

COLLEGE OF MEDICINCE AND HEALTH SCIENICE

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PREVALENCE AND ASSOCIATED FACTORS OF GLAUCOMA AMOUNG PATIENT ATTENDING WOLKITE HEALTH CENTER EYE CARE UNIT GURAGE ZONE, CENTRAL ETHIOPIA, (2025)

BY: FIREHIWOT AMBELU

WORKNEH TESHOME

DAGMAWI BIZUALEM

ADVISORS: Mr. TAMRAT M.

Mr. KENZUDIN A.

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Acronyms and Abbreviations

AOAG…….Adult open angel glaucoma

AOR……...Adjacent odd ratio

BSc-…….…….. Bachelor of Science

CCT……. Central corneal thickness

COR……Crud odd ratio

CI…….Confidence interval

Dr. ……....Doctor

EC- ……..…… Ethiopian calendar

GKLQ-…….……... Glaucoma knowledge level questionnaire

IEC-……..…....Informational educational communication

IOP-…….Intra ocular pressure

LC-…….…...……Laminar crib Rosa

LGN- ……..…..……Lateral geniculate neurons

MSc- …….Masters of Science

OAG…….Open angle glaucoma

POAG-……..Primary open angle glaucoma

RE…….Refractory error

SD-……standard deviation

TMs –……. Team Members

UNDP-…….. United Nation Development Program

VCDR……... Vertical cup to disk ratio

JOAG…… Juvenile open angle glaucoma

ABSTRACT

Introduction

Glaucoma accounts for over 1.9% of blindness worldwide, 15% of blindness in Africa which I shockingly high and 5.2% of blindness in Ethiopia. In Ethiopia, it ranks as the fifth leading cause of blindness. There is scarce information on glaucoma in Ethiopia. The purpose of this study was to determine the prevalence of glaucoma and the factors that were associated to it in Wolkite Health Center's eye care unit, Gurage Zone, central Ethiopia.

Objective

The aim of this study was to determine the prevalence and its associated factor of glaucoma in Wolkite health center eye care unit gurage zone central Ethiopia.

Method

An institutional based cross sectional study was employed from December 24/2024 up to January 6/2025. Systematic random sampling technique was used to select study unit from patient who was visited ophthalmology. Data were collected using structured interviewer administered questionnaire. The data were analyzed by using a Statistical Package for Social Sciences (SPSS) version 27 software.

Binary and multivariable logistic regression analyses were performed to identify associated factors, A P-value of less than 0.05 was used as a cut of point to declare statistical significance in the multivariable analysis.

Result

A total of 302 study participants were involved in this study with a 92.1% response rate. The prevalence of glaucoma was 11.3% (95% CI: 7.9-15.4 14.5%). Age >65 (AOR:5.13 CI:1.76-14.98), being hypertensive AOR =3.46, 95% CI: 1.27-10.15), positive family history of

glaucoma(AOR = 5.8, 95% CI 1.94-17.25) and positive history of smoking (AOR =4.18, 95% CI: 1.69-10.32) were significantly associated with glaucoma.

Conclusion

The overall magnitude of glaucoma in our study area was 11.3%. Older age, being hypertensive, positive family history of glaucoma, and a positive history of smoking were associated with glaucoma

Work Plan and Budget: the total duration for this study was from December 09/2024 up to January 28/2025 and budget required for this study was 3074 (three thousand seventy four) Ethiopian Birr.

Keywords*:* glaucoma, intraocular pressure, prevalence

1. INTRODUCTION

1.1. Background

Glaucoma is a group of ocular disorders that involves progressively damaged optic nerve and is characterized by progressive optic neuropathy resulting in a characteristic appearance of the optic disc and a specific pattern of irreversible visual field defects [1, 2].

There are two most common types of glaucoma; open angle glaucoma and closed angle glaucoma. Open angle glaucoma is the most common type of glaucoma [3]. It has subtle sign and symptom until the disease is advanced so it is also known as silent type [3]. Its sign and symptom includes no eye pain compared to closed angle glaucoma, optic disc cupping, tunnel vision (lose of peripheral vision) [3]. Closed angle glaucoma has noticeable sign and symptoms and it requires immediate treatment [4]. Its sign and symptom includes severe eye pain, nausea and vomiting, vision change (hollows around lights/blurred), red eye, and edema cornea [4].

World Health Organization (WHO) recommended its member countries combat the public health problem of glaucoma through a program approach. Additionally, World Glaucoma Week (WGW) is conducted every year for 1 week during March to provide more emphasis on awareness of glaucoma.

1.2. Statement of the Problem

Glaucoma is the second cause of avoidable blindness globally and needs long-term care. The asymptomatic nature and the irreversible blindness make glaucoma a public health challenge [5].Worldwide the current number of glaucoma patients is about 80 million [6]. Moreover, the worldwide prevalence of glaucoma was estimated to increase to 111.8 million by 2040[7].

Globally, glaucoma affecting an estimated 80 million people worldwide [4]. This is sadly high in Africa which is around 15% and in Ethiopia; glaucoma is responsible for 5.2% of blindness. It is also the fifth cause of blindness in Ethiopia. In Sub-Saharan African (SSA) countries including Ethiopia, glaucoma is responsible for an estimated 11.7% of total blindness, a relatively larger proportion of blindness than is seen in other regions of the world [8]. It is estimated that approximately 90% of glaucoma-related blindness is preventable with proper early treatment [9].

Eye care professionals must promptly examine risk factors for glaucoma, including high intraocular pressure, systemic or topical corticosteroid usage, older age, black race, and family history of glaucoma [10].Glaucoma is the primary cause of irreversible blindness worldwide and the second most common cause of blindness after cataracts [11, 12]. Globally, an estimated 64.3 million persons suffered with glaucoma in 2013; this number is expected to rise to 76.0 million in 2020 and 111.8 million in 2040 [13]. According to global estimates, the number of people who will become blind due to glaucoma will rise from 8.4 million in 2010 to 11.1 million by 2020 [12, 13]. Tonometry, gonioscopy, ophthalmoscopy, perimetery, and slit-lamp microscopy are among the instruments used to evaluate and diagnose glaucoma which is used to measure intraocular pressure, central corneal thickness, anterior chamber depth, lens thickness, and axial length [12, 14–16].

Glaucoma is still a public health problem also in developed countries. In Eastern Europe, for instance in Finland, glaucoma is the second cause of permanent visual impairment among elderly persons [17]. However, in general, Europe has the lowest prevalence of glaucoma at 2.93% in people over 40 years old [18]. In Ireland, the prevalence of glaucoma was 2.83% among the population aged 50 years and older [19].

Blindness due to glaucoma is also highest in Africa accounting for 15% of global blindness [20]. It has been estimated that half of glaucoma patients are already blind in at least one eye in presentation in Africa [21]. The situation is worse in Sub-Saharan Africa, [22, 23]. On the other hand, High glaucoma morbidity among some African communities may be attributed to low trained professionals, low awareness, and under-utilization of eye care service as well as limited availability of treatment procedures [24 _ 26].

In Ethiopia, glaucoma is one of the leading causes of blindness, causing irreversible sight loss. The increasing prevalence of glaucoma is expected to cause a significant economic burden and poor quality of life [27]. It is the fifth common cause of blindness which results an irreversible sight loss for an estimated 62,000 Ethiopians [28, 29].Positive family history of glaucoma are contributing factors for the emergence of glaucoma [30].

On the other hand, visual disability and blindness have significant individual repercussions; since vision is the prevalent sense used by humans at all life stages [31, 32]. The impact of these

conditions on individuals families, caregivers, health systems and finally on society as a whole, is also significant. A study by [33] shown that vision loss from glaucoma has a significant impact on health-related quality of life even in the early stages of disease. The overall burden increases as glaucomatous damage and vision loss progress. The economic burden of glaucoma is significant and increases as the disease worsens. Besides, the increasing prevalence of glaucoma and glaucoma blindness is expected to cause a significant economic burden and poor quality of life [34 _36]. It impairs quality of life, increases rehabilitation cost for the blind which all affects the economic growth of a nation [35]. It also results a huge burden for the healthcare system and government's spending toward health care [36]. It imposes significant economic burden not only for individuals affected [37] but also it increases healthcare cost [38].

In Ethiopian context, glaucoma has significant health and socio-economic impact of elderly patients. A study conducted [39] in Jimma found out the most significant influence of glaucoma on patients was the financial burden and patients spent around 29% of their income for medication only. Patients who come from rural area spent 54.5 % of their reported income. The average cost of medication depend on severity of glaucoma, patients who had advanced glaucoma spent higher cost for medications than patients with early and moderate glaucoma. Besides, a significant percentage of the participants have occupational, psychological and social influence of glaucoma on them. A study by [40] also pointed out glaucoma patients, including those with normal visual acuity and early disease, had poorer quality of life compared to normal controls. Older age, rural residence, low income and more advanced disease were significantly associated with poorer quality of life.

Glaucoma is associated with diseases like hypertension and diabetes, and if persons with risk factors are adequately screened for glaucoma, the chance of early detection is presumably increased [29]. As many studies revealed the importance of blood pressure and glycemic control in the development and progression of diabetic retinopathy reduces the numbers of cases [41].

1.3. Significance of the Study

Glaucoma is one of the leading causes of irreversible blindness worldwide. Understanding its prevalence will help public health officials to allocate resource effectively and develop targeted screening programs to identify and treat affected individuals early. It also helps in estimating

future burden of the disease and can guide future research efforts aimed at developing new treatment or intervention.

Identifying associated factors such as age, race, gender, family history, chronic illness, medication, surgery, injury and smoking can help in understanding who is at great risk, this information is crucial for developing preventive and guidelines.

Different stakeholders, institutes and individuals will benefit from this study for instance it will help health care providers to identify population at risk and implement early detection strategies, it can also help public health officials for resource allocation, to promote screening programs and to raise awareness, Individuals at risk of or diagnosed with glaucoma can benefit from better understanding the risk factor of the disease, leading to earlier detection and treatment, it may provide a foundation for further research on different aspects of glaucoma, the study can help in designing effective programs for eye care and management of glaucoma, optimizing healthcare delivery.

Overall Studying the prevalence and associated factors of glaucoma is essential for improving public health outcome, enhancing patient care and guiding future research and policy decisions improving awareness, prevention and management of glaucoma, benefiting individuals and society as a whole.

2. LITERATURE REVIEW

2.1. Prevalence of Glaucoma

The study conducted in Europe has the lowest prevalence of glaucoma at 2.93% in people over 40 years old [42]. The study conducted in Ireland, the prevalence of glaucoma was 2.83% among the population aged 50 years and older [43]. Study conducted in Germany, Gutenberg health study, on age ranges 35 – 74 revealed that the prevalence of definite glaucoma was 1.44% which was similar to other European population-based cohorts, with slightly higher prevalence in younger subjects [44]. On the other hand, a nationwide population based study on the prevalence and incidence of glaucoma in Norway from 2004 –2018 revealed 1.4% prevalence, whilst in those over 70 years of age, 8.0%. When divided into counties, the prevalence varied between 1.1 and 1.9%. Overall, the prevalence was stable in the period 2004–2018. Life time prevalence was found to be 9.4% for men and 10.2% for women. National one-year incidence proportion per 10000 was 17.0 for the total population and a peak incidence of 93.8/10000 in the 80–89 year age group was identified [45]. Another nationwide study by [46] on the prevalence and incidence of glaucoma in Denmark in a fifteen year period shown the prevalence of glaucoma increased from 0.79% to 1.72% during the investigated period. Moreover, in 2011 glaucoma affected 3.76% of the population above 50 years and 10% in patients above 80 years. The age-specific incidence rate of glaucoma seemed to be constant and the increasing prevalence was primarily attributed to an aging population.

In African context, a hospital based study conducted on prevalence and clinical profile of glaucoma patients in rural Nigeria revealed of the 5482 case files that were reviewed, 995 (18.15%) had glaucoma particularly primary open angle glaucoma (11.55%) and were mostly females (564, 56.7%) aged 69 ± 12 years (range, 50–103 years). In contrast to other glaucoma types, the prevalence of primary angle closure glaucoma increased by 15% over 5 years. The mean intraocular pressure was ranged from 15–50 mmHg but higher in females than males. The high prevalence of glaucoma in older people remains a public health problem in Nigeria [47] and other study conducted in Nigeria the prevalence of glaucoma was 5.2%[48].

The study conducted in DebreTabor Comprehensive Specialized Hospital, North West Ethiopia the prevalence of glaucoma was 66 (26%) patients suffering from glaucoma during the study period, [49]

2.2. Factors associated with glaucoma

The prevalence of POAG rises with age. Typical estimates in white persons 0.9 %, 2% and 3% at age 65, 75 and 85 years respectively. The prevalence of POAG in black populations is four to seven times higher. Overall, men hold a more than three times higher risk of having POAG than women [50] Perceived risk of glaucoma was also influenced by area of residence (rural)[51].

The older the person is, the higher his/her risk of having glaucoma. People age 60 and older are more at risk of developing glaucoma [52, 53 and 54].

A study conducted in China found in multivariate regression analysis, age, family history of glaucoma, systemic hypertension, and IOP were associated with glaucoma [55].

A study conducted in Netherland Rotterdam community-based study which examining every participant by perimeter, tonometry and ophthalmoscopy the presence of diabetes mellitus was associated with an overall rise of mean IOP of both eyes of 0.31 mmHg and with a three-fold increased presence of high-tension glaucoma. Hypertension was associated with an odds ratio of 2.33 for high-tension glaucoma [52].

A study in increased age and increased intraocular pressure (IOP) were associated with increased risk of development of open angle glaucoma (OAG), according to multivariate analyses. A family history of glaucoma, the presence of age-related macular degeneration, the presence of pseudo exfoliation, and a cup-disc ratio (CDR) greater than 0.7 were associated with greater risk of development of at least possible OAG. Having ever taken blockers, the presence of pseudo exfoliation, and a CDR higher than 0.7 also indicated significant risk of development of at least probable OAG[56]

The occurrence of glaucoma is affected by the level of intra ocular pressure (IOP), race, age and inheritance. Among these intra ocular pressure is the only modifiable risk factor [57]

The risk factors of glaucoma are numerous: age, intraocular pressure (IOP), pseudo exfoliation syndrome, high myopia (greater than −3 diopters), thinner central corneal thickness, family

history of glaucoma, low ocular perfusion pressure, drugs (steroids, antidepressants, calcium antagonists) [58]

Glaucoma is a devastating long term complication after acute ocular trauma, including corneal surgery, open globe injury, chemical burn and infection [59] IOP elevation in the healing stage has usually been considered the primary reason for post traumatic glaucoma, however, resent animal studies have demonstrated that inflammation might also be an important, IOP-independent pathway [60]

Smoking is associated with Higher Intraocular Pressure regardless of glaucoma. A study by [61] result shown that compared with never smokers, current and past smokers showed a statistically significantly higher IOP. In addition, the difference in IOP between current and never smokers was the high, regardless of the glaucoma status. Moreover, Current smokers and past smokers have higher IOP than patients who never smoked. This difference is higher in patients with an underlying glaucoma diagnosis. Another study by [62] revealed there is a direct association between current smokers and the incidence of glaucoma. In particular, this association was related with the number of pack years which was not found in the case of former smokers or in the case of passive smokers.

But, in contrast with the above two studies a study conducted by [63] found out in either JOAG or AOAG, no association of cigarette smoking was found with disease onset. In controls and JOAG, no significant effects of smoking were found on VCDR, IOP or CCT. Smoking was found to be correlated with decreased CCT in AOAG and combined POAG, but no association with VCDR or IOP was observed. Therefore, as they pointed out, although cigarette smoking was not found to be risk factor for onset of POAG, it was correlated with CCT in AOAG, and thus might still play a role in the disease course, especially for AOAG

Regional or racial variations in the prevalence of glaucoma have been attributed to genetic and possible environmental differences. The susceptibility gene loci are significantly associated with POAG. Genes involved in the IOP regulation have been studied, and some African populations and Igbo tribe of Nigerian, homogenous ethnic group have the highest prevalence of glaucoma [64].

A Study conducted on prevalence of glaucoma and it's predictors on north west Ethiopia shows that the individuals with older age family history and elevated IOP were associated with glaucoma [49].

In Ethiopian, a study conducted at Felege Hiwot Referral Hospital, Bahir Dar found out the predictor age, residence, family history of glaucoma, type of medication, cup-disk ratio, and follow-up time were significantly associated with the intraocular pressure of glaucoma patients. [65]

2.3. Conceptual framework

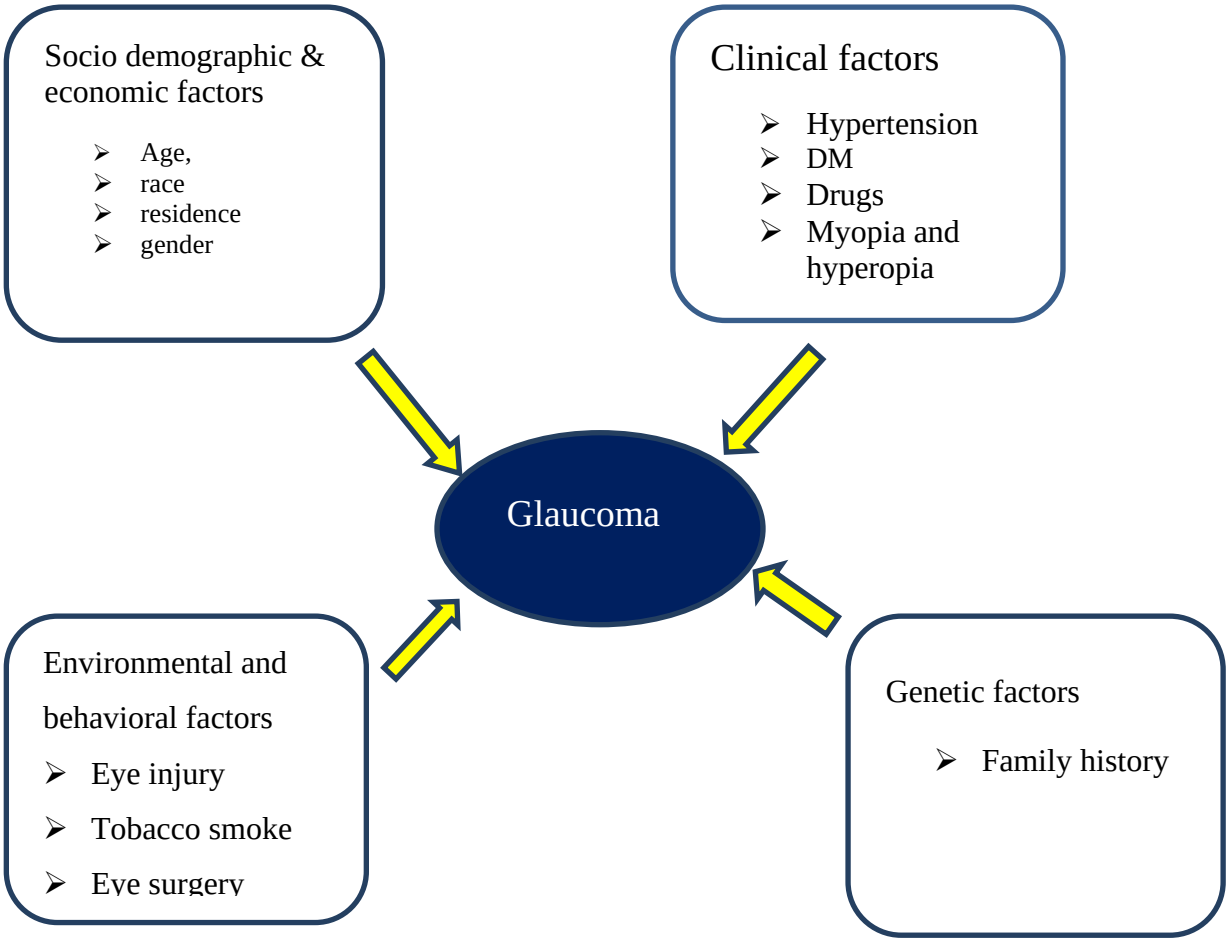


Figure 1 Conceptual framework for prevalence and associated factors among patient attending the eye care unit in Wolkite health center, gurage zone Wolkite, central Ethiopia, 2025. Developed from literatures, [40-65].

3. Objectives

3.1. General objective

To determine the prevalence and associated factors of glaucoma among patient attending the eye care unit in Wolkite health center, gurage zone Wolkite, central Ethiopia, from December 24/2024 up to January 6/2025

3.2. Specific Objective

1, To determine the prevalence of glaucoma among patient attending the eye care unit in Wolkite health center, gurage zone Wolkite, central Ethiopia, from December 24/2024 up to January 6/2025

2, To identify factors associated with glaucoma among patient attending the eye care unit in Wolkite health center, gurage zone Wolkite, central Ethiopia, from December 24/2024 up to January 6/2025

4. Methods and material

4.1 Study area and period

Wolkite town is the capital of Gurage zone. It is found 153 km southwest to Addis Ababa, the capital of Ethiopia. The total population of Wolkite town is 92,531.

Wolkite health center is the leading health center in the town, which was established in 1983 E.C as Wolkite clinic. It is now being providing preventive, curative & rehabilitative health care services to the population of Wolkite town and others. There are three catchment kebeles around the health center (Menaharia, Edgetchora & Selamber) giving different health care services for about **46,166** populations. The institution is currently hosting 208 employees, 5 general practitioners, 26 health officers, 14 Bsc Nurses, 9 midwifes, 17 laboratorians, 2 pharmacists, Ophthalmic nurse 1 ,Cataract surgery + MPH 1 ,Ophthalmic official 1, Optometrist 2.Total

patient screened annually in 2016 EC is 13442. The study was conducted from December 24/ 2024 to January 6/ 2025 GC.

4.2 Study design

Institutional based cross-sectional study design was conducted.

4.2.1. Source Population

All patients who were visited Wolkite health center eye care unit was the source population.

4.2.2. Study Population

Patients, those who were 40 and above and who visited Wolkite health center eye care unit was the study population.

4.3. Eligibility criteria

Inclusion criteria

- Clients who were 40 and above and visited Wolkite health center eye care unit at the time of data collection.

Exclusion criteria

- Patients with cognitive, speech or hearing impairment
- Patients who was seriously ill or unable to respond on the study questions during data collection period was excluded.

4.4. Sample Size Determination and Sampling Procedure

4.4.1. Sample Size Determination

The sample size for this study was estimated using a single population proportion formula by considering a 95% CI with 0.05 level of precision or margin of error, and the prevalence obtained from the previous study (26%). Therefore, the sample size was calculated as follows

$$n = \frac{(Z^{\wedge}2\ P\ (1-p)}{w^2}$$

$n = \frac{(1.96)^2\ 0.26(1-0.26)}{(0.05)2}$ n=295.6 296

Where, $n_{Patients}$ = the sample size of the patients; Z = the standard normal curve deviate usually set as 1.96 which corresponds to the 95% confidence interval; p = 26%(0.26) the population proportion with prevalence of glaucoma adapted from [52] and e = level of precision = 5%

Therefore, the final sample size for the research was 325 with 10% added considering non – response rate.

For the second objective sample size was calculated using 95%CI, 80% power and exposed unexposed ratio 1. Epi info was used. (Table 1)

Table : 1 sample size determination for factor associated with glaucoma to determine the prevalence and associated factor of glaucoma among patient attending the eye care unit in Wolkite health center, gurage zone Wolkite, central Ethiopia, 2025.

Exposure variable	AOR	Ratio	Power	%of outcome		10% nonresponse rate	Total sample size	Reference
				Unexposed	Exposed			
Family history of glaucoma	3.72	1:1	80%	23%	66.7%	5	53	[49]
Elevate IOP	3.09	1:1	80%	6.6%	43.7%	5	57	[49]

As the largest sample size for all these was that of prevalence of glaucoma, for conducting the study we used the highest sample size which is 325.

4.4.2. Sampling Procedures

A systematic random sampling technique was used to select the study participants. A total of 1040 patients were visiting the eye care unit over the last four week period. So we took the average to estimate total patient attending to the eye care unit over the two week which was 520. Therefor we calculated the sampling interval (i.e., K=N/n = 520 / 325; K = 1.6~2). Then the

lottery method was used to get the random starter which was 2. The first individual was taken as nth and the next was by sampling fraction (K=2). And then every 2nd individual was interviewed until the allocated sample size was achieved. When there were no eligible persons who met the inclusion criteria immediately was replaced by the second individual.

4.5. Study Variables

4.5.1. Dependent variables

Glaucoma

4.5.2. Independent Variables

Socio-demographic related variables: gender, age, race and place of resident.

Clinical related variables: ,DM ,HTN, myopia, hyperopia and medication.

Behavioral related variables: tobacco usage

Environmental related variable; Eye injury, Eye surgery

Genetic related variable; family history

4.6 Data analysis

4.6.1. Data Processing and Statistical Analysis

The collected data was cleaned, entered, and analyzed using SPSS version 27. To explain the study population concerning relevant variables, data were described using summary measures (frequency, proportion means). Proportions estimated along with 95% CI level. Both bivariate and multivariable logistic regression analyses were carried out. Variables with a p-value < 0.25 in the bivariate analysis were fitted into the multivariable logistic regression model for the prediction of determinants. The Hosmer-Lemeshow goodness-of-fit statistics were used to assess whether the necessary assumptions for the application of multiple logistic regression were fulfilled. Crude and adjusted odds ratio with 95% confidence interval was computed. The Adjusted Odds ratio with a 95% confidence interval is used to measure the strength of association and the actual predictors of the outcome variables. P-values less than 0.05 were used as a cut off point for declaring statistically significant.

4.7 Data quality management

The quality of data was assured through careful design of the questionnaire, proper training of the data collectors, Furthermore, data collected through the questionnaire was checked for completeness and consistency. To ensured the reliability of the instruments, the questionnaire was tested on 5% of the sample of similar population from the health center who was not included in the actual study. Finally, the necessary modifications were made before the actual data collection period.

4.8. Operational and Term Definition

Glaucoma: Glaucoma is an eye condition that damages the optic nerve. This damage can lead to vision loss or blindness.

History of diabetes mellitus and hypertension was defined if the individual has/had a diagnosed diabetic mellitus/ hypertension or undergoing anti-diabetes mellitus/antihypertensive treatment

Family history of glaucoma was defined as a family member (mother, father, brother, and sister) of glaucoma diagnosed by professionals or any spectacle use

Smoking was defined as those who smoked cigarette within their entire life.

4.9. Ethical Considerations

Before conducting the research, ethical clearance was obtained from Wolkite University Ethical Review Board. Legal permission was also obtained from Wolkite local health center based. After this process, participants were provided with an explanation of the purpose of the study. The study was confirmed confidentiality, the right of an individual protection was ensured and their name was not mentioned on the questionnaire. Participant was also informed that they could withdraw from participation at any time for any reason and without any consequences. Moreover, all the resources to be used for this study were appropriately acknowledged.

4.10. Dissemination of the Plan

The result of this study will be presented to Wolkite University College of Health Science Department of public health in partial fulfillment of the requirements for the Degree of Sciences in public health, by hard and soft copy and it will be disseminated to Wolkite Town Health Office. It will be disseminated through scientific publications if possible. Finally effort will made to present on seminars.

5. RESULTS

5.1. Socio – Demographic Characteristics of the Respondents

A total of 302 participants were involved in the study, the remaining 23 individuals were non respondents making a response rate 92.8%. The mean age of the participant was 61 years. Out of 302 study participants, 172 (57%) were male, 96 (31.8%) were farmers and 91 (30.1%) had primary educational status, 129 (42.7) of them were gurage by ethnicity and regarding to residence 157 (52%) were from rural area (Table 2)

Table 2: Respondents' Socio-Demographic Characteristics among patient attending Wolkite health center eye care unit, Gurage zone central Ethiopia, from December 24/2024 up to January 6/2025

No	Variable	Category	Frequency	Percent
1	Gender	Male	172	57
		Female	130	43
2.	Age	40 – 54 years	73	24.2
		55 - 64 years	112	37.1
		65 and above years	117	38.7
3.	Educational Background	No formal education	71	23.5
		Primary school (1 – 8)	91	30.1
		Secondary school (9 – 12)	63	20.9
		Diploma & above	77	25.5
4.	Religion	Orthodox	103	34.1
		Muslim	127	42.1
		Protestant	51	16.8
		Others	21	7
5.	Ethnicity	Gurage	129	42.7
		Oromo	75	24.8
		Amhara	64	21.2
		Others	34	11.3
6.	Marital Status	Single	31	10.3
		Married	195	64.6
		Divorced	22	7.3
		Widowed/er	54	17.9
7.	Occupation	Employee	86	28.5
		Merchant	79	26.2
		Daily labor	21	7
		Farmer	96	31.8
		Housewife	20	6.6
8.	Monthly Income In Ethiopian Birr	< 5000	59	19.5
		5000 – 10000	155	51.3
		>10000	88	29.1
9.	Residence	Urban	145	48
		Rural	157	52

5.2. Behavioral and clinical factors

This study reported that 66(21.9%), 37(12.3%), and 34(11.3%) of the study participants had a history of smoking, RE, and hypertension respectively. Besides, family history of glaucoma was found 25(8.2%) of the study participants (Table 3).

Table 3: Respondents behavioral and clinical factors among patient attending Wolkite health center eye care unit, Gurage zone central Ethiopia, from December 24/2024 up to January 6/2025

No	Variable	Category	Frequency	Percent
1	history of eye injury	Yes	33	10.9
		No	269	89.1
2.	history of eye surgery	Yes	48	15.9
		No	254	84.1
3.	Tobacco use (Smoking)	Yes	66	21.9
		No	236	78.1
4	DM	Yes	19	6.3
		No	283	93.7
5.	HTN	Yes	34	11.3
		No	268	88.7
6.	long term medication use	Yes	27	8.9
		No	276	91.1
7.	If yes	Steroid	7	2.2
		Anti-depressant	2	0.7
		Others	18	6
8.	Family history of glaucoma	Yes	25	8.2
		No	277	91.8
9.	If yes	Mother	7	2.3
		Father	15	4.9
		Other	3	1
10.	Refractory error	Yes	37	12.3
		No	265	87.7
11.	If yes	Myopia	9	3
		Hyperopia	6	2
		Presbyopia	22	7.3

Source: Own construct from survey data, 2025

5.3 Prevalence of glaucoma

Among the total of 302 participants, 34 (11.3%) [95% CI] had glaucoma. (Fig 2).

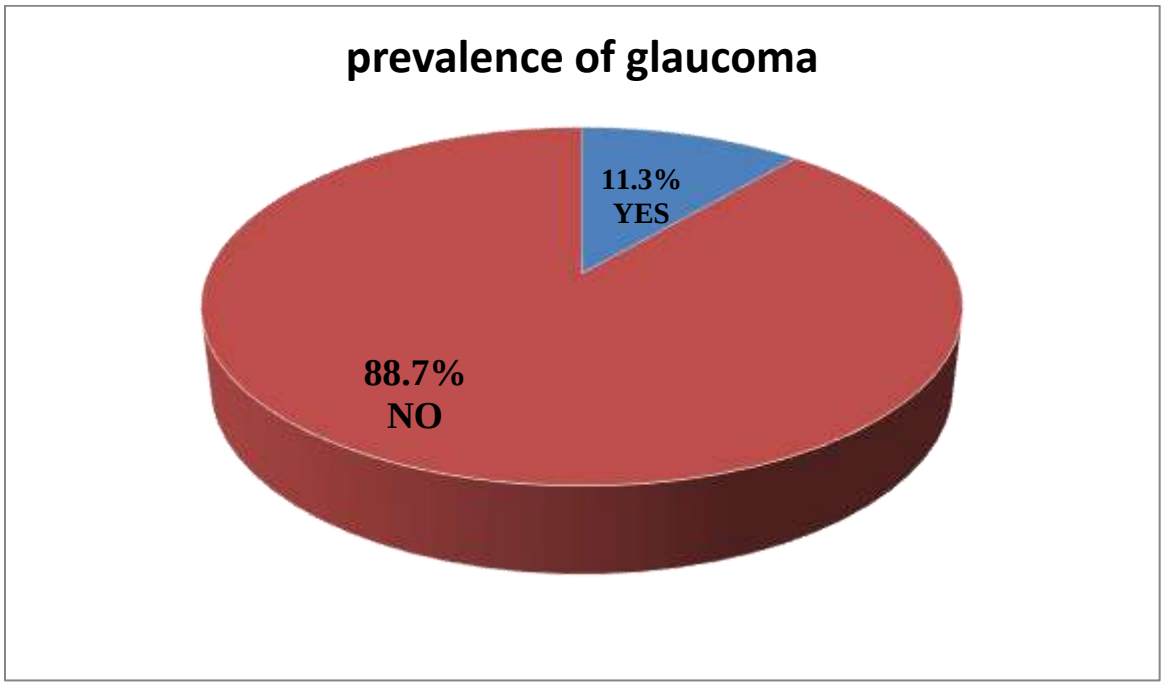


Figure 2 Prevalence of glaucoma among patient attending the eye care unit in Wolkite health center, gurage zone Wolkite, central Ethiopia, 2025

5.4. Clinical sub type of glaucoma

Among the overall prevalence of glaucoma identified in the study revealed that 68.1% of them had POAG and 31.9% had CAG (Fig 3).

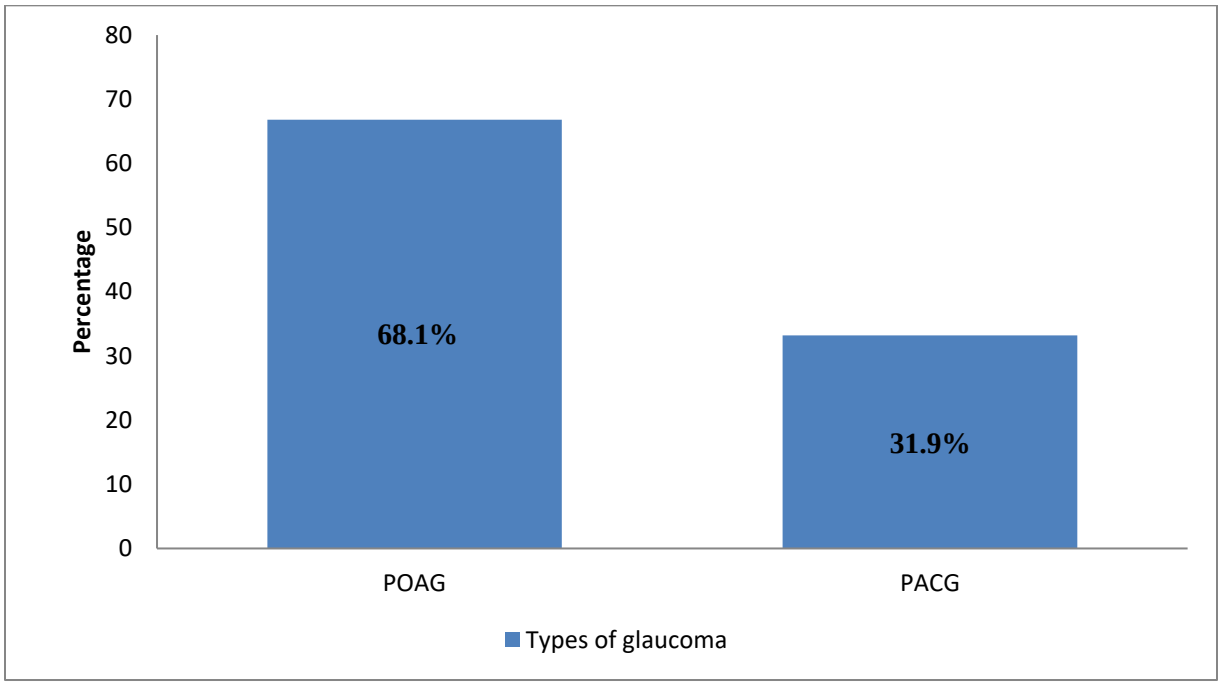


Figure 3 Prevalence of types of glaucoma among patient attending the eye care unit in Wolkite health center, gurage zone Wolkite, central Ethiopia, 2025

5.5 Factors associated with Glaucoma

Bivariable and multivariable binary logistic regression was performed to identify factors associated with glaucoma. In Bivariable binary logistic regression analysis, male sex, older age, positive history of hypertension, history of eye injury, family history of glaucoma, having smoking history, and RE were associated with glaucoma.

Those variables in the Bivariable analysis that had a P-value less than 0.25 were entered into a multivariable binary logistic regression. A family history of glaucoma, positive history of

clinically diagnosed hypertension, older age and history of smoking were significantly associated with glaucoma in multivariable logistic regression with a P-value of less than 0.05.

Table 4 Multivariable binary logistic regression analysis for factors associated with glaucoma among patient attending Wolkite health center eye care unit, Gurage zone central Ethiopia, from December 24/2024 up to January 6/2025

Variable		**Glaucoma**		**COR (95%CI)**	**AOR (95%CI)**	**P-value**
		Yes	**No**			
Age	>65years	23	94	3.8(1.5-8.94)	5.13(1.76-14.98)	0.003
	<65years	11	174	1	1	
History of smoking	Yes	17	49	4.46(2.13-9.36)	4.18(1.69-10.32)	0.002
	No	17	219	1	1	
History of HTN	Yes	9	25	3.49(1.47-8.31)	3.46(1.27-10.15)	0.016
	No	25	243	1	1	
Family history of glaucoma	Yes	10	15	7.02(2.85-17.34)	5.8(1.94-17.25)	0.002
	No	24	253	1	1	

6. Discussion

The prevalence and associated factors of glaucoma were assessed in this institutional-based cross-sectional study in Wolkite health center, central, Ethiopia. The finding of this study revealed that the prevalence of was 11.3% (95% CI 7.9-15.9). The finding of this study was lower than studies conducted in Debere tabor Northwest Ethiopia 26% [49] and Nigeria 18.15%

[47]. In this case, the discrepancy might be due to the fact that study was conducted in referral hospital unlike our study which was conducted in health center level this might affect the result because there is increased patient flow with referral paper from different hospitals and health centers for better management and there is better diagnostic setup with more skilled professionals, the other cause might be socio-demographic characteristics of the study population and the study setting.

On the other hand, the finding of this study was higher than studies compared to other studies conducted in Europe (2.93%)[42], Ireland (2.83%)[43], Germany (1.44%)[44], Denmark (3.76%)[46], Nigeria (5.02%)[48]. The high prevalence is might be caused by the fact that glaucoma is more common in black race as different studies show there is increased prevalence in Africa than that of Europe[64] and population based studies tend to have lower prevalence than hospital based studies because in hospital based study the data is collected from patients there for it is more likely to have more prevalence in hospital based studies than population based studies and our sample might also influence the prevalence.

In this study after conducting Bivariable and multivariable binary logistic regression positive family history, older age, history of smoking and history of clinically diagnosed hypertension became significantly associated.

Participants who had positive family history were more likely to develop glaucoma than participants with negative family history. Studies conducted in china[55] found the same result another study conducted in Debretabore[49] and Bahi Dar[65] also found the same result to ours. Family history is significant risk factor for glaucoma the reason is believed to be polygenic inheritance and inherited traits affecting IOP, optic nerve structure and the angle of the eye which are the leading points to develop glaucoma.

Participants whose age was 65 and above were more likely to develop glaucoma than participants who were less than 65, study conducted in Australia [56], Italy [58], found the same association and studies conducted in Debretabore and Bahir Dar [49],[65] also found the same results, This could result from a number of years of exposure to ocular risk factors and an age-related rise in intraocular pressures, both of which raise the risk of developing glaucoma.

When we come to hypertension patients with positive history of clinically diagnosed hypertension were more at risk than patients with negative history of clinically diagnosed hypertension this result was found to be similar to studies conducted in Netherlands [50] and china [55]. Increased blood pressure may cause glaucoma by causing damage to the blood vessels of the eye especially small vessels that supply the optic nerve and by disrupting the auto regulation proses which will keep blood flow to the optic nerve steady regardless of the change in blood pressure. Both of the problems we mentioned above will cause decreased blood flow and damage to the optic nerve which will then lead to glaucoma.

The other variable which significantly associated with glaucoma according to our study was positive history of smoking, participants who had history of smoking or currently smoking was more likely to develop glaucoma than non-smokers. Studies conducted in USA[61][62] found that smoking is significantly associated with increased IOP which is the main cause of glaucoma, smoking can cause glaucoma in many ways the first one is by increasing IOP as we mentioned above and the other is by causing vascular damage, systemic vasoconstriction and decreased blood flow.

Limitation of the study

A cross-sectional study design does not reveal a cause-and-effect relationship between dependent and independent variables. Recall bias was another issue due to the nature of the questionnaire to assess family history of glaucoma and history of eye injury

7. Conclusion

The prevalence of glaucoma in this study area was 11.3% (95%CI: 7.9-15.4). A family history of glaucoma, a positive history of hypertension, a history of smoking and age of patient were significantly associated with glaucoma.

8. Recommendations

Based on the findings of the study and the conclusions, the following recommendations are forwarded accordingly.

8.1 For Health Professionals:

Glaucoma is known to cause irreversible blindness, early detection is the only way to prevent the disease so health care professionals should work on early detection by promoting screening programs for individuals at risk, according to our study two of the factors (smoking and hypertension) are modifiable so the professionals should work on creating awareness on life style modification, smoking and to create on glaucoma as a general.

8.2 For governmental and non-governmental organizations

Glaucoma is a second leading cause of blindness worldwide so non-governmental organizations should work on creating awareness about glaucoma, its associated factors and the importance of early detection on the community level. Governmental organizations especially the health biro should work on resource allocation to build better diagnostic and management setup on health center level so the community will get the help they need there and to cover as many people as possible.

8.3 individual diagnosed with glaucoma

For those diagnosed with glaucoma adherence to prescribed medication is essential to manage IOP effectively.

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APPENDICES

Appendix I: Subject Information Sheet (English Version)

Wolkite university College of Medicine and Health Sciences Department of Public health

INFORMED CONSENT

Hello, my name is ---------- and I ‘m from WUSH. I am conducting a study on prevalence and factors associated to glaucoma in WHC. As part of this, you kindly requested to be included in the study, which has great importance to improve those problems and the interview will take a maximum of 15 minutes. It will not cause you any financial or psychological harm. Your participation will based on your willingness and you have the right not to participate fully or

partially. If you agree to be included in the study, I will start my question by asking general identification questions. May I continue?

Yes ----------

No ----------

Thank you for volunteering to be part of the study!

Date ----------

Name of the interviewer ----------

Sign ----------

This questionnaire is

Completed ----------

Partially completed ----------

No	**Part 1:- socio-demo and economic characteristics**	**Coding category**
101	Sex of the patient	A. Male B. Female
102	Age of the patient	A. 40-54 B. B. 55–64 C. C. >65
103	Educational status	A. Illiterate B. Primary education C. Secondary education D. above

104	Religion	A. Orthodox B. Muslim B. Protestant D. Others (specify)
105	Ethnicity	A. Gurage B. Oromo C. Amhara D. Others
106	What is your current marital status?	A. Single B. Married B. Divorced D. Widowed
107	What is your occupation?	A. Daily laborer C. Student B. Employee D. Merchant E house wife
108	What is your monthly income	A. < 5000 birr B. 5000-10,000 birr C. > 10,000 birr
109	Residence	A. urban B. rural

No	**Part 2:- Environmental and Behavioral factor**	**Coding category**
201	Do you have history of eye injury	A. Yes B. No
203	Do you smoke or have you ever smoke before	A. Yes B. No
204	Do you have history of eye surgery	A. Yes B. No
No	**Part 3:- clinical factors**	**Coding category**
301	Do you have clinically diagnosed HTN	A. Yes B. No
302	Did you have clinically diagnosed DM	A. Yes B. No
303	Did you have history of long term medication use	A. Yes B. No
304	If yes the type	A. steroid B. antidepressant C. others

305	**Do you have refractory error**	**A. myopia** **B. hyperopia** **C. presbyopia**
No	**Part 4:- Genetic factor**	**Coding category**
401	Is there similar illness in the family	B. Yes C. No
402	If yes for 501, who has similar illness?	A. Mother B. Father C. Sibling D. Grand parents
403	Glaucoma	A. Present B. absent

That is the end of the question. Thank you very much for your cooperation & sacrificing your time

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101	□□	1. □□□ 2. □□
102	□□□	1. 40-54 2. 55-64 3. >65
103	□□□□□□ □□□	1. □□□□□

		2. □□□□ □□□□ 3. □□□□ □□□□ 4. □□ □□□□
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105	□□□	1. □□□ 2. □□□ 3. □□□ 4. □□ □□□□ □□□□
106	□□□□ □□□□	1. □□□□ 2. □□□ 2. □□□ 3. □□□□□□
107	□□□ □□□	1. □□□ □□□□ 2. □□□ 3 □□□□ 4. □□□ 5 □□□ □□□□
108	□□□ □□	1. < 5000 □□ 2. 5000-10000 □□ 3. > 10000 □□
109	□□□□□□ □□	1 □□□ 2 □□□

ቁጥር	ክፍል 2:- አካባቢያዊ ሁኔታዎች	ኮድ
201	□□□ □□□ □□□ □□ □□□ □□□□□□	1. □□ 2. □□□□□□□□

202	□ □□□ □□□□ □□□□□ □□□□	1. □□ 2. □□□□□
203	□□□□□ □□□ □□□ □□□	1. □□ 2. □□□□□
ቁጥር	**ክፍል 3:- በፊት የነበሩ የበሽታ ሁኔታዎች**	**ኮድ**
301	□□□□□ □□□□□□ □□□ □□□ □□□□	1. □□ 2. □□□□
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ቁጥር	**ክፍል 4:- የስነባህሪ ሁኔታዎች**	**ኮድ**
401	□□□□□ □□□ □□□□ □□□ □□ ?	1. □□ 2. □□□
402	□ “401” □□□□ □□ □□□, □□□?	1. □□□ 2. □□□ 3. □□□□ □□□ □□□

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403	□□□□□	1 □□ 2 □□□