ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
COLLEGE OF HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH

BURDEN AND RISK FACTORS OF HYERTENSION, DIABETES MELLITUS AND DYSLIPIDEMIA AMONG ADULTS IN ADDIS ABABA, ETHIOPIA: A COMMUNITY BASED STUDY

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DISSERTATION FOR THE DEGREE OF DOCTOR OF PHILOSOPHY (PhD) IN PUBLIC HALTH, ADDIS ABABA UNIVERSITY, ETHIOPIA

MAY 2025

ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

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A PHD DISSERTATION SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF AAU IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY (PH.D.) IN PUBLIC HEALTH

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DATE: MAY, 2025

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DISSERTATION APPROVAL

ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

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Internal Examiner	Signature and date
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Internal Examiner	Signature and date

Lists of original papers

I. Asemu MM, Yalew AW, Kabeta ND, Mekonnen D. Prevalence and risk factors of HTN among adults: A community based study in Addis Ababa, Ethiopia. PLoS One. 2021 Apr 1;16 (4):e0248934.

II. Meseret Molla Asemu; Alemayehu Worku Yalew; Negussie Deyessa; Desalewu Mekonnen Kassie. Prevalence and Risk Factors of Dyslipidemia among Adults: A Community Based Study in Addis Ababa, Ethiopia. *Am. J. Nurs. Sci.* **2022**, *11*(1), 20-29. doi: 10.11648/j.ajns.20221101.13

III. Asemu MM, Yalew AW, Deyessa N, Kassie DM. Prevalence of Diabetes among Adults 18 Years and Older in Addis Ababa, Ethiopia: A Community-Based Study. The Ethiopian Journal of Health Development. 2024 Aug 21;38 (3). doi.org/10.20372/ejhd.v38i3.6227

List of acronyms and abbreviations

ACC	American College of Cardiology
ADA	American Diabetes Association
AOR	Adjusted Odds Ratio
BMI	Body Mass Index
BP	BP
CHD	Coronary Heart Disease
CI	Confidence Interval
CVDs	Cardio Vascular Diseases
DALYs	Disability Adjusted Life Years
DBP	Diastolic BP
DM	Diabetes Mellitus
GDP	Gross Domestic Product
GPAQ	Global Physical Activity Questionnaire
HAART	Highly Active Antiretroviral Therapy
HbA1c	Glycated Hemoglobin
HDL-C	High Density Lipoprotein Cholesterol
HSDP	Health Sector Development Programs
HTN	HTN
IDF	International Diabetes Federation
IFG	Impaired Fasting Glucose
IHD	Ischemic Heart Disease
IQR	Inter Quartile Range
LDL-C	Low Density Lipoprotein Cholesterol
LMICs	Low and Middle Income Countries
MET	Metabolic Equivalent
NCDs	Non Communicable Diseases
NCDI	Non-Communicable Disease and Injuries
NCEP ATP	National Cholesterol Education Program Expert Panel and Adult Treatment Panel
NHANES	National Health and Nutrition Examination Survey
RAAS	Renin Angiotensin Aldosterone System
RBG	Raised Blood Glucose
SBP	Systolic BP
SPSS	Statistical Package for the Social Sciences
STEPS	STEPwise approach to surveillance
TC	Total Cholesterol
TG	Triglyceride
TPA	Total Physical Activity
USD	U.S. Dollar
VLDL	Very Low Density Lipoprotein
WHO	World Health Organization
WHR	Waist Hip Ratio

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Abstract

Background: Non-Communicable Diseases (NCDs) are the leading cause of illness worldwide, disproportionately affecting Low and Middle Income Countries (LMICs), accounting for more than four-fifths of premature deaths every year. The African continent experiences a high burden of NCDs, mainly cardiovascular diseases (heart disease and stroke), cancer, diabetes, chronic respiratory diseases, and poor mental health. Alike most LMICs across the world, Sub-Saharan African countries are undergoing a rapid epidemiological transition characterized by a shift from disease-burden profiles dominated by communicable diseases and childhood illnesses to profiles dominated by chronic non-communicable diseases. In Ethiopia, especially in the study area, few studies have been done on the epidemiology of NCDs, like HTN, diabetes and dyslipidemia. Therefore, we sought to evaluate the epidemiology of HTN (HTN), Diabetes Mellitus (DM) and dyslipidemia among adult populations of Addis Ababa Ethiopia.

Objective: To describe the prevalence and associated risk factors of HTN, diabetes, and dyslipidemia among adults living in Addis Ababa, Ethiopia.

Methods: Between June and October of 2018, the study was carried out in Ethiopia's capital city of Addis Ababa. For all three papers (paper I, II, and III), a community-based cross-sectional study design was used to collect data on the prevalence and related variables of non-communicable diseases (HTN, diabetes, and dyslipidemia). The source population consisted of adults who were at least 18 years old. A multi-stage cluster sampling technique was used. A total of 3724 participants were recruited to work on objective 1, while 692 participants were recruited to work on objectives 2 and 3.

All the three World Health Organization STEPwise approach to Non-Communicable Diseases risk factor surveillance were used. The investigator hired phlebotomists with prior experience in data collection and health professionals with a Bachelor of Science degree to collect data. A face-to-face interview was conducted, followed by physical measurements and the collection of a blood sample the next day. The statistical program EpiData 3.1 was used for double data entry operations, and SPSS version 23 was used for analysis. Logistic regression, both bivariate and multivariable, was used.

Results: In all, 3560 people aged 18 to 91 took part in objective 1, representing a 95.6% response rate. Most people (42.4%) were between the ages of 18 and 29, with the median age being 32 (IQR 25, 45). Women made up the majority of responders (57.3%), whereas 602 and 582 people participated in objectives 2 and 3, respectively. The percentages of people with HTN, diabetes mellitus, and dyslipidemia, were, 29.2% (95% CI: 27.7–30.7), 14.3% (95% CI: 11.5–17.1), and 77.3% (95% CI: 73.9–80.7) respectively. Among the respondents, 61.9% of hypertensive cases, 70.9% of diabetes cases, and 96.2% of dyslipidemia cases had been newly diagnosed at the time of the survey.

The following factors were found to be significantly associated with HTN: being male (AOR = 1.9, 95% CI: 1.2–2.9), eating vegetables ≤ three days a week (AOR = 2.4, 95% CI: 1.2–4.9), drinking coffee more than two cups per day (AOR = 0.5, 95% CI: 0.3-0.8), being obese (AOR = 2.05, 95% CI: 1.1–3.7), and being in the age groups 30–49 and ≥ 50 years (AOR = 2.8, 95% CI: 1.4–5.6) and 8.23, 95% CI: 4.1–16.6), respectively. While hypertriglyceridemia (AOR= 1.9, 95% CI: 1.2–3.4), low HDL-C level (AOR= 2.7, 95% CI: 1.6–4.7), obesity (AOR= 4.6, 95% CI: 2.2–9.3), overweight (AOR= 2.3, 95% CI: 1.2–4.2), and age 50 years and above (AOR= 3.9, 95% CI: 1.6–9.5) were significantly associated with diabetes mellitus.

Furthermore, factors associated with triglyceridemia included being female (AOR=0.6, 95% CI: 0.4-0.9), aged 30-49 and ≥50 years (AOR= 2.7, 95% CI: 1.6-4.6) and 2.3, 95% CI: 1.3-4.0) respectively, having diabetes mellitus (AOR= 2.1, 95% CI: 1.3-3.4), sitting for more than three hours a day (AOR=1.6, 95% CI: 1.0-2.4), and having HTN (AOR= 2.3, 95% CI: 1.6-3.3); factors associated with low HDL-C were being female (AOR=2.1, 95% CI: 1.4-3.3), obese (AOR=1.9, 95% CI: 1.2-3.4), and having diabetes mellitus (AOR= 2.3, 95% CI: 1.4-3.8); factors associated with cholesterolemia were being female (AOR= 1.6, 95% CI: 1.0-2.4), being in the age groups 30–49 and ≥ 50 years (AOR= 5.2, 95% CI: 2.7-10.3) and 6.4, 95% CI: 3.2-13.0), respectively, and having HTN (AOR=1.6, 95% CI: 1.1-2.3); moreover, factors associated with high LDL- C were being in the age groups 30–49 and ≥ 50 years (AOR = 8.4, 95% CI: 2.9-24.0) and 8.5, 95% CI: 2.9-24.8), respectively, and being hypertensive (AOR=1.7, 95% CI: 1.1-2.7).

Conclusions and Recommendation: In Addis Ababa, one in three people has HTN, and one in seven has diabetes mellitus. Furthermore, a significant portion of the study subjects had dyslipidemia. Many of the individuals were not aware that they had HTN, diabetes, or dyslipidemia.

The factors associated with HTN included age, obesity, eating less vegetable, coffee drinking (protective), and being a man. Age, obesity, overweight, low HDL-C, and triglyceridemia were the risk factors for diabetes mellitus. In addition, factors linked to dyslipidemia included sex, age, and obesity, HTN, sitting for longer than three hours a day, and diabetes mellitus. Moreover, diabetes mellitus is a disorder that is associated with dyslipidemia and vice versa. Furthermore, HTN and diabetes mellitus are risk factors for dyslipidemia. Advanced age and obesity were significant risk factors for hypertension, diabetes, and dyslipidemia.

The Ministry of Health must take a comprehensive approach in order to support programs for the prevention and control of NCDs and lower the risks related to them. It is also advised that health facilities expand their ability to provide NCDs-related services, such as screening. In order to track and evaluate changes in the burden of NCDs over time, strategies for community surveillance programs and intervention measures that address modifiable risk factors must also be developed. Community-level encouragement should also be given to selective screening programs and intervention strategies that focus on modifiable risk factors. The mass media should play a role in the behavioral change of the community towards early screening, discouraging smoking, khat chewing, and alcohol consumption.

Keywords: HTN, diabetes mellitus, dyslipidemia, triglyceride, cholesterol, HDL-C, LDL-C, prevalence, associated factor, Addis Ababa, Ethiopia

1. Introduction

1.1. Background of the study

The term “non-communicable diseases” (NCDs) refers to a group of conditions that are not primarily caused by an infection. Those conditions are the result of a complex interaction of genetic, physiological, environmental, and behavioral factors that have long-term health consequences and often demand long-term treatment and care (1, 2). Those conditions include cardiovascular diseases (CVDs), cancer, diabetes, and chronic respiratory diseases, which collectively constitute the leading global cause of death, accounting for 74% of deaths worldwide, which equates to the loss of 41 million people each year(3). Of these annual premature losses, 17 million people die before the age of 70, with 86% occurring in low- and middle-income countries (LMICs)(4). Every year, four categories of NCDs account for 81% of all premature mortality: cardiovascular diseases (17.9 million deaths), cancers (9.3 million deaths), chronic respiratory diseases (4.1 million deaths), and diabetes (2.0 million deaths) (3, 4).

The burden of NCDs in the African region remains high. In 2019, the age-standardized NCD mortality rate was 587.1 [342.3 - 955.4] per 100,000 populations in the region(2). Non-Communicable Diseases Progress Monitor report by the World Health Organization indicated that 43% of the total annual deaths in 2022 were attributable to NCDs(3). Similarly, the Ethiopian Non-Communicable Disease and Injuries (NCDIs) Commission report estimated that 43.5% of annual deaths in Ethiopia were attributable to NCDIs (5).

HTN, the leading cause of CVD and premature death worldwide, is both a disease and a major risk factor for other diseases. Population studies reveal an increase in cardiovascular events, such as stroke and premature mortality(associated with a systolic BP ≥115 mmHg) (6). Meanwhile, the national and the pooled prevalence of HTN in Ethiopia were 16% and 20.6% respectively (7, 8). Ischemic heart disease (IHD) is another major cause of CVDs, with dyslipidemia being a major cardiovascular risk factor that leads to serious morbidity, mortality, and medical costs worldwide (9-11). The first nationwide survey conducted in Ethiopia in 2015 showed a 68% and 21% prevalence of low HDL-C and hypertriglyceridemia, respectively (12).

Diabetes mellitus is one of the NCDs that has become a global health challenge (13). Diabetes affects an estimated 537 million adults aged 20to 79 worldwide (10.5% of all adults in this age group) (14). In 2021, approximately one in every 22 (24 million) adults aged 20-79 were living with diabetes in Africa (2). The first national Steps survey in Ethiopia was conducted in 2015, reporting a 5.9% prevalence of raised blood glucose levels among adults aged 15 and above (8).

The major risks of developing NCDs include tobacco use, physical inactivity, harmful alcohol consumption, and poor dietary habits (15). The Ethiopian Steps Survey reported 1-2 NCDs risk factors among 95% of the studied population, with the disease burden expected to be highest in the urban population (8).

1.2. Statement of the problem

NCDs are the leading cause of illness worldwide (16), disproportionately affecting LMICs, which account for more than four-fifths of premature deaths every year. The African continent experiences a high burden of NCDs, mainly cardiovascular diseases (heart disease and stroke), cancer, diabetes, chronic respiratory diseases, and poor mental health. Alike most LMICs across the world, Sub-Saharan African countries are undergoing a rapid epidemiological transition, characterized by a shift from disease-burden profiles dominated by communicable diseases and childhood illnesses to profiles dominated by chronic non-communicable diseases (1, 17).

The risk of dying from NCDs is highest in the Sub-Saharan African region for both sexes (16). In 2017, CVDs were the leading causes of NCDs burden across the region, contributing to more than 22.9 million DALYs (15.1% of the total NCDs burden)(17). In Addis Ababa, the prevalence of NCDs was 63.2%, and 55% of all deaths were related to NCDs(18). Furthermore, diabetes mellitus and cardiovascular diseases were two of Ethiopia's leading causes of death (18).

Meanwhile, the economic consequences of NCDs are significant, owing mostly to their impact on the non-health sector through reduced workforce number and productivity. In 2017, Ethiopia’s total government healthcare expenditure on NCDs was 14.7 billion birr (19). Of this, the total expenditure due to the four main NCDs in 2017 was estimated to be 4.4 billion birr. Meanwhile, the indirect cost of CVDs and diabetes-related work absenteeism was estimated to

be 1.3 billion birr. The total burden (direct and indirect cost) of NCDs on the Ethiopian economy was thus 31.3 billion birr 1.84% of Gross Domestic Product (GDP) in 2017(19).

Detection, screening, treatment, and palliative care are key components of the NCDs response (1). However, in Ethiopia, only 42% and 36% of health facilities offer diagnostic services for DM and CVDs, respectively(20). Besides, there is a critical shortage of trained workforce (15% for DM and 16% for CVDs) and the availability of guidelines for the provision of NCDs services in the country(20). While community-based opportunistic screening for CVDs is one of the interventions for the national strategic plan of Ethiopia, clinical interventions for CVDs accounted for most of the estimated costs (19).

Implementing the entire CVDs and DM clinical intervention package over the 5-year (2018-2022) would cost 32.95 billion birr (19) while Policy packages to reduce the consumption of tobacco, alcohol and salt and to increase physical activity were estimated to cost 0.88 billion birr, 1.73 billion birr, 1.58 billion birr and 1.54 billion birr over 5 years, respectively). These challenges collectively heightened the need for strengthening prevention strategies(21).

A large percentage of NCDs can be prevented by reducing the four major behavioral risk factors(referred to as modifiable risk factors): tobacco use, physical inactivity, the harmful use of alcohol, and unhealthy diets (2). Up to 80% of heart disease, stroke, and type 2 DM could be prevented by controlling these risk factors (22). People with CVDs or those at high cardiovascular risk (due to the presence of one or more risk factors such as HTN, diabetes, dyslipidemia, or already established disease) need early detection and management(2). Many of the deaths from CVDs can be prevented by treating HTN(23).

HTN is a serious, chronic medical condition that increases mortality from cardiovascular and kidney disease (23). It is an important risk factor for CVDs and remains to be the single biggest risk factor for stroke (24). An estimated 1.28 billion adults aged 30–79 years worldwide have HTN, most (two-thirds) living in LMICs (in 2023)(24). About 46% of people who suffer from HTN are not aware that they have the disease. Only 42 percent of adults with HTN receive a diagnosis and treatment, and 21% of adults with HTN have their condition under control. Furthermore, one of the leading causes of premature death globally is HTN (24).

The prevalence of HTN varies across regions and country income groups. The WHO African Region has the highest prevalence of HTN (27%), while the America has the lowest (18%) (2, 25). According to the 2015 National NCDs STEPS Survey, the prevalence of HTN in Ethiopia was 16%, with higher prevalence among urban dwellers (22% versus 13% rural) and older adults (8). It is a major risk factor for coronary heart disease, chronic kidney disease, and ischemic, as well as hemorrhagic, stroke(25).

Despite HTN being a public health concern that we cannot ignore, most people with it are asymptomatic and go undiagnosed for years. HTN is known as the "silent killer" as it rarely causes symptoms (26). Thus, BP measurement is the cornerstone of HTN detection and it should be done on all adults aged 18 years and above at least every 2 years (27). The Ethiopian national survey revealed that 76.6% of residents (79.9% rural and 63.5% urban) reportedly never measured their BP (8).

Regardless of the benefits of early HTN diagnosis and treatment, only a small proportion of HTN patients are aware of, treated for, and controlled it, making HTN an iceberg disease (26). The proportion of undiagnosed HTN in Ethiopian study was 84.0% (28). Moreover, a hospital based meta-analysis study showed that 47% of stroke patients had HTN (29). In addition, stroke was the leading causes of premature mortality for all sexes in Ethiopia in 2019(30), while a 2017 verbal autopsy data from the country's capital rated HTN as one of the top five leading causes of death (31). Furthermore, in facility-based studies conducted in Ethiopia, 51.8% of stroke patients at the Tertiary Hospital of Northern Ethiopia had HTN as a major risk factor (32). According to data from Saint Peter Specialized Hospital, stroke was the reason for 63.6% of admissions for HTN-related complications (33).

Actions to control the burden of HTN, including population-level interventions to prevent HTN and scale up treatment, are key to make a contribution to Sustainable Development Goals (SDGs) targets, including those relating to universal health coverage and access to affordable essential medicines (23).

In 2021, more people with diabetes live in urban (360.0 million) than in rural areas (176.6 million), with 12.1% prevalence in urban areas and 8.3% in rural. The number of people with

diabetes living in urban areas is expected to sharply increase in 2045, as a result of global urbanization(14).

In 2021, nearly one-in-two (44.7%; 239.7 million) adults living with DM (aged 20 to79) were uninformed of their status(14). The proportion of undiagnosed DM varies significantly by geography, with African region having the highest proportion. Over half of (54%) of people with diabetes in the African region are undiagnosed, the highest proportion of all International Diabetes Federation (IDF) regions(14).

Thus, it is fundamental for people with diabetes to be diagnosed as early as possible to prevent or delay complications, avoid a premature death and improve quality of life (15). Although the Africa region is home to 4.5% of the world's diabetics, only 12.6 billion USD was spent on the disease, representing 1.3% of the total spending worldwide (14). Ethiopia is one of the top five African countries for diabetics, with 1.9 million people aged 20 to 79 with DM in 2021(14). It is the leading causes of premature mortality for all sexes in the country in 2019(30) and one of the top five leading causes of death in the capital (31).

Dyslipidemia is a major CVDs risk factor; especially for Coronary Heart Disease (CHD) resulting in serious morbidity, mortality, and medical costs worldwide (9-11). In 2017, high non-HDL cholesterol was responsible for an estimated 3.9 million (3.7–4.2 million) worldwide deaths from ischemic heart disease(IHD) and ischemic stroke, accounting for a third of deaths from these causes(34). Meta analysis revealed one in five adults worldwide had dyslipidemia with a higher prevalence among the general adult population in Africa(35).

Early screening and effective lipid management may substantially reduce the burden of CVDs and provide great social value(36). However, a national WHO STEPwise approach to surveillance (STEPS) survey revealed most (99.5%) respondents reportedly declared that their blood cholesterol had never been measured(8). While the SDGs three stated ensure healthy lives and promote wellbeing for all at all ages and as a target reduction of premature mortality from non-communicable diseases by one third (37).

According to the Ethiopian Health Sector Transformation Plan, NCDs and their risk factors are expected to be accorded their proper attention as they are recognized to be not only a health but also a development agenda (22). However, NCDs pose a significant threat to Ethiopia's health and economic development. NCDs are not only major causes of premature death, disease and illness but also threaten to slow Ethiopia's rapid economic growth. Ethiopian citizens face the financial burden through out-of-pocket health spending and lost income from breadwinners who leave the labor force. This burden undermines efforts to improve nutrition and education and reduce poverty and inequalities to leave no one behind(19).

Thus, we sought to evaluate the epidemiology of HTN, diabetes mellitus and dyslipidemia among adult populations of Addis Ababa Ethiopia.

1.3. Rationale of the study

Ethiopia has a high burden of NCDs, with the number of DALYs lost increasing three times over the past 25 years(38). According to data from 2016, NCDs are thought to be the cause of 46% of all deaths in Ethiopia. Additionally, one in five people (18.3%) have a risk of dying before turning 70 due to one of the four major NCDs (38).

Due to the growing evidence of the increasing burden of NCDs among Ethiopian populations and the limited number of studies(8), the Federal Ministry of Health of Ethiopia has formulated the second comprehensive strategic action plan for the prevention and control of NCDs and their risk factors(5).

The plan was developed, based on the Global Action Plan on NCDs Control(2013- 2020) and the SDGs 2030 and contains four priority areas, the fourth is research, surveillance, monitoring, and evaluation, with the WHO Stepwise Survey on NCDs risk factors being one of the strategic interventions (5). However, there was limited data on the epidemiology of common NCDs at the community level in Ethiopia, including the study area of Addis Ababa. So far, there is only one national level survey and urban area study (Gondar) conducted using all the Stepwise survey tools(8, 39). There are only a few studies left that were conducted by the institution among teachers, staff members of the Commercial Bank of Ethiopia, clients at the health facilities,

secondary data and verbal autopsy (18, 31, 40, 41). In contrast to the current comprehensive study, previous research efforts were limited in scope and sample size, focusing solely on adults aged 35 years and older.

The most common NCDs, including HTN and DM, can be detected easily using simple tests (42). Meanwhile, initiatives to prevent NCDs in Ethiopia, especially through the identification of common risk factors, are relatively cheap and cost-effective (19). By timely identifying the presence of major risk factors, tomorrow's NCDs can be predicted and prevented timely(43). On the other hand, most patients with NCDs may not show signs or symptoms until they develop complications or death(2). Thus, assessing the risk factors and the magnitude of the diseases forms the foundation to minimize the perplexing disease burden.

The WHO Global Healthy-lifestyle counseling, Evidence-based protocols, Access to essential medicines and technology, Risk-based CVDs management, Team-based care, and Systems for monitoring (HEARTS) strategy established an 80-80-80 goal for HTN: 80% of people with HTN are aware of their condition; 80% of those aware are treated with antihypertensive medication; and 80% of those treated have their BP controlled to an acceptable range by 2040(44). However, Ethiopian national survey showed that 63.5% of urban residents reported that their BP was never measured (8), while another study found 84.0% proportion of undiagnosed HTN (28). Accordingly, conducting community-based studies is paramount to inform policy directions. Besides, given that urbanization in Africa has been linked to the growing burden of NCDs, it is worthwhile to conduct a study in Addis Ababa, Ethiopia's largest urban center and capital, which is home to approximately one-quarter of the country's urban population (45). Urbanization processes have amplified lifestyle risk factors for NCDs, including unhealthy diets, tobacco use, harmful alcohol intake, and physical inactivity(46).

In general, the findings of this dissertation can help healthcare providers, programmers, researchers, and policymakers to minimize the magnitude of undiagnosed non-communicable diseases and their complications among the community and optimize the efficiency and quality of early detection and treatment of common NCDs. Likewise, it will encourage and help health care providers in Addis Ababa city and the country to improve their early detection practice for

all adults at health facilities and selected community-based screening programs. Moreover, the society at large will benefit by recognizing their status, receiving timely treatment, and helping disease-free participants in making lifestyle modifications.

1.4. Literature review

Non- Communicable diseases pose a significant threat to global health and development in the twenty-first century, given the misery they inflict on individuals and the damage they do to the socioeconomic structures of nations, especially those with low and middle incomes. The human, societal, and economic costs of NCDs will keep rising and surpass nations' ability to handle them in the absence of evidence-based policy (23).

A political declaration with strong commitments to address the global burden of NCDs was adopted by world leaders in September 2011, acknowledging the devastating social, economic, and public health impact of NCDs(47). The WHO was given several assignments to support national efforts in addressing the NCD problem. Among those was the creation of the WHO worldwide Action Plan for Prevention and Control of NCDs 2013–2020, also referred to as the Global NCDs Action Plan(47). It features a worldwide monitoring structure and nine optional global targets. In a similar vein, the Ministry of Health in Ethiopia has created a thorough strategic action plan for NCDs prevention and control, with an emphasis on risky behavior reduction, for both the disease and its risk factors in 2014(22).

The nine voluntary global NCDs targets highlight the significance of giving national action a high priority in order to reduce harmful alcohol use, inadequate physical activity, salt/sodium intake, tobacco use, and HTN; to stop the rise in obesity and diabetes; and to improve access to basic technologies and medications as well as treatment coverage for heart attack and stroke prevention.

By 2025, the following voluntary worldwide goals for NCDs prevention and control were set (47):

1) A 25% relative reduction in the overall mortality from CVDs, cancer, DM, or chronic respiratory diseases.
(2) At least 10% relative reduction in the harmful use of alcohol.
(3) A 10% relative reduction in prevalence of insufficient physical activity.
(4) A 30% relative reduction in mean population intake of salt/sodium.
(5) A 30% relative reduction in prevalence of current tobacco use.

(6) A 25% relative reduction in the prevalence of raised BP

7) Stop the rise in diabetes and obesity.
(8) At least 50% of eligible people receive drug therapy and counseling (including glycemic control) to prevent heart attacks and strokes.
(9) An 80% availability of the affordable basic technologies and essential medicines

Globalization of unhealthy habits, fast urbanization, and aging populations are the three main factors influencing human health worldwide(23). The existence of NCDs, like CVDs, for which HTN, or elevated BP, is a major risk factor, is among the most dramatic examples of this transition (23).

1.4.1. Hypertension

Definition

HTN is a long-term, chronic BP elevation that raises morbidity and death and damages end organs. Another name for it is elevated or high BP (defined as 140/90 mmHg or higher for both the systolic and diastolic BP). When blood is pumped by the heart, it presses on the walls of blood vessels, or arteries, creating BP. By measuring the systolic and diastolic components, it is often estimated. The maximum pressure in blood vessels during systole, or heart contraction, is known as systolic BP (SBP), and the lowest pressure in blood vessels during diastole, or heart rest in between contractions, is known as diastolic BP (DBP)(24).

Blood Pressure (BP) is expressed as two numbers and is measured in millimeters of mercury (mm Hg). A SBP of less than 120 mm Hg and a DBP of less than 80 mm Hg are considered normal BP values for adults. However, lower diastolic (60 mm Hg) and systolic (105 mm Hg) BP levels are also associated with cardiovascular advantages with normal BP (27).

In addition to being a disease in and of itself, HTN is a significant modifiable risk factor for CVDs and is directly linked to 47% of CHD and 54% of strokes globally (48).

Etiology

The cause of high BP is unknown for most people. This is categorized as a primary or essential HTN. Secondary HTN is the term used to describe the small percentage of people who have a specific cause for their high BP (26). Primary HTN affects more than 90% of people with high BP. Although there is no cure for primary HTN, it can be managed with the right therapy (medication and lifestyle changes). The onset of primary HTN may be significantly influenced by genetic variables. This type of HTN usually appears gradually over several years (49). Secondary HTN affects less than 10% of patients with high BP. Resolving secondary HTN will lower BP by treating the underlying medical issue or stopping the medication(s) causing it (26).

Pathophysiology

Primary HTN is caused by a number of BP-regulating variables. The two main causes are imbalances in electrolytes (potassium, chloride, and salt) or issues with hormonal (renin-angiotensin-aldosterone system (RAAS) and natriuretic hormone) systems(49). BP rises as a result of the natriuretic hormone's increase in cell sodium concentrations. The RAAS controls BP in the arteries by controlling sodium, potassium, and blood volume (blood channels that convey blood away from the heart). The RAAS system is regulated by two hormones: aldosterone and angiotensin II. Angiotensin II promotes the production of aldosterone, narrows blood vessels, and releases substances that raise BP(50). With less space, the same volume of blood increases BP due to blood artery constriction, which puts pressure on the heart. Water and sodium are retained in the circulation by aldosterone. There will be more blood as a result, which will put more strain on the heart and raise BP (26, 49).

Classification and definitions

The average of two or more accurately recorded BP readings from two or more clinical visits is used to classify BP in adults (18 years of age and older) (Table 1).

The overall classification is established using the higher of the two BP readings in the event that the systolic and diastolic BP values belong to different categories. There are three categories into which BP is divided. Although pre HTN is not regarded as an illness, it does identify those who will eventually reach stages 1 or 2 of HTN (26, 27, 51, 52).

Table 1: Classification of BP in adults (age ≥18 years)(26, 27, 51, 52)

Guideline differences	ACC/AHA*	ESH**	JNC 8 ***
HTN definition	≥130/80	≥140/90	≥140/90
Normal BP Ranges (mmHg)	Normal : <120 /80 Elevated: 120-129/<80	Optimal: <120/80 Normal: 120-129/80-84 High Normal:130-139/85-89	Normal :<120 and <80 Pre-HTN: 120-139 or 80-89
Hypertensive BP Ranges (mmHg)	HTN Stage 1:130-139/80-89 HTN Stage 2:≥ 140/90	HTN Grade 1:140-159/90-99 HTN grade 2: 160-179/100-109 HTN Grade 3: ≥180/110	HTN Stage 1: 140-159 or 90-99 HTN Stage 2: ≥160 or ≥100

- ACC/AHA*- American College of Cardiology/American Heart Association; ESH**-European Society of Hyperensionn; JNC***- Joint National Committee

Diagnosis of HTN

Clinically, uncomplicated HTN is typically asymptomatic, and many of the symptoms that are frequently associated with it like headache, tinnitus, lightheadedness, and fainting are most likely psychogenic in nature(26). Due to the fact that overt symptoms and indicators typically coincide with the commencement of target organ damage, HTN, even if it is not completely asymptomatic, might go undiagnosed for years. As a result, accurate BP measuring techniques are essential for identifying HTN, and screening for BP should be performed on all persons 18 years of age and older without known HTN (26).

Prevalence of hypertension

As per the WHO 2023 study, it is a leading factor in early deaths globally, impacting over a billion people, or around 1 in 4 men and 1 in 5 women. Approximately 1.28 billion persons globally, aged 30-79, suffer from HTN; the majorities, or two-thirds, reside in low- and middle-income nations (24). The disease affects 32% of adults in high-income nations, and 34% of adults in low-income countries between the ages of 30 and 79. Variability between countries and regions is more noticeable. Males have a slightly greater global prevalence of HTN (34%) than females (32%) (23-25).

A systematic review and meta-analysis conducted in Southeast Asian countries showed that the overall pooled prevalence of HTN for the urban population was 33.9% (53). Research in Nepal found that 32.5% of people had HTN and that men were more likely than women to have it (38.4% versus 28.4%, respectively) (p value <0.01) (54).

In the city of Dehui, North-East China, a cross-sectional population-based study revealed that the prevalence of HTN was 41.1% overall, with a greater prevalence (44.4%) among urban inhabitants than among rural people (36.3%, p value <0.001)(55). Comparably, research conducted in Bangladesh revealed that the general prevalence of HTN was 31.0%, with a considerably higher prevalence among those who lived in cities (urban: 36.9%, rural: 30.6%) (56).

The WHO reports that 36% of persons between the ages of 30 and 79 had HTN in 2019 (23). A comprehensive meta-analysis conducted in Sub-Saharan Africa revealed that, with a pooled frequency of 30%, the prevalence of HTN varied greatly throughout the studies (range 15%–70%) (57). According to a community-based study conducted in Gadarif, eastern Sudan, 40.8% of persons who are 18 years of age or older have high BP (58). Additionally, 35.3% of participants in research done in Lagos, Nigeria, had HTN (59).

A cross-sectional study was carried out at the Addis Health Demographic Surveillance System (Addis-HDSS) site in Addis Ababa, Ethiopia. The study aimed to evaluate the self-reported prevalence of NCDs and the factors associated with them among adults aged 18 years and above. The findings of the study indicated that HTN was the most commonly reported disease, affecting 5.9% of adults (95% CI: 5.7%-6.1%)(60).

Several cross-sectional investigations carried out in Ethiopia revealed a wider range in the prevalence of HTN within the society(45, 61). A study carried out at Jimma University's Gilgel Gibe Field Research Center revealed that 9.3% of people had HTN (61). Despite this, the national steps findings indicated that 16% of Ethiopians had HTN, and the finding from the pooled prevalence was 20.6% (7, 8). A population-based cross-sectional study was conducted among 3,227 individuals in Gondar City, Ethiopia. The results revealed that the overall prevalence of HTN was 27.4% with a 95% confidence interval of 25.8% to 28.9%(39). In 2019, 27.4% (21.3–34.4) of people aged 30-79 had HTN, according to WHO data (23). Furthermore,

the overall prevalence of HTN in the Addis Ababa study region decreased to 22.1% in 2021(62) from 28.9% for women and 31.5% for men in 2009(45).

In summary, the prevalence of hypertension exhibits considerable variation across different regions and even within specific areas of a country. In some regions, reported prevalence rates can soar to as high as 41.1%, while in others, they may be as low as 5.9%. While in Ethiopia, the prevalence ranges from 5.9% to 27.4%.This disparity is influenced by factors such as the age of the participants involved in the studies.

1.4.2. Diabetes mellitus

Diabetes also known as diabetes mellitus is a chronic illness that is identified by elevated blood glucose levels. It arises from insufficient insulin production or utilization by the body (15). The pancreas secretes the hormone insulin, which is necessary to move glucose from the bloodstream into the body's cells so that it can be used as fuel (14). In diabetic, insulin is either inefficient or absent, which allows glucose to continue floating around in the blood. Hyperglycemia, the resultant elevated blood glucose levels, damages numerous bodily tissues over time and can result in life-threatening and incapacitating health concerns (15).

There are three main types of diabetes:

- Type 1 diabetes
- Type 2 diabetes
- Hyperglyacemia first detected during pregnancy

Less common types of diabetes include:

- Hybrid forms of diabetes:- Slowly evolving immune-mediated diabetes of adults and Ketosis prone type 2 diabetes
- Unclassified diabetes:- This category should be used temporarily when there is not a clear diagnostic category especially close to the time of diagnosis of diabetes
- Other specific types: such as monogenic diabetes, the result of a genetic mutation. Examples of monogenic diabetes include Maturity-Onset Diabetes of the Young and Neonatal Diabetes Mellitus; Secondary diabetes, which arises as a complication of other diseases, such as hormone disturbances (e.g. Cushing’s disease or acromegaly) or diseases of the pancreas (14, 15).

Type 1 diabetes (previously known as insulin-dependent, juvenile or childhood-onset diabetes) is characterized by deficient insulin production in the body(accounts for approximately 5% of all diagnosed cases of diabetes in adults) (63). It is caused by an autoimmune process in which the body's immune system attacks the insulin producing beta-cells of the pancreas. As a result, the body produces very little or no insulin. The causes of this destructive process are not fully understood, but a likely explanation is that the combination of genetic susceptibility and an environmental trigger, such as a viral infection, initiate the autoimmune reaction(14, 15).

Type 2 diabetes (formerly called non-insulin-dependent or adult-onset diabetes) results from the body's ineffective use of insulin. Type 2 diabetes accounts for the vast majority of people(accounts for about 90-95% of all diagnosed cases of diabetes in adults) with diabetes around the world (14, 63). Insulin resistance, a disorder where the body's cells are unable to adequately respond to insulin, is the primary cause of hyperglycemia. Insulin resistance occurs when the hormone is no longer as effective, which eventually leads to an increase in the synthesis of insulin. Over time, insufficient insulin production may arise from the pancreatic beta cells' inability to meet the body's demands (14).

Since type 2 diabetes symptoms are typically milder than those of type 1 diabetes and can take years to manifest, many people with the disease go for a very long time without realizing they have it. Because of that, many persons with type 2 diabetes already exhibit symptoms at the time of diagnosis. There are a number of significant risk factors for type 2 diabetes, although its precise causes are yet unknown. The three most significant ones are inadequate nutrition, physical inactivity, and excess body weight. Ethnicity, past experience of gestational diabetes, family history of diabetes, and advancing age are additional factors that contribute (14, 63).

Impaired glucose tolerance (IGT) and **impaired fasting glycaemia (IFG)** are intermediate conditions in the transition between normal blood glucose levels and diabetes (especially type 2), though the transition is not inevitable (63). People with raised blood glucose levels that are not high enough for a diagnosis of diabetes are said to have IGT or IFG. These conditions are sometimes called "pre-diabetes" (14).

Pregnancy-related gestational diabetes is a transient illness that raises the risk of type 2 diabetes in the long run. When blood glucose levels are above normal, but yet below those that indicate

diabetes, the disease is present. Both the mother and the child of a woman with gestational diabetes are more likely to experience certain pregnancy and delivery difficulties (14, 63).

Hyperglycaemia that is first detected at any time during pregnancy is classified as either:

- Gestational diabetes mellitus
- Diabetes mellitus in pregnancy

Pregnant women who have slightly high blood glucose levels are diagnosed with gestational diabetes; pregnant women who have significantly elevated blood glucose levels are diagnosed with DM. The 24th week of pregnancy is when gestational diabetes typically manifests itself (14).

Diagnostic criteria of DM

Four diagnostic tests for diabetes are currently recommended, including measurement of fasting plasma glucose; 2-hour post-load plasma glucose after a 75 g Oral Glucose Tolerance Test; HbA1c; and a random blood glucose in the presence of signs and symptoms of diabetes(15). The clinical diagnosis of diabetes is often prompted by symptoms, such as increased thirst and urine volume, recurrent infections, unexplained weight loss and, in severe cases, drowsiness and coma (14). People with:-

- Fasting plasma glucose ≥ 7.0 mmol/L (126 mg/ dl)
- Two-hour plasma glucose ≥ 11.1 mmol/L (200 mg/dl) following two hours ingestion of 75g oral glucose load
- Glycated hemoglobin (HbA1c) ≥ 48 mmol/mol (≥ 6.5%)
- In a patient with classic symptoms of hyperglycemia, random plasma glucose ≥200 mg/dL (11.1mmol/L) is considered to have diabetes (15, 64).

IGT should be diagnosed if both of the following criteria are met:

- ✓ Fasting plasma glucose < 7.0 mmol/L (126 mg/ dl) and
- ✓ Two-hour plasma glucose 7.8-11.1 mmol/L (140-200 mg/dl) following two hours ingestion of 75g oral glucose load

IFG should be diagnosed if both of the following criteria are met:

- ✓ Fasting plasma glucose 6.1-6.9 mmol/L (110-125 mg/ dl) and

- ✓ Two-hour plasma glucose < 7.8 mmol/L (140 mg/dl) following two hours ingestion of 75g oral glucose load (65).

While American Diabetes Association (ADA) Criteria defining:

- Prediabetes is FPG 100 mg/dL (5.6 mmol/L) to 125 mg/dL (6.9 mmol/L) (IFG)

OR

- 2-h PG during 75-g OGTT 140 mg/dL (7.8 mmol/L) to 199 mg/dL (11.0 mmol/L) (IGT)

OR

- HbA1C 5.7–6.4% (39–47 mmol/mol) (64).

Prevalence of DM

DM is now a problem for world health (13). It is a dangerous, protracted illness that is sometimes referred to as "chronic" (14). Regional differences were also noted; in 2021, the Middle East and North Africa recorded the highest percentage (16.2%), while Africa recorded the lowest percentage (14).

According to a community-based cross-sectional study carried out in Iran, women are more likely than men to have diabetes mellitus (15.6% vs. 12.4%), with a prevalence of 14.1%(34). In addition, the combined prevalence of diabetes in Nepal was reported to be 8.5%, despite the fact that the prevalence of DM in India was 8.9% in 2019(66, 67).

A population-based cross-sectional study was conducted in Brazil, Bangladesh, India, and Jeddah. According to their findings, the prevalence of DM was 2.3%, 11%, 11.2%, and 15.7%, in that order (68-71). The IDF estimates that in 2021, 4.5% of Africans had diabetes. A study carried out in Tanzania, Uganda, and Nigeria revealed that 11.9%, 10.1%, and 12.7% of individuals had DM, respectively (72-74). Furthermore, data from the 2016 South African Demographic Health Survey revealed that 22% and 67% of people had diabetes and pre-diabetes, respectively (75).

In 2021, Ethiopia had 1.9 million adults aged 20 to 79 who had diabetes, ranking it in the top five African nations (14). Even though Ethiopia's first nationwide steps survey was carried out in 2015, 5.9% of persons over the age of 15 had elevated blood glucose (8). A population-based cross-sectional study was conducted at the Addis Health Demographic Surveillance System site

in Addis Ababa, Ethiopia with the aim of assessing the self-reported prevalence of NCDs and the associated factors among all adults aged 18 years and older. The results of the study revealed that the most prevalent conditions reported was diabetes mellitus, affecting 3.4% of adults (95% CI: 3.3%-3.5%)(60). In addition, the pooled prevalence of DM in Ethiopia was 6.5%(76). There was a significant regional variation in prevalence with the highest in Addis Ababa(14.8%)(77) and the lowest in Tigray region (1%) (78). DM was also found to be prevalent generally in Addis Ababa, with a sex-specific prevalence of 18.4% and 16.6% for men and women, respectively, according to a study conducted in a public health institution (77).

To summarize, the prevalence of diabetes mellitus in Ethiopia varies significantly, ranging from 18.4% in hospital-based studies to 1.0% in community-based studies. This variation is influenced by regional differences and the specific settings in which the studies are conducted.

1.4.3. Dyslipidemia

One condition affecting lipoprotein metabolism is dyslipidemia. It is characterized by low plasma concentrations of HDL-C, elevated plasma concentrations of LDL-C, triglycerides, or total cholesterol, or a combination of those characteristics (79). Cholesterol is a steroid. It is necessary for the correct operation of cell membranes as well as the manufacturing of numerous hormones that are vital to overall health and regular physiological activities. Cholesterol is also necessary for cell wall permeability and the synthesis of steroid hormones (80).

Esterified and unesterified cholesterol, triglycerides, phospholipids, and protein components known as apolipoproteins—which serve as structural elements, ligands for cellular receptor binding, and enzyme activators or inhibitors—are all components of lipoproteins. LDL-C, HDL-C, very low-density lipoprotein (VLDL), chylomicrons, intermediate-density lipoprotein (IDL), and lipoprotein (a) are the six main lipoproteins found in blood(81).

LDL-C typically makes up 60–70% of the total cholesterol in the blood. There is only one apolipoprotein in it, Apolipoprotein (APO) B-100. HDL cholesterol makes up 20–30% of serum cholesterol. The primary constituents of HDL-C are apolipoproteins A-I and Apolipoprotein A-II. A complex process that results in lipid deposition and the beginning of a fatty substance that gradually accumulates in the arteries is initiated by lipoproteins containing ApoB that become

lodged in the arterial wall (81, 82). HDL-C levels and the risk of CHD are inversely correlated. However, because LDL-C can accumulate and form clumps in the walls of the arteries, it is a harmful kind of cholesterol. A heart attack may result from this accumulation (9, 81).

The VLDL is rich in triglycerides; they only make up 10-15% of the TC in the blood. APO B-100, Apo Cs (C-I, C-II, and C-III), and APO E are the main apolipoproteins (proteins that bind lipids) of VLDL. The liver produces VLDL, which is a precursor to LDL. Like LDL, some kinds of VLDL, especially VLDL remnants, seem to encourage atherosclerosis(82). Elevated triglyceride levels are also a major risk factor for CHD. On the other hand, high HDL cholesterol levels shield the heart by assisting in clearing the LDL accumulation from the arteries(83).

Triglyceride-rich lipoproteins known as chylomicrons, a fourth class of lipoproteins, are created in the intestine from dietary fat and appear in the bloodstream after a high-fat meal. The only difference between chylomicron apolipoproteins and VLDL is that B-48 is present instead of apoB-100. There is probably some atherogenic potential in chylomicron fragments or partially degraded chylomicrons (82). Tables 2 and 3 present the classification of LDL-C, HDL-C, and TC (82).

Table 2: Classification of Total Cholesterol and LDL Cholesterol according to Adult Treatment Panel III (82)

TC			**LDL-C**		
			in mg/dl	in mmol/l	
			<100	<2.58	Optimal
<200 (mg/dl)	<5.17 mmol/l	Desirable	100-129	2.58-3.33	Near optimal/above optimal
200-239 (mg/dl)	5.17-6.18 mmol/l	Borderline high	130-159	3.36-4.11	Borderline high
≥240 (mg/dl)	≥6.20 mmol/l	High	160-189	4.13-4.88	High
			≥190	≥4.91	Very high

Table 3: Classification of HDL-C according to Adult Treatment Panel III (82)

Serum HDL-C		
<40 mg/dl	<1.03 (mmol/l)	Low HDL-C
≥ 60 mg/dl	≥1.55(mmol/l)	High HDL-C

Triglycerides

Triglycerides, which are lipid molecules make up of three fatty acid molecules and a glycerol molecule, are the primary source of energy and lipid storage in the human body. The glycerol phosphate pathway is the main pathway by which they are generated. The trafficking of TGs in particular tissues, such as muscle, liver, and adipose tissue, is a biological process that is necessary for life and is dependent on the nutritional status of the individual (84).

Increases in total, LDL, and HDL-C are intimately linked to lipoprotein metabolism and blood triglyceride levels. Additionally, triglycerides are linked to non-lipid risk factors like obesity, diabetes, HTN, and cigarette smoking, as well as other emerging risk factors like insulin resistance, glucose intolerance, and prothrombotic conditions (82). Table 4 present the classification of triglyceride levels.

Table 4: Categories of serum triglycerides according to Adult Treatment Panel II and III

Triglyceride Category	ATP II Levels	ATP III Levels	
Normal TG	<200 mg/dl	<150 mg/dl	<1.69(mmol/l)
Borderline high TG	200-399mg/dl	150-199 mg/dl	1.69-2.25(mmol/l)
High TG	400-1000 mg/dl	200-499 mg/dl	2.26-5.63(mmol/l)
Very high TG	>1000 mg/dl	≥500 mg/dl	≥5.64(mmol/l)

Classification of dyslipidemia

Four phenotypes of dyslipidemia were identified based on the criteria established by the National Cholesterol Education Program-Adult Treatment Panel III (NCEP-ATP III)(82):

(a) Isolated hypertriglyceridemia was defined as having serum triglycerides ≥1.7mmol/L or on medication and TC <6.2 mmol/L;

(b) Isolated hypercholesterolemia was defined as having TC ≥6.2 mmol/l or on medication and triglycerides <1.7mmol/L;

(c) Mixed hyperlipidemia was defined as having triglycerides ≥1.7 mmol/L and TC ≥6.2 mmol/L; and

(d) Isolated low HDL-C was defined as having HDL-C ≤1.03 mmol/L in male and ≤1.29 mmol/L in female without hypercholesterolemia or hypertriglyceridemia.

Dyslipidemia may not show any symptoms until problems arise and a blood test confirms the diagnosis. One of the main modifiable risk factors for the onset of type 2 diabetes, atherosclerosis, stroke, and cardiovascular illnesses is dyslipidemia (85).

There are several etiological causes of dyslipidemia, including lifestyle and genetic factors. Genetic factors that result in either overproduction or slow clearance of TGs and LDL-C or underproduction or rapid clearance of HDL-C can induce dyslipidemia. A sedentary lifestyle coupled with an excessive intake of cholesterol, trans-fats, saturated fats, and added sugars can also cause it. Insulin resistance, DM, alcohol consumption, hypothyroidism, central obesity, medications, smoking, obesity, and HTN are further risk factors (86, 87).

Prevalence of Dyslipidemia

It is anticipated that elevated cholesterol (≥ 5.0 mmol/l or 190 mg/dl) will result in 2.6 million deaths (4.5 percent of all deaths) and 29.7 million DALYs, or 2% of all DALYs. This data is taken from a 2008 WHO document. It contributes significantly to the burden of disease in both developed and developing nations as a risk factor for IHD and stroke. Globally, 39% of people have high TC (37% of men and 40% of women) (88).

It was predicted that elevated LDL-C would account for 4.4 million (7.8%) of all fatalities worldwide in 2019, up from 3.0 million (6.4%) in 1990. These percentages increased in low- and lower-middle-income nations between 1990 and 2019 but decreased in high- and upper-middle-income nations (9).

A National Health and Nutrition Examination Survey (NHANES) conducted in the United States of America in 1999–2000 among adults showed that the prevalence of undiagnosed cholesterolemia among obese US adults was 37.7% (89).
According to a 2008 survey of the population of São Paulo, the prevalence of dyslipidemia in all its forms was 59.7%, while the prevalence of dyslipidemia in adults, adolescents, and the elderly was 60.3%, 55.7%, and 60.3%, respectively (90). Low HDL-C (39.6%) was the most prevalent form of dyslipidemia, while isolated triglyceridemia came in second (26.8%)(90).

The Chinese study also showed that the prevalence of lipid abnormalities was 47.8%, 13.8%, 25.7%, and 30.7% for TC, HDL-C, LDL-C, and TG, respectively, and 64.4% had at least one type of abnormal lipid concentration(91). An additional study in Chongqing, China, showed that the overall prevalence of dyslipidemia was 37.4% (29.1% among men and 42.4% among women)(92). Among the participants with dyslipidemia, 44.2% had isolated hypertriglyceridemia, 14.7% had isolated cholesterolemia, 13.2% had mixed dyslipidemia, and 28.0% had isolated low HDL-C (92).

According to the Iranian study, 8.7% had high cholesterol and 20.9% had borderline cholesterol (cholesterol levels between 200 and 239), 14.1% (95% CI: 13.0–15.2) had a high serum TG level, while 13.8% had a borderline level (TG level 150–199). Regarding this, it was found that 10.4% of people had elevated LDL-C and 77.4% had low HDL-C (93).

While the Indian study showed that dyslipidemia was observed in 52.7% males and 42.9% females, the prevalence was even higher (68.4% and 78.2% among participants aged above 60 years for males and females, respectively) (94). Another Indian study showed that the proportion of hypercholesterolaemia (TC level ≥200 mg/dl) was 63.8% (95). A community-based survey was carried out among people in Saudi Arabia ranging in age from 15 to 64. The percentage of patients with dyslipidemia varied from approximately 47% for TG in obese individuals to 12% for TC in non-obese individuals (96).

Africa's pooled prevalence of dyslipidemia was found to be 23.6 (95% CI: 18.4-29.2) in a 2018 systematic review and meta-analysis (35). In 2022, however, an additional systematic review and meta-analysis found that the overall prevalence of dyslipidemia was 52.8 (95% CI: 40.8–64.9). While the prevalence among participants with DM and HTN was 70%, the general population was 48.8%. The highest prevalence of dyslipidemia found in East Africa was 60.8%(87). On the other hand, the lowest prevalence of dyslipidemia (43.7%) was reported among studies conducted on a group of participants with infectious diseases (patients with human immunodeficiency virus)(87).

A study from Asmara, Eritrea, showed that at least one dyslipidemia was present in 87.4% of the study respondents. The most prevalent lipid abnormality was low HDL-C (55.2%), followed by high TC (49.7%), high LDL-C (44.8%), and triglyceridemia (38.1%). Moreover, the prevalence of dyslipidemia increased with age (97).

In Gilgel Gibe Field Research Center, Ethiopia, a cross-sectional community-based study carried out in 2008/2009 revealed that 10.7% of the study participants (12.3% women and 9.0% males) had high total serum cholesterol (cholesterol level of 5.22mmol/L or above). In comparison to rural areas, where the prevalence of high cholesterol was 7.9% and 10.7% among men and women, respectively, urban areas had a higher prevalence of high cholesterol (17.5% and 21%, respectively). A total of 7.7% of people had high TG levels (TG of 2.26 mmol/L or higher)(61).

A population-based cross-sectional study was conducted among 3,227 individuals aged 18 years and above in Gondar City, Ethiopia. The results revealed that the overall prevalence of high TG levels among men was 23.61% and among women was 20.99%. Additionally, the prevalence of high LDL-C was 16.52% among women and 10.88% among men. The prevalence of TC was 26.67% among women and 17.35% among men(98).

Ethiopia conducted its first nationwide study in 2015, and the results showed that low HDL-C (68%) and triglyceridemia (21%) were prevalent. Nonetheless, 5.6% of study participants had high TC levels exceeding 190 mg/dl (12).

A 2019 study from Mekelle, Ethiopia found that 66.7% of participants had dyslipidemia. 49.5%, 40.2%, 30.8%, and 16.5% of the population, respectively, had low HDL-C, elevated TG, elevated TC, and high LDL-C (99).

To summarize, the prevalence of dyslipidemia in Ethiopia ranges from 5.6% to 66.7%. This variation can be attributed to differences in study methodologies; some studies focused on a single lipid abnormality, while others identified at least one lipid abnormality. Additionally, the criteria used to classify dyslipidemia differ across studies, further contributing to the observed range in prevalence rates.

Risk factors for HTN, DM and Dyslipidemia

Four modifiable behavioral risk factors tobacco use, physical inactivity, unhealthy diet, and harmful alcohol use are responsible for the majority of NCDs (3).

Tobacco use

One of the main causes of illness and mortality for NCDs is tobacco usage. Tobacco-related diseases claimed the lives of more than 8 million individuals (100). In 2019, 1.2 million of them passed away as a result of secondhand smoking exposure. There is no acceptable amount of tobacco use or smoke exposure. All tobacco users, whether they smoke regularly or not, run the risk of developing NCDs and other detrimental health outcomes throughout their lives. Lowering the existing tobacco use prevalence will greatly lower the premature death rate from NCDs. There are smokeless and smoked tobacco products (100).

By 2020, 25.3% of people worldwide who were 15 years of age or older reported using tobacco products; the rate for men was more than four times higher than the rate for women (36.7 vs. 7.8% among men and women, respectively). In 2020, the African Region had the lowest frequency, at 10% (100).

Ethiopia has a 5.1% prevalence of tobacco smoking among persons 15 years of age and older, according to the WHO assessment (100). Even while tobacco usage is more common in men (8.8 and 1.3%, respectively) than in women, 4.2% of participants in the first Ethiopian Steps survey reported being current smokers (men 7.3%, women 0.4%) (8).

Interventions against tobacco use in Ethiopia: In February 2019, the Ethiopian Parliament passed the Food and Medicine Administration Proclamation No. 112/2019, a historic tobacco control law, with majority approved(101). The President then signed the act into effect. The use of tobacco products and smoking is forbidden by Proclamation No. 1112/2019 in all indoor workplaces, indoor public workplaces, on all public transportation, and in all common spaces of condominium buildings. Stakeholders reported that there is very little enforcement of Proclamation No. 299/2013, which prohibits smoking in all indoor workplaces, public areas, and public transportation. Additionally, there is a lack of clear legal or administrative consequences

for breaking the law. The control efforts included tax increases on tobacco products, prohibitions on tobacco advertising, and warnings about the dangers of smoking (19, 101, 102).

It is well recognized that smoking tobacco raises the risk of HTN and cardiovascular conditions, such as thrombosis, stroke, and heart attacks. Smokers' ambulatory BP is higher than non-smokers' due to the acute rise in BP that comes with smoking. It is well recognized that quitting smoking lowers one's risk of CVDs overall (100).

Numerous researches reveal that smokers have a higher risk of HTN than non-smokers (53-55, 103). These are a few studies on the impact of smoking on HTN that were carried out in various nations (53-55, 103).

A robust correlation has been observed between active smoking and the development of micro- and macro-vascular problems, as well as the pathophysiology of diabetes, based on both clinical and experimental research. Smoking alters the pancreatic β cell's release of insulin and can also contribute to insulin resistance, which impairs glucose metabolism and raises the risk of diabetes. Furthermore, a major contributing factor to the development of vascular problems in this syndrome is smoking-induced endothelial dysfunction (104).

A study in the YiLi District of Xinjiang, China, revealed a link between diabetes and smoking. (105). Furthermore, a study conducted in Tanzania and Uganda revealed that smoking poses a substantial risk of developing diabetes (72, 74). Ethiopian researchers' systematic study and meta-analysis revealed an association between smoking and DM (76).

Between January and August of 2013, a cross-sectional study with 11,956 participants in the general Chinese population who were 35 years of age or older was carried out. Following multivariate logistic analysis, the findings indicated that there was correlation between current smoking and a high TG AOR= 1.31 (95% CI: 1.16–1.47) and low HDL-C AOR= 1.24 (95% CI: 1.09–1.41)(91).

In 2011, a cross-sectional study with 5900 people aged 15–75 was carried out in southeast Iran. The findings indicated that smoking and opium use were not shown to be significant predictors of dyslipidemia (93).

Excessive use of alcohol

Alcohol abuse is linked to alcohol dependence as well as an increased risk of behavioral and mental health issues. It carries a significant risk for cardiovascular disorders, some types of cancer, liver cirrhosis, and injuries from violence and accidents(106). The amount of alcohol consumed in the African Region in 2019 was 4.9 liters of pure alcohol per person who was 15 years of age or older (106). Ethiopia's 2016 total alcohol consumption per person was 2.9 L, which is less than the WHO African Region average(19). Ethiopia is thought to have one of the lowest rates of alcohol usage on the whole African continent (19). According to estimates from the 2015 NCDs STEPS survey in Ethiopia, 46.6% of men and 33.5% of women had consumed alcohol in the prior 30 days (8).

Ethiopian alcohol control interventions: Excise tax Proclamation No. 307/2002 imposes a 50% excise tax on imported beer, wine, and whisky(19). Proclamation 1112/2019 mandates that alcohol advertisements warn that selling alcohol to anyone under 21 is illegal. It also imposes restrictions on the availability of retailed alcohol, restricts alcohol advertising, enforces laws against drunk driving (sobriety checkpoints), increases taxes on alcoholic beverages, and uses screening and brief interventions for risky and harmful alcohol consumption (19).

Everyone must adopt healthy lifestyles in order to prevent high BP and to effectively treat HTN in those who already have it (26) (Table 5). An interventional quasi-experimental study carried out in Bishoftu, Ethiopia, demonstrated that individuals with HTN who received a 3-month educational intervention encouraging a healthy lifestyle experienced significant reductions in their weight, TC, DBP, and SBP (107).

Table 5: Effect of lifestyle modifications to prevent and manage HTN

Modification	Recommendation	Approximate SBP reduction range
Weight reduction	Maintain normal body weight (body mass index, 18.4–24.9 kg/m^2)	5-20 mm Hg/ 10 kg weight loss
Adopt DASH *eating plan	Consume diet rich in fruits, vegetables, low-fat dairy products, with reduced content of saturated and total fats	8-14 mmHg
Dietary sodium reduction	Reduce dietary sodium intake to no more than 100 mmol/day (2.4g sodium or 6g sodium chloride)	2-8 mmHg
Physical activity	Engage in regular aerobic physical activity (e.g., brisk walking) at least 30 min/day, most days of the week	4-9 mmHg
Moderation of alcohol consumption	Most men: limit consumption to no more than two drinks/day Most women and those who weigh less than normal: no more than one drink/day	2-4 mmHg

- ✓ *Dietary Approaches to Stop HTN (DASH). (Source from : Joint National Committee 7)(27).

In Africa, alcohol drinking is comparatively common. Increased risk of HTN is directly correlated with high levels and certain patterns of alcohol intake (e.g., binge drinking) (108). Several researches revealed that drinkers had a higher risk of HTN than non-drinkers (54, 55, 103, 109).

The WHO estimated in 2012 that 3.3 million deaths, or 5.9% of all deaths worldwide, were attributable to alcohol consumption(47). More than half of those deaths resulted from NCDs, chiefly CVDs and diabetes (33.4%), cancer (12.5%), and gastrointestinal diseases, including liver cirrhosis (16.2%)(47).

A study from Bambuí, Brazil, showed that impaired glycemia was statistically associated with alcohol consumption (71). Different Ethiopian studies also revealed that DM was positively associated with alcohol consumption (76, 110, 111). Moreover, a study in Asmara, Eritrea showed that a high TC level was associated with alcohol consumption (97).

Physical inactivity

Fewer than 150 minutes of moderate-intensity or fewer than 75 minutes of vigorous-intensity physical activity a week is considered physical inactivity (1). According to research, the fourth most important risk factor for mortality worldwide (6% of all fatalities) is physical inactivity. This comes after smoking (9%), having high BP (13%), and having excessive blood sugar (6%). Five percent of deaths worldwide are attributable to overweight and obesity(112).

The proportion of adults aged 18 years and older in the African Region not engaging in sufficient physical activity ranged from 5.52% to 41.31% in 2016(106). In Ethiopia, the prevalence of physical inactivity among adults over 18 years of age was 18 and 11% among women and men, respectively, in 2022(113). The Ethiopian NCDs STEPS survey in 2015 showed that 13.6% of the population aged 15–69 years had low physical activity, with a significant difference between sexes (8.6% of men and 19.4% of women)(8).

A public awareness campaign about physical activity and brief guidance as part of routine care was implemented in Ethiopia as a physical activity intervention (19). In addition to its many other health-promoting benefits, adequate physical activity directly and independently lowers BP. It has long been believed that a high degree of physical activity contributes to the low prevalence of chronic illnesses throughout most of Africa. However, due to the rapid urbanization that has been taking place throughout the continent, there has been a decline in the amount of physical exercise (113). Additionally, a number of studies have demonstrated that a risk factor for HTN is physical inactivity (54, 56, 103, 114).

The WHO reports that regular physical activity lowers blood glucose levels and the risk of diabetes(63). It also has a significant role in maintaining overall energy balance, controlling weight, and preventing obesity—all risk factors that are connected to the prevalence of diabetes in the future (63).

Diabetes was found to be significantly influenced by low levels of physical activity, according to a community-based cross-sectional study carried out in Ireland (115). An adult population-based cross-sectional study carried out in Bambu, Brazil, revealed a favorable correlation between

impaired fasting glycemia and physically inactive people (71). The aforementioned results are corroborated by additional research (66, 111).

A Chinese study found that engaging in regular physical activity was an independent protective factor against Dyslipidemia (92). Similarly, a study from Ethiopia revealed a negative relationship between leisure time activities that involve intense exercise and LDL-C and TC (116). Furthermore, walking for less than 150 minutes a week was found to be a significant predictor of dyslipidemia in a study conducted in Mekelle, Ethiopia (99).

Overweight, obesity and co-morbidities (HTN, diabetes and Dyslipidemia)

Obesity is defined by the WHO as a condition in which excess body fat has accumulated to the point that health risks may arise. Body Mass Index (BMI), or the ratio of weight in kilograms to height in meters squared, is typically used to represent the degree of body weight. A person's body weight is classified using their BMI as underweight (less than 18.5 kg/m^2), normal weight (between 18.5 and 24.9 kg/m^2), overweight (between 25 and 29.9 kg/m^2), or obese (above 30 kg/m^2). In addition to being linked to a higher risk of HTN, obesity has also been linked to a lower life expectancy, coronary artery disease, and some malignancies (23, 47).

Overweight and obesity are linked to 44% of diabetes cases, 23% of IHD cases, and 41% of certain cancer cases worldwide(117). Furthermore, a number of researches have shown that obesity raises the risk of HTN (53-56, 109).

In 2022, there were 2.5 billion adults over the age of 18 who were overweight, including more than 890 million who were obese(118). This corresponds to 43% of adults aged 18 years and over (43% of men and 44% of women) who were overweight; an increase from 1990, when 25% of adults aged 18 years and over were overweight (118). The WHO asserts a strong correlation between diabetes and being overweight or obese(63). Insulin resistance, dyslipidemia, and a host of other metabolic abnormalities are more common and severe in obese people due to the complex relationships and shared pathophysiological pathways between obesity and type 2

diabetes(119). Because of changes in the biology of adipose tissue, obesity is associated with insulin resistance and beta cell dysfunction. As a result, an increased BMI and the distribution of abdominal fat increase the risk of type 2 DM positively (120).

A community-based cross-sectional investigation revealed a relation between dyslipidemia, obesity, and overweight, with both diagnosed and undiagnosed Type 2 DM (115). Additionally, compared to participants who are with normal weight, those who are obese have a significantly higher prevalence of Type 2 DM, according to the Russian study (115). Additional community-based research revealed that triglyceridemia, obesity, a high waist-to-hip ratio, and overweight were all linked to DM (68, 69, 71). Furthermore, a number of African researches have demonstrated that dyslipidemia and obesity have turned into DM risk factors (74, 76, 110, 121).

Between January and August of 2013, a cross-sectional study in the general Chinese population who were 35 years of age or older was carried out(91). Multivariable logistic analysis revealed an association between high TC, low HDL-C, and high LDL-C and BMI, or obesity. The respective AORs= 1.4 (95% CI: 1.1-1.7), 3.3 (95% CI: 2.6-4.1), and 2.5 (95% CI: 1.8-3.2). Additionally, there was a positive relation between high TG and obesity AOR = 3.0 (95% CI: 2.5–3.7)(91).

In 2014, a population-based cross-sectional study was carried out in Chongqing, China among adults 18 years old and above. The results of the multivariable logistic regression analysis demonstrated that an increased risk of dyslipidemia was significantly associated with obesity AOR = 2.73 (95% CI: 2.61-2.85) among men, AOR = 1.52 (95% CI: 1.45-1.59) among women, and central obesity AOR = 1.90 (95% CI: 1.76-2.04) among men and AOR = 1.72 (95% CI: 1.63-1.80) among women (92).

Moreover, a southeast Iran study also showed that obesity and overweight were predictors of dyslipidemia with an AOR= 2.4 (95% CI: 1.8–3.3) and an AOR= 2.3 (95% CI: 1.8–2.9), respectively (93). A cross-sectional study was conducted in the Indian Kulappuram among adults 30 years of age or older. The findings indicated that, in comparison to normal (18–22.9 kg/m^2; 59%), the prevalence of cholesterolemia was higher in individuals with a BMI ≥25 kg/m^2 (69%) and in those with a BMI in the range 23–24.9 kg/m^2 (71.1%). Those with a BMI between

23.0 and 24.9 kg/m^2 AOR= (1.78, 95% CI: 1.04–3.02) and BP ≥140/90 mmHg AOR= (1.62, 95% CI: 1.1–2.38) were more likely to have cholesterolemia (95).

At Ethiopia's Hawassa University Referral Hospital, a cross-sectional comparative study with an institutional focus was carried out. This study involved 226 adult patients who were at least 18 years old. Of those, 113 were HIV-positive patients receiving first-line highly active antiretroviral therapy (HAART) regimens, while another 113 were not on HAART and were part of the pre-HAART group(122). Results from multivariate analysis among HIV-positive individuals indicated that elevated TC, LDL-C, and TG were substantially and positively correlated with a high BMI. Participants with a BMI >25 kg/m^2 had a higher risk of dyslipidemia, with AORs for TC, LDL-C, and TG of 2.96 (95% CI: 1.35–6.49), 2.66 (95% CI: 1.17–5.59), and 2.82 (95% CI: 1.31–1.07), respectively (122).

A cross-sectional study within the institution was carried out on 217 staff members of Jimma University in Jimma, Ethiopia, to evaluate the participants' lipid and lipoprotein profiles and their risk profile for coronary atherosclerosis(116). The findings indicated a negative correlation between BMI and HDL-C, with a correlation coefficient of -0.164, $p<0.05$. Conversely, there was a positive correlation ($r = 0.239$, $P<0.05$) seen between LDL-C and BMI. Likewise, a significant positive correlation ($P<0.05$) was seen between TC and BMI. Furthermore, the results showed that TG and BMI had a positive correlation (0.294, $P<0.05$)(116).

HTN was associated with high TC AOR= 1.43 (95% CI: 1.3–1.6), high LDL-C AOR= 1.6 (95% CI: 1.3–1.9), and high TG AOR= 1.6 (95% CI: 1.4–1.8), according to a cross-sectional study done in the general Chinese population(91). Furthermore, low HDL-C AOR = 1.5 (95% CI: 1.3-1.8), high LDL-C AOR = 1.5 (95% CI: 1.2-1.8), high TG AOR = 2.6 (95% CI: 2.3–3.0), and TC AOR = 1.6 (95% CI: 1.4–1.8) are also associated to type 2 diabetes (91).

A cross-sectional study conducted in the Indian town found that cholesterolemia was more common in those with HTN (95). The odds of having cholesterolemia were higher in those with HTN cases (BP ≥140/90 mmHg) (AOR=1.62, 95% CI: 1.1–2.38)(95).

Blood glucose levels were positively related to LDL-C, TC, and TG, according to an institutional study conducted in Jimma, Ethiopia. The correlation levels were ($r = 0.24$, $p<0.05$), ($r = 0.35$, $p<0.05$), and ($r = 0.27$, $p<0.05$), respectively(116). Saudi Arabia demonstrated that having high TC and diabetes were a risk factor of HTN (123). Furthermore, a study conducted in Nepal also revealed that diabetes was found to be a substantial risk factor for HTN (54).

Dyslipidemia was associated with HTN in Southeast Asian nations, according to a systematic review and meta-analysis (53). Furthermore, a number of Ethiopian researches show that diabetes increases the risk of HTN (103, 109, 114, 124).

A community-based cross-sectional study carried out in Ireland revealed a correlation between the use of cholesterol-lowering drugs and type 2 DM, both diagnosed and undiagnosed (115). Furthermore, a Chinese study demonstrated a significant correlation between HTN and a higher risk of diabetes (105). According to a Bangladeshi study, having HTN increased the risk of developing diabetes (69). Numerous researches conducted in Africa revealed a substantial association between a history of HTN and a higher frequency of type 2 diabetes (72, 74, 76, 111, 125).

Patients with DM, high waist circumference, and HTN were more likely to present with dyslipidemia, according to a systematic review and meta-analysis conducted in Africa (87). Furthermore, participants with diabetes and HTN had higher TC levels, according to a study conducted in Asmara, Eritrea (97). An important predictor of dyslipidemia was found to be having elevated fasting blood glucose, according to a study from Mekelle, Ethiopia(99).

Unhealthy diet

Unhealthy diets are one of the main risk factors for chronic diseases, like diabetes, cancer, heart disease, and other fat-related conditions. A healthy diet, include consuming less sodium, sugar, and fats and increasing your intake of fruit, vegetables, legumes, nuts, and grains. It's also recommended to choose plant-based unsaturated fats rather than saturated fats(43).

The following are examples of unhealthy diet interventions in Ethiopia: surveillance (steps survey), despite the lack of policies or proclamations to reduce population intake of saturated

fats; initiatives to reduce salt intake, despite the lack of a salt reduction strategy in place; no action taken to reduce sugar intake; and no policies or proclamations restricting or eliminating trans-fats in the food chain (19).

In Africa, people frequently consume large amounts of sodium, primarily from the salt that is used to preserve or enhance food. Reducing salt consumption has several positive cardiovascular effects that are both independent of and additive to its BP-lowering effects. It also lowers BP and the risk of cardiovascular disease (18). Consumption of fruits and vegetables, which is a component of a healthy diet, differs greatly throughout nations due to differences in economic, cultural, and agricultural production contexts. The majority of fruits and vegetables' health benefits stem from lowering risk factors for CVDs, especially HTN. Many Africans consume large amounts of salt together with little fruits and vegetables, which leaves them deficient in potassium (23). Furthermore, a number of researches have demonstrated that a poor diet increases the risk of HTN (55, 114, 126).

Inadequate intake of fruits and vegetables and excessive consumption of meals high in calories and protein are indicators of unhealthy eating habits. Empirical data supports the notion that replacing Trans-and saturated-type fat with mono- and polyunsaturated-type fat lowers the risk of coronary heart disease. Additionally, there is proof that consuming trans- and saturated fats raises your risk of type 2 diabetes, but eating polyunsaturated fat from vegetables lowers your risk(127).

A cross-sectional study conducted in Harar, Eastern Ethiopia, showed that participants who consumed fruits and vegetables on ≥3 days/week were approximately 50% less likely to be diabetic than those who consumed on <3 days/week, AOR=0.49, (95% CI: 0.27-0.91)(125).

Socio-demographic risk factors

The prevalence of HTN increases with advancing age to the point where more than half of people 60–69 years of age and approximately three-fourths of those 70 years of age and older were affected(26). The age related rise in SBP is primarily responsible for an increase in both incidence and prevalence of HTN with increasing age(24, 26). Framingham Heart Study

reported the lifetime risk of HTN to be approximately 90 percent for men and women who were non hypertensive at 55 or 65 years and survived to age 80–85(128). Dehui, North-East China study also showed being male, having diabetes mellitus) and family history of high BP were significantly related to high BP (129).

A systematic review and meta-analysis in Southeast Asian countries, showed that the urban population, being male, men aged < 45 years and women aged > 45 years, low education and socioeconomic levels were associated with HTN(53). Bangladesh study showed that higher educational status, unmarried women and respondents who were not working were associated with HTN(56).

Nigerian and Sudan studies also revealed that age above 50 years was factor for HTN(58, 130). Moreover, different studies conducted in Ethiopia showed, age, and living in urban areas were risk factors for HTN (103, 109, 114, 124). Russian study also showed that being female and live in rural area were associated with DM (131). Chinese study also showed that being male, older age ≥ 65 and unmarried were significantly associated with an increased risk of diabetes(105).

The Bangladesh study also revealed that the probabilities of developing diabetes were higher in those who were older (over 55), had greater levels of education, and were in a higher socioeconomic class (69). Several African researches revealed that a higher frequency of type 2 diabetes was significantly associated with an older age, illiteracy, and a family history of the disease (72, 74, 76, 111, 125).

In 2013, a cross-sectional study in a broad Chinese population with participants aged 35 years or older revealed a positive correlation between gender and high TC and high LDL-C, whereas an inverse relationship was found with low HDL-C(91). Furthermore, a high family income was linked to a higher odds of having high TC and low HDL-C among single people (91).

A cross-sectional population-based study conducted in 2014 in Chongqing, China, found that women, older age groups, and education levels above junior high school were associated with dyslipidemia (92). A study carried out in southeast Iran found that dyslipidemia was more common among women (93). Conversely, it was not discovered that education level, or a family history of dyslipidemia were significant predictors of Dyslipidemia (93). A cross-sectional study

conducted in the Indian town of Kulappuram found that hypercholesterolemia was more common in women than in men (95).

According to a study conducted at the Hawassa University Referral Hospital in Ethiopia, elevated TC, LDL-C, HDL-C, and TG were positively associated with age, and individuals over 40 had a higher risk of Dyslipidemia (122). Furthermore, an investigation conducted at Jimma University in Jimma, Ethiopia, revealed a negative connection ($r = -0.21$, $p<0.05$) between HDL and age; in contrast, positive associations ($r = 0.152$, $p<0.05$), TC and age ($r = 0.24$, $p<0.05$), and TG and age ($r = 0.22$, $p<0.05$) were noted. Additionally, there was a favorable correlation between monthly income and both TC and LDL-C ($r = 0.32$, $p<0.05$) and 0.27, $p<0.05$, respectively(116). According to a Mekelle, Ethiopia study, having a medium socioeconomic class and being older than 64 were found to be significant predictors of dyslipidemia (99). Ethiopians now expect to live an average of 65.5 years in 2017 compared to 58 years in 2007(5).

To summarize the risk factors associated with the three outcome variables, we can categorize them into modifiable and non-modifiable factors. Modifiable factors include tobacco use, excessive alcohol consumption, physical inactivity, unhealthy diets, obesity, comorbid conditions, income, education, and occupation. In contrast, non-modifiable factors encompass age, gender, and genetic predispositions.

1.5. Conceptual framework

Various publications, guidelines, and research articles were examined to identify potential risk factors for prevalent non-communicable diseases. To make the concepts simple to understand and demonstrate how various factors influence the adult population's outcome variables (HTN, DM, and dyslipidemia), conceptual framework work was adapted(132, 133).

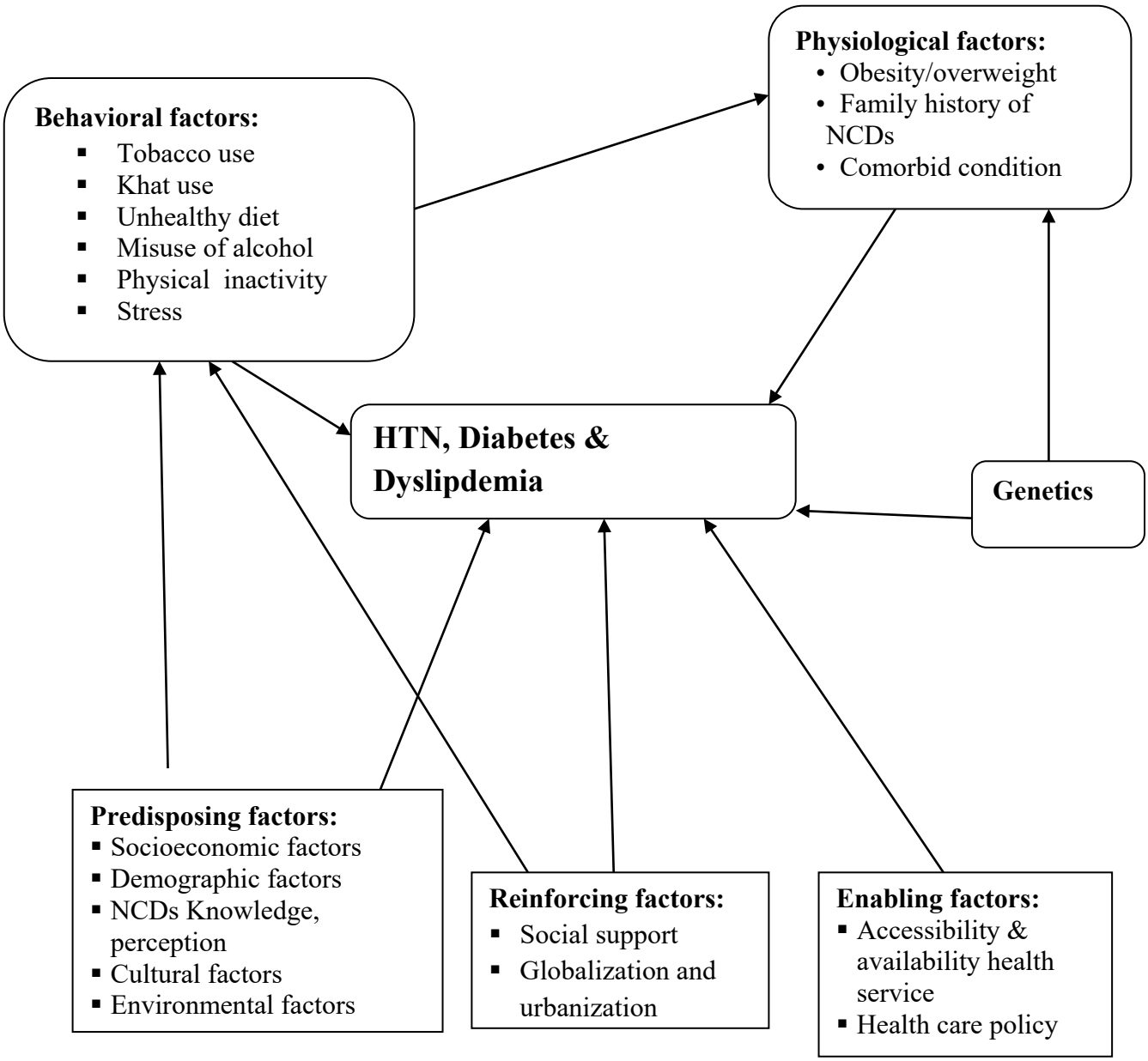

Figure 1: Conceptual framework for common non-communicable diseases among adults (131, 132, 134)

2. Research questions

1. What is the prevalence of HTN among adults in Addis Ababa, Ethiopia?
2. What factors are associated with HTN among adults in Addis Ababa, Ethiopia?
3. What is the prevalence of diabetes mellitus among adults in Addis Ababa, Ethiopia?
4. What factors are associated with diabetes mellitus among adults in Addis Ababa, Ethiopia?
5. What is the prevalence of dylipidemia among adults in Addis Ababa, Ethiopia?
6. What factors are associated with dyslipidemia among adults in Addis Ababa, Ethiopia?

3. General objective

The overall aim of this study was to describe the prevalence and associated risk factors of HTN, diabetes, and dislipidemia among adults living in Addis Ababa, Ethiopia.

3.1. Specific objectives

1. To assess the magnitude and associated factors of HTN **(Paper- I)**
2. To determine the magnitude and associated factors of DM**(Paper-II)**
3. To examine the magnitude and associated factors of Dyslipidemia **(Paper-III)**

4. Materials and Methods

4.1. Study area and population/ the setting

The study was carried out in Ethiopia's capital, Addis Ababa. Addis Ababa serves as Ethiopia's political and cultural hub and is home to the African Union and the Economic Commission for Africa. In terms of political, social, and economic life, it is currently also acting as a hub for numerous international organizations and developing into a metropolis for African countries (135, 136).

Addis Ababa is the largest and the country's leading political, economic, cultural, and historical city. It is both a chartered city and the seat of the Federal Government of Ethiopia. The sub-cities, which are the second administrative division after the city administration, were divided into ten during data collection time (currently eleven, Lemi Kura is added) (Figure 2).

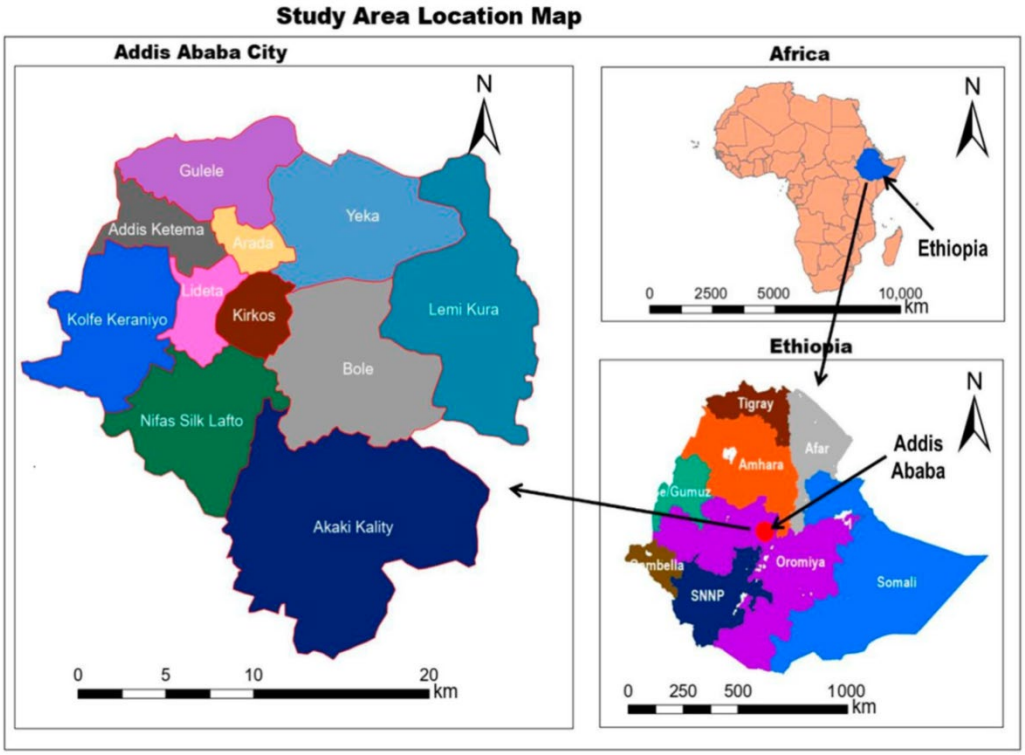

Figure 2: The current administrative Map of Addis Ababa city

Ten sub-cities made up the city at the time of data collection. In terms of the overall area covered, Bole was the largest sub-city, followed by Akaki Kality and Yeka. Arada and Lideta were the two smallest sub-cities after Addis Ketema (Table 6). The inner site also included the four sub-cities of Addis Ketema, Arada, Lideta, and Kirkos. This is because the city's sub-cities were its oldest areas. Due to their shared borders with a neighboring region, the remaining six sub-cities were classified as outer site (135, 137). Besides, during the data collection time, the sub-cities were also divided into 116 woredas, which were the smallest administrative units in the city. The number of woredas varies based on their size (Table 6). In addition, each woredas further divided into Ketenas, where they had no financial or political power(21).

During the data collection period, the crude population density (calculated by dividing the total population by the total area) was varied by sub cities. With 43,250.4 people per km^2, Addis Ketema sub-city had the highest population density, followed by Arada and Lideta. On the other hand, Akaki Kality was a rather sparsely populated sub-city, with 1,925.2 residents per km^2 (Table 6).

The Central Statistics Agency of Ethiopia estimated that 3,344,999 people would live in Addis Ababa in 2017, with 1,624,999 of them being men and the remaining 1,809,000 being women (Table 6). As a result of the sub-cities' differing populations, Kolfe Keraniyo (537,561), Yeka (434,599), Nefas Silk-Lafto (396,489), and Bole (387,355) each had the biggest city's total population. However, the sub-city of Akaki Kality (227,182) has the lowest population of the city(138).

Table 6: Distribution of Addis Ababa sub cities based on number of woredas, area in km2, density of sub-cities, and projected population of Addis Ababa, Ethiopia, October 2018 (21, 138)

Sub cities	Woredas	Area in km^2	Population density	2017 population projection		
				Male	Female	Total population
Bole	14	122.0	3,175.0	180,782	206,573	387,355
Akaki Kality	11	118.0	1,925.2	110,435	116,747	227,182
Yeka	13	85.9	5,059.3	201,156	233,443	434,599
Nefas Silk-Lafto	12	68.3	5,805.0	185,461	221,025	396,486
Kolfe Keraniyo	15	61.2	8,783.6	258,480	279,081	537,561
Gullele	10	30.1	11,143.9	161,078	174,356	335,434
Lideta	10	9.1	27,784.8	119,843	132,999	252,842
Kirkos	11	14.6	18,996.3	128,841	148,505	277,346
Arada	10	9.9	26,781.9	123,445	141,696	265,141
Addis Ketema	10	7.4	43,250.4	155,478	164,575	320,053
Total	**116**			**1,624,999**	**1,809,000**	**3,433,999**

Ethiopian Health system: primary, secondary, and tertiary health care systems are organized into a three-tiered service delivery structure. Both public and private healthcare facilities are part of the healthcare tier system. Primary hospitals, health centers, and health posts make up the primary level of healthcare. Secondary health care: This level of care is made up of general hospitals that are expected to serve, on average, one million people and offer services comparable to those of primary hospitals. They serve as training facilities and referral centers for primary hospitals. The third level of the Ethiopian healthcare system, known as tertiary level healthcare, is provided by a specialist hospital serving a population of about 5 million people. It acts as a referral center for general hospitals as well(20, 22).

There are 106 health centers, 3 primary hospitals, 31 general hospitals, and 5 specialized hospitals in Addis Ababa that offer health care (139)**.** In Addis Ababa, 77% of facilities provided services for the diagnosis and management of cardiovascular disease. And, diabetes diagnosis and/or management were generally available (82%); however, only 36% of persons received treatments for diabetes diagnosis and/or management in 2018 (20). The study was conducted from June to October 2018.

4.2. Study design

Community based cross sectional study design was employed for all objectives to generate data on the prevalence and associated factors of non-communicable diseases (HTN, diabetes and dyslipidemia) for the three papers (paper I, II and III).

4.3. Source and study population

4.3.1. Source population

Addis Ababa residents aged 18 years and above, including both males and females, comprised of the source population.

4.3.2. Study population

Adults aged 18 years and above found in selected households of seven sub cities, including Yeka, Bole, Nifas Silk-Lafto, Kolfe Keraniyo, Lideta, Addis Ketema and Kirkos of Addis Ababa city.

4.4. Eligibility criteria

Inclusion criteria

- ✓ All adults aged 18 years and above
- ✓ Residing in Addis Ababa for 6 months and above

Exclusion Criteria

- ✓ Pregnant and lactating women up to 6 weeks postpartum
- ✓ Individuals who were non-cooperative or refused to provide the necessary information
- ✓ Bed ridden and disabled study participants, that is not suitable for physical measurement (weight and height) were excluded from this study

4.5. Sample size and sampling methods

Seven out of the then ten sub-cities were initially selected, using predetermined criteria, such as the area's location (inner and outer) and population density, in order to apply multi-stage cluster

sampling procedures. Next, a single woreda was chosen at random from every sub-city. Next, two Ketenas, the smallest geographical units within woredas, were chosen at random from the selected woredas. Lastly, the first household in each Ketena was chosen at random, and homes that followed were chosen depending on how close they were to the first and previous houses (Figure 3).

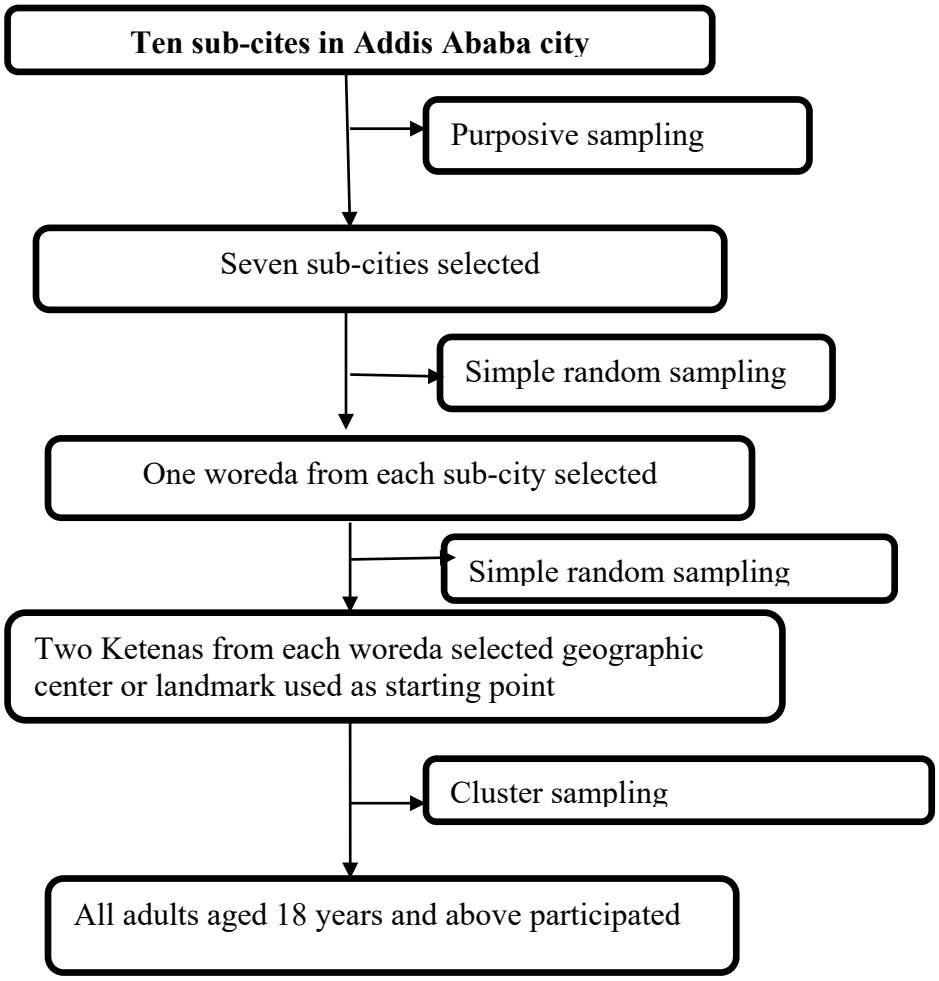

Figure 3: Sampling architecture to select the required sample size in Addis Ababa, Ethiopia, October 2018.

4.6. Sample size determination

Different sample sizes were calculated for addressing all objectives of the study with different scenarios as described below.

- ✓ For determining the magnitudes of HTN, diabetes and dyslipidemia single proportion formula was used, by using Epi Info version 7.2 (Table 7).

$$n = \frac{(z\alpha/_2)2p(1-P)}{d^2}$$

Where:-

n =the desired sample size

zα/2= corresponding z score for a significance level of (1 - α) %

P= expected prevalence

d^2=margin of error

Then, we added 20% possible non-response rate.

Table 7: Sample size calculation for determining the prevalence of common NCDs in Addis Ababa, Ethiopia, October 2018

Outcome measure	Expected prevalence(reference)	Margin of error	Level of confidence	Design effect	Non response rate	Sample size requires
HTN	31.5% (45)	2%	95%	1.5	20%	3723
Diabetes	5.1% (111)	1%	95%	1.5	20%	3341
Dyslipidemia	50% (no study)	5%	95%	1.5	20%	692
Maximum sample size for determining the magnitude of common NCDs						**3723**

- ✓ We employed two population proportion formula utilizing Epi-Info StatCalc for cross-sectional studies to assess the factors associated with HTN, DM, and dyslipidemia. Assumptions were made as follows: 95% confidence level, 80% power. According to Table 8 below, the estimation was conducted using the five common factors: age, smoking, physical activity, alcohol consumption, and fruit and vegetable intake.

$$n = \frac{\left[Z\alpha/2\sqrt{\left(1+\frac{1}{r}\right)P(1-P)} + Z\beta\sqrt{P1(1-P1)+\frac{P2(1-P2)}{r}}\right]^2}{(P1-P2)^2}$$

Table 8: Sample size calculation for determining the associated factors of HTN, DM and dyslipidemia in Addis Ababa, Ethiopia, October 2018

Risk factors	HTN(114, 140)			Diabetes(111, 125, 141)			Dyslipidemia(142-144)		
	Proportion among exposed	Proportion among non exposed	Total sample size	Proportion among exposed	Proportion among non exposed	Total sample size	Proportion among exposed	Proportion among non exposed	Total sample size
Age ≥55	47	8	182	9.3	4.8	2427	20.3	8.2	675
Smoking	51	23	225	22	6	488	44.9	31.1	774
Physical activity	13	27	598	8	16	1181	11.2	26.1	528
Alcohol	34.6	22.6	913	19.2	12.5	1892	47.8	34.1	803
Fruit and veg.	43	22	355	5	10	1988	47.4	29.8	566

- ✓ Therefore, to achieve the first objective of the study, we chose a maximum sample size of 3723 participants out of all the sample sizes that were computed. The study's second and third objectives (biochemical assessments) were then addressed using the minimum sample size of 692 individuals for budgetary considerations.

- ✓ After that, the total sample size for each sub-city was determined using probability proportional to size, and questionnaire-based assessment and physical measures were collected from all sampled participants. The distribution of the population was made based on the population size of each sub city (Table 9).

Table 9: Allocation of population based on proportion to size during data collection in Addis Ababa, Ethiopia, October 2018

Sub cities	Number of woredas	Total population size	Percent allocation proportion to population size	Sample size
Nefas Silk-Lafto	12	396,486	15.2	566
Kolfe Keraniyo	15	537,561	20.6	767
Lideta	10	252,842	9.7	361
Kirkos	11	277,346	10.6	395
Addis Ketema	10	320,053	12.3	458
Yeka	13	434,599	16.7	622
Bole	14	387,355	14.9	555
Total	**85**	**2,606,242**	**100**	**3723**

4.7.Survey instruments

We employed the modified WHO STEPwise surveillance methodology. We modified the instrument for the current study; additional questions were added, since they were thought to be significant locally (e.g., chewing khat, coffee drinking, consuming raw meat). Every change was made in compliance with the STEPS guide (133).

The key feature of the STEPS framework is the distinction between the different levels of risk-factor assessment:

Step 1 – Questionnaire-based assessment

- Contains self- report information by questionnaire (Table 10).

Step 2 – Questionnaires and physical measures

- Adds to Step 1 with the inclusion of physical measurements, such as height, weight, waist circumference, and BP (Table 10).

Step 3 – Questionnaires, physical measures and biochemical assessment

- Includes Steps 1 and 2 and adds blood samples for biochemical measurements (Table 10).

Table 10: STEPS approach to risk factor assessment of non-communicable diseases

Measures	Step 1 (Self-Report)	Step 2 (Physical)	Step 3 (Biochemical)
Core	Socioeconomic and demographic variables, years of education, tobacco and alcohol use, physical inactivity, intake of fruit and vegetables	Measured weight and height, waist circumference, BP	Fasting blood glucose, total cholesterol
Expanded Core	Ethnicity, Income, education, household indicators, dietary patterns	Hip circumference, pulse rate	HDL-cholesterol, triglycerides
Optional (Examples)	Other health-related behaviors, mental health, disability, injury	Timed walk, Pedometer, skin fold thickness	Oral glucose tolerance test; urine examination

*In this study, the core and expanded core were used as a data collection tool.

Data collectors and supervisors recruitment: Thirty Bachelor of Science holders with prior experience in data gathering were recruited by the investigators to serve as data collectors, and data were gathered between June 1 and Augest 31, 2018. The study's objectives, the suggested sampling technique, eligibility requirements, the structure of data collection tool and its purpose, techniques (such as the use of calibrated weight and height measuring devices and how to measure BP, weight, and height), methods of data collection, and the roles and responsibilities of the field team members to exercise caution throughout the study were then covered in a four-days training. The tools used to collect data were introduced to the trainees. The data collectors had a practical session focused on physical and biochemical measurements until their skills were deemed appropriate. Participants in the primary data gathering process were limited to those who showed sufficient ability. Additionally, six supervisors with MScs were hired.

Four phlebotomists, who work for the Armed Forces Comprehensive Specialized Hospital and have experience drawing blood samples were recruited by the investigator. The laboratory experts, Master of Science holder also provided comprehensive instructions on how to draw blood, how much volume of blood is required, how to label the test tubes, how to handle and transport blood sample, and how to follow universal precautions. Additionally, the phlebotomists were taught on how to stop excessive bleeding a participant tends to bleed by applying direct pressure over the area with gauze or clean clothes, and how to refer the participant to a nearby

medical facility for a thorough diagnosis and treatment, if the bleeding from the injection site did not stop after following this procedure.

4.8. Data collection procedures

During the data collection process, in-person interviews for each participant were held by two data collectors at the home level after all sampled participants in the survey had given their signed consent and been informed of the objectives of the study. Physical measurements, including height, weight, waist circumference, hip circumference, and BP, were obtained following the in-person interview. To address the second and third objectives, six hundred ninety-two (692) randomly selected respondents were asked to undergo a biochemical test the next day following the completion of the in-person interview and physical examinations.

The criteria, which required that each study participant need to have an early morning appointment and fast for at least eight hours overnight, were also given to the replies. In addition, we told participants who were selected at random to give a blood sample the next morning at the nearest health institution; the study team was present in all of the nearby healthcare facilities.

After cleaning the cubital region with 70% alcohol, blood sample was obtained the following morning from participants who reported adhering to an overnight fast. Five milliliters of whole blood were extracted from the venous (via vacutainer tubes) in order to calculate the blood glucose, total cholesterol, HDL-C, LDL-C, and triglycerides. Following the separation of the serum by centrifugation, the sample was put in an ice box and brought to the Armed Forces Comprehensive Specialized Hospital Laboratory. There, it underwent laboratory operations and was examined with a Mindray BS-200 Chemistry Analyzer.

Each study participant received a pamphlet at the conclusion of the data collection, which could aid in raising awareness of non-communicable diseases, including diabetes and HTN.

Measurement techniques:

a. BP measurement procedures

BP was measured using the digital device on the left arm, according to the WHO protocol, after informing participants to sit and relax. Three BP measurements took place at intervals of at least

two minutes. The average value of the 2nd and 3rd measures was used in the analysis (133). BP (BP) is classified as per the Seventh National Joint Committee on the Prevention, Detection, Assessment, and Treatment of HTN (JNC VII)(27). The digital device (OMRON M2 Eco) has been clinically approved and recommended by the WHO Organization(133).

b. Anthropometric measurement procedures

The subjects underwent anthropometric measurements while dressed comfortably and without shoes. Prior to each measurement, the scales were calibrated to the zero level.

Weight and Height measurements

Once participants were instructed to face forward, stand motionless, and place their arms on their sides, their weight was measured using a portable PRESTiGE weight height scale. To the nearest 0.1 kilogram, the weight was recorded in kilograms. The interviewer also measured the respondents' height when they faced the interviewer, stood on the board without shoes or headgear, placed their feet together, pressed their heels against the board, kept their knees straight, and looked straight ahead. The interviewer then lowered the measuring stick and placed it a top the respondent's head, recording the height in centimeters to the nearest 0.1 cm. between measurements, zero levels were changed and weighing scales were inspected. The scale was also setted up on a level, sturdy surface.

Waist and hip circumferences

Measurement was done with the tension measuring tape. For that, a private setting was selected. The following successive steps were taken: the superior border of the iliac crest and the inferior margin of the last rib in the mid-axillary plane; using a tape measure, determined and marked the midpoint between the two; applied the tension tape over the marked point, ensuring that it was horizontal across the back; and recorded at the point of normal expiration. The measurement of the hip circumference was taken at the buttocks' maximum circumference. During the measurement, the subject stood straight, with their feet evenly spaced, their arms relaxed at their sides, and their body weight uniformly distributed (145).

Waist-Hip-Ratio (WHR)

We estimated the waist-to-hip ratio using the waist and hip circumferences. That ratio was computed using SPSS and was derived by dividing the waist circumference by the hip circumference.

Measurement of physical activity

The Global Physical Activity Questionnaire (GPAQ) component of the STEPS instrument was used to measure physical activity. The overall physical activity was expressed in MET (metabolic equivalent) minutes per week. The tool examines three primary domains of daily life: employment (including household work), transportation, and leisure pursuits. The STEPS instrument was accompanied by GPAQ analysis guidelines, which were used to categorize the overall physical activity level as high, moderate, or low. This survey evaluate the use of physical exercise in three distinct contexts: paid and unpaid employment, both inside and outside the home; transportation (traveling to and from locations); and leisure time (133).

Metabolic equivalents, or METs, are frequently employed in the interpretation of GPAQ data as well as in the expression of physical activity intensity. We can compute total physical activity by applying MET values to activity levels. The working-to-resting metabolic rate ratio is known as the metabolic exchange ratio, or MET. A MET, or the energy cost of sitting still, is equal to one kcal/kg/hour of caloric consumption. For the analysis of GPAQ data, existing guidelines have been adopted: It is estimated that, compared to sitting quietly, a person's caloric consumption is four times as high when being moderately active and eight times as high when being vigorously active. Therefore, for the calculation of a person's total physical activity using GPAQ data, the following MET values were used:

Domain	**MET value**
Work	Moderate MET value=4.0
	Vigorous MET value=8.0
Transport	Cycling and walking MET value=4.0
Recreation	Moderate MET value=4.0
	Cycling and walking MET value=8.0

4.9.Variables of the study

Dependent variables:-

- ✓ BP levels
- ✓ Blood glucose levels
- ✓ Serum lipid levels

Independent variables:-

The independent variables included:

- ✓ Socio-demographic factors: age, sex, religion, ethnicity, education, marital status, occupation
- ✓ Behavioral factors: - Smoking habit, alcohol consumption, consumption of vegetables and fruit, physical activity, khat chewing habit.
- ✓ Physiological factors: - overweight, obesity, comorbid condition.
- ✓ Genetic factor: - history of non communicable diseases among his/her family (history of HTN, diabetes and dyslipidemia).
- ✓ Predisposing (knowledge and perception), enabling and reinforcing factors

4.10. Operational definitions

Adequate fruit and or vegetable intake: Daily consumption of fruit and/ or vegetable at least five serving

Current alcohol consumers: participants who consumed any amount of alcohol in the past 30 days

HTN: a mean measured BP of ≥ 140 mmHg systolic and/or the mean measured diastolic BP of ≥ 90 mmHg or self-reported history of HTN.

Body Mass Index (BMI): calculated as weight in kilograms divided by height in meters squared (weight (kg)/height (m^2). BMI was categorized as per the World Health Organization guidelines underweight (BMI <18.5), normal (BMI ≥18.5 to ≤ 24.9), overweight (BMI ≥ 25.0 to ≤ 29.9) or obese (BMI ≥ 30.0).

Waist to hip ratio: calculated as waist circumference in cm divided by hip circumference in cm and it was used as a measure of abdominal obesity. Waist to hip ratio ≥ 0.90 m in men and ≥ 0.85 m in women is defined as having abdominal obesity.

High physical activity: a person reaching any of the following criteria was classified in this category:

- Vigorous-intensity activity on at least 3 days achieving a minimum of at least 1,500 MET-minutes/week OR
- 7 or more days of any combination of walking, moderate- or vigorous intensity activities achieving a minimum of at least 3,000 MET-minutes per week.

Moderate physical activity: a person not meeting the criteria for the "high" category, but meeting any of the following criteria was classified in this category:

- 3 or more days of vigorous-intensity activity of at least 20 minutes per day
  OR
- 5 or more days of moderate-intensity activity or walking of at least 30 minutes per day
  OR
- 5 or more days of any combination of walking, moderate- or vigorous intensity activities achieving a minimum of at least 600 MET-minutes per week.

Low physical activity: a person not meeting any of the above-mentioned criteria under moderate or high physical activities falls in this category.

DM/ Raised fasting blood glucose: serum blood value ≥126 mg/dl or on medication for raised blood sugar.

Dyslipidemia: was defined according to the third report of National Cholesterol Education Program Adult Treatment Panel (NCEP ATP III) criteria (27) with the following cut off values:

Hypercholesterolemia: serum TC level ≥ 200 mg/dl;

Hypertriglyceridemia: serum TG level ≥ 150 mg/dl;

Low HDL-C: serum HDL-C level < 40 mg/dl for men and <50 mg/dl for women;

High LDL-C: serum LDL-C level ≥ 130 mg/dl;

Isolated dyslipidemia was defined as follows:

Isolated hypercholesterolemia: serum TC ≥ 200 mg/dl without hypertriglyceridemia;

Isolated hypertriglyceridemia: serum TG ≥ 150 mg/dl without hypercholesterolemia;

Isolated low HDL-C: serum HDL-C < 40 mg/dl for men and < 50 mg/dl for women without hypertriglyceridemia and hypercholesterolemia;

Mixed hyperlipidemia: having serum triglycerides ≥150 mg/dl and total cholesterol ≥ 200 mg/dl;

4.11. Dissemination of findings

The study's final report was delivered and turned in to the public health department of the Addis Ababa University College of Health Sciences. Additionally, it was presented at conferences and seminars held nationally or internationally. Additionally, the study's results were published in reputable local and international journals.

4.12. Data management and analysis

Double data entry procedures were performed using the EpiData 3.1 statistical software, and analyses were performed using SPSS software version 23. To determine risk factors, binary logistic regression was applied. Using bivariate analyses, potential risk factors were first identified. Multivariable models included variables established in the literature as affecting outcomes, as well as those associated with the outcome at p-value <0.25 on bivariate analysis. Statistical significance was considered when the P-value was less than 0.05. Then, we used the multivariable logistic regression model to adjust for confounding variables. The Hosmer-Lemeshow goodness-of-fit statistic was used to evaluate whether or not the assumptions necessary for the application of multiple logistic regression were met. Odds ratios (OR) with 95% CI were computed.

4.13. Data quality assurance

Data quality was assured through the following measures:

The participants were chosen using random sampling techniques, and data were gathered from seven sub-cities of Addis Ababa. After examining several works of literature, the data collection tools were created and then adapted for our situation. Language experts translated pertinent field instrument items into Amharic, the native language, and then back to English to ensure consistency. Pretesting was carried out to evaluate the questionnaires and data-gathering tools for potential changes. Furthermore, data collectors received training. For physical measurements including weight, height, and BP, we employed reliable, standard equipment. Zero levels were changed in between readings, and weighing scales were inspected. We also set the scale down on a level, sturdy platform. The World Health Organization has certified the OMRON M2 Eco digital instrument as clinically appropriate and recommended.

In addition, five milliliters of blood samples for serum analysis were obtained, centrifuged, and transported after being stored in an ice box for examination at Armed Forces Comprehensive Specialized Hospital. Both an external and internal quality check was performed on the equipment. The lead investigator and supervisors were closely monitoring the data collection processes.

4.14. Ethical considerations

The Addis Ababa Health Bureau Ethical Review Committee of the municipal government, and the Institutional Review Board of the College of Health Sciences, Addis Ababa University granted their ethical clearance. An authorization letter was acquired from the designated sub-city health departments.

The importance of knowing the prevalence and contributing causes of prevalent non-communicable diseases, along with the asymptomatic nature and complications of the diseases, was explained to participants. There were no improper financial or nonfinancial inducements used in this study. There was no form of coercion or persuasion applied to the study participants to get them to participate.

After receiving complete information about the study's objectives, respondents provided both written and verbal consent. During the study period, participants who experienced elevated BP, elevated blood glucose levels, or abnormal lipid profiles were advised to seek additional evaluation and treatment from nearby healthcare facilities.

A participant's unambiguous consent to participate in the study was required for her/him to be included. That consent enhanced participation in the interview, physical examination, blood sample collection, and potential follow-up phone calls to discuss results. The study eliminated everyone's hesitation to participate voluntarily. Respondents had the option to stop talking at any point throughout the interview or to avoid answering certain questions.

During the blood investigation conducted in the survey, no reports of injuries or uncontrollable bleedings happened. All details regarding the subject's personality, mental and physical health, and integrity were treated with utmost discretion. All participant-related information was kept private and confidential. After the file was coded, their identity was hidden and stored in a secure location. Each component of the information gathered was kept secret and private.

4.15. Summary table of study objectives and methods

The summary of the objectives and methods used in the dissertation is shown in (Table 11).

Table 11: Summary of objectives and study methods of the dissertation, in Addis Ababa, Ethiopia, October 2018

Paper	Study objectives	Study design	Study population	Sample size	Data collection tools	Data analysis
I	To assess the magnitude and associated factors of HTN	Community based cross sectional study design	Adults 18 years and above	3560	WHO step 1 & 2	Descriptive analysis and logistic regression analysis (Bivariate and multivariable)
II	To determine the magnitude and associated factors of DM	Community based cross sectional study design	Adults 18 years and above	602	WHO step 1,2 & 3	Descriptive analysis and logistic regression analysis (Bivariate and multivariable)
III	To examine the magnitude and associated factors of Dyslipidemia	Community based cross sectional study design	Adults 18 years and above	582	WHO step1,2 & 3	Descriptive analysis and logistic regression analysis (Bivariate and multivariable)

5. Results

5.1. Prevalence and associated factors of HTN

Socio-demographic characteristics of study participants

An overall response rate of 95.6% was obtained from the 3724 sampled population, of those 3560 people gave consent to participate in the first and second questionnaire phases. Of the total number of participants, 361 (10.1%) were from Lideta sub-city, while 716 (20.1%) were from Kolfe Keraniyo. The majority of responders—57.3%—were female. One thousand five hundred eight (42.4%) of the participants were between the ages of 18 and 29. The respondents' ages ranged from 18 to 95, with a median age of 32 (IQR 25, 45) (Table 12).

Regarding education, 83.3 percent of participants were in formal education; 33.0%, 20.2%, and 15.1% of respondents had finished primary, secondary, and college or university education, respectively. A total of 1,776 (49.6%) of them were married at the time, with 1331 (37.4%) never having been married. Orthodox Christians made up the majority (74.8%), followed by Muslims (14.9%). The majority of survey participants, 1316 (37.0%), were self-employed, with housewives coming in second at 750 (21.1%). One to four people made up over two-thirds (61.2%) of the participants' families (Table 12).

Table 12: Socio-demographic characteristics of the study participants in Addis Ababa, Ethiopia, October 2018 (n=3560)

Variables	Frequency	Percent
Sub cities		
Addis Ketema	465	13.1
Bole	526	14.8
Kirkos	362	10.2
Kolfe Keraniyo	716	20.1
Lideta	361	10.1
Nifas Silk-Lafto	508	14.3
Yeka	621	17.4
Sex		
Male	1520	42.7
Female	2040	57.3
Age in years		
18-29	1508	42.4
30-49	1304	36.6
50 years and above	748	21.0
Highest education levels		
Primary (1-8)	1176	33.0
Secondary (9-10)	719	20.2
Preparatory (11-12)	464	13.0
Technique	67	1.9
College and above	539	15.1
Not attended formal education	595	16.7
Marital status		
Never married	1331	37.4
Currently married	1767	49.6
Separated	49	1.4
Divorced	139	3.9
Widowed/Widower	271	7.6
No response	3	0.1
Religion		
Orthodox Christian	2664	74.8
Muslim	530	14.9
Protestant	333	9.4
Catholic	14	0.5
Other	19	0.6
Employment status		
Government employee	388	10.9
Non-government employee	257	7.2
Self employed	1468	41.2
Student	301	8.5
House wife	750	21.1
Unemployed(able and Unable to work)	220	6.2
Retired	176	5.0
Family size		
1-4	2178	61.2
Five and above	1382	38.8

Behavioral factors

Tobacco use

Tobacco use was assessed by interviewing respondents about their current smoking status, previous smoking experience, the age they started smoking, and exposure to second-hand smoke. Overall, about one hundred fifty 4.2% (95% CI: 3.6-4.9) of survey respondents were current smokers (daily and non-daily smokers); the prevalence of smoking was higher among men 9.0% (95% CI: 7.5-10.4) compared to women 0.7% (95% CI: 0.3-1.0) (Table 13). More than three-fourths (90.7%) of current smokers were males compared to females ($p < 0.001$).

From the total current smokers, a majority (88.7%) smoke cigarettes on a daily basis, with an average of 10 cigarettes per day. The average age at which smokers started smoking was 21 ± 6.58 years, and the mean duration of smoking was 15 years ± 15.7 years. Fifty-five (1.6%) have smoked cigarettes in the past. One hundred nineteen (3.4%) were exposed to second-hand smoke at home and 162 (4.6%) in the workplace.

Table 13: Distribution of current smoking based on age and sex among the study participants in Addis Ababa, Ethiopia, October 2018

	Current smokers								
Age	**Male**			**Female**			**Both sex**		
groups (years)	N	%	95%CI	N	%	95%CI	N	%	95%CI
18-29	736	8.3	6.3-10.3	772	0.7	0.1-1.2	1508	4.4	3.3-5.4
30-49	541	10.7	8.1-13.3	763	1.1	0.3-1.8	1304	5.1	3.9-6.3
≥50	243	7.0	3.8-10.2	505	0.2	0.0-0.6	748	2.4	1.3-3.5
Total	1520	9.0	7.5-10.4	2040	0.7	0.3-1.0	3560	4.2	3.6-4.9

Khat chewing

Three hundred thirty 9.3% (95% CI: 8.3–10.2) participants reported currently chewing khat. On the other hand, 18.8% (95% CI: 16.9–20.8) of males and 2.2% (95% CI: 1.5–2.8) of females currently chew khat. The magnitude of current chewing was higher 11.8 (95% CI: 10.1–13.6) in the age group of 30-49 compared to others (Table 14).

The mean age of khat chewing was 23.3 ± 11.5 years. Over a third of the respondents, 105 (31.5%) and half, 172 (51.7%), chew khat on a daily and weekly basis, respectively. On the other hand, 153 participants (4.3%) had previously chewed khat.

Table 14: Distribution of Khat chewing across based on age and sex of respondents in Addis Ababa, Ethiopia, October 2018

	Current khat user								
Age groups (years)	**Male**			**Female**			**Both sex**		
	N	%	95%CI	N	%	95%CI	N	%	95%CI
18-29	736	17.7	14.9-20.4	772	1.7	0.8-2.6	1508	9.5	8.0-11.0
30-49	541	24.6	20.9-28.2	763	2.8	1.6-3.9	1304	11.8	10.1-13.6
≥50	243	9.5	5.8-13.2	505	2.0	0.8-3.2	748	4.4	2.9-5.9
Total	1520	18.8	16.9-20.8	2040	2.2	1.5-2.8	3560	9.3	8.3-10.2

Alcohol consumption

One thousand one hundred sixty-two 32.7% (95% CI: 31.1-34.2) participants ever consumed alcohol, and of that, 782 (22.0%) consumed alcohol of all types of alcoholic drinks, including the local ones, namely Araki, Tejji, Tella, and others such as beer, wine, spirits, and to name but a few, during the last month. Of the total participants who consumed alcohol within one month, 529 (78.0%) were men and 253 (56.0%) were women. Binge drinking is defined as consuming alcohol for men five and above or women four and above on one occasion. The result showed that 249 (7.0%) of men and 72 (2.0%) of women binge drink.

Reported consumption of alcohol within the 12 months preceding the study was 31.7% (95% CI: 30.2–33.3), and it was higher among males 44.5% (95% CI: 42.0–47.3) compared to women 22.2% (95% CI: 20.4–24.0). Moreover, 40.8% (95% CI: 37.2-44.3) of males and 22.3% (95% CI: 19.3-25.2) of females consume alcohol in the age group of 18–29 years (Table 15).

Two hundred sixty-seven (7.5%) of participants, out of the total number of people who had drunk in the previous 12 months, reported that they were unable to quit after they had begun.

Table 15: Distribution of alcohol users across based on age and sex of respondents in Addis Ababa, Ethiopia, October 2018

Alcohol user for 12 months									
Age groups (years)	Male			Female			Both sex		
	N	%	95%CI	N	%	95%CI	N	%	95%CI
18-29	736	40.8	37.2-44.3	772	22.3	19.3-25.2	1508	31.3	29.0-33.6
30-49	541	49.5	45.3-53.8	763	25.3	22.2-28.4	1304	35.4	32.8-38.0
≥50	243	44.9	38.6-51.2	505	17.4	14.1-20.8	748	26.3	23.2-29.5
Total	1520	44.5	42.0-47.0	2040	22.2	20.4-24.0	3560	31.7	30.2-33.3

Dietary habits of the study participants

Two thousand three hundred ninety-two (67.2%) consumed fruits at least once per week, and the mean fruit consumption per week was 2.1 (±1.5) days (Table 16). As well, the majority of 2268 (94.7%) ate fruit 1–2 servings per day, with a mean of 1.4 (±0.6) times per day. Similarly, more than three-fourths of the participants, 2997 (84.2%), ate vegetables at least one time per week with a mean of 2.5 (± 1.5) per week, and most of them, 2827 (94.3%), ate them 1-2 times per day with a mean serving time per day of 1.6 (±0.6) (Table 16).

Nearly three-fourths of 2511 (70.6%) of respondents reported that they usually use vegetable oils like nug (Guizotia abyssinica), sesame, and sunflower oil for meal preparation, while nearly one-fourth of 839 (23.6%) use palm oil. Only 137 (3.8%) participants consumed five or more (recommended) servings of vegetables or fruit on a daily basis (Table 16).

Table 16: Frequency of fruit and vegetable consumption per week among respondents in Addis Ababa, Ethiopia, October 2018

Variables			Variables	
Vegetables per week	**Number**	**Percent**	**Fruits per week**	**Percent**
1 time	734	24.5	1032	29.0
2 times	1175	39.2	714	20.1
3 times	640	21.4	380	10.7
4 times	189	6.3	89	2.5
5 times	82	2.7	48	1.3
6 times	30	1.0	18	0.5
7 times	147	4.9	111	3.1
Didn't consume	563	15.8	1168	32.8
Mean (SD)	2.5(1.5)		2.1(1.5)	
Type of oil				
Vegetable	2511	70.5		
Palm	839	23.6		
Don't know	210	5.9		
Veg./Fruit consumption				
≥5 times	137	3.8		
< 5 times	3423	96.2		

The highest frequency of vegetables eating across all age categories was twice per week, followed by once and three times per week. For the age groups of 18–29, 30-49, and 50–95, the majority of participants—527, 18.0%, 418, 14.0%, and 230, 8.0%—consume vegetables twice a week, respectively. Furthermore, the frequency of vegetable consumption declined as age groups increased from 18–29 to 50–95 years old (Figure 4).

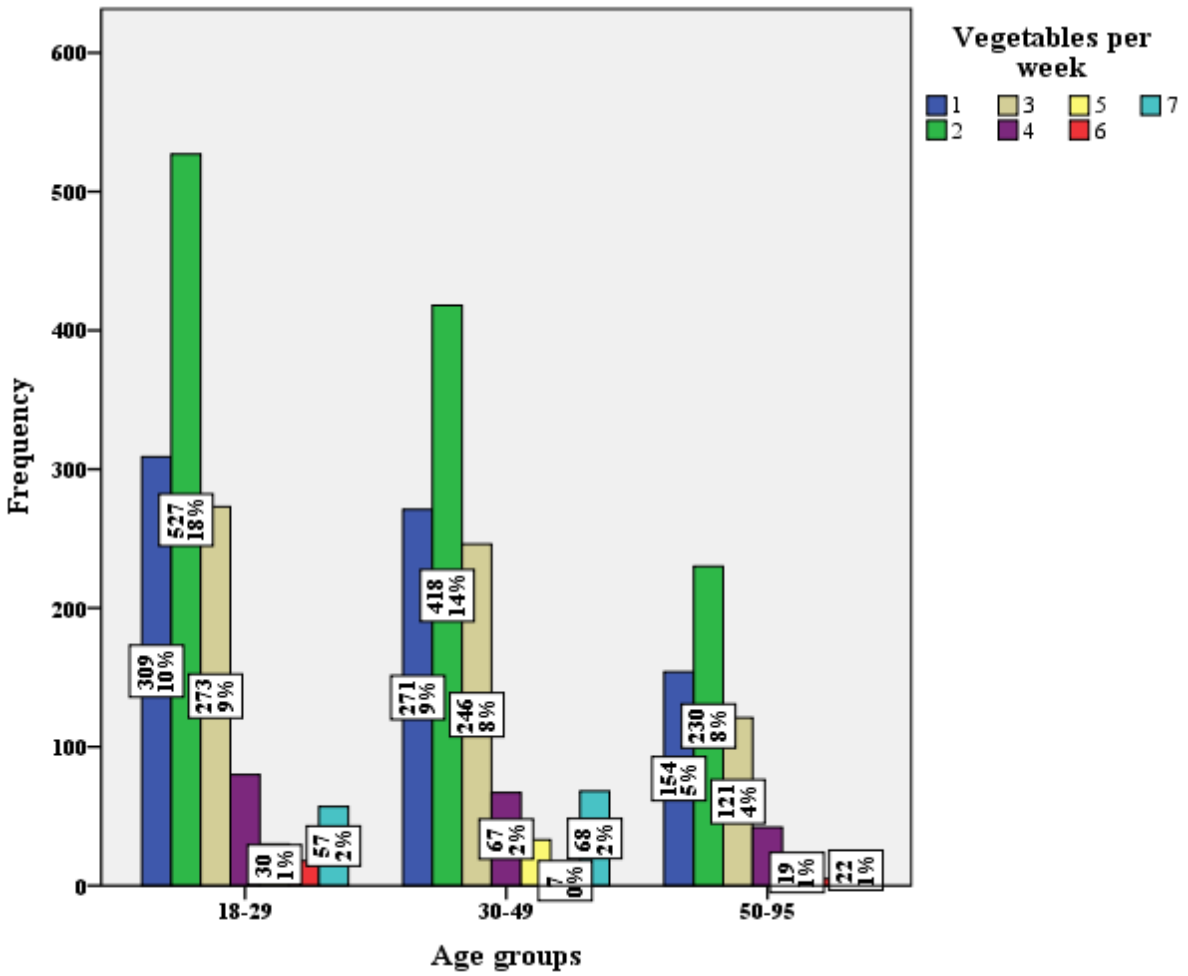

Figure 4: Distribution of reported weekly vegetables intake by age among respondents in Addis Ababa, Ethiopia, October 2018

The highest frequency of fruit eating across all age categories was once per week, followed by twice and three times per week. For the age groups of 18–29, 30-49, and 50–95, the majority of participants—464, 19.0%, 351, 15.0%, and 257, 9.0%—consume fruits once a week, respectively. Furthermore, the frequency of fruit consumption declines as age groups increase from 18–29 to 50–95 years old (Figure 5).

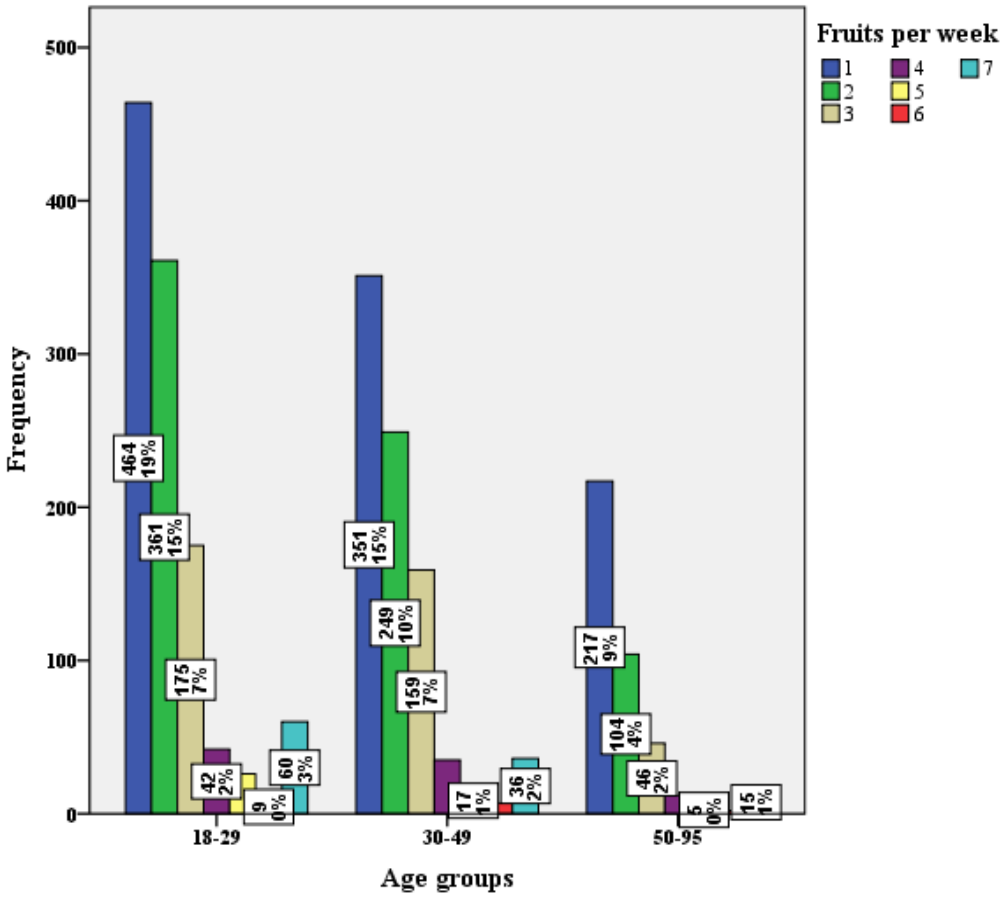

Figure 5: Distribution of reported weekly fruit intake by age among respondents in Addis Ababa, Ethiopia, October 2018

Additional dietary habits

When asked how many meals they ate each week that weren't made at home, 997 respondents (28%) said they ate at least one, 520 respondents (14.6%) said they didn't know, and 2043 respondents (57.4%) said they didn't eat outside of their home. Of the total participants, 202 (5.7%) and 795 (22.3%) of the males and females, respectively, had dinner away from home (Figure 6). Nearly half 1697 (47.7%) of participants ate raw meat; moreover, the majority (81%) of participants drunk coffee, and 1963 (68.1%) of them consumed it in two cups or more per day (Table 17).

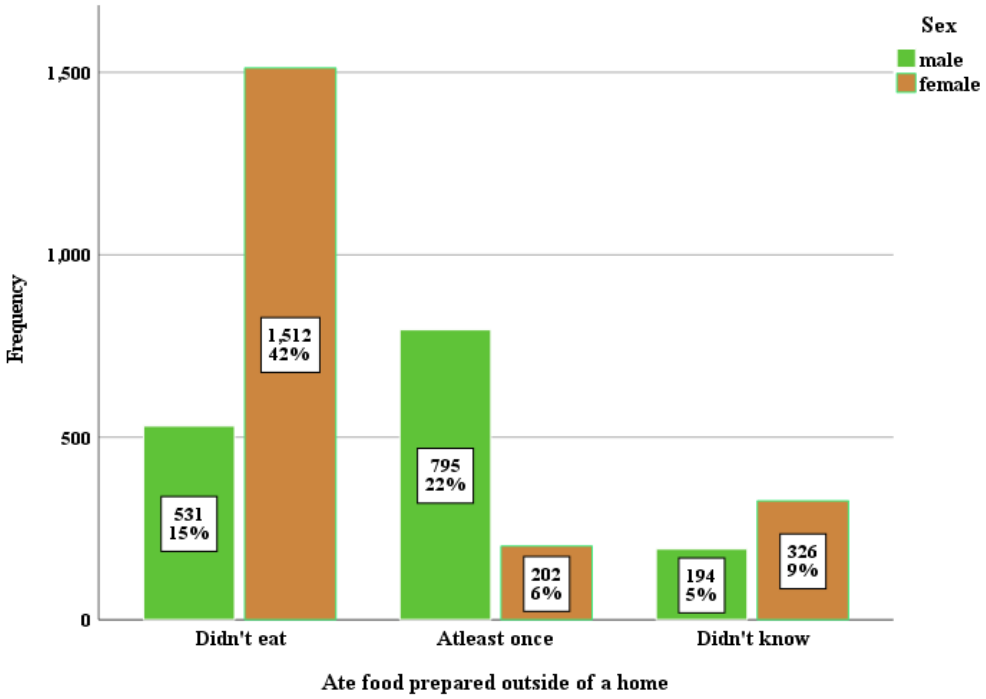

Figure 6: Reported meal behavior prepared outside the home per week among respondents in Addis Ababa, Ethiopia, October 2018

Dietary salt consumption was determined by looking at how frequently people added salt or a salty sauce, like soy sauce, to their food either before or while they were eating it. Of the study participants, 2424 (68.1%) used it always or often. Furthermore, 995 (27.9%) of the participants said they always used salt or salty sauce to food preparation or cooking in their homes (Table 17).

Regarding the understanding of the advantages of reducing salt intake, nearly all 3335 (93.7%) participants believed that eating too much salt or salty sauce could lead to health problems. Total participants were asked which specific regular control measures were used to control salt intake. Only 217 (6.1%) of them replied that they reduced their salt intake by limiting their intake of processed foods; 150 (4.2%) said they checked the salt or sodium level on the food labels; 176 (4.9%) said they substituted spices for salt while cooking; and 177 (5.0%) avoided regularly consuming food that was cooked outside of their home (Table 17).

Table 17: Frequency of additional dietary habits of the respondents in Addis Ababa, Ethiopia, October 2018

Variables	Frequency	Percent
Eating raw meat		
Yes	1697	47.7
No	1863	52.3
Coffee drinking		
Yes	2885	81.0
No	675	19.0
Cups of coffee per day		
≤1	922	31.9
2 and more	1963	68.1
How often do you add salt before you eat it or as you are eating it?		
Always	2258	63.4
Often	166	4.7
Sometimes	294	8.3
Rarely	226	6.3
Never	616	17.3
How often is salt, salty seasoning or a salty sauce added in cooking food?		
Always	819	23.0
Often	176	4.9
Some times	514	14.4
Rarely	434	12.2
Never	1402	39.4
Don't know	215	6.0
Too much salt causes a health problem		
Yes	3335	93.7
No	218	6.1
Don't know	7	0.2
Questions on how to control salt intake		
Limit processed food		
Yes	217	6.1
No	3343	93.9
Look at the salt content on food labels		
Yes	150	4.2
No	3410	95.8
Substitute spicy food		
Yes	176	4.9
No	3384	95.1
Avoid eating outside home		
Yes	177	5.0
No	3383	95.0

Physical activity

This survey assessed the use of physical exercise in three distinct contexts: paid and unpaid employment, both inside and outside the home; transportation (traveling to and from locations); and leisure time. In total, 15.2% (95% CI: 14.0–16.4) of participants engaged in vigorous-intensity activity related to all domain for a minimum of 10 minutes daily. Conversely, males were more engaged than women in vigorous-intensity physical activity 29.5% (95% CI: 27.2–31.8) versus 4.6% (95% CI: 3.7–5.5) (Table 18).

In addition, over half of the study participants, 57.1% (95% CI: 55.4–58.7), engaged in moderate physical activity. Between the ages of 18-29 and 50-90, moderate physical activity among both sexes increases: among males, it increases from 49.2% (95% CI: 45.6–52.8) to 54.5% (95% CI: 52.0–57.1), and among females, it increases from 55.9% (95% CI: 52.4–59.5) to 59.8% (95% CI: 55.5–64.1). In comparison to males, females were generally moderately active (Table 18).

However, low levels of physical activity were reported by 27.7% (95% CI: 26.2–29.7) of participants, or nearly one-third. Furthermore, low levels of physical activity were less common in men 15.9% (95% CI: 14.1–17.8) than in women 36.4% (95% CI: 34.3–38.5) (Table 18).

Table 18: Distribution of physical activity based on age and sex among the study participants in Addis Ababa, Ethiopia, October 2018

Physical activity									
Vigorous activity related to all domains									
Age groups (years)	Male			Female			Both sex		
	N	%	95%CI	N	%	95%CI	N	%	95%CI
18-29	736	38.0	34.5-41.6	772	4.3	2.8-5.7	1508	20.8	18.7-22.8
30-49	541	26.1	22.4-29.8	763	6.8	5.0-8.6	1304	14.8	12.9-16.7
≥50	243	11.1	7.1-15.1	505	1.8	0.6-2.9	748	4.8	3.3-6.4
Total	1520	29.5	27.2-31.8	2040	4.6	3.7-5.5	3560	15.2	14.0-16.4
	Moderate physical activity related to all domains								
18-29	736	49.2	45.6-52.8	772	55.9	52.4-59.5	1508	52.6	50.1-55.2
30-49	541	56.9	52.7-61.1	763	61.5	58.0-64.9	1304	59.6	56.9-62.3
≥50	243	65.4	59.4-71.4	505	59.8	55.5-64.1	748	61.6	58.1-65.1
Total	1520	54.5	52.0-57.1	2040	58.9	56.8-61.1	3560	57.1	55.4-58.7
Low physical activity									
18-29	736	12.8	10.4-15.2	772	39.8	36.3-43.2	1508	26.6	24.4-28.8
30-49	541	17.0	13.8-20.2	763	31.7	28.4-35.0	1304	25.6	23.2-27.9
≥50	243	23.5	18.1-28.8	505	38.4	34.2-42.7	748	33.6	30.2-36.9
Total	1520	15.9	14.1-17.8	2040	36.4	34.3-38.5	3560	27.7	26.2-29.7

Physiological characteristics of the study participants

Body mass index and waist to hip ratio

All participants had their height and weight assessed at 3560; the average BMI of the responders was 23.5 (±4.4 kg/m^2). Two hundred eighty seven participants (8.1%) were obese and 865 respondents (24.3%) were overweight. In terms of BMI and sex, 3.3% of men and 11.5% of women were obese, while 19.9% of men and 27.5% of women were overweight (Figure 7). In addition, the average hip-waist ratio was 0.9 (±0.1 m^2), with the corresponding values for men and women being 0.9 (±0.1 m^2) and 0.8 (±0.1 m^2).

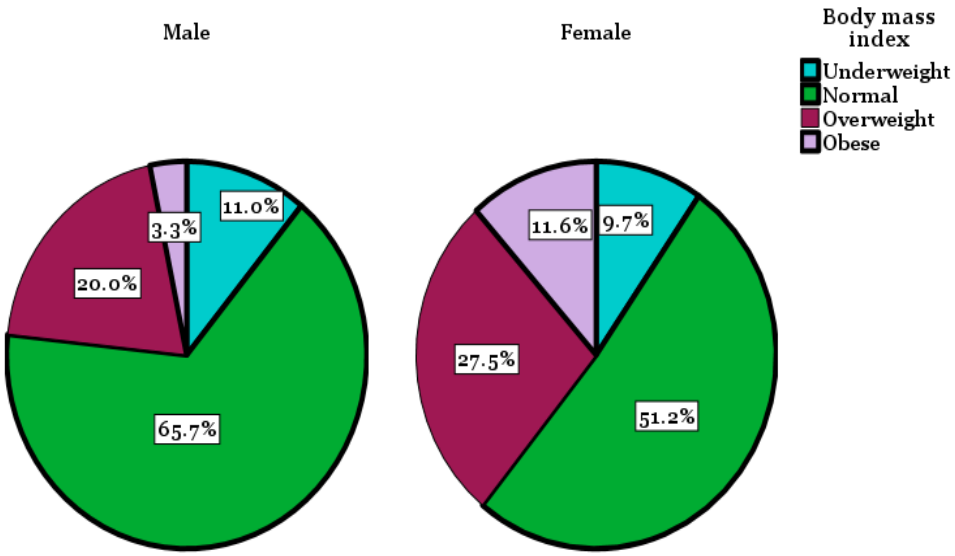

Figure 7: Distribution of Body Mass Index among male and female respondents in Addis Ababa, Ethiopia, October 2018

History of HTN

Three thousand five hundred sixty (3,560) respondents had their BP measured three times in a row. The average of the second and third readings was used to calculate the BP. The participants' mean BP measurements were 125.0 (95% CI: 124.4–125.6) mm Hg for the systolic and 79.6 (95% CI: 79.8–79.9) mm Hg for the diastolic. The average SBP for males was 126.9 (95% CI: 126.0–127.9) mmHg, whereas the mean SBP for females was 123.6% (95% CI: 122.7–124.5) mmHg. Similarly, the average DBP for males was 80.8 (95% CI: 80.1–81.4) mm Hg, whereas

for females it was 78.7 (95% CI: 78.2–79.2) mm Hg. Men had considerably higher mean SBP (P < 0.001) and DBP (P < 0.001) than women.

As age progressed, the mean SBP rose, but the mean DBP rose significantly in both sexes until age 50, after which it slightly increased in men and decreased in women (Figures 8 and 9).

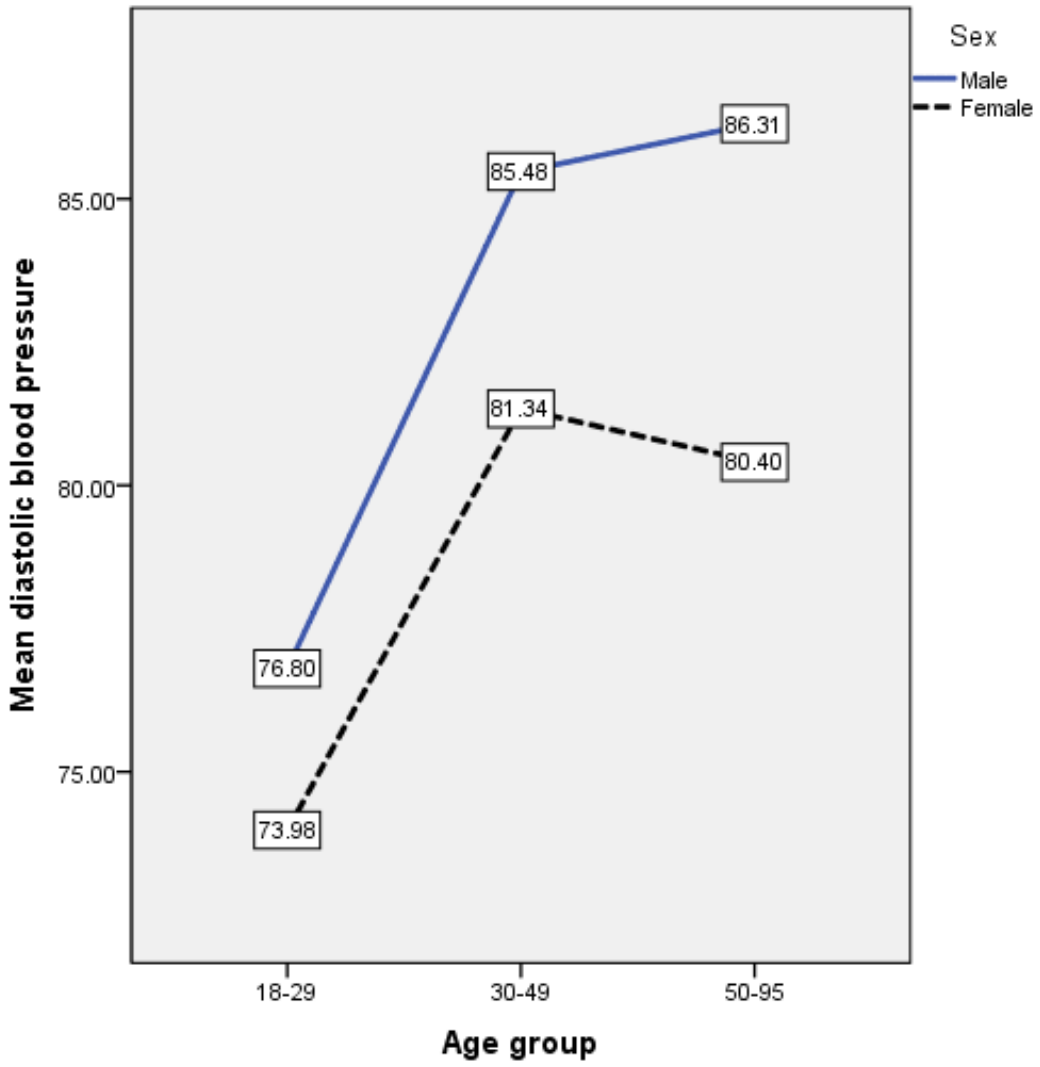

Figure 8: Mean diastolic BP related to age group and sex among the study participants in Addis Ababa, Ethiopia, October 2018

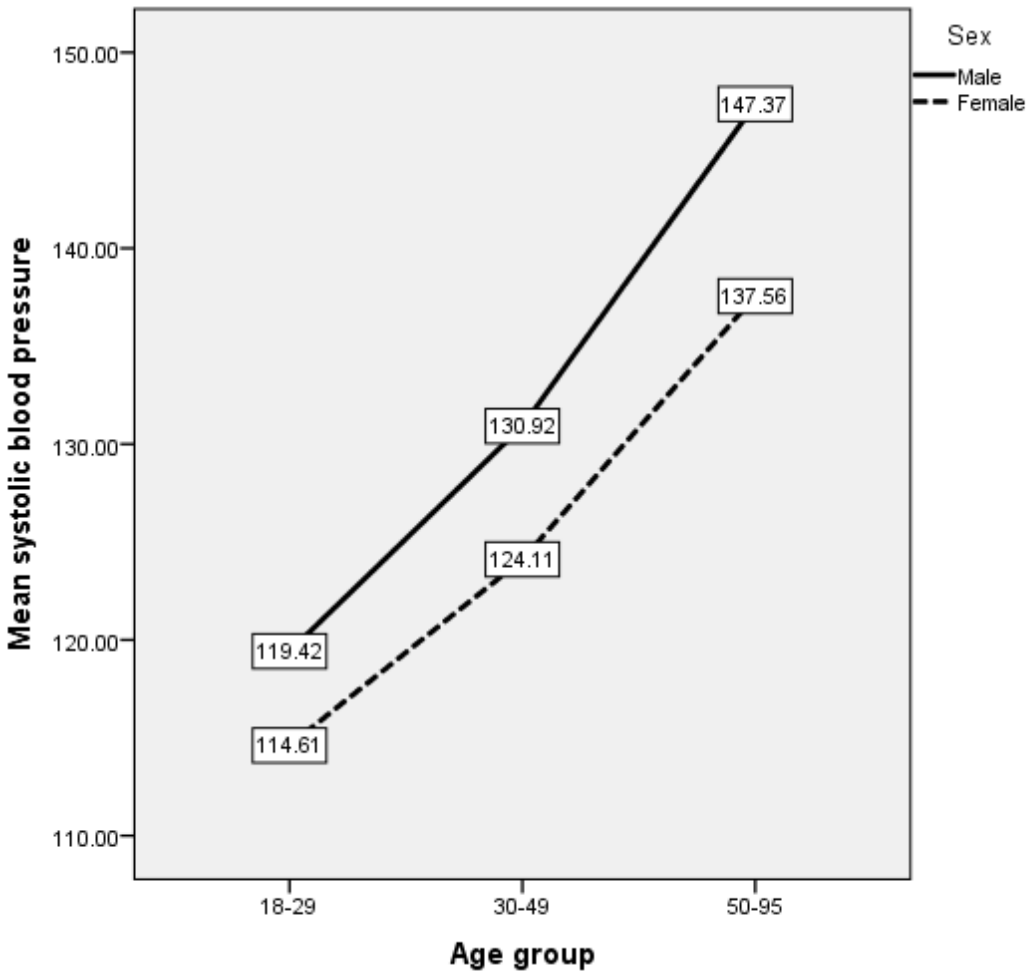

Figure 9: Mean systolic BP related to age group and sex among the study participants in Addis Ababa, Ethiopia, October 2018

In terms of pulse pressure, the majority of participants (2994, 84.1%) fall within the range of 25-60 mmHg. Additionally, 470 participants (13.2%) have a pulse pressure greater than 60 mmHg, while 96 participants (2.7%) have a pulse pressure less than 25 mmHg.

Systolic HTN was revealed in 8.5% (95% CI: 7.5–9.4) of the population; it was not statistically significant, but slightly greater in women 9.2% (95% CI: 7.9–10.5) than in men 7.4% (95% CI: 6.1–8.6). Additionally, diastolic HTN is more common in men 9.2% (95% CI: 7.8–10.7) than in women 5.49% (95% CI: 4.5–6.5), with a p-value <0.001. Its prevalence was 7.1% (95% CI: 6.2–7.9).

Overall, 29.2% (95% CI: 27.8–30.7) of people had HTN; men had a slightly higher prevalence 30.1% (95% CI: 27.8–32.4) than women 28.6% (95% CI: 26.7–30.5). The prevalence of HTN rose in both the younger and older age cohorts. Out of the 1041 respondents with HTN, the proportion of undiagnosed HTN was 645, 61.9% (95% CI: 59.0–64.9). Moreover, the prevalence of undiagnosed or recent diagnosed HTN was 18.1% (95% CI: 16.9–19.4), greater in males than in women 21.4% (95% CI: 19.3-23.5) and 15.7% (95% CI: 14.1–17.3). Furthermore, the prevalence of undiagnosed HTN increased with increasing age groups (Table 19 and 20).

From previously measured participants, 395 (11.1%) said they had HTN (reported HTN). The percentage of respondents diagnosed with high BP during the previous 12 months was 288 (8.1%).

Table 19: Prevalence of HTN among the study participants in Addis Ababa, Ethiopia, October 2018

Prevalence of HTN									
Age groups (years)	**Male**			**Female**			**Both sex**		
	N	%	95%CI	N	%	95%CI	N	%	95%CI
18-29	736	15.5	12.9-18.1	772	10.4	8.2-12.5	1508	12.9	11.2-14.6
30-49	541	34.4	30.4-38.4	763	29.1	25.9-32.3	1304	31.3	28.8-33.8
≥50	243	65.0	59.0-71.1	505	55.6	51.3-60.0	748	58.7	55.2-62.2
Total	1520	30.1	27.8-32.4	2040	28.6	26.6-30.5	3560	29.2	27.8-30.7

Table 20: Prevalence of undiagnosed HTN among the study participants in Addis Ababa, Ethiopia, October 2018

Undiagnosed HTN									
Age groups (years)	**Male**			**Female**			**Both sex**		
	N	%	95%CI	N	%	95%CI	N	%	95%CI
18-29	736	13.7	11.2-16.2	772	8.6	6.6-10.5	1508	11.1	9.5-12.7
30-49	541	26.8	23.1-30.6	763	15.9	13.3-18.5	1304	20.4	18.2-22.6
≥50	243	32.5	26.6-38.4	505	26.3	22.5-30.2	748	28.3	25.1-31.6
Total	1520	21.4	19.3-23.4	2040	15.7	14.1-17.3	3560	18.1	16.9-19.4

Factors associated with HTN

Of several non-modifiable factors, age and sex were associated with HTN. The odds of HTN increased with age. The odds of HTN was higher almost three times AOR = 2.8 (95% CI: 1.4–5.5) among respondents aged 30–49 years, and it was eight times AOR = 8.0 (95% CI: 4.0–15.8) higher among respondents aged 50 years and above as compared to those 18–29 years old. The odds of HTN were twice as high AOR = 2.0 (95% CI: 1.3–3.2) in men compared with women. From modifiable and other factors, coffee drinking, body mass index, abdominal obesity, triglyceridemia, and eating fewer vegetables per week were associated with HTN (Table 21).

The odds of HTN was reduced by 50.0% AOR = 0.5(95% CI: 0.3-0.8) among respondents who drank coffee more than two cups per day as compared to those who drank less than two cups. The odds of HTN was reduced by 70.0% underweight participants AOR = 0.3 (95% CI: 0.1–0.9), but the odds were two times higher AOR = 2.2 (95% CI: 1.2–4.0) among obese participants as compared to those having a normal BMI. The odds of HTN were almost two times higher AOR = 1.7 (95% CI: 1.1–2.6) among participants with abdominal obesity as compared to their counterparts. The odds of HTN were also 1.8 times higher AOR=1.8 (95% CI: 1.2–2.7) among participants who had triglyceridemia, as compared to their counterparts. Moreover, the odds of HTN higher than two times AOR = 2.6 (95% CI: 1.3–5.2) among respondents who consumed vegetables less than or equal to three days per week compared to those who ate more than three days per week (Table 21).

In this particular study alcohol use, high salt intake, low physical activity, family history of HTN, DM, and, high cholesterol levels, were not significantly associated with HTN (Table 21).

Table 21: Bivariate and multivariable logistic regression analysis of factors associated with HTN among study participants in Addis Ababa, Ethiopia, October 2018

Variable	HTN		Crude OR (95% CI)	AOR (95% CI)
	Yes	No		
Age				p<0.001
18-29	194	1314	1.00	1.00
30-49	408	896	3.08 (2.55-3.73)	2.77 (1.41-5.45)* .003
≥50	439	309	9.62(7.80-11.87)	7.95(3.99-15.84)**
Sex				p=0.004
Female	538	1457	1.00	1.00
Male	458	1062	1.08 (0.93-1.25)	2.02 (1.26-3.23)*
Alcohol 12 months				
No	673	1757	1.00	1.00
Yes	368	762	1.26 (1.08-1.46)	1.15(0.74-1.79)
Coffee consumption				p=0.001
Less than 2 cups per day	499	1098	1.00	1.00
2 cups and above per day	542	1421	0.83(0.72-0.97)	0.51(0.34-0.76)*
Salt consumption				
Normal	430	810	1.00	1.00
High	611	1709	0.67(0.58-0.78)	0.95(0.63-1.43)
Low physical activity				
No	282	502	1.49 (1.26-1.77)	1.00
Yes	759	2017	1.00	1.17(0.75-1.85)
Family history of HTN				
Yes	718	1996	1.00	1.00
No	275	443	0.58 (0.48-0.69)	0.87 (0.56-1.36)
Body Mass Index			P=0.005	
18.5-24.9	504	1539	1.00	1.00
<18.5	48	319	0.46 (0.33-0.63)	0.26 (0.07-0.94)* .04
25-29.9	341	519	2.01 (1.69-2.34)	1.48 (0.94-2.32)
≥ 30	145	139	3.19 (2.47-4.10)	2.18 (1.2-3.98)* .01
Abdominal obesity ≥ 0.90 m (Men) & ≥ 0.85 m (Women)				P=0.02
No	350	1308	1.00	1.00
Yes	691	1211	2.13 (1.84-2.48)	1.67 (1.1-2.6)*
DM				
No (< 126 mg/dl)	207	344	1.00	1.00
Yes (≥ 126 mg/dl)	30	21	2.37 (1.32-4.27)	0.74 (0.41-1.32)
Cholesterolemia				
No (<200 mg/dl)	103	224	1.00	1.00
Yes (≥ 200 mg/dl)	127	128	2.158 (1.54-3.03)	1.26 (0.82-1.95)
Triglyceridemia				P=0.007
No (<150 mg/dl)	99	242	1.00	1.00
Yes (≥ 150 mg/dl)	131	110	2.91 (2.06-4.11)	1.79 (1.17-2.73)*
Vegetable servings consumed in days per week				P= 0.008
>3 days	128	320	1.00	1.00
≤ 3 days	905	2174	1.04 (0.84-1.29)	2.59 (1.28-5.21)*

P-value < 0.05* and <0.001**

Knowledge, attitudes, and practices related with HTN

Most participants (87.6%) knew that HTN was an illness, and 3158 (88.7%) agree that BP checks were necessary regularly. More than half (1862, or 52.3%), measured their BP before the survey, while 395 (21.2%) said they had HTN, and 288 (72.9%) of participants were diagnosed with it 12 months before the survey (Table 22).

Regarding the risk factors for HTN, the participants believed that while physical exercise and a balanced diet would lower the risk of HTN, smoking and excessive salt intake would raise it. The main symptoms of HTN that were mentioned by more than two-thirds (69.3%) of the participants were headaches in the morning, nosebleeds, changes in eyesight, buzzing in the ears, and nausea. According to seventy-nine percent (79.4%) of the participants, it is possible to prevent HTN. There was a familial history of HTN in one-fifth (20.2%) of the participants (Table 22).

Table 22: Knowledge, attitudes, and practices related to HTN among the study participants in Addis Ababa, Ethiopia, October 2018 (n=3560)

Variables	Frequency	Percent
Do you know HPN is a disease		
Yes	3119	87.6
No	441	12.4
You should check your BP regularly		
Yes	3158	88.7
No	402	11.3
Have you measured your BP		
Yes	1862	52.3
No	1698	47.7
Have you ever told Hypertensive (n=1862)		
Yes	395	21.2
No	1467	78.8
Have you been told HTN in the past 12 months (n=395)		
Yes	288	72.9
No	107	27.1
Excess salt can be a risk factor for HTN		
Yes	2987	83.9
No	573	16.1
Can exercise lower BP		
Yes	2828	79.4
No	732	20.6
Balanced diet lower BP		
Yes	2761	77.6
No	799	22.4
Smoking is risk factor for HTN		
Yes	2547	71.5
No	1013	28.5
Sign and symptoms of HTN *(headache in the morning, nosebleeds, changes in eyesight, buzzing in the ears, nausea)*		
Mention at least one	2468	69.3
Don't know	1092	30.7
HTN is preventable disease		
Yes	2825	79.4
No	735	20.6
HTN is hereditary disease		
Yes	1981	55.6
No	1579	44.4
Family history of HTN		
Yes	718	20.2
No	2714	76.2
Don't know	128	3.6

5.2. Prevalence and associated factors of DM

Description of the study participants

Of the 3560 participants who completed the first and second questionnaires, 692 persons were chosen at random for this study, and 602 people agreed to participate. More than two-thirds (71.8%) of the respondents were females. The respondents' ages ranged from 18 to 95, with a median age of 40 (IQR 30, 56). Almost half (43.5%) of the participants were between the ages of 30-49. Over one-third (32.6%) were enrolled in primary school, and about two-thirds (60.3%) of the women were married. Muslims comprised the second largest group (12.6%), with Orthodox Christians accounting for more than three-quarters (77.6%).Additionally, one-third (33.2%) were housewives, and four-fifths (80.6%) of participants had no family history of DM (Table 23).

Table 23: Socio demographic characteristics of the study respondents, in Addis Ababa, Ethiopia, October 2018

Variables	Number	Percent
Sex		
Male	170	28.2
Female	432	71.8
Age group		
18-29	129	21.4
30-49	262	43.5
50 and above (50-95)	211	35.0
Highest education level		
Primary	196	32.6
Secondary	86	14.3
Preparatory	76	12.6
Technique	13	2.2
College and above	86	14.3
Not attended formal education	145	24.1
Marital status		
Never married	113	18.8
Currently married	363	60.3
Separated	14	2.3
Divorced	31	5.1
Widowed	79	13.1
Religion		
Orthodox	467	77.6
Muslim	76	12.6
Protestant	51	8.5
Catholic	6	1.0
Employment status		
Government employee	87	14.5
Non-government employee	29	4.8
Self employed	158	26.2
Student	27	4.5
Housewife	200	33.2
Daily laborer	6	1.0
Merchant	7	1.2
Able to work but unemployed	32	5.3
Unable to work & unemployed	56	9.3
Family size		
1-4	343	57.0
≥5	259	43.0
First relative with DM		
Yes	100	16.6
No	485	80.6
Don't know	**17**	2.8

Behavioral and physiological features of the respondents

Overall, about 11 (1.8%) of participants were current smokers (smoking cigarettes daily and non-daily). The mean age of smokers to start smoking was 20.8 ± 5.17 years. Twenty (3.3%) participants were presently chewing khat (Cata edulis forsk). Nearly two-thirds of 180 (29.9%) drank alcohol for the last 12 months (Table 24).

The consumption of fruits and vegetables among the study respondents was assessed as indicated in Table 24. In terms of the dietary habits of the participants, almost all 581 (96.5%) of them consumed fruits and/or veggies below the recommendations of the WHO, and only 21 (3.5%) ate five or more times per day. More than half (364, or 60.5%) of the participants said they regularly used palm oil, while only 230 (38.2%) ate oils made from vegetables like Niger, sesame, and sunflower oil when cooking their food. Regarding physical activity, more than a quarter (27.2%) of participants had low-level physical activity and 54 (9.0%) performed high-level physical activity. Nearly one-third (32.4%) of participants were overweight; in addition, 82 (13.6%) were obese (Table 24).

Table 24: Behavioral and physiological features of the study respondents, in Addis Ababa, Ethiopia, October 2018

Variables	Number	Percent
Smoking		
Current smoker	11	1.8
Ex- smoker	11	1.8
Never smoker	580	96.3
Mean age 20.8 ± 5.17		
Khat		
Yes	20	3.3
No	582	96.7
Alcohol consumption		
Current drinker	180	29.9
No drinking	422	70.1
5+serving fruit/veg. per day		
Yes	21	3.5
No	581	96.5
Type of oil used in cooking		
Sesame and Sunflower oil	230	38.2
Palm oil	364	60.5
Don't know	8	1.3
Level of physical activity		
High	54	9.0
Moderate	384	63.8
Low	164	27.2
Body Mass Index		
Normal (18.5-24.9)	280	46.5
Underweight (<18.5)	43	7.1
Overweight (25.0-29.9)	195	32.4
Obese (≥30)	82	13.6

The median fasting blood glucose levels

For participants aged 18-29, 30-49, and 50 years and above, the median FBG value rose with age to 103 mg/dl (IQR 97-113), 109 mg/dl (IQR 100-117), and 117 mg/dl (IQR 105-128), respectively (Figure 10). The blood glucose levels at fasting were 110 mg/dl (IQR 100,119).

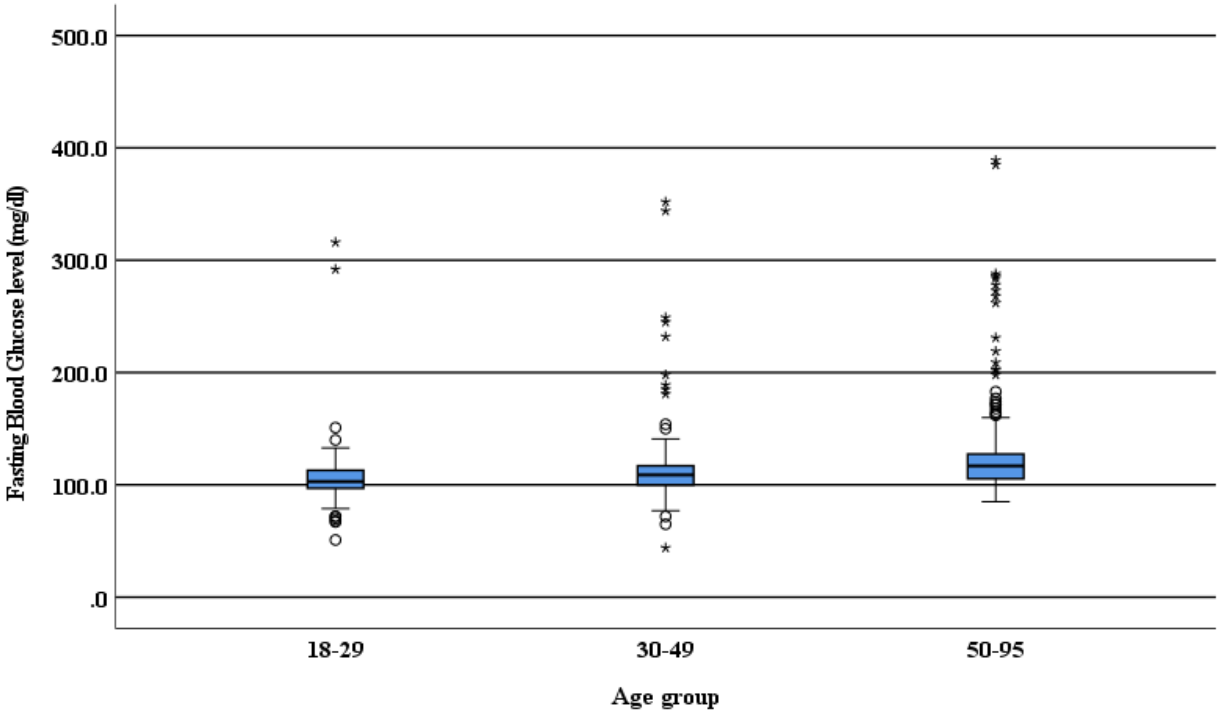

Figure 10: Median Fasting Blood Glucose levels of respondents among age groups in Addis Ababa, Ethiopia, October 2018

Prevalence of DM

The overall prevalence of DM was 14.3% (95% CI: 11.5–17.1). The prevalence of DM was 16.5 % (95% CI: 10.8-22.1) and 13.4% (95% CI: 10.2-16.7) among men and women, respectively (Table 25). From the total eighty-six respondents who noticed to have DM, more than two-thirds 61 (70.9 %) were detected during this survey. The overall prevalence of reported DM was 99 (2.8%).

Table 25: Prevalence of DM among the study respondents, in Addis Ababa, Ethiopia, October 2018

Age groups (years)	Male			Female			Both sex		
	N	%	95%CI	N	%	95%CI	N	%	95%CI
18-29	42	2.4	1.0-7.2	87	6.9	1.5-12.3	129	5.4	1.5-9.4
30-49	66	9.1	2.0-16.3	196	8.2	4.3-12.0	262	8.4	5.0-11.8
≥50	62	40.3	33.9-46.0	149	24.2	17.2-31.1	211	27.1	21.0-33.1
Total	170	16.5	10.8-22.1	432	13.4	10.2-16.7	602	14.3	11.5-17.1

Factors associated with DM

The results of the multivariable analysis showed that DM was associated with age. The odds of DM was higher almost four times AOR =3.9(95% CI: 1.6-9.5) among those aged 50 years and above compared to 18–29 years (Table 26).

From modifiable factors, body mass index, abdominal obesity, amount of TG, and HDL-C were associated with DM. The odds of diabetes mellitus was higher by two times AOR =2.3 (95% CI: 1.2-4.2) and more than four times AOR=4.6 (95% CI: 2.2-9.3) among overweight and obese participants, respectively, in comparison to possessing normal BMI. Furthermore, the odds of DM was two times higher AOR=2.1 (95% CI: 1.0-4.4) between participants with abdominal obesity in contrast to their analog (Table 26).

Moreover, the odds of DM were higher two times AOR =2.0 (95% CI: 1.2-3.4) and nearly three times AOR=2.7 (95% CI: 1.6-4.7) among participants with triglyceridemia and low HDL-C level respectively in contrast to their analog. In this specific survey, marital status, education, consumption of alcohol, high consumption of sweet foods, family history of DM, and HTN are not associated to DM (Table 26).

Table 26: Multivariable analysis for variables related to DM on the surveyed respondents in Addis Ababa, Ethiopia, October 2018

Variables	DM		Crude OR (95% CI)	AOR(95% CI)	P-value
	Yes (N=86)	No (N=516)			
Age in years					
18-29	7	122	1.00	1.00	
30-49	22	240	1.6(0.7-3.8)	0.9 (0.3-2.3)	0.79
≥50	57	154	6.45(2.8-14.7)	3.9 (1.6-9.5)	0.003*
Marital status					
Never married	7	106	1.00	1.00	
Married [1]	78	409	0.4 (0.2-0.8)	1.04 (0.4-2.8)	0.93
Education					
Primary	24	172	1.00	1.00	
2ry & preparatory	22	140	1.13 (0.6-2.1)	1.5 (0.7-3.1)	0.29
Technique & college	7	92	0.6 (0.2-1.3)	0.71 (0.3-2.0)	0.51
Not attended formal education	33	112	2.1(1.2-3.8)	1.5 (0.8-2.9)	0.24
Consumption of alcohol					
No	69	353	1.00	1.00	
Yes	17	163	0.5(0.3-0.9)	0.6(0.3-1.1)	0.07
Frequent consumption of sweets					
No	72	374	1.00	1.00	
Yes	14	142	0.5(0.3-0.9)	0.6(0.3-1.2)	0.16
First relative with DM					
No	64	421	1.00	1.00	
Yes	19	81	1.5(0.9-2.7)	1.6(0.9-3.1)	0.15
BMI (kg/m^2)					
< 25	25	298	1.00	1.00	
25–29.9	34	161	2.5(1.5-4.4)	2.3(1.2-4.2)	0.008*
≥30	27	55	5.9(3.2-10.8)	4.55(2.2-9.3)	<0.001**
Abdominal obesity (≥ 90 cm for males and ≥ 85 cm for females)					
No	12	169	1.00	1.00	
Yes	74	347	3.0(1.6-5.7)	2.1(1.0-4.4)	0.04*
TG level (≥150mg/dl)					
No	34	307	1.00	1.00	
Yes	52	189	2.5(1.6-4.0)	2.0(1.2-3.4)	0.01*
HDL-C (< 40 mg/dl for men and <50 mg/dl for women)					
No	35	308	1.00	1.00	
Yes	51	188	2.4(1.5-3.8)	2.7(1.6-4.7)	<0.001**
HTN					
No	39	326	1.00	1.00	
Yes	47	190	2.1(1.3-3.3)	1.0(0.5-1.7)	0.86

*p < 0.05 and **p < 0.001; [1]Married includes currently married, divorced and widowed/widower

Knowledge, attitudes and practices related DM

A total of 3560 respondents provided their knowledge, attitude, and practice, even though 602 individuals had their blood samples taken. The majority of participants (85.2%) were aware that DM was an illness and 3397 (95.4%) agreed that blood glucose checks were necessary even in cases where a person had no symptoms. Before the survey, 775 (21.8%) of the participants, or less than one-fourth, had a blood glucose test. Of individuals who provided blood samples prior to the survey, 99 (12.8%) had been diagnosed with DM, and most of them (86.9%) had been diagnosed within 12 months before the study (Table 27).

Among the participants, 2,142 (60.2%) recognized at least one risk factor for DM, such as obesity, physical inactivity, alcohol drinking, and insufficient fruit and vegetable intake. Among the symptoms of DM, 2,472 (67.5%) of participants said they were aware of thirst, polyuria, blurred vision, and weight loss. Of the participants, half (49.6%) mention at least one diabetes mellitus consequence, and over two-thirds (68.7%) mention at least one DM prevention measure (regular physical activity, minimize alcohol intake, weight reduction, and practice healthy diet) (Table 27).

Table 27: Knowledge, attitudes, and practices related to DM among the study participants in Addis Ababa, Ethiopia, October 2018

Variables	Frequency	Percent
Do you hear about DM		
Yes	3034	85.2
No	526	14.8
Do you think that you should screen to DM		
Yes	3397	95.4
No	163	4.6
Have you ever measured your blood for DM		
Yes	775	21.8
No	2785	78.2
Have you ever been told that you have DM (775)		
Yes	99	12.8
No	676	87.2
Have you been told in the past 12 months? (99)		
Yes	86	86.9
No	13	13.1
Risk factors of DM *(obesity, physical inactivity, alcohol drinking, and insufficient fruit and vegetable intake)*		
Mention at least one	2142	60.2
Don't know	1418	39.8
Symptoms of DM *(thirst, polyuria, blurred vision, and weight loss)*		
Mention at least one	2402	67.5
Don't know	1158	32.5
Complication of DM *(blindness, kidney problem, amputation, death)*		
Mention at least one	1766	49.6
Don't know	1794	50.4
Prevention of DM *(regular physical activity, minimize alcohol intake, weight reduction, and practice healthy diet)*		
Mention at least one	2445	68.7
Don't know	1115	31.3

5.3. Prevalence and associated factors of dyslipidemia

Description of the Study Participants

Out of the 3560 participants that filled out the first and second questionnaires, 692 were randomly chosen for this study, despite the fact that only 602 gave consent. Blood samples from 582 people were examined for lipid profiles since the remaining 20 participants declined to provide blood samples after several trials; the samples were insufficient, and clots formed.

More than two-thirds (72.2%) of the participants were female. The respondents' ages ranged from 18 to 95, with a median age of 40 (IQR 30, 55), and almost half (44.3%) of the participants were between the ages of 30 and 49. Nearly one-third (32.8%) were enrolled in primary school, and about two-thirds (61.0%) of the women were currently married. Muslims comprised the second largest group (12.5%), with Orthodox Christians accounting for more than three-quarters (77.8%). Additionally, one-third (33.3%) were housewives, and one to four people made up more than half (57.0%) of the participants' families (Table 28).

Table 28: Background characteristics of the study respondents, in Addis Ababa, Ethiopia, October 2018

Characteristics	Frequency	Percent
Sex		
Male	162	27.8
Female	420	72.2
Age in years		
18-29	122	21.0
30-49	258	44.3
≥50	202	34.7
Highest education level		
Primary	191	32.8
Secondary	82	14.1
Preparatory	74	12.7
Technique	12	2.1
College and above	84	14.4
Not attended formal education	139	23.9
Marital status		
Never married	108	18.6
Currently married	355	61.0
Separated	14	2.4
Divorced	30	5.2
Widowed	73	12.5
Non response	2	0.3
Religion		
Orthodox	453	77.8
Muslim	73	12.5
Protestant	49	8.4
Catholic	5	0.9
Other	2	0.4
Employment status		
Government employee	86	14.8
Non-government employee	29	5.0
Self employed	151	25.9
Student	24	4.1
Housewife	194	33.3
Daily labourer	6	1.0
Merchant	6	1.0
Unemployed (able to work)	32	5.5
Unemployed (unable to work)	9	1.5
Retired (pensioner)	45	7.7
Family size		
1-4	332	57.0
≥5	250	43.0

Behavioral and physiological characteristics of the study participants

A total of 11 (1.9%) of those who responded to the study were current smokers (smoking cigarettes daily and non-daily). Smokers started smoking at an average age of 20.8± 5.1 years old. Ten people (1.7%) had ever smoked cigarettes. Nineteen people (3.3%) were passive smokers or inhalers of secondhand smoke. Additionally, 3.3% of the individuals chewed khat (Table 29).

Of the participants, 174 (29.9%) reported drinking alcohol during the past 12 months. Furthermore, 59 respondents, or 12.7%, reported eating vegetables more than three times per week, while 28 respondents, or 8.5 percent, reported eating fruit more than three times per week. Just 223 (38.3%) of the participants reported using vegetable oils such as Niger, sunflower, and sesame to cook, compared to 351 (60.3%) who reported using palm oil (Table 29).

Regarding physical activities, more than a quarter (26.6%) of participants had low-level physical activity and 51 (8.8%) performed high-level physical activity. The majority (92.6%) of participants walked 10 minutes per day. Nearly one-third (32.2%) of participants were overweight; in addition, 82 (14.1%) were obese (Table 29).

Table 29: Descriptive characteristics of the study respondents according to gender, in Addis Ababa, Ethiopia, October 2018

Variables	Men(N=162)	Women(N=420)	Overall(N=582)
Lifestyle, diet and exercise			
Smoking			
Current smoker	8(4.9)	3(0.71)	11(1.9)
Ex-smoker	8(4.9)	2(0.48)	10(1.7)
Never smoker	146(90.1)	415(98.8)	561(96.4)
Mean age 20.8 ± 5.2			
Passive smoker			
Yes	4(2.5)	15(3.6)	19(3.3)
No	156(97.5)	405(96.4)	561(96.7)
Khat			
Yes	14(8.6)	5(1.2)	19(3.3)
No	148(91.4)	415(98.8)	563(96.7)
Alcohol consumption			
Yes	77(47.5)	97(23.1)	174(29.9)
No	85(52.5)	323(76.9)	408(70.1)
Vegetable consumed in days per week (n=466)			
≤ 3days	110(27.0)	297(73.0)	407(87.3)
> 3 days	17(28.8)	42(71.2)	59(12.7)
Fruit consumed in days per week (n=328)			
≤ 3days	81 (27.0)	219(73.0)	300(91.5)
> 3 days	8(28.6)	20(71.4)	28(8.5)
Type of oil used in cooking			
Sesame, Nug, Sunflower	58(35.8)	165(39.3)	223(38.3)
Palm	102(63.0)	249(59.3)	351(60.3)
Don't know	2(1.2)	6(1.4)	8(1.4)
Level of physical activity			
High	33(20.4)	18(4.3)	51(8.8)
Moderate	104(64.2)	272(64.8)	376(64.6)
Low	25(15.4)	130(31.0)	155(26.6)
Walk for10' per day			
Yes	151(93.2)	388(92.4)	539(92.6)
No	11(6.8)	32(7.6)	43(7.4)
Anthropometric indicators			
Body Mass Index[2]			
Normal(18.5-24.9)	94(58.0)	178(42.6)	272(46.9)
Underweight(<18.5)	10(6.2)	29(6.9)	39(6.7)
Overweight(25.0-29.9)	48(29.6)	139(33.3)	187(32.2)
Obese(≥ 30)	10(6.2)	72(17.2)	82(14.1)

[1] Missing data on Body Mass Index for 2 females

Description of dyslipidemia

It was found that the overall mean values of TC, HDL-C, and LDL-C were 182.7± 48.4, 50.0 ± 12.9, and 112.5± 34.9 mg/dl, respectively. Furthermore, 136.5 (IQR 94, 192) mg/dl was the median TG level.

In terms of the lipid profile distribution, men had greater TG levels (148 and 132 mg/dl, respectively), and women have higher average TC levels (184 and 179 mg/dl, respectively) (Figure 11).

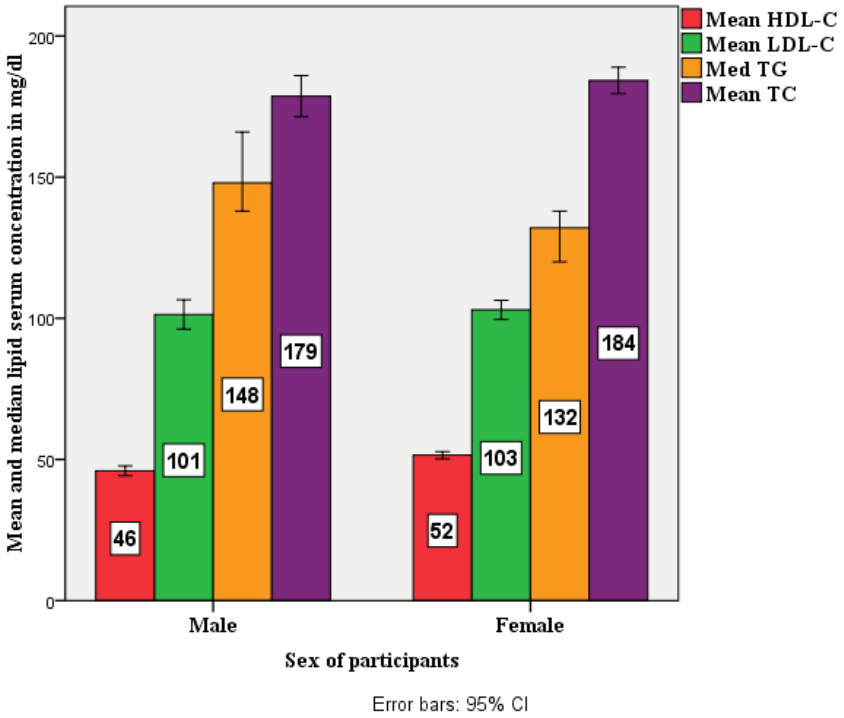

Figure 11: Serum lipid concentration based on sex among the study participants, in Addis Ababa, Ethiopia, October 2018.

Prevalence of Dyslipidemia

Out of all the participants in the study, 60 (1.7%) had examined their lipid profile before the survey; nevertheless, only 17 (0.5%) of them reported having dyslipidemia.

Dyslipidemia was identified in 451 study subjects, representing 77.5% of the participants (95% CI: 74.1–89.9). Specifically, isolated low HDL-C was observed in 131 participants 22.5% (95% CI: 19.1-25.9), isolated triglyceridemia in 111 participants 19.1% (95% CI: 15.9-22.3), and isolated cholesterolemia in 75 participants 12.9% (95% CI: 10.7-15.6). Mixed hyperlipidemia was found in 128 participants 22.0% (95% CI: 18.6-25.4). Furthermore, among the 450 respondents with dyslipidemia, 433 individuals (96.2%) were newly diagnosed. These findings highlight the prevalence of dyslipidemia and its various types within the study population and the huge number of newly diagnosed individuals.

The prevalence of triglyceridemia, low HDL-C, cholesterolemia, and high LDL-C levels were 41.4% (95% CI: 37.4-45.4), 41.1% (95% CI: 37.1-45.1), 34.0% (95% CI: 30.2-37.9), and 24.6% (95% CI: 21.1-28.1), respectively. The two most common dyslipidemias were triglyceridemia and low HDL-C (Table 30-33).

Table 30: Prevalence of triglyceridemia based on age and sex among the study participants, in Addis Ababa, Ethiopia, October 2018

Prevalence of triglyceridemia									
Age groups (years)	**Male**			**Female**			**Both sex**		
	N	%	95%CI	N	%	95%CI	N	%	95%CI
18-29	38	23.7	9.5-37.9	84	19.1	10.5-27.6	122	20.5	13.2-27.8
30-49	63	60.3	47.7-72.7	195	38.9	32.1-45.9	258	44.2	38.1-50.3
≥50	61	52.5	39.6-65.4	141	49.7	41.3-58.0	202	50.5	43.5-57.5
Total	162	48.8	41.0-56.5	420	38.6	33.9-43.3	582	41.4	37.4-45.4

Table 31: Prevalence of low HDL-C based on age and sex among the study participants, in Addis Ababa, Ethiopia, October 2018

Prevalence of low HDL-C									
Age groups (years)	Male			Female			Both sex		
	N	%	95%CI	N	%	95%CI	N	%	95%CI
18-29	38	28.9	13.8-44.1	84	51.2	40.3-62.1	122	44.3	35.3-53.2
30-49	63	30.2	18.5-41.8	195	42.6	35.6-49.6	258	39.5	33.5-45.5
≥50	61	27.9	16.3-39.5	141	46.8	38.5-55.2	202	41.1	34.3-47.9
Total	162	29.0	21.9-36.1	420	45.7	40.9-50.5	582	41.1	37.1-45.1

Table 32: Prevalence of cholesterolemia based on age and sex among the study participants, in Addis Ababa, Ethiopia, October 2018

Prevalence of cholesterolemia									
Age groups (years)	Male			Female			Both sex		
	N	%	95%CI	N	%	95%CI	N	%	95%CI
18-29	38	7.9	1.0-16.9	84	9.5	3.1-15.9	122	9.0	3.9-14.2
30-49	63	33.3	21.4-45.3	195	38.9	32.1-45.9	258	37.6	31.7-43.6
≥50	61	36.1	23.7-48.5	141	48.2	39.9-56.6	202	44.6	37.6-51.5
Total	162	28.4	21.4-35.4	420	36.2	31.6-40.8	582	34.0	30.2-37.9

Table 33: Prevalence of high LDL-C based on age and sex among the study participants, in Addis Ababa, Ethiopia, October 2018

Prevalence of high LDL-C									
Age groups (years)	Male			Female			Both sex		
	N	%	95%CI	N	%	95%CI	N	%	95%CI
18-29	38	2.6	1.0-7.9	84	3.6	1.0-7.6	122	3.3	0.07-6.5
30-49	63	25.4	14.4-36.5	195	28.7	22.3-35.1	258	27.9	22.4-33.4
≥50	61	34.4	22.2-46.7	141	32.6	24.8-40.5	202	33.2	26.6-37.9
Total	162	23.5	16.9-30.1	420	25.0	20.8-29.2	582	24.6	21.1-28.1

Factors associated with TG, HDL-C and TC

The results of the multivariable analysis revealed that triglyceridemia was associated with sex and age. Females had a 40% lower AOR = 0.6 (95% CI: 0.4-0.9) odds of having a high TG level than males. With increasing age, the odds of triglyceridemia increased. When compared to those aged 18–29 years, the odds of triglyceridemia higher nearly threefold AOR = 2.7 (95% CI: 1.6–4.6) among those aged 30-49 years and more than two fold AOR = 2.3 (95% CI: 1.3–4.0) among those aged 50 and above (Table 34).

Among modifiable factors, triglyceridemia was associated with DM, sitting for more than three hours per day, and HTN. Respondents with DM were twice as higher odds to develop triglyceridemia as their counterparts AOR = 2.1 (95% CI: 1.3–3.4). In addition, the odds of triglyceridemia was almost twice as high for those who sat for more than three hours a day AOR = 1.6 (95% CI: 1.0-2.4) as for the other group. Moreover, the odds of triglyceridemia raised twice as much in HTN respondents as in non-hypertensive respondents AOR = 2.3 (95% CI: 1.6-3.3) (Table 34).

Low HDL-C levels, according to our findings, were also associated with sex, BMI, and DM. When females were compared to males, the odd of having a low HDL-C level was higher by double AOR = 2.1 (95% CI: 1.4-3.3). The odds of low HDL-C level was also twice as common among obese respondents as among those with a normal BMI, with an AOR= 2.0 (95% CI: 1.2-3.4). Furthermore, respondents with DM had more than twice the odds of having a low HDL-C AOR = 2.2 (95% CI: 1.4-3.8) than their counterparts (Table 34).

In addition, sex, age, and HTN were all found to be associated with cholesterolemia. Females had a one-and-a-half time AOR=1.6 (95% CI: 1.0-2.4) higher odds of cholesterolemia than males. The odds of cholesterolemia was five times more among those aged 30-49, AOR =5.2 (95% CI: 2.7–10.3), and more than six times among those aged 50 and above, AOR =6.4 (95% CI: 3.2–13.0), compared to those aged 18–29. Moreover, respondents with HTN had a nearly two-fold higher odds of having cholesterolemia compared to respondents without HTN AOR = 1.6 (95% CI: 1.1–2.3) (Table 34).

Table 34: Multivariable logistic regression analysis on the prevalence of dyslipidemia among respondents in Addis Ababa, Ethiopia, October 2018

Variables	Triglyceridemia≥150 mg/dl		Low HDL-C < 40 for male and < 50 mg/dl for female		Cholesterolemia ≥200 mg/dl	
	N (%)	**AOR (95% CI)**	**N (%)**	**AOR (95% CI)**	**N (%)**	**AOR (95% CI)**
	241(41.4)		**239 (41.1)**		**198 (34.0)**	
Sex						
Male	79(48.8)	1.00	47(29.0)	1.00	46(28.4)	1.00
Female	162(38.6)	0.6(0.4-0.9) *	192 (45.7)	2.1(1.4-3.3) **	152(36.2)	1.6 (1.0-2.4)*
Age						
18-29	25(20.5)	1.00	54(34.3)	1.00	11(9.0)	1.00
30-49	114(44.2)	2.7(1.6-4.6) *	102(39.5)	0.7(0.5-1.2)	97(37.6)	5.2(2.7-10.3) **
≥50	102(50.5)	2.3(1.3-4.0) *	83(41.4)	0.7(0.4-1.3)	90(44.6)	6.42(3.2-13.0) **
Alcohol consumption						
No	165(40.4)	1.00	175(42.9)		142(34.8)	1.00
Yes	76(43.7)	0.91(0.6-1. 4)	64(36.8)		56 (32.2)	0.8(0.6-1.3)
BMI						
18.5-24.9	104(38.2)	1.00	93(34.2)	1.00	84 (30.9)	1.00
<18.5	8(20.5)	0.6 (0.3-1.4)	14(35.9)	1.1 (0.6-2.3)	5 (12.8)	0.7(0.3-1.7)
25-29.9	85(45.5)	1.2(0.8-1.8)	83(44.4)	1.4(0.9-2.1)	71(38.0)	1.1 (0.8-1.7)
≥ 30	43(52.4)	1.3(0.7-2.2)	47(57.3)	2.0(1.2-3.4) *	38(46.3)	1.5(0.9-2.5)
High physical activity						
No	218(41.1)	1.00	216(40.7)	1.00	187(35.2)	1.00
Yes	23(45.1)	1.4(0.8-2.8)	23(45.1)	0.6(0.3-1.1)	11(21.6)	1.5(0.8-3.0)
DM						
No	189(38.1)	1.00	188(37.9)	1.00	161(32.5)	1.00
Yes	52(60.5)	2.1(1.3-3.4) *	51(59.3)	2.3(1.4-3.8) *	37 (43.0)	0.7(0.4-1.4)
Abdominal obesity						
No	60(34.7)	1.00	57(32.9)		47 (27.2)	1.00
Yes	181(44.3)	1.38 (0.9-2.2)	182(44.5)		151(36.9)	1.4(0.9-2.1)
Sitting per day						
≤ 3 hrs	172(38.4)	1.00	194(43.3)	1.00	144(32.1)	1.00
>3hrs	69(51.9)	1.6(1.0-2.4) *	45(33.8)	0.7(0.5-1.1)	53(39.8)	1.15(0.7-1.8)
HTN						
No	110(31.3)	1.00	145(41.2)		96 (27.3)	1.00
Yes	131(57.0)	2.3(1.6-3.3) **	94(40.9)		102(44.3)	1.57(1.1-2.3) *

*p < 0.05 and **p < 0.001

Factors associated with LDL- C and Dyslipidemia

The results of the multivariable analysis indicated that LDL-C was associated with both age and HTN. The odds of having high LDL-C rose with age. The odds of having LDL-C was more than eight times higher in those aged 30-49 AOR = 8.4 (95% CI: 2.9–24.0) and aged 50 and above AOR = 8.5 (95% CI: 2.9–24.8), than in those aged 18–29. Moreover, the odds of LDL-C higher

almost twice as high in HTN respondents as in non-hypertensive respondents AOR = 1.7 (95% CI: 1.1-2.7) (Table 35).

Moreover, dyslipidemia was associated with marital status, BMI, and DM. The odds of dyslipidemia were reduced among never married by 50% AOR = 0.5 (95% CI: 0.3-0.9) as compared to married. The odds of dyslipidemia were higher among obese, diabetes mellitus, and hypertensive participants: AOR =6.1 (95% CI: 1.8-21.1), 6.7 (95% CI: 1.9-23.1), and 1.8 (95% CI: 1.2-3.2), respectively (Table 35).

In this particular study, alcohol use, high physical activity, and abdominal obesity were not significantly associated with dyslipidemia (Table 34 and 35).

Table 35: Multivariable logistic regression analysis of factors associated with high LDL-C and dyslipidemia among study participants in Addis Ababa, Ethiopia, October 2018

Variables	LDL- C ≥130		AOR (95% CI)	Dyslipidemia		AOR (95% CI)
	Yes	No		Yes	No	
Sex						
Female	105	315	1.00	336	84	1.00
Male	38	124	0.85(0.5-1.4)	115	47	0.60(0.4-1.0)
Age						
18-29	4	118	1.00	73	49	1.00
30-49	72	186	8.4(2.9-24.0)*	202	56	1.3(0.7-2.3)
≥50	67	135	8.5(3.0-24.8)**	176	26	1.8(0.7-3.7)
Marital status						
Married	128	344	1.00	386	86	1.00
Never married	14	94	1.1(0.6-2.3)	64	44	0.5(0.3-0.9)*
Alcohol						
No	99	309	1.00	321	87	1.00
Yes	44	130	1.0(0.7-1.6)	130	44	1.0(0.6-1.6)
BMI						
18.5-24.9	57	215	1.00	195	77	1.00
<18.5	3	36	0.5 (0.2-1.9)	22	17	0.6 (0.3-1.4)
25-29.9	53	134	1.2(0.7-1.8)	154	33	1.6(0.9-2.6)
≥ 30	30	52	1.4(0.8-2.5)	78	4	6.1 (1.8-21.1) *
High physical activity						
Yes	9	42	1.00	38	13	1.00
No	134	397	1.2(0.5-2.7)	413	118	0.5(0.2-1.1)
DM						
No	113	383	1.00	368	128	1.00
Yes	30	56	1.3(0.7-2.2)	83	3	6.7(1.9-23.1) *
Abdominal obesity						
No	45	164	1.00	151	58	1.00
Yes	98	275	0.9(0.6-1.3)	300	73	1.2(0.8-1.9)
Sitting per day						
≤ 3 hrs	103	345	1.00	344	104	1.00
>3hrs	40	93	1.33(0.8-2.1)	106	27	1.2(0.7-2.0)
HTN						
No	62	290	1.00	252	100	1.00
Yes	81	149	1.7(1.3-2.7)*	199	31	1.8(1.2-3.2)*

*p < 0.05 and **p < 0.001

6. Discussion

Early in 1993, the Ethiopian Health Policy prioritized the prevention of non-communicable diseases as a secondary concern, emphasizing primarily the promotion and prevention of communicable diseases. While there was no significant NCDs program implementation initially, the prevention and control of NCDs gained attention with the Health Sector Development Programs (HSDP) III from 2005 to 2010. Some national NCDs prevention and control initiatives were then launched with the HSDP IV from 2010 to 2015(5). With numerous strategies and substantial interventions, NCDs were recognized as one of the main disease control objectives in the Health Sector Transformation Plan 2015/16-2019/20 (22). The primary strategies addressed the four primary risk factors for NCDs: tobacco use, harmful alcohol consumption, unhealthy diet, and physical inactivity.

Behavioral characteristics

Tobacco/ Smoking

By 2020, the global smoking prevalence was 15.5% (26.4% for men and 4.6% for women), whereas in Africa, it was 7.1% (13.4% for men and 0.9% for women) .(146). According to the Ethiopian National Steps Report, 2.9% (1.2–4.5%) of respondents in Addis Ababa were current smokers; women made up 0.7%, while men made up 13.3% (5.0–10.3%). Furthermore, data from Ethiopia's Global Adult Tobacco Survey (GATS) revealed that the prevalence of current smokers in Addis Ababa was 2.2% (1.3-3.9%) in 2016 (147). According to our data, about 4.2% of survey participants are current smokers; men are more likely to smoke (9.0) than women (0.7). The results of previous studies conducted in the same area are comparable to ours.

Tobacco use is the world's most common preventable cause of death. Reducing tobacco use is essential not only for global health but also for the economy, sustainable development, and human rights. Despite the fact that no nation has fully met its obligations under the WHO Framework Convention on Tobacco Control, the number of people at risk of tobacco-related premature death and disability continues to rise with each passing day, hindering progress towards the sustainable development goal.

Harmful use of alcohol

In 2016, 43% of people worldwide and 32.2% of people in Africa were current drinkers. The Ethiopian Steps report showed a higher proportion, with 35.3% of Addis Ababa residents reporting drinking alcohol in the previous month. Men were more likely to drink (46.0%) than women (30.6%) (8, 108). Our study aligns with these findings. Under SDGs goal three, alcohol is specifically listed in the context of preventing and treating substance use, including the abuse of narcotic drugs and hazardous alcohol consumption. Numerous studies have established a clear link between alcohol use and major non-communicable diseases. Reducing dangerous alcohol intake within populations is essential to successful NCDs prevention and control, which will reduce the number of fatalities and complications.

The study area and its surroundings are home to industries that make alcoholic beverages, and traditional festive drinks like Teji, Areki, and Tella are made at home. Alcohol is an essential component of many festivities, such as weddings and graduations. Another issue is the widespread perception that traditional alcohol (Areki) can treat HTN. All these factors make it easier for people to obtain alcohol, increasing the number of drinkers.

Fruits and vegetables

Fruit and vegetable-rich diets are linked to a lower risk of NCDs (148). Our data showed that 67.2% of people consumed fruits at least once a week. In a similar vein, WHO data indicated that Ethiopia was one of the five countries with the lowest fruit consumption rates, with an average daily consumption of 1.2 fruits (43). Vegetable consumption was higher in urban areas, averaging1.7 days per week. It was discovered that Addis Ababa had a low frequency of fruit consumption—0.9 days a week (8).

In line with WHO findings, individuals in this study consumed vegetables at least once a week, with a mean of 2.46 servings. Regarding average vegetable consumption per week and day, Ethiopia ranked among the least developed nations with 1.6 and 1.4 servings, respectively (43). Our findings are consistent with Addis Ababa's steps and WHO reports, which showed that 97.0% and 98.9% (the highest country) of participants, respectively, ate less than five servings of fruit and/or vegetables on average per day. Only 96.2% of participants consumed less than five

servings of fruit or vegetables daily (8, 43). Our research showed a significant age gap in fruit and vegetable consumption, consistent with Ethiopia's national progress report (8).

In the nation's capital, Addis Ababa, vegetables grown with irrigated water are cultivated alongside fruits and vegetables from other regions of the country. Despite believing that fruits and vegetables protect against non-communicable diseases, participants did not consume enough of them. Due to the relatively low cost of fried foods like chips and samosas sold by many street vendors, they prefer eating these over fruits. They also opted for easily accessible prepackaged food found in nearby stores, an additional effect of urbanization. Another issue is the price of fruits, which can make it difficult to afford the amount recommended by the WHO.

Physical inactivity

Overall, 15.2%of our participants engaged in high-intensity activities related to their jobs, sports, fitness, or leisure pursuits. A high (vigorous) total physical activity (TPA) was found in about 29.5% of males and 4.6% of females. This finding was consistent with the Ethiopian Steps Report and another study in the Tigray region, where 14.2% of participants engaged in vigorous exercise (8, 134).

Women were categorized as having low activity levels, with 27.7% of participants in this study engaged in low physical activity. Similarly, the WHO reported that the prevalence of physical inactivity in Ethiopia was 26.0%, with32.1% of men and 17.2% of women being inactive (43). Furthermore, in 2016, 28% of person worldwide aged18 and above were not physically active enough (23% of men and 32% of women). In high-income nations, 26% of men and 35% of women were not physically active enough, compared to 12% of men and 24% of women in low-income nations (113).

The relatively higher prevalence of physical inactivity observed in the current study could be attributed to the participants' lifestyles. First, the easy access to buses, trains, and taxis might tempt the Addis Ababa residents to use these modes of transport after work. Second, due to poorly regulated construction and the continuing trend of more building projects that occupy

walking roads with sand and construction materials, walking on Addis roads is inconvenient and dangerous, as pedestrians are forced onto car roads. Third, aside from annual mass sports and monthly events in a few selected locations, there aren't suitable places to work out. Fourth, the high cost of living drives residents to work multiple jobs, which often leaves them exhausted and with little free time and is still insufficient to cover the expensive fitness center fees near their homes and workplaces.

This constant exposure to media and technology may lead individuals to prioritize passive forms of entertainment over outdoor activities or social interactions. As a result, the lack of physical activity and face-to-face communication during weekends could further exacerbate the differences in health outcomes between urban and rural populations. Additionally, the sedentary lifestyle associated with excessive screen time may also contribute to higher rates of obesity and other chronic health conditions in urban areas. Overall, the combination of globalization, urbanization, and technological advancements may be shaping societal norms and behaviors in ways that impact health disparities between urban and rural communities.

6.1. Prevalence and associated factors of HTN

Prevalence of HTN

The mean systolic pressure in our study increased with age, which could be attributed to arterial stiffness and increased atherosclerosis, causing blood vessels to narrow and become more voluminous (149). In line with the rise in the mean diastolic pressure in young and middle-aged participants, additional research revealed these age groups were more likely to have elevated diastolic pressure. In contrast, middle-aged and elderly patients were likelier to have elevated systolic pressure. This is because DBP tends to rise until age 50due to increased arterial resistance. Later in life, major artery stiffening leads to wider pulse pressure, characterized by a low diastolic BP (150, 151). Furthermore, our results are consistent with others showing that men are more likely than women to have diastolic HTN (152).

According to the current study, HTN affected 29.2% (95% CI: 27.8–30.7) of participants, with a slightly higher prevalence in males than in females. Of the 1,041 participants with HTN, six hundred forty-five (61.95%) had only recently been diagnosed, suggesting the effectiveness of recent screening initiatives. Most participants were unaware of their condition, linked to poor regular screening behavior in the community. Even when diagnosed, individuals often fear drug side effects and are reluctant to discuss or begin treatment. Additionally, there is a common misconception that HTN only affects older adults.

Our results showed that almost half of the participants had not measured their BP before the survey, despite the WHO's recommendation that 80% of people with HTN be screened and aware of their diagnosis to meet BP targets (44). However, 88.7% of participants agreed to screen even if they exhibited no symptoms. On the other hand, 11.1% of participants with HTN knew they had the condition, which was consistent with the 14.1% reported in the Cameroon research (153). This may be related to factors involving medical practitioners and the community's poor health-seeking behavior.

There are two perspectives on the factors related to medical practitioners. First, health extension workers visit houses in their catchment areas during working hours. However, people who work are often unavailable during these times, and when they are, they prioritize reproductive and child health concerns over non-communicable illnesses. Second, in health facilities, medical professionals often fail to screen all clients, despite NCDs guidelines advocating for universal screening.

Interestingly, during childhood, there are minor variations in BP between the sexes, with boys generally having higher average levels. However, this difference becomes less pronounced when people become younger. This trend can even reverse in later life stages (52).

In the present study, the prevalence of HTN is equivalent across men and women, with a slight increase among men. This finding is comparable to other community-based studies carried out in Nigeria 35.3% (95% CI: 29.0–42.1), Kenya 29.4 % (95 %: CI 27.0–31.7), Jalalabad, Afghanistan (28.4%), and Gondar, Ethiopia 28.4% (95% CI: 25. 8–28.9) (39, 59, 154, 155). Furthermore, community-based study in Addis Ababa and Gondar, Ethiopia, revealed the prevalence of HTN was slightly higher among men as compared to women (39, 45).

Comparing this study to others conducted in China (22.7%), South Africa (21%), Addis Ababa, Ethiopia (25%), Bahir Dar, Ethiopia (25.1%), and Dire Dawa (24.4%), Ethiopia, revealed a higher prevalence of HTN (62, 114, 140, 156, 157). The discrepancy could be attributed to the age distribution of study populations (18 years and older in our study, compared to15 to 64 years in others). Variations may also be related to the range of socio demographic characteristics, way of life, and food habits of study participants.

Meanwhile, the prevalence of HTN in our study was lower compared to other community-based studies conducted in Sudan (35.7%), South Africa (38.9%), and Bangladesh (36.9%) (56, 130, 158, 159). Variations in race, heredity, and the frequency of other risk factors can all contribute to this discrepancy by influencing BP.

Factors associated with HTN

Although the prevalence and associated factors with HTN have been documented in other studies, the findings in the current study area are novel. Additionally, the study area is unique in realizing the beneficial effects of coffee drinking.

This study found an association between HTN and respondents who were 30 years of age or older. Numerous studies have demonstrated that age is a significant non-modifiable risk factor associated with HTN, with the odds of HTN rising with age (52, 114, 159). This is primarily due to the aging-related rise in systolic BP, which is mainly caused by the increasing stiffness and decreased elasticity of the large duct arteries (160). Furthermore, being male sex was also associated with HTN. This result is in line with the Cameroon study (153). However, research from Dire Dawa and South Africa revealed no gender differences (156, 157).

Overall, our study revealed low vegetable consumption, which was in line with earlier findings that demonstrated a significant association between vegetable consumption and HTN (154). Low fruit and vegetable consumption has been identified as a major risk factor for HTN. Therefore, restrictive diets, such as the Dietary Approaches to Stop HTN (DASH), have been found to help lower BP. A diet high in fruits and vegetables and focusing on meal planning can reduce BP by 8–14 mmHg (26, 27).

Our result indicated that individuals who consumed too much coffee had reduced odds of developing HTN. One of the most popular drinks liked by people globally is coffee. Research indicates an inverse U-shaped relationship between coffee intake and the development of HTN. This means that those who consume coffee at the highest levels or abstain from it are less likely to develop HTN than people who consume it at low to moderate levels (161). Factors such as the type of coffee consumed, the amount consumed, individual genetics, lifestyle factors, and overall diet should all be taken into account when examining the potential link between coffee consumption and HTN. Additionally, considering the potential confounding variables and biases in studies is crucial to accurately interpret the results. Conducting longtiudinal studies and controlling for various factors can help provide more conclusive evidence on the relationship between coffee consumption and HTN.

Our result showed a higher prevalence of obesity. One of the biggest issues facing public health today is obesity, which is closely associated with a higher risk of cardiovascular disease. The intricate interaction of many processes, such as improper activation of the sympathetic nervous system and RAAS, adipocyte dysfunction, and impaired pressure natriuresis,exacerbated by physical compression of the kidneys, results in obesity-related HTN (162). This study also found an association between HTN and obesity. A Nigerian investigation confirms our conclusion that being underweight was inversely associated with HTN (130). Furthermore, our results are in line with studies from Cameroon and South Africa that show abdominal obesity to be a factor in HTN (153, 157). This might portend an increase in the incidence of HTN in the research area in the future.

In our finding hypertriglyceridemia was associated with HTN. Hypertriglyceridemia is a strong indicator of cardiovascular illness, which damages the endothelium. Endothelial damage can lead to a lack of physiological vasomotor activity, potentially resulting in elevated BP (163). Moreover, our finding was in line with the Japan study, which showed that a high triglyceride level was independently associated with HTN (164).

This study found no significant association between HTN and diabetes mellitus, a family history of HTN, alcohol consumption, cigarette smoking, low literacy, physical inactivity, or excessive salt intake. Thus far, research conducted in Afghanistan (154), South Africa(157), Kenya(155) and Ethiopia(114) has indicated that the following factors were significantly associated with HTN: alcohol consumption, cigarette smoking, low literacy, physical inactivity, diabetes mellitus, family history of diabetes, high salt consumption, and family history of HTN.

The inconsistency in these results may be due to variations in sample size, study settings, and population characteristics. This study included adults aged 18 or older, while different studies used different age groups, making comparisons difficult. Study design issues may also explain the variations, as a cross-sectional design cannot distinguish the sequences of explanatory variables and the outcome. Additionally, respondents might not know whether they had a family history of HTN due to the silent and asymptomatic nature of the diseases, which may underestimate the risk factors.

6.2. Prevalence and associated factors of DM

Prevalence of DM

Our study showed that 70.9% of those who had diabetes were identified during our survey. This could suggest that the illness is asymptomatic, that participants lack awareness of it, or that screening practices are inadequate. If this situation continues, complications and mortality will increase among adults in the study area. Ultimately, this will impact the economy and health of the country. Similarly, the Gondar and Dire Dawa Ethiopian investigations reported 81.6% and 62% of newly diagnosed DM cases, respectively (111, 165).

According to the current population-based cross-sectional survey, one in seven persons aged 18 and above 14.3% (95% CI: 11.5–17.1) has diabetes. This result is consistent with similar research from Tanzania 11.9%, Oman 15.7% (95% CI: 14.0–17.5), and eastern Ethiopia 14.9% (95% CI: 12.1-17.4) (72, 166, 167). The incidence is likely to increase in the future unless there is a robust community-based blood glucose screening program. Additionally, interventions targeting related variables such as lipids at primary health facilities are necessary. Weight reduction measures implemented by the adult population in the research area are also crucial.

Our reported prevalence, however, is less than that found in Saudi Arabia and Bangladesh (166, 168). One reason for this mismatch may be the age of participants in the cited studies. Two-thirds of the Saudi respondents were over 40, a substantial risk factor for DM, while most of the respondents in the Bangladeshi study were over 35. Additionally, the discrepancy could be explained by the higher rates of overweight and obesity found in both investigations as well as the varying genetic susceptibility to diabetes among different population groups (63).

However, the prevalence found in our study was higher than the WHO's estimate for Ethiopia (4%), a study conducted in Benin (6.7%), and two other community-based studies in Ethiopia (4.6% and 5.1%) (25, 111, 169, 170). The higher incidence in our study may be due to differences in study circumstances, as our study was conducted in an urban region where diabetes is anticipated to be more common due to various lifestyle factors (14, 111).

Factors associated with DM

This study found a strong association between diabetes and age. The average fasting glucose level rose with age in both men and women. These results add weight to the ADA recommendations to test people aged 45 and above, emphasizing age as a major risk factor for diabetes (171). Our findings align with studies conducted in Tanzania, Bangladesh, and China (72, 172, 173). Furthermore, research done in several regions of Ethiopia reached the same conclusion (111, 165, 169). This may be brought on by the loss of lean body mass and a rise in visceral fat that comes with aging, leading to insulin resistance (174).

This study found an association between DM and being overweight or obese. Metabolic changes linked to obesity are associated with elevated levels of hormones, pro-inflammatory cytokines, fatty acids, glycerol, and other substances that are critical in the development of insulin resistance (175). Our results align findings from the WHO and ADA(63, 171). In a similar vein, other studies from Bangladesh, Saudi Arabia, and southwest Ethiopia have shown that obesity is a risk factor for DM (168, 172).

This study also found a significant association between central obesity and DM, consistent with data from the WHO, ADA, Oman, and Ethiopia (63, 141, 167, 171).

Our research also revealed a relationship between DM, low HDL-C levels, and hypertriglyceridemia. Insulin severely affected serum lipids. Regardless of insulin resistance or shortage, abnormal serum lipid (dyslipidemia) is frequently observed in diabetic populations (176). These results are consistent with earlier studies from Saudi Arabia and Oman (167, 168). This study found no significant association between DM and a sedentary lifestyle, alcohol drinking, low fruit and vegetable consumption, family history of diabetes, or HTN. However, other studies have reported that low physical activity raises the risk of developing diabetes mellitus, even though this wasnot statistically significant in the current study (72, 167, 177).

6.3. Prevalence and associated factors of Dyslipidemia

Prevalence of dyslipidemia

The current study reported that 96.2% of participants with lipid abnormalities were detected during the survey, affecting 77.5% (95% CI: 74.1–89.9) of the study population. This high prevalence may be associated with obesity (14.1%), physical inactivity (26.6%), and inadequate vegetable consumption (87.3%), though the latter were not statistically significant. The high undetected rate could be due to the asymptomatic nature of the condition, poor screening habits, lack of participant knowledge, and financial hardship, as lipid tests are costly and only available in hospitals and health centers.

These results were consistent with other community-based studies, showing that 79% of people in India, (178), 86.7% in Yemen and 67.3% in South Africa (179, 180) had dyslipidemia. If this trend continues, the large number of adults in the research area could lead to complications and deaths, impacting the nation's health and economy.

Meanwhile, the prevalence reported in the current study was lower than other Ethiopian studies: Mekelle (66.7%) (99), Addis Ababa's industry workers 67.8% (95% CI: 62.5–72.7%) (11) and Haramaya (59.6%) (181), while African pooled prevalence stood at 52.8% (95% CI: 40.8–64.9) (87). Variations in the study population, study area, socio demographic background, and cultural makeup could contribute to this discrepancy.

The most prevalent dyslipidemias among the research participants were triglyceridemia and low HDL cholesterol. Similar results were reported in research carried out in Latin America, the

Caribbean, India, Iran, Mekelle, Ethiopia, Gondar, Ethiopia, and Ethiopia (national survey) (12, 98, 134, 178, 182, 183). Conversely, a study conducted in Nigeria revealed that cholesterolemia followed by low HDL-C and triglyceridemia, were the most common dyslipidemias (184).

Factors associated with Dyslipidemia

There has been inconsistent data about the contribution of gender to the development of dyslipidemia (185). Except for triglyceridemia, which was more common in men, our research revealed that females had considerably higher levels of lipid abnormalities than males. This result is in line with previous conclusions (10, 140, 143, 144, 178).

In line with other studies, our research found a significant relationship between age and dyslipidemia (10, 143, 144, 186-188). Changes in body composition associated with aging may cause older persons to experience several metabolic issues. It is often recognized that body fat tends to rise with age and is frequently localized in the abdomen, leading to abdominal obesity. This belly fat buildup may increase the risk of CVDs and other NCDs in older individuals (189). Furthermore, alterations in lipid and carbohydrate metabolism associated with metabolic syndrome are paralleled by aging. The concentrations of TGs and TG rise with age, while HDL-C falls (186).

All of the lipoproteins are negatively impacted by excess body fat, but HDL-C is continuously lowered (190). Similarly, our research revealed a decreased HDL-C level in obesity.This result is consistent with earlier findings from Turkey, China, and Nigeria (10, 184, 191).

In our study, comorbidities such as elevated blood glucose and HTN were risk factors for dyslipidemia. These conditions were also identified as risk factors for CVDs morbidity and mortality (192). Our results are consistent with previous research showing that triglyceridemia, LDL-C, and cholesterolemia were independently related to the existence of comorbidities such as HTN (144, 184, 193). In line with previous studies, elevated blood glucose was also linked to low HDL-C and triglyceridemia (10, 144, 193).

Earlier studies reported a strong correlation between dyslipidemia and alcohol use, tobacco use, physical activity, vegetarian diet, the type of oil used for food preparation, education level, marital status, and occupation. In contrast, this study found no significant correlation between those characteristics and dyslipidemia. The overall low incidence of those characteristics in the population might cause the inconsistencies.

7. Validity and generalizability

We took several precautions during the research process to ensure the precision and dependability of our findings. These precautions were taken, from the initial study design to the final data analysis, to reduce the impact of bias, chance, and confounding variables on our findings.

We employed STEPwise approach-adapted instruments for all WHO-developed articles. The WHO recommends using STEP as a surveillance tool for chronic disease-specific morbidity and mortality as well as risk factors for the disease. It is meant to operate as a gateway for low- and middle-income nations to monitor chronic illnesses and the risk factors associated with them (133). Ethiopia is among the developing nations where the STEPS instrument has been used and verified in the past (45).

Before the beginning of data collection, the seasoned professionals who collected the data underwent extensive training. Supervisors also kept a careful eye on everything during the data collection phase. By minimizing interviewer and other measurement biases, these steps were taken to guarantee the correctness and dependability of the data that was gathered.

The degree to which the chosen sample of an instrument accurately represents the entire spectrum of content is known as content validity (194). A comprehensive literature review was carried out to determine the factors being measured to guarantee the authenticity of the content. Validity of the statistical results was ensured by achieving sufficient statistical power through a considerable sample size and by performing multivariable binary logistic regression analysis to control confounding factors.

We utilized constant tension tape and a pre-calibrated portable analog weight-height scale. The instruments were calibrated by measuring the known weight or length of objects. Additionally, pressure was measured using a validated pressure machine, specifically the OMRON M2 device.

We used the Armed Forces Comprehensive Specialized Hospital's Mindray BS-200 automated chemistry system to perform blood glucose and lipid profiles. We also used internal quality controls to examine the machine every day before analyzing samples. We did not start the sample analysis till the test had fulfilled the predetermined conditions. Additionally, the Ethiopian Public Health Institute performed an external evaluation of the system.

Regarding the applicability of our results, we gathered study participants from seven Addis Ababa sub-cities. By using this strategy, we were able to increase the results' applicability to adults in Addis Ababa as well as other cities with comparable features.

8. Strengths and limitations

This study has several strengths. First, one of the survey's major strengths is its ability to recruit participants from seven sub-cities. Second, we employed the WHO STEPS, a standardized tool and procedure that allows comparisons between populations and periods. Finally, we employed all three of the stepwise tools: biochemical tests, physical measurements, and questionnaire-based assessments. This allowed us to triangulate the study results from various sources and included all possible risk factors (variables).

- Meanwhile, our study has limitations. Due to the cross-sectional study design we employed, establishing a cause-and-effect link was impossible. Although respondents were reassured and encouraged to remember their experiences, the self-reporting approach and the short assessment period could have caused recall bias, potentially affecting data. Due to financial constraints, the minimum sample size for a blood test has been taken into consideration. BP and fasting blood glucose measurements were done in a single visit.

9. Conclusions

This study identified that men were more likely than women to engage in specific behavioral risk factors, such as drinking alcohol, smoking cigarettes, and using khat. Meanwhile, men were shown to be more likely to be physically active. Biological risk factors, such as obesity, were more common in women than men. Only 3.8% of people get five or more servings of fruits and vegetables daily, which is low based on the WHO's recommendation.

Adults in Addis Ababa had a significant prevalence of HTN, which could point to a population-wide concealed epidemic. The percentage of adults with diabetes mellitus (14.3%) was also higher than other Ethiopian studies. Similarly, dyslipidemia affects a sizable portion of adults, suggesting another possible hidden epidemic.

Despite higher prevalence, it is alarming to learn that a significant portion of participants who are residents of the most urban part of the country (the capital city)were unaware of their HTN (61.9%), diabetes (71.0%), and dyslipidemia (96.2%) disease statuses before the study. Similarly, although most participants agreed on the need for clinical checkups for diabetes and HTN even when there were no symptoms, most had never had their cholesterol, BP, or blood sugar levels checked. The community's inclination to wait until symptoms worsen before seeking medical assistance could be the reason for this lack of proactive health monitoring.

We reported a significant association between male gender, age, obesity (underweight preventive), abdominal obesity, low vegetable consumption, coffee drinking (preventive), elevated triglyceride levels, and HTN. There was also a strong association between diabetes mellitus and people who are 50 years of age or older, obesity, have abdominal obesity, hypertriglyceridemia, and have low HDL-C values. Moreover, dyslipidemia was strongly associated with advancing age, gender, obesity, DM, HTN, and sitting for longer than three hours a day. Diabetes mellitus and HTN were risk factors for dyslipidemia, while dyslipidemia is a risk factor for both of these diseases. This suggests that there is a risk factor between the diseases.

10.Recommendations

Based on the findings, the following specific recommendations have been identified:

Policymakers and program implementers

To effectively support the prevention and control of NCD programs and reduce associated risks, the Ministry of Health (MOH) needs to adopt a comprehensive strategy. This strategy must be implemented through collaboration with other ministries, and regional, woreda, and facility-level health entities.

- ✓ Enhance service standards: The MOH shall consider strengthening facility service standards in all its policy documents to ensure that screening and management programs for NCDs receive the necessary emphasis and commitment for successful implementation. The MOH, regional, woreda, and facility-level leadership, must emphasize NCD-related agendas by allocating adequate resources for program implementation and regular evaluation. Additionally, efforts should be intensified to make NCDs a standing agenda item in all healthcare review activities, including national and regional healthcare review meetings, forums, and conferences.

- ✓ Strengthen screening programs: We advised healthcare facilities to broaden their scope of NCD-related services to include screening. All adults visiting health facilities for any reason should be prioritized for screening. Introducing annual NCD screening for adults can help detect and prevent the onset of non-communicable diseases such as diabetes, HTN, and dyslipidemia at an early stage. Health extension workers should regularly perform community-based screenings at homes. Additionally, frequent mass screenings should be organized at workplaces, high schools, colleges, and other locations where people gather such as Edir and religious places. Every healthcare facility should also conduct special screenings for patients with dyslipidemia, diabetes, or HTN. Finally, reorganizing the primary care system is indispensable for the early detection and treatment of diabetes, HTN, and dyslipidemia.

- ✓ Enhance training curricula for healthcare providers (HCPs): Training curricula for front-line HCPs should be strengthened to integrate key competencies related to NCDs. This includes incorporating deliberately designed inter professional learning and student assessment activities on facility and community-based screening programs and management of NCDs. The Team Training Program (TTP) and Community-Based Training Programs (CBTP) courses found in HCP curricula can be the focus of curricular revision and strengthening.
- ✓ Support curricular implementation: Higher education institutions should be continuously supported to ensure proper curriculum implementation through orientation and training sessions, establishing experience-sharing platforms, and developing teaching, learning, and assessment materials for students.
- ✓ Enhance regulation for HCPs: Responsible national and regional regulatory authorities should ensure that regulatory documents (e.g., scope of practice, job evaluation, and grading documents) incorporate key NCD-related tasks as core expectations from frontline healthcare professionals. Additionally, mandating HCPs to complete certain units of NCD-related Continuing Professional Development (CPD) courses as part of their license renewal process could also be considered. Finally, the Ministries of Health and Education must ensure that NCDs receive adequate emphasis in national licensing and exit examinations for HCPs, which will further drive in-school training. Implementing regulations on unhealthy food and beverage marketing, promoting physical activity in schools and communities, and creating urban planning strategies that prioritize walking and biking.

- ✓ Promote healthy lifestyles: The MOH in collaboration with other stakeholders shall develop a well-thought-out national strategy to limit the availability and consumption of several risk factors for NCDs, including alcohol, fats, processed foods, and khat. Activities should also involve creative behavior change communication campaigns to inform the public about the importance of supporting healthy lifestyles and lowering risk factors among various demographic groups. Plans should also be created to improve everyone's access to and consumption of fruits and vegetables.

Health care provider

- Engage in relevant CPD courses regularly: HCPs should ensure they are updated with current recommendations and scientific principles to assess, diagnose, manage, and prevent NCDs effectively. This requires proactive self-reflection and regular engagement in relevant CPD courses and other development opportunities, including annual conferences and grand rounds.

- Design and implement community awareness sessions: HCPs should regularly plan and conduct educational sessions to raise public awareness about NCDs and their risk factors. This shall include educating people about the dangers of unhealthy lifestyles, including alcohol and tobacco use, and the benefits of quitting these habits. HCPs should also emphasize the importance of incorporating fruits and vegetables into daily diets, encouraging exercise, deterring khat usage, and stressing the need for routine checkups with the HCPs.

Researchers

- Uphold the NCD agenda as a priority research theme: Researchers should maintain NCDs as a priority research agenda, ensuring continuous evidence generation, policy dialogue, and intervention modification. This recommendation also applies to higher education institutions and research centers, which play a significant role in designing and conducting research.

- Examine health promotion programs: Researchers should engage in studies that evaluate the impacts of interventions that are aimed at encouraging healthy habits and reducing the effects of risk factors for NCDs. This will help generatelocal evidence that program managers and policymakers can use to implement efficient NCD prevention and control policies.

- Examine the success of the NCD initiatives: We recommend researchers evaluate NCD prevention and control initiatives using morbidity and mortality data gathered by the current system. This will enhance community-based risk factor surveillance and enable a comprehensive analysis to direct future interventions.

- Undertaking small-scale investigations: Researchers are recommended to conduct small-scale assessments and surveillance to evaluate the general prevalence and risk factors of NCDs, particularly, for high-risk populations. The knowledge gained from such investigation will be essential for developing targeted therapies and strategies to effectively address NCDs.

Acknowledgements

I am immensely thankful to the people and organizations who supported my PhD journey.

I am profoundly grateful to my supervisors, Prof. Alemayehu Worku, Prof. Negussie Deyessa, and Dr. Desalew Mekonnen for their unwavering support and guidance. Prof. Alemayehu, I am truly delighted to have you as my supervisor. Since my enrollment as an MPH student at AAU over a decade ago, I have consistently heard your name as a great role model with outstanding performance. I remember when I first asked you to be my PhD supervisor, mentioning the marvelous learning experience I had while doing my MPH under your supervision. Thank you for believing in me, accepting me as your supervisee, and creating a joyful learning experience despite your busy schedule. You were not just a supervisor but also a selfless and supportive close friend who used your expertise and connections to help me realize my dream. Thank you, Prof. Negussie Deyessa and Dr. Desalew Mekonnen, for creating a wonderful learning environment for me.

I am grateful to Addis Ababa University for hosting me as a PhD student and providing every opportunity, including financial support, to make my journey valuable and enjoyable. I would also like to thank the college's defendable committee members for their constructive comments. I am particularly grateful for the detailed feedback from Prof. Ahmed Ali, which helped me improve the quality of my thesis and provided additional learning opportunities.

I am deeply grateful for the financial and technical support from my organization, Ethiopian Defense University, and the Armed Forces Comprehensive Specialized Hospital. Without their assistance, my journey would have been hard to imagine. In particular, I want to mention my best friend and brother, Mekonnen Tsegaye (PhD candidate), for his unwavering advice and support. Dear Mekonnen, all this success would not have been possible without your help.

Gezishu, my wonderful husband, this part of the journey is ending, but none would be possible without your support. You helped me identify my true potential, shoulder family matters, and share insightful thoughts. Kidus and Rebika, my lovely kids, I know you were eagerly awaiting this moment. Thank you, and may you be even more blessed.

I would like to extend my heartfelt gratitude to my mother, Elitu Marie, as well as my sisters and brothers, Eshitisha, my friends, the dedicated data collectors, supervisors, and all the study participants. Your unwavering support and contributions have been invaluable to this endeavor. Thank you for being an essential part of this journey.

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Appendices

Annex I. English version participant information sheet and consent form

Questionnaire ID: _____

Part I: Participant information sheet

Good morning, my name is **…., and** I am here to collect the data of a PhD student. She is learning at the Addis Ababa University College of Health Sciences School of Public Health.

Her telephone number: **0911-540207**

The aim of the Survey

The aim of this survey is to assess the magnitude and risk factors of the common non-communicable diseases such as HTN, diabetes mellitus and dyslipidemia in Addis Ababa.

This information will help the Ministry of Health to plan on how to address these health problems, and for the participants it will help to know their status and to take preventive and therapeutic measures.

Random selection

You have been randomly selected to be part of this survey and this is why we would like to interview you. The survey is currently taking in the seven sub-cities of Addis Ababa among 3724 participants.

Confidentiality

The information you provide is totally confidential and will not be disclosed to anyone. It will only be used for purposes of the survey. Your name, address, and other personal information will be removed from the questionnaire, and only a code will be used to connect your name and your answers without identifying you. You may be contacted by the survey team again only if it is necessary to complete the information on the survey and if your blood sample result suggests raised blood sugar or dyslipidemia.

Voluntary participation

Your participation is voluntary and you can withdraw from the survey after having agreed to participate. You are free to refuse to answer any question that is asked in the questionnaire. If you have any questions about this survey you may ask or contact me, on my mobile phone number 0911-540207.

What is involved?

This survey involves answering some questions related the above mentioned diseases and factors associated with them, then having your BP, height, weight, hip and waist circumference measured and these processes will be completed between 30 to 45 minutes. Finally, the next after an overnight fasting of study participants' blood sample will be taken for each participant to test

Diabetes and dyslipidemia diseases. In order to test for Diabetes and dyslipidemia diseases you will be asked to have a small amount (5 ml) of blood taken from your arm for analysis.
This may cause some mild pain. You will be informed immediately or few days later about the results of your blood tests if it is elevated or abnormal results seen. The small blood that will be taken from you will NOT be used for any other test apart from Diabetes and dyslipidemia diseases.

Consent to participate

Signing this consent indicates that you understand what will be expected of you and are willing to participate in this survey.

Read by participant	Agreed		Read by Interviewer	Agreed	
	Refused			Refused	

Signatures

I hereby provide **INFORMED CONSENT** to take part in the survey.

Name of participant:

Signature: Date-------

Name of data collectors, date and signature

1. …. …….
2. ……..

Annex II: English version study instruments

Location and date	**Response**	**Code**	**Skip to**
Cluster/ village ID	------	I1	
Sub city name	--------	I2	
Ketena name	-----	I3	
Interviewer Name	------	I4	
Date of completion of the questionnaires	dd/mm/year	I5	
Consent, interview language and name	**Response**	**Code**	
Consent has been read and obtained	1, yes 2, No if no , end	I6	
Interview language	Amharic	I7	
Participant code number	----------	I9	
Name of participant	----------	I10	
Contact phone number where possible	----------	I11	

Step 1 Demographic information			
Question	**Response**	**Code**	**Skip to**
Sex	Male ----------1 Female----------2	C1	
What is your date of birth?	dd/mm/yr---------- Don't know 88	C2	If known ➔ C4
How old are you?	…… in years	C3	
Where was your birth place?	Rural ----------1 Urban----------2 I don't know-------3	C4	
What is your region of childhood life?	1. Tigray 2. Afar 3. Amhara 4. Oromia 5. Somali 6. B. Gumuz 7. SNNPR 8. Harari 9. Gambella 10. Dire Dawa 11. Addis Ababa 12. Other Other specify----------	C5	
For how many years did you live in Addis Ababa?	---------- in months ----------in years Born in Addis Ababa-----1	C6	
In total, how many years have you spent at school and in full-time study (excluding pre-school)?	…… in years	C7	
Expanded: Demographic information			
Have you ever attended school?	Yes----------1 No ----------2	C8	If yes go to C9
What is the highest level of school you attended:	Primary (1-8)----------1 Secondary (9&10)------- 2 Preparatory(11 &12)--- -3 Technical/Vocational ---4 College & university -------- 5 I don't know----------88	C9	
What is your Ethnic group?	Amhara----------1 Oromo ----------2 Gurage ----------3 Tigray ----------4 Other---------- 5	C10	

	Other, specify----------		
What is your marital status?	Single never married------1 Currently married--------- 2 Separated----------3 Divorced----------4 Widowed----------5 Refused ----------88	C11	
What is your religion?	Orthodox ----------1 Muslim---------- 2 Protestant----------3 Catholic----------4 Other----------5 Other, specify----------	C12	
Which of the following best describes your main work status over the past 12 months?	Government employee----1 Non government employee--------2 Self employed----------3 Student----------4 Housewife----------5 Daily laborer----------6 Merchant----------7 Unemployed(able to work)-----8 Unemployed(unable to work)-----9 Retired---------- 10 Other----------11 Other, specify----------	C13	
How many people older than 18 years, including yourself, live in your household?	Number of people.....	C14	
How many people live in your household including yourself?	Number of people----------	C15	
Can you tell me the monthly income of the household?	.....birr-------1 Didn't have any income ------2 Refused ---------- 88	C16	
Step 1 Behavioral measurements			
CORE: Tobacco use			
Now I am going to ask you some questions about tobacco use			
Question	**Response**	**Code**	**Skip to**
Do you currently smoke any tobacco products, such as cigarettes, cigars, Gaya or pipes?	Yes---------- 1 No ---------- 2	T1	If no, ➔ T8
Do you currently smoke tobacco products daily?	Yes ---------- 1 No---------- 2	T2	
How old were you when you first started smoking?	Age in years ---------- Don't know---------- 88	T3	If known, ➔

					T5a/T5aw
Do you remember how long ago it was? (Record only one, not all 3)	In years --------			T4a	If known, ➔ T5a/T5aw
On average, how many of the following products do you smoke each day/ week? Don't know 7777		Daily	Weekly		
	Manufactured cigarettes			T5a/Tsaw	
	Hand rolled cigarettes			T5b/Tsbw	
	Pipes full of tobacco			T5c/Tscw	
	Cigars, cheroots, cigarillos			T5d/Tsdw	
	Number of Shisha sessions			T5e/Tsew	
	Other			T5f/Tsfw	
	If other, go to T5 other, else go to T6				
During the past 12 months, have you tried to stop smoking?	Yes ---------- 1 No ---------- 2			T6	
During any visit to a doctor or other health worker in the past 12 months, were you advised to quit smoking tobacco?	Yes---------- 1			T7	IfT2=yes, T12, ➔ IfT2=No, ➔ T9
	No.....2				IfT2=yes, T12, ➔ IfT2=No, ➔ T9
	No visit during the past 12 months----3				IfT2=yes, T12, ➔ IfT2=No, ➔ T9
In the past, had you ever smoked any tobacco products?	Yes---------- 1 No ---------- 2			T8	If no, ➔ T 12
In the past, had you ever smoked daily?	Yes---------- 1			T9	If T1=yes, ➔ T12, else ➔ T10
	No---------- 2				If T1=yes, ➔

			T12, else → T10

EXPANDED: TOBACCO USE

Question	Response	Code	Skip to
How old were you when you stopped smoking?	Age (years)---------- Don't know ----------88	T10	If known, → T12
How long ago did you stop smoking? (Record only one answer) Don't know 88	Years ago ----------	T11a	If known, → T12
	Or months ago-----	T11b	If known, → T12
	Or weeks age------	T11c	
Do you currently use any smokeless tobacco products such as (snuff, chewing tobacco, betel)?	Yes 1 No 2	T 12	If no, → T15
Do you currently use smokeless tobacco products daily?	Yes 1 No 2	T13	If no, → T14aw
On average, how many times a day/ week you use (If less than daily, record weekly) Don't know 777		Daily / Weekly	
	Snuff, by mouth		T14a/ T14aw
	Snuff, by nose		T14b/ T14bw
	Chewing tobacco		T14c/ T14cw
	Other		T14d/ T14dw — *If Other;* → *T14other, if T13=No,* → *T16, else T17*
	Other(please specify):		14other/ T14other w — *If T13=No,* → *T16, else* → *T17*
In the past, did you ever use smokeless tobacco products such as (snuff, chewing tobacco, or betel)?	Yes---------- 1 No ----------2	T15	If no, → T17
In the past, did you ever use smokeless tobacco products such as [snuff, chewing tobacco, or betel]daily?	Yes ---------- 1 No ---------- 2	T16	

During the past 30 days, did someone smoke in your home? For never smoke only)	Yes------- 1 No------- 2	T17	
During the past 30 days, did someone smoke in closed areas in your workplace (in the building, in a work area or a specific office)?	Yes---------- 1 No---------- 2 Don't work in a closed area-- 3	T18	
Are you currently chewing khat?	*Yes ---------- 1* *No ---------- 2* *Refused---------- 88*	T20	If no ➔ T26
During the last 30 days, on average how many days did you chew khat?	Daily ----------1 Weekly ----------2 Less than a month--------3 Monthly----------4 Other----------5 Other, specify----------	T21	
How many **Zurbas/"esire"** do you chew on **one** of those days?	---------- Zurbas/"esire"	T21a	
How old were you when you first started chewing Khat?	Age in years---------- I don't know-------88	T22	
Do you remember how long ago it was, you have been started chewing khat?	Weeks -------- Months --------- Years ----------	T23	
In the past, did you ever chew khat? (For currently non khat chewer)	Yes----------1 No----------2 No response----------88	T26	If no ➔ A1
How old were you when you stopped chewing khat?	Age in years--------	T27	
How long ago did you stop chewing khat?	Weeks -------- Months --------- Years ----------	T28	

CORE: Alcohol Consumption

The next questions ask about the consumption of alcohol

Question	**Response**	**Code**	**Skip to**
Have you ever consumed any alcohol such as Beer, Wine, Spirits, Whisky, etc.?	Yes 1 No 2	A1	If no, ➔ A16
Have you consumed any alcohol within the past 12 months?	Yes 1 No 2	A2	If no, ➔ A4
Have you stopped drinking due to health reasons, such as a negative impact on your health or on the advice of your doctor or other	Yes 1 No 2	A3	If yes, ➔ A16

health worker?			
During the past 12 months, **how frequently** have you had at least one standard alcoholic drink?	Daily 1	A4	
	5-6 days per week 2		
	3-4 days per week 3		
	1-2 days per week 4		
	1-3 days per month 5		
	Less than once a month 6		
Have you consumed any alcohol within the **past 30 days**?	Yes 1 No 2	A5	If no, ➔ A13
During the past 30 days, on how many **occasions** did you have at least one standard alcoholic drink?	Number ---------- Don't know ----------88	A6	
During the past 30 days, when you drank alcohol, how many **standard drinks on average** did you have during one drinking occasion?	Number ---------- Don't know ----------88	A7	
During the past 30 days, what was the **largest number** of standard drinks you had on a single occasion, counting all types of alcoholic drinks together?	Largest number---------- Don't know ----------88	A8	
During the past 30 days, how many times did you have **six or more** standard drinks in a single drinking occasion?	Number of times ---------- Don't know ----------88	A9	
For men: five or more	Number of times--------- Don't know ----------88	A9a	
For women: four or more	Number of times ---------- Don't know ----------88	A9b	
During each of the **past 7 days**, how many standard drinks did you have each day? *Don't Know 77*	Monday	A11a	
	Tuesday	A11b	
	Wednesday	A11c	
	Thursday	A11d	
	Friday	A11e	
	Saturday	A11f	
	Sunday	A11g	

I have just asked you about your consumption of alcohol during the past 7 days. The questions were about alcohol in general, while the next questions refer to your consumption of homebrewed alcohol, alcohol brought over the border/from another country, any alcohol not intended for drinking or other untaxed alcohol. Please only think about these types of alcohol when answering the next questions.

Question	**Response**	**Code**	**Skip**

During the **past 7 days**, did you consume any **homebrewed** alcohol; any alcohol **brought over the border/from another country**, any alcohol ?(like Tella, Teji, Yehabesha Areki, …etc)	Yes 1 No 2	A12	If no, ➔ A14
On average, **how many standard drinks** of the following did you consume **during the past 7 days**? Don't know 77	Homebrewed spirits, e.g. moonshine	A13a	
	Homebrewed beer or wine, e.g. Tella, Teji or Araki	A13b	
	Alcohol brought over the border/from another country	A13c	
	Alcohol not intended for drinking, e.g. alcohol-based medicines, perfumes, after shaves	A13d	
	Other untaxed alcohol in the country	A13e	
EXPANDED: Alcohol Consumption			
During the **past 12 months,** how often have you found that you were not able to stop drinking once you had started?	Daily or almost daily 1	A14	
	Weekly 2		
	Monthly 3		
	Less than monthly 4		
	Never 5		
During the **past 12 months,** how often have you failed to do what was normally expected from you because of drinking?	Daily or almost daily 1	A15	
	Weekly 2		
	Monthly 3		
	Less than monthly 4		
	Never 5		
During the **past 12 months,** how often have you needed a first drink in the morning to get yourself going after a heavy drinking session?	Daily or almost daily 1	A16	
	Weekly 2		
	Monthly 3		
	Less than monthly 4		
	Never 5		
CORE: Diet			
The next questions ask about the fruits and vegetables that you usually eat. I have a nutrition card here that shows you some examples of local fruits and vegetables. Each picture represents the size of a serving. As you answer these questions, please think of a typical week in the last year.			
Question	**Response**	**Code**	**Skip to**
In a typical week, on how many days do you **eat**	Number of days……	D1	if Zero ➔

fruit?	Don't Know ----88		days, D3
How many **servings** of fruit do you eat on **one** of those days?(serving in this case refers to slice or one full fruit e.g. orange, banana, mango, ...)	Number of servings-------- Don't Know--------88	D2	
In a typical week, on how many days do you **eat vegetables**?	Number of days ---------- Don't Know ------88	D3	if Zero days, ➔ D5
How many **servings** of vegetables do you eat on one of those days? (serving in this case refers to cups or "**Chilfa"**) of vegetable stews)	Number of days ---------- Don't Know -----88	D4	
Dietary salt and sugar			
With the next questions, we would like to learn more about salt in your diet. Dietary salt includes ordinary table salt, unrefined salt such as sea salt, iodized salt, salty stock cubes and powders, and salty sauces such as soya sauce, fish sauce, tomato sauce, or Magi Mereq. The following questions are on adding salt to the food right before you eat it, on how food is prepared in your home, on eating processed foods that are high in salt, and questions on controlling your salt intake. Please answer the questions, even if you consider yourself to eat a diet low in salt.			
How often do you **add salt or a salty sauce, such as soya sauce** to your food right before you eat it or as you are eating it? (Select only one)	Always 1 Often 2 Sometimes 3 Rarely 4 Never 5 Don't know 88	D7	
How often is **salt, salty seasoning or a salty sauce added** in cooking or preparing foods in your household?	Always 1 Often 2 Sometimes 3 Rarely 4 Never 5 Don't know 88	D8	
How often do you eat **processed food high in salt**? By processed food high in salt, I mean foods that have been altered from their natural state, such as packaged salty snacks, canned salty food, including pickles and preserves, salty food prepared at a fast food restaurant, cheese, bacon and processed meat *[chips]*.	1 Always 2 Often 3 Sometimes 4 Rarely 5 Never Don't know---88	D9	
How much salt or salty sauce do you think you consume?	1 Far too much 2 Too much 3 Just the right amount 4 Too little 5 Far too little Don't know---88	D10	

How often do you consume sweet food? like soft drink, sugar	1 Always 2 Often 3 Sometimes 4 Rarely 5 Never Don't know---88	D11	
EXPANDED: Diet			
Question	**Response**	**Code**	**Skip to**
How important to you is **lowering the salt** in your diet?	1 Very important 2 Somewhat important 3 Not at all important Don't know—88	D12	
Do you think that too much salt or salty sauce in your diet could cause a **health problem**?	1 Yes 2 No Don't know----88	D13	
Do you do any of the following on a regular basis to control your salt intake			
Limit consumption of processed foods	1. Yes 2. No	D14a	
Look at the salt or sodium content on food labels	1. Yes 2. No	D14b	
Buy low salt/sodium alternatives	1. Yes 2. No	D14c	
Use spices other than salt when cooking	1. Yes 2. No	D14d	
Avoid eating foods prepared outside of a home	1. Yes 2. No	D14e	
Do other things specific to control your salt intake	1. Yes 2. No	D14f	if yes, ➔ D14 other
Other (please specify)	_____	D14 other	
The next questions ask about the oil or fat that is most often used for meal preparation in your household, and about meals that you eat outside a home.			
What type of **oil or fat is most often** used for meal preparation in your household?	1) Palm oil(e.g. Viking, Chief...) 2) Sesame/Nug oil/Sun flower 3) Sheno Lega, Shadi Lega 4) Natural butter 5) Margarine 6) Other 7) Other, specify--------	D15	if other, ➔ D15 other

	8) None in particular 9) None used 88)Don't know		
On average, how many meals per week do you eat that were not prepared at a home? By meal, I mean breakfast, lunch and dinner.	Number Don't know 88	D16	
CORE: Physical Activity			
Next I am going to ask you about the time you spend doing different types of physical activity in a typical week. Please answer these questions, even if you do not consider yourself to be a physically active person. Think first about the time you spend doing work. Think of work as the things that you have to do such as paid or unpaid work, study/training, household chores, harvesting food/crops, fishing or hunting for food, seeking employment. In answering the following questions 'vigorous-intensity activities' are activities that require hard physical effort and cause large increases in breathing or heart rate, 'moderate-intensity activities' are activities that require moderate physical effort and cause small increases in breathing or heart rate.			
Question	**Response**	**Code**	**Skip to**
Work			
Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like [carrying or lifting heavy loads, digging or construction work] for at least 10 minutes continuously?	Yes 1 No 2	P1	if no, ➔ P4
In a typical week, on how many days do you do vigorous-intensity activities as part of your work?	Number of days -------	P2	
How much time do you spend doing vigorous-intensity activities at work on a typical day?	Hours:-- minutes---	P3 (a-b)	
Does your work involve moderate-intensity activity, that causes small increases in breathing or heart rate such as brisk walking [or carrying light loads] for at least 10 minutes continuously?	Yes 1 No 2	P4	if no, ➔ P7
In a typical week, on how many days do you do moderate-intensity activities as part of your work?	Number of days	P5	
How much time do you spend doing moderate-intensity activities at work on a typical day?	Hours:-- minutes---	P6 (a-b)	
Travel to and from places			
The next questions exclude the physical activities at work that you have already mentioned. Now I would like to ask you about the usual way you travel to and from places. For example to work, for shopping, to market, to place of worship. *[to church]*			
Do you walk or use a bicycle *(pedal cycle)* for at least 10 minutes continuously to get to and from places?	Yes 1 No 2	P7	if no, ➔ P10
In a typical week, on how many days do you walk	Number of days per week----	P8	

or bicycle for at least 10 minutes continuously to get to and from places?	--		
How much time do you spend walking or bicycling for travel on a typical day?	Hours:------- minutes---	P9 (a-b)	
During the last 7 days, on how many days did you travel in a motor vehicle like a train, bus, car, or tram?	Number of days per week---- No traveling in a motor vehicle --------1	P10	if no, ➔ P12
How much time did you usually spend on one of those days **traveling** in a train, bus, car, tram, or other kind of motor vehicle?	_____ hours per day _____ minutes per day	P11(a-b)	
Recreational activities			
The next questions exclude the work and transport activities that you have already mentioned. Now I would like to ask you about sports, fitness and recreational activities (leisure), *[Jim]*.			
Do you do any vigorous-intensity sports, fitness or recreational *(leisure)* activities that cause large increases in breathing or heart rate like *[running or football, aerobics, fast bicycling, fast simming]*for at least 10 minutes continuously? *[Jim, tennis…]*	Yes 1 No 2	P12	if no, ➔ P15
In a typical week, on how many days do you do vigorous-intensity sports, fitness or recreational *(leisure)* activities?	Number of days	P13	
How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a typical day?	Hours:---- minutes---	P14(a-b)	
Do you do any moderate-intensity sports, fitness or recreational *(leisure)* activities that cause a small increase in breathing or heart rate such as brisk walking*, [cycling, swimming, and volleyball]* for at least 10 minutes continuously?	Yes 1 No 2	P15	if no, ➔ P18
In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational *(leisure)* activities?	Number of days	P16	
How much time do you spend doing moderate-intensity sports, fitness or recreational *(leisure)* activities in a typical day?	Hours:-- minutes---	P17 (a-b)	
EXPANDED: Physical Activity			
Sedentary behavior/ Time spent sitting			
The following question is about sitting or reclining at work, at home, getting to and from places, or with friends, including time spent sitting at a desk, sitting with friends, traveling in a car, bus, train, reading, playing cards or watching television, but do not include time spent sleeping.			
How much time do you usually spend sitting or reclining on a typical day?	Hours:-- minutes---	P18 (a-b)	
During the **last 7 days**, how much time did you	Hours:-- minutes---	P19	

usually spend **sitting** on a **weekday**?		(a-b)	
During the **last 7 days**, how much time did you usually spend **sitting** on a **weekend**	Hours:-- minutes---	P20 (a-b)	
Other life style questions			
Have you visit health facilities for medical checkup during the last 12 months?	Yes----------1 No ----------2 I didn't remember--------3	L1	
If yes, where did you go?	Hospital ----------1 Health center-------2 Pharmacy ----------3 Other----------4 Other, specify----------	L2	
Did you have a regular medical checkup?	Yes----------1 No ----------2	L3	
How many hours do you sleep within 24 hours (both at night and day) ?	----------hours.	L4	
CORE: History of Raised BP			
Question	**Response**	**Code**	**Skip to**
Do you know HTN is a disease?	Yes ----------1 No ----------2	H1	
What is the normal level of BP?	Number---------- I don't know----------88	H2	
What are the risk factors of HTN?	Stress ----------1 Old age---------2 Hereditary -------3 Obesity ----------4 Less physical activity-----5 Other----------6 Other, specify----------	H3	
What are the signs and symptoms of HTN?	Headache----------1 Dizziness----------2 Nausea----------3 Other----------4 Other, specify---------- Don't know---88	H4	
Do you believe exercise can help lower your BP?	Yes ----------1 No ----------2 I don't know----88 Other----------3 Other, specify----------	H5	
Can a balanced diet assist in lowering BP?	Yes ----------1 No ----------2	H6	

	I don't know----88		
Does smoking affect BP?	Yes ----------1 No ----------2 I don't know----88	H7	
HTN is a preventable disease	Yes ---------- 1 No----------2 Don't know-----88	H8	
Is there an association between salty food and HTN?	Yes ---------- 1 No----------2 Don't know-----88	H9	
I should check my BP at least once in two years, even though I have no symptom of HTN	Agree---------1 Disagree------2 Not sure-------3	H10	
Do you get any health related information from things or persons below?	Books, magazines or newspaper-----1 Brochure or pamphlet From a hospital or health center---2 TV or radio-----3 Family members or friends--4 Have learned since being a student----5 Internets ----------6 No information --------7 Other----------8 Other, specify----------	H11	
Have you ever had your BP measured by a doctor or other health worker?	Yes 1 No 2	H12	if no, ➔ H21
Have you ever been told by a doctor or other health worker that you have raised BP or HTN?	Yes 1 No 2	H13	if no, ➔ H21
When was the last time you had your BP measured?	----year,-----month--weeks I don't know---------88	H14	
Have you been told in the past 12 months?	Yes 1 No 2	H15	
In the past two weeks, have you taken any drugs (medication) for raised BP prescribed by a doctor or other health worker?	Yes 1 No 2	H16	
Are you currently receiving any of the following treatments/ advice for high BP prescribed by a doctor or other health worker?	Yes 1 No 2	H17	
If yes, what type of treatments or advice do you get?	Drugs (medication)------1 Advice to reduce salt intake-	H18 a H18 b	

	--2		
	Advice or treatment to lose weight-----3	H18c	
	Advice or treatment to stop smoking-------4	H18d	
	Advice to start or do more exercise------5	H18e	
	Other, specify----------	H18 other	
Have you ever seen a traditional healer for raised BP or HTN?	Yes 1 No 2	H19	
Are you currently taking any herbal or traditional remedy for your raised BP?	Yes 1 No 2	H20	
Is anyone in your family hypertensive?	Parents----------1 Father----------2 Mother----------3 Brothers and sisters-----4 Children ----------5 No one----------6 Don't know----------88	H21	
CORE: History of Diabetes			
Question	**Response**	**Code**	**Skip**
Do you hear about DM?	Yes---------1 No ----------2	H22	
What was your source of information?	Television/radio --------1	H23	
	Health care provider------2		
	Relative/ friends----------3		
	School ----------4		
	Internets ----------5		
	Other----------6 Other, specify----------		
What is/ are the symptoms of diabetes mellitus?	Frequent hunger-----1	H24	
	Frequent thirst--------2		
	Frequent urination-------3		
	Blurred vision----------4		
	Slow healing of cuts and wounds—5		
	I don't know-------88		
	Other----------6 Other, specify --------		
What are the risk factors of diabetes mellitus?	Older age--------1	H25	
	alcohol drinking -----2		
	Obesity ----------3		

	Pregnancy--------4		
	physical inactivity ------5		
	Insufficient fruit and vegetable intake-------6		
	Family history-------7		
	I don't know-------88		
	Other, specify ------		
Which one is/are prevention mechanism of DM?	Doing regular exercise---1	H26	
	Practices healthy diet---2		
	Doing a medical check up---3		
	Weight reduction--------4		
	Other----------5 Other, specify----------		
	I don't know--------88		
The complication of diabetes mellitus are-	Blindness---------1	H27	
	HTN ------2		
	Kidney problem-----3		
	Amputation of limb----4		
	I don't know----------88		
	Other----------5 Other, specify------		
Do you think that you should be screened for DM?	Strongly agree --------1	H28	
	Agree----------2		
	Neutral----------3		
	Disagree ----------4		
	Strongly disagree-------5		
Have you ever had your blood sugar measured by a doctor or other health worker?	Yes 1 No 2 Don't know-----88	H29	if no, ➔ H35
Have you ever been told by a doctor or other health worker that you have raised blood sugar or diabetes?	Yes 1 No 2	H30a	if no, ➔ H35
Have you been told in the past 12 months?	Yes 1 No 2	H30b	
In the past two weeks, have you taken any drugs (medication) for diabetes prescribed by a doctor or other health worker?	Yes 1 No 2	H31	
Are you currently taking insulin for diabetes prescribed by a doctor or other health worker?	Yes 1 No 2	H32	
Have you ever seen a traditional healer for diabetes or raised blood sugar?	Yes 1 No 2	H33	
Are you currently taking any herbal or traditional	Yes 1	H34	

remedy for your diabetes?	No 2		
Is anyone in your family diabetes?	Parents----------1 Father----------2 Mother----------3 Brothers and sisters-----4 Children ----------5 No one----------6 Don't know----------88	H35	
CORE: History of Raised Total Cholesterol			
Question	**Response**	**Code**	**Skip**
Have you ever had your cholesterol (fat levels in your blood) measured by a doctor or other health worker?	Yes 1 No 2 Don't know-----88	H36	if no, ➔ H39
Have you ever been told by a doctor or other health worker that you have raised cholesterol?	Yes 1 No 2	H37a	if no, ➔ H39
Have you been told in the past 12 months?	Yes 1 No 2	H37b	
In the past two weeks, have you taken any oral treatment (medication) for raised total cholesterol prescribed by a doctor or other health worker?	Yes 1 No 2	H38	
Is anyone in your family dyslipidemic?	Parents----------1 Father----------2 Mother----------3 Brothers and sisters-----4 Children ----------5 No one----------6 Don't know----------88	H39	
Now I am going to ask you more about your dietary habit			
Did you eat raw meat?	1. Yes, if yes, go to M2 2. No	O1	If no ➔ o3
How many times did you eat raw meat?	1. Weekly 2. Monthly 3. Other, specify	O2	
Do you currently drink coffee?	1. Yes, 2. No	O3	if yes, ➔ O4.
How often would you drink coffee? In cups	1. One cup in a day 2. Two cups in a day 3. Three cups in a day 4. Four cups in a day 5. Other Other, specify ---------	O4	
Step 2 Physical Measurements			

CORE: BP			
Question	**Response**	**Code**	
Interviewer ID	----------	M1	
Device ID for BP	----------	M2	
Cuff size used	1) Small 2) Medium 3) Large	M3	
Reading 1	Systolic (mmHg)----------	M4a	
	Diastolic (mmHg)---------	M4b	
Reading 2	Systolic (mmHg)----------	M5a	
	Diastolic (mmHg)---------	M5b	
Reading 3	Systolic (mmHg)----------	M6a	
	Diastolic (mmHg)---------	M6b	
During the past two weeks, have you been treated for raised BP with drugs (medication) prescribed by a doctor or other health worker?	Yes 1 No 2	M7	
CORE: Height and Weight			
Interviewer ID	---------	M8	
Device IDs for height and weight	Height ------- Weight ------	M9a M9b	
Height	in Centimeters (cm)-------	M10	
Weight	in Kilograms (kg)-------	M11	
CORE: Waist			
Device ID for waist	----------	M12	
Waist circumference	in Centimetres (cm)	M13	
EXPANDED: Hip Circumference			
Hip circumference	in Centimeters (cm)	M14	
Step 3 Biochemical Measurements			
CORE: Blood Glucose			
Question	**Response**	**Code**	**Skip**
During the past 12 hours have you had anything to eat or drink, other than water?	Yes 1 No 2	B1	
Technician ID	--------	B2	
Device ID	--------	B3	
Time of day blood specimen taken (24 hour clock)	Hours-----, mins-----	B4	
Fasting blood glucose	*Mg/dl* ----------	B5	
Today, have you taken insulin or other drugs (medication) that have been prescribed by a doctor or other health worker for raised blood glucose?	Yes 1 No 2	B6	
CORE: Blood Lipids			
Device ID	----------	B7	
Study ID number		B8	

Location		B9	
Sample ID		B10	
Draw Time		B11	
Report Date		B12	
Report Time		B13	
Total cholesterol	*Mg/dl*----------	B14	
During the past two weeks, have you been treated for raised cholesterol with drugs (medication) prescribed by a doctor or other health worker?	Yes 1 No 2	B15	
EXPANDED: Triglycerides, LDL and HDL Cholesterol			
Question	**Response**	**Code**	**Skip**
Triglycerides	*Mg/dl* ----------	B16	
HDL Cholesterol	*Mg/dl* ----------	B17	
LDL Cholesterol	*Mg/dl* ----------	B18	

Annex III: Amharic version participant information sheet and consent form

እንደምን አደሩ

..... እባላለሁ የአዲስ አበባ ዩንቨርስቲ የሶስተኛ ዲግሪ ተማሪን መረጃ ለመሰብሰብ ነው የመጣሁት፡፡

የተመራማሪው(ተማሪው) ስ.ቁ. **0911-540207**

የዳሰሳ ጥናቱ ዓላማ

የዚህ ዳሰሳ ጥናት ዓይነተኛ ግብ ተላላፊ ያልሆኑ በሽታዎች ማለትም የደም ግፊት፣ የስኳር ህመም እንዲሁም በደም ውስጥ የቅባት መጠን አለመመጣጠንን በተመለከተ በአዲስ አበባ ነዋሪዎች ላይ የሚከናወን ሲሆን አላማውም በበሽታው የተጠቁትን ሰዎች ብዛት ማወቅ፤ በተጨማሪም ለችግሩን መከሰት አጋላጭ የሆኑ ምክንያቶችን ማጥናት ነው፡፡

የዚህ ጥናት ውጤት በርካታ ጥቅሞች ይኖሩታል፤ ለምሳሌ ያህል የጥናቱ አካል የሆኑት ግለሰቦች የጤናቸውን ሁኔታ ይረዱበታል፣ ወይም በሽታው በምን ሁኔታ ላይ እንዳለ ግንዛቤ ይኖራቸዋል፤ ብሎም ቅድመ ጥንቃቄም ሆነ ችግሩን ለመፍታት የሚያስችሉ መፍትሔዎችን ያገኙበታል፡፡ ከዚህ በተጨማሪ ለጤና ጥበቃ ሚኒስትር ዕቅድ እንደግብአት ሆኖ ሊያገለግል ይችላል፡፡

የጥናቱ ተሳታፊዎች አመራረጥ

የዚህ ጥናት አካል እንዲሆኑ ሰዎች የሚመረጡት እንዲሁ ነው፡፡ ማለትም ምንም ዓይነት የምርጫ መስፈርትን መሠረት ያደረገ አይደለም፡፡ በዚህ የዳሰሳ ጥናት ወደ 3724 የሚሆኑ በሰባት የአዲስ አበባ ክፍለ ከተማ ያሉ አዋቂ ሰዎች ይሳተፋበታል፡፡

ምስጢራዊነቱን በተመለከተ

እርሰዎ የሚሰጡት መረጃ ምስጢርነቱ በጥብቅ የተጠበቀ ነው፡፡ የሚሰጡት መረጃም በምንም አይነት መልኩ ለሌላ ወገን ይፋ አይደረግም፡፡ ከእርስዎ የሚገኘው መረጃ የጥናቱን ግቦች ለማሳካት ብቻ ይውላል አድራሻዎ፣ ስምዎና ግላዊ መገለጫዎ ከመጠይቅ ወረቀት ተቆርጦ በሌላ ምስጢራዊ ቁጥር ይተካል፡፡ይህ ሚስጥራዊ ቁጥር በጥናቱ ውስጥ ይሰራበታል፡፡ በጥናት ቡድን ዳግመኛ ሊፈለጉ የሚችሉት የሰጡት መረጃ ያልተሟላ ሆኖ ሲገኝ ለማሟላት እና መረጃውን ሙሉዕ ለማድረግ እና የሰጡት የደም ናሙና የምርመራ ውጤት ለእርሶ ደህንነት ሲባል መንገር ሲያስፈልግ ብቻ ነው፡፡

ተሳትፎዎ በፍቃደኝነት ላይ ስለመመስረቱ

እርሶዎ በዚህ ጥናት የሚካተቱት ተጠይቀው በሚሰጡት ሙሉ ፈቃደኝነት መሠረት ነው፡፡ ለተሳትፎ ጥያቄ ሲቀርብልዎት ያለምንም ማመንታት አለመፈለግዎን ማሳወቅ ይችላሉ፡፡ ስለመጠይቁ ምንም ዓይነት ጥያቄ ሲኖርዎት ተመራማሪውን በመገናኛ ዘዴ ማነጋገር ይችላሉ፡፡ ከላይ በተጠቀሰው ስልክ ቁጥር ተመልክተው መደዎል ይችላሉ፡፡

የመጠይቁ ይዘትና ትኩረት

የዳሰሳ ጥናቱ ትኩረት የሚያደርገው ከላይ በተገለጹት ተላላፊ ባልሆኑ የውስጥ ደዌ ህመሞች ማለትም የደምግፊት፣ የስኳር በሽታ እንዲሁም በሰውነት ደም ውስጥ የቅባት መጠን አለመመጣጠን በሽታዎች የስርጭት መጠን እና አጋላጭ ሁኔታዎችን ለማጥናት ነው፡፡ ይህም በመሆኑ ለጥናቱ ይረዳ ዘንድ በቅድሚያ የተወሰኑ መጠይቆችን እንጠይቀዎታለን፤ በመቀጠልም የደም ግፊት መጠንዎን፣ ቁመትዎን፣ ክብደተዎን እና የወገብ እና የዳሌ ዙሪያ ልኬትዎን መጠን እንወስዳለን ወይም እንለካለን ይህም ተግባር ከ 30 እስከ 45 ደቂቃ ሊዎስድ ይችላል፡፡ በመጨረሻም በመጀመሪያው ቀን ማታ ከምሽቱ ሁለት ሰአት ጀምሮ ምግብ እንዳይበሉ ምክር ይሰጥዎትና በሁለተኛው ቀን ወይም በማግስቱ የስኳር እና የቅባት መጠን ምርመራ ይደረገልዎታል፡፡ በሰውነትዎ ውስጥ ያለውን የስኳር እና ቅባት መጠንን ለመመርመር ከክንድዎ ላይ 5 ሲሲ የሚሆን ደም ይወሰዳል፡፡ ደም በሚወሰድበት ጊዜ የመርፌ መወጋት የሚያስከትለው ጠቅታ ህመም

ይሰማዎታል፡፡ በተረፈ ስለስኳር መጠንዎ ልኬት ወዲያውኑ እንዲያውቁ ይደረጋል፤ በደም ውስጥ ስላለው የቅባት መጠን ግን ከቀናት በኋላ ውጤቱ የቅባት አለመመጣጠን የሚያሳይ ከሆነ ብቻ አድራሻዎን በመጠቀም ይነገረወታል፡፡ የተወሰደው የደም ናሙና በሰውነትዎ ውስጥ ስላለው ከስኳር እና ከቅባት መጠን ውጪ አንዳች አይነት ተጨማሪ ምርመራ አይደረግበትም፡፡

የተሳታፊውን ይሁንታ ስለመጠየቅ

ከዚህ በታች ስምዎን እና ፊርማዎን ሲያስቀምጡ በጥናቱ የሚፈለግብዎን ነገር አውቀው ይሁንታዎን በሙሉ ፍቃደኛነት በመስጠት መሆኑን ይገልፃል ::

እስማማለሁ----------አልስማማም----------

ጊዜዎን ሰጥተው በጥናታችን ተሳታፊ ስለ ሆኑ በቅድሚያ እናመሰግናለን!!

ከዚህ በታች ስምና ፊርማዬን ያስቀመጥኩት የዚህ ጥናት ተሳታፊ ባቀረቡልኝ ጥያቄና ማብራሪያ በመስማማት ሙሉ ፍቃዴን መስጠቴን ያረጋግጣል፡፡

ተሳታፊዎች ስምምነቱን አንብበዋል	ተስማምቻለሁ		መረጃ ሰብሳቢዎች ስምምነቱን አንብበዋል	ተስማምቻለሁ	
	አልተስማማሁም			አልተስማማሁም	

የተሳታፊው ስም ----------

ፊርማ----------ቀን----------

የመረጃ ሰብሳቢዎች

ስም---------- ስም----------

ፊርማ ---------- ቀን--------- ፊርማ -------- ቀን----------

Annex IV: Amharic version study instruments

መረጃው የሚሰበሰብበት ቦታና ቀን	**ምላሽ/ መልስ**	**ኮድ**	**ማለፍ/ መዝለል**
የአካባቢው/ ስፍራው መለያ ቁጥር	----------	I1	
የክፍለ ከተማ ስም	----------	I2	
የቀጠና/ የመንደር ስም	----------	I3	
የጠያቂው ሙሉ ስም	----------	I4	
መጠይቁ ሙሉውኑ ተሞልቶ ያለቀበት ቀን	ቀን----------ወር----------ዓ.ም----------	I5	
ፍቃደኝነት፣የተጠየቁበት ቋንቋና ስም			
ይሁንታን ስለመጠየቅ እና ስለጥናቱ ማብራሪያ ስለመስጠቱ	1. ተስማምተዋል 2.አልስማሙም; ካልተስማሙ ማቋረጥ	I6	
የተጠየቁበት ቋንቋ	አማርኛ	I7	
የተጠየቁበት ሰአት	ሰአት----------ደቂቃ----------	I8	
የተሳታፊ የሚስጥር ቁጥር	----------	I9	

የተሳታፊው ሙሉ ስም	----------	I10	
የተሳታፊው አድራሻ ወይም ስልክ ቁጥር	----------	I11	

ክፍል 1 ግለሰባዊ መረጃዎች

ቋልፍ ግለሰባዊ መረጃዎች

ተ/ቁ	ጥያቄ	ምላሽ/መልስ	ኮድ	ማለፍ/ መዝለል
1	ዖታ	ወንድ----------1 ሴት----------2	C1	
2	የልደት ቀንዎ መቼ ነው?	ቀን--------ወር----------ዓ.ም---------	C2	ካወቁት → ተ/ቁ 4
3	እድሜዎ ስንት ነው?	----------አመት	C3	
4	የትውልድ ቦታዎ የት ነው?	ገጠር----------1 ከተማ----------2 አላውቀውም----------8	C4	
5	በልጅነት ጊዜዎ የኖሩበት/ ያደጉበት ቦታ የት ነው?	ትግራይ----------1 አፋር----------2 አማራ----------3 ኦሮሚያ----------4 ሶማሌ----------5 ቤ/ጉሙዝ---------6 ደቡብ ህዝቦች----7 ሀረሪ----------8 ጋምቤላ----------9 ድሬዳዋ----------10 አዲስ አበባ--------11 ሌላ ----------12 ሌላ ካለ ይጥቀሱ----------	C5	
6	አዲስ አበባ ከተማ ውስጥ ለስንት አመት ኖረዋል?	----------ወራት ----------አመታት አዲስ አበባ ነው የተወለድኩት-----1	C6	
7	በአጠቃላይ መደበኛ ትምህርት የተማሩት ለስንት አመታት ነው? መዋዕለ ህፃናትን ወይም ቄስ ትምህርት ቤትን ሳይጨምር	----------አመት አላስታውስም--------88	C7	
	የተብራራ መጠይቅ፤ግልሰባዊ መረጃዎች			
8	መደበኛ ትምህርት ተከታትለዋል?	አዎ ----------1 የለም----------2	C8	የለም → ተ/ቁ 10

9	ከፍተኛ የትምህርት ደረጃዎ ስንት ነው?	የመጀመሪያ ደረጃ (1-8)----------1 ሁለተኛ ደረጃ (9-10)----------2 መሰናዶ (11-12)----------3 የሙያ ትምህርት----------4 ኮሌጅ እና ከዚያ በላይ----------5 መልስ የለኝም----------88	C9	
10	የየትኛው ብሄር አባልነዎ?	አማራ----------1 ኦሮሞ----------2 ጉራጌ----------3 ትግራይ----------4 ሌላ ----------5 ሌላ ካለ ይጥቀሱ---------- መመለስ አልፈልግም----------88	C10	
11	የትዳር ሁኔታዎ እንዴት ነው?	ምንም ያላገቡ----------1 ያገቡ----------2 የተለያዩ----------3 የተፋቱ----------4 የትዳር አጋራቸውን በሞት ያጡ----5 መልስ የለኝም----------88	C11	
12	ሃይማኖትዎ ምንድነው?	ኦርቶዶክስ----------1 ሙስሊም----------2 ፕሮቴስታንት----------3 ካቶሊክ----------4 ሌላ ----------5 ሌላ ካለ ይጥቀሱ----------	C12	
13	ከሚከተሉት የማብራሪያ ሐረጎች ባለፉት 12 ወራት የትኛው መልስ የነበሩበትን የስራ ሁኔታ በሚገባ ይገልፃል?	የመንግስት ሰራተኛ----------1 መንግስታዊ ያልሆኑ ድርጅቶች ተቀጣሪ----------2 በግል ተዳዳሪ----------3 ተማሪ----------4 የቤት እመቤት----------5 የቀን ሰራተኛ----------6 ነጋዴ----------7 ስራ የሌለው ግን መስራት የሚችል----------8 ስራ የሌለውና መስራት የማይችል----------9 ጡረተኛ----------10 ሌላ ----------11 ሌላ ካለ ይጥቀሱ----------	C13	

14	በሚኖሩበት ቤት ውስጥ ከእርሰዎ ጋራ በተጨማሪ ዕድሜአቸው ከ 18 ዓመት በላይ የሆናቸው የቤተሰብ አባላት ቁጥር ምን ያህል ነው?	የሰዎች ብዛት በቁጥር----------	C14	
15	ከእርሰዎ ጋራ የቤተሰብዎ ብዛት ስንት ነው?	የሰዎች ብዛት በቁጥር----------	C15	
16	ወርሃዊ የመተዳደሪያ ገቢዎን ሊገልፁልን ይዎዳሉ?	----------ብር ምንም ገቢ የለኝም -------98 ለመመለስ አልፈልግም----88	C16	

ክፍል 2- የባህሪ መለያዎች

ቁልፍ - ትንባሆ/ሲጃራ ማጨስን በተመለከተ

ከዚህ ቀጥሎ ሲጃራ ወይም ትንባሆ ማጨስን በተመለከተ እጠይቀዎታለሁ

ተ/ቁ	ጥያቄ	ምላሽ/መልስ			ኮድ	ማለፍ/ መዝለል
17	ባሁኑ ወቅት ሲጃራ/ትምባሆ ያጨሳሉ? ለምሳሌ፡- ሲጃራ፣ ፒፓ፣ ጋያ	አጨሳለሁ----------1 አላጨስም----------2			T1	አላጨስም → ተ/ቁ 24
18	ባሁኑ ወቅት ሲጃራ/ትምባሆ በየቀኑ ያጨሳሉ?	አጨሳለሁ----------1 አላጨስም----------2			T2	
19	ሲጃራ/ትምባሆ ማጨስ የጀመሩት በስንት አመትዎ ነበር?	----------አመቴ እድሜዬን አላስትውስም---------88			T3	
20	ለምን ያህል ዘመን እንዳጨሱ ያስታውሳሉ?	----------አመት ----------ወራት ----------ሳምንታት አላስትውስም----------88			T4a T4b T4c	
21	በአማካይ በእያንዳንዱ ቀን ወይም ሳምንት ጊዜ ውስጥ የሚከተሉትን ምርቶች ምን ያህል ያጨሳሉ ወይም ይጠቀማሉ?		**በየቀኑ**	**በየሳምንቱ**		
		በፋብሪካ የተመረቱ ሲጃራዎችን			T5a/Tsaw	
		በእጅ የሚጠቀለሉ ሲጃራዎችን			T5b/Tsbw	
		ፒፓዎችን			T5c/Tscw	
		በትንባሆ ቅጠል የተጠቀለሉ ሲጃራዎችን			T5d/Tsdw	
		ሺሻዎችን በቁጥር			T5e/Tsew	
		ሌላ			T5f/Tsfw	
		ሌላ ካለ ይግለጹ				
		አላውቀውም--88				

22	ባለፉት 12 ወራት ማጨስ ለማቆም ሙከራ አድርገዋል?	አዎ ----------1 የለም አላደረኩም-----2		T6	
23	ባለፉት 12 ወራት ወደ ህክምና ሲሄዱ የጤና ሙያተኞች ማጨስ እንዲያቆሙ ነግረዎወት ነበር?	አዎ----------1 የለም----------2 በ12 ወራት ውስጥ ወደ ሃኪም ቤት አልሄድኩም-------3		T7	
24	በህይወት ዘመንዎ የትምባሆ ምርቶችን ተጠቅመው ያውቃሉ?	አዎ----------1 የለም ----------2		T8	የለም → ተ/ቁ 28
25	በህይወት ዘመንዎ የትምባሆ ምርቶችን በየቀኑ ይጠቀሙ ነበር?	አዎ----------1 የለም----------2		T9	
የተበራራ መጠይቅ ፤ ማጨስዎን በተመለከተ					
ተ/ቁ	**ጥያቄ**	**ምላሽ/መልስ**		**ኮድ**	**ማለፍ/ መዝለል**
26	ማጨስ ሲያቆሙ እድሜዎ ስንት ነበር?	----------እድሜ አላውቀውም--------88		T10	
27	ማጨስ ካቆሙ ምን ያህል ጊዜ ሆነዎት?	----------አመት ----------ወራት ----------ሳምንታት		T11a T11b T11c	
28	በአሁኑ ወቅት ጭስ የሌላቸውን የትምባሆ ምርቶች ይጠቀማሉ? ለምሳሌ፤ የሚሸተት፣ የሚታኘክ፣ በምግብ የሚወሰድ	አዎ----------1 የለም----------2		T12	የለም → ተ/ቁ 31
29	በአሁኑ ወቅት ጭስ የሌላቸውን የትምባሆ ምርቶች በየቀኑ ይጠቀማሉ? ለምሳሌ፤ የሚሸተት፣ የሚታኘክ፣ በምግብ የሚወሰድ	አዎ----------1 የለም----------2		T13	
30	የሚጠቀሙ ከሆን በአማካይ በቀን ምን ያህል ጊዜ ይጠቀማሉ? (ከቀን ያንሰ ከሆን በሳምንት ይያዝ)		**በየቀኑ**	**በየሳምንቱ**	
		በአፍ የሚማግ			T14a/T14aw
		በአፍንጫ የሚሸተት			T14b/T14bw
		የሚታኘክ			T14c/T14cw
		ሌላ			T14d/T14dw
		ሌላ ካለ ይጥቀሱ----------			
		ካላዎቁት 88 ይፃፍ			
31	በህይወት ዘመንዎጭስ የሌላቸው የትምባሆ ምርቶችን ተጠቅመው ያውቁ ነበር? ለምሳሌ፤ የሚሸተት፣ የሚታኘክ፣ በምግብ የሚወሰድ	አዎ----------1 የለም----------2		T15	የለም → ተ/ቁ 33

32	በህይወት ዘመንዎጭስ የሌላቸው የትምባሆ ምርቶች በየቀኑ ተጠቅመው ያውቁ ነበር? ለምሳሌ፤ የሚሸተት፣ የሚታኘክ፣ በምግብ የሚወሰድ	አዎ----------1 የለም----------2	T 16	
33	በለፉት 30 ቀናት በቤትዎ ውስጥ ሲጃራ የሚያጨስ ሰው ነበር? (ሲጃራ የማያጨሱ ከሆነ)	አዎ----------1 የለም----------2 አላስታውስም----------88	T 17	
34	በለፉት 30 ቀናት እርስዎ በሚገኙበት ጠባብ ክፍል ውስጥ ሲጃራ የሚያጨስ ሰው ነበር? ለምሳሌ፣ በሚኖሩበት ህንፃ፣ በሚሰሩበት ስፍራ፣ በቢሮዎ ውስጥ	አዎ----------1 የለም----------2 በተጣበበ ቦታ ስራ አልሰራም---3	T18	
35	በአሁኑ ወቅት ጫት ይቅማሉ?	አዎ----------1 የለም----------2 መመለስ አልፈልግም---------88	*T19*	የለም → ተ/ቁ 42
36	በአማካይ በአንድ ወር ጊዜ ውስጥ ለምን ያህል ቀናት ጫት ይቅማሉ?	በየቀኑ/በየቀኑ በሚያስብል ሁኔታ---1 በየሳምንቱ----------2 በየወሩ----------3 ሌላ ----------4 ሌላ ካለ ይጥቀሱ----------	*T20*	
37	በአንድ ጊዜ በሚቅሙበት ወቅት ምን ያህል ዙርባ ወይም እስር ይቅማሉ?	----------ዙርባ/ እስር	*T20a*	
38	ጫት መቃም የጀመሩት በስንት አመትዎ ነበር?	----------አመቴ	*T21*	
39	ለምን ያህል ዘመን/ጊዜ ጫት ቅመዋል?	----------ሳምንታት ----------ወራት ----------አመታት	*T22*	
42	በህይወት ዘመንዎ ጫት ቅመው ያውቃሉ?	አዎ----------1 የለም----------2 መልስ የለኝም---------88	*T23*	የለም → ተ/ቁ 45
43	ጫት መቃም ያቆሙት በስንት አመትዎ ነበር?	----------አመቴ	*T24*	
44	ጫት መቃም ካቆሙ ምን ያህል ዘመን/ ጊዜ ሆኖዎታል?	----------ሳምንታት ----------ወራት ----------አመታት	*T25*	

ቁልፍ፣ የአልኮል አወሳሰድን በተመለከተ

የሚከተሉት መጠይቆች የአልኮል ፍጆታወን እና አወሳሰድዎን የሚመለከቱ ይሆናሉ

ተ/ቁ	**ጥያቄ**	**ምላሽ/መልስ**	**ኮድ**	**ማለፍ/ መዝለል**
45	የአልኮል መጠጦችን ይጠጣሉ? ለምሳሌ፡- ቢራ፣ ወይን፣ አረቂ፣ውስኪ ወዘተ	አዎ----------1 የለም----------2	A1	የለም → ተ/ቁ 64

46	በለፉት 12 ወራት የአልኮል መጠጦችን ወስደው/ ጠጥተው ያውቃሉ?	አዎ----------1 የለም----------2	A2	አዎ → ተ/ቁ 48
47	መጠጥ መጠጣትን በጤናዎ ምክንያት አቁመዋል? ምን ማለቴ ነው በጤናዎ ላይ አሉታዊ ተፅእኖ በማሳደሩ? (ወይም የጤና ሙያተኛ በሰጠዎ ምክር የተነሳ)	አዎ----------1 የለም----------2	A3	አዎ → ተ/ቁ 64
48	በለፉት 12 ወራት በተደጋጋሚ በሚያስብል ስሌት ቢያንስ አንድ መደበኛ/ የአልኮል መጠን ያለው መጠጥን ለምን ያህል ጊዜ አዘውትረው ነበር?	በየቀኑ----------1 በሳምንት ለ5 ወይም 6 ቀናት----------2 በሳምንት ከ3 እስከ 4 ቀናት----------3 በሳምንት 1 ወይም 2 ቀናት----------4 በወር ከ1 እስከ 3ቀናት----------5 በወር ከ 1 ቀን ያነሰ ቀናት----------6	A4	
49	በለፉት 30 ቀናት የአልኮል መጠጥ ወስደው ወይም ጠጥተው ያውቃሉ?	አዎ----------1 የለም----------2	A5	የለም → ተ/ቁ 60
50	በለፉት 30 ቀናት በምን ያህል የተለያዩ ዝግጅቶች ላይ ቢያንስ አንድ መደበኛ የአልኮል መጠጥ ጠጥተዋል?	በቁጥር ይግለፁ---------- አላውቅም----------88	A6	
51	በለፉት 30 ቀናት በአማካይለምን ያህል ጊዜ መደበኛ የአልኮል ይዘት ያላቸውን መጠጦች በግብግ ኩነቶች ጠጥተዋል?	በቁጥር ይግለፁ---------- አላውቅም----------88	A7	
52	በለፉት 30 ቀናት ብዛት ያለው መደበኛ የአልኮል መጠጥ በአንድ አጋጣሚ ጠጥተው ከሆነ የሁሉንም መጠጥ አይነት የጠጡትን ደምረው ቢነግሩኝ?	ትልቁ የጠጡት የመጠጥ ቁጥር---- አላውቅም----------88	A8	
53	በለፉት 30 ቀናት ስድስት እና ከዚያ በላይ የሆኑ መደበኛ የአልኮል መጠጦችን በአንድ ግብግ ብቻ ለምን ያህል ጊዜ ተጠቅመዋል?	የተጠቀሙበት የጊዜ መጠን በቁጥር---- አላውቅም----------88	A9	
54	ለወንዶች፤ አምስት እና ከአምስት በላይ	የተጠቀሙበት የጊዜ መጠን በቁጥር---- አላውቅም----------88	A10	
55	ለሴቶች፤ አራት እና ከአራት በላይ	የተጠቀሙበት የጊዜ መጠን በቁጥር---- አላውቅም----------88	A11	
56	ባለፉት ሰባት ቀናት ውስጥ ምን ያህል መደበኛ የአልኮል መጠጦችን በየአለቱ ጠጥተዋል?	ሰኞ	A12a	
		ማክሰኞ	A12b	
		ረቡዕ	A12c	
		ሐሙስ	A12d	
		አርብ	A12e	
		ቅዳሜ	A12f	

		እሁድ	A12g	
		አላውቅም----------88		

እስካሁን ድረስ ላለፉት ሰባት ቀናት ስለጠጡት አልኮሆል ነበር ስንነጋገር የነበረው በቀጣይ ልጠይቀዎት የምፈልገው ሁሉንም አይነት አልኮሎች ሳይሆን በቤት ውስጥ የሚዘጋጁ፣ ከውጭ አገር የሚገቡ የአልኮል መጠጦችን፣ በተለይም የመንግስት ቀረጥ ሳይከፈልባቸው ለመጠጥ ፍጆታ የማይውሉ ደንበር አቋርጠው የሚገቡ መጠጦችን በተመለከተ ይሆናል፡፡ ስለሆነም ጥቂት ጊዜ ወስደው ያስቡበት እና ጥያቄዎችን ይመልሱልኛል፡፡

ተ/ቁ	ጥያቄ	ምላሽ/መልስ	ኮድ	ማለፍ/ መዝለል
57	ላለፉት ሰባት ቀናት በቤት ውስጥ የተዘጋጀ፣ ለመጠጥ ፍጆታ ፍቃድ ሳይኖራቸው ደንበር አቋርጠው የገቡ መጠጦችን ጠጥተዋል? ለምሳሌ ጠላ፣ ጠጅ፣ የሃበሻ አረቂ	አዎ----------1 የለም----------2	A13	የለም → ተ/ቁ 59
58	ባለፉት ሰባት ቀናት በአማካይ ምን ያህል መደበኛ የአልኮል መጠጦችን ጠጥተዋል?	በቤት ውስጥ የተዘጋጀ የተጣራ አልኮል ለምሳሌ ጠላ------	A14a	
		በቤት ውስጥ የተዘጋጀ ጠጅ--	A14b	
		በቤት ውስጥ የተዘጋጀ አረቂ----	A14c	
		ከአገር ውጭ የገቡ የአልኮል መጠጦች----------	A14d	
		ለመጠጥ ፍጆታ ያልተፈቀዱ እና ቀረጥ ሳይከፈልባቸው ደንበር አቋርጠው የገቡ መጠጦች------	A14e	
		ሌሎች ታክስ ያለልተከፈለባቸው መጠጦች----------	A14f	
		አላውቅም----------88		
ማበራሪያ የሚጠይቁ ጥያቄዎች፤ የአልኮል መጠጥ አወሳሰደዎን በተመለከተ				
59	ባለፉት 12 ወራት ከመጠጥ ለመቆጠብ አስበው ሲሞክሩ ለምን ያህል ጊዜ አልቻሉም?	በየቀኑ----------1 በየሳምንቱ----------2 በወራት----------3 ከወር ባነሰ----------4 አልሞከርኩትም---------5	A15	
60	ባለፉት 12 ወራት ለምን ያህል ጊዜ መስራት የፈለጉትን ጉዳይ ለማሳካት አስበው መጠጥ በመጠጣተዎ ምክንያት ብቻ ዳር ያልደረሰልዎ ስራ አለ?	በየቀኑ----------1 በየሳምንቱ----------2 በወራት----------3 ከወር ባነሰ----------4 በጭራሽ----------5	A16	
61	ባለፉት 12 ወራት መጠጥ ከጠጡ በኋላ የተለመደ ስራዎትን ለመስራት ለምን ያህል ጊዜ አቅቶዎታል?	በየቀኑ----------1 በየሳምንቱ----------2 በወራት----------3 ከወር ባነሰ----------4 በጭራሽ----------5	A17	
ቁልፍ ፣ አመጋገብን በተመለከተ				

የሚቀጥሉት መጠይቆች መሰረት የሚያደርጉት በአመጋገብ ስርአትዎ ውስጥ አትክልትና ፍራፍሬዎችን በዘወትር ገቢታዎ ላይ መጠቀምን ይመለከታል፡፡ በካርዱ ላይ ያለው እያንዳንዱ ስዕል ለአገልገሎት ሊውል የሚችለውን የምግቡን መጠን ይገልፃል፡፡ እባከዎ ከባለፈው አመት ትዝታዎ አንድ ሁነኛ

ሳምንት አስታውሰው ይንገሩኝ፡፡				
ተ/ቁ	**ጥያቄ**	**ምላሽ/መልስ**	**ኮድ**	**ማለፍ/ መዝለል**
62	በአንድ ሁነኛ ሳምንት ለምን ያህል ቀናት ፍራፍሬ ተመግበዋል?	ቀኖቹን በቁጥር ይጥቀሱ------- አላውቀውም----------88	D1	ዜሮ ቀን → ተ/ቁ 64
63	ፍራፍሬ በተመገቡበት ባንዱ ቀን ውስጥ ምን ያህል የገበታ አቅርቦትዎ ፍራፍሬዎችን ያካተተ ነበር? (ለምሳሌ፡- የተከፈለ ወይም አንድ ሙሉ ማንጎ፣ ብርቱካን፣ ፓፓዬ የመሳሰሉትን ማለቴ ነው)	የገበታ አቅርቦትዎ በቁጥር------ አላውቀውም----------88	D2	
64	በአንድ ሁነኛ ሳምንት ለምን ያህል ቀናት አትክልቶችን ተመግበዋል?	ቀኖቹን በቁጥር ይጥቀሱ--------- አላውቀውም----------88	D3	ዜሮ ቀን → ተ/ቁ 66
65	አትክልቶችን በተመገቡበት ባንዱ ቀን ውስጥ ምን ያህል የገበታ አቅርቦትዎ አትክልቶችን ያካተተ ነበር? (ለምሳሌ፡-በጭልፋ፣ በማንኪያ....)	የገበታ አቅርቦትዎ በቁጥር------- አላውቀውም----------88	D4	
በምግብ ገበታዎ ውስጥ የጨው አጠቃቀምዎን በተመለከተ				
በሚቀጥሉት መጠይቆች ማተኮር የምፈልገው በምግብዎ ውስጥ ስለሚጠቀሙት የጨው(ጥሬ ጨው) መጠን ነው፡፡ የገበታ ጨው የሚባሉት መደበኛ የገበታ ጨው(የታሸገ)፣ ከውቅያኖስ የሚወጣ ያልተጣራ ጨው፤ አዮዳይዝድ የገበታ ጨው፤ አሞሌ ወይም የደቀቀ አሞሌ፣ የሾርባ ጨው፣ ሶያ የሾርባ ጨው፣ ማጂ መረቅ፣ የቲማቲም ሶስ ወይም የአሳ ሾርባ ጨው ሊሆኑ ይችላሉ፡፡ የሚከተሉት ጥያቄዎች በምግብዎ ውስጥ ስለሚጨምሩት ጨው የሚመለከቱ ናቸው፡፡ ይህም ሲባል ከመመገብዎ በፊት ምግቡዎ ውስጥ ስለሚጨምሩት የጨው መጠን፣ ምግብ በቤትዎ እንዴት እንደሚዘጋጅ፣ ከፍተኛ የሆነ የጨው መጠን ያላቸውን የታሸጉ ወይም የተዘጋጁ ምግቦችን እንደሚጠቀሙ፣ በምግበዎ ውስጥ ያለውን የጨው መጠን እንዴት እንደሚቆጣጠሩ የሚሉ ይገኙበታል፡፡ እባክዎ አነስተኛ ጨው ነው በምግቡቹ የምጠቀመው የሚሉ ቢሆን እንኳን ለጥያቄዎች መልስ ይስጡቸው፡፡				
ተ/ቁ	**ጥያቄ**	**ምላሽ/መልስ**	**ኮድ**	**ማለፍ/ መዝለል**
66	በምግብዎ ውስጥ ጨው፣ የሶያ ጨው፣ የቲማቲም ሶስ ምን ያህል አዘውትረው ይጠቀማሉ ከምግብ በፊት ወይም እየተመገቡ እያለ?(አንድ መልስ ብቻ ይምረጡ)	ሁልጊዜ----------1 ብዙውን ጊዜ----------2 አንዳንድ ጊዜ---------- 3 አልፎ አልፎ---------- 4 በጭራሽ---------- 5 አላውቅም----------88	D5	
67	በቤትዎ ውስጥ ምግብ በሚሰሩበትና በሚያዘጋጁበት ወቅት ጨዋማ የሆነ፣ የጨው ማጣፈጫ፣ የቲማቲም ሶስ የሆነ ወይም የሾርባ ጨው ምን ያህል ይጨምራሉ?	ሁልጊዜ---------- 1 ብዙውን ጊዜ---------- 2 አንዳንድ ጊዜ---------- 3 አልፎ አልፎ---------- 4 በጭራሽ---------- 5 አላውቅም----------88	D6	
68	ከፍተኛ የጨው መጠን ተጨምሮባቸው የተዘጋጁ ምግቦችን ምን ያህል ያዘወትራሉ? ይህን ስል ምግብን ለማቆየት ሲባል ከፍተኛ የጨው መጠን በምግብ ውስጥ ይጨመራል ለምሳሌ፡- የታሸጉ ምግቦች፣ ቱና፣ የድንች ጥብስ፣ ቋንጣ፣ ቺዝ የመሳሰሉትን ለማለት ፈልጌ ነው፡፡	ሁልጊዜ---------- 1 ብዙውን ጊዜ---------- 2 አንዳንድ ጊዜ---------- 3 አልፎ አልፎ---------- 4 በጭራሽ---------- 5 አላውቅም----------88	D7	

69	የሚጠቀሙት የጨው እና የሶያ ጨው መጠን ምን የህል ነው ብለው ያስባሉ?	እጅግ በጣም ብዙ--------1 በጣም ብዙ----------2 ትክክለኛውን መጠን ----3 አነስተኛ መጠን ---------4 አልጠቀምም ----------5 አላውቀውም----------88	D8	
70	ጣፋጭ ምግቦችን ምን ያህል ያዘወትራሉ? ለምሳሌ፡- ስኳር፣ ለስላሳ፤ ኬክ ወዘተ...	ሁልጊዜ---------- 1 ብዙውን ጊዜ---------- 2 አንዳንድ ጊዜ---------- 3 አልፎ አልፎ---------- 4 በጭራሽ---------- 5 አላውቅም----------88	D9	
ማብራሪያ ጥያቄዎች፤ የአመጋገብ ስርአትን በተመለከተ				
ተ/ቁ	**ጥያቄ**	**ምላሽ/መልስ**	**ኮድ**	**ማለፍ/ መዝለል**
71	በምግብ ውስጥ ያለውን የጨው መጠን መቀነስ ጥቅም ይሰጣል ብለው ያምናሉ?	በጣም ይጠቅማል---------1 ጥቅም ይኖረዋል----------2 ምንም አይጠቅምም------3 አላውቅም----------88	D10	
72	በምግብዎ ውስጥ ከፍተኛ የጨው መጠን መኖር የጤና እክል ያመጣብኛል ብለው ያስባሉ?	አዎ----------1 የለም----------2 አላውቅም----------88	D11	
በመደበኛ ሁኔታ የጨው አጠቃቀምን ለመቆጣጠር (ለመወሰን) ከሚከተሉት ውስጥ የትኛውን ርምጃ ይዎስዳሉ?				
73	በፋበሪካ የተዘጋጁ ምግቦችን ባለመመገብ	አዎ----------1 የለም----------2	D12a	
74	በምግብ መግለጫ ዝርዝር ውስጥ የጨው አይነትና መጠንን በመመልከት	አዎ----------1 የለም----------2	D12b	
75	ዝቅተኛ የጨው መጠን ያላቸውን ምግቦች በመግዛት	አዎ----------1 የለም----------2	D12c	
76	ምግቦቼን ለማጣፈጥ ከጨው ውጭ ቅመማ ቅመሞችን በመጠቀም	አዎ----------1 የለም----------2	D12d	
77	ከቤት ውጭ የተዘጋጁ ምግቦችን ባለመመገብ	አዎ----------1 የለም----------2	D12e	
78	የጨው ፍጆታዎን ለመወሰን ከላይ ከተገለጹት ውጭ ሌሎች መንገዶችን ይጠቀማሉ	አዎ----------1 የለም----------2	D12f	አዎ → ተ/ቁ 79
79	እጠቀማለሁ ካሉ የሚጠቀሙትን ይጥቀሱ	----------	D12 other	
የሚቀጥሉት መጠይቆች በቤተዎ ውስጥ ወይም ከቤትዎ ውጭ ምግብ ሲመገቡ ስላለው የቅባት እና የዘይት አጠቃቀምዎ ላይይሆናል				
ተ/ቁ	**ጥያቄ**	**ምላሽ/መልስ**	**ኮድ**	**ማለፍ/ መዝለል**
80	በአብዛኛው ጊዜ በቤተዎ ውስጥ ምግብ ሲዘጋጅ የሚጠቀሙት ዘይት ወይም ቅባት ምን አይነት እንደሆነ	ጠጣር(የሚረጋ) የአትክልት ዘይት (ቫይኪንግ፣ ቺፍ)--------1	D13	

	ይምረጡ	የሰሊጥ/የኑግ/የሱፍ ዘይት----------2 ሽሮ ለጋ/ ሻዲ ለጋ------3 ቅቤ----------4 ማርጋሪን----------5 ሌላ ----------6 ሌላ ካለ ይጥቀሱ-------- ምንም አልጠቀምም----98 አላውቀውም----------88		
81	በአማካይ በሳምንት ውስጥ ከቤትዎ ውጭ የተዘጋጁ ምግቦችን ለምን ያህል ጊዜ ይጠቀማሉ? ማለቴ ቁርስ፣ ምሳ ወይም ራት ማለቴ ነው።	በቁጥር ይግለፁ---------- አላውቀውም ----------88 አልመገብም----------98	D14	
ቁልፍ፣ የአካል እንቅስቃሴን በተመለከተ				
ከዚህ ቀጥሎ ደግሞ በሳምንት ውስጥ የተለያዩ ተግባራትን ለመከወን ስለሚያደርጉት አካላዊ እንቅስቃሴ እጠይቀዎታለሁ። እባክዎ እነዚህን ጥያቄዎች ንቁ የአካል እንቅስቃሴ የማደርግ ሰው አይደለሁም ቢሉ እንኳን ምላሽ ይስጡባቸው። በመጀመሪያ በስራ ላይ ሆነው ያሳለፉትን ጊዜ ያስታውሱ/ ያስሉ።ያከናወኑት ስራ ክፍያ ያለው ወይም የሌለው ሊሆን ይችላል፤ ማንበብ፣ ትኩረት የሚሻ ምርምር፣ የቤት ውስጥ ስራዎች፣ አዝርእት ማጨድ፣ አሳ ማስገር፣ ስራ ፍለጋ ዞረው ሊሆን ይችላል። በሚቀጥሉት መጠይቆች ውስጥ "ጥልቅ ትኩረትና አንክሮ የሚጠይቁ ተግባራት" የሚለው ሀረግ ጠንካራ ጉልበት ብሎም ብዙ ትንፋሽ የሚያስወጣ ስራ ወይም ተግባርን ይዎክላል። "መጠነኛ ትኩረት እና አንክሮ የሚጠይቁ ተግባራት" የሚለው ሀረግ ደግሞ ተግባሩ መለስተኛ ጉልበት ብሎም ብዙ ትንፋሽ የማያስወጣ የሚል እንደሆነ እንዲረዱልኝ እፈልጋለሁ።				
ተ/ቁ	**ጥያቄ**	**ምላሽ/መልስ**	**ኮድ**	**ማለፍ/ መዝለል**
ስራዎን በተመለከተ				
82	የእርሰዎ ስራ ጠንካራ ጉልበት ብሎም ጥልቅ ትኩረት እና አንክሮ ይጠይቃል? ለማብራራት ያህል ስራዎ ብዙ ትንፋሽ የሚያስወጣና የልብን ምት የሚያስጨምሩ ማለትም(ከባድ ሸክሞችን ማንቀሳቀስ፣ መቆፈር ወይም የግንባታ ስራወችን ያጠቃልላል)? በተጨማሪም ቢያንስ ለ 10 ደቂቃዎች ያለማቋረጥ በስራ ላይ ሊቆዩ ይችላሉ?	አዎ----------1 የለም----------2	P1	የለም → ተ/ቁ 85
83	ሁነኛ በተባለ አንድ ሳምንት ውስጥ ለምን ያህል ቀናት ጠንካራ ጉልበት፣ ጥልቅ ትኩረትና አንክሮ የሚጠይቅ ስራ ሰርተው ያውቃሉ?	የቀናቱን ቁጥር በአሀዝ ይጥቀሱ----------	P2	
84	ሁነኛ በተባለ አንድ ቀን ውስጥ ለምን ያህል ሰአት ጠንካራ ጉልበት፣ ጥልቅ ትኩረትና አንክሮ የሚጠይቅ ስራ ይሰራሉ?	ሰአት----------ደቂቃ -	P3 (a-b)	
85	የእርስዎ ስራ መለስተኛ ጉልበት ብሎም ብዙ ትንፋሽ የማያስወጣ መጠነኛ ትኩረትና አንክሮ የሚፈልግ ስራ ነው? ለምሳሌ ፈጠን ያለ ርምጃ፣ ቀለል ያለ እቃ መሸከም (ቢያንስ ለ 10 ደቂቃ በተከታታይ)	አዎ----------1 የለም ----------2	P4	የለም → ተ/ቁ 88
86	ሁነኛ በተባለ አንድ ሳምንት ውስጥ ለምን ያህል ቀናት መለስተኛ ጉልበት ብሎም ብዙ ትንፋሽ የማያስወጣ መጠነኛ ትኩረትና አንክሮ የሚፈልግ ስራ ሰርተው ያውቃሉ?	የቀናቱን ቁጥር በአሀዝ ይጥቀሱ----------	P5	
87	ሁነኛ በተባለ አንድ ቀን ውስጥ ለምን ያህል ሰአት መለስተኛ ጉልበት ብሎም ብዙ ትንፋሽ የማያስወጣ መጠነኛ ትኩረትና አንክሮ የሚፈልግ ስራ ያከናውናሉ?	ሰአት---------ደቂቃ ---------	P6 (a-b)	

ከቦታ ወደ ቦታ መንቀሳቀስን በተመለከተ				
አሁን የምጠይቀወት የሚከተሉት ጥያቄዎች ጉልበት የሚጠይቁ ተግባራትን ሳይሆን በተለመደው እለታዊ እንቅስቃሴ ከቦታ ወደ ቦታ ስለሚያደርጉት ጉዞ ነው፡፡ ለምሳሌ ያህል ገበያ ሲገበዩ፣ ወደ ሱፐር ማርኬት ሲሄዱ ወይም ወደ ቤተ እምነት ሲሄዱ ስለሚያደርጓቸው እንቅስቃሴወች እንደማለት ነው፡፡				
ተ/ቁ	**ጥያቄ**	**ምላሽ/መልስ**	**ኮድ**	**ማለፍ/ መዝለል**
88	ከአንድ ቦታ ደርሶ ለመመለስ ቢያንስ 10 ደቂቃወች የሚዎስድ ጉዞን በእግር ወይም ቢስክሌት በመጠቀም ይጓዛሉ?	አዎ----------1 የለም ----------2	P7	የለም → ተ/ቁ 91
89	በአንድ ሁነኛ በተባለ ሳምንት ውስጥ ለምን ያህል ቀናት በእግርዎ ወይም ቢስክሌት በመጠቀም ቢያንስ ለ10 ደቂቃወች የሚዎስድ ጉዞን ተጉዘዋል?	የቀናቱን ቁጥር በአሀዝ ይጥቀሱ----------	P8	
90	በአንድ ሁነኛ በተባለ እለት ለምን ያህል ሰአት በእግርዎ ወይም ቢስክሌት በመጠቀም ተጉዘዋል?	ሰአት---------ደቂቃ ----------	P9(a-b)	
91	ባለፉት ሰባት ቀናት ውስጥ ለምን ያህል ቀናት የሞተር ተሽከርካሪዎችን በመጠቀም ተጉዘዋል? (ለምሳሌ ታክሲ፣ ባቡር፣ አውቶቢስ)	የቀናቱን ቁጥር በአሀዝ ይጥቀሱ----------	P10	የለም → ተ/ቁ 93
92	በአንድ ሁነኛ በተባለ እለት ለምን ያህል ሰአት የሞተር ተሽከርካሪዎችን በመጠቀም ተጉዘዋል? (ለምሳሌ ታክሲ፣ ባቡር፣ አውቶቢስ)	ሰአት---------ደቂቃ ----------	P11(a-b)	
ለመናፈስወይም ለመዝናናት የሚደረጉ እንቅስቃሴዎችን በተመለከተ				
የሚከተሉት ጥያቄዎች ከላይ የተጠቀሱትን የስራ ወይም የጉዞ እንቀሰቃሴወች አይመለከቱም፡፡ ይልቁንም እርስዎ ራስዎን ለማዝናናት መንፈስዎን ለማደስ በሚያደርጓቸው እንቅስቃሴዎች ላይ ትኩረት ያደርጋሉ፡፡ ለምሳሌ ስፓርት፣ የአካል ብቃት እንቅስቃሴ እና ለመናፈስ የሚደረግ ጉዞ የመሳሰሉትን ያጠቃልላል ነገር ግን በቀጣይነት ወይም ያለማቆራረጥ የሚሰሩ ስራዎችን ይመለከታል፡፡(ጂም፣ ዋና)				
ተ/ቁ	**ጥያቄ**	**ምላሽ/መልስ**	**ኮድ**	**ማለፍ/ መዝለል**
93	ለራስዎ በሚሰጡት የመዝናኛ ጊዜ ጉልበት የሚጠይቁ እና ትንፋሽ የሚያበዙ ስፖርቶችን ወይም የአካል ብቃት እንቅስቃሴዎችን ቢያንስ ለተከታታይ አስር ደቂቃ ያደርጋሉ (ለምሳሌ- እግር ኳስ ይጫወታሉ፣ ቴኒስ፣ ሩጫ፣ ፈጣን ዋና፣ ጂም፣በሙዚቃ የታገዘ የሰውነት ማጎልመሻ)	አዎ----------1 የለም ----------2	P12	የለም → ተ/ቁ 96
94	በአንድ ሁነኛ በተባለ ሳምንት ውስጥ ለምን ያህል ቀናት ብርቱ እና አድካሚ ስፖርት፣ የአካል ብቃት እንቅስቃሴ እና የሚያዝናኑ እንቅስቃሴዎችን ያደርጋሉ?	የቀናቱን ቁጥር በአሀዝ ይጥቀሱ----------	P13	
95	በአንድ ሁነኛ በተባለ ቀናት ውስጥ ለምን ያህል ሰአት ብርቱ እና አድካሚ ስፖርት፣ የአካል ብቃት እንቅስቃሴ እና የሚያዝናኑ እንቅስቃሴዎችን ያደርጋሉ?	ሰአት----------ደቂቃ----------	P14 (a-b)	
96	መለስተኛ ጉልበት ብሎም ብዙ ትንፋሽ የማያስወጣ መጠነኛ ትኩረትና አንከሮ የሚፈልግ እና ቢያንስ በቀጣይነት ለ10 ደቂቃ የሚሰራ፤ ለምሳሌ ፈጠን ያለ የእግር ጉዞ፣ ሳይክል፣ ዋና፣ የእጅ ኳስ ያካሂዳሉ?	አዎ----------1 የለም----------2	P15	የለም → ተ/ቁ 99
97	በአንድ ሁነኛ በተባለ ሳምንት ውስጥ ለምን ያህል ቀናት ብርቱ እና አድካሚ ያልሆኑ ለምሳሌ ስፖርት፣ የአካል ብቃት እንቅስቃሴ እና የሚያዝናና እንቅስቃሴዎችን ያደርጋሉ?	የቀናቱን ቁጥር በአሀዝ ይጥቀሱ-----	P16	

98	በአንድ ሁነኛ በተባለ ቀን ውስጥ ለምን ያህል ሰአት ብርቱ እና አድካሚ ያልሆኑ ለምሳሌ ሰፖርት፣ የአካል ብቃት እንቅስቃሴ እና የሚያዝናኑ እንቅስቃሴዎችን ያደርጋሉ?	ሰአት----------ደቂቃ--------	P17 (a-b)	
አካላዊ እንቅስቃሴን በተመለከተ የተብራራ ምላሽ የሚጠይቁ ጥያቄዎች				
ብዙ እንቅስቃሴ ያለማድረግ ባህሪያት				
የሚከተሉት ጥያቄዎች ያለምንም እንቅስቃሴ ወይም የጎላ እንቅስቃሴ በማይጠይቁ ለምሳሌ ያህል በቤት ውስጥ መቀመጥ፣ ገደም ማለት፣ በበረንዳ ላይ ዘወርወር ማለት፣ ከጓደኛ ጋራ በጠረጴዛ ዙሪያ ውይይት ማድረግ፣ በመኪና መጓዝ፣ ማንበብ፣ ካርታ መጫወት፣ ቴሌቪዥን መመልከት የመሳሰሉትን እለታዊ ተግባራት ይመለከታል የእንቅልፍ ጊዜን ግን አይጨምርም፡፡				
ተ/ቁ	**ጥያቄ**	**ምላሽ/መልስ**	**ኮድ**	**ማለፍ/ መዝለል**
99	ሁነኛ በሚባል ቀን ለምን ያህል ሰአት ቁጭ ወይም ጋደም ይላሉ?	ሰአት----------ደቂቃ----------	P18 (a-b)	
100	ባለፉት ሰባት ቀናት ውስጥ, በስራ ቀናት ጊዜ ለምን ያህል ሰአት ቁጭ በማለት ያሳልፋሉ ገደም ማለትንም ያካትታል?	ሰአት---------- ደቂቃ----------	P19(a-b)	
101	ባለፉት ሰባት ቀናት ውስጥ, በሳምንቱ መጨረሻ ቀናት ለምን ያህል ሰአት ቁጭ በማለት ያሳልፋሉ ገደም ማለትንም ያካትታል?	ሰአት---------- ደቂቃ----------	P20(a-b)	
ሌሎች ባህሪያትን በተመለከተ				
102	በዚህ 12 ወራት ውስጥ አጠቃላይ የጤና ምርመራ አድርገው ነበር?	አዎ----------1 የለም----------2 አላስታውስም-------88	L1	
103	አዎ ካሉ የሄዱት ወደ የት ነበር?	ሆስፒታል----------1 ጤና ጣቢያ---------2 ፋርማሲ----------3 ሌላ----------4 ሌላ ካለ ይጥቀሱ-----	L2	
104	መደበኛ (ሁል ጊዜ) በሚባል ሁኔታ አጠቃላይ የጤና ምርመራ ያደርጋሉ?	አዎ----------1 የለም----------2	L3	
105	በአማካይ በ 24 ሰዓታት ውስጥ (ቀንና ማታ) ለምን ያህል ሰአት ይተኛሉ?	----------ሰአት	L4	
ቁልፍ፤የደም ግፊት በሽታን በተመለከተ				
ተ/ቁ	**ጥያቄ**	**ምላሽ/መልስ**	**ኮድ**	**ማለፍ/ መዝለል**
106	ስለ ደም ግፊት ህመም ሰምተው ያውቃሉ?	አዎ----------1 የለም----------2	H1	
107	የአንድ ጤናማ ሰው የደም ግፊት ስንት በስንት ነው?	በቁጥር---------- አላውቀውም----------88	H2	

108	ለደም ግፊት ህመም የሚያጋልጡ መንስኤዎች የትኞቹ ናቸው?	ጭንቀት----------1 በእድሜ መግፋት----------2 በዘር ሀረግ----------3 ከመጠን ያለፈ ውፍረት-----4 የአካል እንቅስቃሴ መቀነስ---5 ሌላ ----------6 ሌላ ካለ ይጥቀሱ---------- አላውቅም----------88	H3	
109	የደም ግፊት ህመም የሚያሳየው ስሜትና ምልክት የቱ ነው?	የራስ ምታት----------1 መፍዘዝ----------2 ማቅለሽለሽ----------3 ሌላ ----------4 ሌላ ካለ ይጥቀሱ---------- አላውቅም----------88	H4	
110	የአካል ብቃት እንቅስቃሴ ማድረግ የደም ግፊት መጠንን ይቀንሳል ብለው ያምናሉ?	አዎ----------1 የለም----------2 አላውቅም----------88	H5	
111	የተመጣጠነ ምግብ መመገብ የደም ግፊት መጠንን ይቀንሳል ብለው ያምናሉ?	አዎ----------1 የለም----------2 አላውቅም----------88	H6	
112	ሲጃራ ማጨስ የደም ግፊት መጠንን ያቃውሳል ብለው ያምናሉ?	አዎ----------1 የለም----------2 አላውቅም----------88	H7	
113	የደም ግፊት ህመምን መከላከል እንችላለን?	አዎ----------1 የለም----------2 አላውቅም----------88	H8	
114	ጨው የበዛበትን ምግብ መመገብ እና የደም ግፊት ህመም ግንኙነት አላቸው ብለው ያስባሉ?	አዎ----------1 የለም----------2 አላውቅም----------88	H9	
115	ቢያንስ በየሁለት አመቱ የደም ግፊት መጠንዎን መለካት አለብኝ ብለው ያስባሉ(ምልክት ባይኖረዎ እንኳን)?	አወ----------1 የለም----------2 እርግጠኛ አይደለሁም----3	H10	
116	ስለ ጤናዎ እና ከጤናዎ ጋር የሚዛመዱ መረጃዎችን የሚያገኙት ከየት ነው?	ከመፅሀፍት፣ መፅሄት-------1 ከጤና ተቋም ----------2 ከቴሌቪዥን/ ራዲዮ--------3 ከቤተሰብ/ጓደኛ----------4 በትምህርት ሲማሩ---------5 ከኢንተርኔት----------6 መረጃ የለኝም----------88 ሌላ ----------7 ሌላ ካለ ይጥቀሱ----------	H11	

117	የደም ግፊት መጠንዎን በጤና ሙያተኞች ተለክተው ያውቃሉ?	አዎ----------1 የለም----------2	H12	የለም → ተ/ቁ 125
118	የደም ግፊት መጠንዎን ከፍ እንዳለ በጤና ሙያተኞች ተነግሮዎት ያውቃል?	አዎ----------1 የለም----------2	H13a	የለም → ተ/ቁ 125
119	ባለፉት 12 ወራት የደም ግፊት መጠንዎ ከፍ ብሏል ተብለው ያውቃሉ?	አዎ----------1 የለም----------2	H13b	
120	የደም ግፊትዎን ለመጨረሻ ጊዜ የተለኩት መቼ ነበር?	ጊዜውን ይግለፁ-------- አላስታውስም---------88	H13c	
121	በለፉት ሁለት ሳምንታት በሀኪም የታዘዘ የደም ግፊት መድሀኒት ወስደዋል?	አዎ----------1 የለም----------2	H14	
122	ባሁኑ ወቅት በሀኪም ወይም በጤና ሙያተኛ የትኞቹን የምክር አገልግሎቶች አግኝተዋል?	የደምግፊት መድሃኒት-------1 ጨው እንዲቀንሱ ምክር----2 ክብደት እንድቀንሱ ምክ----3 ሲጃራ ማጨስ እንዲያቆሙ-4 እንቅስቃሴ እንዲያደርጉ---5 ሌላ ----------6 ሌላ ካለ ይጥቀሱ----------	H15	
123	የደም ግፊት ችግርዎን በተመለከተ የባህል መድሀኒት አዋቂ ጋራ ራስዎን አሳይተው ነበር?	አዎ----------1 የለም----------2	H16	
124	አሁን ባሉበት ሁኔታ የደም ግፊት ችግርዎን በተመለከተ ያስተካከላል ብለው የሚያምኑትን የባህል መድሀኒት እየወሰዱ ነው?	አዎ----------1 የለም----------2	H17	
125	በቤተሰብዎ ውስጥ የደም ግፊት በሽታ ያለበት ሰው ነበር(አለ)?	ቤተሰብ----------1 አባት----------2 እናት----------3 ወንድምና እህት----------4 ልጆች----------5 ማንም የለም----------6 አላውቅም----------88	H18	
ቁልፍ፤ የስኳር በሽታን በተመለከተ				
ተ/ቁ	**ጥያቄ**	**ምላሽ/መልስ**	**ኮድ**	**ማለፍ/ መዝለል**
126	ስለ ስኳር ህመም ሰምተው ያውቃሉ?	አዎ----------1 የለም----------2	H19	
127	ከሰሙ ከማን ነበር የሰሙት?	ከመገናኛ ዘዴዎች--------1 ከጤና ሙያተኞ----------2 ከጓደኛ/ ቤተሰብ---------3 ከተምህርት ቤት---------4 ከ ኢንተርኔት----------5	H20	

		ሌላ ----------6 ሌላ ካለ ይጥቀሱ----------		
128	የስኳር ህመም ምልክቶች ምን ምን ናቸው?	ቶሎ ቶሎ መራብ--------1 ቶሎ ቶሎ መጠጣት-----2 ቶሎ ቶሎ መሸናት------3 ብዥ ማለ----------4 ተሎ የማይድን ቁስል----5 አላውቅም----------88 ሌላ ----------6 ሌላ ካለ ይጥቀሱ---------	H21	
129	ለስኳር ህመም ተጋላጭነት መንስኤ የሆነው የቱ ነዉ?	በእድሜ መግፋት-------1 አልኮል መጠጥ----------2 በጣም በመወፈር---------3 በእርግዝና ወቅት--------4 እንቅስቃሴ ባለማድረግ--5 በቂ አትክልትና ፍራፍሬ ያለመመገብ----------6 በዘር----------7 አላውቅም----------88 ሌላ ----------8 ሌላ ካለ ይጥቀሱ----------	H22	
130	የስኳር ህመምን ለመከላከል የሚጠቅመውዘዴ የቱነው?	ሁልጊዜ የአካል ብቃት እንቅስቃሴ ማድረግ------1 አመጋገብን ማስተካከል--2 የህክምና ምርመራ ማድረግ----------3 ክብደት መቀነስ----------4 ሌላ ----------5 አላውቅም----------88 ሌላ ካለ ይጥቀሱ----------	H23	
131	የስኳር ህመም ሲወሳሰብ የሚያመጣው ችግር ምንድነው?	የአይን እይታን ማሳጣት----------1 የደም ግፊት ህመም------2 የኩላሊት ችግር----------3 የእግር አካልን ማጣት---4 አላውቅም----------88 ሌላ ----------5 ሌላ ካለ ይጥቀሱ----------	H24	

132	የስኳር ህመም እንዳለበዎት እና እንደሌለበዎት ለማወቅ መመርመር እንዳለበዎት ይስማማሉ?	በጣም እስማማለሁ-------1 እስማማለሁ----------2 እርግጠኛ አይደለሁም---3 አልስማማም----------4 በጣም አልስማማም-------5	H25	
133	በደምዎ ውስጥ ያለው የስኳር መጠን ተለክቶ ያውቃል?	አዎ----------1 የለም----------2	H26	የለም → ተ/ቁ 142
134	በደምዎ ውስጥ ያለው የስኳር መጠን በጤና ሙያተኛ ተለክቶ ከፍተኛ ነው ወይም የስኳር በሽታ አለበዎት ተብለው ያውቃሉ?	አዎ----------1 የለም----------2	H27a	የለም → ተ/ቁ 142
135	ባለፉት 12 ወራት በደምዎ ውስጥ ያለው የስኳር መጠን ከፍተኛ ነው ወይም የስኳር በሽታ አለበዎት ተብሎ ተነግሮዎታል?	አዎ----------1 የለም----------2 አላስታውስም------88	H28b	
136	በለፉት ሁለት ሳምንታት በጤና ሙያተኞች የታዘዘ የስኳር በሽታ መድሀኒት እየወሰዱ ቆይተዋል?	አዎ----------1 የለም----------2	H29	
137	በአሁኑ ወቅት ኢንሱሊን የሚባል ለስኳር በሽታ የሚሰጥ መድሀኒት በጤና ሙያተኞች ታዘለወት እየወሰዱ ነው?	አዎ----------1 የለም----------2	H30	
138	ከሚከተሉተ ውስጥ የትኞቹን የምክር አገልገሎቶች ከሃኪምዎ አግኝተዋል?	አመጋገብዎን እንዲያስተካልሉ----------1 ክብደት እንዲቀንሱ-------2 ሲጃራ ማጨስ እንዲያቆሙ---3 የአካል እንቅስቃሴ እንዲያደርጉ----------4 ሌላ ----------11 ሌላ ካለ ይጥቀሱ----------	H31	
139	በደምዎ ውስጥ ያለው የስኳር መጠን በመጨመሩ ወይም የስኳር በሽታዎን አስመልክቶ ወደ ባህላዊ መድሀኒት አዋቂ ዘንድ ሄደው ነበር?	አዎ----------1 የለም----------2	H32	
140	በአሁኑ ወቅት በደምዎ ውስጥ ያለው የስኳር መጠን በመጨመሩ ወይም የስኳር በሽታዎን ለማስታገስ የባህል መድሀኒት እየወሰዱ ነው?	አዎ----------1 የለም----------2	H33	
141	በቤተሰብዎ ውስጥ የስኳር በሽታ ያለበት ሰው ነበር(አለ)?	ቤተሰብ----------1 አባት----------2 እናት----------3 ወንድምና እህት--------4 ልጆች----------5 ማንም የለም----------6 አላውቅም----------88	H34	
ቁልፍ፤ በደም ውስጥ የኮሌስትሮል መጠን መጨመርን በሚመለከት				
ተ/ቁ	**ጥያቄ**	**ምላሽ/መልስ**	**ኮድ**	**ማለፍ/ መዝለል**

142	በደም ውስጥ ያለውን የኮሌስትሮል ቅባት መጠን በጤና ሙያተኛ ተለክተው ያውቃሉ?	አዎ----------1 የለም----------2	H35	የለም → ተ/ቁ 148
143	በጤና ሙያተኛ በደምዎ ውስጥ ያለው የኮሌስትሮል ቅባት መጠን ከፍተኛ ነው ተብለው ያውቃሉ?	አዎ----------1 የለም----------2	H36a	የለም → ተ/ቁ 148
144	ባለፉት 12 ወራት በጤና ሙያተኛ በደምዎ ውስጥ ያለው የኮሌስትሮል ቅባት መጠን ከፍተኛ ነው ተብለዋል?	አዎ----------1 የለም----------2	H36b	
145	ባለፉት ሁለት ሳምንታት በጤና ሙያተኛ በደምዎ ውስጥ ያለውን ከፍተኛ የኮሌስትሮል ቅባት መጠን የሚያስተካክል በአፍ የሚወሰድ መድሃኒት ወስደዋል?	አዎ----------1 የለም----------2	H37	
146	በደምዎ ውስጥ ያለውን ከፍተኛ የኮሌስትሮል ቅባት መጠን ተከትሎ የባህላዊ መድሀኒት አዋቂ ዘንድ ሄደው ነበር?	አዎ----------1 የለም----------2	H38	
147	በአሁኑ ወቅት በደምዎ ውስጥ ያለውን ከፍተኛ የኮሌስትሮል ቅባት መጠን ተከትሎ የባህላዊ መድሀኒት የሚወስዱት አለ?	አዎ----------1 የለም----------2	H39	
148	በቤተሰብዎ ውስጥ ከፍተኛ የኮሌስትሮል ቅባት መጠን ያለበት ሰው ነበር(አለ)?	ቤተሰብ----------1 አባት----------2 እናት----------3 ወንድምና እህት-------4 ልጆች----------5 ማንም የለ----------6 አላውቅም----------88	H40	
አሁን ስለአመጋገብዎ የተወሰኑ ማብራሪያዎችን እጠይቀዎታለሁ				
149	ጥሬ ስጋ ይመገባሉ?	አዎ----------1 የለም----------2	O1	
150	ጥሬ ስጋ ከተመገቡ አመጋገብዎ እንዴት ነው?	በየሳምንቱ ----------1 በየወሩ----------2 ሌላ ----------3 ሌላ ካለ ይጥቀሱ-------	O2	
151	ቡና ይጠጣሉ	አዎ----------1 የለም----------2	O3	የለም → ተ/ቁ 153
152	ቡና በአማካይ በቀን ስንት ስኒ ወይም ብርጭቆ ይጠጣሉ?	አንድ----------1 ሁለት----------2 ሶስት----------3 አራት ----------4 ሌላ ----------5 ሌላ ካለ ይጥቀሱ--------	O4	
ክፍል ሁለት፤ አካላዊ ልኬቶች				
ቁልፍ፤ የደም ግፊት መጠን				
ተ/ቁ	**ጥያቄ**	**ምላሽ/መልስ**	**ኮድ**	**ማለፍ/ መዝለል**

153	የጠያቂው ስምና መለያ ቁጥር	----------	M1	
154	የደም ግፊት መለኪያ መሣሪያው ቁጥር	----------	M2	
155	የተጠቀሙበት ካፍ/cuff/ መጠን	ትንሹ----------1 መጠነኛ----------2 ትልቁ----------3	M3	
156	ንባብ 1	ሲስቶሊክ---------- ሚሊ ሜትር ሜረኩሪ ዲያስቶሊክ---------- ሚሊ ሜትር ሜረኩሪ	M4a M4b	
157	ንባብ 2	ሲስቶሊክ---------- ሚሊ ሜትር ሜረኩሪ ዲያስቶሊክ ---------- ሚሊ ሜትር ሜረኩሪ	M5a M5b	
158	ንባብ 3	ሲስቶሊክ---------- ሚሊ ሜትር ሜረኩሪ ዲያስቶሊክ---------- ሚሊ ሜትር ሜረኩሪ	M6a M6b	
159	ባለፉት ሁለት ሳምንታት የደም ግፊት መጠንዎ ስለ ጨመረ ከሃኪም የደም ግፊት መድሃኒት እንዲወስዱ ተመክረው ነበር?	አዎ----------1 የለም----------2	M7	
ቁልፍ፤ ቁመትና ክብደት				
160	የጠያቂው መለያ ቁጥር	----------	M8	
161	የቁመት እና ክብደት መጠንን ለመለካት የተጠቀሙበት መሣሪያ ቁጥር	የቁመት---------- የክብደት----------	M9	
162	ቁመት	----------ሴ.ሜ	M10	
163	ክብደት	----------ኪ.ግ	M11	
ቁልፍ ፤ የወገብ ዙሪያ ልኬት				
164	የወገብ ዙሪያ ልኬት	----------ሴ.ሜ	M12	
የተብራራ ምላሽ፤ የዳሌ ዙሪያ ልኬት እና የልብ ምት መጠን				
165	የዳሌ ዙሪያ ልኬት	----------ሴ.ሜ	M13	
ክፍል 3፤ በደም ውስጥ ያለ የስኳር መጠን				
ቁልፍ፤ በደም ውስጥ ያለ የስኳር መጠን				
166	ባለፉት 12 ሰዓታት ውሃን ሳይጨምር የበሉት ወይም የጠጡት ነገር አለ?	አዎ----------1 የለም----------2	B1	
167	የቴክኒክ ባለሙያው መለያ ቁጥር	----------	B2	
168	ደም የወሰዱበት ዕለታዊ ሰዓት	ሰአት----------ደቂቃ----------	B4	
169	ምግብ ሳይመገቡ በፊት በደም ውስጥ የነበረው የስኳር መጠን	----------ሚግ/ዴሊ	B5	
170	በዛሬው ዕለት የደም ውስጥ የስኳር መጠንዎ ከፍ ከማለቱ ጋር በተያያዘ በሃኪም የታዘዘለዎትን ኢንሱሊን ወይም ሌላ መድሃኒት ወስደዋል?	አዎ----------1 የለም----------2	B6	

ቁልፍ፤ በደም ውስጥ ያለው የቅባት መጠን				
171	የተሳታፊው መለያ ቁጥር	----------	B7	
172	የተሳታፊው መኖሪያ ቦታ	ክፍለ ከተማ---------- ወረዳ----------ቀጠና----	B8	
173	የናሙናው መለያ ቁጥር	----------	B9	
174	ናሙናው የተወሰደበት ሰአት	----------	B10	
175	ናሙናው የተዘገበበት ቀን	----------	B11	
176	ናሙናው የተዘገበበት ሰአት	----------	B12	
177	በደም ውስጥያለውአጠቃላይ የኮሌስትሮል መጠን	----------ሚግ/ዴሊ	B13	
178	ባለፉት ሁለት ሳምንታት ውስጥ በደምዎ ውስጥ ያለው የኮሌስትሮል ቅባት መጠን በመጨመሩ ምክንያት በሃኪም የታዘዙለዎት መድሃኒቶች ተጠቅመው ነበር?	አዎ----------1 የለም----------2	B14	
የተብራራ ምላሽ፤ ትራይግላይሴራይድ እና ከፍተኛ ዴንሲቲ ያለው የኮለስትሮል ቅባት ልኬቶች				
179	የትራይግላይሴራይድ መጠን	----------ሚግ/ዴሊ	B15	
180	ከፍተኛዴንሲቲ ያለውየኮለስትሮልቅባት መጠን(በሚሊሞል ወይም በ ሚግ/ዴሊ)	----------ሚግ/ዴሊ	B16	
181	ዝቅተኛዴንሲቲ ያለውየኮለስትሮልቅባት መጠን	----------ሚግ/ዴሊ	B17	

Annex V: Sample Brochure

ተላላፊ ያልሆኑ በሽታዎችን እንከላከል

መግቢያ፡-

ተላላፊ ያልሆኑ በሽታዎች ማለት ከሰው ወደ ሰው መተላለፍ የማይችሉ እና በአይን በማይታዩ ተህዋስያን ምክንያት የማይመጡ ወይም ሊከሰቱ የማይችሉ በሽታዎች ማለት ናቸው፡፡

ጥናቶች እንደሚጠቁሙት በ2008 እ.ኤ.አ በዓለም አቀፍ ደረጃ በተለያዩ ምክንያቶች 57 ሚሊዮን ሰዎች ሞተዋል፤ ከነዚህ ውስጥም ሁለት ሶስተኛው ወይም 36 ሚለዮን የሚሆኑት ሰዎች የሞቱት ተላላፊ ባልሆኑ በሽታዎች ምክንያት ነው፡፡ ተላላፊ ካልሆኑ በሽታዎች ውስጥ በዋናነት የደም ግፊት፣ የስኳር፣ የካንሰርና በሰውነታችን ውስጥ የደም ውስጥ የቅባት መጠን አለመመጣጠን ይጠቀሳሉ፡፡

1. የደም ግፊት በሽታ

- እንደ የአለም ጤና ድርጅት ዘገባ በአሁኑ ወቅት ከጠቅላላው የዓለም ህዝብ 22 በመቶ የሚሆኑት አዋቂ ሰዎች የደም ግፊት በሽታ እንዳለባቸው ተጠቁሟል፡፡

- ✓ የደም ግፊት በሽታ ሲባል የደማችን የግፊት መጠን ከወትሮው በላይ ጨምሮ (ከፍ በሎ) ሲገኝ ወይም ልባችን አስፈላጊውን የደም መጠን ወደ ሰውነታችን ውስጥ ባስፈላጊው ኃይል መግፋት ሲያቅተው ነው፡፡
- ✓ የደም ግፊት ሁለት አይነት ልኬት ያለው ሲሆን የላይኛው (ሲስቶሊክ) እና የታችኛው (ዲያስቶሊክ) ልኬት ተብሎ ይታወቃል፡፡
- ✓ የአንድ ጤናማ ሰው የደም ግፊት የሚባለው በአማካይ ከ120/80 ሚሊ ሜትር ሜርኩሪ በታች ሲሆን ነው፡፡
- ✓ የደም ግፊት ልኬት በሶስት የተለያዩ ጊዜያት ተለክቶ 140/90 ሚሊ ሜትር ሜርኩሪና ከዚህ በላይ ከሆነ አንድ አዋቂ ሰው የደም ግፊት በሽታ እንዳለበት ያመለክታል፡፡

2. የስኳር በሽታ

- የስኳር በሽታ በዓለም አቀፍ ደረጃ ማለትም ባደጉም ሆነ ባላደጉት ሀገራት ከፍተኛ የሆኑ የጤና ችግሮችን እያስከተከ የሚገኝ ህመም ነው፡፡
- እንደ የአለም ጤና ድርጅት ሪፖርት ከአለም ህዝብ 9 በመቶ የሚሆኑት አዋቂ ሰዎች የስኳር በሽታ እንዳለባቸው ተጠቁሟል፡፡

- የስኳር ህመም ማለት በሰውነታችን ውስጥ ያለው ኢንሱሊን ወይም ንጥረ ቅመም /ሆርሞን/ በደንብ ሳይመረት ሲቀር ወይም የተመረተውን ሰውነታችን በአግባቡ ሳይጠቀምበት ሲቀርና በደም ውስጥ የስኳር መጠን ከተለመደው መደበኛ መጠን በላይ ሲሆን ማለት ነው::

የስኳር በሽታ እንዳለብን እንዴት ማወቅ ይቻላል?

የስኳር በሽታ እንዳለብን ለማወቅ ህመሙ የሚያሳየውን ምልክት በመለየት ወይም የደም ምርመራ በማድረግና በደም ውስጥ ያለውን የስኳር መጠን ልኬታ በማወቅ ማረጋገጥ እንችላለን::

- ❖ ህመምተኛው በሚያሳየው ምልክቶች ስንል፣ ቶሎ ቶሎ መሸናት፣ የማያቋርጥ የውሃ ጥምና አሁንም አሁንም መብላት ዋነኛወቹ ምልክቶች ሲሆኑ
- ❖ ሌላዉ ደግም የደም ምርመራ በማድረግ እና በደም ውስጥ ያለው የስኳር (glucose) ልኬት መጠን ምግብ በልተው ከተሰራ 200 ሚሊግራም/ ዴሲሊትር እና ከዚያ በላይ ከሆነ ወይም
- ❖ ምግብ ሳይበሉ ከተሰራ የልኬት መጠኑ 126 ሚሊግራም/ ዴሲሊትር እና ከዚህ በላይ ከሆነ የስኳር በሽታ ህመምተኛ መሆንዎን ያመለክታል::

ተላላፊ ያልሆኑ በሽታዎች መንስኤ

- የደም ግፊት ወይም የስኳር በሽታ አሁን እስካለንበት ዘመን ድረስ መንስኤያቸው ይህ ነው ተብሎ በትክክል አይታወቅም:: ይሁን እንጂ የተለያዩ ምክንያቶች ለበሽታው ሊያጋልጡና አስተዋፅኦ ሊኖራቸው ይችላል ተብለው የሚጠቀሱ አሉ እነዚህም:-
  - ከመጠን በላይ መወፈር
  - ሲጋራ ማጨስ
  - ብዙ አልኮል መጠጣት
  - የደም ውስጥ የቅባት መጠን አለመመጣጠን
  - በዘር
  - በእድሜ መግፋት
  - በቂ የሰውነት እንቅስቃሴ ባለማድረግ
  - አትክልትና ፍራፍሬ በበቂ ሁኔታ ያለመመገብ በተደጋጋሚ የሚጠቀሱ ናቸው::

የደም ግፊት እና የስኳር በሽታ ምልክቶች ምንድናቸው?

የደም ግፊት ወይም የስኳር በሽታ ብዙውን ጊዜ ምልክት ሳያሳይ ሊቆይ ይችላል:: ለዚህም ነው በተለይ የደም ግፊት ድምፅ አልባ ገዳይ በሽታ በመባል የሚጠራው:: ነገር ግን በተወሰኑ ሰዎች በሽታዎቹን ሊጠቁሙ የሚችሉ ምልክቶች ያሳያሉ ለምሳሌም:-

የደም ግፊት በሽታ ምልክቶች

- ✓ የልብ ቶሎ ቶሎ መምታትና ህመም
- ✓ የአይን ብዥታ
- ✓ በጆሮ የሚሰማ የፈሳሽ አይነት ድምፅ
- ✓ የራስ ምታት
- ✓ የደረት ውጋት

የስኳር በሽታ ምልክቶች

- የማያቋርጥ የውሃ ጥም
- አሁንም አሁንም መብላት

- የኣይን ብሸፐታ
- ድካም ናቸው::

<u>የደም ግፊት ወይም የስኳር በሽታ ጉዳቶች</u>

ህመሞቹ በሰዎች አካላት ውስጥ የሚያደርሱት ጉዳት ብዙ ሲሆኑ ጥቂቶቹን ለመጥቀስ፡-

- የልብ ጉዳት(መድከም)
- የኩላሊት መታወክ (የኩላሊት መድከም)
- የሰውነት መልፈስፈስና ራስን መሳት
- አንጎል ውስጥ ደም መፍሰስ ወይም መጓጎል
- የኣይን ብርሀንን ማጣት (መቀነስ)
- ለድንገተኛ ሞት መዳረግ ናቸው::

<u>የደም ግፊት እና የስኳር በሽታን ለመከላከል መወሰድ ያለባቸው ጥንቃቄዎች፡-</u>

- **አመጋገብን ማስተካከል**
  - ✓ ቅባት ነክ የሆነ ምግቦችን በመቀነስ አትክልትና ፍራፍሬን አዘውትሮ መመገብ
  - ✓ የጨውን መጠን ቀንሶ መመገብ
  - ✓ ጣፋጭነት ያላቸውን ምግብ መቀነስ
- **ከመጠን በላይ አለመወፈር**
  - ✓ በቀን ውስጥ ቢያንስ ለ30 ደቂቃ ያህል በእግር የመጓዝ ልምድን ማዳበር
  - ✓ ክብደትን መቀነስ
- **ሲጋራ አለማጨስ**
- **አልኮል አለመጠጣት**

ከደም ግፊት ህክምና ጋር የተያያዙ እምነቶችንና አመለካከቶችን ለይቶ ማወቅና አላስፈላጊ የሆኑትን ነገሮች ማስወገድ ለምሳሌ፡-

- በሽታው መድሀኒቱን ይላመድብኛል ብሎ በማሰብ የታዘዘውን መድሀኒት አለማቋረጥ
- ጉዳት የሚያስከትለው የታችኛው የደም ግፊት ልኬት /ዲያስቶሊክ/ ብቻ ነው ብሎ መከታተል ስህተት መሆኑን አምኖ ለላይኛው የግፊት ልኬትም /ሲስቶሊክ/ እኩል ግምት መስጠት
- የደም ግፊት በራስ ምታትና ማጅራት በመጨምደድ ብቻ ይታወቃል ብሎ ማሰብ የተሳሳተ መሆኑን ተገንዝቦ በየጊዜው ምርመራ ማድረግ
- የደም ግፊት ወይም የስኳር በሽታ ወፍራም ሰዎችን ብቻ ያጠቃል ብሎ ማሰብ የተሳሳተ መሆኑን ተገንዝቦ ማንኛውም አዋቂ በየጊዜው ምርመራ ማድረግ::
- የደም ግፊት ወይም የስኳር በሽታ በሀብት የበለፀጉ ሰዎችን ብቻ ያጠቃል ብሎ ማሰብ የተሳሳተ መሆኑን ተገንዝቦ ምርመራ ማድረግ::
- የደም ግፊትና የስኳር በሽታዎች አብዛኛውን ጊዜ ምልክት ስለማይኖራቸው በየጊዜው ቅድመ ምርመራ በማድረግ ራስን ማወቅ::
- የሐኪምን ሙያዊ ምክር መቀበል፣ መከታተልና መተግበር ከብዙዎች ጥቂቶቹ ናቸው::

Annex VI: Declaration Form

I, the undersigned declare that this is my original work, has never been presented in this or any other university, and that all the resources and materials used for the dissertation have been fully acknowledged.

Name: _____

Signature: _____

Date: _____

Place: _____

This dissertation has been submitted for examination with my approval as university supervisor.

Name: _____

Signature: _____

Date: _____

Annex VII: Published Original Papers/ and/ or manuscripts

PLOS ONE

RESEARCH ARTICLE

Prevalence and risk factors of hypertension among adults: A community based study in Addis Ababa, Ethiopia

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Citation: Asemu MM, Yalew AW, Kabeta ND, Mekonnen D (2021) Prevalence and risk factors of hypertension among adults: A community based study in Addis Ababa, Ethiopia. PLoS ONE 16(4): e0248934. https://doi.org/10.1371/journal.pone.0248934

Editor: Rudolf Kirchmair, Medical University Innsbruck, AUSTRIA

Received: August 26, 2020

Accepted: March 8, 2021

Published: April 1, 2021

Peer Review History: PLOS recognizes the benefits of transparency in the peer review process; therefore, we enable the publication of all of the content of peer review and author responses alongside final, published articles. The editorial history of this article is available here: https://doi.org/10.1371/journal.pone.0248934

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Data Availability Statement: All relevant data are within the manuscript and its Supporting Information files.

Abstract

Background

In all areas of the World Health Organization, the prevalence of hypertension was highest in Africa. High blood pressure is a significant risk factor for coronary and ischemic diseases, as well as hemorrhagic stroke. However, there were scarce data concerning the magnitude and risk factors of hypertension. Thus, this study aimed to identify the prevalence and associated factors of hypertension among adults in Addis Ababa city.

Method

A community-based cross-sectional study was conducted from June to October 2018 in Addis Ababa city. Participants aged 18 years and older recruited using a multi-stage random sampling technique. Data were collected by face-to-face interview technique. All three WHO STEPS instruments were applied. Additionally, participants' weight, height, waist, hip, and blood pressure (BP) were measured according to standard procedures.

Multiple logistic regressions were used and Odds ratios with 95% confidence intervals were also calculated to identify associated factors.

Results

In this study, a total of 3560 participants were included.The median age was 32 years (IQR 25, 45). More than half (57.3%) of the respondents were females. Almost all (96.2%) of participants consumed vegetables and or fruits less than five times per day. Eight hundred and sixty-five (24.3%) of respondents were overweight, while 287 (8.1%) were obese. One thousand forty-one 29.24% (95% CI: 27.75–30.74) were hypertensive, of whom two-thirds (61.95%) did not know that they had hypertension.

Factors significantly associated with hypertension were age 30–49 and ≥50 years (AOR = 2.79, 95% CI: 1.39–5.56) and (AOR = 8.23, 95% CI: 4.09–16.55) respectively, being male (AOR = 1.88, 95% CI: 1.18–2.99), consumed vegetables less than or equal to 3 days per week (AOR = 2.44, 95% CI: 1.21–4.93), obesity (AOR = 2.05, 95%CI: 1.13–3.71),

Funding: This work was funded by Addis Ababa University, Addis Ababa, Ethiopia. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Competing interests: The authors have declared that no competing interests exist.

abdominal obesity (AOR = 1.70, 95% CI: 1.10–2.64) and high triglyceride level (AOR = 2.06, 95% CI: 1.38–3.07).

Conclusion

In Addis Ababa, around one in three adults are hypertensive. With a large proportion, unaware of their condition. We recommend integrating regular community-based screening programs as integral parts of the health promotion and disease prevention strategies. Life-style interventions shall target the modifiable risk factors associated with hypertension, such as weight loss and increased vegetable consumption.

Introduction

Between 1980 and 2010, the proportion of the world's population with high blood pressure (defined as systolic and or diastolic blood pressure $\geq$ 140/90 mmHg) or uncontrolled hypertension had dropped modestly. However, sharp rises due to population growth and aging have been recorded across the World Health Organization (WHO) regions over the past decade, with the largest rise in Africa at 30%. The lowest prevalence of raised blood pressure was noted in the Americas region, at 18%, while the global estimate among adults aged 18 years and above was around 22% in 2014. According to the WHO estimates,Ethiopia tops at 24.4% for all adults combined [1–3].

High blood pressure accounts for about 13.5% of annual deaths in the world. Moreover, hypertension directly accounts for 54% of all strokes and 47% of all coronary artery disease worldwide. At the same time, the most productive segment of the population is those aged 45 to 69, who make up more than half of this burden [4].

High blood pressure is a major risk factor for coronary and ischaemic diseases as well as bleeding stroke. It has been shown that blood pressure levels are positively associated with the risk of stroke and coronary heart disease [5]. One of the most modifiable risk factors for cardiovascular diseases is hypertension. However, awareness towards the treatment and control of hypertension is extremely low among the low and middle-income counties (LMICs), including Ethiopia.On top of this, the health care resources of the LMICs are overwhelmed by other priorities, including HIV/AIDS, tuberculosis, and malaria. As a result, many LMICs have not yet given due attention to its prevention and control [6].

In Ethiopia, non-communicable diseases such as hypertension and diabetes mellitus have begun to emerge as the leading causes of hospital admissions, morbidity, and mortality in health facilities located around the nation [7]. A 2016 report by the Ethiopian Public Health Institute (EPHI) found that 95% of Ethiopian adult populations have 1 to 2 risk factors for non-communicable diseases [8,9]. But there was little information on the extent and risk factors for hypertension at the community level in Ethiopia, including the Addis Ababa study area.

That little information was done by using the WHO stepwise tool step one and step two only [6,10]. And the study setting was at the facility level, though; there was a single study done at the national level using all the three World Health Organization stepwise tools [8,11]. Besides, the study area, Addis Ababa, is the largest urban center and capital of Ethiopia, providing approximately one-quarter of the urban population in Ethiopia [6]. This study aimed to determine the prevalence and associated factors of hypertension in the adult population of Addis Ababa using the three stepwise tools of the World Health Organization.

Methods

Study design and area

A cross-sectional community study was conducted from 1 June to 31 October 2018 in Addis Ababa City. Addis Ababa city is the capital city of Ethiopia. Administratively, Addis Ababa subdivided into ten sub-cities and 116 woredas [12]. According to the Central Statistical Agency of the Federal Democratic Republic of Ethiopia, the city was projected to inhabit 3,433,999 population by 2017 [13].

Sampling techniques and sample size determination

Multi-stage cluster sampling techniques were employed by first identifying seven of the ten sub-cities based on preset criteria, including the location of the area, population density, and socioeconomic status. Then, one woreda was randomly selected from each selected sub-cities. After that, two 'ketenas' were randomly picked from the chosen woredas, which are the smallest geographical units within woredas. Finally, for each ketena, the first household was randomly selected, while subsequent households were selected based on proximity to the first and the preceding household.

A total of 3,724 eligible adults aged 18 and over were interviewed at the selected households. The required sample size was determined using the single population proportion formula by considering: prevalence of hypertension 31.5% from a previous study done in Addis Ababa, Ethiopia [6], $\alpha = 0.05$ ($z = 1.96$), the margin of error 2%, design effect of 1.5 and 20% possible non-response rate. We also determined the sample size for the risk factors of hypertension by using two population proportion formula. But the maximum sample size was attained during the single population proportion formula. As well, the total sample size for each sub-city was determined using with probability proportional to size (PPS).

Data collection instruments and measurements

We used the adapted WHO STEPwise approach to surveillance tools. These tools have a sequential process and aim to serve as an entry point for low- and middle-income countries to monitor chronic diseases and their risk factors. All the three WHO STEPS instrument was applied to collect data on the selected information, including socio-demographic, behavioral, physical, and biochemical measurements as a part of the core and expanded modules [14]. The tools were first pretested among adults found outside the study area and, then modifications were made based on the findings.

The data were collected via face-to-face interview by trained baccalaureate nurse and laboratory technicians. Weighing scales and non stretch tape were used to measure body weight and height. Weight and height were measured as participants were standing without shoes and wearing lightweight clothing. Height was recorded to the nearest 0.5 cm; weight was recorded to the nearest 100g. Body Mass Index (BMI) was calculated as weight in kilograms divided by height in meters squared (weight (kg)/height (m^2) and classified as underweight (<18.5), normal (18.5–24.9), overweight (25–29.9) and obese (≥ 30.0).

Waist circumference was measured at the level of the iliac crest using a non stretch tape measure. Hip circumference measured at the maximum circumference of the hip and; waist-to-hip ratio (WHR) calculated as a ratio of waist and hip circumference.

Physical activity was measured using the Global Physical Activity Questionnaire (GPAQ) section of the STEPS instrument, and the total physical activity is presented in MET (metabolic equivalent) minutes per week. The instrument explores three main areas of day-to-day activities: work (including domestic work), transport, and recreational activities. The level of total

physical activity was subsequently classified into high, moderate, or low using the GPAQ analysis guideline provided along with the STEPS instrument [14].

Using a standardized automated blood pressure monitor, blood pressure was measured on the left arm as per the WHO protocol by informing the participants to remain seated and relaxed.Three blood pressure measurements were taken with at least 3-minute intervals between them. The mean value of the $2^{nd}$and 3^{rd} measurements was used for analysis [14]. Blood pressure (BP) classified according to the Seventh Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VII) [3].

To ensure the quality of the data collection, data collectors were trained by the principal investigator; and later on, daily checks were carried out by field supervisors and the principal investigator. The weight of the participants, measured on a pre-calibrated electronic scale. Weighing scales checked and zero levels adjusted between measurements; we also placed the scale on a firm flat surface. The blood pressure was measured in a seated position by a digital device (OMRON M2 Eco). The instrument has been clinically approved and recommended by the World Health Organization. In addition, WHO's STEPwise tools have been previously validated and implemented in mainly developing countries, including Ethiopia [6,8].

Operational definitions

Hypertension: defined as a mean measured blood pressure of $\geq$ 140 mmHg systolic and/or the mean measured diastolic blood pressure of $\geq$ 90 mmHg or self-reported history of hypertension.

Body Mass Index (BMI): calculated as weight in kilograms divided by height in meters squared (weight (kg)/height (m^2). BMI was categorized as per the World Health Organization guidelines [14], underweight (BMI <18.5), normal (BMI $\geq$18.5 to $\leq$ 24.9), overweight (BMI $\geq$ 25.0 to $\leq$ 29.9) or obese (BMI $\geq$ 30.0).

Waist to hip ratio: calculated as waist circumference in cm divided by hip circumference in cm and it was used as a measure of abdominal obesity. Waist to hip ratio $\geq$ 0.90 m in men and $\geq$ 0.85m in women is defined as having abdominal obesity [15].

High physical activity: a person reaching any of the following criteria is classified in this category:

- Vigorous-intensity activity on at least 3 days achieving a minimum of at least 1,500 MET-minutes/week OR
- 7 or more days of any combination of walking, moderate- or vigorous intensity activities achieving a minimum of at least 3,000 MET-minutes per week.

Moderate physical activity: a person not meeting the criteria for the "high" category, but meeting any of the following criteria is classified in this category:

- 3 or more days of vigorous-intensity activity of at least 20 minutes per day

  OR
- 5 or more days of moderate-intensity activity or walking of at least 30 minutes per day OR
- 5 or more days of any combination of walking, moderate- or vigorous intensity activities achieving a minimum of at least 600 MET-minutes per week.

Low physical activity: a person not meeting any of the above mentioned criteria under moderate or high physical activities falls in this category.

Raised fasting blood glucose was defined as capillary whole blood value $\geq$110 mg/dl.

Raised total cholesterol was defined as total blood cholesterol level $\geq$190mg/dl.

Raised triglyceride was defined as raised triglyceride level ≥150 mg/dl.

Data analysis

Double data entry procedures were performed using the EpiData 3.1 statistical software, and analyses were performed using IBM SPSS software version23. Binary logistical regression was used to identify risk factors for hypertension. Initially, possible risk factors were assessed using bivariate analyses; then we did the multivariable logistic regression model to control confounding factors, and statistical significance was accepted when the P-value < 0.05. The Hosmer-Lemeshow goodness-of-fit statistic was used to evaluate whether or not the assumptions necessary for the application of multiple logistic regression are met. Odds ratios (OR) with 95% Confidence Intervals (CI) were computed.

Ethical clearance

Ethical clearance was obtained from the Addis Ababa University, College of Health Sciences Institutional Review Board (IRB), and the city government of Addis Ababa Health Bureau Ethical Review Committee (ERC). A letter of permission was obtained from the selected sub-city health offices. Respondents were fully informed about the purpose of the study and gave verbal and written consent. Participants having high blood pressure, high blood glucose level, and or abnormal lipid profiles during the study period were referred and informed to go to nearby health facilities for further diagnosis and management.

Results and discussion

Description of the study participants

From the total 3724 sampled population, consent was given to the 3560 participants to involve in step one and two questionnaires, making an overall response rate of 95.59%. Using a random sampling technique, 582 (20%) of the study participants who participated in the interview and physical measurements were selected for the step three questionnaires (biochemical assessment).

Respondents were between 18 and 95 years old and, the median age was 32 years old (IQR 25, 45). More than half (57.3%) of the respondents were females. The majority (74.8%) were Orthodox Christians, followed by Muslims (14.9%). Above one-third (37%) of them were self-employed, while nearly a half (49.6%) were currently married (Table 1).

Behavioral risk factors of the study participants

Tobacco use. Tobacco use was assessed by interviewing respondents about their current smoking status, previous smoking experience, the age they started smoking, and exposure to second-hand smoke. Overall, about 4.2% (150) of survey respondents were current smokers (daily smokers and non-daily smokers) (Table 2). Of these, a majority (88.66%) smoke cigarettes on daily basis, with an average of 10 cigarettes per day. More than three-fourth 136 (90.66%) of current smokers were male compared to female ($p < 0.001$). The average age at which smokers started smoking was 21 ± 6.58 years. Fifty-five (1.61 percent) have smoked cigarettes in the past. One hundred nineteen (3.4%) were passive smokers or second-hand smokers.

Khat chewing. There were 330 (9.3%) participants who reported chewing khat (Table 2). Over a third of the respondents, 105 (31.53%) and half, 172 (51.65%) chew khat on a daily and weekly basis, respectively. On the other hand, 153 participants (4.3%) had previously chewed khat.

Table 1. Socio-demographic characteristics of the study participants in Addis Ababa, Ethiopia, October 2018.

Characteristics	Frequency	Percent
Sex		
Male	1520	42.7
Female	2040	57.3
Religion		
Orthodox	2664	74.8
Muslim	530	14.9
Protestant	333	9.4
Catholic	14	0.4
Other	19	0.6
Employment status		
Government employee	388	10.9
Non-government employee	257	7.2
Self employed	1316	37.0
Student	301	8.5
House wife	750	21.1
Daily laborer	83	2.3
Merchant	69	1.9
Unemployed(able to work)	173	4.9
Unemployed(unable to work)	47	1.3
Retired (pensioner)	176	5.0
Age		
18–29	1508	42.4
30–49	1304	36.6
50 and above (50–95)	748	21.0
Family size		
1–4	2178	61.2
≥5	1382	38.8
Marital status		
Never married	1331	37.4
Currently married	1767	49.6
Separated	49	1.4
Divorced	139	3.9
Widowed	271	7.6
Non response	3	0.1
Highest education level		
Primary	1176	33.0
Secondary	719	20.2
Preparatory	464	13.0
Technique	67	1.9
College and above	539	15.1
Not attended formal education	595	16.7

https://doi.org/10.1371/journal.pone.0248934.t001

Alcohol consumption. One thousand one hundred sixty-two (32.6%) participants consumed alcohol and of that 783 (22.0%) consumed alcohol during the last month (Table 2). Binge drinking is defined; as consuming alcohol for men five and above, or women four and above drink on one occasion and, the result showed that 269 (7.6%) of men and 81 (2.3%) of women binge drunker.

Table 2. Prevalence of hypertension across different characteristics of respondents in Addis Ababa city, October 2018.

Characteristics	Number	Percent	Hypertension (%, CI)
Age			
18–29	1508	42.4	12.86 (11.17–14.56)
30–49	1304	36.6	31.29 (28.77–33.81)
≥50	748	21.0	58.69 (55.15–62.23)
Current smoker			
Yes	150	4.2	34.67 (26.96–42.37)
No	3410	95.8	29.00 (27.48–30.53)
Current khat use			
Yes	330	9.3	31.2 (26.19–36.24)
No	3229	90.7	29.0 (27.45–30.58)
Current alcohol use			
Yes	1162	32.6	32.79 (30.09–35.49)
No	2397	67.4	27.53 (25.74–29.32)
Fruit servings consumed in days per week			
None	1107	31.1	34.24 (31.44–37.04)
1–3 days	2126	59.7	27.19 (25.29–29.08)
4–7 days	266	7.5	24.81 (19.59–30.04)
Don't know	61	1.7	29.51 (17.73–41.29)
Vegetable servings consumed in days per week			
None	530	14.9	30.19 (26.27–34.11)
1–3 days	2549	71.6	29.23 (27.46–30.99)
4–7 days	448	12.6	28.57 (24.37–32.77)
Don't know	33	0.9	24.24 (8.81–39.67)
High physical activity			
Yes	542	15.2	21.77 (18.29–25.26)
No	3018	84.8	30.58 (28.94–32.23)
Low physical activity			
Yes	986	27.7	30.53 (27.65–33.41)
No	2574	72.3	28.75 (27.00–30.50)
Raised blood glucose (≥110 mg/dl)			
Yes	51	8.5	58.82 (44.84–72.80)
No	551	91.5	37.57 (33.51–41.62)
Raised cholesterol (≥190 mg/dl)			
Yes	255	43.8	49.80 (43.63–55.98)
No	327	56.2	31.50 (26.44–36.56)
Raised triglyceride (≥150 mg/dl)			
Yes	241	41.4	54.36 (48.02–60.69)
No	341	58.6	29.03 (24.19–33.87)
Family history of hypertension			
Yes	718	20.2	38.30 (34.74–41.87)
No	2714	76.2	26.46 (24.79–28.12)
Don't know	128	3.6	37.50 (29.00–46.00)

https://doi.org/10.1371/journal.pone.0248934.t002

Dietary habits of the study participants. Two thousand three hundred ninety-two (67.2%) consumed fruits, at least one time per week, and the mean fruit consumption per week was 2.12 (±1.48) days, as well, the majority 2268 (94.77%) ate fruit 1–2 serving per day with a mean of 1.36 (±0.58) times per day. Similarly, more than three forth 2997 (84.2%) of the

participants ate vegetables at least one time per week with a mean of 2.46 (± 1.46) per week, and most of them 2827 (94.33%) ate it 1–2 times per day with mean serving time per day was 1.55 (±0.61). Nearly three fourth 2511 (70.6%) of respondents reported that they usually use vegetable oils like Nug (Guizotia Abyssinica), Sesame, and Sunflower oil for meal preparation, while nearly one-fourth 839 (23.6%) use a vegetable oil which was solid at room temperature. Nearly all 3423 participants (96.2%) consumed vegetables and fruits less than five times a day.

Physical activity. The total median physical activity of the respondents was 7440 (IQR 2888, 12240) and, the median total physical activity (TPA, in MET-minutes per week) was estimated to be 7800 (IQR 3000, 14280) in males and 7200 (2880, 11320) in females. Approximately 29.5% of males and 4.6% of females were; categorized as having a high (vigorous) level of TPA. However, significantly more women (36.4%) than men (16.0%) classified as having low levels of TPA ($P < 0.001$). In addition, most of the study participants, 3198 (89.8%), walked or cycled for a minimum of 10 minutes per day.

Physiological characteristics of the study participants

Body mass index and waist to hip ratio. Weight and height measured in all participants at 3560; the average BMI for respondents was 23.54 (±4.39 kg/m^2). Eight hundred and sixty-five (24.3%) were overweight, while 287 (8.1%) were obese. Moreover, the average hip-waist ratio was 0.88 (±0.086 m^2)) with 0.89 (± 0.086 m^2) and 0.87 (±0.085 m^2) for men and women, respectively. Over two-thirds of females (67.06%) and 32.9% of males had abdominal obesity.

Biochemical measurements of the respondents. Of the total number of participants, the blood sample was collected from 582 participants (20 percent). The average FBS was 86.7 (±36.2 mg/dl), and the prevalence of high blood sugar, high cholesterol, and triglycerides was 8.5%, 43.8%, and 41.4%, respectively (Table 2).

Prevalence of hypertension

Three consecutive blood pressure measurements took from 3,560 respondents (95.16%) and; an average of the second and third measurements used for blood pressure analysis. The mean systolic and diastolic blood pressure of the respondents was 125.03 (95% CI: 124.39–125.62) mm Hg and 79.58 (95% CI: 79.8–79.97) mm Hg, respectively. The mean SBP was 126.95 (95% CI: 126.03–127.87) mmHg among males and 123.59 (95% CI: 122.72–124.47) mmHg among females. Likewise, the mean DBP was 80.76 (95% CI: 80.14–81.38) mm Hg in males and 78.69 (95% CI: 78.17–79.21) mm Hg in females. Both mean SBP ($P < 0.001$) and DBP ($P < 0.001$) were significantly higher in men compared to women.

The overall prevalence of hypertension was 29.24% (95% CI: 27.75–30.74), slightly higher among men 30.13 (95% CI: 27.82–32.44) than women 28.58 (95% CI: 26.66–30.54). Of the 1041 hypertensive respondents, 645 (61.95%) had just been diagnosed in the survey (new screening).

Factors associated with hypertension

Multivariable logistic regression analysis found that of several non-modifiable factors, age and gender were associated with hypertension. The odds of hypertension increased with increased age. The odds of hypertension increased almost three times AOR = 2.79 (95% CI: 1.39–5.56) among respondents aged 30–49 years, and it was eight times AOR = 8.23 (95% CI: 4.09–16.55) higher among respondents aged 50 years and above as compared to those 18–22 years old. The odds of hypertension were almost twice as high AOR = 1.88 (95% CI: 1.18–2.99) in men compared with women.

From modifiable and other factors, eating fewer vegetables per week, body mass index, abdominal obesity, and high triglycerides levels were associated with hypertension. The odds of hypertension increased more than two times AOR = 2.44 (95% CI: 1.21–4.93) among respondents who consumed vegetable less than or equal to three days per week compared to those who ate more than three days per week.

The chance of hypertension reduced by 73% among underweight participants AOR = 0.27 (95% CI: 0.07–0.97), but the odds were two times higher AOR = 2.05 (95%CI: 1.13–3.71) among obese participants as compared to those having normal BMI. Moreover, the odds of hypertension was almost two times higher AOR = 1.70 (95% CI: 1.10–2.64) among participants with abdominal obesity as compared to their counterparts.

The odds of hypertension was also increased by two AOR = 2.06 (95% CI: 1.38–3.07) among participants who had high triglyceride level as compared to their counterparts.

The odds of hypertension was also increased by two AOR = 2.06 (95% CI: 1.38–3.07) in participants with high triglyceride level compared to their counterparts. In this particular study, risky behaviors, including alcohol use, vigorous physical activity, family history of hypertension or diabetes, high blood sugar, and high cholesterol level not significantly associated with hypertension (Table 3).

Discussion

The study found that approximately one in three adults aged 18 and over is hypertensive. During childhood, there are modest facts about a gender change in blood pressure. However, beginning with youth, males tend to have a higher average level. But later in life, the difference gets smaller, and the pattern can even be changed [16]. The prevalence of hypertension in the current study is slightly higher among men than women, which is comparable; a community-based study conducted in Addis Ababa, Ethiopia, reported prevalence of hypertension was 31.5% and 28.9% among males and females, respectively [6]. Moreover, this study is also comparable with other community-based studies conducted in Jalalabad, Afghanistan (28.4), Kenya (29.4%), Uganda (30.5%), and Gondar city (28.3%) [10,17–19].

The prevalence of hypertension in this study is considerably higher as compared to other studies Bangladesh (16.0%), Eritrea (16.4%), Addis Ababa (25%), Bahir Dar (25.1%), Durame Southern Ethiopia (22.4%), Gilgel Gibe South West Ethiopia (5.8%) and Mekelle (20.1%) [11,20–25]. The difference may be explained by the age differences of the surveyed populations (18 years and above in our case, whereas in the other studies, the age of the participants varies between 15 and 64 years). Differences may also be attributed to the diversity of sociodemographic characteristics, sample size, lifestyle, and dietary patterns of the study participants.

On the contrary, the prevalence of hypertension in our study is lower than other similar community-based studies conducted in South Africa (38.9%), Sudan (35.7%), Nigeria (33.1%) and Cameroon (47.5%) [26–29]. This disparity can be due to variations in race, genetics, and prevalence of obesity (higher among others), all of which are likely to influence blood pressure.

From non-modifiable risk factors, age is one of the risk factors of hypertension proved by many studies; there is a positive association between age and hypertension when age increases, the odds of hypertension also increases [6,10,11,17,18,21,24,26]. It is primarily due to the increase in systolic blood pressure with age, mainly due to the reduction in elasticity (increased stiffness) of large duct arteries [30]. Inthe same vein, this study, this study found out that respondents aged 30–49 years had 3 times higher odds of hypertension, and 8 fold higher odds among participants aged 50 and above. In terms of gender, the prevalence of hypertension was almost two times higher in males compared to females in the current study, which is consistent with other study findings [11,22,25,28].

Table 3. Bivariate and multivariable logistic regression analysis of factors associated with hypertension among study participants in Addis Ababa city, October 2018.

Variable	Hypertension		Crude OR (95% CI)	Adjusted OR (95% CI)	P-value
	Yes	No			
Age					
18–29	194	1314	1.00	1.00	
30–49	408	896	3.08 (2.55–3.73)	2.79 (1.39–5.56)*	0.003
≥50	439	309	9.62(7.80–11.87)	8.23 (4.09–16.55)**	< 0.001
Sex					
Female	538	1457	1.00	1.00	
Male	458	1062	1.08 (0.93–1.25)	1.88 (1.18–2.99)*	0.004
Education					
Primary	334	842	1.00	1.00	
2ry & preparatory	304	879	0.87 (0.73–1.05)	1.03 (0.58–1.80)	0.66
Technique & college	142	464	0.77 (0.62–0.97)	0.97 (0.49–1.89)	0.94
Unable to read & write	261	334	1.97 (1.60–2.42)	1.10 (0.64–1.88)	0.65
Alcohol					
No	660	1737	1.00	1.00	
Yes	381	781	1.28 (1.10–1.49)	1.35 (0.87–2.09)	0.34
High physical activity					
No	923	2095	1.00	1.00	
Yes	118	424	0.62 (0.51–0.79)	1.05 (0.51–2.15)	0.88
Family history of diabetes					
Yes	848	2142	1.00	1.00	
No	169	300	0.70 (0.57–0.86)	1.02 (0.59–1.78)	0.93
Family history of hypertension					
Yes	718	1996	1.00	1.00	
No	275	443	0.58 (0.48–0.69)	0.73 (0.45–1.19)	0.34
Body Mass Index					
18.5–24.9	504	1539	1.00	1.00	
<18.5	48	319	0.46 (0.33–0.63)	0.27 (0.07–0.97)*	0.036
25–29.9	341	519	2.01 (1.69–2.34)	1.48 (0.95–2.32)	0.072
≥ 30	145	139	3.19 (2.47–4.10)	2.05 (1.13–3.71)*	0.011
Abdominal obesity ≥ 0.90 m (Men) & ≥ 0.85 m (Women)					
No	350	1308	1.00	1.00	
Yes	691	1211	2.13 (1.84–2.48)	1.70 (1.10–2.64)*	0.026
Raised blood glucose					
No (< 110 mg/dL)	207	344	1.00	1.00	
Yes (≥ 110 mg/dL)	30	21	2.37 (1.32–4.27)	0.943 (0.35–2.54)	0.74
Raised cholesterol					
No (<190 mg/dL)	103	224	1.00	1.00	
Yes (≥ 190 mg/dL)	127	128	2.158 (1.54–3.03)	0.92 (0.46–1.86)	0.48
Raised triglyceride					
No (<150 mg/dL)	99	242	1.00	1.00	
Yes (≥ 150 mg/dL)	131	110	2.91 (2.06–4.11)	2.06 (1.38–3.07)**	< 0.001
Vegetable servings consumed in days per week					
>3 days	128	320	1.00	1.00	
≤ 3 days	905	2174	1.04 (0.84–1.29)	2.44 (1.21–4.93)*	0.009

P-value < 0.05 * and <0.000**, (backward logistic regression method was employed).

https://doi.org/10.1371/journal.pone.0248934.t003

According to the World Health Organization, overweight and obesity are a major risk factor for heart disease, including high blood pressure, which is the number one cause of death [31]. In our study, the odds of hypertension were two times higher among obese participants compared to those with normal body mass index; however, the chances of hypertension were reduced by 73% among underweight participants. This finding (especially the obese category) was in line with previous reports from Ethiopia, Kenya, Uganda, Sudan, Bangladesh, and Cameroon [10,18,21,22,24,25,27,28,32], and this showed that obesity is one of the risk factor associated with hypertension almost all studies. Moreover, the odds of hypertension were two times higher among abdominally obese respondents compared to their counterparts, the result is also consistent with other studies [27,28,33,34].

Hypertriglyceridemia is a powerful predictor of cardiovascular disease, which causes endothelial damage, and loss of physiological vasomotor activity that results from endothelial damage can occur in the form of high blood pressure [35]. In our study, having a high triglyceride level was independently associated with hypertension. The odds of hypertension increased by two among participants with high triglyceride levels relative to their counterparts; our findings are consistent with those of others [33,36].

Previous studies done so far suggested that use of alcohol, cigarette smoking, Khat use, literacy level, physical activity, raised fasting glucose level, family history of hypertension, family history of diabetes, and excessive salt use were significantly associated with hypertension. In contradiction, in this study, the above variables were not significantly associated with hypertension [4,17,18,24,25,27,37]. A contradicting finding was noted in this current study where all the above variables showed no significant association with hypertension.The inconsistency in these results may be due to the variation of sample size, study settings, and population characteristics. These variations may also be explained by the research design issues (as a cross-sectional design can't distinguish the sequences of explanatory variables and the outcome). The other element of this study included adults 18 years of age or older, but different studies used a different age class, which should make comparisons difficult. Additionally, the respondents might not know whether they had a family history of hypertension or not due to the silent killer and asymptomatic nature of the diseases this may underestimate the risk factors of the disease. Though, we use the standardized WHO STEPs risk factor questionnaire allows for comparability on the presence of risk factors between various communities, regions, and countries.

Conclusion

There was a high prevalence of hypertension among adults in the city of Addis Ababa, which may indicate a hidden epidemic in the population. Even though the study was conducted in the capital city, there was a large proportion of hypertensive respondents (61.95%) were unaware of having the condition and newly screened for the first time by the current study. Increasing age, gender being male, obesity and abdominal obesity, consumption of low vegetables, and raised triglyceride levels were significantly associated with hypertension.

As a result, lifestyle changes and the introduction of obesity and hypertension screening programs are recommended. These programs should focus on lifestyle changes, including eating fruits and vegetables, maintaining a normal weight, and weight loss intervention. The findings also underscore the vital need for community-based screening programs for the early detection of hypertension and obesity.

Supporting information

S1 File.
(SAV)

S1 Annex. English version questionnaires.
(PDF)

S2 Annex. Amharic version questionnaire.
(PDF)

Acknowledgments

The authors would like to express their appreciation to the following organizations and individuals for contributing to the success of this study: The authors wish to extend their most sincere thanks to all participants in the study. We thank the data collectors and supervisors. We also want to convey our deepest gratitude to Armed Forces Comprehensive Specialized Hospital because they allowed us to do all the lipid profiles with their laboratory technicians.

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American Journal of Nursing Science
2022; 11(1): 20-29
http://www.sciencepublishinggroup.com/j/ajns
doi: 10.11648/j.ajns.20221101.13
ISSN: 2328-5745 (Print); ISSN: 2328-5753 (Online)

Prevalence and Risk Factors of Dyslipidemia Among Adults: A Community Based Study in Addis Ababa, Ethiopia

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To cite this article:

Meseret Molla Asemu, Alemayehu Worku Yalew, Negussie Deyessa, Desalewu Mekonnen Kassie. Prevalence and Risk Factors of Dyslipidemia Among Adults: A Community Based Study in Addis Ababa, Ethiopia. *American Journal of Nursing Science*. Vol. 11, No. 1, 2022, pp. 20-29. doi: 10.11648/j.ajns.20221101.13

Received: December 11, 2021; **Accepted**: January 10, 2022; **Published**: January 18, 2022

Abstract: Dyslipidemia is the leading population-level risk factor for ischemic heart disease in Africa. There were inadequate data regarding the prevalence and associated factors of dyslipidemia. So, this survey aimed to identify the prevalence and associated factors of dyslipidemia among participants aged 18 years and above in Addis Ababa city, capital of Ethiopia. This cross-sectional community-based survey was conducted from June to October 2018; in the Ethiopian capital of Addis Ababa. Participants 18 years of age and older were selected by using a multi-stage probability sampling method. The data was gathered through an in-person interview. The WHO phased-in approach was used for data collection. In addition, respondents' height, weight, waist, hip, blood pressure, and laboratory investigations were performed in keeping with standard procedures. We used multiple logistic regressions to analyze the data and, Odds ratios with 95% confidence intervals were also calculated to assess the factors that had an association. Four hundred fifty 77.3 % (95% CI: 73.9-80.7) of study respondents had a minimum of one kind of lipid abnormalities. Hypertriglyceridemia and low HDL-cholesterol were the more common dyslipidemia 41.4% (95% CI: 37.4–45.4) and 41.1% (95% CI: 37.1–45.1), respectively. Among all respondents who had at least one type of dyslipidemia 433 (96.2%) were, newly diagnosed during the survey. In multivariable logistic regression, analysis being male, age≥30 years, raised blood glucose, sitting per day for more than 3 hours, and being hypertensive were the factors associated with hypertriglyceridemia; being female, obese and raised blood glucose were the factors significantly related with low HDL-C; being female, age ≥30 years and hypertensive were the factors associated with hypercholesterolemia. Low HDL-Cholesterol and hypertriglyceridemia were the more common dyslipidemia. With a large proportion unaware of their status, intervention measures have to be taken targeting the modifiable risk factors and screening programs for adults with risk factors.

Keywords: Dyslipidemia, Hypertriglyceridemia, Hypercholesterolemia, Low HDL-C, Prevalence, Risk Factors

1. Introduction

Non-Communicable Diseases (NCDs) are by far one of the leading causes of death in the world. About 41 million deaths occurred from non-communicable diseases (NCDs), representing 71% of the total of 57 million deaths in 2016. A considerable part of such deaths was caused by the four major NCDs, specifically: cardiovascular disease (17.9 million deaths; accounting for 44% of all NCD deaths); cancer (9.0 million deaths; 22%); chronic respiratory disease (3.8 million deaths; 9%); and diabetes (1.6 million deaths; 4%) [1-3].

Cardiovascular diseases (CVD) caused by arterial vessel wall atherosclerosis and thrombosis are the most frequent cause of premature death and disability-adjusted life years (DALY) in Europe; and, it has also become more prevalent in

developing countries. Cardiovascular diseases are the result of modifiable and unmodifiable risk factors [4]. Modifibility factors, arterial hypertension, type 2 diabetes, and dyslipidemia are included. Furthermore, dyslipidemia is a key risk factor for CVD [5].

The definition of dyslipidemia is a condition that occurs as a result of plasma lipid abnormalities. Dyslipidemia could be due to bad cholesterol (high Low-Density Lipoprotein Cholesterol (LDL-C)), elevated plasma Total Cholesterol (TC), reduced good cholesterol (High-Density Lipoprotein Cholesterol (HDL-C) levels, and elevated Triglycerides (TG), occurring either singly or in combinations [6]. In medical practice guidelines, dyslipidemia is frequently defined as elevated total cholesterol (TC) or low-density lipoprotein cholesterol (LDL-C) but is also frequently extended to include other lipid abnormalities such as non-optimal triglyceride (TG) and the good cholesterol (HDL-C) levels [7, 8].

More than half of the world's cases of coronary cardiac disease are associated with dyslipidemia. The disease is also responsible for more than 4 million deaths a year, stated by World Health Organization (WHO) estimates. Various epidemiological studies showed that a considerable number of people aged 80 and over are affected by dyslipidemia [9].

Research has shown that abnormal levels of blood lipids are associated with a high risk of coronary artery disease, heart attack, and coronary death. The pathogenicity of atherosclerosis and cardiovascular disease; is also determined by the cholesterol level [10].

In 2008, according to the WHO estimate, the worldwide prevalence of increased total cholesterol in adults (≥ 5.0 mmol/l) was estimated to be 39%, and a third of ischemic heart disease is attributable to this risk factor. It is estimated that more than 2.5 million deaths are caused by increased cholesterol levels each year; the risk of heart disease also increases and, moreover three-quarters of those deaths from non-communicable diseases (NCDs) (28 million) occurred in low- and middle-income countries [2, 9]. In addition, the INTERHEART study showed that dyslipidemia is the major risk factor of ischemic heart disease in the African population [11].

The prevalence of dyslipidemia varies from one country to another. Mexico and Lima (Peru) study found that 50.1% and 68.1% of adults exhibited lipid abnormalities, respectively [12]. In addition, studies in China and Beijing showed that 43.3% and 35.4% of the adults studied had at least one type of lipid abnormality, respectively [13, 14]. Coming to Africa, a Nigerian study showed 58.1% of adult study participants were dyslipidemic; the Ugandan research showed that the prevalence of low High-Density Lipoprotein-cholesterol (HDL-c) was 71.3% [15, 16].

Ethiopia's first national survey found that low-density lipoprotein-cholesterol (HDL-c) prevalence was 68.7%; additionally, grave monitoring in Addis Ababa, Ethiopia, showed that 51% of deaths were attributed to non-communicable diseases. Of the total number of deaths, the primary cause was cardiovascular disease 24%, hypertension about 12%, while 11% of deaths were attributed to stroke [17].

There are several factors involved in increasing the risk of dyslipidemia. Among these, modifiable risk factors include a high saturated or trans-fat diet, physical inactivity, smoking, and obesity. Risk factors cannot be changed, such as age and sex. Secondary causes include insulin-resistant diabetes, high blood pressure, and hypothyroidism [18, 19].

To date, little data was available on the extent and determining factors of lipid abnormalities at the community level in Ethiopia, including the Addis Ababa study area. Within these few data, the prevalence of dyslipidemia was high [20]. In addition, our study area represents the enormous urban center in Ethiopia, home to approximately 25% of the country's urban population [21].

These few studies were done with settlement workers and clients in health facilities [22, 23]. Even though; only one study was done at the national level using all the World Health Organization STEPS survey tools [19]. But the current study uses the World Health Organization's three progressive tools to assess the magnitude and associated factors of dyslipidemia in adults in Addis Ababa.

2. Methods

2.1. Study Setting and Design

This study is part of a larger study that has many objectives. This cross-sectional community-based study conducted from 1 June to 30 October 2018 aimed to identify the prevalence and associated factors of dyslipidemia among adults aged 18 years and above in Addis Ababa. Addis Ababa is the Ethiopian capital. Administratively, Addis Ababa is divided into ten sub-cities (currently eleven) and 116 weredas [24, 25]. According to the Federal Democratic Republic of Ethiopia, Central Statistical Agency Population Projection of Ethiopia, Addis Ababa had a population of 3,433,999 in 2017 [25, 26].

2.2. Selection of the Study Participants

The multi-stage cluster sampling technique was used by first identifying seven of the ten sub-cities based on pre-established criteria, including the location of the area, population density, and socioeconomic status. Then, a wereda has been randomly chosen from each selected sub-cities.

Following this, two 'ketenas' were randomly selected from the selected weredas, which are the smallest geographical units in the weredas. In the end, from each ketena, the first household was randomly selected, while subsequent households were selected based on proximity to the first and the preceding households [25].

A total of 3,724 eligible adults aged 18 and over were interviewed at the selected households. The required sample size was determined using the single population proportion formula by considering: prevalence of hypertension 31.5% from a previous study done in Addis Ababa, Ethiopia [21], $\alpha = 0.05$ ($z = 1.96$), the margin of error 2%, design effect of 1.5 and 20% possible non-response rate. We also determined the sample size; for the prevalence of diabetes mellitus and dyslipidemia. Since the study has multiple objectives, we

determined the sample size for the risk factors of hypertension, diabetes Mellitus, and dyslipidemia by using two population proportion formulas. But the maximum sample size attained during the single population proportion formula considering the prevalence of hypertension. As well, the total sample size for each sub-city was determined using the probability proportional sampling method.

Then, the interview and physical measurements were done from the total participants; but to address the biochemical measurements, 20% of the study participants who participated in the interview and physical measurements; were selected using a simple random sampling technique. According to World Health Organization, for resource-limited countries, biochemical measurement can be done from the sub-sampling of 20% of the total sample size [27].

2.3. Data Collection Instruments and Measurements

All the three WHO STEPS instrument was adapted to collect data on the selected information including socio-demographic, behavioral, physical, and biochemical measurements as a part of the core and expanded modules [27]. The data were collected via face-to-face interviews by trained baccalaureate nurses and laboratory technicians. We measured weight and height by using a weighing scale and height measuring scales. Weight and height were measured, as participants were standing without shoes and wearing lightweight clothing. Height was recorded to the nearest 0.5 cm; weight was also recorded to the nearest 100g. Body Mass Index (BMI) was calculated as weight in kilograms divided by height in meters squared (weight (kg)/height (m^2) and classified as underweight (<18.5), normal (18.5–24.9), overweight (25–29.9) and obese (≥ 30.0) [27].

Waist circumference was measured at the level of the iliac crest using a non-stretch tape measure. Hip circumference was measured at the maximum circumference of the hip and, waist-to-hip ratio (WHR) was calculated as a ratio of waist and hip circumference [27].

The global physical activity questionnaire (GPAQ) section of the STEPS instrument was used for assessment of physical activity, and total physical activity was presented in MET (metabolic equivalent) minutes per week it is commonly used to express the intensity of physical activities and are also used for the analysis of GPAQ data. The instrument looks into three major domains of day-to-day activities; work (including domestic work), transport, and recreational activities. The level of total physical activity was subsequently classified into high, moderate, or low using the GPAQ analysis guideline provided along with the STEPS instrument [25, 27].

We measured blood pressure on the left arm using a standardized digital automatic blood pressure monitor. Respondents were asked to remain seated, relaxed, and blood pressure measurements were taken as per WHO steps protocol. In summary three blood pressure measurements were taken with at least a 3 minutes interval between each measure. The mean value of the 2nd and 3rd measures was used for analysis [27]. Then the Blood pressure (BP) was classified according to the Seventh Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VII) [28].

The principal investigator gave training for the data collectors and supervisors. Then during data collection, daily checks were carried out by field supervisors and the principal investigator to ensure the quality of the interview.

Biochemical measurement

After the interview, selected respondents were advised to be fasting after dinner for at least 8 hours for blood sample collection. The fasting capillary blood glucose measurement was determined using a glucometer. Raised blood glucose is defined according to WHO [29]. Meanwhile, 5 ml of venous blood was collected from the study participants to measure cholesterol, HDL-C, and triglyceride. Then the sample was centrifuged to separate the serum and transported to the hospital for analysis. The samples were then analyzed using the enzymatic colorimetric method by the Mindray BS-200 Chemistry Analyzer at the Armed Forces Comprehensive Specialized Hospital. The definition of dyslipidemia was according to the third report of the National Cholesterol Education Program Adult Treatment Panel (NCEP ATP III) criteria [30].

2.4. Operational Definitions

Hypertension: defined as mean measured blood pressure of ≥ 140 mmHg systolic and/or the mean measured diastolic blood pressure of ≥ 90 mmHg or self-reported history of hypertension.

Body Mass Index (BMI): calculated as weight in kilograms divided by height in meters squared (weight (kg)/height (m^2). BMI was categorized as per the World Health Organization guidelines [27], underweight (BMI <18.5), normal (BMI ≥18.5 to ≤ 24.9), overweight (BMI ≥ 25.0 to ≤ 29.9) or obese (BMI ≥ 30.0).

Waist to hip ratio: calculated as waist circumference in cm divided by hip circumference in cm and it was used as a measure of abdominal obesity. Waist to hip ratio ≥ 0.94 m in men and ≥ 0.80 m in women is defined as having abdominal obesity [31].

High physical activity: a person reaching any of the following criteria is classified in this category:

a. Vigorous-intensity activity on at least 3 days achieving a minimum of at least 1,500 MET-minutes/week OR
b. 7 or more days of any combination of walking, moderate- or vigorous intensity activities achieving a minimum of at least 3,000 MET-minutes per week [27].

Moderate physical activity: a person, not meeting the criteria for the "high" category, but meeting any of the following criteria is classified in this category:

a. 3 or more days of vigorous-intensity activity of at least 20 minutes per day OR
b. 5 or more days of moderate-intensity activity or walking of at least 30 minutes per day OR
c. 5 or more days of any combination of walking, moderate- or vigorous intensity activities achieving a minimum of at least 600 MET-minutes per week [27].

Low physical activity: a person, not meeting any of the

above mentioned criteria under moderate or high physical activities falls in this category.

Raised fasting blood glucose was defined as capillary whole blood value ≥126 mg/dl.

Dyslipidemia- was defined according to the third report of National Cholesterol Education Program Adult Treatment Panel (NCEP ATP III) criteria [30] with the following cut off values:

Hypercholesterolemia-serum TC level ≥ 200 mg/dl;

Hypertriglyceridemia–serum TG level ≥ 150 mg/dl;

Low HDL-C– serum HDL-C level < 40 mg/dl for men and <50 mg/dl for women;

Isolated dyslipidemia was defined as follows:

Isolated hypercholesterolemia-serum TC ≥ 200 mg/dl without hypertriglyceridemia;

Isolated hypertriglyceridemia–serum TG ≥ 150 mg/dl without hypercholesterolemia;

Isolated low HDL-C–HDL-C < 40 mg/dl for men and < 50 mg/dl for women without hypertriglyceridemia and hypercholesterolemia;

Mixed hyperlipidemia was defined as having triglycerides ≥150 mg/dl and total cholesterol ≥ 200 mg/dl;

2.5. Data Analysis

Double data entry was done using the EpiData 3.1 statistical software, and then exported to IBM SPSS software version 23 for analysis. Binary logistic regression was applied to identify the risk factors for dyslipidemia. Initially, possible risk factors were assessed using bivariate analyses a p-value of < 0.20 was used as criteria to include it in the multivariable logistic regression model to control the confounding factors. The statistical significance was accepted when the p-value < 0.05. We applied Hosmer-Lemeshow goodness-of-fit test to assess whether the necessary assumptions for the application of multiple logistic regression was fulfilled or not. Odds Ratios (OR) with 95% confidence intervals (CI); were also calculated.

2.6. Ethical Clearance

We obtained ethical clearance from the Addis Ababa University, College of Health Sciences Institutional Review Board (IRB), and the city government of Addis Ababa Health Bureau Ethical Review Committee (ERC). Moreover, we obtained a permission letter from the selected sub-city health offices. After that, the purpose of the study was explained to the study participants then they gave verbal and written consent. Participants having high blood pressure, high blood glucose level and, or abnormal lipid profiles during the study period was referred and informed to go to nearby health facilities for further diagnosis and management [25].

3. Results

3.1. Description of the Study Participants

From the total of 3560 participants who were given consent for the interview (step one) and physical measurement (step two) questionnaires, one out of five (20%) of the study respondents selected using random sampling techniques for step three (biochemical assessment), and in this work, a total of 582 respondents participated.

The age of the respondents ranges from 18 to 95 years. The mean age was 43.7±16.3 years. Nearly half of the participants (44.3%) were between 30-49 years of age, more than two-thirds (72.2%) of the participants were females. More than three-fourth (77.8%) were Orthodox Christians, followed by Muslim religion (12.5%). One-third (33.3%) were housewives; nearly two-thirds (61.0 %) were currently married (Table 1).

Table 1. *Background characteristics of the study respondents. Addis Ababa, Ethiopia, October 2018.*

Characteristics	Frequency	Percent
Sex		
Male	162	27.8
Female	420	72.2
Religion		
Orthodox	453	77.8
Muslim	73	12.5
Protestant	49	8.4
Catholic	5	0.9
Other	2	0.4
Employment status		
Government employee	86	14.8
Non-government employee	29	5.0
Self employed	151	25.9
Student	24	4.1
Housewife	194	33.3
Daily labourer	6	1.0
Merchant	6	1.0
Unemployed (able to work)	32	5.5
Unemployed (unable to work)	9	1.5
Retired (pensioner)	45	7.7
Age in years		
18-29	122	21.0
30-49	258	44.3
50 and above (50-95)	202	34.7
Family size		
1-4	482	82.8
≥5	100	17.2
Marital status		
Never married	108	18.6
Currently married	355	61.0
Separated	14	2.4
Divorced	30	5.2
Widowed	73	12.5
Non response	2	0.3
Highest education level		
Primary	191	32.8
Secondary	82	14.1
Preparatory	74	12.7
Technique	12	2.1
College and above	84	14.4
Not attended formal education	139	23.9

Behavioral and physiological characteristics of the study participants

Overall about 11 (1.9%) of the survey participants were current smokers (smoking cigarettes daily and non-daily). The mean age of smokers to start smoking was 20.8 ± 5.13 years. Ten (1.7%) were ever smoked cigarettes. Nineteen (3.3%) were passive smokers or second-hand smoke (Table 2).

Nearly two-thirds 174 (29.9%) drank alcohol for the last one year, and 111 (19.1%) drank alcohol for the last one month. The word Binge is defined as drinking alcohol five or more (for men); or four or more (for women) in one moment and, our finding revealed that 21 (3.6%) of men and 15 (2.6%) of women categorized under binge drinker (Table 2).

More than half 328 (56.4%) of them consume fruits, a minimum of once a week, and the average fruit utilization in a week was 2.03 (±1.36) days; moreover, most 312 (53.6%) consumed fruit 1-2 servings a day with an average of 1.34 (±0.58) times a day. In addition, four-fifth 466 (80.1%) of the respondents consumed vegetables a minimum of one time a week with an average of 2.37 (± 1.43) per week, and three fourth 438 (75.2%) of them consumed it 1-2 times a day with an average serving time a day was 1.57 (±0.63). More than half 351 (60.3%) of participants responded that they frequently utilized palm oils; only 223 (38.3%) prepared their food using vegetable oils like Niger, sunflower, and sesame. Almost all (93.0%) of respondents consume fruits and or vegetables less than five times a day (Table 2).

Table 2. *Descriptive characteristics of the study participants according to gender. Addis Ababa, Ethiopia, October 2018.*

Variables	Men (N=162)	Women (N=420)	Overall (N=582)
Lifestyle, diet and exercise			
Smoking			
Current smoker	8 (4.9)	3 (0.71)	11 (1.9)
Ex- smoker	8 (4.9)	2 (0.48)	10 (1.7)
Never smoker	146 (90.1)	415 (98.8)	561 (96.4)
Khat			
Yes	14 (8.6)	5 (1.2)	19 (3.3)
No	148 (91.4)	415 (98.8)	563 (96.7)
Alcohol consumption			
Current drinker	77 (47.5)	97 (23.1)	174 (29.9)
No drinking	85 (52.5)	323 (76.9)	408 (70.1)
5+serving fruit/veg. per day[1]			
Yes	4 (5.0)	17 (7.7)	21 (7.0)
No	76 (95.0)	204 (92.3)	280 (93.0)
Type of oil used in cooking			
Liquid	58 (35.8)	165 (39.3)	223 (38.3)
Solid at room temperature	102 (63.0)	249 (59.3)	351 (60.3)
Don't know	2 (1.2)	6 (1.4)	8 (1.4)
Level of physical activity[2]			
High	33 (20.4)	18 (4.3)	51 (8.8)
Moderate	104 (64.2)	272 (64.8)	376 (64.6)
Low	25 (15.4)	130 (31.0)	155 (26.6)
Walk for 10' per day			
Yes	151 (93.2)	388 (92.4)	539 (92.6)
No	11 (6.8)	32 (7.6)	43 (7.4)
Anthropometric indicators			
Body Mass Index[3]			
Normal (18.5-24.9)	94 (58.0)	178 (42.6)	272 (46.9)
Underweight (<18.5)	10 (6.2)	29 (6.9)	39 (6.7)
Overweight (25.0-29.9)	48 (29.6)	139 (33.3)	187 (32.2)
Obese (>=30)	10 (6.2)	72 (17.2)	82 (14.1)

[1] Missing data on fruit/vegetable servings for 82 males and 199 females
[2] Missing data on Body Mass Index for 2 females
[3] Overall levels of physical activity based on total minutes spent in vigorous and moderate activity each week.

3.2. Prevalence of Dyslipidemia

The Mean Total Cholesterol (TC) and High-Density Lipoprotein Cholesterol (HDL-c) were 182.7 (± 48.4) and 50.0 (± 12.9), respectively. The median Triglyceride (TG) level was 136.5 (IQR 94, 192) (Figure 1).

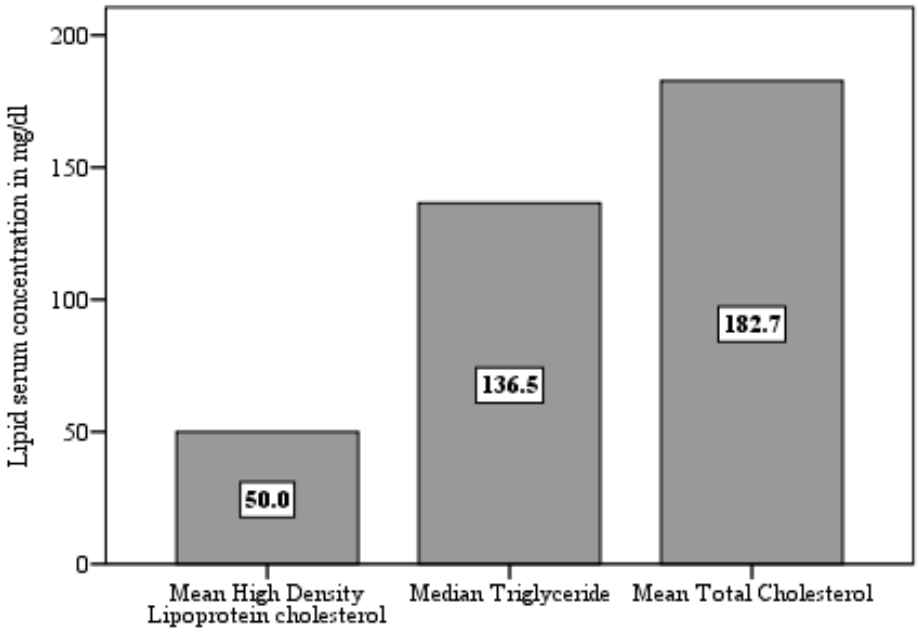

Figure 1. *Serum concentration of High-Density Lipoprotein cholesterol, Total Cholesterol and Triglycerides levels in Addis Ababa, Ethiopia, October 2018.*

The two more prevalent dyslipidemias were; hypertriglyceridemia and low HDL-cholesterol 41.4% (95% CI: 37.4–45.4) and 41.1% (95% CI: 37.1–45.1), respectively. The prevalence of Low HDL-C and hypercholesterolemia were higher among women 45.7% and 36.2 as compared to men 29.0% and 28.4 respectively; on the contrary, the prevalence of hypertriglyceridemia was higher among men 48.8% as compared to women 38.6%; moreover, the findings were statistically significant with p-value 0.001, 0.03 and 0.02 respectively.

Four hundred fifty 77.3% (95% CI: 73.9-80.7) of the study participants had at least one type of dyslipidemia (lipid abnormality). One hundred thirty-one (22.5%) participants have isolated low HDL-C, 111 (19.1%) isolated triglyceridemia, and 75 (12.9%) isolated cholesterolemia. Moreover, 130 (22.3%) had mixed hyperlipidemia. Among four hundred fifty respondents who had at least one type of dyslipidemia, 433 (96.2%); were newly diagnosed.

3.3. Factors Associated with Dyslipidemia

The multivariable analysis result showed that sex and age were associated with hypertriglyceridemia. The odds of hypertriglyceridemia increased with increased age. The odds of hypertriglyceridemia increased by nearly three times AOR =2.72 (95% CI: 1.60-4.62) among respondents aged 30-49 years, and it was more than two times AOR=2.26 (95% CI: 1.27-4.02) higher among respondents aged 50 years and above as compared to those 18–29 years old. The chance of high TG level was reduced by 38% AOR= 0.62 (95% CI: 0.41-0.94) among females compared to males.

From modifiable and other factors, raised blood glucose, sitting more than 3 hours per day, and having hypertension were related to hypertriglyceridemia. The odds of hypertriglyceridemia increased by two times AOR= 2.07 (95% CI: 1.25-3.44) among respondents with raised blood glucose levels contrasted to their counterparts. Furthermore, the odds of hypertriglyceridemia increased by nearly twice AOR=1.57 (95% CI: 1.03-2.38) among respondents sitting more than 3 hours per day contrasted to their correspondent. Moreover, the odds of hypertriglyceridemia increased twice, AOR=2.28 (95% CI: 1.56-3.33), among hypertensive respondents, compared to their counterparts.

Our analysis also showed that sex, body mass index and raised blood glucose were associated with low HDL-c levels. The odds of low HDL-c level increased twice AOR= 2.13 (95% CI: 1.39-3.27) among females related to males. The odds of low HDL-c level also increased twice AOR=1.98 (95% CI: 1.16-3.39) among obese respondents related to having a normal body mass index. In addition, the odds of low HDL-c level was more than two times higher AOR=2.32 (95% CI: 1.41-3.81) among respondents having raised blood glucose levels related to their counterparts.

Furthermore, sex, age, and being hypertensive were the significant risk factors for hypercholesterolemia. The odds of hypercholesterolemia was increased by one and half time AOR= 1.55 (95% CI: 1.02-2.36) among females compared to males. The odds of hypercholesterolemia increased with increasing age. The odds of hypercholesterolemia increased by more than five times AOR =5.22 (95% CI: 2.65-10.28) among participants aged 30-49 years, and it was more than six times higher AOR=6.42 (95% CI: 3.17-13.0) among participants aged 50 years and above related to those 18–29 years old.

Moreover, the odds of hypercholesterolemia increased nearly twice AOR=1.57 (95% CI: 1.07-2.31) among hypertensive respondents compared to counterparts.

In our study, behavioral factors, including alcohol use and type of physical activity, were not statistically associated with dyslipidemia.

Table 3. *Multivariable logistic regression analysis on the prevalence of dyslipidemia among respondents in Addis Ababa, Ethiopia, October 2018.*

Variables	Hypertriglyceridemia ≥150 mg/dl		Low HDL-c < 40 for male and < 50 mg/dl for female		Hypercholesterolemia ≥200 mg/dl	
	N (%)	Adjusted OR (95% CI)	N (%)	Adjusted OR (95% CI)	N (%)	Adjusted OR (95% CI)
	241 (41.4)		239 (41.1)		198 (34.02)	
Sex						
Male	79 (48.8)	1.00	47 (29.0)	1.00	46 (28.4)	1.00
Female	162 (38.6)	0.62 (0.41-0.94) *	192 (45.7)	2.13 (1.39-3.27) **	152 (36.2)	1.55 (1.02-2.36)*
Age						
18-29	25 (20.5)	1.00	54 (344.3)	1.00	11 (9.0)	1.00
30-49	114 (44.2)	2.72 (1.60-4.62) *	102 (39.5)	0.73 (0.45-1.18)	97 (37.6)	5.22 (2.65-10.28) **
≥50	102 (50.5)	2.26 (1.27-4.02) *	83 (41.4)	0.74 (0.44-1.25)	90 (44.6)	6.42 (3.17-13.0) **
Alcohol						
No	165 (40.4)	1.00	175 (42.9)		142 (34.8)	1.00
Yes	76 (43.7)	0.91 (0.59-1.34)	64 (36.8)		56 (32.2)	0.84 (0.56-1.27)
BMI						
18.5-24.9	104 (38.2)	1.00	93 (34.2)	1.00	84 (30.9)	1.00
<18.5	8 (20.5)	0.59 (0.25-1.42)	14 (35.9)	1.12 (0.55-2.29)	5 (12.8)	0.67 (0.28-1.59)
25-29.9	85 (45.5)	1.16 (0.77-1.77)	83 (44.4)	1.44 (0.97-2.13)	71 (38.0)	1.13 (0.75-1.69)
≥ 30	43 (52.4)	1.27 (0.72-2.23)	47 (57.3)	1.98 (1.16-3.39) *	38 (46.3)	1.46 (0.85-2.52)
High physical activity						
No	218 (41.1)	1.00	216 (40.7)	1.00	187 (35.2)	1.00
Yes	23 (45.1)	1.43 (0.75-2.75)	23 (45.1)	0.58 (0.31-1.09)	11 (21.6)	1.53 (0.78-3.01)
Raised blood glucose						
No	189 (38.1)	1.00	188 (37.9)	1.00	161 (32.5)	1.00
Yes	52 (60.5)	2.07 (1.25-3.44) *	51 (59.3)	2.32 (1.41-3.81) *	37 (43.0)	0.73 (0.39-1.36)
Abdominal obesity						
No	60 (34.7)	1.00	57 (32.9)		47 (27.2)	1.00
Yes	181 (44.3)	1.38 (0.85-2.24)	182 (44.5)		151 (36.9)	1.44 (0.98-2.11)
Sitting per day						
≤ 3 hrs	172 (38.4)	1.00	194 (43.3)	1.00	144 (32.1)	1.00
>3hrs	69 (51.9)	1.57 (1.03-2.38) *	45 (33.8)	0.69 (0.45-1.05)	53 (39.8)	1.15 (0.74-1.78)
Hypertension						
No	110 (31.3)	1.00	145 (41.2)		96 (27.3)	1.00
Yes	131 (57.0)	2.28 (1.56-3.33) **	94 (40.9)		102 (44.3)	1.57 (1.07-2.31) *

P-value < 0.05 * and <0.001**.

4. Discussion

This is one of a few community-based studies conducted in Addis Ababa, Ethiopia. So, to fill this gap, the present study aimed to determine the prevalence and associated factors of dyslipidemia among adults aged 18 years and above, Addis Ababa, Ethiopia.

Our finding showed that more than three fourth of the study participants have at least one type of lipid abnormality and, this study is comparable with other community-based studies done in India the overall dyslipidemia was 79%, and dyslipidemia from four regions was 76.9%, 77%, 80%, and 82.9%; South Africa community-based study also showed that 67.3% of study participants had dyslipidemia; Egypt study showed that 63.8% of university students aged 17 to 24 years had at least one type of dyslipidemia [6, 32, 33]. From our findings, we can see that dyslipidemia is a widely prevalent health problem affecting the adult Addis Ababa population and putting them at enormous risk for CVD [9].

Using the National Cholesterol Education Program Adult Treatment Panel (NCEP ATP) III criteria; Hypertriglyceridemia (≥150 mg/dl) and low HDL-cholesterol (< 40 for males and < 50 mg/dl for females) were more prevalent dyslipidemia in the study participants. The finding was comparable with other studies conducted in Ethiopia (national survey), Mekelle (Ethiopia), Nigeria, India (ICMR–INDIAB study), Iran, Latin America, and the Caribbean [16, 18, 19, 32, 34-36].

On the contrary, a Nigerian study showed that hypercholesterolemia was the most prevalent dyslipidemia, followed by the low HDL-C and hypertriglyceridemia 31.7%, 10.6%, and 8.7% respectively [37].

In our study, the prevalence of hypertriglyceridemia was 41.4%. It was the first most dyslipidemia in the study area. Our finding was comparable and slightly higher with a community-based study conducted at Mekelle (Ethiopia) (36.0%), Beijing (China) (35.6%), a systematic review in Latin America and the Caribbean reported the pooled prevalence (43.12%). But it is higher than a study conducted in Ethiopia National survey report (21.0%), Nigeria (21.4%), India (29.5%), Turkey (30.5%), and Iran (28.8%). Even

though our finding is lower than South Africa (59.3%); and the Pan-European studies (47-57% and 44-48% among men and women) [14, 16, 18, 19, 32, 34-36, 38).

The second most dyslipidemia was low HDL cholesterol. The prevalence of low HDL cholesterol was 41.1%. Our finding was comparable with Nigeria (42.8%) and Iran (42.3%) studies. But it is higher than the Turkey study (21.1%) and; lower than a community-based study conducted in Ethiopia (national survey) (68.7%), India (72.3%), and Latin America and the Caribbean (48.27%) studies [16, 19, 32, 35, 36, 38).

In the present study, the prevalence of hypercholesterolemia was 34.02%. It was the least prevalent. Our finding was comparable with community-based research conducted at Mekelle, Ethiopia (33.5%), Turkey's community-based study (37.5%). But our finding was higher than that in Ethiopia National survey report (7.1%), Nigeria (2.6%), India (13.93), and Iran (13.4%) [16, 19, 32, 34, 35, 38] and lower than Beijing (China) study (42.7%) [14].

The difference could be due to variations in the exposure to behavioral risk factors like alcohol, cigarette, dietary habit, and physical activity of the two populations. Additionally, physiological factors like the magnitude of obesity, family history of dyslipidemia could affect the outcome variable. The other might be the variation in the socio-demographic characteristics, sample size, and genetic factors.

From those risk factors that cannot change, age and sex are associated with dyslipidemia. Aging is associated with unwanted changes in body composition that expose older adults to several metabolic complications. It is recognized that body fat increases with age and is preferentially accumulated in the abdominal region (abdominal obesity), thereby increasing the risk of Cardio Vascular Diseases (CVD) and other non-communicable diseases in older adults [39].

Moreover, increasing age is, accompanied by the change of carbohydrate and lipid metabolism, which leads to metabolic syndrome. With increasing age, the total cholesterol, triglyceride concentration increase, while HDL-c decreases [40]. Similarly, our study showed that the odds of dyslipidemia, especially triglyceridemia and cholesterolemia, increased with increasing age; but did not show a significant association with low HDL-c levels, this finding is partially and fully in line with other studies [13, 14, 40-44].

Research related to the significant role of ethnicity and sex in the formation of hyperlipidemia has been controversial [45]. However, our study showed that females had considerably higher levels of abnormality of lipid than counterparts, except hypertriglyceridemia higher among males; this finding is consistent with other findings [13, 14, 32, 38, 42, 44, 46].

Different studies showed that having excess body fat is related to a scope of disorders, including lipid abnormality, high blood glucose, and increased blood pressure [47, 48]. Overweight and obesity negatively affect the entire metabolism of lipids and proteins but more consistently lower HDL-C levels [49]. Similarly, our study showed that obese people had two times higher odds of low HDL-C levels compared to those with normal BMI. This finding was in line with previous reports from Nigeria, China, and Turkey [13, 14, 37, 38, 44].

In our study, comorbid conditions like hypertension and raised blood glucose are the risk factor for dyslipidemia. And different studies showed that hypertension and raised blood glucose are the risk factors for CVD morbidity and mortality [50]. Hypertension was independently associated with hypertriglyceridemia and hypercholesterolemia. The odds of hypertriglyceridemia increased by two times, whereas the odds of hypercholesterolemia also increased by 1.5 times among participants who have dyslipidemia compared to their counterparts. And our finding is in line with other studies [14, 37, 51].

Moreover, raised blood glucose is also associated with hypertriglyceridemia and low HDL-C level and, this finding is also in line with others [13, 14, 44, 51].

Previous studies have done so far suggested that the drinking of alcohol and high physical activity were; significantly associated with dyslipidemia. In contradiction in this study, the above variables were not significantly associated with dyslipidemia. The difference in these results may be due to the inadequate frequency of these factors in the community. The study design is cross-sectional has its limitation, lacks to differentiate which comes first, whether the explanatory or the outcome (dyslipidemia) variables. Lack of some details on exposures such as alcohol consumption, smoking, and Khat chewing is another limitation although, khat chewing and smoking are generally low among adults of this age in the study area. Some of the information was based on self-reporting, which leads to unable to memorize past events.

5. Conclusions

The prevalence of dyslipidemia among adults in Addis Ababa city shows an unseen distribution of the disease in the study population. In spite of the fact that the study was done in the metropolis, a significant portion of dyslipidemic respondents (96.2 %) were oblivious of having the disease. Increasing age, sex, obesity, raised blood glucose, hypertension, and sitting greater than three hours per day were remarkably associated with dyslipidemia.

Therefore, we recommend that the health system needs to develop a strategy to implement a selective screening program for dyslipidemia in this community. Intervention measures have to be taken targeting the modifiable risk factors associated with dyslipidemia. More curiosity should be given to those participants with the concurrent medical condition since hypertension and raised blood glucose are the factors associated with dyslipidemia. And all of them are risk factors for CVD morbidity and mortality. Thus, screening programs for adults for dyslipidemia especially, in high-risk groups, are of paramount importance.

Acknowledgements

The authors would like to express their gratitude to the

following bodies and individuals for their contribution to the success of this study: The authors would like to express their deepest and heartfelt thanks to all study participants. We thank the data collectors and supervisors. We would also like to forward our deepest gratitude to Addis Ababa University for funding and supporting this project. We would also like to forward our deepest gratitude to Armed Forces Comprehensive Specialized Hospital since they permitted us to do all the lipid profiles with their laboratory technicians. This work was funded by Addis Ababa University, Addis Ababa, Ethiopia.

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Original Article

Prevalence of Diabetes Among Adults 18 Years and Older in Addis Ababa, Ethiopia: A Community-Based Study

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Abstract

Background: Diabetes Mellitus (DM) is a chronic metabolic disease characterized by elevated blood glucose levels that cause significant damage to major organs over time. Ethiopia is one of the most densely populated countries in Africa and has the highest number of diabetes cases. However, there is little empirical evidence on DM in Ethiopia, particularly in the country's capital. Therefore, the aim of this study was to investigate the prevalence and associated factors of DM in adults aged 18 years and older in Addis Ababa, Ethiopia.

Methods: A cross-sectional community-based study was conducted in Addis Ababa City from June 1 to October 31, 2018. A multi-stage random sampling technique was used to capture adults aged 18 years and above.. Face-to-face interviews were conducted using the WHO-STEPwise approach to monitor risk factors for non-communicable diseases. Physical and biochemical measurements were also collected following standard procedures.We performed binary and multiple logistic regressions to identify associated factors. Results are presented as adjusted odds ratios (AOR) with 95% confidence intervals (CI).

Results: In this study, a total of 602 participants were included.The overall prevalence of DM was 14.3% (95% CI: 11.5–17.1), with 70.9% of the cases diagnosed for the first time during the study. Age 50 years and above (AOR: 3.89, 95% CI: 1.59–9.48), overweight (AOR: 2.28, 95% CI: 1.24–4.18), obesity (AOR: 4.55, 95% CI: 2.24–9.25), abdominal obesity (AOR: 2.14, 95% CI: 1.03–4.44), hypertriglyceridemia (AOR: 1.99, 95% CI: 1.17–3.38), and low HDL-C level (AOR: 2.74, 95% CI: 1.59–4.71) were significantly associated with DM.

Conclusion: The prevalence of DM was higher in the population of Addis Ababa. DM was significantly associated with increasing age, overweight, obesity, abdominal obesity, hypertriglyceridemia, and a low HDL-C level. Our findings recommend the development of a strategy for the health system to implement selective screening programs and interventions targeting modifiable risk factors. [*Ethiop. J. Health Dev.* 2024; 38(3): 00-00]

Keywords: Diabetes mellitus, prevalence, risk factors

Introduction

Diabetes Mellitus (DM) is a chronic metabolic disorder characterized by elevated blood glucose (or blood sugar) levels that,over time, severely damage body organs, particularly the heart, blood vessels, eyes, kidneys, and nerves(1, 2).There are two reasons: the pancreas does not produce enough insulin hormones, or the body does not use them effectively(2, 3).Diabetes is a complex group of diseases with numerous causal factors, including obesity, physical inactivity, glucose production abnormalities, beta-cell dysfunction, and genetic susceptibility. Besides age, gender, alcohol intake, smoking, hypertension, family history, living in an urban area, and lipid profile values have been identified as factors that cause diabetes(4, 5).

Diabetes is one of the four most common non-communicable diseases (NCDs) causing death world-wide. It is recognized as a vital cause of premature death (deaths occurring before the age of 70) and disability in the twenty-first century (6, 7). The International Diabetes Federation estimated that more than half a billion adults aged 20 to 79 world-wide (10.5% of all adults in this age group) have Diabetes (2). Diabetes was the direct cause of 1.5 million deaths in 2019, with 48% of all deaths under the age of 70 attributable to Diabetes. It was also the world's seventh leading cause of mortality and disability combined (7, 8). It is estimated that the number of Diabetes-related deaths will rise to over 6.7 million people aged 20 to 79 in 2021(2).

Diabetes causes 58% of premature deaths in Africa, more than the global average of 48%. Meanwhile, the age-standardised diabetes death rate in the region is 48 per 100,000 people, more than double the global rate of 23 per 100,000 (9). In 2022, 24 million adults were affected by Diabetes resulting in 416,000 deaths in 2021. It is estimated that this number will increase by 129% to 55 million by 2045, the largest predicted increase of any region. Besides, the proportion of undiagnosed diabeties is the highest in the regions at 53.6(2).

Currently, more people in the Sub-Saharan Africa (SSA) region are living in urban areas, resulting in less emphasis on chronic diseases such as Diabetes. However, due to an increasing mismatch in the demand and supply of diabetes care resources, which affects the overall quality of care, Diabetes has become more prevalent in the region than ever (10, 11). Ethiopia, an SSA country, is one of the top five countries with the highest number of people aged 20 to 79 who have Diabetes (2). Diabetes affected roughly 1.7 million people in the country in 2019, with an age-adjusted diabetes prevalence of 4.3 (3.1–8.2). It is also estimated that by 2045, the nation will have 14.7 (11.6-

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31.1) million people with impaired glucose tolerance (12).

The first national steps survey in Ethiopia was conducted in 2015, reporting a 5.9% prevalence of raised blood glucose levels among adults aged 15 and above (13). Meanwhile, another regional study revealed a 14.8% prevalence of DM in public institutions in Addis Ababa (14). Other Ethiopian studies also found that the proportion of undiagnosed Diabetes ranged from 63% to 88.5% (15-17). The substantial proportion of undiagnosed persons, along with the rising number of newly referred diabetics experiencing complications, heightened the need for early detection since the disease has a long and latent asymptomatic period (18).

Despite the sharp rise in the prevalence of Diabetes, its complications, and the detrimental impact on quality of life and the health system, community-based studies are scarce in Ethiopia, particularly in Addis Ababa.By understanding its prevalence and associated factors, policymakers can design effective diabetes prevention, early detection, and intervention programs. Besides, given that Addis Ababa is Ethiopia's largest urban center, accounting for approximately 25% of the nation's urban population at risk of Diabetes, it is worthwhile to assess the magnitude of the disease in the area (2, 4, 19).Therefore, the purpose of this study was to assess the prevalence and related factors of diabetes mellitus among adults in the city of Addis Ababa.

Methods

Study design and setting

This study is part of a larger project that has multiple objectives. In this study, we conducted a cross-sectional survey between June 1and October 31, 2018, in Addis Ababa, the capital of Ethiopia's. Administratively, the city was divided into ten sub-cities (currently eleven) and 116 Weredas(20). According to the Ethiopian Central Statistical Agency, Addis Ababa had a population of 3,433,999 in 2017 (21).

Selection of the study participants

We calculated a sample size of 3,341 using the single population proportion formula, considering a 5.1% prevalence of Diabetes from a prior Ethiopian study(15), a 95% confidence interval (CI), of 95%, a margin of error of 1, a 1.5 design effect, and a 20% possible non-response rate. We also calculated the sample size for the risk factors using two population proportion formulas, with the single population proportion formula yielding the largest sample size.

A multi-stage cluster sampling technique was employed by first identifying seven of the ten sub-cities based on pre-established criteria, including geography, population density, and socioeconomic status. Then, one wereda was randomly chosen from each of the selected sub-cities.Following that, two 'ketenas' (the smallest geographical units in the weredas) were chosen randomly from the selected weredas. Finally, from each ketena, the first household was randomly selected, while subsequent households were included based on proximity to the first and the preceding household.All adults in the selected households who fulfilled the eligibility criteria were included. The total sample size of each sub-city was also determined using probability proportional to size (PPS).

Survey response and physical measurements were performed on all 3,341 participants, while the biochemical measurements were taken from 20% of the selected respondents (n=602) interviewees using a simple random sampling technique. For biochemical measurements, the World Health Organization (WHO) recommended 20% of the total sample size for resource-limited countries (22, 23).

Study population

Inclusion criteria

All adults aged 18 years and above

Residing in Addis Ababa for 6 months and above

Exclusion criteria

Pregnant and lactating women up to 6 weeks postpartum

Individuals who were non-cooperative or refused to provide the necessary information

Study participants who are bedridden and disabled do not meet the criteria for physical measurements (weight and height).

Individuals who were absent during the data collection process.

Data collection instruments and measurements

As part of the core and expanded modules, we used all three tools, including socio-demographic, behavioral, physical, and biochemical measures (23). Face-to-face interviews were conducted using the WHO STEPwise approach to non-communicable disease risk factor surveillance; following the interview and physical assessments, selected respondents were asked to fast for at least 8 hours after dinner to obtain biochemical measurements. Five milliliters of venous blood was drawn from each study participant to calculate plasma glucose, cholesterol, HDL-C, and triglyceride levels. The serum was separated from the sample, centrifuged, and transferred to a tertiary hospital for analysis using conventional methods. At the Armed Forces Comprehensive Specialized Hospital, samples were analyzed using the enzymatic colorimetric method on the Mindray BS-200 Chemistry Analyzer.

A trained graduate nurse conducted in-person interviews while laboratory technicians (phlebotomists) took blood samples. Diabetes mellitus and dyslipidemia were defined according to the criteria of the International Diabetes Federation and the third report of the National Cholesterol Education Program Adult Treatment Panel (NCEP ATP III), respectively(2, 24).

Operational definitions

Diabetes mellitus: a fasting blood glucose value ≥ 7.0 mmol/l (≥126 mg/dl) or a previous history of Diabetes (2).

Waist-to-hip ratio: This is computed by dividing waist circumference in centimeters by hip circumference in centimeters and was used to assess abdominal obesity. Abdominal obesity is defined as a waist-to-hip ratio of 0.94 m in men and 0.80 m in women (25).

Body Mass Index (BMI): calculated as weight in kilograms divided by height in meters squared (weight (kg)/height (m2). BMI was categorized as per the World Health Organization guidelines: underweight (BMI <18.5), normal (BMI ≥ 18.5 to ≤ 24.9), overweight (BMI ≥ 25.0 to ≤ 29.9), or obese (BMI ≥ 30.0).

Data analysis

The double entry was performed with the statistical software EpiData 3.1, and the analyses were performed with the software IBM SPSS 23. The Hosmer-Lemeshow goodness-of-fit statistic was used to assess whether the necessary assumptions for the application of multiple logistic regression were met. After the assumptions were ensured, we performed multivariable logistic regression to examine the factors predicting diabetes. A p-value of less than 0.20 in the bivariate regression was considered in the selection of variables for the multivariable model. The results of the regression analysis are presented as adjusted odds ratio (AOR) and 95% confidence interval (CI). A p-value of less than 0.05 was considered statistically significant for all tests.

Ethical clearance

Ethical clearance was obtained from the Addis Ababa University, College of Health Sciences Institutional Review Board (IRB), and the city government of Addis Ababa Health Bureau Ethical Review Committee (ERC). Permission letter obtained from selected sub-city health offices. Respondents were fully informed about the purpose of the study and gave their verbal and written consent. During the study, participants with high blood pressure, high plasma glucose levels, and/or abnormal lipid profiles were informed and referred to nearby health facilities for further diagnosis and treatment.

Results

Description of the study participants

Study participants ranged in age from 18 to 95 years old, with a mean age of 43.8 ±16.5 years and nearly half (43.5%) between the ages of 30-49. The majority of the participants were female (71.8%), Orthodox Christians (77.6%), and currently married (60.3%). One-third were housewives (33.2%) and had a primary education (32.6%) (Table 1).

Table 1.**Socio-demographic characteristics of the study participants. Addis Ababa, Ethiopia, October 2018**

Characteristics	Frequency	Percent
Sex		
Male	170	28.2
Female	432	71.8
Age		
18-29	129	21.4
30-49	262	43.5
50 and above(50-95)	211	35.0
Marital status		
Never married	113	18.8
Currently married	363	60.3
Separated	14	2.3
Divorced	31	5.1
Widowed	79	13.1
Non response	2	0.3
Religion		
Orthodox	467	77.6
Muslim	76	12.6
Protestant	51	8.5
Catholic	6	1.0
Other	2	0.4
Employment status		
Government employee	87	14.5

Non-government employee	29	4.8
Self-employed	158	26.2
Student	27	4.5
House wife	200	33.2
Daily laborer	6	1.0
Merchant	7	1.2
Unemployed (able to work)	32	5.3
Unemployed (unable to work)	9	1.5
Retired (pensioner)	47	7.8
Highest education level		
Primary	196	32.6
Secondary	86	14.3
Preparatory	76	12.6
Technique	13	2.2
College and above	86	14.3
Not attended formal education	145	24.1
Family size		
1-4	343	57.0
≥5	259	43.0
Family history of DM		
Yes	100	16.6
No	485	80.6
Do not know	17	2.8

Behavioral and physiological characteristics of the study participants: A relatively small proportion of respondents reported currently smoking (1.8%) and chewing khat (Cataedulis) (3.3%), while almost a third (29.9%) reported consuming alcohol for over a year. Nearly all participants (96.5%) consume fruits and or vegetables less than five times a day, whereas only 38.2% reported using vegetable oils, with palm oils accounting for the majority (60.5 %). While slightly above a quarter of participants (27.2%) engaged in low-level physical activity, almost half (46.0%) were overweight or obese (Table 2).

Table 2. **Behavioral and physiological characteristics of the study participants, Addis Ababa, Ethiopia, October 2018**

Variables	Number	Percent
Smoking		
Current smoker	11	1.8
Ex-smoker	11	1.8
Never smoker	580	96.3
Khat		
Yes	20	3.3
No	582	96.7
Alcohol consumption		
Current drinker	180	29.9
No drinking	422	70.1
5+serving fruit/veg. per day		
Yes	21	3.5
No	581	96.5
Type of oil used in cooking		
Sunflower	230	38.2
Palm	364	60.5
Don't know	8	1.3
Level of physical activity		
High	54	9.0
Moderate	384	63.8
Low	164	27.2
BodyMass Index[1]		
Normal(18.5-24.9)	280	46.5
Underweight(<18.5)	43	7.1
Overweight(25.0-29.9)	195	32.4

Obese(>=30)	82	13.6

Prevalence of Diabetes mellitus

The overall mean fasting blood glucose level was 116.5 ±36.5, with males having a higher level (119.6 ± 42.7) than females (115.3±33.7). The mean fasting blood glucose levels (for both genders) rise with age. Except for those aged 18-29, men have higher plasma glucose levels than women (Figure 1).

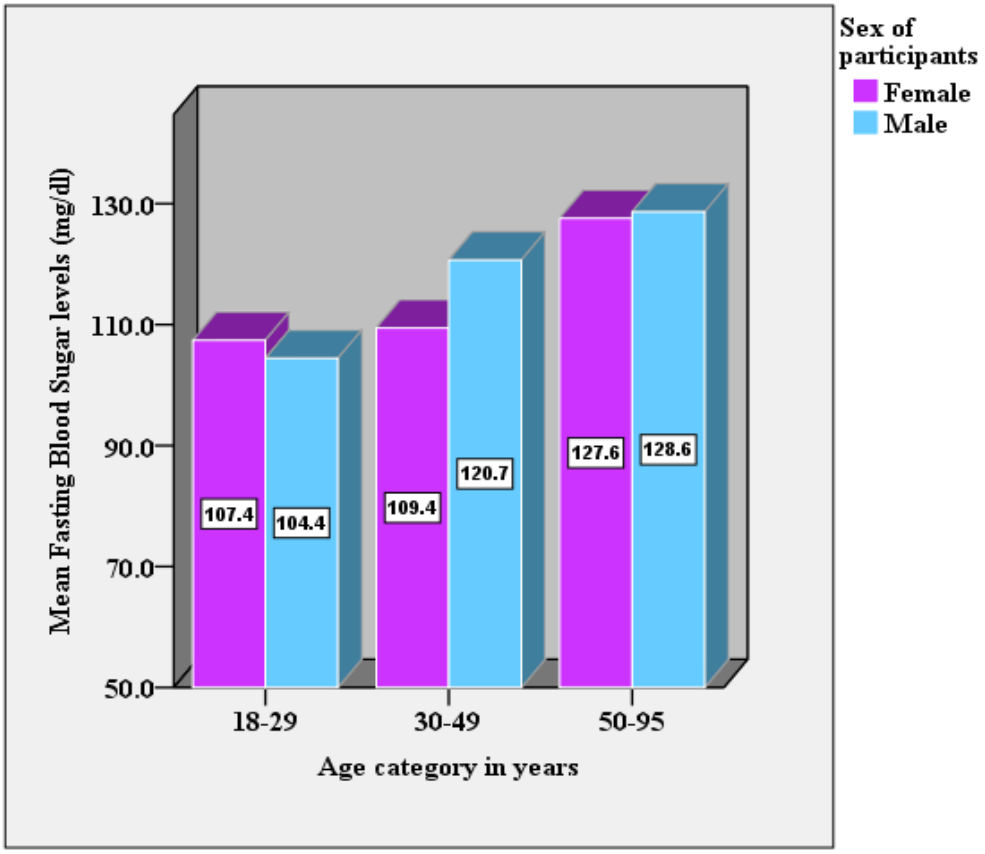

Figure 1. **Fasting blood glucose of the study population, according to gender and age. Addis Ababa, Ethiopia, October 2018**

The overall prevalence of DM was 14.3% (95% CI: 11.5–17.1), with men (16.5%, 95% CI: 10.8-22.1) and more commonly affected than women (13.4%, 95% CI: 10.2-16.7), although the difference was not statistically significant ($\chi 2$=0.92, p=0.33). Of the eighty-six diabetic participants, 70.9% were newly diagnosed during the survey.

Factors associated with Diabetes mellitus

In multivariable logistic regression, age (non-modifiable factor) and four other modifiable factors (BMI, abdominal obesity, high triglyceridemia, and low HDL-C) were associated with DM.The odds of developing DM increased almost fourfold (AOR = 3.89; 95% CI: 1.59-9.48) among respondents aged 50 years and above compared to those 18–22. Meanwhile, the odds of developing DM was higher among overweight (AOR=4.55; 95% CI: 2.24-9.25), obese (AOR =2.28 (95% CI: 1.24-4.18), abdominal obesity (AOR=2.14; 95% CI: 1.03-4.44), low HDL-C (AOR=2.74; 95% CI: 1.59-4.71) and higher triglyceridemia (AOR = 1.99; 95% CI: 1.17-3.38) compared to their peers .On the other hand, education, marital status, alcohol consumption , excessive intake of sweet foods, family history of DM, and hypertension were not significantly associated with Diabetes (Table 3).

Table 3. **Binary and multivariable logistic regression analysis of factors associated with diabetes mellitus among study participants in Addis Ababa city, October 2018**

Variable	Diabetes mellitus		Crude OR(95%CI)	Adjusted OR(95%CI)	P-value
	Yes (N=86)	No (N=516)			
Agein years					
18-29	7	122	1.00	1.00	
30-49	22	240	1.59(0.66-3.84)	0.88(0.34-2.28)	0.79
≥50	57	154	6.45(2.84-14.65)	3.89(1.59-9.48)	0.003*

Marital status [1]					
Never married	7	106	1.00	1.00	
Married	78	409	0.35(0.16-0.77)	1.04(0.39-2.77)	0.93
Education					
Primary	24	172	1.00	1.00	
2ry & preparatory	22	140	1.13(0.61-2.09)	1.47(0.71-3.06)	0.29
Technique & college	7	92	0.55(0.23-1.31)	0.71 (0.26-1.95)	0.51
Not attended formal education	33	112	2.11(1.19-3.76)	1.49 (0.76-2.92)	0.24
Consumption of alcohol					
No	69	353	1.00	1.00	
Yes	17	163	0.53(0.30-0.94)	0.56(0.29-1.05)	0.07
Frequent consumption of sweets					
No	72	374	1.00	1.00	
Yes	14	142	0.51(0.28-0.94)	0.61(0.31-1.22)	0.16
Family history of Diabetes mellitus					
No	64	421	1.00	1.00	
Yes	19	81	1.54(0.88-2.71)	1.62(0.85-3.08)	0.15
BodyMass Index(kg/m^2)					
< 25	25	298	1.00	1.00	
25–29.9	34	161	2.52(1.45-4.37)	2.28(1.24-4.18)	0.008*
≥30	27	55	5.85(3.16-10.83)	4.55(2.24-9.25)	<0.001**
Abdominal obesity(≥94 cm for males and ≥80 cm for females)					
No	12	169	1.00	1.00	
Yes	74	347	3.00(1.59-5.68)	2.14(1.03-4.44)	0.04*
Triglyceride level (≥150mg/dl)					
No	34	307	1.00	1.00	
Yes	52	189	2.48(1.56-3.97)	1.99(1.17-3.38)	0.01*
HDL-C(<40mg/dl for men and <50mg/dl for women)					
No	35	308	1.00	1.00	
Yes	51	188	2.39(1.49-3.81)	2.74(1.59-4.71)	<0.001**
Hypertension					
No	39	326	1.00	1.00	
Yes	47	190	2.07(1.30-3.28)	0.95(0.54-1.68)	0.86

*p <0.05 and **p <0.001.

Discussion

In Ethiopia, preventive and curative care for diabetes mellitus relies heavily on hospital care. Unfortunately, this approach proves to be prohibitively expensive and fails to make a substantial impact on reducing the prevalence of the disease. It is worth noting that the symptoms of Diabetes usually go unrecognized until the disease has advanced to a stage where complications occur. Consequently, our research findings reveal a concerning lack of awareness among the majority of study participants regarding the presence of this condition.

This population-based cross-sectional study reveals that approximately one in seven adults aged 18 and over is diabetic. This finding aligns with similar studies conducted in Oman, Tanzania, and Eastern Ethiopia (26-28).

However, our reported prevalence is lower than the studies conducted in Bangladesh and Saudi Arabia (29, 30). One possible explanation for this discrepancy could be the older age group of participants in the cited studies. In the Bangladeshi study, respondents were over 35 years old, while two-thirds of the Saudi respondents were over 40 years old, a significant risk factor for DM(2).Furthermore, the higher overweight and obesity observed in both studies, combined with the variable genetic predisposition to DM among different population groups, may also contribute to the observed disparity (3). On the other hand, the prevalence reported in our study is higher than that of two similar community-based studies conducted in Ethiopia (4.6% and 5.1%), as well as the WHO's estimate for Ethiopia (4%) and a study conducted in Benin (6.7%)(6, 15, 31, 32). The higher incidence in our report may be due to the variation in study settings, as we conducted the study in an urban area where Diabetes is likely to be more prevalent due to varied lifestyles (2, 15).

In this study, age was significantly associated with Diabetes. Specifically, the mean fasting glucose level increased with age in both males and females. These findings further support the recommendations of the American Diabetes Association (ADA), which emphasizes the importance of testing individuals aged 45 years and older, highlighting age as a significant risk factor for Diabetes (33).Our findings also align with previous studies conducted in Ethiopia, which

have also reported an increased likelihood of developing Diabetes with advancing age(15, 28, 32). Moreover, our results are consistent with two additional studies conducted in Bangladesh and Tanzania. The study conducted in Bangladesh revealed a twofold increase in the odds of Diabetes among individuals aged 55 to 59 years(34). Similarly, the study conducted in Tanzania demonstrated sevenfold higher odds of Diabetes among respondents aged 40 and above (27).

Obesity has been linked to metabolic alterations in the body, leading to the increased release of fatty acids, glycerol, hormones, pro-inflammatory cytokines, and other factors that play a crucial role in developing insulin resistance (35). The current study has demonstrated a significant association between overweight and obesity with DM. Our finding is congruent with the reports by the WHO and the ADA(3, 33). Similarly, other studies conducted in Southwest Ethiopia, Bangladesh, and Saudi Arabia have identified obesity as an independent risk factor for DM(30, 34).Meanwhile, the current study has revealed a significant association between central obesity and DM, which aligns with the findings of a previous Ethiopian study(36), reports by the WHO and the ADA(3, 33), and a study conducted in Oman(26).

Our study has uncovered that hypercholesterolemia is not typically observed in populations with Diabetes. However, hypertriglyceridemia and low-density lipoprotein (HDL-C) levels are more prevalent(37). Furthermore, our study found a significant association between hypertriglyceridemia, low HDL-C levels, and DM. These findings align with previous studies conducted in Oman and Saudi Arabia (26, 30).

Finally, we found no significant association between DM and various factors, such as marital status, level of education, alcohol consumption, family history of DM, and hypertension. This lack of association could be attributed to the relatively low prevalence of these factors within the study population.

Conclusion

In conclusion, 14.3% of the adult population aged 18 years and above in Addis Ababa city have diabetes mellitus. Specifically, individuals who are 50 years and older, obese, have abdominal obesity, hypertriglyceridemia, or low HDL-C levels are significantly more likely to have diabetes mellitus. Based on these findings, we strongly recommend that the health system develop a strategy to implement a selective screening program for Diabetes mellitus in this community. It is crucial to prioritize screening programs for DM, particularly among individuals in high-risk groups such as the elderly, obese, and centrally obese. Additionally, intervention measures should be implemented to target weight reduction among obese and overweight participants. Further prospective studies may be necessary to explore the association in more depth.

Acknowledgments

The authors thank the study participants, data collectors, and supervisors. Furthermore, we thank Addis Ababa University for generously funding this study. Additionally, we are grateful to the Armed Forces Comprehensive Specialized Hospital for permitting us to conduct all biochemical tests with the assistance of their skilled laboratory technicians.

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