherence rate

The rate of glaucoma medication non-adherence in this study was 186/340 [54.71% (95% CI: 50.90–58.5)]. Only 45.29% of respondents were adherent. See Fig. 1.

Reported barriers to glaucoma medication adherence

Overall 285(83.9%) patients reported at least one barrier to glaucoma medication adherence. About 55(16.17%) participants selected no barrier. Out of those reported no barriers noticed, 96.36% were adherent; however, 52.17%(48/92) of those who selected one barrier were adherent, and 72.54%(140/193) of those who selected more than one barrier were non-adherent (Table 2).

Overall forgetfulness 200(58.8%), medication cost 116(34.1%), and life stress 88 (25.9%) were the top three barriers to glaucoma medication adherence respectively (Table 3).

Barriers associated with glaucoma medication nonadherence

Binary logistic regression of univariate analysis indicate that miss perception of glaucoma not blinding disease and belief eye drops cannot effectively treating glaucoma were significantly associated with glaucoma medication non adherence. Physical and health related barriers such poor self-efficacy, difficulty in instilling eye drops and forgetfulness were identified as barriers significantly affecting the adherence. The other factors observed to affect adherence were mistrust of physician, medication side effect and cost, and difficulty with medication schedule.

In the multivariable analysis, forgetfulness, difficulty with medication schedule, belief that the eye drops are not effective for treating glaucoma, and poor self-efficacy were significantly associated with non-adherence to glaucoma medication. Those who mentioned forgetfulness as a barrier were 28.32-fold more likely to be non-adherent to the medication. Similarly, those who stated difficulty with scheduling as a barrier were 2.52 times more likely to be non-adherent. Those who believe that eye drops are not effective for treating glaucoma were also 6.35 times more likely to be non-adherent to glaucoma medication. On the other hand, individuals with poor self- efficacy were 10 times more likely to be non-adherent (Table 3).

Discussion

Glaucoma medication non-adherence rate in this study was 54.71%. Only 45.29% were adherent to their prescribed anti-glaucoma medication. The non-adherence rate in this study is higher than that in studies in Nigeria 36.8% [26], Pakistan(Al-Shifa Trust Eye Hospital (ASTEH)) 30% [27]. The reason for disparity between current study and that of Nigeria was due to difference in age of the study participants.

It was lower than studies in the US community (71% [9, 10], South Korea 73% [11], Oman 75.24% [28] and Australia (58.6%) [29]. The difference was due time of the study and age of the study participants, majority of the study participants in the previous studies were older individuals compared to current study. Forgetfulness which as among the top three barriers identified reported in this study increase with age because degenerative condition of the brain such as dementia and Alzaimers increase with age. Similarly, non-adherence to glaucoma medication was lower than the finding in a study in Jima, Ethiopia which was 67.5% [17]. The difference was due to some difference in the operational definition, socio economic and some cultural practice that could affect perception towards the disease and eye drops can account for the deference. It was higher than observations of studies in Ghana 41.7% [12], Nigeria 44.4% [13] and Gondar 44.4%, Bahir dar 43.8% Ethiopia respectively [13, 15, 16].

The most frequently reported barrier for non-adherence to glaucoma medication in this study was forgetfulness (89.25%) among non-adherent. Those who mentioned forgetfulness as a barrier were 28 times more likely to be non-adherent to medication. Similarly, those who stated difficulty with schedule and life stress as barriers were 2.52 and 1.88 times more likely to be non-adherent, respectively. Forgetfulness was similarly reported as the main barrier in studies conducted in the USA (glaucoma clinics in Ann Arbor, Michigan and Baltimore, Maryland), Vanderbilt Eye Institute, and systematic review of glaucoma adherence [18, 19, 22, 23, 30]. The most frequently cited barrier by adherents was the cost of the medication (57.14%); because ant glaucoma medications are lifelong treatment. Cost and life stress have also been similarly reported as barriers in previous

Table 3 Associated barriers to glaucoma medication nonadherence

Selected barriers	Non adherent	Adherent	95% confidence interval (CI) CORCI COR	*p*-value	95% AOR	*P*-value
Forgetfulness						
Selected as the barrier	166	34	29.29(16.07–53.39)	0.001	28.32(14.80-54.16)	0.001
Not selected	20	120	1.00			
Medication cost						
Selected as the barrier	28	88	2.06(1.61–2.53)	0.002	1.88(0.96.-3.67)	0.06
Not selected	30	194	1.00		1.00	
Life stress						
Selected as the barrier	52	36	1.64(0.78–2.080)	0.338	1.27(0.778–2.08)	0.118
Not selected	118	134	1`0.00		1.00	
Difficulty with schedule						
Selected as the barrier	54	21	5.89(2.882–12.041)	0.001	2.52(1.009–6.29)	0.048
Not selected	81	185	1.00		1.00	
Believe glaucoma does not cause vision loss						
yes	34	10	3.22(1.54–6.76)	0.002	2.53(0.87–7.35)	0.088
No	152	144				
Believe that eye drops are not effective						
Yes	28	4	6.65(2.28–19.40)	0.001	6.35(1.17–34.49)	0.032
No	158	150				
Poor self-efficacy						
Yes	162	152	11.26(2.62–48.45)	0.001	10.96(1.26–95.57)	0.030
No	24	2				
Poor knowledge about glaucoma						
Yes	16	6	2.32(0.89–6.09)	0.087	1.87(0.35–10.08)	0.58
No	170	148				
Mistrust physician						
Yes	162	152	11.26(2.62–48.45)	0.001	5.16(0.73–36.65)	0.101
No	24	2	1/00		1.00	
Difficulty in instilling eye drops						
Yes	48	2	26.44(6.31–110.8)	0.000	1.72(0.68–4.39)	0.045
No	138	152				
Side effects of medication						
Yes	26	2	12.35(2.88–52.93)	0.001	1.56(0.29–8.28)	0.603
No	160	152				

studies in the USA [15–18, 20] and systematic reviews of different ligatures [19].

Significant number of patients reported cost of medication as a barrier to glaucoma medication adherence. However it was not significantly associated with the non-adherence. This implies that most of the patients were willing to pay for the medication compromising other expenses. It also indicate that many people are wasting medication they bought due their miss perception about the disease and the eye drops effectiveness seeking restoration of lost vision.

In the multivariable analysis, forgetfulness, difficulty with medication schedule, belief that the eye is not effective for treating glaucoma, and poor self-efficacy were significantly associated with non-adherence to glaucoma medication. Those who mentioned forgetfulness as a barrier were 28.32-fold more likely to be non-adherent to medication. Similarly, those who stated difficulty with scheduling as a barrier were 2.52 times more likely to be non-adherent. This finding is similar to that of a study in Brazil [30]. Those who believe that eye drops are not effective for treating glaucoma were also 6.35 times more likely to be non-adherent to glaucoma medication. On the other hand, individuals with poor self- efficacy were 10 times more likely to be non-adherent.

Conclusions and recommendations

The nonadherence rate to glaucoma medication among patients with glaucoma attending Hawassa University comprehensive hospital was high (54.71%). Forgetfulness, difficulty with schedule, belief that the drug was not effective and poor self-efficacy were associated barriers to

glaucoma medication non-adherence in Hawassa. Holistic approach to increase glaucoma medication including but not limited to setting up reminder, prescribing medication with low frequency of application, awareness creation on the effectiveness of eye medication are needed to increase adherence to glaucoma medication. It is also better to conduct study on how to minimize the identified barriers. Limitations of this study - Recall bias is the main limitation of the study since subjects were asked to remember days they missed to apply their prescribed medication.

Abbreviations

HUCSH	Hawassa University Comprehensive Specialized Hospital
IOP	Intraocular pressure
OPD	Outpatient department
MSc	Master of Science
hr	hour
COR	Crude odds ratio
AOR	adjusted odds ratio

Acknowledgements
Our deepest gratitude goes data collectors Hawassa University graduating class optometry students.

Author contributions
In conducting this research BN provided conception, designed and developed manuscript and ensured that all authors approved the manuscript before submission.BK supervised data collection and organized the data, made analysis and interpretation of the data. SM designed the study and revised data analysis, gave professional consultation and comment. EG assessed data quality, entered data to SPSS, provided scientific concepts to the study and write discussion.Finally all authors made substantial contribution for important intellectual concept. Finally gave approval of the version to be published; agree to accountable for all aspects of the work.

Funding
The research did not receive any specific grant from funding agencies in the public commercial or not for profit sectors.

Data availability
Database from which analysis made available on request from Seid Mohammed/ email: seidopto@gmail.com.

Declarations

Ethics approval and consent to participate
The research was conducted according to the Declaration of Helsinki. All reported findings were obtained by analyzing interview data; no experiments or physical examinations were performed for the study participants. The study was approved by the Hawassa University School of Medicine Research Committee, and ethical clearance was obtained. The objective and purpose of our study were explained to the patients, and written informed consent was obtained from each participant before beginning the interview. Informed consent for those who could not read and write was obtained from their parents or legal guardians. Only those who provided consent and were willing to participate were interviewed. To ensure confidentiality, the respondents were not asked to write their names at the time of interview. Consent to declare that participant's participation is voluntary. They were also informed there was no risk associated with refusal to participate and had the right to draw at any time they wished. They also have a full right to contact and ask authors what they want.

Consent to publish
Consent for publication was not applicable for this study because the study did not include any individual data.

Competing interests
The authors declare no competing interests.

Received: 15 February 2024 / Accepted: 29 October 2024
Published online: 08 November 2024

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