



ST. PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE GRADUATE
STUDY PROGRAM

PREVALENCE OF HYPERTENSIVE RETINOPATHY AND ASSOCIATED
FACTORS AMONG HYPERTENSIVE PATIENTS ON FOLLOW-UP AT A
SELECTED FEDERAL HOSPITAL, ADDIS ABABA, ETHIOPIA, 2023 G.C.

INVESTIGATOR: JIREGNA ETICHA DAKO

ADDIS ABABA, ETHIOPIA

JUNE 2023 G.C.

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SURGICAL NURSING IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE IN CARDIOVASCULAR NURSING PRACTITIONER, ST.
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Table of Contents

Acknowledgements	i
Table of Contents	ii
List of tables.....	iv
List of figures.....	v
Acronyms and Abbreviations	vi
Abstract.....	vii
1.1. Background	1
1.2. Statement of problem.....	2
1.3. Rationale of the study	4
1.4. Significance of study	5
2. LITERATURE REVIEW	7
2.1. Introduction.....	7
2.2. Prevalence of Hypertensive Retinopathy.....	7
2.3. Factors associated with Hypertensive Retinopathy.....	9
2.4. Conceptual frame work.....	11
3. OBJECTIVE	12
3.1. General objective.....	12
3.2. Specific objective	12
4. METHODS	13
4.1. Study setting.....	13
4.2. Study period	13
4.3. Study design	13
4.5. Study population.....	14
4.6. Inclusion.....	14
4.7. Exclusion.....	14
4.8. Sample size	14

4.9. Sampling procedures	15
4.10. Study Variables	16
4.10.1. Dependent variable	16
4.10.2. Independent variable.....	16
4.11. Data Collection tools and Procedures.....	17
4.12. Operational Definitions.....	18
4.13. Data Quality Control and Management	18
4.14. Measurements.....	18
4.15. Data Analysis Plan and Procedures	19
4.16. Ethical clearance.....	19
4.17. Results dissemination	20
5. RESULTS	21
6. Discussion.....	29
8. Conclusion	32
8. Reference	33
Annex. 1. Approval sheet	40
ANNEX .2: Questionnaire.....	41

List of tables

Table 1: Sample size calculation of the second objective among study.....	15
Table 2: Socio-demographic characteristics for assessment of the prevalence of hypertensive retinopathy and associated factors among hypertensive patients visiting selected federal hospitals in Ethiopia in 2023 G.C.....	21
Table 3: Behavioral related factors for assessment of prevalence of hypertensive retinopathy and associated factors among hypertensive patients visiting at selected Federal hospitals in Ethiopia, 2023.G.C.....	22
Table 4: Clinical factors for assessment of prevalence hypertensive retinopathy and associated factors among hypertensive patients visiting at selected Federal hospitals in Ethiopia, 2023.G.C.....	23
Table 5: Institutional related factors among hypertensive patients visiting at selected Federal hospitals in Ethiopia, 2023.G.C.....	25
Table 6: Multivariable logistic regression for assessment of prevalence of hypertensive retinopathy and associated factors among hypertensive patients visiting at selected federal hospital in Ethiopia, 2023 G.C.....	27

List of figures

Figure 1: Conceptual framework for the study on prevalence hypertensive retinopathy and associated factors among hypertensive patients, Addis Ababa, Ethiopia,2023G.C.....	11
Figure 2: Schematic presentation of systematic random sampling technique	16
Figure 3: Type of anti-hypertensive drugs being taken among hypertensive patients visiting at selected Federal hospitals in Ethiopia, 2023.G.C	24
Figure 4: Level of hemoglobin among hypertensive patients visiting at selected Federal hospitals in Ethiopia, 2023.G.C.....	25

Acronyms and Abbreviations

AOR	Adjusted Odds Ratio
CI	Confidence Interval
CVA	Cardiovascular Accidents
DBP	Diastolic Blood Pressure
ETB	Ethiopian Birr
HCW	Health Care Worker
HTR	Hypertensive Retinopathy
HTN	Hypertension
KWB	Keith Wagener Barker
MOH	Ministry Of Health
MSc	Masters in Science
OPD	Outpatient Department
SBP	Systolic Blood Pressure
SPHMMC	Saint Paul's Hospital Millennium Medical College
SPSH	Saint Peter's Specialized Hospital
WHO	World Health Organization

Abstract

Background: Hypertensive retinopathy is one of the commonest complications of hypertensive patients that cause eyesight disorders or vision loss. Worldwide, the prevalence of hypertensive retinopathy was estimated to be as high as 75%. Despite its remarkable burden, there are limited studies in Ethiopia. Therefore, this study aimed to assess the prevalence and associated factors of hypertensive retinopathy in selected federal hospitals in Addis Ababa.

Objectives: The purpose of this study was to assess the prevalence of hypertensive retinopathy and associated factors among hypertensive patients on follow-up at selected federal hospitals of Addis Ababa, Ethiopia, 2023 G.C.

Methods: A hospital-based cross-sectional study was conducted from March 6, 2023, to April 5, 2023 G.C. The study was carried out among hypertensive patients in St. Paul's hospital, Millennium Medical College, and St. Peter's specialized hospital. A systematic random sampling was performed to select study participants, and data were collected face-to-face using a structured questionnaire. Data was entered into Epi-Info version 7.20 and exported to SPSS version 26 for analysis. Bivariable and multivariable logistic regression were employed. Independent variables with a p-value ≤ 0.25 in bivariable logistic regression analysis were considered for multivariable logistic regression. Using a p-value ≤ 0.05 and 95% CI with the respective adjusted odds ratio, the degree of association of each independent variable with the outcome variable was implemented.

Results: Data was collected from 312 participants, of whom 61.2% were male. The prevalence of hypertensive retinopathy was found to be 8%, where 3.8% had grade 1 hypertensive retinopathy, 2.2% had grade 2 hypertensive retinopathy, 1.3% had grade 3 hypertensive retinopathy, and 0.7% had grade 4 hypertensive retinopathy. Being ≥ 76 years old (AOR=4.27, 95% CI, 2.01, 11.76), having ≥ 16 years of living with hypertension (AOR=2.26, CI=95% 2.11, 5.32), obesity (AOR=0.18, CI=95%, 0.05-0.24), family history of hypertension (AOR=3.56, CI=95%, 2.78, 7.61), hyperlipidemia (AOR=0.54, CI=95%, 0.042-0.82), and presence of other heart disease (AOR=0.82, CI=95%, 0.06, 0.97).

Conclusion & recommendation: The prevalence of hypertensive retinopathy among hypertensive patients was low and was significantly influenced by higher age, obesity, family history of the disease, long duration of hypertension, hyperlipidemia,

and co-existing heart problems. A recommendation was given on prevention, follow-up, and early diagnosis, as well as management and conducting further study in both study areas.

Keywords: Hypertensive retinopathy, hypertension, vision loss, prevalence, associated factors, SPHMMC, SPH.

1. INTRODUCTION

1.1. Background

Hypertension (HTN) is defined as when a measurement of blood pressure continuously raised of systolic blood pressure or diastolic blood pressure greater than equal to or 140/90 mmHg in adults that aged 18 years and greater(1).

Hypertensive retinopathy is one of the commonest eyesight disorder that occurs because of high blood pressure (2), a clinical evidence and systemic indication of high blood pressure and one of the leading causes of visual damaged among adult patients with high blood pressure(3). Poorly controlled hypertension has great result on these organs leading to target organ damage. High blood pressure can be causing the arteries to extend, narrow and become impaired over time. The chance of damage to the retina increases with the severity of high blood pressure and the length of time over which the condition is experienced(4). Hypertensive retinopathy(HTR) is one the commonest complication of hypertensive patients that results damage retinal vessels. Hence, retinal micro vascular changes are indicative signs of hypertensive retinopathy and may be helpful in classifying risk factors and treatment for hypertension. Apart from hypertension, genetics is other etiologic factor for hypertensive retinopathy(5). Hypertensive retinopathy is retinal vascular damage caused by hypertension. This hypertensive retinopathy diagnosis by history (duration and severity of hypertension) and fundus copy and ophthalmologist classify (graded) based on Keith Wagener Barker (KWB) grades. Grade 1: Elevated blood pressure and narrowing of the arteries is mild, no symptoms are present. Grade 2: Elevated blood pressure and narrowing of the arteries is more pronounced, no symptoms are present. Grade 3: Signs of damage such as retinal hemorrhage (bleeding) and cotton wool spots, i.e. white patches on the retina, are present upon inspection, symptoms may be present. Grade 4: Severe Grade 3 plus papilledema, symptoms are present (6). In hypertensive retinopathy, retinal vessels are visible on routine examination. As result of elevated chronic HTN are cause hypertensive retinopathy was easily visible on the eyes(6). Hypertensive retinopathy (HRP) is a possible complication of high blood pressure (Persistent, untreated high blood pressure can cause damage to the retina. An ophthalmologist based on the symptoms present diagnoses it. This symptoms was double or dim vision, loss of vision and headaches(3).

1.2. Statement of problem

Hypertension is a worldwide problem that affects up to 50 million people in the United States and approximately one billion worldwide and is the single most important modifiable risk factor for plenty of medical complications, including stroke. Raised blood pressure expenses the nation about \$131 to \$198 billion each year. This total includes the cost of health care services, medications to treat high blood pressure, and loss of productivity from premature death. There is inadequate information on the economic burden of hypertension treatment in Ethiopia (7). Approximately 75% of the world's population suffers from arterial hypertension (8), with a prevalence rate of hypertensive retinopathy in patients suffering from mild hypertension of 25.3%, moderate hypertension of 34.5%, and severe hypertension of 84.6%. The degree and duration of hypertension increase the incidence of retinopathy. Degree and duration of hypertension increase the incidence of retinopathy (9), and of the patients with retinopathy, 42.36% had grade I, 20% had grade II, and 2.35% had grade III retinopathy(10).

In Africa hypertensive retinopathy is twice as frequent in African Americans and particularly in Ethiopia, prevalence hypertensive retinopathy was high up to 11.2% (11)(12) (13) .The prevalence of hypertension is particularly high in people of black African descent throughout the world, and the consequences of hypertension, such as hypertensive heart and renal disease and stroke, are also more common. However, there is little consensus on whether hypertensive retinopathy follows a similar pattern(14).

In Ethiopia, according to a study done on the prevalence and associated factors of hypertension complications among hypertensive patients at the University of Gondar Comprehensive Specialized Referral Hospital, the prevalence of HRP was 11.2% (12), and there was also insufficient information and predisposing factors on the prevalence of hypertensive retinopathy.

Hypertensive retinopathy predicts CHD in high risk men (15)(16) and is a risk factor for stroke, cardiovascular disease and cerebrovascular disease, diet, aging, elevated blood pressure, smoking, family history of hypertension, severity of hypertension ,high cholesterol, duration of hypertension, obesity, high salt diet (17) (20,21). The chance of damage to the retina increases with the severity of high blood pressure and the length of time over which the condition is experienced (17).

Both modifiable and non-modifiable risk Factors of HTN increases the prevalence of retinopathy(19).This hypertensive retinopathy cause vision loss, stroke, damage optic nerve, nerve fibers(20). Most risk factors for HTN, like prolonged high blood pressure, heart disease, atherosclerosis, diabetes, smoking, high cholesterol, being overweight, eating an unhealthy diet, and sodium and heavy alcohol consumption, cause hypertensive retinopathy (20). Therefore, it is important to study the risk factors of retinopathy among hypertensive patients on the grounds that it will decrease the magnitude of hypertensive retinopathy and associated cardiovascular as well as cerebrovascular diseases (19).

Despite specific intervention on hypertensive, retinopathy was not forwarded in Ethiopia yet; WHO is a preventive strategy on hypertensive retinopathy was emphasized within cardio-vascular diseases. It aimed at reducing the risk of coronary heart disease and cerebrovascular disease through the voluntary or regulated reduction in dietary salt intake, control of blood pressure and cholesterol with drugs, and combination drug therapy for people at an absolute (as opposed to relative) risk of experiencing a cardiovascular disease event over the next 10 years >25% (22). Furthermore, as there is absence of updated data and uninitiated preventive strategy on hypertensive retinopathy, this study can provide prevalence of the hypertensive retinopathy on the ground that baseline problem is essential for setting strategies for Ethiopia.

Addressing aspects of the problem as above, an objective of this study was to assess the prevalence and associated factors of hypertensive retinopathy among hypertensive patients on follow-up at a selected federal hospital, Addis Ababa, Ethiopia, 2023 G.C.

1.3. Rationale of the study

The main rationale of this study is that, first, despite extensive study in the developed world on the burden of hypertensive retinopathy among hypertensive patients; little has been done in sub-Saharan Africa and Ethiopia on this issue. Second, on the other hand, this is the main indicator of health care service quality and patient treatment outcomes in general. Third, those hypertensive patients may wish to know the impact of the disease on their current vision status. Over all, globally, it is reported that hypertension causes a huge burden on retinopathy. As a result, SPHMMC and SPH are the largest hypertensive care clinics in Ethiopia, but there was no previous study that investigated the burden of hypertension on retinopathy in both institutions; hence, the main purpose of this study is to assess the prevalence of hypertensive retinopathy and associated factors among hypertensive patients on follow-up at SPHMMC and SPH, Addis Ababa, Ethiopia, 2023 G.C.

1.4. Significance of study

In Ethiopia, few studies assess the prevalence of hypertensive retinopathy and associated factors in hypertensive patients' awareness of individuals who have hypertension towards hypertensive retinopathy. Studying hypertensive retinopathy is an essential step to improving public understanding and the health care delivery system through community health education. Therefore, after the study is completed, this study would provide information on the awareness of complications in hypertensive patients to ward off hypertensive retinopathy.

This study provided vital concepts important for the federal ministry of health, SPHMMC, SPH, the cardiovascular nursing profession, and researchers as well as concerned local and international NGOs. Since there was no previously conducted study in that area with the same problem, the findings of this research can be used as footstep and initiative-based information for further study to be conducted so far.

On the other hand, it is helpful to identify associated factors that contribute to the development of hypertensive retinopathy in the SPHMMC and SPH. The determination of the prevalence of HTR helps to understand the extent of its impact and create appropriate investigation and treatment guidelines. Another significance of this study for the cardiovascular nursing profession is that it provides evidence-based data for hypertensive retinopathy care and helps to improve hypertensive retinopathy care. Furthermore, this finding may serve as baseline data for policymakers and researchers.

The original findings of this research will that, health institutions used predicate information to set plans based on their own setting with available resources and potential. In addition, it opens a logically reasonable and subscribed avenue for local health institutions to intensify their partnership and diplomacy with international and local health and other committed organizations. Many available non-government organizations are working with the health and other sectors of the government of Ethiopia and need tangible data to allocate the necessary budget as well as to set the right plan for the identified and exhibited gaps. So, this research can be used as a problem identifier and indicator tool.

Hence, the aim of this study was to assess the prevalence of hypertensive retinopathy and associated factors among hypertensive patients on follow-up at a selected federal hospital in Addis Ababa, Ethiopia, in 2023.G.C.

2. LITERATURE REVIEW

2.1. Introduction

Hypertensive retinopathy is diagnosed on retinal fundusoscopic examination by the presence of micro aneurysms, hemorrhages, exudation, cotton wool spots, and/or new vessels, indicating retinal vascular damage caused by hypertension. Developed signs in the late disease and diagnosis by history (duration and severity of hypertension). Treatment is directed at controlling blood pressure and, when vision loss occurs, treating the retina (6).

2.2. Prevalence of Hypertensive Retinopathy

The magnitude of retinopathy in patients suffering from mild hypertension was 25.3%, moderate hypertension was 34.5% and severe hypertension 84.6 % (22). According to research, done by American ophthalmology in the United States 33% adults have hypertension and have controlled blood pressure 52%. In diabetic patient's hypertensive retinopathy ranges from 2-17% but the prevalence differs by statistics (2). Hypertension is a common condition that affects the body's arteries. When you have hypertension, the force of the blood pushing against the artery walls is consistently very rise. Among worldwide hypertension was estimated one out of four of people affected 1.39 million of adults affected (23). The heart has to work harder to pump blood-according studies showed that in American College of Cardiology and the American Heart Association (23). In German at Gutenberg Health Study prevalence of HRP was 6.7% (24). According to research Epidemiological studies, conducted in Chinese patients with hypertension, have indicated that 67-73% of patients have fundus lesions and 12-15% have retinopathy (25). Study showed that in Nepal, Asia done based on standard preformed used to collect socio-demographic, clinical variables and fundus evaluation (detailed eye examination) of the patient's prevalence of hypertensive retinopathy was 38.95% and graded according to Keith-Wagener-Barker classification (26).

Hypertensive retinopathy is an eye problem condition that can occur in people with hypertension. The rise blood pressure is easily damaged blood vessels of the eye and retina and can lead to loss of sight (21). The presence of retinopathy is one of important the clinical marker of hypertensive end-organ injury and spectrum of lesions seen in

the retina resulting from hypertensive injury to the microvasculature (e.g. retinal hemorrhages, micro aneurysms). Studies show that among African Americans the prevalence of hypertension is higher than white persons in the United States was well documented. And also African Americans are more likely to develop hypertensive-related complications like left ventricular hypertrophy, hypertensive with kidney disease, and stroke, to have increase mortality rates, and to have less access to antihypertensive treatment(27).

In African Americans and Chinese is hypertensive retinopathy more common. In addition, the occurrence of blood pressure increases with age. Women in age groups less than 45 years are less affected than men and women are greater affected than men in age groups greater than 65 years old(2).High blood pressure causing affects three types of ocular damage, from that one is retinopathy. This hypertensive retinopathy occurs due to retinal damaged of retinal vessel by high blood pressure and HBP affects targets organ damage e.g. Cardiovascular, renal, cerebrovascular, and retina(5). Hypertensive retinopathy is a risk factor for stroke, cardiovascular disease and cerebrovascular disease. Study of the risk factors of retinopathy in hypertensive patients decrease the occurrences of hypertensive retinopathy and associated cardiovascular and cerebrovascular diseases(21). In Sub-Saharan Africa (SSA), million individuals have hypertension approximately 74.7 and this number is expected to reach 125.5 million individuals by 2025 and also Prevalence of hypertension in some Africa countries are Sudan (40.8%)(23), Tanzania (28%)(28), Madagascar(29), Ghana (24.1% and 27%), Nigeria (19.3%), and Kenya (21.4%)(29), Ethiopia (34.7%) (30).

In Africa, country prevalence of HRP was Malawi (75.0%) (31), Tanzania (70.1% (32).In Tanzania study showed that prevalence of hypertensive retinopathy and associated factors among non-diabetic chronic kidney disease patients seen at a tertiary hospital is 70.1%. Level mean of creatinine, DBP, SBP, was increasing with severity of hypertensive(33).According research done at Queen Elizabeth Central Hospital in Malawi prevalence of retinopathy was high 75.0%. Mild hypertensive retinopathy was the most prevalent grade. There are no patients with malignant hypertensive retinopathy(31).Very common problems of hypertensive retinopathy and risk factors was in male and old age(34),was advanced age, obesity, smoking, lack of regular physical exercise, sedentary lifestyle, duration of hypertension and uncontrolled high blood pressure(35).

Hypertension is associated with several ocular morbidities affecting both the anterior and posterior segments of the eye. Common eye problems associated with hypertension is hypertensive retinopathy(36). Some of the eye complications due to hypertension can lead to visual damaged and blindness when diagnosis or treatment was delayed. Blood pressure control and regular eye follow-ups can help to decrease these complications. Hypertensive retinopathy is the most common issue of hypertension and a major retinal problem(37). Population-based studies have reported prevalence of numerous grades of hypertensive retinopathy ranging from 6% to 20% among subjects with hypertension(38). The major risk factors associated with hypertensive retinopathy was duration of hypertension, severity of hypertension, poor control of blood pressure, ageing, smoking, concurrent hyperlipidemia (20). Hypertensive retinopathy stated the long-term risk of stroke and cardiovascular diseases, independent of blood pressure, even with good hypertension control(39). Among the hypertensive patients having knowledge of hypertensive retinopathy is low(40). Having knowledge of hypertensive effects in the eye is very important to promote compliance and regular eye evaluation by patients with hypertension. In study show that at University of Gondar Comprehensive Specialized Referral overall prevalence of hypertension complications was (52.7%), complication of hypertensive patients was documented, those are dyslipidemia (31.5%), kidney disease (28.7%), Stroke (23.1%), eye problem (11.2%), and heart disease (10.5%)(12). However, studies on the awareness are scarce, and there were few population-based studies on perception of hypertensive ocular effects or prevalence and risk factors associated with hypertensive retinopathy in Ethiopia.

2.3. Factors associated with Hypertensive Retinopathy

In Africa high blood pressure is highly related to life style and environmental factors e.g. Tobacco use, use high amount of alcohol, less physical activity, unhealthy diet like high salt intake, less use of consumption of fruit and vegetable and obesity(41). Uncontrolled blood pressure and untreated patients of hypertension were the significant risk factors for hypertensive retinopathy (42). Very common problems of hypertensive retinopathy and risk factors was in male and old age (5), advanced age, obesity, smoking, lack of regular physical exercise, sedentary lifestyle, duration of hypertension and uncontrolled high blood pressure (43).

Socio-demographic-factors: sex, age, level education, income, marital status, ethnicity, religion. Women(54%) was more affected than men(46%) (44). Hypertensive retinopathy was more frequent in the age group 70-79 years (15.23%), males (13.25%), illiterates (13.56%) (36). Older aged are most at risk of developing high blood pressure and are therefore also most at risk of developing hypertensive retinopathy (43).

Behavioral –factors: alcohol, smoking, unbalanced diet, physical inactivity. Globally, magnitude and total load of hypertension among in low and middle-income countries are rising. Modifiable risk factors of hypertension recommended to prevention and control of hypertension are high sodium intake, obesity, alcohol consumption, physical inactivity and unhealthy diet (45).

Clinical-factors: duration of hypertension, family history of hypertension, uncontrolled hypertension (SBP, DBP), obesity, high cholesterol, high creatinine, neuropathy, nephropathy. High prevalence of uncontrolled hypertension, high prevalence of hypertensive retinopathy (31).

Institutional-factors: less information, access care, duration of appointment, relation with HCW.

Based on study-conducted Prevalence and associated factors of hypertension complications among hypertensive patients at University of Gondar Comprehensive Specialized Referral Hospital. This conceptual frame work is developed from screening of hypertensive clinical practice guideline, tool for assessment of hypertension and hypertensive retinopathy .The diagram shows the relationship between HTR with socio-demographic factors, clinical factors, institutional factors and lifestyle factors (12).

2.4. Conceptual frame work

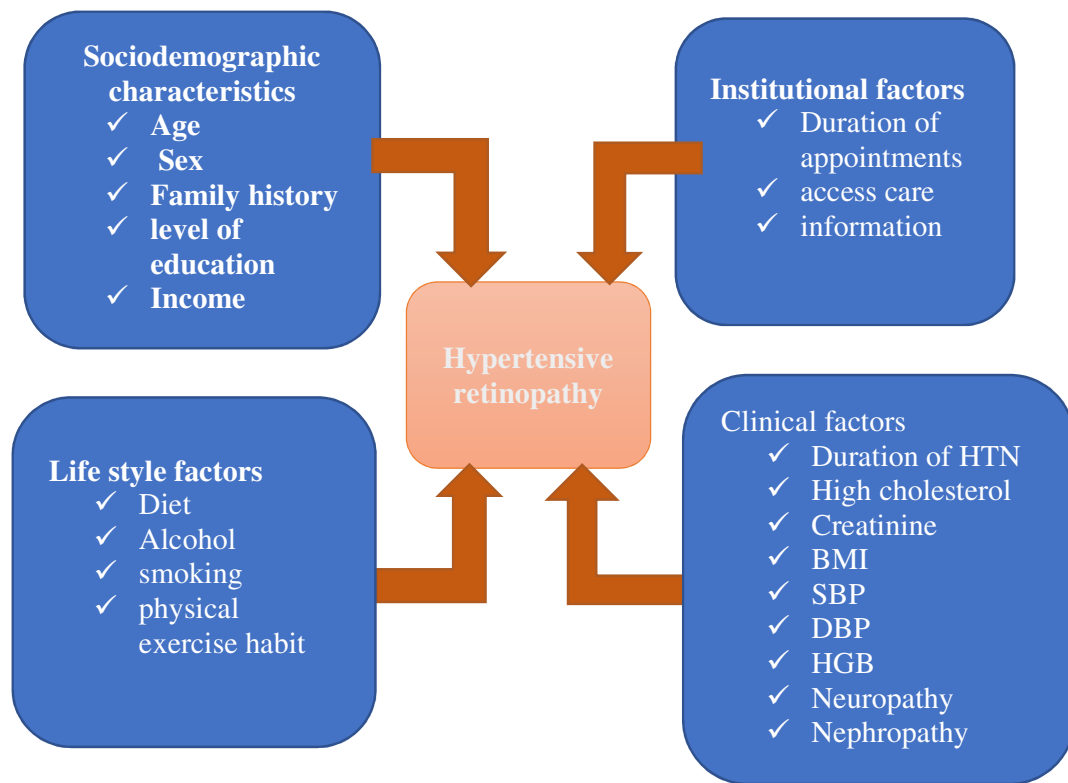


Figure 1: Conceptual framework for the study on prevalence hypertensive retinopathy and associated factors among hypertensive patients, Addis Ababa, Ethiopia, 2023 G.C.

3. OBJECTIVE

3.1. General objective

- To assess the prevalence of hypertensive retinopathy and associated factors among hypertensive patients on follow-up at selected federal hospital, Addis Ababa, Ethiopia, 2023 G.C.

3.2. Specific objective

- To determine the prevalence of hypertensive retinopathy among hypertensive patients on follow-up at selected federal hospitals in Addis Ababa, Ethiopia, 2023 G.C.
- To identify factors associated with hypertensive retinopathy among hypertensive patients on follow-up at selected federal hospital, Addis Ababa, Ethiopia, 2023 G.C.

4. METHODS

4.1. Study setting

This study was conducted in two selected federal hospitals: Saint Paul's Hospital, Millennium Medical College, and Saint Peter's Specialized Hospital. SPHMMC is one of the specialized and teaching hospitals located in the northwestern part of Addis Ababa, the capital city of Ethiopia. Its catchment population is over 5 million, making it one of the largest referral centers in the country. As a tertiary center, it receives severe patients, which it cannot manage with other hospitals in every corner of the country. The hospital has around 250 faculty members and more than 2800 clinical, academic, administrative, and supportive staff. Its inpatient capacity is more than 700 beds, and the hospital provides services to an average of 1200 outpatient and emergency clients daily. (46). Saint Peter's specialized hospital is one of the federal hospitals under the Ministry of Health (MOH), founded by Emperor Haile Selassie in 1953. The hospital is the country's first TB referral hospital. Saint Peter's Hospital is one hospital, but formerly it was located in two places. The Sanatorium was located in Entoto (a house of the late patriot Ras Abebe Aregay), while the OPD was located in Kolfe sub-city. In the 1960s, the hospital was named the TB Demonstration and Training Center and Sanatorium. By incorporating all its services into the compound of the late patriot, Saint Peter's Hospital also accepts the legacy of the patriot and uses it to provide compassionate care. Saint Peter's has been serving the nation as the only tuberculosis hospital for more than four decades, and furthermore, now that it has expanded from a single disease hospital into a multi-service specialized hospital, Saint Peter's has more than 14 specialties and an excellence center (47). Both of these selected federal hospitals have hypertensive clinics. This study was conducted at Saint Paul's Hospital, Millennium Medical College, and Saint Peter's Specialized Hospital among hypertensive outpatients.

4.2. Study period

The study was carried out from March 6, 2023, to April 5, 2023 G.C.

4.3. Study design

Hospital based cross-sectional was employed.

4.4. Source population

All hypertensive patients who attended medical follow up at SPHMMC and SPH were included.

4.5. Study population

Hypertensive patients who were visiting outpatient departments of SPHMMC and SPH during the study period

4.6. Inclusion

All hypertensive patients who visited outpatient department at SPHMMC and SPH during the study period were included.

4.7. Exclusion

Hypertensive patients with severe illnesses and acute life-threatening conditions, mentally incapable and severely injured patients, and patients with impaired communication

4.8. Sample size

For the first objective, the sample size was determined using a single proportion formula. The previous hospital-based cross-sectional study conducted on the prevalence and associated factors of hypertension complications among hypertensive patients at the University of Gondar Comprehensive Specialized Referral Hospital found that the prevalence of hypertensive retinopathy is 11.2% in Ethiopia(12). By using the formula below, taking the confidence interval as 95% (1.96), and the margin of error as 0.05,

$$\text{Sample size (n)} = \frac{(Z_{\alpha/2})^2 P(1-P)}{d^2} = \frac{(1.96)^2 \times 0.112 \times (1-0.112)}{(0.05)^2} = 151$$

Where;

n = estimated sample size

$Z_{1-\alpha/2}$ = standard normal value which corresponds 95% of confidence level=1.96.

P = estimated prevalence retinopathy

q = 1-p

d = tolerable sample error=0.05.

Taking 10% of the non-response rate, the final sample became 166, Epi Info 7.2.5. For the second objective, considering 80% power and a one-to-one ratio based on a study conducted in Gondar Comprehensive Specialized Referral Hospital, the sample size for the recent study was calculated as follows:

Table 1: Sample size calculation of the second objective among study

Variable name	P1	P2	OR	N	Reference
Residence(rural)	40	22	1.515	310	(26)
Family history	38	18	2.0	242	(26)
High BP	49	23	3.31	163	(26)
Smoking	43	30	1.035	312	(26)

N.B. P1: Percentage outcome in exposed group, P2: Percentage outcome in unexposed group. The sample size of the second objective was greater than the first objective. Therefore, the final sample size for study was 312.

4.9. Sampling procedures

According to SPHMMC and SPH hypertensive outpatient's reports, on average, a total from SPHMMC was 703 and from SPH were 585 hypertensive patients that attended follow-up in the last month. Therefore, 312 study participants were selected from both study areas using the method of proportional allocation, which follows the formula $nb = n(n)/N$, where, nb is the sample size allocated to the respondent group, n is the population allocated to the respondent group, (n) is the total sample size, and N is the total population of the study area. Therefore, using this formula, the sample allocation for SPHMMC and SPH was 170 and 142, respectively. Then, systematic random sampling techniques were used to select eligible participants from both study areas. To do so, lists of hypertensive patients were first alphabetically ordered from the registration logs of HMS in the departments. Next, K was calculated for both study areas, which were four. Thus, the study participants were selected at every fourth interval. To get the initial study participant, the lottery method was used. Then, each study participant was selected at every fourth interval using systematic random sampling techniques. However, when the selected study participant did not fulfill the inclusion criteria, the next individuals were included.

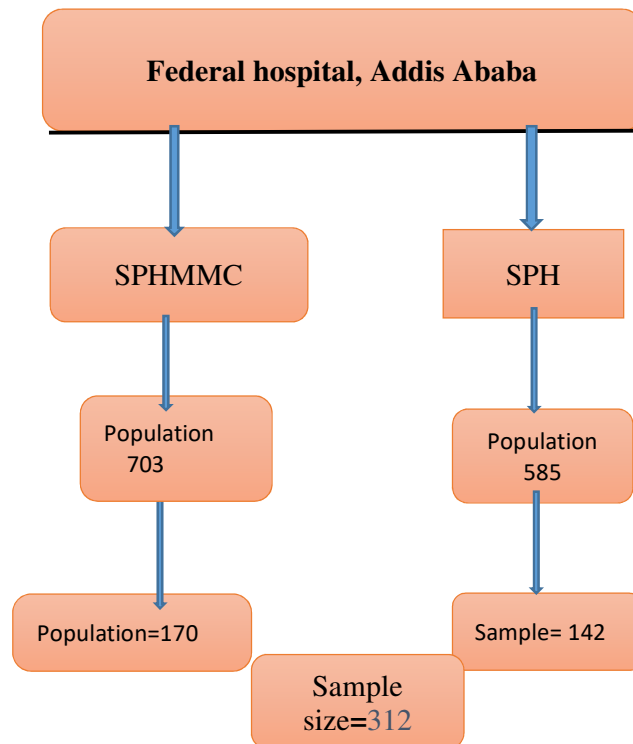


Figure 2: Schematic presentation of *systematic random sampling technique*

4.10. Study Variables

4.10.1. Dependent variable

Hypertensive retinopathy

4.10.2. Independent variable

Socio-demographic characteristics

- ✚ Age
- ✚ Sex
- ✚ Education level
- ✚ Income
- ✚ Family history

Clinical factors

- ✚ Systolic blood pressure
- ✚ diastolic blood pressure

- ✚ blood urea nitrogen and creatinine
- ✚ hyperlipidemia
- ✚ hemoglobin level
- ✚ neuropathy
- ✚ nephropathy
- ✚ Cholesterol
- ✚ Duration of with hypertension
- ✚ Treatment HTN

Lifestyle factors

- ✚ Diet
- ✚ smoking
- ✚ Physical exercise habit
- ✚ Alcohol consumption
- ✚ Smoking
- ✚ BMI

Institutional-factors

- ✚ Hypertensive access care
- ✚ Duration of appointments
- ✚ Health education or information

4.11. Data Collection tools and Procedures

Data were collected using face-to-face interviews for socio-demographic characteristics, behavioral factors, and institutional-related questions. Document reviews for eye examination and clinical factor questions. The questionnaire has four sections: Section I: socio-demographic information (06 items); Section II: behavioral factors (11 items); Section III: clinical factors (18 items). Section IV: Institutional-related questions (04 items) Data on socio-demographic and behavioral factors was collected through a face-to-face interview using the WHO STEPS Instrument for Chronic Disease Risk Factor Surveillance(48). Hypertensive retinopathy was identified by reviewing records using checklists. A structured questionnaire reviewing records was used for data collection. Data was collected by three BSc students and supervised by one BSc student with a public health degree. Data collectors were

trained for one day on how to collect data, understand the general questionnaire, and give informed consent.

4.12. Operational Definitions

Hypertensive retinopathy: - on retinal camera examination, the presence of micro aneurysms, hemorrhages, yellow hard exudation, cotton wool spot, and/or new vessels and retinal vascular damage caused by hypertension. Diagnosis confirmed by physician with help of funduscopy examination and graded by Keith Wagener Barker (KWB) (38).

Behavioral risk factors: - unhealthy behaviors that can be changed or prevented and factors can include lack of exercise, poor nutrition, tobacco use, and excessive alcohol use (49).

Clinical risk factors: - Physiological attributes at certain levels associated with an increased risk of certain diseases or death and clinical assessment through measurement, or biochemical analysis of a blood sample (50).

4.13. Data Quality Control and Management

After assessing the literature, the questionnaire was prepared in English. Data collectors were trained for 1 day on how to collect, for how long, where to collect, privacy issues, and data saving. At the time of data collection, the completeness of each questionnaire, i.e., whether or not each question was completely answered, was checked daily. Before actual data collection, the questionnaire was tested by 5% of the interviewees to check the appropriateness of the question for the respondents at Tikur Anbesa Hospital and Alert Hospital. Moreover, for any inadequacy, the questionnaire was revised.

4.14. Measurements

An ophthalmologist measured hypertensive retinopathy with any characteristic lesion on retinal camera examination: micro aneurysms, hemorrhages, exudation, cotton wool spots, and/or new vessels (51). Body mass index was used to define underweight ($BMI < 18.5$), normal ($18.5-24.9$), overweight ($25.0-30.0$), and obesity ($BMI > 30$) in adults(52). Hypertension defined as systolic blood pressure ($SBP \geq 140$ mmHg, diastolic blood pressure ($DBP \geq 90$ mmHg or current use of antihypertensive

medication(53). Hyperlipidemia is defined as a total cholesterol level > 200 mg/dl or triglyceride level > 150 mg/dl (54), (55). Adherence to diet was measured if the patient followed the recommended diet for more than 3 days in the last 7 days (56). Adherence to exercise were measured if the patient performed a 30-min activity prescribed by a physician for more than 3 days in the last 7 days(57).Alcohol consumption history was measured if the patient reported drinking any alcohol within the last 12 months(58).

4.15. Data Analysis Plan and Procedures

The variables were coded, cleaned, and entered into Epi-data version 7.2 after data collection was completed. The data was checked for statistical assumptions and outliers before the main data analysis. IBM statistical package for social sciences (SPSS) version 26 Descriptive statistics such as frequencies, pie charts, histograms, proportions, means, medians, and standard deviations were calculated to describe the participants. Interactions between predictor variables were also examined. Both bivariable and multivariate logistic regression analyses were used to assess factors associated with hypertensive retinopathy. Variables that scored a p-value ≤ 0.25 during bivariate analysis were included in multivariate analysis to determine the independent association of each independent variable. The results of a p-value ≤ 0.05 in multivariate logistic regression analysis were considered to have a statistically significant association with the dependent variable. Adjusted odds ratios with a 95% confidence interval (CI) were calculated to assess the strength and direction of association of each independent variable with the outcome variable.

4.16. Ethical clearance

Ethical clearance was obtained from the research ethical review board of SPHMMC. Both oral and written informed consent was obtained from each study participant after an explanation of the purpose and procedure of the study. Data collectors and supervisors were assured confidentiality by limiting data access. Data that exposed the identity of the participants was not collected and de-identified during analysis and publication. Participants were informed, as they have the right to withdraw from the study at any time without explanation.

4.17. Results dissemination

The findings of this research were submitted to SPHMMC, Department of Medical and Surgical Nursing, for the partial fulfillment of a master's degree in cardiovascular nursing. It will be defended orally for the thesis examiners and university community. A technical report will be provided for the study hospital. The findings will also be orally presented at different scientific conferences. It will be communicated to the scientific community through publication in peer-reviewed, reputable journal.

5. RESULTS

5.1. Socio-demographic characteristics

This study could have obtained a 100% of response rate. The mean age of the participants was 59.36 ± 12.07 with a maximum age of 82 and a minimum age of 30. The majority of participants were males (191 (61.2%)), between 61-75 years old (49.4%). The number of males with hypertensive retinopathy was high, at 17 (5.44%) among males and 8 (2.56%) among females.

Table 2: Socio-demographic characteristics for assessment of the prevalence of hypertensive retinopathy and associated factors among hypertensive patients visiting selected federal hospitals in Ethiopia in 2023 G.C

S.N	Variable	Category	Frequency	Percent (%)
1	Sex	Male	191	61.2
		Female	121	38.8
2	Age	30-45	49	15.7
		46-60	85	27.2
		61-75	154	49.4
		≥ 76	24	7.7
3	Marital status	Married	290	7.1
		Unmarried	22	92.9
4	Occupation	Employed	157	50.3
		Unemployed	155	49.3
5	Education level	Below college	111	35.6
		Above college	201	64.4
6	Average monthly income	<1500	87	27.9
		1500-2500	23	7.4
		2501-3500	30	9.6
		3501-4500	12	3.8
		>4501	160	51.3

5.2. Behavioral related factors

Numbers of participants who consumed alcohol were 26% of which most of them (21.5%) drunk 1-2 times per week. Majority of participants had no regular exercise (64.4).

Table 3: Behavioral related factors for assessment of prevalence of hypertensive retinopathy and associated factors among hypertensive patients visiting at selected Federal hospitals in Ethiopia, 2023.G.C

S.N	Variable	Category	Frequency	Percent (%)
1	Ever consumed and alcoholic drink?	Yes	81	26
		No	231	74
2	Frequency for least one alcoholic drink	5-6 /week	14	4.5
		1-2/week	67	21.5
3	Quantity of alcoholic drinking per day	Two bottles	31	9.9
		Three bottles	3	1
		≥4 bottles	47	15.1
4	Ever smoking any tobacco products	Yes	27	8.7
		No	285	91.3
5	Frequency of eat food per day	Two times	32	10.3
		Three times	280	89.7
6	Occasion of eating fruits in a typical week	One	146	46.8
		Two	61	19.6
		Three	29	9.3
		No	76	24.4
7	Physical exercise	Regular	14	4.5
		Irregular	97	31.1
		No	201	64.4

5.3. Clinical factors

Mean value of serum creatinine was 1.2 with the standard deviation of 0.65 where, the minimum and maximum value of creatinine were 0.66 mg/dl and 4.83 mg/dl re respectively. Regarding the BUN, mean value was 39.15 with the standard deviation of 17.8 where minimum and maximum value of creatinine were 73.7 mg/dl and 16 mg/dl re respectively. Mean value of level of hemoglobin was 14.3 where, minimum and maximum value was 10 and 17.5 respectively. Coming into cholesterol, mean

value was 184.4 as well as, minimum and maximum values were 57 and 299 respectively.

Table 4: Clinical factors for assessment of prevalence hypertensive retinopathy and associated factors among hypertensive patients visiting at selected Federal hospitals in Ethiopia, 2023.G.C

S.N	Variable	Category	Frequency	Percent (%)
1	Duration of living with HTN	≤5 years	102	32.7
		6-10 years	78	25.0
		11-15 years	53	17.0
		≥16 years	79	25.3
2	BMI	18.5-24.5 mg/kg	129	41.3
		24.6-30 mg/kg	183	58.7
3	Family history of HTN	Yes	165	52.9
		No	147	47.1
4	Ever diagnosed with Hypertensive retinopathy	Yes	25	8.0
		No	287	92
5	Grades of hypertensive retinopathy	Grade 1	12	3.8
		Grade 2	7	2.2
		Grade 3	4	1.3
		Grade 4	2	0.7
6	duration hypertensive retinopathy since known	≤ 1 year	12	3.8
		≤ 2 year	5	1.6
		≥3	8	2.6
7	Average level of lipedimia	High	126	40.4
		Normal	186	59.6
8	History of nephropathy	Yes	61	19.6
		No	251	80.4
9	History of neuropathy	Yes	76	24.2
		No	236	75.6
10	Presence of kidney problems	Yes	50	16
		.No	262	84
11	Level of serum creatinine	High	53	16.4
		Normal	247	76.2
		Low	12	3.7
12	Level of BUN	High	49	15.1
		Normal	257	79.3
		Low	6	1.9
13	History of cataract surgery	Yes	46	14.7
		No	266	85.3

14	Other heart disease	Yes	77	24.7
		No	235	75.3
15	Type of heart disease	Atrial fibrillation	8	2.6
		IHD	19	6.1
		DVHD	17	5.4
		CRVHD	11	3.5
		Class 4 CHF	10	3.2
		Cardiomyopathy	12	3.8

The mean average and standard deviation blood pressure of participants was 145.73 mmHg $\pm$ 14.356 for systolic and 88.21 mmHg $\pm$ 9.837 for diastolic. In this case, most participants (54.8% (171)) had systolic blood pressure of 140–159 mmhg, and 37.8% (118) had diastolic blood pressure of 90–99 mmhg. The below figure shows the types of antihypertensive drugs being taken by participants. Accordingly, a high number of participants (24.4%) had taken diuretics and ACE inhibitors.

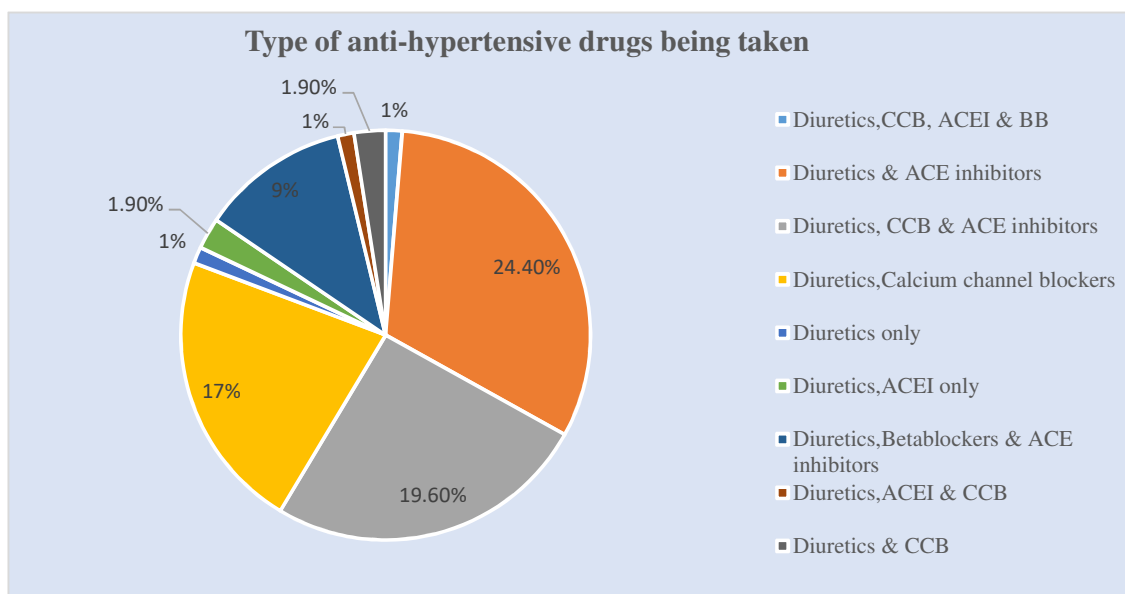


Figure 3: Type of anti-hypertensive drugs being taken among hypertensive patients visiting at selected Federal hospitals in Ethiopia, 2023.G.C.

5.4. Laboratory profiles

173(55.4%) were within the normal range of cholesterol levels, while the rest had high cholesterol levels. The majority of respondents 247(79.2%) had a normal average value of serum creatinine. Around 242(77.6%) of respondents had a normal value of hemoglobin, and around 49(15.7%) had an increased or high number of BUN. More details are illustrated in the below pie charts.

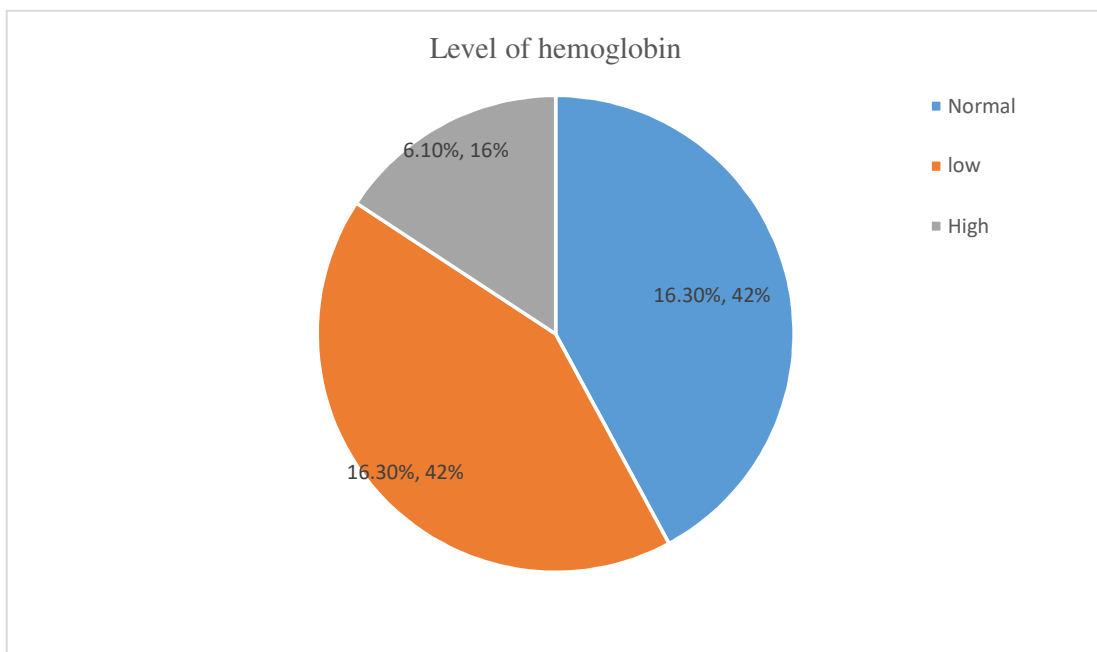


Figure 4: Level of hemoglobin among hypertensive patients visiting at selected Federal hospitals in Ethiopia, 2023.G.C.

5.5. Institutional related factors

Majority of participants were got health education and information on hypertensive retinopathy (71.5%), found no difficulty in getting access to hypertensive care (83.3%) and had trusted relationship with HCW (87.8%).

Table 5: Institutional related factors among hypertensive patients visiting at selected Federal hospitals in Ethiopia, 2023.G.C

S.N	Variable	Category	Frequency	Percent (%)
1	Did you get health education or information	Yes	223	71.5
		No	89	28.5

	on hypertensive retinopathy?			
2	Is difficulty to getting access to hypertensive care?	Yes	52	16.7
		No	260	83.3
3	Type of difficulty	Functionality of screening device	12	3.8
		Distance to the facility	1	0.3
		Many people have follow up at this clinic.	39	12.5
4	Frequency of visit to appointed every	≤3 months	49	15.7
		≥ 3 months	263	84.3
5	Trusting relationship HCW	Good	274	87.8
		Poor	38	12.2

5.6. Prevalence of hypertensive retinopathy

This study found a prevalence of hypertensive retinopathy of 8% (95% CI 5.1, 10.6) with a higher rate among males (17%) than females (8). Of these patients with hypertensive retinopathy, 3.8% had grade 1-hypertensive retinopathy, 2.2% had grade 2-hypertensive retinopathy, 1.3% had grade 3-hypertensive retinopathy, and 0.7% had grade 4- hypertensive retinopathy.

5.7. Factors associated with hypertensive retinopathy

In this study, even though many independent variables like age, religion, consuming alcohol, duration of living with HTN, BMI, family history of HTN, level of lipedimia, presence of kidney problems, history of neuropathy, other heart problems, and getting health education or information on hypertensive retinopathy were selected for multivariate logistic analysis, only six variables, such as age, duration of living with HTN, BMI, family history of HTN, level of lipedimia, and presence of other heart problems, were significantly associated with hypertensive retinopathy.

Table 6: Multivariable logistic regression for assessment of prevalence of hypertensive retinopathy and associated factors among hypertensive patients visiting at selected federal hospital in Ethiopia, 2023 G.C

Variable	Category	Hypertensive retinopathy		COR (95 % CI)	P-value	AOR (95 % CI)	P-value
		Yes	No				
Age	30-45	6	43	1	.		
	46-60	8	77	0.74 (0.173, 4.423)	0.872		
	61-75	9	145	0.44 (0.297, 7.229)	0.639		
	≥76	2	22	0.652 (0.121, 0.88)	0.017	4.27 (2.01, 11.76)	0.016
Ever consumed an alcoholic drink	Yes	4	77	0.519 (0.173, 0.662)	0.244	3.64 (0.29, 6.42)	0.081
	No	21	210	1			
Duration of living with HTN	≤5 years	7	95	1			
	6-10 years	10	68	1.99 (0.156, 2.435)	0.344		
	11-15 years	4	49	1.1 (0.223, 2.933)	0.577		
	≥16 years	4	75	0.72 (0.465, 0.92)	0.011	2.26 (2.01, 5.32)	0.012
BMI	18.5-24.5 mg/kg	11	118	1			
	24.6-30	14	169	0.88 (0.033, 0.92)	0.015	0.18 (0.05, 0.65)	0.037

	mg/kg			0.93)		0.24)	
Family history of HTN	Yes	13	152	0.96 (0.016, 0.98)	0.134	3.56 (2.78, 7.61)	0.024
	No	12	135	1			
Average level of lipedimia	High	7	166	0.283 (0.115, 0.7)	0.006	0.54 (0.042, 0.82)	0.006
History of neuropathy	Yes	5	74	0.72 (0.261, 0.89)	0.125	0.79 (0.05, 1.84)	0.078
	No	20	213	1			
Presence of kidney problems	Yes	10	50	3.16 (1.36, 7.44)	0.008	4.6(0.64, 10.88)	0.530
	.No	15	237	1			
Other heart problem	Yes	10	67	0.457 (0.196, 0.64)	0.069	0.82 (0.06, 0.97)	0.025
	No	15	220	1			
Getting health education on HTR	Yes	23	200	5 (4.12, 21.69)	0.031	0.26 (0.062, 1.604)	0.058
	No	2	87	1			

6. Discussion

The primary aim of this study was to assess the prevalence of hypertensive retinopathy and associated factors among hypertensive patients visiting hypertensive clinics at SPHMMC and SPH. This study revealed that the prevalence of hypertensive retinopathy was 8 % (95% CI 5.1, 10.6) with a higher frequency among males (17 (5.44%)) than females (8 (2.56%)). Moreover, though many variables were selected for multivariable analysis after univariable analysis, age, year of living with hypertension, BMI, family history of hypertension, and a high level of lipedimia were significantly associated with hypertensive retinopathy.

This finding was dissimilar with study conducted in Nepal (52.7%) (36), Iran (12.9%) (59), Australia (36%) (61), Tanzania (70.1%) (62), Pakistan (30.21%) (63), India (72%) (64), Malaysia (34%) (65). Discrepancy could be due to study design in different areas and selection bias of authors. Moreover, there may be confounding variables, which were not investigated in the study.

Hypertensive patients with ≥ 76 years older were 4.27 times more likely to develop hypertensive retinopathy than hypertensive patients who were ≤ 76 years old. This finding is consistence with study conducted with India, where raised blood pressure was significantly associated with Age-related macular degeneration (ARMD)(66) and in Nepal, where upper level of age was associated with hypertensive retinopathy (36). This may be have pathophysiological background where with the development of the disease with advancement of age, the formation of atherosclerotic plaques gradually increases the thickness and decreases the diameter of blood vessels, followed by the development of arteriosclerosis and the corresponding retinopathy (21). On the other hand, retinal arteriolar and venular diameters narrow with increasing age which further aggravates microvascular damage from elevated blood pressure (67).

In our study duration, length of years with hypertension was another positively associated factor, which this study found. Hypertensive patients who have been living with the disease for ≥ 16 years were 2.26 times more likely to develop hypertensive retinopathy than those who have living with the disease for ≤ 5 years ($p=0.01$). In this case, even though this finding was typically consistent with the study conducted in China, taking three or more antihypertensive medications were not significant

variable in this study unlike it did there (68). Moreover, this association opposed research conducted in Nepal (26). These variations may be due to quality of life, preventative strategy and other risk factors of hypertensive, which may be controlled well there.

Body mass index (BMI) remained associated factor as usual like it does for many non-communicable diseases (69). Here, odds ratio of developing hypertensive retinopathy was high to among obese hypertensive patients of between 24.6-30 mg/kg (OR=0.18). The results of this study found that the overweight respondents who experienced hypertension were (7.7%). Obesity is an imbalance situation when the incoming energy is greater than the energy released. Overweight conditions are associated with increased intravascular volume and cardiac output. The finding of this study can be interpreted from the perspective of obesity has a risk of hypertension two times greater compared to people who are not obese as heart pumping power and blood volume circulation of hypertensive patients are higher than those of normal weight hypertension sufferers (70), (71).

Recent study mentioned that hypertensive patients who have family history of the disease were 3.56 times more likely to develop hypertensive retinopathy than those who had not. High blood pressure tends to run in families for many reasons. Blood relatives tend to have many of the same genes that can predispose a person to high blood pressure, heart disease, or stroke. Genes are units of heredity that are passed from parents to children. The more family members you have with high blood pressure before the age of 60, the stronger the family history of high blood pressure you have as well. Having one or more close family members with high blood pressure before the age of 60 means, you have two times the risk of having it also (72). Study conducted in northern Ethiopia which aligns with recent study revealed that Participants with a family history of hypertension were 5 times more likely to develop complications than those with no family history of hypertension (AOR = 5.372, $p = 0.001$) (12).

Among co-existing diseases, heart problem was significantly associated with dependent variable. Odds of ratio of hypertensive retinopathy was high among co-existed cardiac problem-hypertensive patients (OR=0.82, $p=0.025$). Despite this study doesn't focused deeply on CVDs in terms of their complications, it is known that hypertensive retinopathy is an independent risk factor for post-acute STEMI complications in successfully thrombolysis patients and increased the relative risk for

complications by 3.17 times (73) and presence of hypertensive retinopathy predicted a doubling of the risk of definite CHD (74).

The last dependent variable associated with hypertensive retinopathy was high level of lipedimia with high odds ratio (OR=0.54). Dyslipidemia in hypertensive patients is itself known to be a predisposing risk factor, an aggravating or complicating factor. Hypertension and hyperlipidemia not only accelerate atherosclerosis but also cause degenerative changes in the walls of large- and medium-sized arteries, which accelerate cerebrovascular hemorrhage, ischemic heart disease, stroke, and cardiac arrest (75). Result of this study matched many related researches where an incidence of hypertensive retinopathy was increased with increase of serum total cholesterol, serum LDL, and serum triglycerides (76). However, even though, cholesterol level associated to hypertensive retinopathy, they showed significant negative correlation ($r = -0.163$, $p = 0.004$).

Strength and Limitation

Strengths

- ✓ The assessment of HTR was done based on the previous results of an ophthalmic examination with support from a fundusoscopic examination.

Limitation of the study

- ✓ Measured cholesterol, hemoglobin, BUN, and CR were collected from current data, which may not be exactly prior to the development of hypertensive retinopathies.
- ✓ Difficulties to differentiate types of IHD as specific diagnoses were not identified.

8. Conclusion

This study found that the prevalence of hypertensive retinopathy among hypertensive patients with SPHMMC and SPH was low. The findings in this study show that hypertensive retinopathies are significantly associated with socio-demographic factors (higher age, family history of the disease), lifestyle factors (obesity), and clinical factors (hyperlipidemia, long duration of hypertension).

Recommendation

1. For federal ministry of health

- ✓ To provide access for awareness creation on prevention and early diagnosis of hypertension retinopathy and retinal screening to hypertensive patients.
- ✓ Retinal screening and management services are important to provide in other government health facilities and private hospitals.

2. For saint peter's specialized Hospital and SPHMMC

- ✓ Care providers are better equipped to pay attention to hypertensive patients' follow-up schedule and duration of illness since these are the contributing risk factors for HTR.
- ✓ Health workers are better advised to be cautious when a patient has a longer duration of hypertension and obesity. When this is the case, appropriate clinical measures like medicine and other support should be provided.
- ✓ Since males have a higher chance of developing hypertensive retinopathy, it is better to conduct further study to investigate the case.
- ✓ It is better to advice patients to visit a health facility every month to minimize the risk of developing hypertensive retinopathy.
- ✓ Though SPHMMC had better facilities for hypertensive retinopathy screening, it would be important to facilitate a specialty in cardiac nursing for nurse professions in order to support the current service.

3. For researchers

- ✓ To conduct further research with a large sample size and a strong study design, including a qualitative approach. In addition, they have to figure out why males are highly at risk for HTR.

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Annex. 1. Approval sheet

Assurance of Principal Investigator

I the undersigned agree to accept all responsibilities for the scientific and ethical conduct of the research project. I will provide timely progress report to my advisor and seek the necessary advice and approval from my primary advisors in the course of the research. I will communicate timely to my advisors all stakeholders involved in the study including any source of funding for this research.

Name of the student: **Jiregna Eticha**

Signature: _____

Date: _____

Approval of the Primary Advisor

Name of the primary advisor: Zebaney Workneh (MSC, MPH, ASSISST.PROF)

Signature: _____

Date: _____

Approval of the Co-Advisor

Name of the primary advisor: Mastewat Wondimu (MSC IN CVNP)

Signature: _____

Date: _____

Approval of the examiner

Name of the examiner:

Signature: _____

Date: _____

ANNEX .2: Questionnaire

Participant's information sheet and informed consent

Information sheet

My name is -----, I am working at Saint Paul hospital as a nurse and MSc of cardiovascular nursing practionar student at Saint Paul. I am collecting data for my thesis research project entitled "Prevalence and risk factors of hypertensive retinopathy in hypertensive patients on follow-up patients". Know I am requesting to participate in this study. The interview questions were taken 30 minutes. Before you decide to do so, it is important you understand why the research is being done and what it was involved. Please take time to read if you can read or listen to me when I read for you if you cannot read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading or listening this information. This research aims to assess the prevalence and associated factors of hypertension retinopathy among hypertensive patients on follow-up patients. If you do decide, to take part you will be able to keep a copy of this information sheet and you should indicate your agreement to the consent form to show as you have decided to participate in this study voluntarily. You can still withdraw at any time from the study without any explanation and judgment. If you take a part in the study, you were asked to share your experiences. There are no other commitments or lifestyle restrictions associated with participating. Participating in this research is not anticipated to cause you any disadvantages or discomfort. The potential physical and/or psychological harm or distress will be the same as any experienced in everyday life. This study is concerned with hypertensive retinopathy among hypertensive patients in Saint Pauls' Hospital and saint peter's hospital. The results of this study was published on international peer reviewed journal to share the findings. If you have any complaints about the research in the first instance, you can contact any member of the research team. If you feel, your complaint has not been handled to your satisfaction you can contact the Saint Pauls' Hospital, office of research and community service using given address. All the information that we collect about you during the course of the research were kept strictly confidential. You were not being able to be identified or identifiable in any reports or publications. Any data collected about you was stored in a form protected by passwords and other

relevant security processes and technologies. Data collected may be shared in an anonymized form to allow reuse by the research team and other third parties. These anonymized data were not allowing any individuals or their background to be identified or identifiable. You were not being identified in any report or publication. The ethical committee and research directorate bureau of Saint Paul hospital has ethically approved this research.

1. Questionnaire

Informed consent

I.....agreed to participate in the research study on Prevalence and associated factors of hypertensive retinopathy in hypertensive patients on follow-up: The purpose and nature of the study has been explained to me in writing and I am participating voluntarily. I understand that I can withdraw from the study, without repercussions, at any time, whether before it starts or while I am participating.

Are you willing to participate? Please encircle the number according to your wish!

1. Yes = continue 2. No = thank you

Participant's Signature-----Date -----/---/----- Signature ____/____/____

Data collector's name -----Date -----/---/-----Signature ____/____/____

This data-collecting format is structured for collecting data for the research to be done on prevalence and risk factors of hypertensive retinopathy in hypertensive patients on follow-up at Saint Paul's hospital millennium medical college and saint peter's hospital.

1.Socio- Demographics characteristic related questionnaire		
SRN	Questions	Options
101	How old are you?	1.....
102	What is your sex?	1. Male 2. Female
103	What is the highest level of education you attained?	1. grade 1-8 2. grade 9-12 3. 1st degree 4. 2nd degree 5. above master degree 6. none
104	What is your marital status?	1. single 2. married

		3. divorced 4. widowed
105	What is your current work status?	1. employed 2. non employed 3. house wife 4. student 5. Farmer 6. Trader
106	What is your average monthly income?	1. <1500 2. 1500-2500 3. 2600-3500 4. 3600-4500 5. >5000
2.Behavioral related factors questionnaire		
201	Have you ever consumed an alcoholic drink?	1. Yes 2. No
202	How frequently have you had at least one alcoholic drink?	1. daily 2. 5-6 /week 3. 1-3 /week 4. once /month
203	How you used per number of bottle to drink per day?	1. one bottle 2. Two bottle 3. Three bottle 4. Greater than equal to four
204	Have you ever smoked any tobacco products?	1. Yes 2. No
205	Which type of smoking do you use?	1. cigars 2. cigarette 3. Hand rolled cigarette 4. others
206	If stopped smoking, when you have stopped?	1. before 1 month 2. before 2 month 3. before 3 and above
207	Do you have information hypertension?	1. yes 2. No
208	How many eat food per day?	1. One 2. Two 3. Three
209	In atypical week, on how many days do you eat fruits?	1. One 2. Two 3. Three 4. no
210	How often do you consume fruits and vegetables of all kinds (fresh, canned, frozen, cooked, and raw and juices)?	1. $\leq 1/\text{day}$. 2. $\geq 1/\text{day}$.
211	Do you perform physical exercise?	1. regular 2. irregular 3. No

3.Clinical related factors questionnaire		
301	How many years after affected by Hypertensive?	1. 5 2. 6-10 3. 11-15 4. 16
302	Do you have family history of HTN?	1. Yes 2. No
303	Have you ever been diagnosed with Hypertensive retinopathy?	1. Yes 2. No
304	If yes to above question (number 304), how long it has been since known?	_____ year(s).
305	Classification of hypertensive retinopathy?	1. Grade 1 2. Grade 2 3. Grade 3 4. Grade 4 5. Unclassified
306	What is level of hemoglobin?	1. ≤ 11 mg/dl 2. 11-16 mg/dl 3. ≥ 17 mg/dl
307	What is level your patient SBP?	1. ≤ 140 mmHg 2. ≥ 140 mmHg
308	What is level your patient DBP?	1. ≤ 90 mmhg 2. ≥ 90 mmhg
309	What is BMI of patients?	1. Under weight (<18.5 mg/kg) 2. Normal (18.5-24.5 mg/kg) 3. Over weight (24.5-30 mg/kg) 4. Obesity >30 mg/kg
310	What is level your patients lipedimia?	1. High 2. low 3. normal
311	Have you had history of nephropathy?	1. Yes 2. No
312	Have you had history of neuropathy?	1. Yes 2. No
313	What do you used medication or treatments of HTN?	1. 2. 3. 4.
314	Do you have another heart problem?	1. Yes 2. No

315	Based on question no.32 If you have what types problems?	1. 2. 3. 4.
316	Do you have kidney problems?	1.Yes 2. No
317	Based question number 34 what is level of...?	CR... 1.high 2.normal 3.low
		BUN... 1.high 2.normal 3.low
318	Do you have history of cataract surgery?	1.Yes 2. No
4.Institutional based questionnaire		
401	Have you get health education or information on hypertensive retinopathy?	1.Yes 2. No
402	Is difficulty to getting access to hypertensive care?	1.Yes 2. No
403	Based on question number 38what type of difficulty?	1. Functionality of screening device 2. Distance to the facility 3. Many people have follow up at this clinic.
404	Frequency of visit to appointed every...?	1. 3 month 2. 6 month

