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DEPARTMENT OF INTERNAL MEDICINE

**MAGNITUDE AND ASSOCIATED FACTORS OF ISCHEMIC HEART
DISEASE AMONG CARDIAC PATIENTS ATTENDING CARDIAC
REFERRAL CLINIC AT ST. PAUL'S HOSPITAL, ADDIS ABABA,
ETHIOPIA**

BY

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Magnitude and Associated Factors of Ischemic Heart Disease Among Cardiac Patients Attending Cardiac Referral Clinic at St. Paul's Hospital, Addis Ababa, Ethiopia

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DECLARATION OF INVESTIGATOR

I, the undersigned student of the internal medicine speciality, declare that this thesis is my original work in partial fulfilment of the requirement for the internist to my best knowledge.

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DECLARATION OF ADVISORS

I, the undersigned Advisor, approve that this thesis is the work of the above mentioned student, in partial fulfilment of the requirement for the internist. With my approval as the college advisor, I confirmed that this thesis is ready for defense.

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ABSTRACT

Introduction: Ischemic heart disease is a condition in which there is an inadequate supply of blood and oxygen to a portion of the myocardium, which is the leading cause of death worldwide, putting a major economic and resource burden on health and public health systems.

Objective: The main objective of this study was to assess the magnitude and associated factors of ischemic heart disease among cardiac patients attending cardiac referral clinics at SPHMMC Addis Ababa, Ethiopia.

Methods: An institution based cross sectional study design was employed, and a total of 280 patients seen from July 1/2023 to August 31/2023 were included in the study. Participants were selected using systematic random sampling technique among cardiac patients attending cardiac referral clinics at St. Paul's Hospital Millennium Medical College. Data was collected using a data extraction checklist and pretested interviewer administered structured questionnaires developed by reviewing different literature. The data was entered using Epidata version 4.6 and exported to SPSS version 25 for further analysis. Descriptive statistics were performed to describe the study population. Bivariable logistic regression is conducted to assess the relationship between each independent variable and dependent variable. Variables with P value of <0.25 are considered candidates for the final (multivariable) logistic regression model. The association is expressed in odds ratio with 95% confidence interval and P -value <0.05 is used as cut-off points to declare significance in the final model.

Results: The study found a prevalence of 13.6% for IHD within the cardiac patient population, with a 95% CI of (9.6% to 17.5%); of which 15 (39.5%) presented with prior IHD without heart failure, 10 (26.3%) with acute coronary syndrome and 13 (34.2%) with ischemic heart disease with heart failure. Male patients (AOR = 2.4, 95% CI: (1.07-5.28)), patients with a history of diabetes mellitus (AOR = 4.5, 95% CI: (6.00-34.79)) and individuals with dyslipidemia (AOR = 2.5, 95% CI: (1.13-5.49)) were more likely to develop ischemic heart disease.

Conclusions and recommendations: In conclusion, the study reveals a notable prevalence of IHD among cardiac patients and identifies key risk factors associated with the condition. Male gender, a history of diabetes mellitus, and the presence of dyslipidaemia are all significant contributors to the development of IHD. Public health initiatives could focus on raising awareness about the importance of gender-specific risk factors and promoting healthy lifestyle choices to prevent the development of IHD.

Keywords: Ischemic heart disease, Magnitude, St. Paul's hospital

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ACRONYMS/ ABBREVIATIONS

AMI	Acute myocardial infarction
BMI	Body Mass Index
CVDs	Cardiovascular diseases
GBD	Global Burden of Disease
HIV/AIDS	Human immune deficiency virus/Acquired immune deficiency syndrome
ICU	Intensive care unit
IHD/CHD	Ischemic Heart Disease/Coronary Heart Disease
LMICs	Low and middle income countries
NCDs	Non-communicable diseases
NYHA	New York Heart Association
SPHMMC	St. Paul's hospital millennium medical college
SPSS	Statistical Package for Social Science
SSA	Sub-Saharan Africa
USA	United States of America
WHO	World Health Organization

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1. Introduction

1.1. Background Information

Ischemic heart disease (IHD) is a condition in which there is an inadequate supply of blood and oxygen to a portion of the myocardium; it typically occurs when there is an imbalance between myocardial oxygen supply and demand. The most common cause of myocardial ischemia is atherosclerotic disease of an epicardial coronary artery sufficient to cause a regional reduction in myocardial blood flow and inadequate perfusion of the myocardium supplied by the involved coronary artery. The presentation of ischemic heart disease can be as: unstable angina, myocardial infarction, heart failure, arrhythmia or sudden death and all of these except sudden cardiac death can lead to chronic stable IHD if patients survive and they are well treated [1]. IHD can be classified as: 1. Angina pectoris which is short lived, relieved with termination of the provoking factor or rest and had no typical ECG features of infarction

2. Acute coronary syndrome, subdivide in to ST elevation myocardial infarction, non ST elevation myocardial infarction and unstable angina is defined by the presence of elevated cardiac biomarkers together with acute onset chest pain, and/or typical ECG changes, 3. Prior myocardial infarction including patients who present with or without heart failure in whom echocardiography detected regional wall motion abnormality in the absence of a history of acute coronary syndrome [2].

Most patients with IHD/coronary heart disease (CHD) have some identifiable risk factor. These include positive family history, male sex, blood lipid abnormalities, diabetes mellitus (DM), hypertension, physical inactivity, abdominal obesity, cigarette smoking, psychosocial factors, and consumption of too few fruits and vegetables and too much alcohol. These risk factors can be either fixed (non- modifiable) or modifiable. Among the risk factors, increased age, male sex and family history are non-modifiable while others are modifiable. Cigarette smoking, diabetes, hyperlipidemia and hypertension are known as conventional risk factors, which are the major risk factors in IHD contributing to a population-attributable risk of nearly 90% for acute myocardial infarction [1].

The diagnosis of IHD depends on the history, physical examination, some laboratory investigation (cardiac enzymes), electrocardiography (ECG) and echocardiography with other additional investigations to rule out or rule in other mimics.

Treatment of IHD depends on the clinical presentation of patients which focuses on treating the underlying risk factors, acute attack, precipitating factors and risk reduction to prevent further attack and complications. The fight against the pandemic of ischemic heart disease must concentrate on an aggressive approach that combines environmental, policy and legislative interventions for health promotion and primary prevention programs, combined with improved access to evaluation, treatment and control of major risk factors which provides the best strategy for averting IHD.

1.2. Statement of the Problem

Ischemic heart disease has become a major global health issue. It is the most prevalent form of heart disease which is the leading cause of death worldwide [3]. The burden and risk factors of IHD remain alarmingly high putting a major economic and resource burden on health systems [4]. The epidemiologic components of IHD burden are IHD death and morbidity from acute myocardial infarction (AMI), stable angina, and ischemic heart failure with more than 20-fold variation in IHD mortality rates between countries and age-standardized mortality falling by more than half in high income countries, a trend being flat or increasing in some low-and-middle income countries [3-6]. Low-and-middle income countries now account for more than 80% of global IHD deaths [7].

The Global Burden of Disease Study (2013) estimated that almost 30% of all deaths worldwide were caused by cardiovascular diseases and about 60-80% of these deaths happen in low and middle income countries (LMICs) [8]. In 2019, IHD accounted for 197.2 million prevalent cases, 9.1 million deaths, and 182.0 million disability adjusted life years worldwide. [43]

According to the World Health Organization (WHO) report of 2015, CVDs were the leading cause of death globally, and they killed 17.5 million people in 2012, which represented 31% of all global deaths [9, 10].

IHD remains one of the leading causes of death in the United States, accounting for approximately 17% of overall national health care expenditures [11]. IHD death rate was highest in Eastern Europe and Central Asia. Following these, Central Europe, North Africa, and Middle East regions had the highest rates of IHD death [6].

About 75% of the global cardiovascular (CVD) mortality occurs in low- and middle-income countries (LMICs). The rates of CVD mortality have been reduced dramatically in some parts of the world, but it still threatens millions of lives in developing countries. Moreover, the risk factors for non-communicable diseases are unacceptably increasing in low- and middle-income countries including Africa [12].

For instance, in South Africa, CVD is the second leading cause of death after HIV/AIDS accounting for up to 40% of deaths among adults [13]. This double burden of communicable and NCDs has long-term public health impacts as it undermines healthcare systems.

In Ethiopia, healthcare resources are currently overwhelmed by public health threats, including HIV/AIDS, tuberculosis, and malaria. At the same time, the rapid urbanization of this country has created a change in people's lifestyles in terms of nutrition, physical activities, and behaviors such as smoking, alcohol, and drug use among urban dwellers, which may impact the risk of developing CVD. It is thus time to address NCDs including CVDs among adults [14]. In addition to the increase in the burden of CVDs in low- and middle-income countries, there is a scarcity of data that shows risk factors for CVDs [15]. The Lack of data on IHD and the non-existence of epidemiological surveillance systems for ischemic heart disease in most of our hospitals in particular and in our country as a whole should not be understood to mean the rarity of the disorder as long as there are risk factors for IHD. Without accurate baseline data it will be challenging to target prevention strategies for the future. Current knowledge about the prevention of CVD is derived mainly from studies done in populations of European origin. However, African populations include individuals of various ethnicities (black, colored, Asian, and European), and it is not known whether information derived from studies conducted in North America or Western Europe is applicable [1]. While IHD is the leading cause of death, majority of the studies done in our set up focus on prevalence rather than its risk factors which would be the focus of intervention. Prevention strategies and programs for IHD and early detection of factors that may contribute to the occurrence of the disease must be considered a public health necessity.

1.3. Significance of the Study

This study will add an understanding of the mode of presentation and trends of IHD and its associated factors for health professionals, administrative bodies of St. Paul's hospital millennium medical college, regional government bodies and NGOs involved in the continuum of care of patients with IHD. It will also help as an input for policy makers by providing current and updated information on the issue. It is hoped that findings of the study will also increase awareness of health care givers working at St. Paul's Hospital Millennium Medical College (SPHMMC) about IHD and its associated factors in the context of our hospital and environment. Additionally, this study will help provide base line information for researchers who need to study ischemic heart disease further.

2. LITERATURE REVIEW

2.1. Magnitude of IHD

Currently, research evidence shows that NCDs are increasing globally and threaten human lives. Specifically, in the 21st century, because of globalization, there has been a paradigm shift in people's lifestyles and modernization across different regions and sub regions in the globe, and such paradigm shift has contributed to the rapid increase of CVD worldwide. The magnitude of IHD continues to accelerate globally due to increasing various risk factors or determinants. In addition, IHD is considered the most common cause of hospital admission worldwide resulting in tremendous economic burden on health care systems [18]. In contrast, IHD previously considered rare in sub-Saharan Africa, now ranks 8th among the leading causes of death in men and women in the region. Furthermore, the burden of IHD and related morbidity is rising in East Africa and Ethiopia [18].

A study done at Jimma University Specialized Hospital showed that out of 781 cardiac patients, 32.8% had RHD, 24.2% HHD, 20.2% cardiomyopathy, 12.0% IHD, 3.8% Cor-pulmonale, 13.5% arrhythmia and 3.4% had other sorts of heart diseases [19]. In a study conducted in Addis Ababa at St. Paulos hospital IHD accounted for 12.2% of all CVD admissions and the prevalence has significantly increased with age and males had significantly higher proportion than females. IHD was more common in residents of Addis Ababa than those who came from outside of Addis Ababa, but the difference was not significant [20]. Another study done at Tikur anbesa hospital in Addis Ababa, Ethiopia showed that IHD occupied 7.4% of deaths [21]. A survey in Jimma showed that of admitted IHD patients, 61.25% were diagnosed with chronic ischemic heart disease [22].

2.2. Associated Factors

Different literatures showed a lot of factors associated with IHD. These factors are categorized and presented as follow.

2.2.1. Socio-Demographic and Economic Factors

Socio-demographic and economic factors have repeatedly been found to be connected with CHD. It either directly or indirectly affects the burden of the CHD [23]. The data on >500, 000 people from the American National Longitudinal Mortality Rate Study indicated that there is a strong association between income and education with CHD. A study examined the educational

differences in entire CHD mortality and morbidity in the US and eleven western union countries and found high morbidity and mortality among the persons having a low level of education in all nations; and evidence was also found on the consistent link of low-income groups with the CHD [24, 25].

Studies indicated that urbanization and economic development have also led to the emergence of a nutritional transition marked by a shift to a higher caloric content diet and/or reduction of physical activity [26].

2.2.2. Behavioral Factors

NCDs including CVDs share various modifiable behavioral risk factors such as unhealthy diet, tobacco use, excess alcohol consumption and physical inactivity which lead to metabolic syndromes. A study conducted in Pakistan in 2013 showed that countries having a population which consumes high cholesterol diet, alcohol, smokes, and is obese have an increased number of CHD. Healthy people have a good quality of life, put fewer burdens on health care and the social system, and contribute less to CHD [27].

The Heart Federation on the global strategy and diet, physical activity, and health showed that in 2015 people with CVD had behavioral risk factors which include unhealthy diet, physical inactivity, tobacco use, and harmful alcohol consumption. These risk factors had an effect on an increase in blood glucose, blood pressure, blood lipids, and overweight and obesity [28].

Un matched case control study done on dietary and behavioral risk factors of ischemic heart disease among patients of medical outpatient departments in southern Ethiopia showed more than half of the cases had history of alcohol intake (57.1%), of which 31.3% drink daily. And among the controls, 31.2% had a history of alcohol intake; among them, 46.4% drank alcohol once a week. Concerning physical inactivity, three-fourths of cases were physically inactive as compared to controls (75.7% vs 53.0%). More controls (39.8%) ate fruit and vegetables (more than three times per week) than cases (21.4%). The majority of cases (79.3%) and controls (56.1%) used palm oil for food preparation. Concerning salt usage, 57.1% of the cases and 25.4% of controls used high amounts of salt in their diet. Almost half of the cases, 64 (45.7%) vs 35 (8.4%) of controls, were obese [29].

2.2.3. Comorbidity related factors

Hypertension, both systolic and diastolic BP, raises the chance of IHD. It was more common in Japanese patients with acute coronary syndrome (ACS), accounting for 70% and 79% of men and women, respectively. In a cross-sectional study conducted in Sri Lanka, 51.8% of non ST segment elevation myocardial infarction (NSTEMI) patients had hypertension, showing a significant connection between hypertension and NSTEMI [30, 31].

Another study in Sub-Saharan Africa discovered that hypertension was the most common risk factor, accounting for 46.8% of STEMI and 51.0% of NSTEMI patients, respectively [32].

In Ethiopia, a retrospective study at Tikur Anbessa specialized hospital (TASH), revealed that 61.3% of patients had a previous history of hypertension, and another retrospective study discovered that 61.2% had hypertension [33, 34].

A study done at St. Paul hospital Addis Ababa revealed that from all IHD patients, 90.24% had hypertension with 13.5% had good hypertension control, 59.5% had poor hypertension control, and 27% were newly diagnosed for hypertension or not on treatment. Similarly, 41.5% of IHD patients had T2DM with 41.5% had good glycemic control, 35.3% had poor glycemic control and 17.6% were newly diagnosed for T2DM. [20].

According to a study conducted in China, STEMI and NSTEMI patients had the highest prevalence of diabetes, accounting for 36.8% and 39.0%, respectively [35].

Another study conducted in a Sub-Saharan African found diabetes to be the most common risk factor, accounting for 38.7% and 34.7% of STEMI and NSTEMI patients, respectively [32].

According to a study conducted in an Ethiopian urban hospital, diabetes is the most common risk factor, accounting for 40% of patients. Another retrospective study showed that 21% of ACS patients had diabetes mellitus [34, 36].

Triglyceride levels that are too high and high density lipoprotein (HDL) levels that are too low are both risk factors for IHD. According to a study conducted in Istanbul, Turkey, total cholesterol, triglyceride/high density lipoprotein cholesterol (TG/HDL) ratio, and triglyceride levels were all higher in young IHD patients [37]. Increased total cholesterol was found in 65 to 70% of all patients in a cohort study conducted in the South African Asian Indian population [38]. Increased total cholesterol was the most common risk factor observed in 69 % of AMI

patients in a study conducted in Tikur Anbessa teaching hospital in Ethiopia, and another study conducted in Ethiopia in 2014 revealed that 63 % of patients had dyslipidemia [33, 39].

2.2.4. Family history of cardiovascular disease

Independent risk factors for IHD include a family history of cardiovascular disease. In a recent combined analysis of 12 cohort studies, people with a first-degree family with cardiovascular disease had a combined relative risk of 1.6 for future occurrences, compared to people without an affected first-degree relative [40]. A study done in Canada showed patients with a family history of coronary artery disease had a higher prevalence of dyslipidemia (64% vs. 53 %) than patients without a family history and young women with a family history of CAD showed the highest risk, including hypertension (67 %), dyslipidemia (67 %), smoking (42 %), and diabetes (33 %) [41].

According to a study conducted among the South African Asian Indian population, the most frequent familial vascular disease seen was CAD [38].

Conceptual Framework

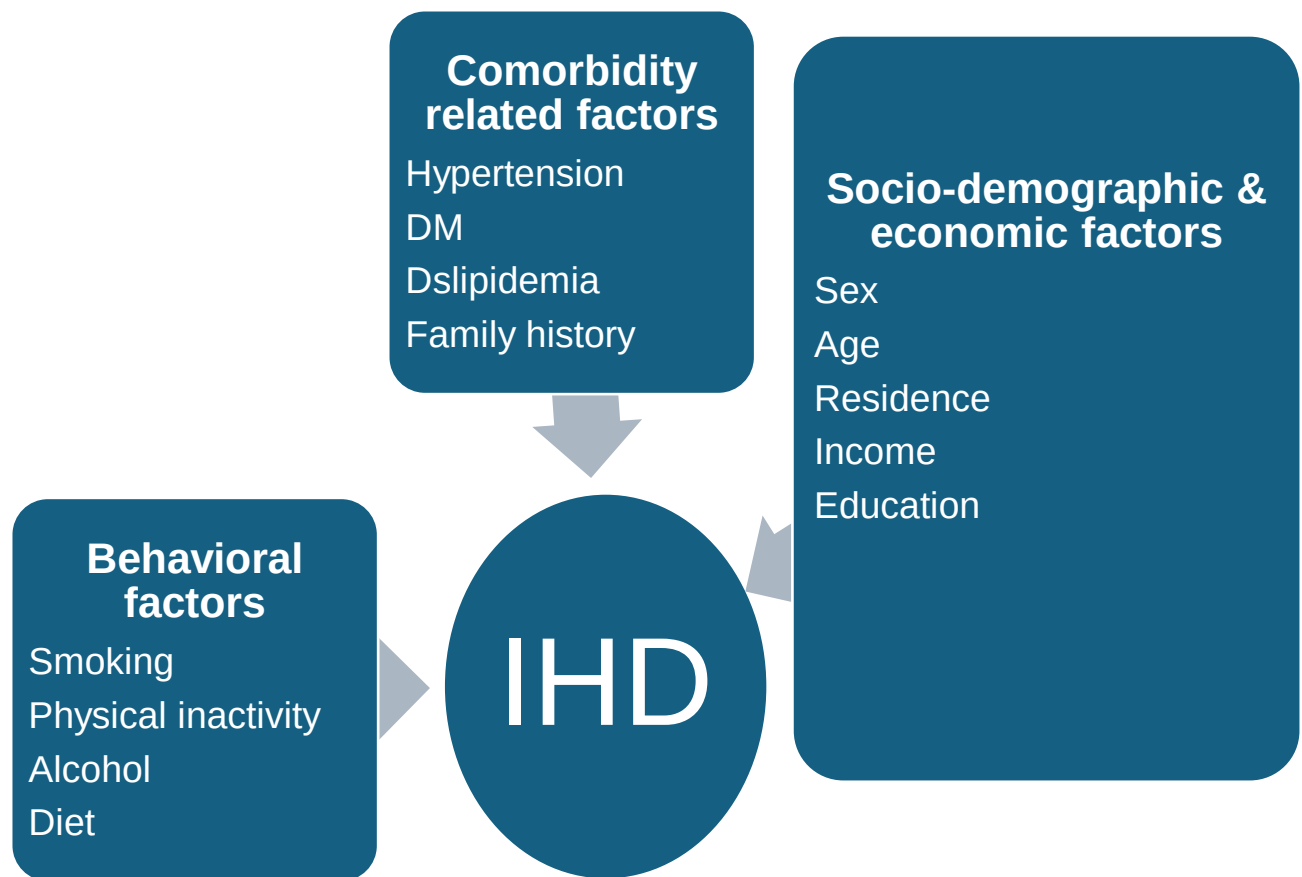


Figure 1: IHD and associated factors among cardiac patients attending cardiac referral clinics at SPHMMC from July 1/2023 to August 31/2023 Addis Ababa, Ethiopia

3. OBJECTIVES

3.1. General Objective

- To assess the magnitude of Ischemic Heart Disease and associated factors among cardiac patients attending cardiac referral clinics at SPHMMC from July 1/2023 to August 31/2023.

3.2. Specific Objectives

- To determine the magnitude of IHD among cardiac patients attending cardiac referral clinics at SPHMMC.
- To identify factors associated with IHD among cardiac patients attending cardiac referral clinics at SPHMMC.

4. METHODS AND MATERIALS

4.1. Study Area

The study is conducted at St. Paul Millennium Medical College which is one of the tertiary governmental Teaching Hospitals in Addis Ababa, the Capital of Ethiopia and the seat of African Union, and the second largest public health Hospital in Ethiopia. The hospital is located in the Gullele sub city and was established by Emperor Hailesillase in 1969. It receives follow up patients, emergency patients and referrals from other hospitals in the country and health centers in the catchment area. It has over 2800 clinical, academic, administrative, and supportive staffs. The total population covered by this hospital per year is greater than 5,000,000. The hospital has a bed capacity of more than 700. Among others, it has eight medical regular outpatient departments for follow up patients working the whole week working days and adult medical emergency OPD providing care 7/24. The cardiac referral OPD is open three days per week and gives cardiac follow up service for more than one thousand cardiac patients per month on average.

4.2. Study Design and Period

Institution based cross-sectional study design was used to conduct this study among cardiac patients attending cardiac referral clinics at SPHMMC from July 1/2023 to August 31/2023.

Population

Source Population

All adult patients attending referral medical clinics at SPHMMC from July 1/2023 to August 31/2023

Study Population

All adult cardiac patients attending cardiac referral clinics at SPHMMC from July1/2023 to August 31/2023

Inclusion criteria and exclusion criteria

Inclusion criteria

All adult cardiac patients attending cardiac referral clinics at SPHMMC from July 1/2023 to August 31/2023 and whose card numbers and charts are available with complete records.

Exclusion criteria

- ✓ Patients age less than 18 are excluded.
- ✓ All cases came for second time follow up during the data collection period.
- ✓ Critically sick and mentally ill cardiac patients who couldn't respond to interviews are excluded.

Sample Size Determination and sampling techniques

Sample Size Determination

The sample size for the first specific objective was calculated using the single population proportion formula by using the following assumptions:

From the study conducted in Jimma referral hospital the proportion of IHD was 12 %, the level of significance was 95% and the margin of error (d) was 4% (0.04). Accordingly, sample size was determined as follows:

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

$$n = (1.96)^2 0.12(1-0.12) / (0.04)^2$$

$$n = 254$$

Then, by adding a 10% non-respondent rate which is 26, the final sample size for the first specific objective was 280.

The sample size for the second specific objective was calculated and summarized as follows by Statcalc under Epi Info 7 software. Hyperlipidemia, Diabetes mellitus and hypertension and smoking are the major factors associated with IHD in previous studies [1, 34].

Table 1: Sample size determination for factors associated with IHD among cardiac patients attending cardiac referral clinics at SPHMMC from July 1/2023 to August 31/2023

Variables	% of outcome in the exposed group	% of outcomes in unexposed	The Ratio of controls to cases	confidence interval (1- α)	Power (1- β)	OR	Calculated sample size
Hypertension	50.4	13.1	1 :1	95%	80%	6.7	58
Diabetes mellitus	4	23.6	1 :1	95%	80%	7.4	116
Smoking	51.6	28.1	1 :1	95%	80%	2.7	152
Dyslipidemia	23.9	6.1	1:1	95%	80%	3.9	146

Finally, by comparing the sample sizes calculated above the largest sample size which is 280 was considered for this study

Sampling Techniques

A Systematic random sampling technique was used to select every 9th cardiac patient who was attending cardiac referral clinics at SPHMMC from July 1/2023 to August 31/2023 until a total of 280 cases were selected.

There were 3 days per week on which a cardiac referral clinic was opened and on average 100 cardiac patients were seen per day making 300 patients per week and 2400 patients were seen over two months of the data collection period. So dividing 2400 by 280 gave us 8.57 which makes the 'k' value 9.

Variables of the Study

Dependent Variable

- ✓ IHD (Yes, No)

Independent Variables:

➤ **Socio-demographic and economic factors:**

- ✓ age
- ✓ sex
- ✓ residence (urban/rural)
- ✓ income
- ✓ Education

➤ **Behavioral factors:**

- ✓ Smoking
- ✓ physical inactivity
- ✓ alcohol
- ✓ diet

➤ **Comorbidity related factors:**

- ✓ Hypertension
- ✓ diabetes mellitus,
- ✓ family history
- ✓ dyslipidemia

4.7. Operational Definitions

- **Ischemic heart disease:** Every case which has diagnosis of IHD on charts using history, physical examination, laboratory and radiologic investigations. This includes unstable angina, non ST elevation myocardial infarction, ST elevation myocardial infarction, chronic stable IHD and IHD with heart failure. For the diagnosis, presence of cardiac enzymes (troponin and CK-MB), ECG finding of ST elevation, echocardiographic wall motion abnormalities and suggestive subjective and objective findings on charts are important criteria

- **STEMI** : patients with ischemic chest pain having persistent ST elevation in two or more contiguous ECG leads with a fall and/or rise of cardiac troponin/CK-MB
- **NSTEMI**: Patients without persistent ST-segment elevation in two or more contiguous leads but with biomarker evidence of myocardial necrosis
- **Unstable angina**: patients presented with ischemic symptoms suggestive of an ACS without elevation in biomarkers with or without ECG changes indicative of ischemia.
- **Prior IHD without heart failure**: in whom echocardiography detected regional wall motion abnormality in the absence of heart failure. Pathologic Q waves on ECG were used to predict the possibility of ischaemia as a cause of the regional wall motion abnormality.[20]
- **IHD with heart failure**: patients with known IHD presenting with heart failure (orthopnea, paroxysmal nocturnal dyspnea, raised JVP, etc.) [14]
- **Hypertension**: a patient with diagnosed hypertension or blood pressure of 140/90 (Systolic/diastolic) and above was taken as hypertensive[33]
- **Diabetes mellitus**: A patient with diagnosed Diabetes mellitus or fasting blood glucose of greater than 126 mg/dl and random blood sugar of greater than 200 mg/dl or HgA1C 6.5 and above was taken as diabetic [14].
- **Hyperlipidemia (dyslipidemia)**: A patient with total cholesterol >200mg/dl, triglyceride>150 mg/dl or high density lipoprotein of <50 mg/dl for women and less than 40 mg/dl for men or LDL of greater than 130 mg/dl was considered dyslipidemia [14]
- **Smoking history**: Any smoking history before the onset of the disease (IHD) was considered positive smoking history [33].
- **Obesity**: Body mass index (BMI) greater than or equal to 30 which is calculated as body weight in kilograms divided by the squares of height in meters. [27]
- **Family history**: presence of IHD in one of the family members(parents, grandparents, sibling, aunt, and uncle)
- **Complete patient chart record**: Patient chart having Patient medical history, physical examination, and related laboratory, ECG and echocardiography result not necessarily behavioral, family and nutritional history.

- **Urban:** Cities, towns and places having a minimum population of 2,000 with infrastructures
- **Rural:** areas not classified as urban

4.8. Data Collection tools and Procedures

Data was collected using a data extraction checklist and pretested interviewer administered structured questionnaires developed by reviewing different literature to complete the missed information on the patient chart [14, 29, 42]. A structured questionnaire was prepared in English and translated into Amharic. Finally, it was translated back to English to check its consistency. The checklist covered socio-demographic information and lists of different variables. Two general practitioners (GPs) were recruited as data collectors and one medical resident was recruited as a supervisor.

4.9. Data Quality Assurance

One day of training was given to data collectors and supervisor. A Pre-test was conducted on 5% of the sample at St. Peter cardiac referral OPD and then adjustments or modifications were made based on the result of the pre-test. The supervisor checked the .data collection process daily for accuracy, consistency, and completeness.

To minimize measurement error anthropometric measurements were taken after prerequisites to avoid error. That was, weight was measured after we checked for the scale pointer at zero, and subjects wore light clothes and stood straight up and unsupported at the center of a balance platform. Height was also measured after participants were asked to take out their shoes; stand erect with knees straight and positioned at the plane with feet together. The heels, buttocks and shoulder blades were made straight against the stadiometer's vertical stand. Instrument calibration and random auditing were performed; measurements were taken twice, and finally, we approximated height to the nearest 0.1 cm and weight to the nearest 0.1kg.

Blood pressure was measured using a digital sphygmomanometer. It was measured two times while the study subject was in a sitting position with the right upper arm placed at the level of the heart and after the subject had a 10 minute rest. The average of the two measurements was considered to compute systolic blood pressure (SBP) and diastolic blood pressure (DBP). There was a 10 min interval between two blood pressure measurements.

No laboratory test was performed at the time of data collection, but investigation results were extracted from the patient chart that was documented at the time of enrollment to the cardiac follow up clinic.

Furthermore, the supervisor and the principal investigator gave feedback and corrections regarding the collected data to the data collectors on a daily basis.

4.10. Data Processing and Analysis

Data was coded, organized and transformed till it was ready for entry into Epi data software. The entered data was exported and analyzed using SPSS version 25. Frequency tables, graphs and descriptive summaries were used to describe the study variables. Bivariable analysis was performed to investigate the relationship between one independent variable and the dependent variable and multivariable analysis was performed to identify significant factors associated with ischemic heart disease. Independent variables with a P-value of <0.25 were considered a candidate for the multivariable logistic regression model. The association was expressed in odds ratio with 95% confidence interval and P-value <0.05 was used as cut-off points to declare significance in the final model.

4.11. Ethical Considerations

Ethical approval was received from the Institutional Ethical Review Board of SPHMMC. The informed oral consent was obtained from each participant before starting the data collection process. Any information collected from all interviewee (patients) was kept confidential throughout the study.

4.12. Dissemination of Results

The final report is presented as partial fulfilment of the requirements for the postgraduate speciality program of internal medicine at SPHMMC. The findings will be released to SPHMMC medical community as well, and attempts will be made to publish the final paper in peer reviewed journals.

RESULTS

5.1. Socio-demographic characteristics of patients

A total of 280 patients were included in this study making the response rate 100%; of which 173 (62.9%) were males. The mean age of patients with standard deviation (SD) was 54.4 (SD±16.0 years). About 215 (76.8%) of them were from urban areas. Of the total study participants, 169 (60.4%) were found to be married (**Table 2**).

Table 2: Sociodemographic characteristics of patients attending cardiac referral clinics at SPHMMC, Addis Ababa, Ethiopia (n=280)

Variables	Category	Frequency	Percentage
Age	≤ 29	24	8.6
	30-39	38	13.6
	40-49	40	14.3
	50-59	57	20.4
	≥60	121	43.2
	Total	280	100
Sex	Male	173	37.1
	Female	107	62.9
	Total	280	100
Residence	Urban	215	76.8
	Rural	65	23.2
	Total	280	100
Educational status	No formal schooling	82	29.3

	Primary school completed	83	29.6
	Secondary school and above	115	41.1
	Total	280	100
Marital status	Never married	46	16.4
	Married	169	60.4
	Divorced	11	3.9
	Widowed	54	19.3
	Total	280	100
Occupation	Government employee	27	9.6
	Private employee	52	18.6
	Farmer	20	7.1
	Housewife	80	28.6
	Student	10	3.6
	Retired	42	15.0
	Others	49	17.5
	Total	280	100
Income	≤1000	161	57.5
	1001-5000	75	26.8
	≥5001	44	15.7
	Total	280	100

5.2. Prevalence of IHD

Among 280 patients, 38 (13.6%) with 95% CI of (9.6-17.5) have IHD; of which 15(39.5%) presented with prior IHD without heart failure, 10(26.3%) with acute coronary syndrome, and 13 (34.2%) with prior ischemic heart disease with heart failure; of which 11(84.6%) have heart failure with reduced ejection fraction and 2(15.4%) have mildly reduced ejection fraction.

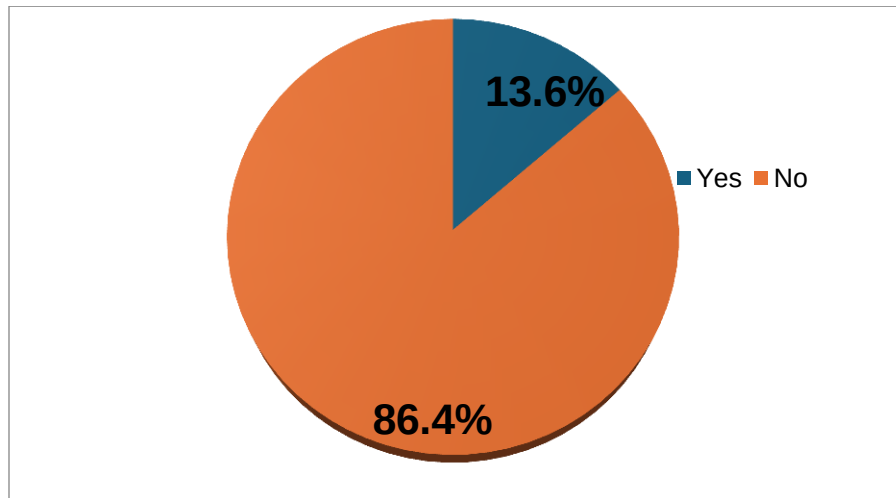


Figure 2: Prevalence of IHD among cardiac patients attending cardiac referral clinics at SPHMMC from July 1/2023 to August 31/2023, Addis Ababa, Ethiopia

5.3. History of Risk Factors of IHD

Out of sampled patients, 51(18.2%) were diabetic and 172(61.4%) were hypertensive. Patients with a history of hyperlipidemia accounted for 114(40.4%), and 7(2.5%) of patients who were noted to have previous family history of CHD. History of smoking habits among patients was found to be 6(2.1%) (**Table 3**).

Table 3: History of comorbidities and behavior of patients attending cardiac referral clinics at SPHMMC, Addis Ababa, Ethiopia (n=280)

Variables	Category	Frequency	Percentage
History of DM	Yes	51	18.2
	No	229	81.8
History of hypertension	Yes	172	61.4
	No	108	38.6
History of hyperlipidemia	Yes	114	40.4
	No	166	59.6
Family history of CHD	Yes	6	2.1
	No	274	97.9
Cigarette smoking	Non-smoker	262	93.2
	Ex-smoker	19	6.8
Vegetable consumption	<3times/week	194	69.2
	3times/week	40	14.3
	>3times/week	46	16.5
Fruit consumption	<3times/week	204	72.8
	3times/week	38	13.6
	>3times/week	38	13.6
Physical activity	<150minutes/week	171	61.1
	150minutes/week	23	8.2

	>150minutes/week	86	30.7	
Salt consumption	Low	199	71.1	
	Optimal	62	22.1	
	High	19	6.8	
Alcohol consumption	None	242	86.4	
	Low	23	8.2	
	Moderate	10	3.5	
	Heavy	5	1.9	
BMI	≤ 18.5	39	13.9	
	18.6-24.9	136	48.6	
	25-29.9	75	26.9	
	≥ 30	24	8.6	
Total cholesterol	<200mg/dl	42	15	
	>200mg/dl	238	85	
Triglyceride	<150mg/dl	70	25	
	>150mg/dl	210	75	
	>50mg/dl	224	80	
	>130mg/dl	220	79.3	
	>150mg/dl	210	75	
HDL	Male	<40mg/dl	36	12.8

		>40 mg /dl	137	49
	Female	>50mg/dl	21	7.5
		≤50mg/dl	86	30.7
LDL	<130mg/dl	58	20.7	
	>130mg/dl	220	79.3	

5.4. Factors associated with IHD

In the Bivariate binary logistic regression analysis, the following variables were found to have a statistically significant association with ischemic heart disease with a p-value of <0.25. These variables were sex, Educational status, history of diabetes mellitus, history of dyslipidemia, smoking history and vegetable consumption.

The results of multivariate analysis showed that being male in sex, having a history of diabetes mellitus and having a history of dyslipidemia were found to have statistically significant associations with ischemic heart disease at P-value < 0.05.

In this study male patients have 2.4 times higher odds of having IHD compared to female patients (AOR = 2.4, 95% CI: (1.07-5.28)), patients with history of diabetes mellitus were 4.5 times more likely to develop IHD (AOR = 4.5, 95% CI: (6.00-34.79)) and individuals with dyslipidemia have 2.5 times higher odds of having IHD compared to individuals without dyslipidemia (AOR = 2.5, 95% CI: (1.13-5.49)) (See **Table 4**).

Table 4: Bi-variable and multivariable logistic regression analysis of the risk factors for Ischemic heart disease among study participants in, SPHMMC, Addis Ababa, Ethiopia (n=280)

Variables	Response	IHD		COR (95% CI)	AOR (95% CI)	P-value
		Yes	No			
Sex	Female	23	84	1	1	
	Male	15	158	2.9(1.43-5.82)	2.4(1.07-5.28)	0.034*
Educational status	No formal schooling	6	68	2.8(1.09-7.23)	2.04 (0.74-5.62)	0.17
	Primary school completed	8	77	2.4(1.01-5.59)	1.75(0.71-4.31)	0.22
	Secondary school+	24	97	1	1	
History of DM	Yes	26	203	2.4(1.12-5.16)	4.5(6.00-34.79)	0.04*
	No	12	39	1	1	
History of dyslipidemia	Yes	14	153	2.9(1.45-5.99)	2.5 (1.13-5.49)	0.024*
	No	24	89	1	1	
Smoking History	Non-smoker	5	14	1	1	
	Ex-smoker	33	228	2.5 (0.83-7.29)	1.12(0.33-3.76)	0.85
Vegetable consumption	<3times/week	23	172	1.9(0.80-4.37)	2.16(0.78-5.33)	0.096
	times/week	6	34	1.4(0.46-4.40)	2.03(0.59-6.97)	0.26
	>times/week	9	36	1	1	

5.5. Measurement Results

The minimum level of fasting blood sugar is 40mg/dl with its maximum being 241.9mg/dl and the mean for hemoglobin A1c is 5.79. The mean for HDL and LDL is 44.84 and 105.07mg/dl (Table 5):

Table 5. Measurement results of patients attending cardiac referral clinics at SPHMMC, Addis Ababa, Ethiopia (n=280)

Measurement	Minimum	Maximum	Mean	Std. Deviation
FBS	40.00	241.90	99.6507	24.73880
HgA1c	4.40	11.50	5.7934	1.11044
Triglyceride	43.60	423.30	133.9396	53.02383
Total Cholesterol	34.10	427.00	153.3161	43.98276
HDL	11.30	97.10	44.8482	10.83820
LDL	23.50	255.40	105.0779	38.46717

5.5. Discussion

The present study provides valuable insights into the prevalence of ischemic heart disease (IHD) among cardiac patients attending the cardiac referral clinic of St. Paul's hospital and identifies important risk factors associated with the condition. The study found a prevalence of 13.6% for IHD within the cardiac patient population, with a 95% confidence interval (CI) ranging from 9.6% to 17.5%. This indicates that a significant proportion of the cardiac patient population in the study had IHD.

Comparable to the results of the present study a prevalence of ischemic heart disease of 16.2 %, 12.0% and 12.2% were reported from studies done at Mongolia, Jimma University Specialized Hospital and St. Paulos hospital (45,19,20) respectively. This finding is higher than the study conducted at Tikur Anbesa hospital which revealed IHD prevalence of 7.4% and slightly lower than the study conducted at Debre Markos Referral hospital which had a magnitude of 18.7% (44). This finding suggests that IHD is a relatively common condition among this population, affecting a significant portion of the patients.

In this study, significant associations were observed between various factors and ischemic heart disease. One notable finding is the higher odds of IHD among male patients compared to female patients. Male patients have 2.4 times higher odds of developing IHD compared to female patients. This indicates a positive association between being male and the likelihood of having IHD.

These results align with researches conducted in Southern Brazil, public hospitals in Thailand and Debre Markos Comprehensive specialized hospital showing that males are at higher risk to develop IHD than to females (46,47,44).

The finding highlights gender as a potential risk factor for IHD. It suggests that being male is associated with an increased likelihood of developing the condition. Several factors contribute to the higher risk of IHD in males. One significant factor is the presence of sex hormones, particularly estrogen, in females which is believed to have a protective effect on the cardiovascular system. Estrogen has been shown to improve lipid profiles, promote vasodilation, and reduce inflammation, all of which can lower the risk of developing IHD. As a result, premenopausal women generally have a lower incidence of IHD compared to men of the same age (44, 47).

Furthermore, the study highlights the significant impact of diabetes mellitus on the development of IHD. The finding that patients with a history of diabetes mellitus were 4.5 times more likely to develop ischemic heart disease (IHD) indicates a significant association between these two conditions. This study result is supported by a study done in Southern Brazil, a meta-analysis done in sub-Saharan Africa (SSA) and a survey conducted in Debre Markos Comprehensive Specialized Hospital, Northwest Ethiopia, showing a positive relationship between DM and IHD (18, 44,46). This finding underscores the increased risk of IHD among individuals with a history of diabetes. Diabetes mellitus is a known risk factor for cardiovascular diseases, including IHD. The presence of diabetes can lead to metabolic abnormalities, such as insulin resistance and dyslipidemia, which contribute to the development and progression of IHD. The finding highlights the importance of effective management and control of diabetes mellitus to reduce the risk of developing IHD. Optimal glycemic control, along with lifestyle modifications and appropriate medical interventions, can help mitigate the risk of cardiovascular complications, including IHD, among patients with diabetes.

Similarly individuals with dyslipidemia have 2.5 times higher odds of having IHD compared to individuals without dyslipidemia (AOR = 2.5, 95% CI: (1.13-5.49)). This indicates a positive association between dyslipidemia and the risk of IHD. This finding agrees with a result of a meta-analysis conducted in Sub-Saharan countries which revealed that dyslipidemia is one of the risk factors for IHD (18).

Dyslipidemia refers to abnormal lipids (cholesterol and triglycerides) levels in the blood. Elevated levels of low-density lipoprotein (LDL) cholesterol and low levels of high-density lipoprotein (HDL) cholesterol are commonly associated with dyslipidemia. These lipid abnormalities contribute to the development of atherosclerosis and increase the risk of IHD.

Lifestyle modifications, such as adopting a healthy diet, regular physical activity, and weight management, along with pharmacological interventions (e.g., statins), can help control lipid levels and lower the risk of IHD.

Limitations

It is essential to acknowledge the limitations of the study. The prevalence of IHD was determined within a specific population of cardiac patients and this study is conducted in a tertiary care setup where challenging cases are referred to and may not properly reflect the prevalence in the general population which may limit the generalizability of the findings to other populations. Additionally, the study's design may not establish causation as it is a cross sectional study. Future studies should address these limitations to strengthen the reliability and applicability of the findings.

Conclusions and Recommendations

6.1. Conclusions

In conclusion, the study reveals a notable prevalence of IHD among cardiac patients and identifies key risk factors associated with the condition. Male gender, a history of diabetes mellitus, and the presence of dyslipidaemia are all significant contributors to the development of IHD. These findings shed light on the significant burden of IHD, highlighting the need for further research and interventions to prevent IHD. The findings of this study also have important implications for healthcare providers, policymakers, and researchers. This information can be valuable for healthcare professionals in identifying high-risk groups and tailoring preventive strategies and interventions accordingly.

6.2. Recommendations

Based on the findings, the following recommendations can be made:

For clinicians and other health care providers

- ✓ **Gender-specific risk assessment:** Healthcare providers should consider the higher odds of IHD among male patients.
- ✓ **Diabetes management:** Given the strong association between diabetes mellitus and IHD, comprehensive diabetes management is essential. Regular monitoring of blood glucose levels, lifestyle modifications, and appropriate pharmacological interventions should be prioritized to reduce the risk of developing IHD among patients with diabetes.
- ✓ **Dyslipidemia screening and management:** A focus on lipid screening should be integrated into clinical practice when indicated, particularly among cardiac patients, to identify individuals with dyslipidemia. Implementing appropriate management strategies, including lifestyle modifications and lipid-lowering medications, can significantly reduce the risk of developing IHD.

For Public health experts

- ✓ **Public health initiatives:** Public health campaigns should focus on raising awareness about the risk factors associated with IHD, including gender-specific risks, diabetes mellitus, and dyslipidemia. Promoting healthy lifestyle choices, such as regular exercise, a balanced diet,

and smoking cessation, can significantly contribute to the prevention and management of IHD.

For the Ministry of Health

- ✓ Developing gender-specific risk assessment tools and guidelines can help accurately identify and manage IHD risk factors in both male and female patients.

For Researchers

- ✓ **Conduct further research:** Continued research is needed to explore additional factors that may influence IHD and identify specific interventions that can decrease the occurrence of IHD.

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7. ANNEXES

7.1. Data extraction check list & Questionnaire

Date checklist filled-----

Code _____

PART I: Socio-demographic background

Ser. No	Variables	Response	Skip
101	Sex of the patient	0. Male 1. female	
102	Age of the patient	_____ Years	
103	Place of Residence	0. Urban 1. Rural	
104	Educational level	0. No formal schooling 1. Primary school completed 2. Secondary school and above	
105	What is your current marital status?	0. Never married 1. Currently married 2. Divorced 3. Widowed	
106	Occupation	0. Government employee 1. Private employee 2. Farmer 3. Home wife 4. Student 5. Retired 6. Other _____	
107	What is your average household monthly income?	_____ Birr	

Part II: History of comorbidities related factors

201	History of diabetes mellitus	0. Yes 1. No	
202	History of hypertension	0. Yes 1. No	
203	History of Dyslipidemia	0. Yes 1. No	
204	Family history of CHD	0. Yes 1. No	

Part III: Clinical characteristics/factors of the patient

S. NO	Variables	Response	Skip
301	Presence of IHD	0. Yes 1. No	
302	If yes, what was the first clinical presentation (diagnosis)	0. STEMI 1. NSTEMI 2. Unstable angina 3. Prior IHD without heart failure 4. Prior IHD with heart failure	
303	If heart failure present, what is the ejection fraction?	_____ %	

Checklist completed by.....Signature-----

Part IV: Behavioral factors

S. No	Variables	Response	Skip
401	Cigarette smoking habit	0. Non-smoker 1. Smoker 2. Ex-smoker	
402	If you are currently smoking what is the duration and number of cigarettes smoked per day?	Duration in year_____ No. of cigarette smoked per day_____	
403	If you are ex-smoker, how many years ago you	_____ Year/s back	

	stopped smoking		
404	Vegetable consumption habits	0. <3times/wk 1. 3times/wk 2. >3times/wk	
405	Fruit consumption habits	0. <3times/w k 1. 3times/wk 2. >3times/wk	
406	Physical activity	0. <150min/week 1. 150min/week 2. >150min/week	
407	Salt consumption behavior	0. low 1. optimal 2. high	
408	Type of oil for food preparation	0. Sunflower 1. Palm oil	
409	Alcohol consumption	0. None 1. Low 2. Moderate 3. Heavy	

Part V: Measurements

S.No.	Meassurements	Response	Skip
501	Weight	_____ Kg	
502	Height	_____ m	
503	BMI	_____ kg	
504	BP	_____	
505	FBS	_____ mg / dl	

506	HgA1C	_____ %	
507	Triglyceride	_____ mg / dl	
508	Cholesterol	_____ mg / dl	
509	HDL	_____ mg / dl	
510	LDL	_____ mg / dl	

7.4. የአማርኛ መጠይቅ

ከድ.....

ቀን.....

ክፍል 1: አጠቃላይ መረጃ

ተ.ቁ	ጥያቄዎች	መልስ	ዝለል
101	ጾታ (በማየት ይመዝግቡ)	0. ወንድ 1. ሴት	
102	ዕድሜ	_____ ዓመት	
103	መኖሪያዎ የትነው?	0. ከተማ 1. ገጠር	
104	የትምህርት ደረጃ	0. አልተማርኩም 2. የመጀመርያ ደረጃ 3. ሁለተኛ ደረጃ እና በላይ	
105	የአሁኑ የጋብቻ ሁኔታዎ ምንድነው?	0. ያላገባ/ች 1. ያገባ/ች 2. የተፋታ/ች 3. ባል/ሚስት የሞተበት	
106	የሥራዎ ሁኔታ	0. የመንግስት ሠራተኛ 1. የግል ሥራ 2. አርሶአደር 3. የቤት እመቤት 4. ተማሪ 5. ጠረተኛ 6. ሌላ (ጥቀስ) _____	
107	የወር ገቢ ምን ያህል ነው	_____ ብር	

ክፍል 2፡ ከጤና ጋር የተያያዙ መረጃዎች

201	የስኳር በሽታ አለበዎት?	0. አዎ 1. የለም	
202	የደም ግፊት አለበዎት?	0.አዎን 1የለም	
203	የደም ቅባት መዛባት	0. አዎን 1. የለም	
204.	የወፍረት ልኬት	0.ከመጠን ቢታች 1. መጠነኛ 2. ከመጠን በላይ 3. በጣም ከፍተኛ	
205	በቤተሰብ የልብ ደም ስር ህመም አለ?	0. አዎን 1. የለም	

ክፍል 3 የታካሚው ሁኔታ

ተ.ቁ	ጥያቄዎች	መልስ	ዝሊል
301	የልብ ደም ስር ህመም አለ?	0. አዎን 1. የለም	
302	አዎ ከሆነ ምን ዓይነት የልብ ህመም ነበር	0. STEMI 1. NSTEMI 2. Unstable angina 3. Prior IHD without heart failure 4. Prior IHD with heart failure	
303	የልብ ድካም ካለ ኢጄክሽን ፍራክሽኑ ስንት ነው?	_____ %	

ክፍል 4: ከባህሪ ጋር የተያያዙ መረጃዎች

ተ.ቁ	ጥያቄዎች	መልስ	ዝላል
401	ሲጋራ አጭሰው ያውቃሉ?	0. በፍጹም 1. አሁንም አጨሳለሁ 2. ቀድሞ አጨሰ ነበር	
402	በማጨስ ላይ ካሉ በቀን ስንት ለምን ያክል ዓመት አጨሱ?	0. የአጨሱበት ጊዜ በዓመት 1. በቀን የሚያጨሱት የሲጋራ መጠን	
403	ቀድሞ ያጨሱ ከነበረ ከምን ያክል አመት በፊት አቆሙ?	_____ ዓመት በፊት	
404	በተለመደው ሳምንት ምን ያክል ቀን አትክልት ትመገባለህ?	0. <3 ጊዜ /በሳምንት 1. 3 ጊዜ /በሳምንት 2. >3 ጊዜ /በሳምንት	
405	በተለመደው ሳምንት ምን ያክል ቀን ፍራፍሬ ትመገባለህ?	0. <3 ጊዜ /በሳምንት 1. 3 ጊዜ /በሳምንት 2. >3 ጊዜ /በሳምንት	
406	በሳምንት ምን ያህል የሰውነት እንቅስቃሴ ያደርጋሉ ?	0. <150 ደቂቃ /ሳምንት 1. 150 ደቂቃ /ሳምንት 2. >150 ደቂቃ /ሳምንት	
407	የጨው አጠቃቀም	0. አነስተኛ 1. መጠነኛ 2. ከፍተኛ	
408	ብዙ ጊዜ ምግብ ለማብሰል ምን ዓይነት ዘዴት ነው የምትጠቀሙት?	2. የአትክልት ዘዴት 3. የረጋ ዘዴት	
409	የአልኮል መጠጥ ጠጥተው ያውቃሉ?	0. በፍጹም 1. አነስተኛ 2. መጠነኛ 3. ከፍተኛ	

ክፍል 5: ልኬቶች

ተ.ቁ	ልኬቶች	መልስ	ዝላል
501	ክብደት	_____ ኪ.ግ.	

502	ቁመት	_____ ሴሜ	
503	BMI	_____	
504	BP	_____	
505	FBS	_____ mg / dl	
506	HgA1c		
507	የደም ትራይግላይሰራይድ	_____ mg / dl	
508	የደም ኮሌስትሮል	_____ mg / dl	
509	የደም ኤችዲኤል	_____ mg / dl	
510	የደም LDL	_____ mg / dl	

መረጃውን የሰበሰበ ሰው ስም _____ ፊርማ _____ ቀን _____