Cardiovascular Risk Behaviour and Health Literacy among Patients with Cardiovascular Disease in Ethiopia

Lemma Negesa Bulto

BSc (Nursing), MSc (Adult Health Nursing Speciality)

Thesis Submitted for the

Degree of Doctor of Philosophy

Adelaide Nursing School

Faculty of Health and Medical Sciences

The University of Adelaide

June 2021

Table of contents

List of figures

List of tables

List of publications from the thesis

Peer-reviewed journal articles

❖ Lemma B Negesa, Judy Magarey, Philippa Rasmussen, Jeroen ML Hendriks. Cardiovascular risk behaviour is an emerging health issue in developing countries: a cross-sectional study. *Eur J Cardiovasc Nurs*. 2019; 18(8): 679–690. Doi: 10.1177/1474515119861772.

❖ Lemma B Negesa, Judy Magarey, Philippa Rasmussen, Jeroen ML Hendriks. Patients' knowledge on cardiovascular risk factors and associated lifestyle behaviour in Ethiopia in 2018: A cross-sectional study. *PLOS One* 2020; 15(6): e0234198. DOI: 10.1371/journal.pone.0234198.

❖ Lemma B Negesa, Judy Magarey, Philippa Rasmussen, Jeroen ML Hendriks. Awareness of heart disease and associated health behaviours in a developing country: A qualitative study: *in press*. *Nursing Open*.

Conference abstract publications

❖ Lemma B Negesa, Judy Magarey, Philippa Rasmussen, Jeroen ML Hendriks. Cardiovascular risk behaviour is an emerging health issue in developing countries: a cross-sectional study. *Heart, Lung and Circulation* 2019; 28(S4): S342. DOI: 10.1016/j.hlc.2019.06.482.

❖ Lemma B Negesa, Judy Magarey, Philippa Rasmussen, Jeroen ML Hendriks. Cardiovascular risk behaviour is an emerging health issue in developing countries: a cross-sectional study. *European Heart Journal* 2019; 40(S1): ehz748.0103. DOI: 10.1093/eurheartj/ehz748.0103.

Conference presentations from the thesis

- ❖ **Conference:** 67th Cardiac Society of Australia and New Zealand Annual Scientific Meeting, September 2019, Adelaide, Australia
  - ➢ **Poster presentation:** Lemma B Negesa, Judy Magarey, Philippa Rasmussen, Jeroen ML Hendriks, *Cardiovascular risk behaviour is an emerging health issue in developing countries* (Appendix H).

- ❖ **Conference**: 2019 European Society of Cardiology Congress, August 31 – September 2, 2019, Paris, France
  - ➢ **Rapid fire abstract oral presentation:** Lemma B Negesa, Judy Magarey, Philippa Rasmussen, Jeroen ML Hendriks, *Cardiovascular risk behaviour is an emerging health issue in developing countries* (Appendix I).

- ❖ **Research Conversazione:** 2019 Adelaide Nursing School Research Conversazione, September 2019
  - ➢ **Oral presentation:** Lemma B Negesa, Judy Magarey, Philippa Rasmussen, Jeroen ML Hendriks, *Cardiovascular risk behaviour is an emerging health issue in developing countries.*

Abstract

Cardiovascular diseases (CVD) are becoming more prevalent globally. Increased urbanisation and life expectancy accompanied by a lack of CVD prevention policies in developing countries, is predicted to escalate the burden of CVD in the future. Moreover, low- and middle income countries are facing a high burden of CVD in a context of limited resources and lack of evidence-based prevention policies. In addition, research indicates significant gaps in knowledge of CVD and its risk factors among patients with CVD and in the general population. Despite the growing burden of CVD in developing countries, there is limited data available to improve awareness of this area. This study was conducted in two phases, and the overall aim was to assess cardiovascular (CV) risk behaviours and related health literacy among patients with cardiovascular conditions in Ethiopia.

In study 1, a hospital-based cross-sectional survey was conducted in two referral hospitals in eastern Ethiopia. Patients with a confirmed diagnosis of CVD such as heart failure, hypertension and myocardial infarction were recruited from the follow-up units of the hospitals, which provide treatment for CVD and counselling of patients to achieve healthy lifestyles. Convenience sampling was used to select the study participants from each hospital. Data were collected through face-to-face interviews with patients using three validated tools: the World Health Organisation STEPs instrument, an international physical activity questionnaire and a heart disease fact questionnaire. The primary aims of the study were assessment of cardiovascular risk behaviours and knowledge of cardiovascular risk factors among patients with cardiovascular conditions. The data were entered on Epidata version 3.0 and was checked for completeness and consistency. Then, it was exported to SPSS version

24 for analysis. Multivariable linear regression was used to examine the relationship between knowledge of CV risk factors and explanatory variables.

A total of 287 CVD patients were recruited, of which 56.4% were females and 90.2% were urban residents. Most patients had inadequate consumption of fruit and vegetables, 51.6% were physically inactive, 20% were current khat chewers, 19% were current alcohol drinkers and only 1% were current smokers. Approximately one-third (30%) of the patients had one of these risk behaviours, more than half (51.9%) had two, 15% had three and 3.1% had four risk behaviours. The majority (70%) of the patients had multiple risk behaviours. The prevalence of multiple risk behaviours did not significantly vary with sex, residence and educational level differences, (p > 0.05). More than half of the patients (54%) had a good knowledge of cardiovascular risk factors (scored > 70%), whilst 46% demonstrated suboptimal knowledge levels in this area. Urban residents had 12.84 units higher mean knowledge scores than rural residents (β = 12.84, 95% CI 6.91 to 18.77; P < 0.001). Those who had no formal education had -18.80 units lower mean knowledge score compared to those who completed college or university (β = -18.80, 95% CI -24.76 to -12.85; P < 0.001). In addition, those who attained less than primary school education had -12.02 units less knowledge scores compared to those who completed college or university (β = -12.02, 95% CI -17.63 to -6.40; P < 0.001). Those who were never married had -14.01 units lower mean knowledge scores than those who were currently married (β = -14.01, 95% CI -20.71 to -7.29; P < 0.001). However, there was no statistically significant association between knowledge of cardiovascular risk factors and actual cumulative risk behaviour (p > 0.05).

In study 2, qualitative in-depth interviews were employed to collect data. The study participants were patients with hypertension who attended follow-up care. Data were collected through face-to-face in-depth interviews. The study is presented in line with consolidated criteria for reporting qualitative reserach. Audio recorded data were transcribed verbatim, and data analysis was guided by the Braun and Clarke steps of thematic analysis and using Nvivo 12 software.

A total of 18 patients with hypertension were interviewed. The findings of this study revealed many patients had a poor understanding of heart disease, were not concerned about developing heart disease in the future and did not know that hypertension predisposes to heart disease. Barriers to fruit and vegetable consumption were poor access, cost and sociocultural factors. Whereas, being busy, poor physical health, and lack of access to an exercise facility were barriers to physical activity.

The participants with CVD maintained unhealthy lifestyles even though they attended follow-up care with a specific focus on risk management. The findings of this study demonstrate the high prevalence of physical inactivity, alcohol consumption and inadequate fruit and vegetable consumption in a developing country. The emerging increase of CVD and the continuation of unhealthy lifestyle in patients is somewhat comparable with western countries, indicating this as a global problem. The burden of CV risk behaviours is increasing whilst the patients' understanding of associated risk factors is limited. Almost half of CVD patients had suboptimal knowledge regarding CVD risk factors, and they had multiple unhealthy behaviours though they attended chronic follow up care clinics. Lower education, rural residence and single marital status were associated with lower knowledge of CVD risk factors.

Despite being at high risk for heart disease, patients with hypertension had an inadequate understanding of heart disease and they had deficient understanding that hypertension predisposes to heart disease. However, they were aware that smoking, drinking alcohol, inadequate consumption of fruit and vegetables and physical inactivity causes heart disease. Results indicated that education level influences participants' understanding of heart disease and the risk factors.

This study provides evidence for policy makers that health services reform is required to promote healthy lifestyle behaviours. Implementation of lifestyle support programs should be considered for the disease prevention policy agenda in Ethiopia. In line with intensive patient counselling and education to improve awareness of CVD risk factors, implementation of multidisciplinary, innovative interventions and systematic nurse-led lifestyle counselling is important to assist CVD patients to adopt healthy lifestyles. Healthcare workers need to identify and consider patients' understanding of health behaviours in planning secondary prevention strategies. Moreover, implementation of CVD prevention programs should be considered for disease prevention policy in Ethiopia.

Thesis declaration

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission in my name, for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree.

I acknowledge that copyright of published works contained within this thesis resides with the copyright holder(s) of those works.

I also give permission for the digital version of my thesis to be made available on the web, via the University's digital research repository, the Library Search and also through web search engines, unless permission has been granted by the University to restrict access for a period of time.

I acknowledge the support I have received for my research through the provision of an Australian Government Research Training Program Scholarship.

Signature... ....
Lemma Negesa Bulto (PhD candidate)

Date...... 2|02|2021 ....

Acknowledgements

Abbreviations

ACC   American College of Cardiology

AHA   American Heart Association

AMI   Acute myocardial infarction

BMI   Body mass index

CAD   Coronary Artery Disease

CHD   Coronary Heart Disease

CI   Confidence interval

CV   Cardiovascular

CVD   Cardiovascular disease

DALYs   Disability adjusted life years

DHS   Demographic and Health Surveillance

EPHI   Ethiopian Public Health Institute

ESC   European Society of Cardiology

FMOH   Federal Ministry of Health

GBD   Global Burden of Disease

HBM   Health Belief Model

HDFQ   Heart Disease Fact Questionnaire

HDL   High density lipoprotein

HEP   Health extension program

HSDP   Health Sector Development Program

IPAQ   International Physical Activity Questionnaire

LDL   Low density lipoprotein

LMICs   Low and Middle Income Countries

MET   Metabolic equivalent

MI   Myocardial infarction

NCD   Noncommunicable disease

NSAP   National Strategic Action Plan

PA   Physical activity

SES   Socioeconomic Status

SSA   Sub-Saharan Africa

WHO   World Health Organization

Chapter 1: Introduction

This introductory chapter presents background information about the Ethiopian healthcare system and health policies. In addition, the research aims, questions, outline of the studies and a brief overview of the remaining chapters of this thesis are presented.

1.1 Background

Ethiopia is the second most populous country in Africa after Nigeria, and has the fastest growing economy in Sub-Saharan Africa.[1] Ethiopian health policy is oriented at disease prevention. However, a major focus of the policy is on prevention of infectious diseases, and chronic disease prevention has received little attention.[2] Recent social and economic changes and urbanisation have resulted in an increasing burden of chronic diseases, predominantly cardiovascular disease (CVD) and diabetes, adding to the existing unresolved infectious disease burden in the country.[3]

1.1.1 Overview of the Ethiopian healthcare system

The Ethiopian healthcare system consists of three tiers: 1) tertiary-level health care (specialised hospitals), 2) secondary-level health care (general hospitals), and 3) primary-level health care (district hospitals, health centres and health posts) (Figure 1). Hospital facilities provide curative, preventive and limited rehabilitation services. Outpatient departments are part of the hospital service units, and they include follow-up units which provide curative and preventive services for patients with chronic conditions, including but not limited to cardiovascular diseases. In hospitals where there is no separate cardiac unit, a cardiac service is provided by the follow-up unit.
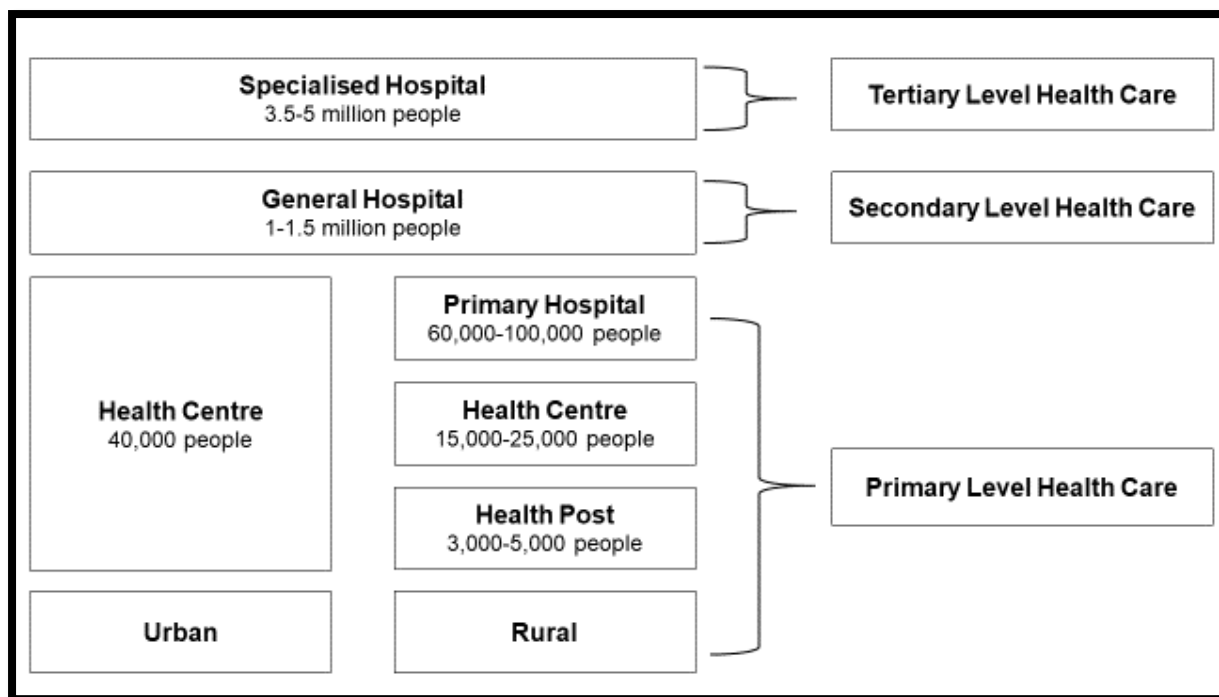
Figure 1: Ethiopian healthcare tier system

Source: Ethiopian Federal Ministry of Health (FMOH)[2]

In 2003, a health extension program (HEP), which is an innovative community-based initiative, was introduced during the third Health Sector Development Programme (HSDP III). The HSDP aimed to develop a health system that provides integrated and comprehensive primary care services in Ethiopia. The HEP aimed to create a healthy environment and promote healthy living by making essential health services available at the grassroots level. The objective of HEP is to improve equitable access to preventive essential health services through community-based health services with a strong focus on sustained preventive health actions and increased health awareness.[2] The Ministry of Health has designed three types of HEP: rural, pastoralist and urban HEP. The program has 16 packages categorised into four major components: 1) disease prevention and control, 2) family health, 3) health education and promotion, and 4) personal and environmental hygiene. These packages are delivered by trained

health extension workers at the community level and health post level. Recently, limited noncommunicable disease (NCD) prevention activities were started in urban areas of the country. NCD prevention was included in the urban HEP packages; however, this has not been adequately addressed as there is no detailed guideline-based intervention activities for individual NCD prevention, diagnosis and treatment. Through HEP, Ethiopia achieved a significant improvement in maternal and child health, infectious disease prevention, hygiene and sanitation, and the number of individuals seeking health care.[2]

In addition, the Urban Health Promotion and Disease Prevention Directorate carries out health programs designed to tackle urban health problems in three major cosmopolitan cities of Ethiopia, Addis Ababa, Dire Dawa and Harar.[4] In 2010, the Ethiopian Federal Ministry of Health developed the National Strategic Action Plan for Prevention & Control of Non-Communicable Diseases in Ethiopia 2014 to 2016, which aimed to prevent, diagnose and treat previously neglected NCDs.[5]

Whilst its prevention and control are inadequate, the burden of CVD and related risk behaviours is increasing in Ethiopia due to socioeconomic and lifestyle changes. However, no national study has been conducted to establish the national prevalence of CVD. Small-scale studies and hospital reports show CVD is a major cause of mortality and morbidity in Ethiopia.[6] The underlying causes of increasing CVD in Ethiopia are the increased prevalence of smoking, khat chewing and alcohol consumption. Khat chewing and drinking alcohol are presumed to be precursors to smoking, and concurrent use of these three substances is a common practice among younger generations in Ethiopia.[7] Khat chewing is often accompanied by the use of other substances such as cigarettes and hashish. Moreover, poor dietary habits and

physical inactivity are also among the main contributors to this major public health problem in Ethiopia.[5]

Data from the Tikur Anbessa Specialised Hospital in the capital, Addis Ababa, show there is a long list of cardiac patients waiting for cardiac care. Cardiology care in Ethiopia has been neglected for many years and, to date, there is no specialised cardiac hospital or cardiac rehabilitation centre in the country. Apart from a few cardiologists, there are no other healthcare providers trained in cardiac care in Ethiopia.[8] However, recently in 2018, the government of Ethiopia signed an agreement with Royal Philips, a global leader in health technology, and the government of Netherlands to construct the first cardiac specialised hospital in Ethiopia, which is expected to transform cardiology services in the country.

A shortage in the trained healthcare workforce is also one of the challenges of cardiovascular services in Ethiopia. Although nurses make up approximately 80% of the Ethiopian healthcare workforce, their role in the follow-up service is limited to recording what physicians do in the unit, and the follow-up service is led by physicians. Cardiac care specialised nurses and nurse-led interventions have been shown to advance cardiovascular care for patients. However, the absence of nurses who are trained in the CV specialty is a major challenge faced by CV services in the country. Despite the importance of self-management for optimal CVD care, lifestyle counselling is given less attention and more focus has been given to medical care.

In summary, social, economic and lifestyle changes are driving the increasing CVD-related mortality and morbidity in Ethiopia. However, CVD prevention is poorly addressed by the health policy of the country, and most health funds are focused on prevention of infectious diseases, and maternal and child health care. Timely action

through research and developing and implementing strong prevention policy is important to halt this significant public health problem. In addition, it is important to integrate control and prevention of CVD, particularly of high blood pressure, into the HEP packages.

The focus of this thesis is CVD risk behaviours among patients with CV conditions such as hypertension, heart failure and myocardial infarction. Major risk behaviours including smoking, alcohol consumption, khat chewing, inadequate consumption of fruit and vegetables and physical inactivity were assessed among CVD patients. In addition, patients' awareness of CVD and associated risk factors was also a focus of this research.

1.2 Research aims

The principal aim of this research was to study the prevalence of major CVD risk behaviours, and awareness of CVD and its risk factors among established CVD patients who were attending follow-up care at referral hospitals in Ethiopia.

The specific research objectives were:

- ❖ to assess the prevalence of major health behaviours in patients with CV conditions
- ❖ to assess the level of knowledge of CVD risk factors in patients with CV conditions
- ❖ to explore awareness of heart disease and related health behaviours in patients with hypertension
- ❖ to assess self-perceived risk and perceived severity and consequences of heart disease in patients with hypertension

❖ to explore barriers to fruit and vegetable consumption and physical activity.

The following research questions were addressed:

1. What is the prevalence of CVD risk factors among patients with known CVD who attend follow-up care? The prevalence of the following five major risk behaviours were assessed among patients known to have CVD:

   ❖ smoking

   ❖ drinking alcohol

   ❖ chewing khat

   ❖ inadequate consumption of fruit and vegetables and

   ❖ physical inactivity.

2. What is the level of knowledge of CVD patients regarding CVD risk factors, and how it is associated with cumulative actual risk behaviour?

3. What is the level of understanding of patients with hypertension regarding heart disease and associated risk behaviours?

   • In particular, patients' understanding regarding smoking, drinking alcohol, chewing khat, consumption of fruit and vegetables, and physical activity was explored. Patients' understanding of hypertension as a heart disease risk factor was also explored. In addition, barriers to fruit and vegetable consumption and physical activity were explored.

4. How do patients with hypertension perceive their future heart disease risk?

5. How do patients with hypertension perceive the severity and consequences of heart disease?

1.3 Research outline

The study was conducted in two phases, from which three research papers were produced, and the papers are consequetive chapters of the thesis. The first two papers were produced from study 1, which was a quantitative cross-sectional survey, and the third paper was produced from study 2, which was a qualitative study using in-depth interviews to collect data. Figure 2 shows the sequence of the studies and their publication outcomes.
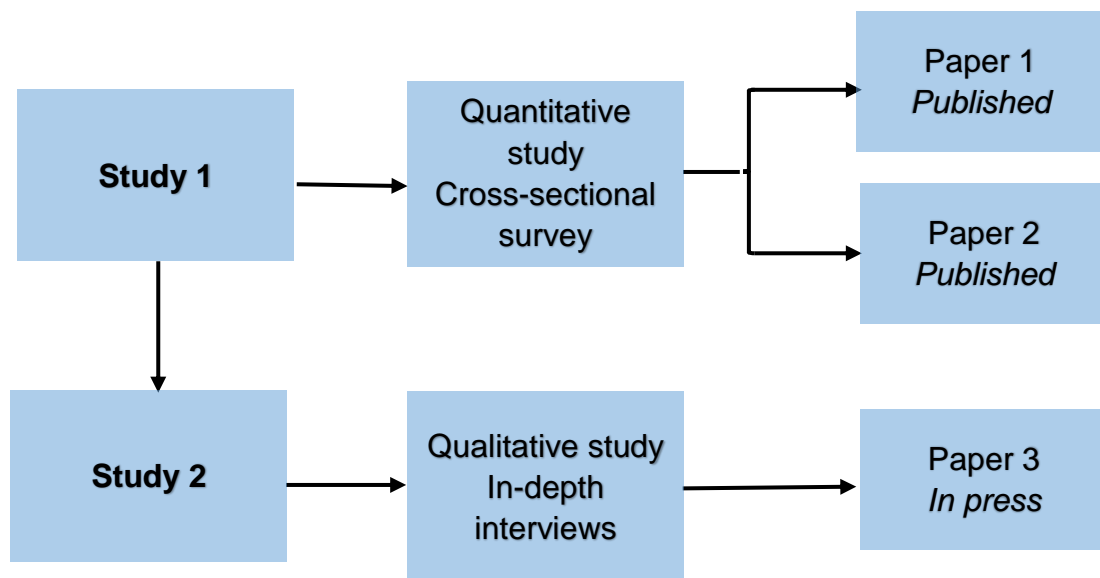
Figure 2: Outline of the study and publication outcomes

1.3.1 Study 1: Health behaviours and knowledge of CVD risk factors in patients with cardiovascular conditions

Study 1 was an investigation of major risk behaviours among CVD patients who were attending follow-up care at two referral hospitals in eastern Ethiopia. This study focused on assessment of five CVD risk behaviours, namely smoking, alcohol consumption, khat chewing, inadequate consumption of fruit and vegetables, and

physical inactivity among patients known to have CVD. The study also identified actual cumulative risk behaviour among the patients. Validated tools (Appendix C1) were used to explore patients' health behaviours and their knowledge of CVD risk factors. Paper 1 and paper 2 resulted from this study. Paper 1 reported on the prevalence of five major CVD risk behaviours, whereas paper 2 explored patients' understanding of CVD risk factors. This study informed the development of the proceeding qualitative study.

1.3.2 Study 2: Awareness of heart disease and related health behaviours in patients with hypertension

Study 2 built on study 1 by further exploring patients' perceptions and understanding of heart disease and associated health behaviours. This study was conducted six months after analysis of the data from study 1. This part of the study used qualitative in-depth interview data to enable detailed exploration of patients' awareness. In this study, patients with hypertension were recruited from two referral hospitals in eastern Ethiopia.

In this study, patients' understanding of heart disease and its signs and symptoms were further investigated to build on the quantitative findings. Self-perceived heart disease risk and perceived severity and consequences of heart disease were also explored among the patients. In addition, this study explored barriers to the two predominant healthy behaviours: physical activity and fruit and vegetable consumption.

Furthermore, through this study, patients' understanding of the causes of heart disease, and the relationships between hypertension and heart disease, diet and heart disease, and physical activity and heart disease were studied.

1.4 Thesis outline

This thesis contains seven chapters including this introductory chapter. Chapter 2 presents a broad literature review performed to inform this thesis. This literature review covers the epidemiology of cardiovascular disease and associated risk factors at the global and regional levels. The distribution of major cardiovascular risk factors including smoking, alcohol consumption, khat chewing, diet and physical activity were also reviewed. In addition, existing evidence on understanding and perceptions of adult populations regarding cardiovascular disease and related risk factors were reviewed.

Chapter 3 describes the overall methods and methodology used to answer the study questions. This chapter details the conceptual framework used, the study design, participant recruitment, how the variables were measured, the data collection procedure and the analysis of the data.

Chapter 4 presents paper 1 produced from study 1 which investigated the prevalence of five cardiovascular risk behaviours and cumulative risk behaviour among CVD patients. This paper was published in the international peer-reviewed journal *European Journal of Cardiovascular Nursing* (Impact Factor: 2.29).

Chapter 5 presents paper 2 produced from study 1, and this chapter focuses on patients' knowledge of cardiovascular risk factors and associated lifestyle behaviours. This paper was published in international peer-reviewed journal *PLOS One* (Impact Factor: 2.7).

Chapter 6 presents paper 3 which reports on the second study. This chapter focuses on awareness of heart disease and associated risk behaviours, and barriers to fruit

and vegetable consumption, and physical activity. This chapter presents a detailed exploration of patients' understanding of each risk behaviour. This paper has been accepted for publication in Nursing Open Journal.

The final chapter of this thesis presents a general discussion of the findings, pratical and policy implications and overall conclusions of the study.

Chapter 2: Literature review

This literature review chapter highlights the burden and prevalence of cardiovascular disease (CVD) and its risk factors at a global and regional level, particularly in the African region. It gives a broad overview of prevalence of CVD risk behaviours, which are predominant drivers of the CVD burden in low- and middle-income countries. In particular, the prevalence of smoking, alcohol consumption, khat chewing, inadequate consumption of fruit and vegetables and physical inactivity among CVD patients as well as the general population are detailed in this literature review chapter. Furthermore, this chapter presents a comprehensive review of evidence regarding awareness of CVD and associated risk factors among adult populations, which is vital for policy making to halt the growing burden of CVD. Effective lifestyle interventions are also reviewed and presented to make recommendations and to guide future intervention studies.

2.1 Global burden of cardiovascular diseases

Cardiovascular diseases are becoming more prevalent and predominant in the growing global burden of diseases.[9] The Global Burden of Disease (GBD) report indicated that in 2015, there were an estimated 422.7 million cases of CVD and it caused 17.92 million deaths.[10] The study also demonstrated that there have been decreases in the Disability Adjusted Life Years (DALYs) for communicable, maternal, neonatal and nutritional diseases, but DALYs due to noncommunicable diseases (NCD) are increasing in developing countries.[11] The most recent findings reveal that the performance of developing countries in the prevention of NCDs is poor, causing these conditions to become the leading causes of premature death.[12]

With the increasing incidence of CVD in low- and middle-income countries (LMICs), the cost of treatment could potentially reverse the improvements made over recent years in poverty reduction in many of these countries.[13] In Sub-Saharan Africa (SSA), the CVD mortality rate is not reducing, whereas it continues to decrease in most high- and middle-income countries. In 2013, CVD caused about one million deaths in Sub-Saharan Africa, which constitutes 38% of NCD deaths and 11% of all deaths in the year.[14] Increased urbanisation and life expectancy accompanied by a lack of CVD prevention policy in developing countries may escalate the burden of CVD in the future.[15, 16] Similarly, in Ethiopia the burden of CVD is high, noncommunicable diseases caused 23,118.1 age-standardised DALYs per 100,000 in 2015, and ischaemic heart is the fourth leading cause of age-standardised DALYs with a rate of 2535.7 per 100,000.[12]

2.1.1 Prevalence of hypertension in developing countries

A World Health Organization (WHO) report on mortality risk factors indicated that high blood pressure (13%) is the leading risk factor for global mortality.[17] In 2010, 31.1% of the world's adults had hypertension; 28.5% in high-income countries and 31.5% in low- and middle-income countries.[18] A study from Bangladesh indicated the prevalence of hypertension is 16% in that country.[19] A finding from the Ugandan national NCD risk factor survey showed the prevalence of hypertension among Ugandan adults is 26.4%.[20] A cross-sectional study by Soubeiga and others in Burkina Faso revealed the overall prevalence of hypertension is 18% in the country, and the prevalence is higher in urban areas (24.8%) than in rural areas (15.37%).[21] In Mozambique, the prevalence of hypertension increased significantly from 33% to 39% over 2005 to 2014/2015.[22] Research findings from Angola and Kenya showed the prevalence of hypertension among adults in the two countries is almost the same, 23%

and 22.8% respectively.[23, 24] A study from urban Nigeria found hypertension is the leading NCD (21.5% of adults), and 27.6% of adults have at least one NCD.[25] Overall, the prevalence of hypertension in developing countries, particularly in Africa, is high; it ranges from a low of 16% in Bangladesh to a high of 39% in Mozambique. The variation could be due to socioeconomic and demographic differences in the populations.

2.1.2 Prevalence of hypertension in Ethiopia

A recent study reported that 1.7% of adults in northwest Ethiopia have at least one type of NCD, of which heart disease and hypertension account for 32.2% and 31.9% of the burden respectively.[3] Another study showed the prevalence of hypertension among adults is 27.9% in northwest Ethiopia, with a high proportion in urban areas and in females.[26] Similar findings indicated that the prevalence of hypertension is 16.9% in southwest Ethiopia,[27] and 22.4% in Durame town, southern Ethiopia.[28] In addition, a facility-based study demonstrated that hypertension accounts for the majority (62.3%) of CVDs followed by heart failure (23.9%) in patients attending chronic follow-up units.[29] Moreover, a recent review of evidence revealed the overall prevalence of hypertension among the Ethiopian population is estimated to be 19.6%, and the prevalence is higher in the urban population (23.7%), and similar in males (20.6%) and females (19.2%).[30] The most up-to-date finding indicates that the prevalence of hypertension among adults is 28.3% in Jigjiga town, eastern Ethiopia,[31] and another study reported it is 23.8% in Jimma town, southwest Ethiopia.[32] In Gonder, northwest Ethiopia hypertension accounts for 62.3% of CVDs followed by heart failure (24%) among patients who attend a follow-up service at a referral hospital in the town.[29] Overall, the prevalence of hypertension in different regions of Ethiopia

is similar; however, it is higher in urban than rural areas, which could be due to differences in lifestyle.

2.1.3 Cardiovascular disease in Ethiopia

No national study has been conducted, but regional findings indicate CVD is the most prevalent NCD and is identified as a common cause of mortality and morbidity in Ethiopia.[33] Findings from a demographic and health surveillance (DHS) study indicate that 41.8% of NCD deaths in northern Ethiopia are due to CVD.[34] A study from Tigray region, northern Ethiopia demonstrated that the overall trend of hypertension mortality is increasing: the number of patients who died in 2011 was 1.6 times higher than those who died in 2012. The admission rate to inpatient departments increased from 9,257 to 23,633 within 4 years.[35] A study conducted in Addis Ababa revealed congestive heart failure is the most common cause of emergency department visits (44%) followed by rheumatic heart disease (40%), hypertension (26%), stroke (22%), ischaemic heart disease (15%) and cardiac arrest (11%).[36] Another hospital-based finding from Addis Ababa indicated the prevalence of CVD is 24%.[33] A study from the southern part of the country reported that the rate of CVD is 18.8% and that of diabetes is 13.1%, these being the most prevalent NCDs among clients who visit the hospital outpatient unit.[37] A study in the Tikur Anbessa Specialised University Teaching Hospital indicated valvular heart disease is the most common primary diagnosis in 62% of patients, followed by hypertension (14.7%), cerebrovascular diseases or stroke (11.5%), heart failure (9%), congenital heart disease (8.5%) and ischaemic heart disease (7.4%).[38]

2.2 Risk factors for cardiovascular disease

CVD is a multifactorial condition, meaning a number of risk factors contribute to its occurrence. CVD is seen as a major challenge for developed nations nowadays, but populations with low socioeconomic status are also facing a high burden of CVD.[16, 39, 40] In fact, poor socioeconomic status is associated with the occurrence of CVD.[41] Sociodemographic factors such as age, sex and ethnicity also play a role in the development of CVD. Moreover, unhealthy behaviours such as smoking, harmful use of alcohol, khat chewing, inadequate consumption of fruit and vegetables, and physical inactivity are the main contributors to the occurrence of CVD.[42] These unhealthy behaviours cause coronary heart disease by contributing to obesity, dyslipidaemia and high blood pressure (Figure 3).[43]
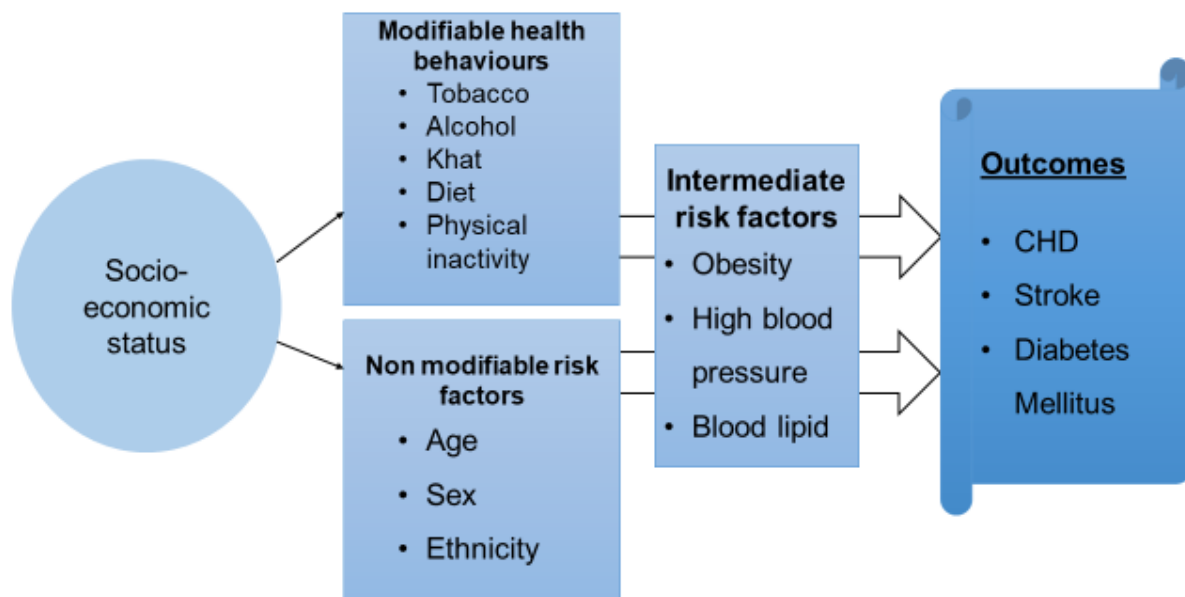
Figure 3: Risk factors for cardiovascular diseases

Source: modified from WHO STEPs NCD surveillance guideline[43]

2.2.1 Sociodemographic determinants of CVD and risk factors

In developing countries, sociodemographic factors appear to be much stronger determinants of CVD and exposure to its risk factors.[16] Lifestyle behaviours adopted by individuals predict their risk of CVD regardless of their socioeconomic status. In India, males with higher education and higher income are more likely to report CVD, and in Iran, women in the low socioeconomic group are the most vulnerable to hypertension.[40, 44] Studies have revealed that age is a strong predictor of CVD, and the risk of CVD is higher in older age groups,[39, 44, 45] and similarly in Iran and India, age is the strongest contributing factor to the risk of CVD.[40, 44] A study from China indicated the incidence of coronary heart disease is higher among those who have a lower educational level. The inverse association between education and the risk of coronary heart disease (CHD) is more evident among individuals who are more than 60 years old.[46] A Ugandan-based study showed the proportion of hypertension was significantly higher among the older age groups and males.[47] A study from urban Nigeria showed that there is no significant variation in CVD risk exposure by sex and age.[25] The variation in the latter two studies could be due to differences in participant characteristics, for example that all participants in the Nigerian study were educated academicians.

2.2.3 Cigarette smoking

The WHO has reported that tobacco use is the second leading risk factor for global mortality (9%) next to hypertension.[17] According to the WHO 2017 report, tobacco kills more than 7 million people each year, and nearly 80% of the world's more than 1 billion smokers live in low- and middle-income countries.[48] Moreover, studies have established that smoking is significantly associated with CVD.[44, 49] A study showed the

5-year risk of stroke, myocardial infarction (MI) or death among stroke patients who quit smoking is 15.7%, compared to 22.6% for patients who continue to smoke.[50] Despite this, cigarette smoking is widespread worldwide, although its prevalence varies between and within countries. De Smedt and others reported 11% of CVD patients are cigarette smokers in Belgium[51] and Mifsud reported 21.8% of CVD patients are cigarette smokers in Malta.[52] A study from Yemen showed that a high proportion (54%) of stable angina pectoris patients undergoing elective coronary catheterisation are smokers.[53] A study revealed that the prevalence of cigarette smoking is 22.5% in Argentina[54] and another study reported it is 29% in Paraguay.[55]

In the African region, the prevalence of cigarette smoking is increasing rapidly and it is posing a major public health challenge in the region.[56-58] A review study indicated the prevalence of current smoking varies widely, ranging from 1.8% in Zambia to 25.8% in Sierra Leone. In addition, the prevalence varies by gender and implementation of tobacco control policies.[58] In the city of Nairobi, Kenya the prevalence of tobacco use is reported to be 12.4%.[59] In addition, the WHO STEPs 2015 study revealed that the prevalence of current smoking in Kenya is 13.5%, with higher prevalence among males, those with lower education and older individuals.[60] Similarly, in South Africa, 13.7% of adults are current smokers, of which 81.3% are daily smokers.[61] Also in Ghana, the prevalence of current smoking among adults is 8%.[16] In Uganda, 9.6% of the adult population are daily smokers.[62]

The prevalence of smoking in Ethiopia is lower than in other African countries.[57, 58] It is variable in different regions of Ethiopia; it is higher in the capital, Addis Ababa, and lower in regional cities, which could be due to differences in population characteristics and variations in how smoking status was measured in the research. Findings from

the 2011 Ethiopian demographic and health survey indicated the overall prevalence of tobacco use among adults is 4.1%.[63] Tibebu and others conducted a cross-sectional study and revealed 14.1% of CVD patients who attend follow-up care at Addis Ababa public hospitals are cigarette smokers.[64] Another study from Addis Ababa revealed 18.6% of adults reported past or present use of cigarettes, and 4.8% are current cigarette smokers,[49] and in southwest Ethiopia, 3.11% of adults are cigarette smokers.[65] A hospital-based cross-sectional study indicated 3.1% of patients who attend the hypertension clinic at Jimma University Specialised Hospital are current smokers.[65] Soboka and others conducted a cross-sectional hospital-based study in southwest Ethiopia, and found that 1.8% of patients with hypertension who attend a follow-up clinic are current smokers.[66] Teshome and others reported 1.3% of patients with hypertension who attend follow-up care in northwest Ethiopia are current smokers.[67]

2.2.4 Alcohol consumption

In 2012, about 3.3 million deaths, or 5.9% of all global deaths, were attributable to alcohol consumption, and 139 million DALYs, or 5.1% of the global burden of disease and injury, were attributable to alcohol consumption. There are significant gender-based differences in the proportion of global deaths attributable to alcohol: in 2012, 7.6% of deaths among males and 4% of deaths among females were attributable to alcohol.[68] Studies have revealed that the prevalence of alcohol use is increasing in developing countries. A cross-sectional study by Olivares and others showed the prevalence of harmful alcohol consumption is 28% in Argentina.[54] A similar study from Nairobi, Kenya revealed the prevalence of harmful use of alcohol is 10.1% among Nairobi urban slum dwellers.[59] A study from South Africa showed the prevalence of

alcohol consumption (alcohol consumption in the last 12 months) among adults is 16.3%.[61]

A study from the Ethiopian capital, Addis Ababa, reported that half (50.2%) of adults admit past or present use of alcohol and 78.5% are current alcohol users.[49] A community-based study in northwest Ethiopia revealed that alcohol consumption is associated with the occurrence of hypertension.[26] Asgedom and others in their hospital-based cross-sectional study showed 16.8% of patients who attend the hypertension clinic at Jimma University Specialised Hospital drink alcohol.[65] A study from northwest Ethiopia showed 12% of patients with hypertension drink alcohol on a daily basis.[67] A cross-sectional study conducted in Addis Ababa public hospitals revealed 25.2% of CVD patients drink harmful alcohol drinking.[64] A hospital-based cross-sectional study in southwest Ethiopia reported that 7.8% of follow-up care attendees with hypertension consume alcohol.[66]

2.2.5 Khat chewing

Khat (*Catha edulis*) is a shrub which is native to east Africa and the Arabian Peninsula, and its leaves (Figure 4) have been chewed by people in these areas for centuries.[69] Khat contains cathinone and cathine chemicals, which are stimulant drugs. Chewing fresh leaves of khat makes people feel more alert and talkative, and it suppresses their appetite. Chewing khat leaves releases cathinone, a stimulant that produces a feeling of euphoria.[69] Regular khat chewing may have sustained effects on the cardiovascular system that can contribute to elevated blood pressure and cause heart failure.[70] A study from Yemen showed a high proportion (86%) of stable angina pectoris patients undergoing elective coronary catheterisation were khat users.[53] Another study from the same country showed khat chewing causes acute myocardial infarction (AMI)

resulting from coronary artery spasm.[71] A case report revealed that khat chewing caused severe cardiomyopathy in an East African migrant living in the UK.[72] A case-control study from Yemen showed the prevalence of khat chewing is significantly higher among AMI cases than a control group, and the study also revealed heavy khat chewing increases the risk of AMI by 39 fold.[73]

Research findings from Ethiopia revealed the prevalence of hypertension is significantly higher among khat chewers (13.4%) than non-chewers (10.7%). In addition, a considerably higher proportion of chewers (29.9%) than non-chewers (20.6%) have suboptimal diastolic blood pressure, and the mean diastolic blood pressure is significantly higher among khat chewers. Moreover, the study revealed khat chewers have a significantly higher mean heart rate (76.3) than non-chewers (73.9).[74] However, a systematic review of three studies by Hassen and others revealed there was no statistically significant association between hypertension and khat chewing.[75] This review finding is opposed by most other findings, and the authors did not include an adequate number of studies to reach the conclusion, and recommended more studies on the causal association between khat chewing and hypertension. A study from the capital, Addis Ababa, revealed 16.9% of the adults working in ministry civil service offices have chewed khat in the past and 5% are current chewers,[49] and similarly, in southwest Ethiopia, 42.7% of adult hypertensive patients were khat chewers.[65] Soboka and others did a cross-sectional hospital-based study in southwest Ethiopia, and found that 19.9% of patients with hypertension who attend follow-up care chew khat regularly.[66] A recent comparative study conducted in southern Ethiopia revealed diastolic blood pressure is significantly higher among khat chewers compared to non-chewers, and duration of khat chewing is significantly associated

with high systolic and diastolic blood pressure.[76] However, none of the previous studies has indicated a dose-based association between khat and heart health.

Figure 4: Fresh leaf of khat

Source: Google Images (re-use permitted)

2.2.6 Diet: Fruit and vegetable consumption

A review evidence by Aune and others revealed that about 5.6 and 7.8 million premature deaths worldwide in 2013 were attributable to fruit and vegetable consumption below 500 and 800 grams/day respectively.[77] Studies have established that a higher intake of fruit, vegetables and legumes is associated with lower risk of CVD.[78-80] A study revealed a significant association between western dietary patterns and coronary heart disease and stroke among populations living in the Middle East and the African region.[81] Dietary risk factors are contributing to the NCD burden in Ethiopia, and the proportion of death from low fruit and vegetable intake is increasing.[82] The burden of disease associated with a poor quality diet is high, and diets low in fruit and vegetables are reported to be the most common dietary risk factor contributing to a large portion of the diet-related NCD burden in Ethiopia.[82] The WHO recommends more than five servings or 400 g of fruit and vegetables a day for adults,[83]

but numerous studies have shown the majority of adults do not meet the WHO recommendations.[84]

Although study has established that adequate consumption of fruit and vegetables has a strong preventive effect against CVD,[81] research has shown that the majority of adults in both developed and developing countries fail to meet the WHO recommendation.[62, 85] A study by Chaves and others revealed the rate of unhealthy diets among adults is 41.2% in Paraguay,[55] and Olivares and others reported 91.8% of adults have a low intake of fruit and vegetables in Argentina.[54] Similarly, a study from the capital of Kenya, Nairobi, showed the prevalence of unhealthy diet among Kenyan adults is 57%, and 48.6% of adults eat fruit less than three days a week; 65% eat vegetables throughout a week.[59] Another study from Kenya showed 98.8% adults do not consume sufficient fruit and vegetables, 9.1% of adults do not consume fruit at all in a typical week, and 63.3% consume only one serving of fruit daily.[86] In South Africa, the majority of adults (88.6%) have a low daily intake of fruit and vegetables,[61] and 67.9% of adults consume insufficient fruit and vegetables in Ghana, as reported in a study conducted by Minicuci and others.[16] A dietary diversity study in South Africa showed 50% of women consume oil and fat for cooking, 22% consume organ meats, 44% consume flesh meat and just 30% consume fruit and vegetables.[87] A study from Uganda revealed only 7.2% of adults eat five or more combined servings of fruit per day, while only 1.2% eat five or more combined servings of vegetables per day.[62] A study from southwest Nigeria showed 60% of adults consume fruit and vegetables less than three days per week, 37.5% consume more than three days per week and 2.3% do not consume fruit and vegetables.[88] Another study from eastern Nigeria found the prevalence of inadequate consumption of fruit and vegetables among Nigerian adults is high (70%).[89] In addition, a study from Cameroon showed 56.1% of adults

have low intake of fruit.[90] Guwatudde and others reported from their study in Uganda that 87% of Ugandan adults eat 1–4 servings of fruit and vegetables per day and only 12.8% eat adequate fruit and vegetables (more than five servings per day).[20]

Several studies conducted in Ethiopia have demonstrated that most adults have inadequate fruit and vegetable consumption which puts them at increased risk for CVD.[49, 91] However, most of these studies reported the number of days adults eat fruit and vegetables in a week and did not report the number of servings of fruit and vegetables adults eat in a day. Research findings from Addis Ababa showed a majority (93.6%) of adult government employees consume fruit 1–3 days per week, and 80.2% consume vegetables 1–3 days a week.[49] Awoke and others revealed 67.7% of adults use vegetable oil for meal preparation while 67.6% eat vegetables at least 1–3 days per week. In addition, this study showed 50% of adults do not eat fruit at all and 21.1% of adults use excessive salt.[91] A study from southern Ethiopia indicated 27.8% of adults eat vegetables less than three days a week, and 14.1% consume them 4–7 days a week. The study also revealed that inadequate vegetable consumption and the use of added salt are significantly associated with hypertension.[28] Teshome and others reported in their hospital-based cross-sectional study only 28% of patients with hypertension who attend follow-up care eat vegetables on most days of a week.[67] However, this study did not indicate whether patients were consuming adequate servings of fruit and vegetables according to the WHO recommendation.

2.2.6.1 Barriers to fruit and vegetable consumption

Studies conducted in the USA have revealed a lack of awareness of the benefits of fruit and vegetable consumption, and the recommended amount of fruit and vegetables, and lack of hygiene are the main barriers to adequate fruit and vegetable

consumption.[92] Other studies found that children and male partners obstructing women's attempts to get them to eat more fruit and vegetables, problems in getting fruit and vegetables, and cost are also barriers to adequate fruit and vegetable consumption.[93] A qualitative study from South Africa revealed affordability, lack of access to healthy food, household poverty and peer influences are barriers to a healthy diet.[94]

2.2.6.2 Excessive use of salt

Studies have established excessive salt intake is associated with increased blood pressure and other CVD.[95, 96] A study from Nigeria revealed 12.4% of adults have a high intake of salt in semi-urban Nigeria.[88] Helelo and others reported adding salt to one's plate is strongly associated with hypertension in their Ethiopian-based study.[28] A study from southwest Ethiopia indicated 55.9% of hypertensive patients add salt to food,[65] and Bonsa and others revealed 8.9% of adults use additional salt in Bedele, Ethiopia.[27] In addition, Awoke and others revealed 21% of adults consume excess salt in Gonder.[91] A hospital-based study from northwest Ethiopia reported 32% of patients with hypertension add salt when cooking food at home.[67]

2.2.7 Physical inactivity

The prevalence of physical inactivity is rising, particularly in low- and middle-income countries, with major implications for the rising burden of NCDs and the general health of the population worldwide.[97] Physical inactivity has been identified by WHO as the fourth leading risk factor for global mortality.[17] Numerous studies have established that physical inactivity is significantly associated with cardiovascular disease.[65, 86, 98] Similarly, other studies have established that engaging in physical activity has a strong preventive effect against CVD and its risk profile,[28, 44, 99] and avoiding a sedentary

lifestyle increases life expectancy.[98] Borrell demonstrated that low physical activity advances the time of death associated with CVD by at least 2.4 years among adults in the USA.[100] Another study from the USA supports Borrell's findings, indicating that physical activity has a protective effect against CVD-attributable mortality.[101] Another study in the Netherlands indicated high-level physical activity leads to 3.7 years more in total life expectancy and 3.2 more years of life without cardiovascular disease.[98] A study in Australia revealed weight loss through physical activity is associated with reduction in the burden of atrial fibrillation and maintenance of sinus rhythm in patients.[102] A study from Kenya revealed adults who exercise only sometimes are 2.2 times more likely to develop hypertension than those who exercise always.[103] Findings of an interventional study showed aerobic exercise significantly reduces body weight, body mass index (BMI), waist and hip circumference, blood glucose and triglycerides,[104] and a study from Malaysia also found that physical activity reduces the cumulative risk of cardiovascular disease.[105]

Although studies have established that physical activity has a significant effect on cardiovascular health, the rates of physical inactivity are increasing among adults, and it is dominating the risk factors for global mortality.[17, 106] A study from Paraguay revealed that the rate of sedentary life among adults is 58%,[55] and a recent study by Olivares and others from Argentina revealed the prevalence of physical inactivity is high (71.5%) among adults.[54] Similarly, 25.7% of adults have a low level of physical activity in Ghana,[16] and in Uganda, 51% of the adult population are physically inactive.[62] Another finding from Ghana revealed more than three quarters (84.1%) of the youth are physically inactive. In addition, the study showed females are more likely to be physically inactive compared to males, and physical inactivity is associated with increased blood pressure.[107] In contrast to most studies, a study from northern

Tanzania showed 96% of adults have sufficient physical activity, with a higher proportion in males (97.3%) than females (94.8%).[106] The high level of physical activity in this study than in other studies is due to differences in participant characteristics: 75% of those in the Tanzanian study were farmers, which is a labour-intensive occupation and physical activity itself. A study from southwest Nigeria revealed the prevalence of physical inactivity among Nigerian adults is 29.8%.[108] Another study from Nigeria showed more than 80% of adults do not meet the WHO physical activity recommendation: only 4% of adults spend 150 minutes or more on moderate-intensity physical activity per week, 13% of adults spend 75 minutes or more on vigorous-intensity physical activity per week, and walking is the most common leisure time physical activity for Nigerian adults.[109] A study based in Angola reported the prevalence of sedentary lifestyle is 87.2% among Angolan public sector workers, and it is higher in women than men.[110] A study by Maimela and others also showed the rate of physical inactivity among adults is high (66.5%) in Limpopo province of South Africa.[61]

However, studies reported Kenyan adults have better physical activity. In Nairobi, the capital of Kenya, the prevalence of physical inactivity among urban resident adults is 14.4%.[59] Joshi and others in their cross-sectional survey also reported 75% of Kenyan adults perform vigorous and moderate physical activity, and walking and cycling are common modes of transportation.[24] Another finding from a WHO STEPs survey conducted by Bloomfield and others indicated 93% of Kenyan adults are physically active, more than 90% of them do vigorous-intensity physical activity, most adults do vigorous physical activity at work (93%) or during travel (96%), and the median number of minutes per day adults spend being sedentary is 126.[111] A study by Kayima and others in Uganda also indicated about 95% of Ugandan adults attained an adequate

physical activity level.[47] However, another study from Uganda revealed that only 26% of patients with hypertension meet the WHO recommendation for physical activity per week.[20] The level of physical activity reported in Kenyan studies is much higher than other African-based studies reported; this could be due to differences in the lifestyle of the populations such as their occupation and mode of transportation, as these count as physical activity.

In Ethiopia, the rates of physical activity are low, particularly among the adult population and urban residents.[3] A study from southwest Ethiopia showed 58% of adults have a low level of physical activity, and only 27.3% have a moderate level of physical activity.[31] Awoke and others in their study in northwest Ethiopia reported only 16% of adults do vigorous physical activity, and 76.9% of adults use a vehicle as their mode of transportation.[91] A study from northern Ethiopia showed 91.3% of hypertensive patients do not do regular physical exercise and only 26% do work requiring vigorous intensity.[112] Asgedom and others reported that 55% of patients with hypertension who attend follow-up care at Jimma University Specialised Hospital are physically inactive.[65] In the capital, Addis Ababa, 65% of patients who attend follow-up care at public hospitals perform physical activity, and walking is the most common physical activity they perform.[64]

The WHO recommended physical activity level for adults in the age group of 18–64 years is:

> Adults aged 18–64 should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity. Aerobic activity should be performed in bouts of at least 10 minutes duration. For additional health benefits, adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of

vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate and vigorous intensity activity.[113]

2.2.7.1 Barriers to physical activity

A study conducted in Iran showed that not having a partner, being busy at work, looking after children, and having physical problems such as leg and back pain are barriers to physical activity. The study also revealed most hypertensive patients believe that engaging in regular physical activity and following a healthy diet have an important role in decreasing one's risk of developing CVD. In addition, the study reported most patients believe having a healthy diet and enough physical activity helps weight reduction and morbidity reduction, and reduces medical costs.[114] A review of available literature revealed pain, fatigue, lack of time, lack of motivation and cost of exercise are barriers to physical activity.[115] Another finding revealed living alone, having stopped exercise, unsafe space and lack of a particular reason to exercise are barriers to physical activity.[116] A study conducted by Mbambo and others in South Africa identified that having physical health problems and lack of time are barriers to physical activity.[117]

2.3 Cumulative cardiovascular risk factors

Studies have revealed adult populations living in low- and middle-income countries are exposed to a cluster of CVD risk factors. In Africa and the Middle East, more than 90% of adults have at least one modifiable CVD risk factor, 74% have more than one, and 53% have 3 or more CVD risk factors.[9] Evidence from a review revealed that the pooled regional prevalence of exposure to three or more CVD risk factors is 3.8% in the Southeast Asian region and 18.6% in the Western Pacific region.[118] A study in Malaysia revealed 63% of adults have at least one CVD risk factor, 33% have two or more risk factors, and 14% have three or more risk factors.[119] Comparable to

developed countries,[120, 121] in the African region the prevalence of multiple risk factors is high.[85] A study from Kenya revealed nearly 72% of adults have at least one NCD risk factor, and 20% have co-occurrence of risk factors,[59] and a similar study from urban Nigeria showed that 67.4% of adults have at least one CVD risk behaviour, and 29.9% of adults have multiple risk behaviours. The study showed 96% of adults have an unhealthy diet, 27.4% practice a sedentary lifestyle, 5% consume excess alcohol and 1.9% are smokers.[25] Another study from southwest Nigeria showed there is a high prevalence of clusters of risk factors; 23% of adults have two or more CVD risk factors.[85] A recent study from southwest Ethiopia reported 71% of the adults living in Jimma town have one or more CVD risk factors and 11% are cigarette smokers.[32]

2.4 Cardiovascular health literacy

2.4.1 Understanding of CVD and its signs and symptoms

Several studies have indicated that the level of knowledge and perception of adults regarding CVD risk factors is suboptimal in developing countries as well as in developed countries.[122-125] A study conducted in Kuwait revealed almost 60% of adults have no knowledge of CVD, and only 29% of them knew of coronary heart disease among the CVDs.[126] Findings from Pakistan revealed 71% of admitted MI patients have poor knowledge of acute MI.[127] A study from the United Arab Emirates also reported women have limited knowledge of heart disease, which results in delay in seeking medical care.[128]

A qualitative study conducted by Surka and others in a peri-urban community of South Africa revealed adults are unsure and unable to define what CVD is however, they are familiar with the term 'heart attack' which they define in general as a 'heart problem'.[129] A review of studies from Sub-Saharan Africa by Boateng and others indicated the level

of knowledge of CVD is suboptimal, the level of knowledge varies with participant characteristics and, overall, more than half of adults in Sub-Saharan Africa have poor knowledge of CVD.[123] In addition, a study in Cameroon indicated the level of knowledge regarding CVD is suboptimal; 52.5% of adults have overall poor knowledge on CVD with only about a quarter correctly identifying types of CVD.[122]

Poor knowledge of signs and symptoms of heart disease is associated with patient delay in healthcare seeking and poor treatment outcomes. A study from Canada revealed more than half of cardiology inpatients and outpatients know chest pain and arm pain as symptoms of heart attack, 39% know shortness of breath, and about one-third identified loss of consciousness, nausea and sweating as warning symptoms of heart attack.[130] A study from Pakistan showed lack of knowledge of any of the symptoms of heart attack and mild chest pain are associated with prehospital delay among myocardial infarction patients.[131] A study conducted by Khan and others in the United Arab Emirates revealed women have poor knowledge of heart disease signs and symptoms.[128]

In Sub-Saharan Africa, adults have suboptimal knowledge of signs and symptoms of CVD, and the level of knowledge varies with sociodemographic characteristics of the adult population.[123] A recent study from Bue, Cameroon also reported 63% of adults have poor knowledge of the warning signs of heart attack.[122]

2.4.2 Understanding of cardiovascular risk factors

The Heart Disease Fact Questionnaire (HDFQ), which was developed by Wagner and colleagues (2005),[132] has commonly been used in studies for the assessment of overall knowledge of CVD risk factors among adult populations. A study conducted in the USA reported the mean HDFQ score was 13.9 for adults and the scores ranged

from 6 to 16 (out of 16 possible points).[125] Another study conducted in the USA revealed African-American men have good knowledge of CVD risk factors despite being at high risk; the minimum HDFQ score was 10 and the maximum was 19, with a mean score of 15 and the total mean score was 75%, revealing that African Americans have good knowledge of CVD risk factors.[133] A study conducted among diabetic patients in the USA revealed diabetic patients have good knowledge of CVD risk factors; 90% of the patients correctly answered most of the HDFQs, and only three questions in the HDFQ were answered correctly by less than 90% of the patients.[134] An Indian study found 48% of adults are able to score 20 and above from the total 25 HDFQ items, whereas 52% of adults score below 20 of the total items.[135] Another study in India indicated 28% of patients have poor knowledge, 30% have fair knowledge, and 42% have good knowledge of modifiable CVD risk factors.[136] A study from Pakistan showed 28.7% of the patients had a good level of knowledge about modifiable CVD risk factors.[127] A study from Poland revealed 6.3% of patients were not able to name any CVD risk factors, whereas only 7.4% of patients knew at least three CVD risk factors.[137]

Smoking appears to be the most commonly recognised CVD risk factor among adult populations. A study conducted in Canada indicated 50% of cardiac patients identify smoking as a risk factor for heart disease.[130] In Poland, 33.1% of patients recognised smoking as a CVD risk factor.[137] A study from Portugal also revealed most adults recognise not smoking (36%) and a healthy diet (32%) as healthy behaviours that reduce the risk of CVD.[42] A study conducted in Pakistan revealed 25% of adults identify smoking as the top risk factor for CVD followed by hypertension.[138] Khan and others revealed that males are more aware of tobacco smoking being a risk factor for CVD, whereas females are more knowledgeable about an unhealthy diet.[139] A

qualitative study in South Africa showed all adults are aware that cigarette smoking and excessive alcohol consumption are risk factors for CVD.[129] A study from Iran revealed coronary bypass surgery patients in the west of Iran have a poor understanding of hypertension, smoking and substance abuse as CVD risk factors.[140] Another study from Iran reported most diabetic patients believe that regular physical activity and healthy diet have an important role in decreasing risk of developing CVD.[114] A study by Maruf and others in Nigeria showed adults have good knowledge of the benefits of physical activity, and the study also revealed there is correlation between knowledge of physical activity, attitude towards physical activity and practice of physical activity.[141]

Existing studies reveal awareness of CVD risk factors among adults in the African region is limited. A review of studies from Sub-Saharan Africa demonstrated the level of knowledge of CVD risk factors varies with region, and is also negatively influenced by low educational attainment and rural residence. The study reported adults who are unable to identify a single risk factor for CVD ranges from the lowest (1.8%) in Nigeria to the highest (73%) in Uganda.[123] A study by Aminde and others in Cameroon also revealed 36% of adults in Buea, Cameroon are unaware of CVD risk factors.[122] A study from Nigeria also reported the mean HDFQ score for adults is 48.6% and only 19.9% of adults have good knowledge, 49% have poor knowledge and 31.2% have fair knowledge regarding heart disease risk factors. In addition, the study reported there is no significant difference in the prevalence of CVD risk factors among those with good, fair or low levels of knowledge.[124]

In Aksum, northern Ethiopia, 51.8% of adults identify high fat intake as a risk factor for hypertension, while only 36.3% identify physical inactivity as a risk factor for CVD.[142]

2.4.3 Correlates of knowledge of CVD and associated risk factors

It has been established through studies that better education and better health literacy are associated with health behaviour change.[143] Higher education attainment is associated with better knowledge of CVD and its risk factors.[126, 127, 143] Moreover, a study revealed health literacy is associated with healthy behaviours in CVD patients.[143] A study conducted in the USA revealed rural residence, being male, attaining less than high school education, and low income are associated with a lower heart disease knowledge score.[144] A study by Awad and AL-Nafisi indicated higher education attainment is associated with better knowledge of CVD. In addition, this study revealed being female, aged 50–59 years, regular eating of a healthy diet and family history of CVD are associated with better understanding of CVD.[126] A study in Pakistan also indicated that males with a higher educational status have a better knowledge of CVD risk factors.[127] A study from Nigeria revealed there is a significant association between educational level and knowledge of lifestyle measures; the higher the level of education of the adult hypertensive patients the more likely they were to be aware of lifestyle behaviours that assist blood pressure control.[145] Alzaman and others also reported awareness of modifiable CVD risk factors is positively associated with healthy behaviour for adult patients.[146] However, Tran and others stated knowledge alone is not sufficient to reduce CVD risk; improving perceptions plays an important role in reducing long-term CVD risk.[125]

2.4.4 Self-perceived heart disease risk

Most at-risk adults do not recognise their actual CVD risk. Research from the Netherlands revealed diabetic and hypertensive patients have inadequate perceptions of their actual risk of CVD: the study revealed 23% of high-risk patients do not

recognise their heart disease risk while 42.3% of them overestimated their actual ten-year heart disease risk. Abed and others in their Jordan-based study reported most high-risk patients underestimate their actual heart disease risk, 48% of high risk patients consider themselves at no risk for developing AMI, while 25% perceive their risk of developing AMI in their lifetime is low. In addition, the study found having obesity, hypertension, angina and first-degree relatives with heart disease are associated with high self-perceived heart disease risk.[147] In Monsuez and others' study, 20.4% of women had low self-perceived CVD risk, whereas 63.3% had moderate self-perceived CVD risk.[148] In a Brazil study, 71.3% of men perceived themselves at low risk of having a heart attack and those who were overweight were more likely to perceive themselves to be at risk of a heart attack compared to those with normal weight.[149] A qualitative study from the United Arab Emirates showed that, despite being aware of heart diseases, many women do not perceive themselves to be at risk and thus ignore their actual heart disease risk.[128] Another study from Seychelles showed only half of adults can report an estimate of their own CVD risk. Moreover, the study indicated reporting a high perceived CVD risk is associated with treatment seeking for CVD risk factors, whereas reporting a low perceived CVD risk is associated with normal BMI, male sex, education and younger age.[150] A study from Malaysia reported patients with uncontrolled hypertension perceive their risk of developing CVD is low.[151] A qualitative study by Surka and others from South Africa revealed most South African adults are knowledgeable about CVD, and they consider themselves to be at risk of developing heart disease.[129]

Some studies have demonstrated that the presence of actual CVD risk in adults may not change their self-perceived CVD risk. A study from Croatia revealed actual CVD risk factors in adults do not change their perceptions of risk; 24.5% of adults with actual

CVD risk factors do not recognise their risk of developing heart disease.[152] Another study from Jordan revealed high-risk patients have low self-perceived heart disease risk despite their actual risk.[147]

Overall, existing studies indicate the burden of CVD is high in Ethiopia, in line with the global context; however, unlike developed countries, no prevention strategies are in place in most developing countries. The prevalence of smoking is lower in Ethiopia than in other African countries, but khat chewing is a common unhealthy behaviour in Ethiopia. Alcohol, unhealthy diet and physical inactivity are also major drivers of NCD in Ethiopia, similar to western countries. Evidence of awareness of CVD and its risk factors is scarce in developing countries, particularly in Ethiopia where there is scarce evidence to guide evidence-based health policy.

2.5 Evidence on effective lifestyle interventions to modify behaviours for CVD patients

Studies have revealed lifestyle interventions have been shown to be effective in reducing CVD risk for high-risk patients. A randomised controlled trial in Brazil demonstrated a systematic and structured nurse-led lifestyle intervention and counselling effectively reduced participants' CVD risk score, and improved adherence to pharmacological treatment.[153] Comprehensive multifactorial lifestyle advice is also effective for secondary prevention of CVD among high-risk patients.[154] A review of interventional studies in Sub-Saharan Africa reported interventions such as dietary modification, health education, health promotion and physical activity are effective in reducing systolic and diastolic blood pressure, BMI, physical inactivity, smoking behaviour and serum cholesterol.[155] A randomised controlled trial conducted by Harting and others in the Netherlands indicated health counselling effectively

decreases fat consumption and smoking behaviour, and improves the physical activity level for cardiac outpatients.[156] A study in Germany demonstrated a self-care behaviour intervention by nurses can effectively modify lifestyle behaviour for educated patients compared to uneducated patients.[157] Also in the context of Ethiopia, a study showed a nurse-led lifestyle education intervention improves clinical parameters for patients with type 2 diabetes. The study showed educational interventions by nurses effectively reduced blood pressure and blood glucose level after nine months of intervention.[158]

2.6 Gaps in the evidence on CVD risk behaviours and patients' health literacy on CVD risk factors in Ethiopia

This literature review has presented evidence on the global and regional burden of CVD, the prevalence of major CVD risk behaviours and awareness of the risk behaviours among adult populations. It has shown the prevalence of CVD is increasing in the African region, including in Ethiopia. Lifestyle changes associated with urbanisation, adoption of western lifestyles and socioeconomic changes are contributing towards this growing public health problem in Ethiopia. This is happening under circumstances of limited resources, and lack of evidence to guide CVD prevention policy development in the country.

All the previous studies focused on investigating determinants of hypertension at the community level.[159, 160] No studies have reported individual risk behaviours among adult general populations nor revealed the actual cumulative CVD risk behaviour among CVD patients in Ethiopia.

In Ethiopia, numerous studies[3, 27, 36, 49] have been conducted and reported on the high burden of CVD; however, most of the studies were focused on revealing the high

prevalence of hypertension and its associated risk factors at the community level, including a systematic review by Kelemu and others.[30] There are also a few studies[64, 65, 67, 142, 160] which have focused on lifestyle adherence and blood pressure control among patients with hypertension. However, none of these studies indicated the prevalence of major CVD risk behaviours, and knowledge and perceptions of CVD patients regarding CVD risk factors to inform policy making to design educational intervention programs. Very few of the previous studies among CVD patients assessed khat chewing, which is one of the main unhealthy behaviours in east Africa, particularly in eastern Ethiopia.

Despite the importance of gathering evidence to fill the knowledge gap on CVD and its risk factors among high-risk populations, no study has explored the understanding of heart disease and associated risk factors among patients with hypertension who are at high risk for the disease.

Except for a study by Gebrihet and others[142] which explored knowledge of hypertension among the general population using mixed methods, no single study has explored CVD patients' health literacy about CVD and associated risk behaviours using a mixed-methods design in Ethiopia.

Although studies have revealed that a higher educational level is correlated with higher knowledge and perception regarding CVD and its risk factors,[145, 161] this has not been explored in the Ethiopian context.

Chapter 3: Methods

This chapter presents the study design, theoretical framework, participant sampling, data collection, variables, measurements, ethical considerations and other related methods employed to address the specified research questions.

3.1 Study settings

Ethiopia is located in East Africa, bounded by Djibouti, Eritrea, Kenya, Somalia and Sudan. Addis Ababa is the capital of Ethiopia and the country has a total area of 1,104,300 km^2. Ethiopia is a predominantly agricultural country, and more than 80% of the population lives in rural areas. According to the Federal Ministry of Health (FMOH) in 2017 the total population was estimated to be 105 million, making the country the second most populous in Africa. The male to female ratio is 1.03, and the total fertility rate is 4.6. The population growth rate of the country is 2.58, and the total life expectancy is 64.8. Lower respiratory tract infections are the leading cause of death followed by diarrhoea and HIV/AIDS, and stroke and heart diseases are on the rise and ranked the fifth and seventh causes of death respectively.[1, 162]

This study was conducted in two selected referral hospitals in eastern Ethiopia: Hiwot Fana Specialised University Hospital, which is located in Harar city, and Dilchora Referral Hospital, which is located in Dire Dawa city administration. The two cities are located 48 km apart from each other. The two hospitals serve as the main referral centres in the eastern part of the country. These two hospitals were selected for this study as they provide follow-up services for patients with CVD conditions. Hiwot Fana Specialised University Hospital has been owned by Haramaya University, College of Health and Medical Sciences since 2010. The hospital has a total bed capacity of 167 and is currently building a new 'mega' hospital which will have a bed capacity of about

900. Dilchora Referral Hospital is the only referral hospital located in Dire Dawa city administration and has a total capacity of 267 beds. The two hospitals provide emergency, inpatient and outpatient services. This study was conducted in chronic follow-up units of the two selected hospitals. The chronic follow-up units are situated in the outpatient departments and provide regular follow-up for patients with chronic conditions including heart failure, myocardial infarction, hypertension, diabetes and epilepsy. The follow-up units specifically focus on providing follow-up services which include treatment of CVD and counselling of patients to achieve healthy lifestyle behaviours.
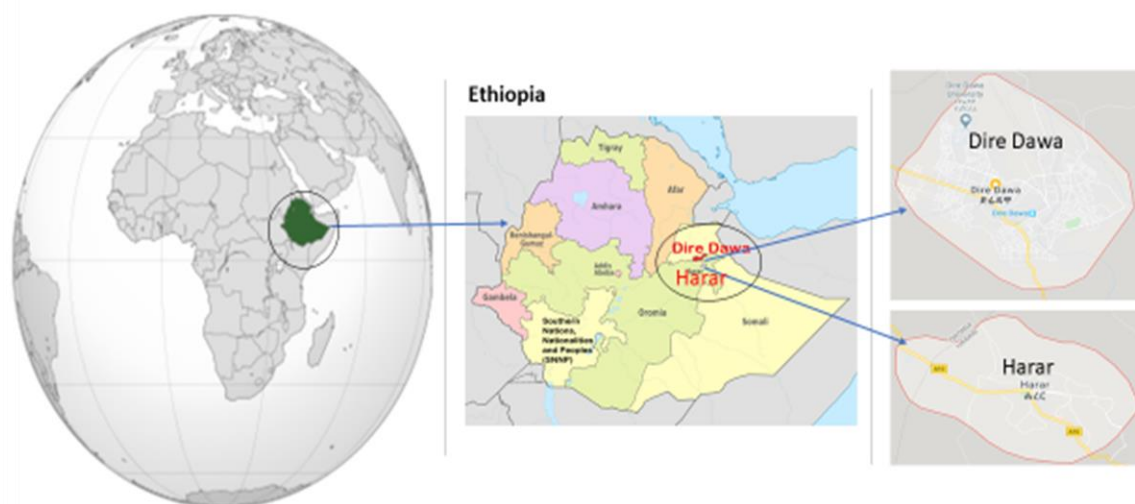
Figure 5: Map of Ethiopia, Dire Dawa and Harar

Source: Google Maps

3.2 Theoretical framework

The Health Belief Model (HBM) was used to underpin the study (Figure 6). This is a psychological model that attempts to explain or predict health behaviours and focuses

on beliefs and attitudes of individuals. It was first developed in the 1950s by social psychologists Hochbaum, Rosenstock and Kegels working in the US Public Health Services. The model proposes that people will respond best to messages about health promotion or disease prevention when the following four conditions for change exist: 1) The person believes that he or she is at risk of developing a specific condition, 2) The person believes that the risk is serious and the consequences of developing the condition are undesirable, 3) The person believes that the risk will be reduced by a specific behaviour change, and 4) The person believes that barriers to the behaviour change can be overcome and managed.[163] This study involved assessment of health behaviour among patients who had received counselling during their regular follow-up appointment; thus, HBM is an appropriate model to underpin this study.
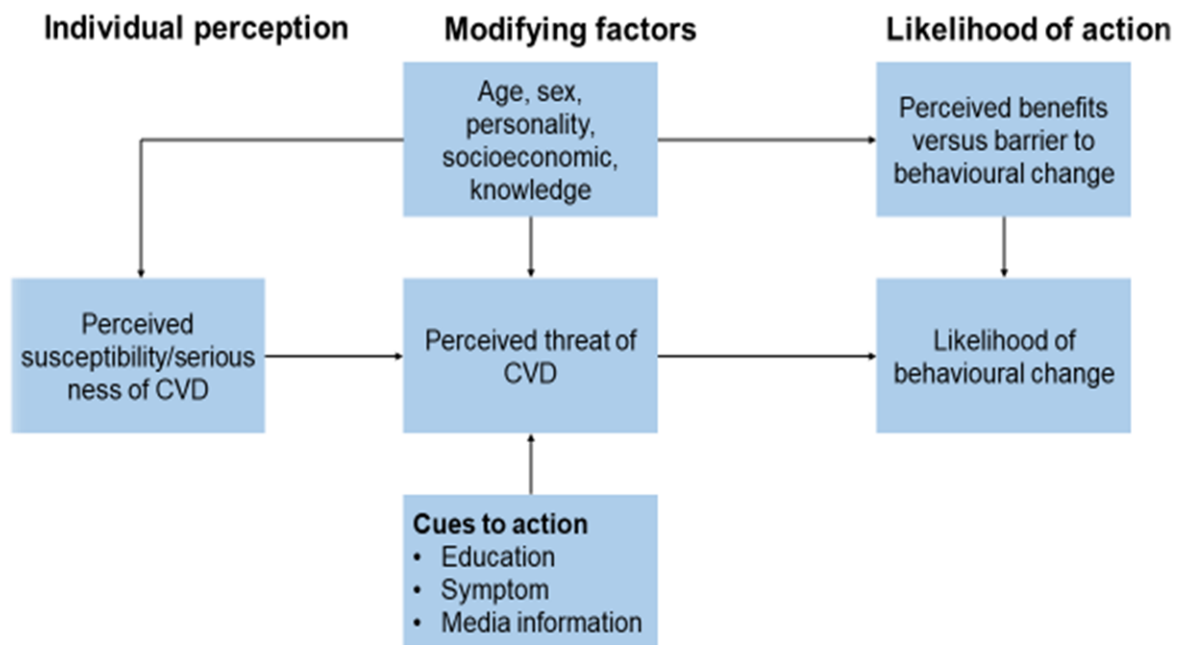
Figure 6: Health Belief Model, modified for CVD

Source: Glanz et al.[163]

3.3 Study design

A mixed-methods approach was used to address the specified research questions. A mixed-methods design provides strengths that offset the particular weaknesses of either quantitative or qualitative research.[164] It also allows the specified research questions to be comprehensively researched by providing more evidence to understand complex health problems.[165] The study was conducted in two phases using a sequential explanatory mixed-methods design. The first phase of the study employed a cross-sectional design while the second phase used qualitative in-depth interviews.

3.3.1 The quantitative study

The hospital-based cross-sectional survey was conducted from June to September 2018. This study was conducted through questionnaire-based face-to-face interviews with patients who were attending the chronic follow-up units in two public hospitals.

3.3.1.1 Participants and sampling

The study participants were patients with CVD who attended the chronic follow-up units of the two hospitals. The study participants were patients who had confirmed medical/clinical diagnoses of chronic CVD including hypertension, heart failure, myocardial infarction and other heart diseases. The participants were enrolled in the study based on their age: those in the age range of 18–64 years were recruited. During the study period, about 820 CVD patients were regularly attending the chronic disease follow-up units of the two hospitals: 490 patients at the Dilchora Referral Hospital and 330 patients at the Hiwot Fana Specialised University Teaching Hospital. According to the hospitals' guidelines the patients should attend their regular follow-up appointments once a month.

Sample size was calculated using single population proportion formulas with the following assumptions: 95% confidence level, 1.96 ($Z_{\frac{\alpha}{2}}$), 50% prevalence as no similar study exists, degree of precision (d) 5%, and N = 820 total CVD patients attending chronic follow-up units of the two hospitals.

Sample size (n)

$$= \frac{(Z_{\frac{\alpha}{2}})^2 * p * q}{d^2}$$

Where p = proportion (0.5), d = margin of error (0.05) and n = minimum sample size.

$$n = \frac{(1.96)^2 * (0.5) * (1 - 0.5)}{(0.05)^2} = 384$$

Since the total population is 820, which is < 10,000, the finite correction formula was used, which gave a sample size of 261. After adding 10% non-response rate, the final sample size was 287. The total 287 sample was allocated for the two hospitals proportional to their total number of patients attending each chronic follow-up unit. Based on the proportion, 172 patients from Dilchora Referral Hospital and 115 patients from Hiwot Fana Specialised University Hospital who fulfilled the inclusion criteria were enrolled in the study. Convenience sampling was used to select the study participants from each hospital. Patients are scheduled to come for their follow-up appointment every month; however, some do not attend. Since the data collection was run over a period of three months, the researcher's assistants had to check that the patients had not previously been involved in the study.

The healthcare providers (nurses or physicians) working in the follow-up units informed the patients that a study was being undertaken in which they were eligible to

participate. The healthcare providers informed the patients on exit from the follow-up unit and referred them to the poster that was displayed on a board. The poster contained the project title, eligibility criteria, researcher's name and the contact details of the research assistants. The research assistants' phone numbers were provided on the poster and interested participants used these to make contact (Appendix E1). The research assistants gave a copy of the information sheet to the participants before the interview (Appendix A1). For those participants who were unable to read the information sheet, it was read out by the research assistants (data collectors) or someone of the participant's choice. After reading the information sheet, if the patients agreed to participate in the study, the data collector gained written consent and conducted the interview face to face.

3.3.1.2 Inclusion and exclusion criteria

Adult patients in the age range of 18–64 years, diagnosed with CVD and attending the chronic disease follow-up units of the two selected hospitals were included in the study. In particular, patients presenting with hypertension, heart failure, arrhythmias, coronary artery disease (CAD), ischaemic heart disease, myocardial infarction or heart attack were included in the study. The patients were those who had a confirmed medical/clinical diagnosis and who were attending their regular follow-up appointment at the two selected hospitals. Patients with congenital heart disorders, rheumatic heart disease, infectious heart diseases, inflammatory heart diseases, paediatric patients, those who were critically sick or mentally ill, and patients with disability which would hinder their ability to talk to the researcher were excluded from the study.

3.3.1.2 Data collection and tools

Four validated tools were used to address the specified research objectives (Appendix C1). The questionnaires contained items that assess behavioural risk factors, and patients' understanding of CVD risk factors.

WHO STEPs Instrument: The WHO STEPs instrument was designed for surveillance of NCDs and their risk factors. It has three steps, among which step one, which focuses on the assessment of sociodemographic and behavioural risk factors, was used for this study (Figure 7). Step two and step three of the instrument deal with physical and biochemical measurement respectively, and are designed to build on the core data from step one. The instrument has core, expanded and optional components in each part. Sociodemographic and behavioural risk factors including smoking, alcohol consumption, and fruit and vegetable consumption were assessed using this instrument. This instrument was adapted for the Ethiopian context by the Ethiopian Public Health Institute (EPHI) and the first NCD surveillance was conducted in Ethiopia in 2014. Khat chewing was included in the WHO STEPs instrument as NCD risk factor, and these questions were used to assess the prevalence of khat chewing among the patients.[166] Given that the physical activity questions of the WHO STEPs instrument are long and burdensome to patients, I replaced them with an international physical activity questionnaire.
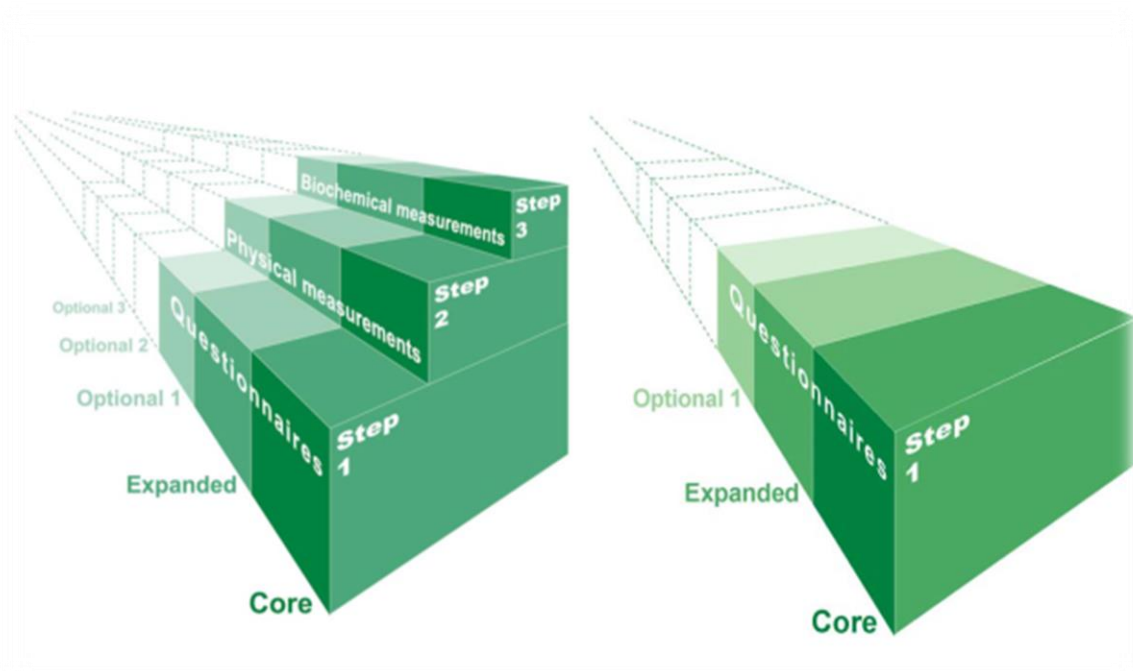
Figure 7: WHO STEPs framework for surveillance of NCD risk factors

International Physical Activity Questionnaire (IPAQ): The International Physical Activity Questionnaire was used to assess participants' level of physical activity. The questionnaire contains open-ended questions to explore the participants' exercise and to classify the intensity as vigorous, moderate or walking.[167] The development of an international measure for physical activity commenced in Geneva in 1998 and was followed by extensive reliability and validity testing undertaken in different countries. The results suggest that these measures have acceptable measurement properties for use in many settings and in different languages, and are suitable for national population-based prevalence studies of participation in physical activity. The IPAQ comprises seven open-ended questions related to vigorous-intensity physical activity, moderate-intensity physical activity and walking. The questions were designed to measure the duration of the types of intensity of physical activity and sitting time that

people do as part of their daily lives, and to use this data to estimate total physical activity in metabolic equivalent (MET) minutes per week and time spent sitting.[167]

Heart Disease Fact Questionnaire (HDFQ): The Heart Disease Fact Questionnaire is a validated tool that was used to assess the patients' knowledge of CVD risk factors. The study participants were asked to choose 'true', 'false' or 'I don't know', with 'I don't know' also being marked as a wrong answer.[132]

The English version of the questionnaire was translated into Amharic, Afan Oromo and the Somali languages and was back translated into English by a language expert to check the reliability of the translations.

The survey data were collected through questionnaire-based face-to-face interviews with patients who attended the follow-up units of the two hospitals. Data collection was conducted at a quiet place in each of the two hospitals to maintain the privacy of participants. Two nurses who have bachelor qualifications carried out data collection, and one nurse was assigned to each hospital. The principal investigator supervised the entire data collection process.

The principal investigator provided theoretical and practical training for the data collectors regarding the data collection tool and the data collection procedure, and the investigator and data collectors conducted some joint interviews to improve inter-rater reliability. The data collectors and the principal investigator reached 100% consensus. Each completed questionnaire was checked for completeness and consistency during submission. Data cleaning was done to check the accuracy, completeness and consistency of the data, and outliers and missing values were managed accordingly.

3.3.1.3 Variables and measurement

Data concerning the following variables were collected.

Independent variables: The independent variables were age, sex, education, ethnicity, religion, income, marital status, occupation, number of cigarettes, number of standard alcoholic drinks, servings of fruit and vegetables, and salt consumption.

Dependent variables: The outcome variables were cumulative CVD risk behaviours and knowledge of heart disease risk factors. The behavioural CVD risk factors include smoking, alcohol consumption, khat chewing, inadequate consumption of fruit and vegetables, and physical inactivity.

Actual cumulative risk behaviour: Actual cumulative risk behaviour was defined as the sum of individual CVD risks including tobacco use, alcohol use, khat chewing, inadequate fruit and vegetable consumption, and physical inactivity. The minimum score was 0 and the maximum score was 5.

Tobacco use: Tobacco use was assessed in terms of previous and current smoking status, duration of smoking and quantity of tobacco use. Current use of cigarettes was defined as use of any tobacco product in the last 30 days.

Alcohol use: Alcohol consumption was assessed by history of alcohol consumption, and alcohol consumption within the last 30 days was used to define current drinkers. One standard drink of alcohol is defined as one bottle for beer and one medium-size glass for wine.

Khat use: Khat use was assessed in terms of previous and current status of use and frequency of khat use in the last 12 months. A history of khat chewing in the last 30 days was defined as current khat chewing.

Fruit and vegetable consumption: Fruit and vegetable consumption was assessed by the number of days in a week and number of servings per day participants consumed. One serving of fruit and vegetables was defined as 75 g or one cup for raw fruit and vegetables and half a cup for cooked fruit and vegetables. WHO show cards or pictures were used to quantify servings of fruit and vegetables (Figure 8).

Figure 8: Show cards for measurement of servings of fruit and vegetables

Source: Google Images, link; https://www.thekitchn.com/10-photos-that-show-you-your-daily-recommended-servings-of-fruits-vegetables-207261

Physical activity: The level of physical activtiy was categorised as: high level, defined as a participant doing vigourous-intensity activity at least three days per week or > 3000 MET minutes per week; moderate, defined as three or more days of vigorous-intensity activity of at least 20 minutes or five or more days of moderate intensity activity/walking at least for 30 minues per day or 600–3000 MET minutes per week; and low level for a person not meeting the criteria for high level or moderate level

physical activity, or < 600 MET minutes per week.[168] MET minutes a week was calculated by multiplying the MET value given (walking = 3.3, moderate activity = 4, vigorous activity = 8) by the minutes the activity was carried out and again by the number of days that that activity was undertaken. Then, the total MET minutes of physical activity a week was obtained by adding the MET minutes achieved in each category (walking, moderate activity and vigorous activity). Low level physical inactivity was defined as attaining less than 600 MET minutes per week. WHO show cards or pictures were used to identify vigorous- and moderate-intensity physical activity.

Vigorous-intensity physical activity: Vigorous intensity refers to activity that is performed at 6.0 or more times the intensity of rest for adults. On a scale relative to an individual's personal capacity, vigorous-intensity physical activity is usually a 7 or 8 on a scale of 0–10. This includes activities such as heavy lifting, cutting firewood, running, football, digging, aerobics or fast cycling.[113]

Moderate-intensity physical activity: Moderate intensity refers to activity that is performed at 3.0–5.9 times the intensity of rest. On a scale relative to an individual's personal capacity, moderate-intensity physical activity is usually a 5 or 6 on a scale of 0–10. This includes activities like carrying light loads, washing clothes, swimming, playing volleyball, cycling at a regular pace or doubles tennis.[168]

Knowledge of cardiovascular disease risk factors: The knowledge of CVD risk factors was measured using the HDFQ, and the total score out of 100 was calculated by multiplying the total correct scores out of 16 by 6.25 for each participant. A higher score was used to indicate higher knowledge, and the score out of 100 was

categorised as good knowledge (score ≥ 70%), moderate knowledge (score between 50% and 69%) and low level of knowledge (score < 50%).[124]

3.3.1.4 Statistical analysis

The data were entered on Epidata version 3.0 and were checked for completeness and consistency. Then, they were exported to SPSS version 24 for analysis. Univariate analysis such as proportion, percentage, ratio and frequency distribution was used, and continuous data were reported using means and standard deviations. Cumulative CVD risk was scored from 0 to 5: a score of 0 was defined as no risk, 1–3 was defined as moderate cumulative risk and 4–5 was defined as high cumulative risk. The findings of the study are presented in this thesis using text descriptions supported by comparative tables, graphs and figures. Chi-squared tests were used to compare if there was a significant difference between categorical variables. Multivariable linear regression was used to examine the relationship between knowledge of CVD risk factors and explanatory variables after checking appropriate assumptions. The association between the different independent variables in relation to the outcome variables was measured using odds ratios and 95% confidence interval (CI), and P values below 0.05 were considered statistically significant.

3.3.2 The qualitative study

A qualitative study that involved in-depth interviews was conducted from May to June 2019. This study was conducted in the two hospitals to explore patients' understanding of heart disease and associated risk factors in more detail. The Health Belief Model[163] was used to underpin the study.

3.3.2.1 Participants and sampling

The study participants were patients with hypertension who were attending chronic follow-up units of the two hospitals during the study period. The participants were recruited in collaboration with the nurses or physicians who were on duty in the follow-up departments. The patients were given an overview of the study by a nurse or physician and were referred to the poster which was located on the board outside the follow-up unit. The poster provided the title of the study, the researcher's name, eligibility criteria and the contact address of the principal researcher. Participants voluntarily contacted the lead researcher by phone or the lead researcher approached the identified participants and provided additional information using a participant information sheet (Appendix A3) upon their exit from the follow-up unit. All participants gave written consent for interviews. Approximately 20 in-depth interviews were planned based on Creswell's recommendation of 5–25 participants for a qualitative study.[169] A purposive sampling technique was used to select study participants. One participant withdrew after starting the interview, complaining the interview was taking up too much of his time, and was excluded from the study. Data collection was continued until saturation of data was reached, and these principles were considered to determine the number of participants. Saturation of information was determined when the last three patients were unable to provide any new data to the researcher.[170]

3.3.2.2 Inclusion and exclusion criteria

Adult patients with hypertension who were in the age range of 18–64 years, and attended one of the chronic disease follow-up departments of the two hospitals were eligible for the study. Patients who had been on antihypertensive treatment for at least two months, and had no confirmed diagnosis of heart disease were selected for

recruitment in this study. Patients who had heart disease were not eligible for participation in this study.

3.3.2.3 Data collection

A semi-structured interview guide was developed based on the previous study's findings; thus the themes were developed under the questions of interest.[171] The interview guide contained open-ended questions, which were designed to explore patients' understanding of heart disease and its sign and symptoms, self-perceived heart disease risk, perceived severity of heart disease, and understanding regarding heart disease risk factors. In addition, the interview guide included questions to explore barriers to fruit and vegetable consumption and physical activity (Appendix D1). The English version of the interview guide was translated into the local languages Amharic, Afan Oromo and Somali, because the residents of the study area speak one or more of these languages. However, only the Amharic version of the questionnaire was used as all the participants preferred to be interviewed in Amharic. The data were collected through face-to-face in-depth interviews with patients who had a confirmed diagnosis of hypertension. The entire data collection was conducted by the principal researcher who had prior experience of qualitative data collection and analysis. The interviews were conducted in the hospitals at a quiet place to avoid disturbance, enable recording and to protect the privacy of patients. Patients were informed their participation involved audio recording and all interviews were recorded using an audio recorder with their consent. Each patient was given a code to keep the interview anonymous. The interviews took 30 minutes on average. The audio-recorded data were transcribed verbatim and were cross-checked with the audio recording. Subsequently they were translated into English for analysis.

3.3.2.4 Data analysis

The study is presented in line with consolidated criteria for reporting qualitative studies (COREQ) guidelines.[172] Data files in Word documents were imported to QSR International's NVivo 12™ for thematic analysis. Data analysis was guided by Braun and Clarke's six steps of thematic analysis.[173] First, two researchers familiarised themselves with the data by reading and re-reading through the translated data. Then, initial ideas were noted, codes were identified, and similar codes were combined into sub-themes and themes. The principal researcher conducted data coding. A report was produced based on the final themes and subthemes. Transcripts of the interviews were not returned to the patients as the study was anonymous and thus individual transcripts could not be identified.

3.3.2.5 Rigour

Lincoln and Guba's[174] four criteria were used to establish the trustworthiness of the study. The researcher spent three months on data collection, and the research team included experts in critical care, qualitative research and a professor in cardiovascular nursing. The team had regular meetings to discuss and debrief on the progress of data collection. A study protocol with a detailed data collection procedure was developed, and data coding was checked for accuracy by the research team to maintain the dependability of the research. The research members checked the codes and themes that emerged, and the findings were reviewed by a panel who were familiar with the Ethiopian context. The use of purposive sampling and operationally defined data saturation[170] ensured the transferability of the study.

3.4 Ethical considerations

The study was conducted according to the National Statement on Ethical Conduct in Human Research (2007), Australia and the Ethiopian National Health Research Ethics guidelines. The basic principles of human research ethics were respected in the process of this research. Ahead of commencement of the research, ethics approval was obtained from the University of Adelaide Human Research Ethics Committee (HREC) (approval number: HR-2018-074) and Haramaya University, Institutional Health Research Ethics Review Committee (approval number: IHRERC/157/2018) (Appendices F1 and F2). A formal letter was written to all concerned authorities and permission was secured at all levels before commencing data collection (Appendix G). Informed written consent was obtained from each respondent after explaining the purpose and procedure of the studies (Appendices B1 and B3). The study subjects were informed about the purpose, risk and benefits of the study, interviews were conducted with those patients who gave voluntary written consent, and the right of the participants to withdraw from the study was respected. No data that could identify any individual were recorded. Given that the number of qualitative study participants was small, patients were informed that confidentiality of information could not be guaranteed. Patients were informed that the findings of the study would be reported in general, and would not be reported for individual patients. The interviews were conducted in a separate room to ensure the privacy of the patients. At the end of each interview, patients had received educational information regarding CVD risk factors and lifestyle modifications.

Chapter 4: Cardiovascular risk behaviour is an emerging health issue in developing countries: A cross-sectional study

Lemma Negesa[1, 2], Judy Magarey[1], Philippa Rasmussen[1], Jeroen ML Hendriks[3,4*]

[1]The University of Adelaide, Adelaide Nursing School, Australia

[2]Haramaya University, College of Health and Medical Sciences, Harar, Ethiopia

[3]Centre for Heart Rhythm Disorders, South Australian Health and Medical Research Institute, the University of Adelaide and the Royal Adelaide Hospital, Australia

[4]Department of Medical and Health Sciences, Linköping University, Sweden

Correspondence:

Dr Jeroen Hendriks

Centre for Heart Rhythm Disorders, University of Adelaide

Adelaide, SA, 5000, AUSTRALIA

Phone: +61 8 8128 4487   Facsimile: +61 8 7074 1785

Email: jeroen.hendriks@adelaide.edu.au

Statement of Authorship

Title of Paper	Cardiovascular risk behaviour is an emerging health issue in developing countries: A cross-sectional study
Publication Status	☒ Published ☐ Accepted for Publication ☐ Submitted for Publication ☐ Unpublished and unsubmitted work written in manuscript style
Publication Details	Lemma B Negesa, Judy Magarey, Philippa Rasmussen, Jeroen ML Hendriks, Cardiovascular risk behaviour is an emerging health issue in developing countries: a cross-sectional study. Eur J Cardiovasc Nurs. 2019, 18(8) 679–690. Doi: 10.1177/1474515119861772.

Principal Author

Name of Principal Author (Candidate)	Lemma Negesa Bulto
Contribution to the Paper	Developed the study protocol, supervised fieldwork, conducted analysis, write up and revision of the manuscript.
Overall Percentage (%)	80%
Certification	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.
Signature	Date 29/03/21

Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

i.   the candidate's stated contribution to the publication is accurate (as detailed above);

ii.   permission is granted for the candidate in include the publication in the thesis; and

iii.   the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Assoc. Prof. Judy Magarey
Contribution to the Paper	Provided guidance, assistance, and critical feedback throughout all steps of this research.
Signature	Date 27. 1. 4

Name of Co-Author	Assoc. Prof. Philippa Rasmussen
Contribution to the Paper	Provided guidance, assistance, and critical feedback throughout all steps of this research.
Signature	Date 28 .1. 21

Name of Co-Author	Professor Jeroen Hendriks
Contribution to the Paper	Provided guidance, assistance, and critical feedback throughout all steps of this research.
Signature	Date 29. 01. 2021

4.1 Abstract

Background

Low and middle income countries are facing a high burden of cardiovascular disease (CVD) whilst limited availability of resources and evidence to educate and modify lifestyle behaviours in the population as well as to guide policy making.

Aim

The goal of the present study was to quantify the prevalence of different cardiovascular risk behaviours among patients with known cardiovascular conditions in a developing country.

Methods

A hospital based cross-sectional survey was conducted in two referral hospitals in eastern Ethiopia. Outpatient unit patients who had a confirmed diagnosis of CVD were recruited for the study. Data were collected through face-to-face interviews with patients using validated tools.

Results

A total of 287 CVD patients were recruited, of which 56.4% were females and 90.2% were urban residents. Most patients had inadequate consumption of fruit and vegetables, 51.6% were physically inactive, 20% were current khat chewers, 19% were current alcohol drinkers and only 1% were current smokers. Approximately one-third (30%) of the patients had one of these risk behaviours, more than half (51.9%) had two, 15% had three and 3.1% had four risk behaviours. The majority (70%) of the patients had multiple (more than two) risk behaviours. The prevalence of multiple risk behaviours did not significantly vary with sex, residence and educational level differences, $(p>0.05)$.

Conclusion

CVD patients continue to follow unhealthy lifestyle though they attend follow-up care with a specific focus on risk management. The findings of this study provide evidence for policy makers that health services reform is required to promote healthy lifestyle behaviours for the patients.

4.2 Introduction

Previously, cardiovascular disease (CVD) were considered as the 'Disease of the Rich', however nowadays also populations with low socioeconomic status have been identified at increased risk of developing CVD.[1, 2] Currently, the burden of CVDs in low and middle-income countries is increasing due to a population shift from rural to urban, social, economic, and dietary and lifestyle changes.[3, 4]

Secondary prevention cardiac services in Ethiopia are still at an early stage. Among other reasons, this may be attributed to the long-standing neglect of non-communicable diseases by the Ethiopian Government and related health policy. In general, populations in developing countries have poor health information access and literacy particularly with regards to CVD, these have made CVD prevention challenging in developing countries.[5] Nurse professionals form the major healthcare workforces and have a crucial and central role in providing health education and information for primary and secondary prevention and contribute to the improvement of health literacy. In the context of Ethiopian healthcare system, nurses constitute about 80% of the healthcare workforce and have a crucial role in providing education to the patient. In addition, nurse has more time during consulting hours compared to physician and they focus on empowering patients to undertake self-management.

The World Health Organization (WHO) report showed that cigarette smoking (9%) is ranked as the second highest global risk for mortality next to hypertension, and nearly 80% of the world's smokers (more than 1 billion) live in low and middle-income countries.[6] Findings reveal more than 50% of adults in Nigeria have at least one risk behaviour and almost one-third have multiple risk behaviours.[7] In addition, the prevalence of khat chewing is increasing in east African countries including Ethiopia.

Khat chewing is different from cigarette smoking that fresh leaf of the plant is chewed for its amphetamine like substance, khat chewers use this to get more concentration and pleasure. Regular khat chewing has sustained effects on the cardiovascular system and contributes to high blood pressure, myocardial infarction and other adverse cardiac effects.[8, 9]

The trend in obesity is increasingly recognised as a main CV risk factor and is foreseen to take on epidemic proportions in the near future.[10, 11] The increasing burden of obesity in developing countries is related to poor diet and physical inactivity.[12, 13] In 2013, dietary factors were responsible for almost a quarter of all noncommunicable disease (NCD) deaths in Ethiopia; nearly nine in every ten diet related deaths (death due to unhealthy diet) were associated with CVD.[14] It is evident that consuming fruit and vegetables in amounts more than five servings (equivalent to 400g) per day, provides a protective effect against CVD.[15] However, insufficient intake of fruit and vegetables is the most significant dietary risk factor in both developed and developing countries.[14, 16]

Physical activity (PA) is associated with reduced cumulative cardiovascular risk and those who engage in physical activity are less likely to have CVD as compared to those who are physically inactive.[17, 18] Currently, physical inactivity (6%) is ranked the fourth leading global risk for mortality and prevalence is increasing among adult populations in developing countries. In particular, the burden of sedentary lifestyle is high among urban residents and females.[19]

The global progress in prevention of cardiovascular disease is sporadic particularly in developing countries.[20] These countries face a significantly high burden of CVD whilst being limited in resources and CV prevention policies which reduce the burden of this

emerging problem.[21] As a result, there is scarcity of data to inform policy making to tackle the rising epidemic of CVD in these countries. To address this gap and highlight the significant burden of CVD in developing countries, the present study investigated CV risk behaviours among patients with established CVD in Ethiopia. The results of the study will guide policy making in redesigning health care, in particular the development of CV risk factor prevention programs.

4.3 Methods

Study design and settings

A facility based cross-sectional survey was conducted in two selected referral hospitals in Eastern Ethiopia. The two hospitals provide emergency, inpatient and outpatient services, and serve as the main referral centres in the eastern part of the country. This study was conducted in chronic follow up units of the two hospitals. The unit is situated in the outpatient department and provides regular appointments for patients with chronic conditions including hypertension, heart failure, myocardial infarction and diabetes. The follow up service includes education on lifestyle modification, refilling medications, checking vital signs and assessing for potential complications. The follow up service is provided by nurse and physician. The patients visit the unit at least once a month. A total of 820 patients with CVD had been attending follow up clinic of the two hospitals during the study period (June to September 2018).

Inclusion criteria

Eligible participants were aged 18-64yrs with a confirmed medical diagnosis of chronic CVD including hypertension, heart failure, myocardial infarction and other heart diseases. The age range of participants was specified as the data collection tool and WHO chronic disease surveillance was designed for this age group. Those patients who visited the clinic two or more times were recruited.

Exclusion criteria

Patients with a congenital heart disorders, rheumatic heart disease, infectious heart diseases, and inflammatory heart diseases were not eligible for participation in this study. Paediatric and critically sick patients were excluded. Mentally ill patients and

those with a disability which would hinder their ability to talk to the researcher were also excluded.

Data collection tool and procedure

Two validated tools were used for data collection. The '*WHO STEPS'* validated questionnaire, which has been adapted to the Ethiopian context was used for the assessment of the behavioural risk factors. The instrument consists of three levels, and in only the first level has been used concerning assessment of sociodemographic status and risk behaviours including smoking, alcohol consumption, khat chewing and fruit and vegetable consumption was used. The 'international physical activity questionnaire' (IPAQ) was used for the assessment of physical activity. The IPAQ comprises seven open-ended questions related to vigorous intensity PA, moderate intensity PA and walking.[22] The English version of the both questionnaires were translated into local languages and was back translated into English by a language expert to check reliability of the translations. The survey data were collected through face-to-face interviews with patients. Two nurses who have Bachelor qualifications carried out the data collection.

Outcome measures

The CV risk behaviours included in this study were cigarette smoking, alcohol drinking, khat chewing, inadequate consumption of fruit and vegetables and physical inactivity. Multiple risk behaviour was defined as two or more risk behaviours. In the first instance, cigarette, alcohol and khat use were defined as 'use' or 'no use'. Current smoking, current khat chewing and current alcohol drinking were defined as use of these within the last 30 days. WHO photo cards were used for the assessment of servings of fruit and vegetables, standards of alcohol and categories of physical activity. One serving of fruit and vegetables was defined as 75g and inadequate

consumption of fruit and vegetables was defined as consumption of less than five serving (equivalent to 400g) of fruit and vegetables per day. Physical activity (PA) level was assessed by computing Metabolic Equivalent (MET)-minutes per week for vigorous intensity PA, moderate intensity PA and walking. The sum MET-minutes per week was categorised as high (above 3000 MET-minutes), moderate (2999 and 600 MET-minutes) and low (less than 600 MET-minutes).

Statistical analysis

The data were entered on Epidata 3.0 and were checked for completeness and consistency. Then, it was exported to IBM SPSS statistics version 25 for analysis. Missing values and outliers were managed accordingly. The univariate analysis was reported as proportion, percentage, and frequency distribution were used, and continuous data were reported using mean and standard deviation.[23] A MET-minutes per week was computed for each category of PA (vigorous intensity, moderate intensity and walking) by multiplying number of days on which patient did specific PA in the last seven days, number of minutes spend doing specific PA on one of those days and MET level (8 for vigorous intensity, 4 for moderate intensity and 3.3 for walking. Chi-square was used to compare if there was significant difference between categorical variables, and $p < 0.05$ were considered statistically significant.

The sample size was calculated using single population proportion formulas with the following assumptions: 95% confidence level, 1.96 (Zα/2, 50% prevalence, 5% degree of precision (d), and N (820) total CVD patients attending chronic follow up at the two hospitals. Based on this assumption and using finite population correction, the final sample size was 287 predicting a 10% nonresponse rate. The total 287 sample was allocated for the two hospitals proportional to their total number of patients attending each chronic follow up unit.

Ethical considerations

Approval for the study protocol was received from the University of Adelaide, Human Research Ethics Committee (approval number-HR-2018-074) and Haramaya University, Institutional Health Research Ethics Review Committee. Informed written consent was obtained from each respondent after explaining the purpose and procedure of the study.

4.4 Results

Sociodemographic characteristics of the participants

A total of 287 consecutive CVD patients who attended the chronic follow up unit were enrolled in the study. The sociodemographic characteristics of the participants are depicted in table 1. Most patients were females 162 (56.4%) and urban residents 259 (90.2%). The mean age was 47(±11 SD) years. Almost one-third 81 (28.2%) of patients had no formal education. The mean monthly income was 1343.1±1388 Ethiopian Birr (equivalent to 43€), which is almost the mean monthly income in the country (**Table 1**).

Table 1: Sociodemographic characteristics of patients attending follow up clinics

Variable (N=287)		N (%)
Mean age ± SD		47±11
Mean monthly income		1343±1388 Birr (43€)
Sex	Male	125 (43.6)
	Female	162 (56.4)
Residence	Urban	259 (90.2)
	Rural	28 (9.8)
Level of education	No formal education	81 (28.2)
	Less than primary school	72 (25.1)
	Primary school completed	52 (18.1)
	Secondary school completed	50 (17.4)
	College or university completed	28 (9.8)
	Postgraduate degree	4 (1.4)
Ethnicity	Amhara	160 (55.7)
	Oromo	90 (31.4)
	Somali	10 (3.5)
	Tigray	10 (3.5)
	Harari	3 (1)
	Gurage/Silte	14 (4.9)
Religion	Orthodox	179 (62.4)
	Muslim	71 (24.7)
	Protestant	37 (12.8)
Marital status	Currently married	228 (79.4)
	Widowed	28 (9.8)
	Never married	21 (7.3)
	Divorced	10 (3.4)
Occupation	Government employee	55 (19.2%)
	Retired	56 (19.5%)
	Home maker or house wife	54 (18.8%)

	Private employee	46 (16.0%)
	Trader	23 (8.0%)
	Private skilled worker	16 (5.6%)
	Unemployed	13 (4.5%)
	Farmer	11 (3.8%)
	Student	6 (2.1%)
	Nongovernment employee	4 (1.4%)
	Others	2 (0.7%)
	Refused	1 (0.3%)
Clinical characteristics	Hypertension	203 (70.7)
	Heart failure	77 (26.8)
	Hypertension and heart failure comorbid	6 (2.1)
	Myocardial infarction	1 (0.3)

Risk Behaviours

Smoking: As illustrated in table 2, 29 (10%) patients had used tobacco in their life and the majority of these 21 (72.4%) smoked more than 10 cigarettes daily. The prevalence of current smoking (defined as cigarette smoking in the last 30 days) among the patients was very low; only 3 (1%) of the recruited patients were current smokers and none of these had tried to stop smoking in the last 12 months.

Alcohol consumption: More than half of the participants 152 (53%) had consumed any alcohol product in the past, 120 (41.8%) had consumed alcohol in the past 12 months and 23 (8%) consumed in the last seven days. The combined prevalence of current alcohol drinking (defined as alcohol consumption within the last 30 days) was 19% for both sexes. However, the prevalence was significantly higher among males (26.4%) compared to females (13%), p=0.006. Most of the current drinkers 34 (63%) consumed more than one standard drink of alcohol on 1-2 occasions, 17 (31.5%) consumed on 3-4 occasions and 3 (5.6%) consumed on more than 4 occasions in the last 30 days.

Khat chewing: Half 50% of the patients had chewed khat in the past, of these, one-fourth 37 (25.9%) chewed on daily basis. Moreover, the combined prevalence of

current khat chewing (defined as khat chewing in the last 30 days) for both sexes was 20%, but the prevalence was significantly higher among males (30.4%) compared to females (11.7%), p<0.001. Employment status was associated with khat chewing (p=0.045). However, monthly income was not associated with khat chewing (p=0.659). **Figure 9** below shows previous and current use of alcohol, khat and tobacco.
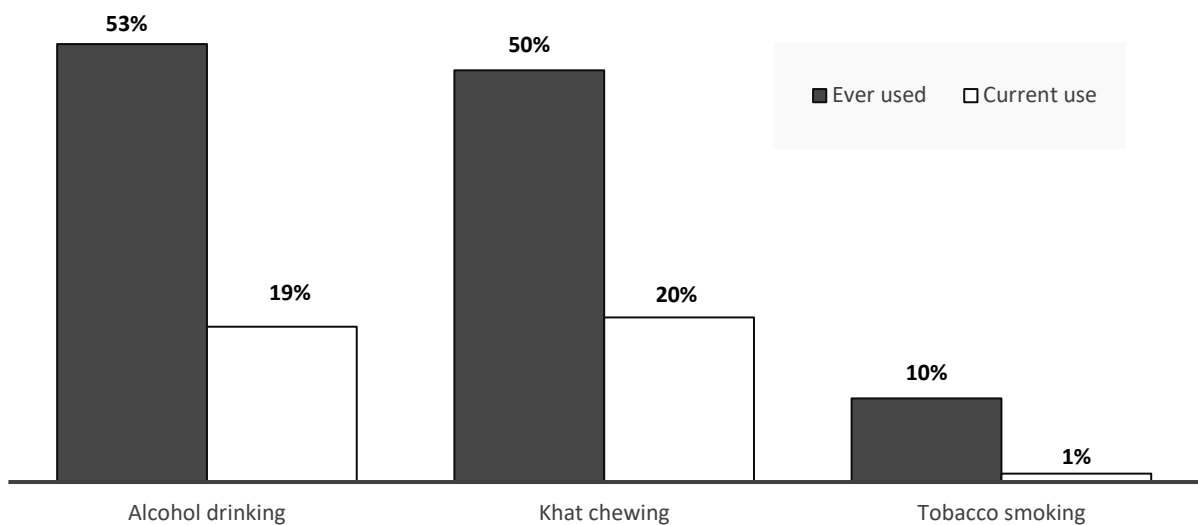
Figure 9: Previous and current alcohol, khat and tobacco use among patients attending chronic follow up clinics

Fruit and vegetables consumption: Of the total patients, 91 (31.7%) had not consumed fruit in a typical week, the majority 174 (60.6%) consumed these on 1-3 days a week and 22 (7.7%) consumed these on 4-7 days a week. The majority 211 (73.5%) of the patients consumed vegetables on 1-3 days a week, 59 (20%) consumed these on 4-7 days a week and 17 (5.9%) never consumed vegetables in a typical week. None of the patients fulfilled the WHO recommendation of daily fruit and vegetables consumption (defined by the WHO as consumption of less than five servings of fruit and vegetables, which is equivalent to 400g per day). In addition, there

was no significant difference in the prevalence of inadequate consumption among males and females. Income and employment status were not associated with consumption of fruit and vegetables. The majority 201 (70%) of patients used solid fat to prepare food at home, whereas 81 (28.2%) used vegetables oil. Furthermore, 41 (14.3%) of the total recruited patients added additional salt to their food before eating.

Physical inactivity: The prevalence of low physical activity (defined as less than 600 MET-minutes per week) in the total population was 51.6% for both sexes; more than half of the total population were physically inactive. Moreover, females had significantly higher prevalence of physical inactivity as compared to males, 58% vs 43.2%, p=0.017. The mean number of minutes per day patients spend sedentary was 222 (excluding sleeping). Only 11 (4%) patients performed vigorous intensity physical activity in the last seven days, and 5 (1.7%) reported their work involved vigorous intensity activity. The majority 183 (63.8%) did moderate intensity physical activity in the last seven days. Most 239 (83.35%) of the patients exercised by walking for at least 10 minutes, about quarter 77 (26.8%) did this on daily basis while the remaining 48 (16.7%) did not exercise by walking in the last seven days. The mean walking MET-minutes per week was 540. Age and was not associated with physical activity level among the patients (p=0.720).

Table 2: Behavioural risk factors among patients attending chronic follow up clinics

Variable (N=287)		Total N (%)	Male N (%)	Female N (%)
Smoking				
	Ever used tobacco product	29 (10)	29 (23)	0
	Current tobacco smoking	3 (1)	3 (2.4)	0
	Had someone smoked in their home	46 (16)	18 (14)	28 (17)
Alcohol consumption				
	Ever consumed any alcohol product	152 (53)	74 (59)	78 (48)

	Alcohol consumption within the past 7 days	23 (8)	15 (12)	8 (5)
	Alcohol consumption within the past 30 days	54 (19)	33 (26)	21 (13)
	Alcohol consumption within the past 12 months	120 (41.8)	60 (48)	60 (37)
Khat chewing				
	Ever chewed khat	143 (50)	87 (70)	56 (35)
	Current khat chewing	57 (20)	38 (30)	19 (12)
Fruit intake				
Number of days on which patients eat fruit on a typical week	None	91 (31.7)	44 (35)	47 (29)
	1-3 days	174 (60.6)	74 (59)	100 (62)
	4-7 days	22 (7.7)	7 (5.6)	15 (9)
Servings of fruit per day	0	91 (31.7)	44 (35)	47 (29)
	1-4	196 (68.3)	81 (65)	115 (71)
	≥5	0	0	0
Vegetable intake				
Number of days on which patients eat vegetables on a typical week	None	17 (5.9)	7 (5.6)	10 (6)
	1-3 days	211 (73.5)	98 (78)	113 (70)
	4-7 days	59 (20)	20 (16)	39 (24)
Servings of vegetables per day	0	17 (5.9)	7 (5.6)	10 (6)
	1-4	270 (94.1)	118 (94)	152 (94)
	≥5	0	0	0
Inadequate fruit and vegetables intake (<5 serving/day) *		287 (100)	125 (100)	162 (100)
Use top added salt on plate	Yes	41 (14.3)	14 (11)	27 (17)
	No	246 (85.7)	111 (89)	135 (83)
Physical activity				
Vigorous intensity PA	Yes	11 (3.8)	10 (8)	1 (0.6)
	No	276 (96.2)	115 (92)	161 (99)
	Mean MET-minutes per week	120	255	14
Moderate intensity PA	Yes	104 (36.2)	30 (24)	74 (46)
	No	183 (63.8)	95 (76)	88 (54)
	Mean MET-minutes per week	291	230	336
Walking	Yes	239 (83.3)	116 (93)	123 (76)
	No	48 (16.7)	9 (7)	39 (24)
	Mean MET-minutes per week	540	691	422
Physical activity level	High (≥3000 MET-minutes /week)	16 (5.6)	10 (8)	6 (4)
	Moderate (600-2999 MET-minutes /week)	123 (42.9)	61 (49)	62 (38)
	Low (<600 MET-minutes /week)	148 (51.6)	54 (43)	94

* Based on recommendations by WHO

Cumulative risk behaviour: All patients had at least one risk behaviour, almost one-third (30%) had only one risk behaviour, more than half (52%) had two risk behaviours, 15% had three risk behaviours and 3% had four risk behaviours. The prevalence of multiple risk behaviours (two or more risk behaviours) was 70% for both sexes and there was no significant difference of the prevalence between males (71.2%) and females (69.1%), p=0.795, in those who have formal education (67%) and have no formal education (77.7%), p=0.086, and in urban (70.3%) and rural (68%) residents, p=0.829.

4.5 Discussion

This study investigated the burden of CVD risk factors and lifestyle behaviour in patients with established CVD. These factors are a major public health challenge in developing countries but are often overlooked. The main finding is that these patients carry a significantly high burden of CV risk factors and that lifestyle behaviour in the majority of this population is insufficient. Most of the CV patients have multiple unhealthy lifestyle behaviours. Inadequate consumption of fruit and vegetables and physical inactivity were the most prevalent risk behaviours. This is a significant public health challenge in developing countries, which is being worsened due to absence of CV prevention programs and the lack of healthcare policy making in this field.

The vast majority of these patients were from urban areas, the high burden of CVD may be attributable to adoption of Western lifestyles in these areas. More than half of the patients were females and relatively young and this is consistent with the results of existing studies.[18, 24, 25] The finding that the distribution of the risk behaviours did not significantly vary among different age groups concurs with what was demonstrated elsewhere.[7]

The rate of smoking is generally high in developed countries,[26, 27] however this was low among patients in the current study as only 1% of the patients were current smokers. This is consistent with a population based study from Ethiopia[28] and demonstrates a lower rate compared to findings from Western Countries.[27, 29, 30] This prevalence rate is very low as compared to findings from Yemen, where almost half of patients with angina pectoris are smokers.[8] However low and middle income countries represent more than 80% of tobacco users, but Ethiopia is one of those countries with a low smoking rate.[31] The discrepancy of smoking prevalence could be due to social,

cultural and religious factors, such as religion and social taboo are seen as main deterrents of smoking in Ethiopia. All current smokers in this study were males and this is consistent with the 2015 global burden of disease (GBD) studies finding which demonstrated that the burden of smoking is higher among males compared to females.[31] Although alcohol intake increases the risk of CVD complications, our findings showed that only 19% were current alcohol drinkers, which is consistent with the results of previous findings.[32, 33] In addition, the rate of alcohol drinking is significantly more prevalent among males compared to females which is consistent with existing evidence.[32] This can be explained in terms of sociocultural factors given that it is taboo for females to drink alcohol in public in Ethiopia.

Although the prevalence of smoking was relatively low in the study population, a significant use of khat was identified. This is a cardio toxic substance being chewed in East Africa and Arab countries for centuries. Khat use has long been part the Ethiopian culture, mainly among Muslims, and is commonly used at social events and gatherings. Fresh leaf of the plant is chewed for its euphoric effect, but it was evident that khat chewing is associated with cardiotoxicity.[9] Ethiopia exports khat to other countries such as Somalia and also to UK before it was banned there as illegal class C drug in 2014. Khat chewing is a rare behaviour in Western Countries, except among immigrants from East Africa and Middle East.[9] A case report from UK found khat chewing causes severe ischemic cardiomyopathy.[34] In addition, it has been shown that khat chewing promotes tobacco smoking among adult Yemeni males.[35] The current study identified khat chewing is prevalent among the patients such that one in five patients were current users. This proportion is lower compared to study conducted in Yemen.[8] This disparity could be explained in terms of sociocultural differences in the studied populations, such that religion is seen as main deterrent of khat chewing.

The significantly higher prevalence of khat chewing among males as compared to females in this study is consistent with existing evidence.[28]

The rate of sedentary life style is increasing and a major factor driving CVD epidemics in developing countries.[19] The prevalence of physical inactivity detected in this study (51.6%) is similar to findings from Belgium[27] and other European regions[36] and it is higher compared to finding from Germany.[37] The latter study demonstrated the prevalence of physical inactivity is as high as it is in developed countries. Ease of access to transportation in cities, increasing number of employed office workers and urbanisation could have contributed to the high prevalence of physical inactivity in the country. Lack of access to facilities, poor awareness regarding on CVD risk reduction by physical activity and improving health status, as well as the existing belief that CVD is not a problem of people living in low socioeconomic status may contribute to the high prevalence of physical inactivity in developing countries. In addition, the significantly higher prevalence of physical inactivity observed among females in the current study is consistent with many other existing findings.[13, 38, 39] This could be due to workload in home and cultural beliefs that restrict females from participating in certain types of physical activity. Improving physical activity remains the most effective strategy to manage obesity and hypertension which are major risk factors for CVD. Thus, health care providers, particularly nurses and policy makers should focus on intensive counselling and promotion of physical activity for patients, as part of follow-up care.

Interestingly, obesity, which is an important CV risk factor in Western Countries[40] is relatively low in developing countries. However, its prevalence is rising particularly in urban areas and evidence indicates this will increase more rapidly in the near future if no prevention strategies are in place.[10] The increasing burden of obesity in developing

countries is associated with unhealthy diet and sedentary lifestyle.[12] This has also been reported by researchers in Russia, Poland and the Czech Republic. In addition, adequate intake of fruit and vegetables is associated with reduced risk of CVD mortality.[16] However, in this study, inadequate consumption of fruit and vegetable is the most prevalent risk factor such that none of the patients met the WHO recommendations for fruit and vegetable consumption. This is consistent with a study conducted in Kenya[41] and is also comparable to findings from Australia and Eastern Europe region, which suggests fruit and vegetables consumption is sub-optimal.[16, 42] The inadequate consumption of fruit and vegetables detected in this study could be attributable to multiple possible reasons. Poor access to fruit and vegetables which vary with season, lack of understanding about benefits of fruit and vegetable intake in CVD risk reduction and the existing cultural belief that fruit and vegetables are of less value as compared to other common food types could be main reasons. For example, culturally meat has more value on special occasions than most other food in Ethiopia. Moreover, '*Injera*' which is made up of *'Teff'* (small-sized grain) is the usual type of food eaten on daily basis by Ethiopians. This has attracted the interest in Europe due to its gluten free nature. This food pattern may deter fruit and vegetable intake in Ethiopia. Inadequate consumption of fruit and vegetable could increase the risk of mortality from CVD,[16] thus, the health care providers should promote consumption of fruit and vegetable for patients. Moreover, multi-sectoral interventions are required to increase consumption of fruit and vegetable for the whole population.

The current study indicated that multiple risk behaviours were prevalent among relatively young patients, which aligns with the results of studies conducted in Western Countries such as UK[43] and USA[44] where most patients have a cluster of risk behaviours such as unhealthy diet, smoking, physical inactivity and alcohol drinking.

Consistent with the findings of this study, more than half of African Americans have more than two risk behaviours.[45] The findings of the current study also concur with those of Vassilaki et al. (2015) who reported in their European research that half of CVD patients had more than two risk behaviours.[36] Occurrence of clustered CV risk behaviours among patients with established CVD will negatively affect their outcome and health related quality of life as they will be predisposed to additional comorbid complications, which will also increase medical costs due to increased health care utilisation.

It was demonstrated through other studies that lifestyle interventions effectively change CV risk behaviours.[46, 47] However, this study shows CV patients practice unhealthy lifestyle despite attending follow up clinic. This could be possibly due to absence of trained health workforce in the area of cardiovascular care and lack of follow up guidelines. In addition, more focus may have been on medical care rather than supporting the patients through intensive counselling regarding the importance of self-management in optimal CVD care. These findings have practical implications. It is recommended to identify patients with higher cumulative risk behaviour to plan individual based prevention of CVD. Continued evaluation and intensive counselling during consecutive follow up sessions is important to reduce the burden of CV risk behaviours among the patients. In addition, intensive interventions and programs designed to increase awareness of risk factors for healthy adults at community level could help halt the increase in CVD in developing countries. Moreover, the findings of this study can be used as baseline evidence for lifestyle intervention programs that aim to reduce the burden of CV risk behaviours. Promoting healthy behaviours may potentially reduce health care utilisation and cost in terms of reducing readmission.

Limitations

This study may be subject to bias given the study is subject to recall and social desirability bias, the self-reported measurement of risk behaviours may have underestimated the prevalence of smoking, alcohol drinking, khat chewing and physical inactivity. However, this underlines the importance of this study indicating that the extent of the problem outline may be even severer, indicating requirement of urgent interventions and policymaking. Other limitations are the study did not assess medication adherence, anthropometric indexes and biochemical measurements.

4.6 Conclusion

Patients with CVD maintain unhealthy lifestyles even though they attend follow up care with a specific focus on risk management. The findings of this study demonstrate the high prevalence of physical inactivity, alcohol consumption and inadequate fruit and vegetable consumption in a developing country. The emerging increase of CVD and the continuation of unhealthy lifestyle in patients is somewhat comparable with western countries, indicating this as a global problem. Moreover, this study provides evidence for policy makers that health services reform is required to promote healthy lifestyle behaviours among the patients. Implementation of lifestyle support programs should be considered for the disease prevention policy agenda in Ethiopia.

Conflict of interest

The authors declare that there is no conflict of interest.

Funding

Implications for practice

- Continuous evaluation of patients' adherence to healthy lifestyles is required by the health care providers working in the chronic follow up care.

- Nurses should focus on counselling patients and ensuring they understand the importance self-management in chronic CVDs care.

- Nurses have important role in promoting healthy behaviour for CV patients, in particular they need to emphasize adequate consumption of fruit and vegetables and physical activity.

4.7 References

1. Amiri M, Majid HA, Hairi F, Thangiah N, Bulgiba A and Su TT. Prevalence and determinants of cardiovascular disease risk factors among the residents of urban community housing projects in Malaysia. BMC Public Health. 2014; 14(Suppl 3): 1-9.

2. Alsheikh-Ali AA, Omar MI, Raal FJ, et al. Cardiovascular Risk Factor Burden in Africa and the Middle East: The Africa Middle East Cardiovascular Epidemiological (ACE) Study. PLoS ONE 2014; 9: 1-9.

3. Misganaw A, Haregu TN, Deribe K, et al. National mortality burden due to communicable, non-communicable, and other diseases in Ethiopia, 1990-2015: findings from the Global Burden of Disease Study 2015. Popul Health Metr. 2017; 15: 1-17.

4. Mathenge W, Foster A and Kuper H. Urbanization, ethnicity and cardiovascular risk in a population in transition in Nakuru, Kenya: a population-based survey. BMC Public Health. 2010; 10: 569.

5. Leuner CJ and Weldegerima AH. Cardiology services in Ethiopia. Eur Heart J. 2018; 39: 2699-700.

6. World Health Organisation. WHO report on the global tobacco epidemic, Monitoring tobacco use and prevention policies. Geneva, Switzerland2017, p. 1-135.

7. Ige OK, Owoaje ET and Adebiyi OA. Non communicable disease and risky behaviour in an urban university community Nigeria. Afr Health Sci. 2013; 13: 62-7.

8. Shujaa AK and Nammas W. Khat chewing and cardiovascular risk profile in a cohort of Yemeni patients with angiographically documented coronary artery disease. Heart Asia. 2012; 4: 164-7.

9. El-Menyar A, Mekkodathil A, Al-Thani H and Al-Motarreb A. Khat use: history and heart failure. Oman Med J. 2015; 30: 77-82.

10. Ziraba A, Jean C and Ochako R. Overweight and obesity in urban Africa: A problem of the rich or the poor? BMC Public Health 2009; 9: 465.

11. Afrifa–Anane E, Agyemang C, Codjoe SN, Ogedegbe G and Aikins AG. The association of physical activity, body mass index and the blood pressure levels among urban poor youth in Accra, Ghana. BMC Public Health 2015; 15.

12. Obirikorang C, Osakunor DN, Anto EO, Amponsah SO and Adarkwa OK. Obesity and Cardio-Metabolic Risk Factors in an Urban and Rural Population in the Ashanti Region-Ghana: A Comparative Cross-Sectional Study. PLoS One. 2015; 10: e0129494.

13. Capingana DP, Magalhaes P, Silva AB, et al. Prevalence of cardiovascular risk factors and socioeconomic level among public-sector workers in Angola. BMC Public Health. 2013; 13: 732.

14. Melaku YA, Temesgen AM, Deribew A, et al. The impact of dietary risk factors on the burden of non-communicable diseases in Ethiopia: findings from the Global Burden of Disease study 2013. Int J Behav Nutr Phys Act. 2016; 13: 122.

15. Pienovi L, Lara M, Bustos P and Amigo H. Fruit and vegetable intake, and blood pressure. A population research. Arch Latinoam Nutr. 2015; 65: 21-6.

16. Stefler D, Pikhart H, Kubinova R, et al. Fruit and vegetable consumption and mortality in Eastern Europe: Longitudinal results from the Health, Alcohol and Psychosocial Factors in Eastern Europe study. Eur J Prev Cardiol. 2016; 23: 493-501.

17. Rasiah R, Thangiah G, Yusoff K, et al. The impact of physical activity on cumulative cardiovascular disease risk factors among Malaysian adults. BMC Public Health. 2015; 15: 1-9.

18. Purohit N, Bhati DK, Gupta SD and Kundu AS. Quantifying Socioeconomic and Lifestyle Related Health Risks: Burden of Cardiovascular Disease Among Indian Males. Cent Asian J Glob Health. 2015; 4: 218.

19. Haregu TN, Oti S, Egondi T and Kyobutungi C. Co-occurrence of behavioral risk factors of common non-communicable diseases among urban slum dwellers in Nairobi, Kenya. Global health action. 2015; 8: 28697.

20. Mendis S. Global progress in prevention of cardiovascular disease. Cardiovasc Diagn Ther. 2017; 7: S32-s8.

21. Ebireri J, Aderemi AV, Omoregbe N and Adeloye D. Interventions addressing risk factors of ischaemic heart disease in sub-Saharan Africa: a systematic review. BMJ open. 2016; 6: e011881.

22. Booth M. Assessment of Physical Activity: An International Perspective. Res Q Exerc Sport. 2000; 71: 114-20.

23. Roth GA, Johnson C, Abajobir A, et al. Global, Regional, and National Burden of Cardiovascular Diseases for 10 Causes, 1990 to 2015. J Am Coll Cardiol. 2017; 70: 1-25.

24. Fateh M, Emamian MH, Asgari F, Alami A and Fotouhi A. Socioeconomic inequality in hypertension in Iran. J Hyperten. 2014; 32: 1782-8.

25. Tachebele B, Abebe M, Addis Z and Mesfin N. Metabolic syndrome among hypertensive patients at University of Gondar Hospital, North West Ethiopia: a cross sectional study. BMC Cardiovasc Disord. 2014; 14: 177.

26. Burger A, Pretorius R, Fourie CMT and Schutte AE. The relationship between cardiovascular risk factors and knowledge of cardiovascular disease in African men in the North-West Province. Health SA Gesondheid. 2016; 21: 364-71.

27. De Smedt D, De Sutter J, De Pauw M, et al. Lifestyle behaviour and risk factor control in coronary patients: Belgian results from the cross-sectional EUROASPIRE surveys. Acta cardiologica. 2018: 1-7.

28. Haile D and Lakew Y. Khat Chewing Practice and Associated Factors among Adults in Ethiopia: Further Analysis Using the 2011 Demographic and Health Survey. PLoS One. 2015; 10: e0130460.

29. Justin M. The PACI survey: Patient adherence to cardioprotective lifestyle interventions in myocardial infarction patients treated with primary percutaneous coronary intervention. Br J Cardiol 2017; 24: 126-8.

30. Prugger C, Heidrich J, Wellmann J, et al. Trends in cardiovascular risk factors among patients with coronary heart disease: results from the EUROASPIRE I, II, and III surveys in the Munster region. Dtsch Arztebl Int. 2012; 109: 303-10.

31. Marissa B, Nancy F, Marie N, et al. Smoking prevalence and attributable disease burden in 195 countries and territories, 1990-2015: a systematic

analysis from the Global Burden of Disease Study 2015. Lancet. 2017; 389: 1885-906.

32. Maimela E, Alberts M, Modjadji SE, et al. The Prevalence and Determinants of Chronic Non-Communicable Disease Risk Factors amongst Adults in the Dikgale Health Demographic and Surveillance System (HDSS) Site, Limpopo Province of South Africa. PLoS One. 2016; 11: e0147926.

33. Asgedom SW, Gudina EK and Desse TA. Assessment of Blood Pressure Control among Hypertensive Patients in Southwest Ethiopia. PLoS One. 2016; 11: e0166432.

34. Saha S and Dollery C. Severe ischaemic cardiomyopathy associated with khat chewing. J R Soc Med. 2006; 99: 316-8.

35. Kassim S, Rogers N and Leach K. The likelihood of khat chewing serving as a neglected and reverse 'gateway' to tobacco use among UK adult male khat chewers: a cross sectional study. BMC Public Health. 2014; 14: 448.

36. Vassilaki M, Linardakis M, Polk DM and Philalithis A. The burden of behavioral risk factors for cardiovascular disease in Europe. A significant prevention deficit. Prev Med. 2015; 81: 326-32.

37. Tiffe T, Wagner M, Rucker V, et al. Control of cardiovascular risk factors and its determinants in the general population- findings from the STAAB cohort study. BMC Cardiovasc Disord. 2017; 17: 276.

38. John B, Todd J, Mboya I, Mosha M, Urassa M and Mtuy T. Physical activity and associated factors from a cross-sectional survey among adults in northern Tanzania. BMC Public Health. 2017; 17: 1-8.

39. Katulanda P, Jayawardena R, Ranasinghe P, Rezvi Sheriff MH and Matthews DR. Physical activity patterns and correlates among adults from a developing country: the Sri Lanka Diabetes and Cardiovascular Study. Public Health Nutr. 2013; 16: 1684-92.

40. Ricci G, Tomassoni D, Pirillo I, et al. Obesity in the European region: social aspects, epidemiology and preventive strategies. Eur Rev Med Pharmacol Sci. 2018; 22: 6930-9.

41. Olack B, Wabwire-Mangen F, Smeeth L, Montgomery JM, Kiwanuka N and Breiman RF. Risk factors of hypertension among adults aged 35-64 years living in an urban slum Nairobi, Kenya. BMC Public Health. 2015; 15: 1251.

42. Nour M, Sui Z, Grech A, Rangan A, McGeechan K and Allman-Farinelli M. The fruit and vegetable intake of young Australian adults: a population perspective. Public Health Nutr. 2017; 20: 2499-512.

43. Meader N, King K, Moe-Byrne T, et al. A systematic review on the clustering and co-occurrence of multiple risk behaviours. BMC Public Health. 2016; 16: 657.

44. Li C, Ford ES, Mokdad AH, Balluz LS, Brown DW and Giles WH. Clustering of Cardiovascular Disease Risk Factors and Health-Related Quality of Life among US Adults. Value Health. 2008; 11: 689-99.

45. Barutha M, Addya CL, Wilcoxa S and Dowdaa M. Clustering of risk behaviours among African American adults. Health Education Journal. 2011; 71: 565-75.

46. Saffi MA, Polanczyk CA and Rabelo-Silva ER. Lifestyle interventions reduce cardiovascular risk in patients with coronary artery disease: a randomized clinical trial. Eur J Cardiovasc Nurs. 2014; 13: 436-43.

47. Harting J, van Assema P, van Limpt P, et al. Effects of health counseling on behavioural risk factors in a high-risk cardiology outpatient population: a randomized clinical trial. Eur J Cardiovasc Prev Rehabil. 2006; 13: 214-21.

Chapter 5: Patients' knowledge on cardiovascular risk factors and associated lifestyle behaviour in Ethiopia in 2018: A cross-sectional study

Lemma B Negesa,[1, 2*] Judy Magarey,[1] Philippa Rasmussen,[1] Jeroen ML Hendriks,[3, 4]

[1]The University of Adelaide, Adelaide Nursing School, Australia

[2]Haramaya University, College of Health and Medical Sciences, Harar, Ethiopia

[3]College of Nursing and Health Sciences, Flinders University and Centre for Heart Rhythm Disorders, Royal Adelaide Hospital, Adelaide, Australia.

[4]Department of Medical and Health Sciences, Linköping University, Sweden

*Correspondence:

Lemma Negesa

University of Adelaide

Adelaide, SA, 5000, AUSTRALIA

Phone: +61 468647475

Email: lemma.bulto@adelaide.edu.au

Statement of Authorship

Title of Paper	Patients' knowledge on cardiovascular risk factors and associated lifestyle behaviour in Ethiopia in 2018: A cross-sectional study
Publication Status	☒ Published ☐ Accepted for Publication ☐ Submitted for Publication ☐ Unpublished and unsubmitted work written in manuscript style
Publication Details	Lemma B Negesa, Judy Magarey, Philippa Rasmussen, Jeroen ML Hendriks, Patients' knowledge on cardiovascular risk factors and associated lifestyle behaviour in Ethiopia in 2018: A cross-sectional study. PLOS ONE, 2020

Principal Author

Name of Principal Author (Candidate)	Lemma Negesa Bulto
Contribution to the Paper	Developed the study protocol, supervised fieldwork, conducted data analysis, write up and revision of the manuscript.
Overall Percentage (%)	80%
Certification	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.
Signature	Date 29/01/21

Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

 i. the candidate's stated contribution to the publication is accurate (as detailed above);

 ii. permission is granted for the candidate in include the publication in the thesis; and

 iii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Assoc. Prof. Judy Magarey
Contribution to the Paper	Provided guidance, assistance, and critical feedback throughout all steps of this research.
Signature	Date 27 / 21

Name of Co-Author	Assoc. Prof. Philippa Rasmussen
Contribution to the Paper	Provided guidance, assistance, and critical feedback throughout all steps of this research.
Signature	Date 28 . 1 . 2 1

Name of Co-Author	Professor Jeroen Hendriks
Contribution to the Paper	Provided guidance, assistance, and critical feedback throughout all steps of this research.
Signature	Date 29 . 01 . 2021

5.1 Abstract

Background

Cardiovascular disease (CVD) is posing a major public health challenge globally. Evidence reports significant gaps in knowledge of cardiovascular risk factors among patients with CVD. Despite the growing burden of cardiovascular disease in developing countries, there is limited data available to improve the awareness of this area, which is crucial for the implementation of prevention programs.

Methods

A cross-sectional survey was conducted in two referral hospitals in Eastern Ethiopia from June-September 2018. Outpatients with a confirmed diagnosis cardiovascular conditions were eligible for participation in the study. A convenience sampling technique was used. The primary outcome of the study was knowledge of cardiovascular risk factors among patients with cardiovascular disease. The knowledge of cardiovascular disease risk factors was measured using a validated instrument (heart disease fact questionnaire). A score less than 70% was defined as suboptimal knowledge. Multivariable linear regression was used to examine the relationship between knowledge of cardiovascular risk factors and explanatory variables.

Results

A total of 287 patients were enrolled in the study. Mean age was 47±11yrs and 56.4% of patients were females. More than half of patients (54%) had good knowledge on cardiovascular risk factors (scored>70%), whilst 46% demonstrated suboptimal knowledge levels in this area. Urban residency was associated with higher cardiovascular risk factors knowledge scores, whereas, never married and no formal

education or lower education were identified as predictors of lower knowledge scores. There was no statistically significant association between knowledge of cardiovascular risk factors and actual cumulative risk behaviour.

Conclusion

Almost half of CVD patients in Ethiopia have suboptimal knowledge regarding cardiovascular risk factors. Residence, education level and marital status were associated with knowledge of cardiovascular risk factors. Implementation of innovative interventions and structured, nurse-led lifestyle counselling would be required to effectively guide patients in developing lifestyle modification and achieve sustainable behaviour change.

Key words

5.2 Introduction

Cardiovascular disease (CVD) remains a global major cause of death [1] and represents a significant disease burden in populations around the world. The global burden of disease studies reported an estimated 422.7 million cases of CVD, causing 17.92 million deaths worldwide in 2015 [1]. Developing countries are facing a high burden of CVD whilst awareness of disease and associated risk factors is limited [2, 3]. Those living in poverty and especially those in low-income countries are significantly more impacted by CVD [4]. Moreover, findings show that the prevalence of CVD is increasing and posing a public health challenge in developing countries [1, 5]. High blood pressure is of major influence in the increasing CVD burden in these countries [1]. For most patients with hypertension it is uncontrolled which causes further cardiovascular (CV) complications [6]. Hypertension affects more than 1.3 billion people worldwide and one third of adults have the condition [7, 8]. The number of adults with hypertension in 2025 is predicted to increase by about 60% [9]. Moreover, the total number of individuals with hypertension is increasing rapidly to epidemic levels with a projected 125.5 million individuals affected by 2025 in Sub-Saharan Africa [10].

From an epidemiologic view on disease prevalence, Ethiopia is in epidemiologic transition from predominantly infectious diseases to chronic diseases. CVD is a major public health challenge in Ethiopia. The overall prevalence of hypertension among the Ethiopian population is 19.6%, and is higher among the urban population (23.7%) [11]. In 2015, ischemic heart disease was the first leading causes of age standardised death rates and fourth leading causes of age standardized disability adjusted life years with rates of 141.9 and 2535.7 per 100,000 population respectively [12]. The increasing prevalence of CVD in developing countries is related to unhealthy lifestyle behaviours.

Except few region based studies, evidence on CV risk behaviours is scarce in Ethiopia. Findings from the Southern part of the country show that 10.8% of CV patients smoke cigarettes, 12.1% drink alcohol and 73.9% don't do any physical activity [13]. A study performed in the capital of Ethiopia reported 68.6% of hypertensive patients don't exercise, 14.1% smoke cigarette, 25.2% drink alcohol and 30.9% don't adhere to healthy diet [14].

According to the health belief model, knowledge regarding health behaviour is a strong modifying factor for healthy lifestyle, however it should be combined with other factors such as good perceptions, positive health attitudes and many other conditions such as socioeconomic factors [15]. Studies also have revealed knowledge of specific risk factors is associated with healthy behaviour, however, knowledge alone does not motivate behavioural change [16-19]. The Heart disease fact questionnaire which was designed and validated by Wagner et al. (2005) and has been commonly used for the assessment of knowledge of CV risk factors knowledge [20].

There is limited research regarding the knowledge of CV risk factors in developing countries [3, 21-23]. The majority of adults in Sub-Saharan Africa fail to name even one CV risk factor, [22] and in Nigeria almost 50% have poor knowledge about CV risk factors [3]. In Cameroon, this knowledge level is also suboptimal, such that 36% of adults are unaware of CV risk factors [21]. Nevertheless, in South Africa, most adults are aware that cigarette smoking and excessive alcohol consumption are risk factors for CVD [24]. The level of education and place of residence have a significant influence on health literacy. It has been reported that higher education levels correlate with a better knowledge of CVD, less number of risk factors and changes in health related behaviour [22, 25].

Gaps in evidence on CVD and risk factors form a barrier to effective prevention of cardiovascular conditions. Thus, evidence on patients' knowledge of CV risk factors is paramount in primary and secondary prevention of CVD [26]. However, research to reduce the existing evidence gap and the increasing burden of CV risk behaviours in developing countries is scarce. Few studies conducted so far in Ethiopia focussed at describing the high burden of CVD, none of the studies explored CV patients' knowledge of CV risk factors. Evidence on patients' knowledge of CV risk factors has vital importance for evidence based health policy and help to design customised interventions. Therefore, the purpose of this study was to assess knowledge of cardiovascular risk factors and associated factors among patients with CVD.

5.3 Methods

Design, settings and sampling

A cross-sectional survey was conducted in two main referral hospitals in East-Ethiopia, Hiwot Fana Specialised University Hospital and Dilchora Referral Hospital. This study was conducted in chronic follow up units of the two hospitals. The chronic follow up unit provides regular outpatient care for patients with chronic conditions such as hypertension, heart failure, myocardial infarction and diabetes mellitus. The clinic specifically focusses on providing follow up services which include treatment of CVD and counselling of patients to achieve healthy lifestyle behaviours. During the study period (June to September 2018), a total of 820 patients with CVD attended the follow up care in the two participating hospitals.

Patients with a confirmed diagnosis of hypertension, heart failure, or myocardial infarction, in the age range between 18-64yrs were eligible for participation in the study. Patients with congenital heart disorders, rheumatic heart disease, infectious heart disease and inflammatory heart disease were excluded. Mentally ill patients and those with a disability (hearing and talking impairment) which would hinder their ability to participate in the study were also excluded.

The sample size was determined using single population proportion formula with the following assumptions: 95% confidence level, 1.96 (Zα/2), 50% proportion, 5% degree of precision (d), and N (820) total CVD patients attending chronic follow up units of the two hospitals. Based on this assumption and using finite correction, the sample size was 261, and predicting a 10% nonresponse rate, the final sample size was 287. The total 287 calculated sample was allocated for the two hospitals proportional to their total number of patients attending each chronic follow up unit. A convenience sampling was used to select study participants.

Participants were given overview of the study by nurse or physician who were working in follow up unit, then, they were referred to poster information which was posted outside the follow up unit. The poster information contained title of the study, researchers name, eligibility criteria and contact address (mobile phone and email) of data collector. Voluntary participants contacted data collector through phone address or the data collector approached the patients and provided additional information using participant information sheet upon their exit from follow up unit. Recruitment of the patients took place from June to September 2018.

Ethical considerations

Ethical approval was obtained from the Human Research Ethics Review Committee, University of Adelaide, Australia, and the Institutional Health Research Ethics Review Committee, Haramaya University, Ethiopia before commencing the study. Informed and written consent was obtained from each participant prior to participation in the study.

Data collection and tools

Data were collected using three validated tools, the World Health Organisation (WHO) STEPs instrument, International physical activity questionnaire and the Heart Disease Fact Questions. The WHO STEPs instrument follows a stepwise approach to chronic disease risk factor surveillance in individuals aged 18-64 years [27]. Ethiopian Public Health Institute adapted the WHO STEPs instrument to Ethiopian context by including khat chewing and the use of local alcohol and cigarette products in the risk behaviour assessment. Locally adapted version of WHO STEPs instrument was translated and used to assess sociodemographic variables and CV risk behaviours including cigarette smoking, alcohol consumption, khat chewing and fruit and vegetable

consumption. The international physical activity questionnaire was used to assess physical activity [28].

The primary outcome of the study was knowledge of cardiovascular risk factors among patients with cardiovascular disease. The 'Heart Disease Fact Questionnaire' (HDFQ) was used to assess the patient's knowledge of CV risk factors. The HDFQ showed good content and face validity, and demonstrated adequate internal consistency, with Kuder–Richardson-20 formula of 0.77 [20]. The English version of both the international physical activity questionnaire and the HDFQ were translated into local languages and were back translated into English by language experts to check reliability of the translations. Two nurses who have bachelor qualifications conducted data collection through face to face interviews with patients.

Measures

Current smoking, khat chewing and alcohol drinking were defined as use within the last 30 days. Inadequate consumption of fruit and vegetables was defined as consumption of less than five servings (equivalent to 400g) of fruit and vegetables per day [27]. Physical activity (PA) level was measured by computing Metabolic Equivalent (MET)-minutes per week for vigorous intensity PA, moderate intensity PA and walking. Vigorous intensity PA was defined as requiring a large amount of effort (>6 METs) and causes rapid breathing and a substantial increase in heart rate. Moderate intensity PA was defined as requiring a moderate amount of effort (3-6 METs) and noticeably acceleration in heart rate. Low level PA was defined as attaining less than 600 MET-minutes per week [29].

Actual cumulative risk behaviour was obtained from the five lifestyle risk behaviours assessed among the patients, (smoking, alcohol drinking, khat chewing, inadequate consumtion of fruit and vegetables and physical inacativity), with a maximum score of

5 (all risk behaviours present) and a minimum score of zero (none of the risk behaviours present).

The patient's knowledge of CV disease risk was measured using the HDFQ [20] on a two point scale with "0" = wrong answer and "1" = correct answer. Then, it was scored by adding the correct scores of all the items for each participant. A higher score was used to indicate a better knowledge of CV risk factors. The score out of 100 was categorised as good/optimal knowledge (score ≥70%), fair knowledge (score between 50% and 69%) and poor level of knowledge (score <50%). A score < 70% was categorised as suboptimal knowledge [3].

Statistical analysis

The data was entered on Epidata version 3.0 and were checked for completeness and consistency. Statistical analysis was performed by using IBM SPSS statistics version 25. The univariate analysis was reported as proportion, percentage, and frequency, and continuous data were reported as mean and standard deviation. A normality test was done for continuous variables age and knowledge of CV risk factors. A linear regression model was used to assess association between knowledge of CV risk factors and independent variables. First, associations between knowledge and predictors were analysed by means of bivariate linear regression to identify factors associated with the dependent variable. Then, those variables with a *P*-value < 0.2 on bivariate linear regression were included in a multivariable linear regression model to test for significant associations. The magnitude of the association between different independent variables in relation to the dependent variable was measured using estimates and 95% confidence intervals, and *P*-values < 0.05 were considered to be statistically significant.

5.4 Results

Characteristics of the participants

A total of 287 patients diagnosed with CVD who attended the chronic follow up care were enrolled in the study; 115 patients from Hiwot Fana Specialised University Hospital and 172 patients from Dilchora Referral Hospital. Mean age was 47 years (±11 SD) and 56.4% of patients were of the female gender. The majority (70.7%) of the patients were diagnosed with hypertension. More than half of the patients had a low level of education. The sociodemographic characteristics of the participants are depicted in table 3.

Table 3: Sociodemographic characteristics of patients attending chronic follow up care in eastern Ethiopia, 2018.

Variable (N = 287)	
Mean age ± SD	47 years ±11
Variable (N = 287)	**N (%)**
Sex	
Female	162 (56.4)
Clinical characteristics	
Hypertension	203 (70.7)
Heart failure	77 (26.8)
Hypertension and heart failure comorbid	6 (2.1)
Myocardial infarction	1 (0.4)
Residence	
Urban	259 (90.2)
Level of education	
No formal education	81 (28.2)
Less than primary school	72 (25.1)
Primary school completed	52 (18.1)
Secondary school completed	50 (17.4)
College or university completed or postgraduate	32 (11.1)
Ethnicity	
Oromo	90 (31.4)
Amhara	160 (55.7)
Somali	10 (3.5)
Tigray	10 (3.5)
Harari	3 (1)
Gurage/Silte	14 (4.9)
Marital status	
Currently married	228 (79.4)
No longer married	38 (13.2)
Never married	21 (7.3)

Knowledge of cardiovascular risk factors

The mean percentage HDFQ score was 70.5% (±15.3). Overall, 155 patients (54%) had optimal knowledge of risk factors (scored ≥70%), whereas, the remaining 132 patients (46%) had sub-optimal knowledge (Figure 10). The majority of patients demonstrated significant knowledge about facts that age, 228 (79.4%), smoking 280 (97.6%), being overweight 262 (91.3%) and high blood pressure 235 (81.9%) are risk factors for cardiovascular disease. At the same time patients had deficient knowledge about the fact that family history of heart disease 249 (86.8%) and diabetes 184 (64.1%) are also risk factors. Almost one fifth 55 (19.2%) did not understand that keeping blood pressure under control reduces the risk of developing cardiovascular disease, 52 (18.1%) were unable to identify eating fatty food affects blood cholesterol level, and 115 (40.1%) assume only exercising at a gym or in an exercise class lower a chance of developing cardiovascular disease. Table 4 shows the percentage of patients who answered the heart disease fact questions correctly.
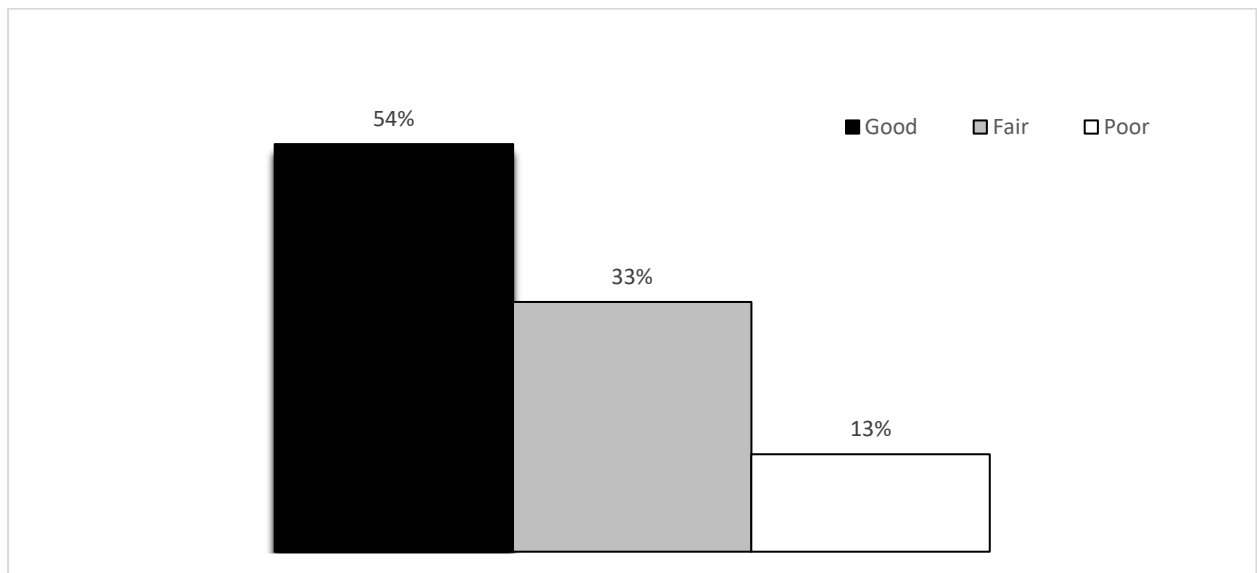
Figure 10: Knowledge of risk factors among CVD patients attending chronic follow up care

Table 4: Responses to the HDFQ among patients attending chronic follow up care in eastern Ethiopia, 2018.

Questions (n = 287)	Correct response	Frequency N (%)
A person always knows when they have heart disease	False	128 (44.6)
If you have a family history of heart disease, you are at risk for developing heart disease	True	38 (13.2)
The older a person is, the greater their risk of having heart disease	True	228 (79.4)
Smoking is a risk factor for heart disease	True	280 (97.6)
A person who stops smoking will lower their risk of developing heart disease	True	256 (89.2)
High blood pressure is a risk factor for heart disease	True	235 (81.9)
Keeping blood pressure under control will reduce a person's risk for developing heart disease	True	232 (80.8)
High cholesterol is a risk factor for developing heart disease	True	247 (86.1)
Eating fatty foods does not affect blood cholesterol levels	False	235 (81.9)
If your 'good' cholesterol (HDL) is high you are at risk for heart disease	False	73 (25.4)
If your 'bad' cholesterol (LDL) is high you are at risk for heart disease	True	220 (76.7)
Being overweight increases a person's risk for heart disease	True	262 (91.3)
Regular physical activity will lower a person's chance of getting heart disease	True	264 (92)
Only exercising at a gym or in an exercise class will lower a person's chance of developing heart disease	False	172 (59.9)
Walking and gardening are considered exercise that will help lower a person's chance of developing heart disease	True	265 (92.3)
Diabetes is a risk factor for developing heart disease	True	103 (35.9)

Actual cumulative risk behaviour and knowledge of cardiovascular disease risk factors association

Through our previous study [30], we have assessed five CV risk behaviours, i.e. smoking, alcohol drinking, khat chewing, fruit and vegetable intake and physical activity. None of the patients met the WHO recommendation for fruit and vegetable consumption (more than five serving daily), 148 (51.6%) were physically inactive (attained less than 600 MET-min per week), 57 (19.9%) were current khat chewers, 54 (18.8%) were current alcohol drinkers and 3 (1%) were current smokers. Almost one-third 86 (30%) them had one risk behaviour, more than half 149 (51.9%) had two

risk behaviours, and 43 (18.1%) had three or more risk behaviours. Out of the total recruited patients, 201 (70%) had multiple risk behaviours (two or more behaviours).

Regarding bivariate linear regression analysis age, sex, residence, ethnicity, marital status, education level and number of actual risk behaviours got p<0.2 (Table 5). These variables were taken in to multivariable linear regression model to identify independent predictors of CV risk factors knowledge.

Table 5: Bivariate linear regression analysis of associated factors of knowledge of CV risk factors in eastern Ethiopia, 2018.

Variables	β	95% Wald Confidence Interval	P-value
Age	0.13	(-0.01, 0.29)	0.080
Sex			
Male	3.51	(-0.26, 7.06)	0.052
Female [R]			
Residence			
Urban	16.30	(10.64, 21.95)	<0.001
Rural [R]			
Ethnicity			
Oromo	1.42	(-7.00, 9.85)	0.740
Amhara	4.17	(-2.02, 14.33)	0.140
Somali	2.67	(-9.46, 14.82)	0.666
Tigray	14.55	(2.40, 26.70)	0.019
Harari	9.52	(-22.23, 15.09)	0.708
Gurage/Silte [R]			
Marital status			
Never married	-11.97	(-18.65, -5.28)	<0.001
No longer married	-3.04	(-8.18, 2.09)	0.246
Currently married [R]			
Education level			<0.001
No formal education	-19.29	(-25.01, -13.57)	
Less than primary	-11.93	(-17.75, -6.11)	<0.001
Primary school completed	-9.16	(-15.32, -3.00)	0.004
Secondary school completed	-5.89	(-12.09, 0.31)	0.063
College or university completed or postgraduate [R]			
Number of actual risk behaviours			
One	1.08	(-9.38, 11.54)	0.839
Two	0.87	(-9.37, 11.12)	0.067
Three	-2.69	(-13.64, 8.25)	0.629
Four [R]			

R-Reference, β- Beta coefficient, variables with P-value <0.2 included in multivariate linear regression

In the multivariable linear regression analysis, knowledge of CV risk factors was significantly associated with place of residence, level of education and marital status. There was a statistically significant association between knowledge of CV risk factors and residence (P < 0.001). Urban residents had 12.84 units higher mean knowledge score than rural residents (β = 12.84, 95% CI 6.91 to 18.77; P < 0.001). In addition, level of education is associated with knowledge of CV risk factors (P < 0.001), those who had no formal education had -18.80 units lower mean knowledge score compared to those who completed college or university (β = -18.80, 95% CI -24.76 to -12.85; P < 0.001). Those who attained less than primary school education had -12.02 units less knowledge score compared to those who completed college or university (β = -12.02, 95% CI -17.63 to -6.40; P < 0.001). There was also a statistically significant association between knowledge and marital status (P < 0.001). Those who were never married had -14.01 units lower mean knowledge score than those who were currently married (β = -14.01, 95% CI -20.71 to -7.29; P < 0.001). There was no statistically significant association between knowledge of CV risk factors and actual cumulative risk behaviour (P = 0.076) or age (P = 0.718) or sex (P = 0.259) or ethnicity (P = 0.196) (Table 6).

Table 6: Multivariable analysis of potential associations of CV risk factors knowledge with health behaviour and sociodemographic variables in eastern Ethiopia, 2018.

Variables	β	95% Wald Confidence Interval	P value
Age	-0.03	(-0.20, 0.14)	0.718
Sex			
Male	2.08	(-1.53, 5.70)	0.259
Female [R]			
Residence			
Urban	12.84	(6.91, 18.77)	**<0.001**
Rural [R]			
Ethnicity			
Oromo	6.11	(-1.39, 13.62)	0.110
Amhara	4.78	(-2.52, 12.08)	0.200
Somali	5.78	(-4.96, 16.51)	0.292
Tigray	14.26	(3.26, 25.27)	0.101
Harari	2.96	(-13.54, 19.57)	0.727
Gurage/Silte [R]			
Marital status			
Never married	-14.01	(-20.71, -7.29)	**<0.001**
No longer married	-0.82	(-5.52, 3.86)	0.729
Currently married [R]			
Education level			
No formal education	-18.80	(-24.76, -12.85)	**<0.001**
Less than primary	-12.02	(-17.63, -6.40)	**<0.001**
Primary school completed	-10.63	(-16.35, -4.91)	**<0.001**
Secondary school completed	-7.56	(-13.33, -1.80)	0.110
College or university Completed or postgraduate [R]			
Number of actual risk behaviours			
One	4.98	(-4.00, 13.97)	0.277
Two	7.38	(-1.48, 16.25)	0.103
Three	2.25	(-7.16, 11.67)	0.639
Four [R]			

R=Reference, β- Beta coefficient, P-value <0.05 is statistically significant

5.5 Discussion

This study examined the level of knowledge of cardiovascular risk factors and associated factors among known CV patients who were attending chronic follow up care at two public referral hospitals in eastern Ethiopia. The study demonstrates that almost half of CVD patients have suboptimal knowledge regarding CV risk factors which may impede secondary CV prevention if effective interventions are not implemented. Thus, the findings of this study warrant the need of improved preventive interventions to achieve optimal knowledge in the general population.

Knowledge of CV risk factors among CVD patients was unsatisfactory, and about half of the patients have suboptimal knowledge, which is in line with existing findings reported from India and United Arab Emirates [16, 31]. However, the mean CV risk factors knowledge score in the current study (70.5%) is higher compared to finding from Nigeria (48.6%), and this could be due to difference in population characteristics [3]. Consistent with the finding of this study, a systematic review showed low level knowledge and awareness of CVD and associated risk factors among populations in Sub-Saharan Africa [22]. The possible reasons for the suboptimal knowledge may be attributed to a lower level of educational attainment of the patients, poor patient counselling during follow up care appointment and absence of intensive lifestyle counselling programs. Moreover, low health literacy may be due to lack of effective patient counselling methodologies that fits the cultural and sociodemographic context and poor health information seeking behaviour of patients. Implementation of innovative health education strategies may help to improve health literacy for CV patients and for the general population as well.

Residence, education level and marital status were associated with knowledge of cardiovascular risk factors, which mirrors that social, cultural and economic factors are major determinants of awareness and health behaviour change [32]. In line with the finding of the current study, numerous studies [25, 33, 34] have revealed higher education is associated with better health literacy. A review conducted in Sub-Saharan Africa reported that place of residence is an important determinant of knowledge of cardiovascular risk factors, i.e. urban residence is associated with improved knowledge of CV risk factors [22]. In Ethiopia, rural residents attain lower educational level and have poor access to health information as compared to urban residents who relatively have better health literacy. Thus, low knowledge of CV risk factors in rural residents could be due to their lower education attainment. Moreover, the current study shows that those who were never married have lower levels of knowledge regarding CV risk factors compared to those who were married. Consistent with this, Manfredini et al. reported that being married is associated with, lower risk factors, better knowledge and better CV health status [35].

Studies from Nigeria, Germany and Luxembourg reported that a higher level of education is associated with healthy lifestyle and appropriate self-care behaviours [25, 36, 37]. In addition, evidence from a review revealed that a lower educational level is associated with lower knowledge of CV risk factors, and this also concurs with the finding of the current study [22]. Findings from Pakistan also support those of this study where lack of formal education is associated with lower knowledge of cardiovascular disease risk factors [38]. However, about one-third of the patients in the current study had no formal education, thus, improving literacy in developing countries is vital in tackling the emerging burden of chronic diseases, in particular, CVD and its associated lifestyle behaviours, as demonstrated previously [22].

The prevalence of alcohol drinking, inadequate fruit and vegetable consumption and physical inactivity in the current study is comparable to findings from Addis Ababa [14], Kenya [39] and Nigeria [40]. However, the rate of smoking in this study is lower compared to findings from Addis Ababa [14], Ghana [41], Kenya [42] and Uganda [43], and this could be due to differences in sociocultural characteristics of participants.

According to the Health Belief Model, knowledge of health behaviour is an important determinant of adherence to healthy lifestyle behaviours. Though, knowledge alone is not sufficient, and patients' perceptions and attitudes of health behaviours are also important predictors of health lifestyle behaviours. The current study demonstrated that occurrence of actual cumulative risk behaviours is not associated with knowledge of CV risk factors. Thus, as patients' perceptions and attitudes of CV risk factors are important determinants of behaviour change, these need to be explored in further research. Consolidating this, Tran et al (2017) states a high level of knowledge of CV risk factors is not sufficient to reduce cardiovascular risk, however, improving the perception of adults regarding CV risk factors plays an important role in reducing long term cardiovascular risk [23]. Nevertheless, the finding of Alzaman et al. which states awareness of modifiable CV risk factors is positively associated with health behaviour for adult patients [44] is inconsistent with the finding of the current study. A potential reason may be due to differences in education profile.

Even though the overall actual risk behaviour is not associated with occurrence of actual cumulative risk behaviour, the vast majority of patients had good knowledge and practice healthy behaviour regarding smoking. Available evidence reports that most adults are aware of the fact that cigarette smoking is a risk factor for CV disease [22, 24, 45]. Inadequate consumption of fruit and vegetables was highly and equally

(100%) prevalent among those who have good or fair or poor level knowledge of CV risk factors. In addition, the majority of patients knew physical activity lowers the chance of developing heart disease, however, more than half of them failed to achieve this. This shows the existence of other factors that determine patients' health behaviours, including individual perceptions and beliefs regarding the disease and the risk factors. This issue needs to be explored more through further research.

Findings show intensive lifestyle counselling improves awareness and adherence to healthy lifestyle behaviours [25, 26, 46]. In the current study, about half of CVD patients who had received follow up care with a focus on the management of CV risk factors had sub-optimal knowledge of these and they were indulged in multiple unhealthy behaviours. This is consistent with findings from USA which reported African Americans have cluster of CV risk behaviours [47]. In addition, about one fifth do not know high blood pressure is a risk factor for heart disease, and this indicates a need for implementing targeted education strategies. Overall, the finding of this study show existing follow-up service is not optimal, and the probable reasons for this may be poor patient counselling service and limitation of resources. This signifies there is a need to improve the follow up service to promote healthy lifestyle behaviours for the patients. Implementing intensive lifestyle support programs based on developed guidelines and delivered by trained health professionals may also help to improve patients' knowledge and health behaviours [48, 49]. Absence of CVD prevention policies and strategies at population level could also have contributed to this problem in Ethiopia. Various CVD prevention guidelines have been developed and are in use to promote effective prevention of CVD in developed countries. The European Society of Cardiology guidelines focus on the importance of patient involvement and patient education which may potentially improve knowledge levels and motivation in patients

[50]. The American College of Cardiology (ACC) and the American Heart Association (AHA) guidelines recommend promotion of lifetime risk estimation and which may represent an additional step forward in supporting lifestyle behaviour change counselling programs [51]. Other than a recently developed *National Strategic Action Plan (NSAP) for prevention & control of non-communicable diseases* [52], there are no specific guidelines for prevention of CVD in use in Ethiopia. Therefore, there is a need for the development and implementation of context specific guidelines and innovations to improve knowledge levels and patient motivation towards healthy lifestyle behaviour, particularly for poorly educated and rural residents.

Adoption of healthy lifestyle behaviours promote better health related quality of life [53], however, the patients in the current study had unhealthy behaviours that may predispose them for further complications and affect their health related quality of life, and this may contribute to the increased CVD related mortality in Ethiopia. Despite the rise in the burden of CV risk factors and lack of awareness among adult population, there is no prevention strategy implemented to reduce the burden of CVD in Ethiopia. The findings of this study have practical implications for health care workers and should inform policy makers that change is required to improve patients' understanding of cardiovascular disease risk factors and reduce the burden of CV risk behaviours.

Given that the actual risk behaviour is not associated with the required knowledge of risk factors in this population, warrants the design and implementation of innovative interventions, in which patients are educated and empowered to self-manage their risk factors. As an example, structured and systematic nurse-led lifestyle counselling effectively reduce cardiovascular risk behaviour, improve patients' knowledge of CV

risk factors and promote healthy lifestyle behaviours [46]. Moreover, health care providers should identify patients with limited understanding of risk factors and actual risk behaviours and provide tailored interventions. Indeed, it is essential to explore how patients perceive their own risk of CV disease and the risk factors, since these are key determinants of health behaviour change according to the Health Belief Model. Therefore, the findings of this study warrant attention and are a call for action from policy makers. As such the presented data can be used as baseline data for the development of intervention programs, specifically focussed at Ethiopia that aim to improve patients' awareness of CV disease risk factors and reduce the burden of CV risk behaviours. Indeed, it is important to design and implement monitoring and evaluation systems to improve the follow up service.

Limitations

This study may be subject to bias. Firstly, the study is subject to the limitations of patient recall and social desirability bias, and the self-reported measurement of risk behaviours may have underestimated the CV risk behaviours. However, this underlines that the real-world problem may be even worse in developing countries, and that a call for action is required. Secondly, the use of cross-sectional study design does not establish causal relationships.

5.6 Conclusion

The burden of CV risk behaviours is increasing whilst the patients' understanding of associated risk factors is limited. Almost half of CVD patients have suboptimal knowledge regarding CV disease risk factors, and they have multiple unhealthy behaviours though they attend chronic follow up care clinics. Lower education, rural residence and single marital status were associated with lower knowledge of

cardiovascular risk factors. Therefore, this study is important to demonstrate the need for implementing an effective prevention program. In line with intensive patient counselling and education to improve awareness regarding CV risk factors, implementation of multidisciplinary, innovative interventions and systematic nurse-led lifestyle counselling is indeed important to effectively assist CV patients in adopting positive lifestyle behaviours. Moreover, implementation of CVD prevention programs should be considered for the disease prevention policy agenda in Ethiopia.

Competing interests

The authors have declared that no competing interests exist.

Acknowledgement

5.7 References

1. Roth GA, Johnson C, Abajobir A, Abd-Allah F, Abera SF, Abyu G, et al. Global, Regional, and National Burden of Cardiovascular Diseases for 10 Causes, 1990 to 2015. J Am Coll Cardiol. 2017;70(1):1-25. Epub 2017/05/22. doi: 10.1016/j.jacc.2017.04.052. PubMed PMID: 28527533; PubMed Central PMCID: PMCPMC5491406.

2. Andhuvan G, Ayyappan P, Sahana C, Poovizhi S, Sivasakthi K. Knowledge of modifiable risk factors of heart disease among patients with cardiovascular risk. Asian J Pharm Clin Res. 2017;10(1):99-102. doi: 10.22159/ajpcr.2017.v10i1.14180.

3. Akintunde AA, Akintunde T, Opadijo OG. Knowledge of heart disease risk factors among workers in a Nigerian University: A call for concern. Niger Med J. 2015;56(2):91-5. Epub 2015/04/04. doi: 10.4103/0300-1652.150688. PubMed PMID: 25838622; PubMed Central PMCID: PMCPMC4382611.

4. Yeates K, Lohfeld L, Sleeth J, Morales F, Rajkotia Y, Ogedegbe O. A Global Perspective on Cardiovascular Disease in Vulnerable Populations. Can J Cardiol. 2015;31(9):1081-93. Epub 2015/09/01. doi: 10.1016/j.cjca.2015.06.035. PubMed PMID: 26321432; PubMed Central PMCID: PMCPMC4787293.

5. Tsega TA, Demissei BG. A systematic review of epidemiology, treatment and prognosis of heart failure in adults in Ethiopia. J Cardiovasc Med (Hagerstown). 2018;19(3):91-7. Epub 2018/01/13. doi: 10.2459/jcm.0000000000000617. PubMed PMID: 29324479.

6. Perumareddi P. Prevention of Hypertension Related to Cardiovascular Disease. Primary care. 2019;46(1):27-39. Epub 2019/02/02. doi: 10.1016/j.pop.2018.10.005. PubMed PMID: 30704658.

7. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. Lancet. 2005;365(9455):217-23. Epub 2005/01/18. doi: 10.1016/s0140-6736(05)17741-1. PubMed PMID: 15652604.

8. Bloch MJ. Worldwide prevalence of hypertension exceeds 1.3 billion. Journal of the American Society of Hypertension : JASH. 2016;10(10):753-4. Epub 2016/09/24. doi: 10.1016/j.jash.2016.08.006. PubMed PMID: 27660007.

9. Cohen DL, Townsend RR, Angell SY, DiPette DJ. The World Health Organization recognizes noncommunicable diseases and raised blood pressure as global health priority for 2025. Journal of clinical hypertension (Greenwich, Conn). 2014;16(9):624. Epub 2014/08/05. doi: 10.1111/jch.12384. PubMed PMID: 25087601; PubMed Central PMCID: PMCPMC5723123.

10. Twagirumukiza M, De Bacquer D, Kips JG, de Backer G, Stichele RV, Van Bortel LM. Current and projected prevalence of arterial hypertension in sub-Saharan Africa by sex, age and habitat: an estimate from population studies. J Hyperten. 2011;29(7):1243-52. Epub 2011/05/05. doi: 10.1097/HJH.0b013e328346995d. PubMed PMID: 21540748.

11. Kelemu TK, Yonatan MM. Prevalence of hypertension in Ethiopia: a systematic meta-analysis. Public Health Reviews. 2015;36(14):1-12. doi: DOI 10.1186/s40985-015-0014-z.

12. Misganaw A, Haregu TN, Deribe K, Tessema GA, Deribew A, Melaku YA, et al. National mortality burden due to communicable, non-communicable, and other diseases in Ethiopia, 1990-2015: findings from the Global Burden of Disease Study 2015. Popul Health Metr. 2017;15:29. Epub 2017/07/25. doi: 10.1186/s12963-017-0145-1. PubMed PMID: 28736507; PubMed Central PMCID: PMCPMC5521057.

13. Buda ES, Hanfore LK, Fite RO, Buda AS. Lifestyle modification practice and associated factors among diagnosed hypertensive patients in selected hospitals, South Ethiopia. Clinical hypertension. 2017;23:26. Epub 2017/12/08. doi: 10.1186/s40885-017-0081-1. PubMed PMID: 29214054; PubMed Central PMCID: PMCPMC5713156.

14. Tibebu A, Mengistu D, Negesa L. Adherence to recommended lifestyle modifications and factors associated for hypertensive patients attending chronic follow-up units of selected public hospitals in Addis Ababa, Ethiopia. Patient preference and adherence. 2017;11:323-30. Epub 2017/03/11. doi: 10.2147/ppa.S126382. PubMed PMID: 28280305; PubMed Central PMCID: PMCPMC5338986.

15. Glanz K, Barbara KR, Viswanaththh K. The Health Belief Model, Health Behavior and Health Education, Theory, Research and Practice. Edt 4 ed1997.

16. Burger A, Pretorius R, Fourie CMT, Schutte AE. The relationship between cardiovascular risk factors and knowledge of cardiovascular disease in African men in the North-West Province. Health SA Gesondheid. 2016;21:364-71. doi: https://doi.org/10.1016/j.hsag.2016.07.003.

17. Alzaman N, Wartak SA, Friderici J, Rothberg MB. Effect of patients' awareness of CVD risk factors on health-related behaviors. South Med J. 2013;106(11):606-9. Epub 2013/11/07. doi: 10.1097/smj.0000000000000013. PubMed PMID: 24192590.

18. Maruf FA, Ojukwu CC, Akindele MO. Perception, Knowledge, and Attitude toward Physical Activity Behaviour: Implications for Participation among Individuals with Essential Hypertension. High Blood Press Cardiovasc Prev. 2017;25(1):53-60. Epub 2017/10/31. doi: 10.1007/s40292-017-0235-y. PubMed PMID: 29082466.

19. Abed MA, Khalil AA, Moser DK. Awareness of modifiable acute myocardial infarction risk factors has little impact on risk perception for heart attack among vulnerable patients. Heart Lung. 2015;44(3):183-8. doi: 10.1016/j.hrtlng.2015.02.008.

20. Wagner J, Lacey K, Chyun D, Abbott G. Development of a questionnaire to measure heart disease risk knowledge in people with diabetes: the Heart Disease Fact Questionnaire. Patient Educ Couns. 2005;58(1):82-7. doi: https://doi.org/10.1016/j.pec.2004.07.004.

21. Aminde LN, Takah N, Ngwasiri C, Noubiap JJ, Tindong M, Dzudie A, et al. Population awareness of cardiovascular disease and its risk factors in Buea, Cameroon. BMC Public Health. 2017;17(1):545. Epub 2017/06/07. doi: 10.1186/s12889-017-4477-3. PubMed PMID: 28583117; PubMed Central PMCID: PMCPMC5460458.

22. Boateng D, Wekesah F, Browne JL, Agyemang C, Agyei-Baffour P, Aikins AD, et al. Knowledge and awareness of and perception towards cardiovascular disease risk in sub-Saharan Africa: A systematic review. PLoS One. 2017;12(12):e0189264. Epub 2017/12/13. doi: 10.1371/journal.pone.0189264. PubMed PMID: 29232703; PubMed Central PMCID: PMCPMC5726714.

23. Tran DT, Zimmerman LM, Kupzyk KK, Shurmur SW, Pullen CH, Yates BC. Cardiovascular risk factors among college students: Knowledge, perception, and risk assessment. J Am Coll Health. 2017;65(3):158-67.

24. Surka S, Steyn K, Everett-Murphy K, Gaziano TA, Levitt N. Knowledge and perceptions of risk for cardiovascular disease: Findings of a qualitative investigation from a low-income peri-urban community in the Western Cape, South Africa. Afr J Prim Health Care Fam Med. 2015;7(1):891. Epub 2016/02/05. doi: 10.4102/phcfm.v7i1.891. PubMed PMID: 26842511; PubMed Central PMCID: PMCPMC4656922.

25. Ike SO, Aniebue PN, Aniebue UU. Knowledge, perceptions and practices of lifestyle-modification measures among adult hypertensives in Nigeria. Trans R Soc Trop Med Hyg. 2010;104(1):55-60. Epub 2009/09/08. doi: 10.1016/j.trstmh.2009.07.029. PubMed PMID: 19733378.

26. Harting J, van Assema P, van Limpt P, Gorgels T, van Ree J, Ruland E, et al. Effects of health counseling on behavioural risk factors in a high-risk cardiology outpatient population: a randomized clinical trial. Eur J Cardiovasc Prev Rehabil. 2006;13(2):214-21. Epub 2006/04/01. doi: 10.1097/01.hjr.0000194416.39508.e9. PubMed PMID: 16575275.

27. World Health Organisation. STEPS Surveillance Manual Geneva2017. p. 260-69.

28. Booth M. Assessment of Physical Activity: An International Perspective. Res Q Exerc Sport. 2000;71(2):114-20.

29. World Health Organisation. Global recommendations on physical activity for health. Switzerland2010. p. 1-60.

30. Negesa L, B., Magarey J, Rasmussen P, Hendriks JM. Cardiovascular risk behaviour is an emerging health issue in developing countries: a cross-sectional study. Eur J Cardiovasc Nurs. 2019:1474515119861772. Epub 2019/07/05. doi: 10.1177/1474515119861772. PubMed PMID: 31269808.

31. Chinju G, Andhuvan G. A population - based study on Awareness of Cardiovascular Disease Risk Factors. Indian J Pharm. 2014;7(2):23-5.

32. Glanz K, Bishop DB. The role of behavioral science theory in development and implementation of public health interventions. Annual review of public health. 2010;31:399-418. Epub 2010/01/15. doi: 10.1146/annurev.publhealth.012809.103604. PubMed PMID: 20070207.

33. Zuhaid M, Kazmi S, Farooq U, Khan IA, Aziz T, Aziz S, et al. Knowledge of modifiable risk factors of cardiovascular diseases among patients with acute myocardial infarction. Journal of Ayub Medical College Abbottabad 2014;26(3):364-7. Epub 2015/02/13. PubMed PMID: 25671949.

34. Aaby A, Friis K, Christensen B, Rowlands G, Maindal HT. Health literacy is associated with health behaviour and self-reported health: A large population-

based study in individuals with cardiovascular disease. Eur J Prev Cardiol. 2017;24(17):1880-8. Epub 2017/09/01. doi: 10.1177/2047487317729538. PubMed PMID: 28854822; PubMed Central PMCID: PMCPMC5680908.

35. Manfredini R, De Giorgi A, Tiseo R, Boari B, Cappadona R, Salmi R, et al. Marital Status, Cardiovascular Diseases, and Cardiovascular Risk Factors: A Review of the Evidence. J Womens Health (Larchmt). 2017;26(6):624-32. Epub 2017/01/28. doi: 10.1089/jwh.2016.6103. PubMed PMID: 28128671.

36. Gonzalez B, Lupon J, Domingo Mdel M, Cano L, Cabanes R, de Antonio M, et al. Educational level and self-care behaviour in patients with heart failure before and after nurse educational intervention. Eur J Cardiovasc Nurs. 2014;13(5):459-65. Epub 2013/10/29. doi: 10.1177/1474515113510810. PubMed PMID: 24163309.

37. Tchicaya A, Lorentz N, Demarest S, Beissel J. Persistence of socioeconomic inequalities in the knowledge of cardiovascular risk factors five years after coronary angiography. Eur J Cardiovasc Nurs. 2018;17(2):136-47. Epub 2017/07/12. doi: 10.1177/1474515117720789. PubMed PMID: 28696137; PubMed Central PMCID: PMCPMC5802545.

38. Khan MS, Jafary FH, Jafar TH, Faruqui AM, Rasool SI, Hatcher J, et al. Knowledge of modifiable risk factors of heart disease among patients with acute myocardial infarction in Karachi, Pakistan: a cross sectional study. BMC Cardiovasc Disord. 2006;6:18. Epub 2006/04/29. doi: 10.1186/1471-2261-6-18. PubMed PMID: 16643643; PubMed Central PMCID: PMCPMC1464150.

39. Bloomfield GS, Mwangi A, Chege P, Simiyu CJ, Aswa DF, Odhiambo D, et al. Multiple cardiovascular risk factors in Kenya: evidence from a health and demographic surveillance system using the WHO STEPwise approach to chronic disease risk factor surveillance. Heart (British Cardiac Society). 2013;99(18):1323-9. Epub 2013/07/23. doi: 10.1136/heartjnl-2013-303913. PubMed PMID: 23872588; PubMed Central PMCID: PMCPmc3898037.

40. Oluyombo R, Akinwusi PO, Olamoyegun MO, Ayodele OE, Fawale MB, Okunola OO, et al. Clustering of cardiovascular risk factors in semi-urban communities in south-western Nigeria. Cardiovasc J Afr. 2016;27(5):322-7. Epub 2016/11/03. doi: 10.5830/cvja-2016-024. PubMed PMID: 27284905; PubMed Central PMCID: PMCPMC5377874.

41. Minicuci N, Biritwum RB, Mensah G, Yawson AE, Naidoo N, Chatterji S, et al. Sociodemographic and socioeconomic patterns of chronic non-communicable disease among the older adult population in Ghana. Global health action. 2014;7:21292. Epub 2014/04/22. doi: 10.3402/gha.v7.21292. PubMed PMID: 24746141; PubMed Central PMCID: PMCPmc3991840.

42. Haregu TN, Oti S, Egondi T, Kyobutungi C. Co-occurrence of behavioral risk factors of common non-communicable diseases among urban slum dwellers in Nairobi, Kenya. Global health action. 2015;8:28697. Epub 2015/09/20. doi: 10.3402/gha.v8.28697. PubMed PMID: 26385542; PubMed Central PMCID: PMCPmc4575413.

43. Mondo CK, Otim MA, Akol G, Musoke R, Orem J. The prevalence and distribution of non-communicable diseases and their risk factors in Kasese district, Uganda. Cardiovasc J Afr. 2013;24(3):52-7. Epub 2013/06/06. doi:

10.5830/cvja-2012-081. PubMed PMID: 23736126; PubMed Central PMCID: PMCPmc3721879.

44. Alzaman N, Wartak SA, Friderici J, Rothberg MB. Effect of patients' awareness of CVD risk factors on health-related behaviors. South Med J. 2013;106(11):606-9. Epub 2013/11/07. doi: 10.1097/smj.0000000000000013. PubMed PMID: 24192590.

45. Gill R, Chow CM. Knowledge of heart disease and stroke among cardiology inpatients and outpatients in a Canadian inner-city urban hospital. Can J Cardiol. 2010;26(10):537-40. Epub 2010/12/18. PubMed PMID: 21165363; PubMed Central PMCID: PMCPMC3006102.

46. Saffi MA, Polanczyk CA, Rabelo-Silva ER. Lifestyle interventions reduce cardiovascular risk in patients with coronary artery disease: a randomized clinical trial. Eur J Cardiovasc Nurs. 2014;13(5):436-43. Epub 2013/09/12. doi: 10.1177/1474515113505396. PubMed PMID: 24021286.

47. Barutha M, Addya CL, Wilcoxa S, Dowdaa M. Clustering of risk behaviours among African American adults. Health Education Journal. 2011;71(5):565-75.

48. Leuner CJ, Weldegerima AH. Cardiology services in Ethiopia. Eur Heart J. 2018;39(29):2699-700. Epub 2018/10/06. doi: 10.1093/eurheartj/ehy373. PubMed PMID: 30289516.

49. Leuner CJ. Cardiology in Mekelle, Ethiopia: Setting up a modern heart cath lab in a University Hospital in Ethiopia was a 5-year endeavour for retired cardiology interventionist Christian Leuner MD. Eur Heart J. 2018;39(19):1666-8. Epub 2018/05/16. doi: 10.1093/eurheartj/ehy198. PubMed PMID: 29762705.

50. Kirchhof P, Benussi S, Kotecha D, Ahlsson A, Atar D, Casadei B, et al. 2016 ESC Guidelines for the Management of Atrial Fibrillation Developed in Collaboration With EACTS. Eur Heart J. 2017;70(1):50. Epub 2017/01/01. doi: 10.1016/j.rec.2016.11.033. PubMed PMID: 28038729.

51. Andrus B, Lacaille D. 2013 ACC/AHA guideline on the assessment of cardiovascular risk. J Am Coll Cardiol. 2014;63(25 Pt A):2886. Epub 2014/04/29. doi: 10.1016/j.jacc.2014.02.606. PubMed PMID: 24768878.

52. MOH. National strategic action plan (nsap) for prevention & control of non-communicable diseases in Ethiopia. 2016. p. 1-60.

53. De Smedt D, Clays E, Annemans L, Boudrez H, De Sutter J, Doyle F, et al. The association between self-reported lifestyle changes and health-related quality of life in coronary patients: the EUROASPIRE III survey. Eur J Prev Cardiol. 2014;21(7):796-805. Epub 2013/01/12. doi: 10.1177/2047487312473846. PubMed PMID: 23307830.

Chapter 6: Awareness of heart disease and associated health behaviours in a developing country: A qualitative study

Lemma B Negesa,[1, 2*] Judy Magarey,[2] Philippa Rasmussen,[2] Jeroen ML Hendriks,[3, 4]

[1]Haramaya University, College of Health and Medical Sciences, Harar, Ethiopia
[2]University of Adelaide, Adelaide Nursing School, Australia

[3]College of Nursing and Health Sciences, Flinders University and Centre for Heart Rhythm Disorders, Royal Adelaide Hospital, Adelaide, Australia.

[4]Department of Medical and Health Sciences, Linköping University, Sweden

*Correspondence:

Lemma Negesa

University of Adelaide

Adelaide, SA, 5000, AUSTRALIA

Phone: +61 468647475

Email: lemma.bulto@adelaide.edu.au

Statement of Authorship

Title of Paper	Awareness of heart disease and associated health behaviours in a developing country: A qualitative study
Publication Status	☐ Published ☒ Accepted for Publication ☐ Submitted for Publication ☐ Unpublished and unsubmitted work written in manuscript style
Publication Details	The manuscript is currently under review.

Principal Author

Name of Principal Author (Candidate)	Lemma Negesa Bulto
Contribution to the Paper	Developed the study protocol, conducted data collection, analysis and write up of the manuscript.
Overall Percentage (%)	80%
Certification	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.
Signature	_[signature]_ Date 26/05/21

Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

    i.   the candidate's stated contribution to the publication is accurate (as detailed above);

    ii.   permission is granted for the candidate in include the publication in the thesis; and

    iii.   the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Assoc. Prof. Judy Magarey
Contribution to the Paper	Provided guidance, assistance, and critical feedback throughout all steps of this research.
Signature	Date 27 / 21

Name of Co-Author	Assoc. Prof. Philippa Rasmussen
Contribution to the Paper	Provided guidance, assistance, and critical feedback throughout all steps of this research.
Signature	Date 28 / 1 / 21

Name of Co-Author	Professor Jeroen Hendriks
Contribution to the Paper	Provided guidance, assistance, and critical feedback throughout all steps of this research.
Signature	Date 29 / 01 / 2021

6.1 Abstract

Background: The burden of heart disease is increasing in developing countries where it appears that there is limited awareness of associated risk factors. The purpose of this study was to explore patients' understanding of heart disease and associated risk factors in Ethiopia.

Objective: The aim of this study was to explore awareness of heart disease and associated health behaviours in patients with hypertension.

Methods: Qualitative in-depth interviews were employed to collect data. The study participants were patients with hypertension attending follow-up care. Data were collected through face-to-face in-depth interviews. The study is presented in line with consolidated criteria for reporting qualitative studies. Audio-recorded data were transcribed verbatim, and data analysis was guided by Braun and Clarke's steps of thematic analysis and using NVivo12 software.

Results: A total of 18 patients with hypertension were interviewed. The patients had poor understanding of heart disease, were not concerned about developing heart disease in the future and did not know hypertension predisposes to heart disease. Barriers to fruit and vegetable consumption were poor access, cost and sociocultural factors. Whereas, being busy, poor physical health, and lack of access to an exercise facility were barriers to physical activity.

Conclusion: Patients with hypertension had a poor understanding of heart disease, and they had deficient understanding that hypertension predisposes to heart disease. Healthcare workers need to identify and consider patients' understanding of risk factors in planning secondary prevention strategies.

6.2 Background

The burden of heart disease is increasing in developing countries against a background of limited awareness of associated risk behaviours [1]. Despite this, its prevention, detection and treatment in developing countries are suboptimal [2]. Ethiopia is the second most populous country in Africa, with an estimated population of 110 million, and the country is in an epidemiological transition from a primarily infectious disease burden to chronic disease burden, predominantly cardiovascular disease (CVD). The increasing burden of CVD is due to the ongoing improvements in socioeconomic status and life expectancy, increased urbanisation, and adoption of western lifestyles [3,4]. Recent data shows hypertension is a predominant factor for most patients presenting with cardiovascular disease who attend chronic follow-up care [5]. A review study revealed that the prevalence of hypertension in Ethiopia is 19.6% [6].

The burden of CVD in Sub-Saharan Africa is mainly associated with an increasing prevalence of multiple risk factors [7,8]. The prevalence of smoking in Ethiopia is 4.1%. Smoking cigarettes, *gaya* (a local water pipe used to smoke homemade tobacco products) and *hashish* (a drug made from the cannabis plant, typically inhaled in a pipe) are common practices in Ethiopia [9]. The World Health Organization (WHO) recommends that drinking no more than 10 standard alcoholic drinks per week and no more than 4 standard drinks on any one day reduces the risk of developing alcohol-related harm. The rate of harmful alcohol consumption in Ethiopia is 8.94% [10]. A study revealed that 19% of known CVD patients are current alcohol drinkers [11]. In addition, khat chewing is a common unhealthy behaviour in eastern Africa; fresh leaves of the

plant are chewed to achieve a state of euphoria and stimulation [12]. However, it is associated with severe cardiac conditions such as acute myocardial infarction and cardiomyopathy [13,14]. One in five known CVD patients are current khat chewers in Ethiopia. Moreover, more than half of CVD patients achieved a low level of physical activity (< 600 MET minutes per week) [11]. Consumption of raw white meat is highly valued in Ethiopia; however, this increases the risk of heart disease due to its high cholesterol content [15].

The understanding of adults regarding CVD and its risk factors is low in developing countries [16-20]. A review study showed the level of knowledge of CVD is suboptimal, as more than half of adults in Sub-Saharan Africa have poor knowledge of CVD. In addition, the level of knowledge of hypertension as a risk factor for heart disease is poor among adult populations in developing countries [17]. However, this review did not reveal patients' knowledge of particular risk behaviours, their risk perception and barriers to healthy behaviours. Studies have demonstrated that patients with hypertension who are at increased risk of developing heart disease do not perceive that they are at risk [21,22]. A study from Seychelles identified one-fifth of patients perceived they had a low cardiovascular disease risk irrespective of their actual risk [23].

Overall, evidence demonstrating the prevalence of CVD and associated risk factors is increasing in Sub-Saharan Africa. However, none of these studies reported on patients' awareness of particular risk factors. There is a scarcity of data on patients' understanding of heart disease and associated risk behaviours in Ethiopia. The present study explored patients' understanding of heart disease and associated major risk factors. Thus, the findings of this study may be used to design interventional

measures to improve awareness and reduce the burden of heart disease among patients with hypertension in developing countries particularly in Ethiopia.

6.3 Methods

6. 3.1 Design and settings

A qualitative study was conducted. The participants were patients with hypertension attending the follow-up units of two main referral hospitals in eastern Ethiopia. These units provide treatment and secondary prevention services for patients with chronic disease. Services include vital sign measurement, providing medications, assessing for complications, and counselling regarding healthy lifestyles. The study was conducted from May to June 2019. The study protocol received ethics approval from the Human Research Ethics Committee, University of Adelaide, and the Institutional Health Research Ethics Review Committee, Haramaya University. Written consent was obtained from each participant before starting the interview. The Health Belief Model [24] was used to underpin the study.

6.3.2 Participants and recruitment

The study participants were patients with hypertension who were attending a chronic follow-up unit at one of the two hospitals during the study period. The participants were recruited in collaboration with the nurses or physicians who were on duty in the follow-up departments. A purposive sampling technique was used to select study participants. Approximately 20 in-depth interviews were planned based on Creswell's recommendation of 5–25 participants for qualitative study [25]. Data collection was continued until saturation of data was reached, and these principles were considered to determine the number of participants. Saturation of information was determined

when the last three patients were unable to provide any new data to the researcher [26].

6.3.3 Inclusion criteria

Adult patients with hypertension who were in the age range of 18–64 years, and attended a chronic disease follow-up department at one of the two hospitals were included in the study. Patients who had been on antihypertensive treatment for at least two months and had no confirmed diagnosis of heart disease were selected for recruitment in this study.

6.3.4 Data collection

A semi-structured interview guide was developed based on the authors' previous study findings; thus the themes were developed under the questions of interest [11]. The interview guide contained open-ended questions, which were designed to explore patients' understanding of heart disease and its sign and symptoms, self-perceived heart disease risk, perceived severity of heart disease, and understanding regarding heart disease risk factors. The English version of the interview guide was translated into local languages. The data were collected through face-to-face in-depth interviews with patients who had a confirmed diagnosis of hypertension. The entire data collection was conducted by the principal author, who had prior experience of qualitative data collection and analysis. The interviews were conducted in the hospitals at a quiet place to avoid disturbance, to enable audio recording and to protect the privacy of patients. Each patient was given a code to keep the interview anonymous. The interviews took 30 minutes on average.

Lincoln and Guba's [27] four criteria were used to establish the trustworthiness of the study. The researcher spent three months on data collection, and the research team

included experts in critical care, qualitative research and a professor in cardiovascular nursing. The team had regular meetings to discuss and debrief on the progress of data collection. A study protocol with a detailed data collection procedure was developed, and data coding was checked for accuracy by the research team to maintain the dependability of the research. The research members checked the codes and themes that emerged, and the findings were reviewed by a panel who were familiar with the Ethiopian context. The use of purposive sampling and operationally defined data saturation [26] ensured the transferability of the study.

6.3.5 Data analysis

The study is presented in line with consolidated criteria for reporting qualitative studies guidelines [28]. In-depth interview audio data were transcribed verbatim and then translated into English. Then, data files in Word documents were imported to QSR International's NVivo 12™ for thematic analysis. Data analysis was guided by Braun and Clarke's six steps of thematic analysis [29]. First, two researchers familiarised themselves with the data by reading and re-reading through the translated data. Then, initial ideas were noted, codes were identified, and similar codes were combined into sub-themes and themes. A report was produced based on the final themes. Transcripts of the interviews were not returned to the patients as the study was anonymous and thus individual transcripts could not be identified.

6.4 Results

6.4.1 Participant characteristics

A total of 18 patients were interviewed. Their ages ranged from 31 to 64 years, and 11 were males. The majority of the patients had received follow-up care for more than two years. About half started follow-up care late in the progress of their disease. The sociodemographic characteristics of the interview participants are depicted in Table 7.

Table 7: Sociodemographic characteristics of patients

Variables (n = 18)	N (%)
Sex	
Male	11 (61.1)
Female	7 (38.9)
Age (mean ± sd)	55±8
Education	
College or university completed	6 (33.3)
Secondary school completed	4 (22.2)
Primary school completed	3 (16.7)
No formal education	5 (27.8)
Occupation	
Government employee	5 (27.8)
Retired	5 (27.8)
Private	3 (16.7)
Housewife	2 (11.1)
Merchant	1 (5.5)
Nongovernment employee	1 (5.5)
Skilled private	1 (5.5)
Time since diagnosed with hypertension	
≥ 6 months	17 (94.4)
< 6 months	1 (5.5)
Time since started follow-up care	
≥ 6 months	16 (88.9)
< 6 months	2 (11.1)

Questions were asked on three main topics: 1) understanding of heart disease, 2) understanding of heart disease risk factors, and 3) barriers to healthy behaviours. Themes were developed from the answers to these questions.

6.4.2 Patients' understanding of heart disease

'*Lebe dikam*', weakened heart: Patients with hypertension had a poor understanding of heart disease. But several described heart disease using its name in the Amharic language, '*Lebe dikam*', which literally means 'weakened heart'. Traditionally, this phrase was used to refer to any heart problem.

> 'Since I don't have heart disease, there is nothing that I know about it.' (P1)

> 'It [heart disease] is 'Lebe dikam', it causes weakness, weakness of all body parts, it worsens health.' (P12)

'What has happened to my heart?' Most patients recognised something was happening to their heart, with the most commonly recognised symptoms being fatigue, difficulty in breathing, increased heartbeat and sweating. But only a few of the patients identified chest pain, which is a common heart disease warning symptom. Several could not name a single sign or symptom of heart disease.

> 'I feel my heartbeat is fast, but I don't know sign and symptoms of heart disease … I had no such problem previously.' (P12)

> 'However I don't have any understanding about heart disease, sometimes I feel my heartbeats very fast … sometimes I question myself … what happened to my heart?' (P15)

'I have not encountered it (hypertension) so far': Even though all patients had been diagnosed with hypertension, most believed there is no relationship between this and heart disease.

> 'I don't think hypertension causes heart disease, because I have not

encountered it so far.' (P17)

'It is in the hand of God': Most of the patients were not worried about developing heart disease. The patients' spiritual beliefs in the healings of *'tsebel'*, and a lack of understanding of hypertension as a heart disease risk affected their understanding of their risk of future heart disease. This was particularly evident in patients with no education.

> 'I may not know what may happen in the future, it is in the hand of God … however, since I do exercise, I am not worried.' (P14)

> 'I don't have any heart problem so far, so I don't think about that [being worried about developing heart disease.' (P1)

'I am developing a heart problem': However, several of the patients reported they were worried about their future heart disease risk. Some of them listed the symptoms they had experienced recently and were worried that they were developing or had already developed heart disease.

> 'I drink coffee, chew khat and also I drink alcohol … I went to hospital for my blood pressure check-up … doctor told me, I may develop another disease. I suspect that I am developing heart problem.' (P11)

'We live only as long as our heart is able to pump blood': Interestingly, most of the patients perceived the consequence of heart disease to be severe illness and finally death. Most importantly, they believed that heart disease is worrying, hard to bear and difficult to live with. Moreover, they knew heart disease can occur suddenly, not allowing time to seek treatment and that delaying seeking treatment may cause sudden death.

'Heart disease is very severe disease, because the heart is responsible for pumping blood for the whole body. For example, if a main water pump gets broken, the whole city will not get water at all. If a heart fails to pump, our body will not get blood at all, so we live only as long as our heart is able to pump blood. So, it is good to take care of the health of our heart.' (P9)

6.4.3 Patients' understanding of heart disease risk factors

Overall, the patients had a reasonable understanding that smoking, alcohol consumption, inadequate fruit and vegetable consumption, and physical inactivity are risk behaviours for heart disease, but they had little knowledge regarding khat chewing and hypertension. Details on patients' understanding of individual risk factors are presented below.

'Smoking affects the heart': Interestingly, the patients consistently understood smoking substances containing nicotine, which results in addiction, could cause heart disease. Several of them expressed they had been smoking cigarettes for years. They also knew that shisha smoking causes heart disease in a shorter time than cigarette smoking. A few of them reported *'gaya'* smoking, which is a traditional way of smoking tobacco in Ethiopia, is also associated with heart disease. Concurrent use of substances such as alcohol, khat, cigarettes and shisha is a common practice in Ethiopia.

'I smoked cigarettes for 25 years, I quitted it now … When I was smoking, I had no understanding that cigarette smoking causes disease … I also didn't encounter any health problem at that time.' (P15)

'Alcohol causes heart disease': Most of the patients understood excessive alcohol consumption is unhealthy. Most also understood locally prepared alcohol, *'areke'*, with 70% alcohol concentration is unhealthy.

'Alcohol drinking can cause heart disease, it also causes hypertension.' (P13)

'Areke [local alcohol] is a medicine': Several patients reported they were informed *areke* is a remedy for hypertension and they had it before breakfast to treat their high blood pressure. Despite their awareness, few patients self-reported they still drink alcohol.

'My friend told me '*areke*' is a medicine, and I always drink two cups in the morning before breakfast.' (P14)

'I chew khat because everybody chews': The patients' understanding of the relationship between khat chewing and heart disease was contradictory. Almost half of the patients reported khat chewing is not associated with heart disease. However, a few patients reported they were not sure about the relationship between heart disease and khat chewing, but they believed that those who chew khat have a tendency to smoke cigarettes and drink alcohol, which they knew are associated with heart disease. A few reported they still chew khat.

'I am not sure about the relationship between heart disease and khat chewing … those who chew khat usually have a tendency to smoke cigarette and drink alcohol … there is a chain between them. They are interconnected, and in such a way, it may have an indirect effect.' (P9)

'A healthy diet': All the patients understood that fruit and vegetables are healthy foods. However, they lacked understanding regarding the recommended daily amount

of fruit and vegetables. Prominent vegetables mentioned by the patients were cabbages, potatoes and salad, whereas bananas, tomatoes and oranges were prominent fruits named by the patients. They also knew white meat, oil and butter-rich foods are heart unhealthy. They identified that a high intake of salt and sugar is associated with heart disease. The patients stated 'injera' (a large sourdough flatbread) which is a common food in Ethiopia is healthy food.

'Healthy diet is … diet with low cholesterol. White meat and butter oil are not advisable. Vegetable oil such as sunflower oil is good ... fruit and vegetables are good for health of heart. 'Injera' is good for health, it contains iron and gives energy. Eating meat on a daily basis is dangerous for health of the heart, as it contains high cholesterol it affects the heart. So, a healthy diet is a diet which contains different types of food and less fat content. Salt should be very limited.' (P9)

'Strengthen body and heart': Interestingly, most of the patients knew that exercise prevents heart disease, helps to control blood pressure and enhances effective heart function. They also believed lack of adequate exercise predisposed them to hypertension. Nevertheless, few of the patients could not describe the relationship between exercise and heart disease.

'Some people eat and sit the whole day. I have five brothers, they are farmers, and they are free of any health problem. I have a number of health problems; I have diabetes, hypertension, heart problem, nerve problem and a lot of things. Since I am retired from the military, I don't work, I sit the whole day and I just eat what I get.' (P4)

6.4.4 Barriers to healthy behaviours

Given that inadequate consumption of fruit and vegetables and physical inactivity were the most prevalent risk behaviours among the patients, barriers to these behaviours are explored below.

Barriers to fruit and vegetable consumption

'The problem is shortage': Poor access to fruit and vegetables was one barrier to fruit and vegetable consumption. As Ethiopian agriculture depends on rainfall patterns, there can be shortages of fruit and vegetables particularly during the dry season.

> 'I think the problem is shortage of fruit and vegetables in market.' (P2)

'It is too expensive': The increasing cost of fruit and vegetables and low income were barriers to fruit and vegetable consumption.

> 'to buy fruit and vegetables, you need money, and nowadays it is costly to buy fruit and vegetables. For example, potato is 25 birr per kilo, cabbage, which we used to buy 5 cents, is more than 10 birr currently. My life situation does not allow me to eat fruit and vegetables as it is too expensive.' (P7)

'Serve him meat and you are a good person': Existing sociocultural beliefs are that eating meat especially white meat is considered a sign of good status and wealth. Fruit and vegetables are considered foods of the poor.

> 'for example, if a guest come to your home, and you serve him fruit or vegetable, he will never consider he is served food, but if you serve him meat he will tell the whole village that you served him meat and you are good person.' (P10)

Barriers to physical activity

'I feel pain': Physical health problems were one of the barriers to physical activity for several of the patients. The prominent physical problems identified as barriers were leg, back and chest pain.

> 'If you go out early in the morning, 6:00 am, you will see a few individuals running on the road and in a stadium. However, I can't do running exercise, because I feel back pain.' (P12)

'Because I feel tired': Lack of time, being busy with routine activities and having a lot of commitments were identified as barriers to physical activity. The patients reported they were busy performing their daily activities and other extra commitments during the daytime and they felt too tired and exhausted to exercise after hours or in the morning.

> 'Now I stop exercising, because I am a driver. Always I wake up early in the morning to go to work, I come back home at night-time. I park my car 2 km away from my home. After parking my car, I catch a taxi to go home rather than walking, because I feel too tired to walk.' (P15)

'Sometimes I am afraid': Lack of accessible exercise facilities was one of the barriers to exercise. The patients reported there were either no exercise facilities or, if they existed, they were not adequate or too far away from where they lived. Most roads have no separate pedestrian walkway; thus people share the road with vehicles. This results in fear of traffic accidents, which negatively affects patients' walking exercise behaviour.

'There is no pedestrian walkway … sometimes I am afraid of a car accident. Where pedestrians walk is the same as the vehicles, and I catch a taxi rather than walking …. if there is a separate pedestrian walkway, I prefer to walk and take fresh air.' (P15)

6.5 Discussion

This study explored patients' understanding of heart disease and related health behaviours, and perceived risks and barriers to health behaviours in a developing country, where there is a paucity of literature. Thus, the findings have contributed to narrowing the evidence gap in this area and making recommendations for the implementation of evidence-based health policy. The study highlights that patients' understanding of heart disease and associated risk factors is variable. Despite the presence of heart disease risk factors, patients had a deficient understanding of heart disease, and failed to recognise their future risk.

Improving patients' health literacy is important to increase their understanding regarding heart disease and associated health behaviours [17,30-32]. The current study shows patients have inadequate knowledge about heart disease, despite being at high risk, and this is in accordance with findings from reviews of evidence from South Africa, [33], Tanzania [34] and Sub-Saharan African [17]. However, the current finding is inconsistent with a finding from the USA, which identified a high level of knowledge about heart disease among high-risk patients [35]. This discrepancy could be due to differences in participant characteristics, particularly their educational attainment, as participants with high levels of education were recruited in the American study.

In addition, the patients in this study demonstrated a moderate knowledge of the main heart disease signs and symptoms, which concurs with findings from Canada which indicated adequate knowledge of heart disease warning signs among patients [36]. Consistent with findings from Canada [37] and African-based review findings [17], only a few patients in this study identified chest pain as a main warning sign of heart disease.

For our participants, their concern about developing heart disease in the future is variable, and it was affected by sociodemographic factors. In particular, a low education level was related with low self-perceived future risk. Despite the fact that hypertension puts patients at risk of heart disease, some patients in the current study underestimated their future risk, and this concurs with the findings of Price et al. from the UK [38] and Frijling et al. from the Netherlands [39]. Consistent with prior findings [17,40], the current research demonstrates that a higher education level is related to patients' better understanding of heart disease, its risk factors, and self-perceived future risk. A study from Spain [41] which demonstrated weak concordance between self-perceived and actual cardiovascular risk among outpatients corroborates the findings of this study.

According to the Health Belief Model, patients' perceived severity and consequence of disease is one of the behaviour modifying factors [24]. Patients in the current study consistently understood the severity and the serious consequences of heart disease, and this aligns with findings from a Lebanese study where most patients perceived heart disease has serious consequence [42]. A study conducted in Iran [43] where hypertensive patients considered cardiovascular disease to be very dangerous also confirms the finding of the current study.

Research has established that high blood pressure is a main driving factor of heart disease [44]. However, patients in this study had a variable understanding about the relationship between hypertension and heart disease, with some patients believing there is no relationship between heart disease and high blood pressure. Being aware of one's heart disease risk is an important factor in lifestyle change and self-care behaviour [24]. However difference in the methodology and participant profile makes it

difficult to compare the current study with the findings of a review from Sub-Saharan Africa which also demonstrated inadequate knowledge of hypertension as a CVD risk factor to confirm the findings of this study [17].

Smoking is the most recognised heart-unhealthy behaviour in the current study; almost all the patients identified smoking is heart unhealthy and predisposes to heart disease. In support of this, it is also the least prevalent risk behaviour among known CVD patients. As we identified in our previous article, only 1% of CVD patients were current cigarette smokers [11]. A few patients in the current study reported they have ceased smoking as they understand it causes heart disease. The finding of Elshatarat and others that most CVD patients believe smoking causes heart disease supports this finding [45]. Consistent with this, numerous other studies identified smoking is commonly identified as a heart disease risk behaviour [33,46,47].

Similarly, almost all the patients in the current study understood drinking alcohol causes heart disease, and this contrasts with prior findings [48] which revealed most individuals perceive alcohol is heart healthy. The discrepancy could be due to differences in participant characteristics. Patients with hypertension used a traditional, locally prepared alcohol, *'areke',* which has a high ethanol concentration, to treat high blood pressure. This traditional alcohol is commonly considered a remedy for a number of diseases in Ethiopia, and thus community education interventions are important to create awareness.

The participants in the current study varied in their understanding of the relationship between heart disease and khat chewing. Some patients know khat chewing causes heart disease whereas an equal number do not know. There is no similar study to make a comparison; however, review evidence shows khat chewing causes serious

cardiovascular problems [14], and the increasing prevalence of khat chewing is a major public health challenge particularly in Ethiopia [49]. Existing cultural and religious beliefs in Ethiopia could have affected patients' understanding of the undesirable health effects of khat chewing.

Through our previous study, we identified that inadequate consumption of fruit and vegetables is the most prevalent risk behaviour among known CVD patients [11]. The current research investigated whether patients understood fruit and vegetables are healthy foods whereas fatty foods are unhealthy. The identified barriers to fruit and vegetable consumption were inadequate access, expense and sociocultural beliefs. Consistent with the findings of this study, prior studies demonstrated cost and lack of access are barriers to fruit and vegetable intake [50,51]. In addition, existing sociocultural beliefs that are passed down in families are major deterrents to fruit and vegetable consumption. In Ethiopia, eating meat has a sociocultural association with high status. Culturally, eating white meat has a special place for Ethiopians; thus, it is served on special occasions such as holiday events. Multi-sectoral interventions are indeed important to improve sociocultural deterrents, access to and cost of fruit and vegetables.

Recognising the poor exercise behaviour of the community and the rising prevalence of physical inactivity in Ethiopia is essential. Recently government officials including the head of the Ministry of Health started a weekly mass sport program in the capital, Addis Ababa, which has attracted and motivated many adults to exercise. As part of this program, some parts of the roads will be free of vehicles and open for mass exercise. This sporting event should be expanded to cities across the country including Harar and Dire Dawa. Also, government officials promised to build sports fields in

various districts to improve access. Having other commitments, poor physical health, lack of access to exercise facilities and easily accessible transportation were main barriers to physical activity for the patients. Consistent with the findings of the current study, Mbambo et al. identified that health problems and having no time are major barriers to physical activity in South Africa [32]. In line with the findings of the current study, a study from Iran revealed tiredness, physical problems and being busy at work are barriers to physical activity among patients [43]. To reduce the perceived constraints on physical activity, healthcare providers should take into account motivation and barriers to physical activity to tailor advice to patients' specific needs [52]. Thus, it is important to identify the barriers to physical activity to learn what to advise to overcome barriers to physical activity for individual patients.

Appropriate primary and secondary CVD prevention strategies should be implemented to reduce the burden of heart disease in Ethiopia. Interventions that improve health literacy should be designed and implemented to improve patients' understanding of heart disease and associated lifestyle behaviours. Implementation of effective and structured lifestyle education programs is important to motivate patients to make lifestyle changes and to prevent serious complications of uncontrolled blood pressure such as heart attack and stroke. In addition, application of effective health behaviour change models can help to improve patients' perceptions and dietary styles [53]. Nurses have a responsibility to educate patients regarding the risk of heart disease from hypertension and preventive lifestyle behaviours. Multi-sector collaborative interventions are recommended to mitigate the multiple barriers to fruit and vegetable consumption and physical activity. Future research should estimate actual heart disease risk using an available future risk estimation such as Framingham Risk Score, and associate it with self-perceived risk and knowledge of heart disease risk factors.

This study was not free of limitations. The use of face-to-face interviews may increase social desirability bias, meaning the participants may have given a socially favourable response rather than their true thoughts or feelings.

6.6 Conclusion

This study identified cultural barriers to heart-healthy behaviours. Despite being at high risk of heart disease, the participants had a deficient understanding that hypertension predisposes to heart disease. Education level influences participants' understanding of heart disease and the associated risk factors. Healthcare workers need to identify and consider patients' understanding of health behaviours in planning secondary prevention strategies. Innovative education strategies are needed to improve patients' understanding of heart disease and risk behaviours and to overcome cultural barriers to health behaviours.

Competing interests

The authors declare that they have no competing interests

Acknowledgements

The researchers would like to thank the University of Adelaide for supporting this study.

5.7 References

1. Ige OK, Owoaje ET, Adebiyi OA. Non communicable disease and risky behaviour in an urban university community Nigeria. Afr Health Sci 2013; 13 (1):62-67.

2. Cappuccio FP, Miller MA. Cardiovascular disease and hypertension in sub-Saharan Africa: burden, risk and interventions. Intern Emerg Med 2016; 11 (3):299-305.

3. Misganaw A, Mariam DH, Ali A, Araya T. Epidemiology of major non-communicable diseases in Ethiopia: a systematic review. J Health Popul Nutr 2014; 32 (1):1-13.

4. Misganaw A, Haregu TN, Deribe K, Tessema GA, Deribew A, Melaku YA, et al. National mortality burden due to communicable, non-communicable, and other diseases in Ethiopia, 1990-2015: findings from the Global Burden of Disease Study 2015. Popul Health Metr 2017; 15 (29):1-17.

5. Tefera YG, Abegaz TM, Abebe TB, Mekuria AB. The changing trend of cardiovascular disease and its clinical characteristics in Ethiopia: hospital-based observational study. Vasc Health Risk Manag 2017; 13:143-151.

6. Kelemu TK, Yonatan MM. Prevalence of hypertension in Ethiopia: a systematic meta-analysis. Public Health Reviews 2015; 36 (14):1-12.

7. Blokstra A, van Dis I, Verschuren WM. Efficacy of multifactorial lifestyle interventions in patients with established cardiovascular diseases and high risk groups. European journal of cardiovascular nursing : journal of the Working

Group on Cardiovascular Nursing of the European Society of Cardiology 2012; 11 (1):97-104.

8. Oluyombo R, Akinwusi PO, Olamoyegun MO, Ayodele OE, Fawale MB, Okunola OO, et al. Clustering of cardiovascular risk factors in semi-urban communities in south-western Nigeria. Cardiovasc J Afr 2016; 27 (5):322-327.

9. Lakew Y, Haile D. Tobacco use and associated factors among adults in Ethiopia: further analysis of the 2011 Ethiopian Demographic and Health Survey. BMC Public Health 2015; 15:487.

10. Ayano G, Yohannis K, Abraha M, Duko B. The epidemiology of alcohol consumption in Ethiopia: a systematic review and meta-analysis. Subst Abuse Treat Prev Policy 2019; 14 (1):26-26.

11. Negesa L, B., Magarey J, Rasmussen P, Hendriks JM. Cardiovascular risk behaviour is an emerging health issue in developing countries: a cross-sectional study. Eur J Cardiovasc Nurs 2019:1474515119861772.

12. Balint EE, Falkay G, Balint GA. Khat - a controversial plant. Wiener klinische Wochenschrift 2009; 121 (19-20):604-614.

13. Al-Motarreb A, Briancon S, Al-Jaber N, Al-Adhi B, Al-Jailani F, Salek MS, et al. Khat chewing is a risk factor for acute myocardial infarction: a case-control study. Br J Clin Pharmacol 2005; 59 (5):574-581.

14. El-Menyar A, Mekkodathil A, Al-Thani H, Al-Motarreb A. Khat use: history and heart failure. Oman Med J 2015; 30 (2):77-82.

15. Seleshe S, Jo C, Lee M. Meat Consumption Culture in Ethiopia. Korean J Food Sci Anim Resour 2014; 34 (1):7-13.

16. Aminde LN, Takah N, Ngwasiri C, Noubiap JJ, Tindong M, Dzudie A, et al. Population awareness of cardiovascular disease and its risk factors in Buea, Cameroon. BMC Public Health 2017; 17 (1):545.

17. Boateng D, Wekesah F, Browne JL, Agyemang C, Agyei-Baffour P, Aikins AD, et al. Knowledge and awareness of and perception towards cardiovascular disease risk in sub-Saharan Africa: A systematic review. PLoS One 2017; 12 (12):e0189264.

18. Akintunde AA, Akintunde T, Opadijo OG. Knowledge of heart disease risk factors among workers in a Nigerian University: A call for concern. Niger Med J 2015; 56 (2):91-95.

19. Tran DT, Zimmerman LM, Kupzyk KK, Shurmur SW, Pullen CH, Yates BC. Cardiovascular risk factors among college students: Knowledge, perception, and risk assessment. J Am Coll Health 2017; 65 (3):158-167.

20. Monsuez JJ, Pham T, Karam N, Amar L, Chicheportiche-Ayache C, Menasche P, et al. Awareness of Individual Cardiovascular Risk Factors and Self-Perception of Cardiovascular Risk in Women. The American Journal of the Medical Sciences 2017; 354 (3):240-245.

21. Mazalin P, Sonicki Z, Reiner Z. Cardiovascular disease (CVD) risk factors in older adults - Perception and reality. Arch Gerontol Geriatr 2015; 61 (1):88-92.

22. Abed MA, Khalil AA, Moser DK. Awareness of modifiable acute myocardial infarction risk factors has little impact on risk perception for heart attack among vulnerable patients. Heart Lung 2015; 44 (3):183-188.

23. Alwan H, William J, Viswanathan B, Paccaud F, Bovet P. Perception of cardiovascular risk and comparison with actual cardiovascular risk. Eur J Cardiovasc Prev Rehabil 2009; 16 (5):556-561.

24. Glanz K, Barbara KR, Viswanathth K. The Health Belief Model, Health Behavior and Health Education, Theory, Research and Practice. 1997.

25. Creswell JW. Qualitative inquiry and research design: Choosing among five traditions. Thousand Oaks, CA: Sage; 1998.

26. Moser A, Korstjens I. Series: Practical guidance to qualitative research. Part 3: Sampling, data collection and analysis. Eur J Gen Pract 2018; 24 (1):9-18.

27. Lincoln y, Guba E. Naturalistic inquiry. CA: Sage; 1985.

28. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. International journal for quality in health care : journal of the International Society for Quality in Health Care 2007; 19 (6):349-357.

29. Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol 2006; 3 (2):77-101.

30. Tchicaya A, Lorentz N, Demarest S, Beissel J. Persistence of socioeconomic inequalities in the knowledge of cardiovascular risk factors five years after coronary angiography. Eur J Cardiovasc Nurs 2018; 17 (2):136-147.

31. Aaby A, Friis K, Christensen B, Rowlands G, Maindal HT. Health literacy is associated with health behaviour and self-reported health: A large population-based study in individuals with cardiovascular disease. Eur J Prev Cardiol 2017; 24 (17):1880-1888.

32. Mbambo SW, Tlou B, Dlungwane TP. Factors associated with physical activity amongst patients with hypertension in two community health centres in uMgungundlovu health district, KwaZulu-Natal, 2018. South African Family Practice 2019; 61 (6):234-238.

33. Surka S, Steyn K, Everett-Murphy K, Gaziano TA, Levitt N. Knowledge and perceptions of risk for cardiovascular disease: Findings of a qualitative investigation from a low-income peri-urban community in the Western Cape, South Africa. Afr J Prim Health Care Fam Med 2015; 7 (1):891.

34. Hertz JT, Sakita FM, Manavalan P, Mmbaga BT, Thielman NM, Staton CA. Knowledge, attitudes, and preventative practices regarding ischemic heart disease among emergency department patients in northern Tanzania. Public health 2019; 175:60-67.

35. Tovar E, Clark MC. Knowledge and health beliefs related to heart disease risk among adults with type 2 diabetes. J Am Assoc Nurse Pract 2015; 27 (6):321-327.

36. Gill R, Chow CM. Knowledge of heart disease and stroke among cardiology inpatients and outpatients in a Canadian inner-city urban hospital. Can J Cardiol 2010; 26 (10):537-540.

37. McDonnell LA, Pipe AL, Westcott C, Perron S, Younger-Lewis D, Elias N, et al. Perceived vs actual knowledge and risk of heart disease in women: Findings from a Canadian survey on heart health awareness, attitudes, and lifestyle. Can J Cardiol 2014; 30 (7):827-834.

38. Price HC, Dudley C, Barrow B, Griffin SJ, Holman RR. Perceptions of heart attack risk amongst individuals with diabetes. Prim Care Diabetes 2009; 3 (4):239-244.

39. Frijling BD, Lobo CM, Keus IM, Jenks KM, Akkermans RP, Hulscher ME, et al. Perceptions of cardiovascular risk among patients with hypertension or diabetes. Patient Educ Couns 2004; 52 (1):47-53.

40. Peterson LM, Helweg-Larsen M, Volpp KG, Kimmel SE. Heart attack risk perception biases among hypertension patients: the role of educational level and worry. Psychology & health 2012; 27 (6):737-751.

41. Perez-Manchon D, Alvarez-Garcia GM, Gonzalez-Lopez E. Perception of cardiovascular risk in an outpatient population of the Madrid Community. Hipertens Riesgo Vasc 2015; 32 (3):100-104.

42. Noureddine S, Massouh A, Froelicher ES. Perceptions of heart disease in community-dwelling Lebanese. Eur J Cardiovasc Nurs 2013; 12 (1):56-63.

43. Sabzmakan L, Morowatisharifabad MA, Mohammadi E, Mazloomy-Mahmoodabad SS, Rabiei K, Naseri MH, et al. Behavioral determinants of cardiovascular diseases risk factors: A qualitative directed content analysis. ARYA Atherosclerosis 2014; 10 (2):71-81.

44. Kokubo Y, Matsumoto C. Hypertension Is a Risk Factor for Several Types of Heart Disease: Review of Prospective Studies. Adv Exp Med Biol 2017; 956:419-426.

45. Elshatarat RA, Stotts NA, Engler M, Froelicher ES. Knowledge and beliefs about smoking and goals for smoking cessation in hospitalized men with cardiovascular disease. Heart Lung 2013; 42 (2):126-132.

46. Khan MS, Jafary FH, Jafar TH, Faruqui AM, Rasool SI, Hatcher J, et al. Knowledge of modifiable risk factors of heart disease among patients with acute myocardial infarction in Karachi, Pakistan: a cross sectional study. BMC Cardiovasc Disord 2006; 6:18.

47. Lechowicz M, Wilinski J, Kameczura T, Wojciechowska W, Glowacki M, Chrapusta A, et al. Awareness of cardiovascular risk factors in ambulatory cardiology patients. Folia Medica Cracoviensia 2015; 55 (2):15-22.

48. Whitman IR, Pletcher MJ, Vittinghoff E, Imburgia KE, Maguire C, Bettencourt L, et al. Perceptions, information sources, and behavior regarding alcohol and heart health. Am J Cardiol 2015; 116 (4):642-646.

49. Haile D, Lakew Y. Khat Chewing Practice and Associated Factors among Adults in Ethiopia: Further Analysis Using the 2011 Demographic and Health Survey. PLoS One 2015; 10 (6):e0130460.

50. Ashton LM, Hutchesson MJ, Rollo ME, Morgan PJ, Collins CE. Motivators and Barriers to Engaging in Healthy Eating and Physical Activity. Am J Mens Health 2017; 11 (2):330-343.

51. Hsiao B-S, Sibeko L, Troy LM. A Systematic Review of Mobile Produce Markets: Facilitators and Barriers to Use, and Associations with Reported Fruit and Vegetable Intake. J Acad Nutr Diet 2019; 119 (1):76-97.e71.

52. Duclos M, Dejager S, Postel-Vinay N, di Nicola S, Quere S, Fiquet B. Physical activity in patients with type 2 diabetes and hypertension--insights into motivations and barriers from the MOBILE study. Vasc Health Risk Manag 2015; 11:361-371.

53. Horwath CC. Applying the transtheoretical model to eating behaviour change: challenges and opportunities. Nutr Res Rev 1999; 12 (2):281-317.

Chapter 7: General discussion and conclusion

In this final chapter, the main findings of both the quantitative and qualitative studies are discussed. In addition, practical and policy implications of the findings, directions for future research, strengths and limitations of the studies, and overall conclusion are presented. This thesis reports on two studies: study 1, which was a quantitative survey and study 2, which involved qualitative in-depth interviews.

7.1 The high burden of CVD and unmet needs in prevention and care delivery in developing countries, especially Ethiopia

The health crisis of cardiovascular disease (CVD) in developing countries is increasing at an alarming rate. A study revealed 80% of worldwide CVD deaths occur in low- and middle-income coutries.[175] Populations with low socioeconomic status are more impacted by CVD.[176] The burden of the disease is intensified particularly in Sub-Saharan Africa by the lack of prevention policies and cardiac rehabilitation centres, as well as by the scarcity of evidence and the unaffordability of the medicines.[177] Access to CVD care is inadequate and there is a need to improve this in developing countries.[178] However, while there is no overall national representative data, individual studies reveal that CVD is overtaking the burden of infectious diseases in Ethiopia.[12, 33] Despite this, most government as well as external funds and health programs are focused on infectious diseases, and maternal and child health services, and less attention is given to cardiovascular health and noncommunicable diseases (NCD) in general. For instance, anti-tuberculosis and antiretroviral therapy drugs are free in Ethiopia, but NCD medications, which most patients cannot afford, are not subsidised. Moreover, lack of appropriate diagnostic technologies, cardiac specialised hospitals and rehabilitation centres, and trained health workers are major challenges for

cardiovascular services. Ethiopian health policy is oriented at disease prevention, and the country has achieved success in prevention of infectious diseases through implementation of a health extension program.[2] Addressing CVD through this program could help to prevent the rising epidemic of the disease. The high prevalence of unhealthy behaviours and suboptimal understanding of CVD risk factors in most developing countries could be partly attributable to poor CVD prevention and treatment services at the community and health facility levels. It is strongly recommended that CVD prevention strategies are integrated into the existing health extension program (HEP) packages. Interventions aimed at both primary and secondary prevention of CVD are essential to reduce the rising burden of the disease. In particular, screening for hypertension and interventions to increase awareness by health extension workers at the community level can improve cardiovascular health literacy. Furthermore, this could help to reduce mortality and morbidity due to CVD, and the cost of medical care. At the facility level, significant measures should be taken to establish and strengthen diagnostic, treatment and rehabilitation services that could help to avert the growing burden of CVD in Ethiopia.

7.2 Key findings of the studies

7.2.1 The high prevalence of multiple CVD risk behaviours in patients with CVD

There is a wide gap in the evidence regarding cardiovascular health in developing countries, and this has made policy making and prevention of CVD difficult. This thesis has contributed to filling the literature gap by providing comprehensive data on a broad range of CVD risk behaviours and related health literacy among patients with CVD conditions in a developing country, where there is limitation of evidence to guide implementation of evidence-based health policy.

Multiple risk behaviours: Chapter 4 of this thesis presented comprehensive evidence on major CVD risk behaviours in patients with known CV conditions and Chapter 5 reported on their understanding of risk factors associated with the disease. Chapter 4 identified the prevalence of five major risk behaviours among known CVD patients who attend follow-up care in two referral hospitals. The findings of this study showed that patients with CVD practise multiple unhealthy behaviours. About three quarters of the patients had two or more of the five risk behaviours assessed, including: smoking, alcohol consumption, khat chewing, inadequate fruit and vegetable consumption, and physical inactivity. This concurs with existing findings from both developed and developing countries, confirming that the increasing prevalence of clustered CVD risk behaviours is a global challenge.[85, 111, 119-121] This also aligns with a finding of a study from Jordan which revealed patients with coronary heart disease have poor adherence to secondary prevention health behaviours.[179] The high prevalence of multiple risk behaviours among the patients may predispose them to additional cardiac complications and comorbidities and may negatively impact their treatment outcomes. Furthermore, adherence to recommended heart-healthy behaviours is of paramount importance for secondary prevention of CVD. Identification of patients with a clustering of CVD risk behaviours is important to target secondary prevention interventions. Thus, innovative and effective secondary prevention strategies and interventions such as mobile applications of CVD management[180] and nurse-led patient-centred care[181] are warranted.

Smoking: Tobacco companies have strategically targeted African countries for cigarette production and marketing,[56] which may worsen the burden of smoking-related health problems in these countries. Though the prevalence of smoking is lower in Ethiopia than in other African countries, potentially due to religious and

socioeconomic factors, its prevalence is increasing significantly.[57, 182] Particularly in Ethiopia, concurrent use of multiple substances such as cigarettes, shisha, khat and alcohol is becoming more common. Chapter 4 of this thesis addressed the rates of smoking, drinking alcohol and khat chewing in patients. The findings of the quantitative study and qualitative studies align with each other with regard to patients' current smoking status and their awareness of smoking as a risk factor for heart disease. Almost all the patients understood that smoking is an unhealthy behaviour and almost all them (99%) reported they were not current smokers. However, the prevalence of smoking among the general population is increasing rapidly in Ethiopia. A finding from Ethiopian and Kenyan demographic and health survey (DHS) data revealed the prevalence of smoking in Ethiopia increased from 8.5% in 2005 to 11.7% in 2011. The same study revealed that the rate of smoking is higher in Kenya but showing a decline from 22.9% to 18.8% between 2005 and 2011.[57] The lack of strict smoking regulations may have contributed to the increasing prevalence in Ethiopia. Recent government measures to increase taxation on tobacco products and to enforce strict smoking regulations may help to reduce the rising smoking prevalence among the younger generation in Ethiopia. The rate of smoking is low in the older generation; however, it is increasing rapidly among the younger generation in Ethiopia, which forced the government to take action.

Alcohol: Despite the scientific evidence that drinking alcohol is associated with increased risk of cardiac conditions,[183] Chapter 4 of this thesis showed one in five known CVD patients was a current alcohol drinker, with a higher rate of drinking among males than females, and this aligns with prior evidence including a review.[184] Chapter 6 of this thesis reported most patients understood that drinking alcohol is an unhealthy behaviour. However, they reported they drink alcohol because they take it

as a traditional remedy for their illness or due to peer influences. In Ethiopia, over a decade, the number of beer factories and rate of beer consumption has increased rapidly. The rate of alcohol consumption is increasing by 16% each year, and the rate of drinking harmful levels of alcohol is higher among males (12%) than females (1.2%).[184] Erroneous social beliefs about the medicinal effect of a local alcohol product known as *'areke'* may have contributed to increased alcohol consumption particularly among patients with cardiovascular conditions. In early 2020, the Ethiopian government increased taxation on alcohol products which doubled the cost of these products. This is a promising prevention strategy and may save the lives of many individuals. In line with this, interventions to increase awareness of the health consequences of drinking alcohol, particularly the local alcohol *'areke'*, mainly for patients with hypertension and heart conditions is essential.

Khat chewing: Khat chewing is a common heart-unhealthy behaviour particularly among populations living in east Africa and the Arabian Peninsula. Specifically, the prevalence of khat chewing is very high in the eastern part of Ethiopia where khat plants commonly grow and where it is a main source of income for the residents. Moreover, in this area, khat chewing has sociocultural associations; the residents chew for social recreation purposes. However, this substance causes addiction, and severe heart problems such as hypertensive heart disease, cardiomyopathy and myocardial infarction. A review of evidence demonstrated khat chewing has a causative or worsening effect on myocardial infarction and heart failure.[185] Studies conducted in Yemen[53, 73] also revealed a high proportion of CVD patients are khat chewers. Chapter 4 of this thesis showed 20% of the patients were current khat chewers. Chapter 6 explored patients' understanding of khat chewing as a heart disease risk behaviour and revealed patients with hypertension had a varying

understanding on khat chewing as a risk factor for heart disease. Half of the patients reported believing that khat chewing is not associated with heart disease. Community education and patient counselling may help to improve understanding and health behaviour for CVD patients. Thus, educational interventions regarding the cardiac effects and other adverse health consequences of khat should be part of the treatment plan delivered for CVD patients and the general population.

Khat chewing is not limited to east African and Arabian Peninsula countries. A case report from Australia showed khat chewing causes cardiomyopathy and malignant hypertension in east African migrants.[186] A case report from the Netherlands reported khat chewing caused myocardial and cerebral infarction.[157] Thus, most developed countries restrict khat use; however, its illegal importation is difficult to stop. More studies are required on the adverse cardiac health effects of khat chewing, particularly investigating the dose-based effect of khat on heart health.

Fruit and vegetable consumption: Chapter 4 reported the rate of fruit and vegetable consumption, whereas Chapter 6 revealed patients' understanding of the relationship between fruit and vegetable consumption and cardiovascular health. Study 1 revealed the inadequate fruit and vegetable consumption is high among the patients, with none consuming five servings of fruit and vegetables on a daily basis. A study in Laos reported similar findings to this study, where 95% of adults consume less than five servings of fruit and vegetables.[187] In the USA, only 12% meet the daily recommended fruit and vegetable consumption.[188] This indicates the magnitude of the problem is greater in Ethiopia. Inadequate consumption of fruit and vegetables is a major contributor to mortality globally, but its burden is higher in developing countries, particularly in Ethiopia.[82]

Study 2 of this thesis demonstrated patients had an understanding that eating fruit and vegetables is heart-healthy behaviour, but they had deficient understanding regarding daily recommendations for fruit and vegetable consumption. Study 2 further explored the barriers to fruit and vegetable consumption, and identified multifactorial barriers to adequate consumption of fruit and vegetables including lack of access, cost and sociocultural factors. This finding concurs with those of studies undertaken in the USA[92] and South Africa.[94] But particular social and cultural factors play a vital role in consumption of fruit and vegetables in Ethiopia, and these need to be addressed through further research. This study identified that a high value is given to eating meat, whilst fruit and vegetables are traditionally considered to be the food of the poor. This social belief is passed down and is being practised by the current generation. In addition, dietary choices may depend on religion. Among Ethiopian Orthodox Christians, a two-month fasting period annually is a time when no animal products are eaten, and after the fasting period, meat and other animal products are commonly consumed which causes excess and consecutive consumption of meat and other unhealthy animal products. In Ethiopia, use of unhealthy cooking oil is one of the factors that predisposes adults to CVD. Recently, the government put a tax on oil products with a high content of saturated fats, and this should be strengthened as it promotes consumption of healthier oil products. Overall, patient counselling and teaching particularly on the daily recommended serving of fruit and vegetables, and ways to mitigate their barriers and increase intake, is crucial to promote health.

Physical inactivity: Physical inactivity is a major contributor to the increasing CVD burden globally, and improving physical activity will contribute to sustainable health.[189] The findings of study 1 revealed that physical inactivity is the second most predominant unhealthy behaviour among CVD patients; more than half (51.6%) of the

patients attained less than 600 MET minutes per week. Females have a higher rate of physical inactivity than males due to sociocultural factors that restrict them from participating in physical activity. This finding concurs with a study from Sweden which revealed 57% prevalence of low physical activity among CVD patients, and numerous studies have shown women have a lower rate of physical activity than men.[190, 191] This confirms that the magnitude of physical inactivity in Ethiopia is almost as high as it is in a developed country. Studies have demonstrated that physical activity may effectively reduce the chance of developing CVD and increase life expectancy, and it is also important for patients in secondary prevention of CVD.[98, 192] Conversely, sedentary CVD patients have a 3.9-fold increased risk of death compared to non-sedentary patients.[193] Physical activity is associated with lower risk of mortality and CVD events, and promoting physical activity is simple, cost effective and the most feasible global strategy that could reduce the burden of CVD.[97] High-risk patients who have a sedentary lifestyle have to be identified and special attention and counselling should be given to improve their level of physical activity.

Study 2 also explored patients' understanding of the relationship between physical activity and heart health and showed patients understand that physical activity is heart-healthy behaviour and reduces the risk of developing heart disease from hypertension. This thesis further investigated barriers to physical activity to help understand the reason why there is a high physical inactivity rate among the patients. Thus, the current study identified that poor physical health, lack of time and lack of accessible exercise facilities were major barriers to physical activity for the patients. These are common barriers to physical activity identified by other research.[114-116]

7.2.2 Inconsistent and suboptimal cardiovascular health literacy in patients

Overall, the findings of both studies revealed that patients have a deficient understanding of cardiovascular health. Chapter 5 of this thesis reported that patients have suboptimal understanding of CVD risk factors. Chapter 6 demonstrated that patients' understanding of heart disease and risk behaviours was inconsistent, and that patients had a lack of understanding of heart disease and related signs and symptoms, khat chewing and hypertension. However, they had good understanding that smoking, drinking alcohol, inadequate fruit and vegetable consumption, and physical inactivity are risk factors for heart disease. The study also revealed that patients' understanding varies with sociodemographic factors, particularly with residence, education level and marital status. Low education, rural residence and being single were associated with poorer knowledge of CVD risk factors.

Chapter 5 demonstrated that higher education levels are associated with better knowledge of CV risk factors. Chapter 6 of this thesis confirmed this, demonstrating a correlation between education and knowledge of heart disease and its signs and symptoms. Moreover, patients also perceived they had a low risk of heart disease. Numerous studies have reported higher education is associated with better understanding of CVD and associated health behaviours.[194, 195] Thus, improving education for the population can help to increase health literacy for the general community. Interventions that target individuals with inadequate understanding, particularly uneducated and rural residents, could help to improve health literacy. The Ethiopian government is working to achieve equitable education in 2030 as part of Sustainable Development Goal 4, and this should be strengthened as it contributes to better health literacy.

This thesis contributes to a better understanding of the crucial role of knowledge of CVD risk factors in secondary prevention of CVD. Improving patients' knowledge of CVD risk factors is essential for secondary prevention of CVD in patients who are at high risk. Despite this, the findings of this thesis revealed patients have a deficient understanding of CVD and associated risk factors. This concurs with findings from developed countries,[134, 196] and this shows the problem is a global challenge. Thus, secondary prevention strategies should aim to improve patients' understanding of the disease and related risk factors.

Even though self-perceived heart disease risk has a vital role in promoting patients' risk reduction behaviour,[197] chapter 6 of this thesis revealed high-risk patients underestimate their future risk of heart disease. This may have contributed to the high prevalence of multiple unhealthy behaviours among patients, which was demonstrated in chapter 4 of this thesis. This reveals that patients need more health information regarding the risk factors of heart disease, particularly the risk of heart disease from hypertension, and secondary prevention strategies.

7.3 Significance of the thesis

This research was the first to explore CVD risk behaviours and health literacy among CVD patients in Ethiopia using a mixed-methods design. The findings suggest future directions for researchers who plan to study this topic. However, there is a need for further research, particularly contextualised interventional and feasibility studies aiming to modify health behaviour and to improve health literacy in CVD patients.

The findings from this research can also be used as baseline data for further interventional studies which aim to improve health behaviour and CV health literacy for patients with CV conditions.

The findings of this research are important for the Harari regional health bureau and the Dire Dawa City Administration health bureau, as well as for the federal health ministry policy makers, as it indicates a change is required to improve follow-up services in order to support patients to adopt healthy behaviours.

It also indicates the importance of healthcare providers assessing patients for unhealthy behaviour and identifying their understanding of health behaviours to tailor individualised health information as well as to identify barriers to health behaviours in order to help patients overcome these.

7.4 Strengths and limitations of the study

7.4.1 Strengths

As previously described, the studies were conducted in two consecutive phases: study 1 informed study 2 and this made it possible to comprehensively investigate the problem.

In addition, a mixed-methods design was used which enabled the researcher to comprehensively explore patients' awareness of CVD and its risk factors.

Lastly, study 1 used several validated instruments which were shown to have appropriate validity and reliability measurement scores.

7.4.2 Limitations

First, the study did not include biochemical measurements such as blood cholesterol and anthropometric measurements such as weight, BMI and waist circumference, which are also important measures in cardiovascular risk assessment.

Second, the use of a cross-sectional study did not enable the analysis of behaviour over time and could not establish a causal relationship between exposure and outcome variables.

Thirdly, the study relied on self-reported assessment of behavioural risk factors, which is prone to social desirability bias, in which patients might have reported a socially desirable response, and recall bias.

Fourthly, this study has not explored medication adherence, which is an important component of self-management and is a challenge of CVD care associated with the availability and cost of drugs in developing countries. In addition, it is important to reflect on health-related quality of life among the patients; however, this was not addressed by the studies in this thesis.

Lastly, the studies were conducted with patients who attended follow-up care clinics in two referral hospitals located in eastern Ethiopia, which may not represent all hospitals in the country. This may make it difficult to generalise the findings to the general population. In addition, the study was conducted in one developing country only and thus may not be generalisable to other developing countries. Thus, a large-scale epidemiological study conducted at the national level is warranted to reach a comprehensive understanding of the prevalence of health behaviours in Ethiopia.

7.5 Implications for practice

There is a need to design innovative, structured and cost-effective patient education and counselling strategies to reduce the burden of CVD risk behaviours. This research showed that a significant number of patients are uneducated, their source of health information is limited, and they have deficient understanding of CVD and associated

health behaviours. Identifying and considering patients' education level, values, preferences and health information needs is crucial to tailor health information for patients. In addition, health education sessions for groups of CVD patients in hospital facilities have to be strengthened to create awareness.

Assessment of patients' health conditions and delivery of tailored counselling and care is crucial because the level of patients' exposure to risk behaviours and their awareness vary with different factors such as residence and education levels.

Currently the focus in treatment is on medical care rather than supporting patients to attain healthy lifestyle behaviours in the follow-up units. Therefore, nurses should be involved in care delivery which should include organised patient counselling. Unfortunately, there is currently no cardiovascular-specific nurse speciality in Ethiopia. Thus, it is important to train nurses and other health care professionals in the area of cardiovascular care to improve the quality of patient care. In addition, continuing professional development through free online resources such as the European Society of Cardiology (ESC) e-Learning platform could help nurses to improve their practice.

Most patients with hypertension who were at high risk of developing heart disease reported they were not concerned. Thus, it is important to create awareness of the impact of hypertension on the risk of heart disease through intensive patient education.

Implementation of community primary prevention strategies can effectively reduce cigarette smoking, blood pressure and diabetes in developing countries, as revealed by reviews of evidence.[198] This may help to improve unhealthy behaviours if implemented in Ethiopia. Review evidence reveals multiple risk factor interventions are effective in reducing CVD risk factors,[199] so application of such primary prevention interventions could help promote healthy behaviours and reduce the burden of CVD

and related risk behaviours at the community level. It is indeed important to promote healthy lifestyles for children particularly healthy diet to prevent childhood obesity and to aid CVD prevention.

7.6 Implications for policy

Despite the high burden of CVD and associated risk behaviours in developing countries, this topic has not received appropriate attention from policy makers. The high prevalence of CVD and related risk behaviours warrants policy directed at CV health. Thus, attention needs to be given to CVD prevention to avert this silent epidemic in developing countries, particularly in Ethiopia.

Implementation of a strict taxation policy and restrictions on advertising tobacco and alcohol products are also important.

Designing and implementing primary and secondary prevention strategies at both community and facility levels is crucial to reduce the burden of CVD and reduce the cost of treatment, which should be prioritized on the policy agenda.

7.7 Directions for future research

Research on CVD has not received the attention it deserves in developing countries, particularly in Ethiopia. Establishing strong chronic disease research teams at the national and regional levels could help to generate evidence to design and implement prevention interventions. Moreover, neglecting this issue will increase the burden and related cost of health care in the long term. Thus, it is important to conduct research at the national level to gather evidence regarding the national prevalence of CVD and related risk behaviours in Ethiopia.

Given that there was no organised patient data base that could be used, I collected primary data for this research. Creating an electronic data base in which patient information could be stored in the follow-up units and appropriate recording of patients' medical information so that it can be used for future research to promote evidence-based prevention interventions is vital. This could help to generate longitudinal data to identify changes in patients' health behaviour overtime. However, manual recording of patients' data and incomplete medical information is currently a challenge to researchers. Integrating clinical care with research may help to provide evidence-based care and improve treatment outcomes for patients.

Interventional research and feasibility studies on innovative strategies are also required to implement effective lifestyle interventions such as nurse-led interventions among patients in Ethiopia.

Future studies should focus on exploring and improving health behaviour and health literacy for CVD patients and the general population. Implementing evidence-based behaviour change models for CVD patients as well as for the general population can help to promote healthy behaviours and improve heart health.

Randomised controlled trials are crucial to identify effective lifestyle interventions for implementation. Studies have revealed nurse-led interventions are effective to promote behaviour change and to improve clinical outcomes for patients;[153, 200] however this has not been demonstrated in the context of Ethiopia in patients with cardiovascular conditions. Thus, it is important to study the feasibility and effectiveness of nurse-led interventions for health behaviour modification in the context of the Ethiopian healthcare system. Moreover, a multidisciplinary patient care

approach should be considered to prevent fragmentation of care, with nurses taking the lead.

In addition to assessing behavioural risk factors, the study of biometric and biochemical measurements such as BMI, blood sugar level and cholesterol levels in both CVD patients and the general population is also critical because these are also major CVD predisposing factors.

The findings of this research emphasise the need for health authority support for research to further narrow evidence gaps on CVD and to guide evidence-based policy development.

Future studies should focus on identifying high-risk populations for CVD as this can help to target intervention activities. Assessment of actual heart disease risk through heart disease risk estimates such as the Framingham Risk Score[201] could help to identify high-risk adults and target interventions to promote behaviour change.

Sociocultural and dietary practices in Ethiopia which are predisposing factors to cardiovascular disease also require further study.

7.8 Conclusion

In general, this thesis revealed that Ethiopia is facing a high burden of CVD risk factors in the presence of limited CV health awareness. Patients who are at high risk for CVD have a lack of understanding of their actual risk and CVD risk factors. The findings of this thesis warrant policy to implement effective primary as well as secondary CVD prevention strategies. Primary and secondary interventions are required to prevent CVD. Nurse-led, intensive and structured counselling services can effectively improve awareness and promote healthy behaviour for patients. Overall, the findings of this

thesis have contributed to narrowing the evidence gap and provided recommendations for potential future change on the distribution of CVD risk behaviours and related health literacy in Ethiopia.

8. References

1. MOH. Health & health-related indicators. Addis Ababa: MOH 2017, p. 1-76.

2. Assefa Y, Gelaw YA, Hill PS, et al. Community health extension program of Ethiopia, 2003-2018: successes and challenges toward universal coverage for primary healthcare services. *Globalization and health* 2019; 15: 24. DOI: 10.1186/s12992-019-0470-1.

3. Abebe SM, Andargie G, Shimeka A, et al. The prevalence of non-communicable diseases in northwest Ethiopia: survey of Dabat Health and Demographic Surveillance System. *BMJ open* 2017; 7: e015496. 2017/10/25. DOI: 10.1136/bmjopen-2016-015496.

4. MOH. Disease Prevention & Control, http://www.moh.gov.et/ejcc/en/dpc (2018, accessed 5/11/2019).

5. FMOH. National Strategic Action Plan (NSAP) for Prevention & Control of Non-Communicable Diseases in Ethiopia Ethiopia 2010, p. 1-60.

6. Yadeta D, Guteta S, Alemayehu B, et al. Spectrum of cardiovascular diseases in six main referral hospitals of Ethiopia. *Heart Asia* 2017; 9: e010829. 2018/03/02. DOI: 10.1136/heartasia-2016-010829.

7. Guliani H, Gamtessa S and Çule M. Factors affecting tobacco smoking in Ethiopia: evidence from the demographic and health surveys. *BMC Public Health* 2019; 19: 938. 2019/07/14. DOI: 10.1186/s12889-019-7200-8.

8. Leuner CJ and Weldegerima AH. Cardiology services in Ethiopia. *Eur Heart J* 2018; 39: 2699-2700. 2018/10/06. DOI: 10.1093/eurheartj/ehy373.

9. Alsheikh-Ali AA, Omar MI, Raal FJ, et al. Cardiovascular Risk Factor Burden in Africa and the Middle East: The Africa Middle East Cardiovascular Epidemiological (ACE) Study. *PLoS ONE* 2014; 9: 1-9. DOI: 10.1371/journal.pone.0102830.

10. Roth GA, Johnson C, Abajobir A, et al. Global, regional, and national burden of cardiovascular diseases for 10 Causes, 1990 to 2015. *J Am Coll Cardiol* 2017; 70: 1-25. 2017/05/22. DOI: 10.1016/j.jacc.2017.04.052.

11. Hay S, Abajobir A, Abate K, et al. Global, regional, and national disability-adjusted life-years (DALYs) for 333 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet* 2017; 390:: 1260-1344.

12. Misganaw A, Haregu TN, Deribe K, et al. National mortality burden due to communicable, non-communicable, and other diseases in Ethiopia, 1990-2015: findings from the Global Burden of Disease Study 2015. *Popul Health Metr* 2017; 15: 1-17. DOI: 10.1186/s12963-017-0145-1.

13. Pandey KR and Meltzer DO. Financial burden and impoverishment due to cardiovascular medications in low and middle income countries: an Illustration from india. *PLoS One* 2016; 11: e0155293. 2016/05/10. DOI: 10.1371/journal.pone.0155293.

14. Mensah GA, Roth GA, Sampson UK, et al. Mortality from cardiovascular diseases in sub-Saharan Africa, 1990-2013: a systematic analysis of data from

the Global Burden of Disease Study 2013. *Cardiovasc J Afr* 2015; 26: S6-10. 2015/05/13. DOI: 10.5830/cvja-2015-036.

15. Moran A, Forouzanfar M, Sampson U, et al. The epidemiology of cardiovascular diseases in sub-Saharan Africa: the Global Burden of Diseases, Injuries and Risk Factors 2010 Study. *Progress in cardiovascular diseases* 2013; 56: 234-239. 2013/09/28. DOI: 10.1016/j.pcad.2013.09.019.

16. Minicuci N, Biritwum RB, Mensah G, et al. Sociodemographic and socioeconomic patterns of chronic non-communicable disease among the older adult population in Ghana. *Global health action* 2014; 7: 21292. 2014/04/22. DOI: 10.3402/gha.v7.21292.

17. World Health Organization. Global health risks: mortality and burden of disease attributable to selected major risks. Geneva: WHO Press, 2009, p. 1-70.

18. Mills KT, Bundy JD, Kelly TN, et al. Global disparities of hypertension prevalence and control: A systematic analysis of population-based studies from 90 countries. *Circulation* 2016; 134: 441-450. 2016/08/10. DOI: 10.1161/circulationaha.115.018912.

19. Khanam MA, Lindeboom W, Razzaque A, et al. Prevalence and determinants of pre-hypertension and hypertension among the adults in rural Bangladesh: findings from a community-based study. *BMC Public Health* 2015; 15: 203. 2015/04/17. DOI: 10.1186/s12889-015-1520-0.

20. Guwatudde D, Mutungi G, Wesonga R, et al. The epidemiology of hypertension in Uganda: findings from the National Non- Communicable Diseases Risk

Factor Survey. *PLoS ONE* 2015; 10: 1-13. DOI: doi:10.1371/journal.pone.0138991.

21. Soubeiga JK, Millogo T, Bicaba BW, et al. Prevalence and factors associated with hypertension in Burkina Faso: a countrywide cross-sectional study. *BMC Public Health* 2017; 17: 64. 2017/01/13. DOI: 10.1186/s12889-016-3926-8.

22. Jessen N, Damasceno A, Silva-Matos C, et al. Hypertension in Mozambique: trends between 2005 and 2015. *J Hyperten* 2017 2017/12/07. DOI: 10.1097/hjh.0000000000001618.

23. Pires JE, Sebastião YV, Langa AJ, et al. Hypertension in Northern Angola: prevalence, associated factors, awareness, treatment and control. *BMC Public Health* 2013; 13: 90.

24. Joshi MD, Ayah R, Njau EK, et al. Prevalence of hypertension and associated cardiovascular risk factors in an urban slum in Nairobi, Kenya: A population-based survey. *BMC Public Health* 2014; 14: 1177.

25. Ige OK, Owoaje ET and Adebiyi OA. Non communicable disease and risky behaviour in an urban university community Nigeria. *Afr Health Sci* 2013; 13: 62-67. 2013/05/10. DOI: 10.4314/ahs.v13i1.9.

26. Abebe SM, Berhane Y, Worku A, et al. Prevalence and associated factors of hypertension: a crossectional community based study in northwest Ethiopia. *PLoS One* 2015; 10: e0125210. 2015/04/25. DOI: 10.1371/journal.pone.0125210.

27. Bonsa F, Gudina EK and Hajito KW. Prevalence of hypertension and associated factors in Bedele Town, Southwest Ethiopia. *Ethiop J Health Sci* 2014; 24: 21-26. 2014/03/05.

28. Helelo TP, Gelaw YA and Adane AA. Prevalence and associated factors of hypertension among adults in Durame Town, Southern Ethiopia. *PLoS One* 2014; 9: e112790. 2014/11/22. DOI: 10.1371/journal.pone.0112790.

29. Tefera YG, Abegaz TM, Abebe TB, et al. The changing trend of cardiovascular disease and its clinical characteristics in Ethiopia: hospital-based observational study. *Vasc Health Risk Manag* 2017; 13: 143-151. 2017/05/04. DOI: 10.2147/vhrm.s131259.

30. Kelemu TK and Yonatan MM. Prevalence of hypertension in Ethiopia: a systematic meta-analysis. *Public Health Reviews* 2015; 36: 1-12. DOI: DOI 10.1186/s40985-015-0014-z.

31. Asresahegn H, Tadesse F and Beyene E. Prevalence and associated factors of hypertension among adults in Ethiopia: a community based cross-sectional study. *BMC Research Notes* 2017; 10: 629. 2017/12/01. DOI: 10.1186/s13104-017-2966-1.

32. Desalegn H, Fekadu S and Deribew A. Clinical assessment of cardiovascular disease associated risk factors in Jimma town, southwest Ethiopia; a community based cross - sectional study. *Ethiop Med J* 2017; 55: 3-9. 2017/11/18.

33. Misganaw A, Mariam DH and Araya T. The double mortality burden among adults in Addis Ababa, Ethiopia, 2006-2009. *Preventing chronic disease* 2012; 9: E84. 2012/04/14.

34. Abera SF, Gebru AA, Biesalski HK, et al. Social determinants of adult mortality from non-communicable diseases in northern Ethiopia, 2009-2015: Evidence from health and demographic surveillance site. *PLoS One* 2017; 12: e0188968. 2017/12/14. DOI: 10.1371/journal.pone.0188968.

35. Gerensea H and Teklay H. Trend of hypertension morbidity and mortality in Tigray Region from 2011 to 2015, Tigray, Ethiopia. *BMC Res Notes* 2018; 11: 375. 2018/06/10. DOI: 10.1186/s13104-018-3488-1.

36. Tsegalem H. Prevalence of cardiovascular emergencies in specialized hospital, Addis Ababa Ethiopia *Emergency Medicine* 2014; 4: 1-5.

37. Endriyas M, Mekonnen E, Dana T, et al. Burden of NCDs in SNNP region, Ethiopia: a retrospective study. *BMC health services research* 2018; 18: 520. 2018/07/06. DOI: 10.1186/s12913-018-3298-0.

38. Abdissa SG, Oli K, Feleke Y, et al. Spectrum of cardiovascular diseases among Ethiopian patients at Tikur Anbessa Specialized University Teaching Hospital, Addis Ababa. *Ethiopian medical journal* 2014; 52: 9-17. 2014/07/30.

39. Murphy GA, Asiki G, Ekoru K, et al. Sociodemographic distribution of non-communicable disease risk factors in rural Uganda: a cross-sectional study. *Int J Epidemiol* 2013; 42: 1740-1753. 2013/11/06. DOI: 10.1093/ije/dyt184.

40. Fateh M, Emamian MH, Asgari F, et al. Socioeconomic inequality in hypertension in Iran. *J Hyperten* 2014; 32: 1782-1788. 2014/07/01. DOI: 10.1097/hjh.0000000000000260.

41. Kaplan GA and Keil JE. Socioeconomic factors and cardiovascular disease: a review of the literature. *Circulation* 1993; 88: 1973-1998. DOI: 10.1161/01.cir.88.4.1973.

42. Ngango JM and Omole OB. Prevalence and sociodemographic correlates of cardiovascular risk factors among patients with hypertension in South African primary care. *Cardiovasc J Afr* 2018; 29: 344-351. DOI: 10.5830/CVJA-2018-038.

43. WHO. The WHO STEPwise approach to Surveillance of noncommunicable diseases (STEPS). Geneva: WHO 2003, p. 1-50.

44. Purohit N, Bhati DK, Gupta SD, et al. Quantifying socioeconomic and lifestyle related health risks: burden of cardiovascular disease among Indian males. *Cent Asian J Glob Health* 2015; 4: 218. 2015/12/22. DOI: 10.5195/cajgh.2015.218.

45. Howitt C, Hambleton IR, Rose AM, et al. Social distribution of diabetes, hypertension and related risk factors in Barbados: a cross-sectional study. *BMJ open* 2015; 5: e008869. 2015/12/20. DOI: 10.1136/bmjopen-2015-008869.

46. Wang H, Yuan Y, Song L, et al. Association between education and the risk of incident coronary heart disease among middle-aged and older Chinese: the Dongfeng-Tongji Cohort. *Scientific Reports* 2017; 7: 776. DOI: 10.1038/s41598-017-00880-8.

47. Kayima J, Nankabirwa J, Sinabulya I, et al. Determinants of hypertension in a young adult Ugandan population in epidemiological transition-the MEPI-CVD survey. *BMC Public Health* 2015; 15: 830. 2015/09/01. DOI: 10.1186/s12889-015-2146-y.

48. World Health Organization. WHO report on the global tobacco epidemic, Monitoring tobacco use and prevention policies. Geneva, Switzerland : WHO2017, p. 1-135.

49. Angaw K, Dadi AF and Alene KA. Prevalence of hypertension among federal ministry civil servants in Addis Ababa, Ethiopia: a call for a workplace-screening program. *BMC Cardiovasc Disord* 2015; 15: 76. 2015/07/23. DOI: 10.1186/s12872-015-0062-9.

50. Epstein KA, Viscoli CM, Spence JD, et al. Smoking cessation and outcome after ischemic stroke or TIA. *Neurology* 2017; 89: 1723-1729. 2017/09/10. DOI: 10.1212/wnl.0000000000004524.

51. De Smedt D, De Sutter J, De Pauw M, et al. Lifestyle behaviour and risk factor control in coronary patients: Belgian results from the cross-sectional EUROASPIRE surveys. *Acta cardiologica* 2018: 1-7. 2018/02/21. DOI: 10.1080/00015385.2018.1438092.

52. Mifsud M. The PACI survey: Patient adherence to cardioprotective lifestyle interventions in myocardial infarction patients treated with primary percutaneous coronary intervention. *Br J Cardiol* 2017; 24: 126-128. DOI: 10.5837/bjc.2017.027

53. Shujaa AK and Nammas W. Khat chewing and cardiovascular risk profile in a cohort of Yemeni patients with angiographically documented coronary artery disease. *Heart Asia* 2012; 4: 164-167. 2012/01/01. DOI: 10.1136/heartasia-2012-010205.

54. Olivares DE, Chambi FR, Chani EM, et al. Risk factors for chronic diseases and multimorbidity in a primary care context of central Argentina: A web-based interactive and cross-sectional study. *Int J Environ Res Public Health* 2017; 14 2017/03/04. DOI: 10.3390/ijerph14030251.

55. Chaves G, Britez N, Maciel V, et al. [Prevalence of cardiovascular risk factors in an urban ambulatory adult population: AsuRiesgo study, Paraguay]. *Revista panamericana de salud publica = Pan American journal of public health* 2015; 38: 136-143. 2015/11/19.

56. Vellios N, Ross H and Perucic AM. Trends in cigarette demand and supply in Africa. *PLoS One* 2018; 13: e0202467. 2018/08/18. DOI: 10.1371/journal.pone.0202467.

57. Tang S, Bishwajit G, Luba TR, et al. Prevalence of smoking among men in Ethiopia and Kenya: a cross-sectional Study. *Int J Environ Res Public Health* 2018; 15: 1232. DOI: 10.3390/ijerph15061232.

58. Brathwaite R, Addo J, Smeeth L, et al. A systematic review of tobacco smoking prevalence and description of tobacco control strategies in Sub-Saharan African countries; 2007 to 2014. *PloS One* 2015; 10: e0132401-e0132401. DOI: 10.1371/journal.pone.0132401.

59. Haregu TN, Oti S, Egondi T, et al. Co-occurrence of behavioral risk factors of common non-communicable diseases among urban slum dwellers in Nairobi, Kenya. *Global health action* 2015; 8: 28697. 2015/09/20. DOI: 10.3402/gha.v8.28697.

60. Ngaruiya C, Abubakar H, Kiptui D, et al. Tobacco use and its determinants in the 2015 Kenya WHO STEPS survey. *BMC public health* 2018; 18: 1223-1223. DOI: 10.1186/s12889-018-6058-5.

61. Maimela E, Alberts M, Modjadji SE, et al. The prevalence and determinants of chronic non-communicable disease risk factors amongst adults in the Dikgale Health Demographic and Surveillance System (HDSS) site, Limpopo Province of South Africa. *PLoS One* 2016; 11: e0147926. 2016/02/18. DOI: 10.1371/journal.pone.0147926.

62. Mondo CK, Otim MA, Akol G, et al. The prevalence and distribution of non-communicable diseases and their risk factors in Kasese district, Uganda. *Cardiovasc J Afr* 2013; 24: 52-57. 2013/06/06. DOI: 10.5830/cvja-2012-081.

63. Lakew Y and Haile D. Tobacco use and associated factors among adults in Ethiopia: further analysis of the 2011 Ethiopian Demographic and Health Survey. *BMC Public Health* 2015; 15: 487. 2015/05/15. DOI: 10.1186/s12889-015-1820-4.

64. Tibebu A, Mengistu D and Negesa L. Adherence to recommended lifestyle modifications and factors associated for hypertensive patients attending chronic follow-up units of selected public hospitals in Addis Ababa, Ethiopia.

Patient preference and adherence 2017; 11: 323-330. 2017/03/11. DOI: 10.2147/ppa.S126382.

65. Asgedom SW, Gudina EK and Desse TA. Assessment of blood pressure control among hypertensive patients in southwest Ethiopia. *PLoS One* 2016; 11: e0166432. 2016/11/24. DOI: 10.1371/journal.pone.0166432.

66. Soboka M, Gudina EK and Tesfaye M. Psychological morbidity and substance use among patients with hypertension: a hospital-based cross-sectional survey from South West Ethiopia. *International journal of mental health systems* 2017; 11: 5. 2017/01/06. DOI: 10.1186/s13033-016-0108-0.

67. Teshome DF, Demssie AF and Zeleke BM. Determinants of blood pressure control amongst hypertensive patients in Northwest Ethiopia. *PLoS One* 2018; 13: e0196535. 2018/05/03. DOI: 10.1371/journal.pone.0196535.

68. World Health Organization. Global status report on alcohol and health Geneva, Switzerland: WHO Press, 2014, p. 1-392.

69. Balint EE, Falkay G and Balint GA. Khat - a controversial plant. *Wiener klinische Wochenschrift* 2009; 121: 604-614. 2009/11/19. DOI: 10.1007/s00508-009-1259-7.

70. El-Menyar A, Mekkodathil A, Al-Thani H, et al. Khat use: history and heart failure. *Oman Med J* 2015; 30: 77-82. 2015/05/12. DOI: 10.5001/omj.2015.18.

71. Al-Motarreb A, Shabana A and El-Menyar A. Epicardial coronary arteries in khat chewers presenting with myocardial infarction. *International journal of*

vascular *medicine* 2013; 2013: 857019. 2013/11/14. DOI: 10.1155/2013/857019.

72. Saha S and Dollery C. Severe ischaemic cardiomyopathy associated with khat chewing. *J R Soc Med* 2006; 99: 316-318. 2006/06/02. DOI: 10.1258/jrsm.99.6.316.

73. Al-Motarreb A, Briancon S, Al-Jaber N, et al. Khat chewing is a risk factor for acute myocardial infarction: a case-control study. *Br J Clin Pharmacol* 2005; 59: 574-581. 2005/04/22. DOI: 10.1111/j.1365-2125.2005.02358.x.

74. Getahun W, Gedif T and Tesfaye F. Regular khat (Catha edulis) chewing is associated with elevated diastolic blood pressure among adults in Butajira, Ethiopia: a comparative study. *BMC Public Health* 2010; 10: 390. 2010/07/03. DOI: 10.1186/1471-2458-10-390.

75. Hassen K, Abdulahi M, Dejene T, et al. Khat as a risk factor for hypertension: A systematic review. *JBI Library Systematic Review* 2012; 10: 2882-2905. 2012/01/01. DOI: 10.11124/jbisrir-2012-27.

76. Geta TG, Woldeamanuel GG, Hailemariam BZ, et al. Association of chronic khat chewing with blood pressure and predictors of hypertension among adults in Gurage Zone, Southern Ethiopia: a comparative study. *Integrated blood pressure control* 2019; 12: 33-42. 2020/01/08. DOI: 10.2147/ibpc.S234671.

77. Aune D, Giovannucci E, Boffetta P, et al. Fruit and vegetable intake and the risk of cardiovascular disease, total cancer and all-cause mortality-a systematic review and dose-response meta-analysis of prospective studies. *Int J Epidemiol* 2017; 46: 1029-1056. 2017/03/25. DOI: 10.1093/ije/dyw319.

78. Miller V, Mente A, Dehghan M, et al. Fruit, vegetable, and legume intake, and cardiovascular disease and deaths in 18 countries (PURE): a prospective cohort study. *Lancet* 2017; 390: 2037-2049. 2017/09/03. DOI: 10.1016/s0140-6736(17)32253-5.

79. Pienovi L, Lara M, Bustos P, et al. Fruit and vegetable intake, and blood pressure. A population research. *Archives of Latinoamerican Nutrition* 2015; 65: 21-26. 2015/09/01.

80. Gan Y, Tong X, Li L, et al. Consumption of fruit and vegetable and risk of coronary heart disease: a meta-analysis of prospective cohort studies. *International journal of cardiology* 2015; 183: 129-137. 2015/02/11. DOI: 10.1016/j.ijcard.2015.01.077.

81. Aljefree N and Ahmed F. Association between dietary pattern and risk of cardiovascular disease among adults in the Middle East and North Africa region: a systematic review. *Food and Nutrition Research* 2015; 59: 27486. 2015/06/20. DOI: 10.3402/fnr.v59.27486.

82. Melaku YA, Temesgen AM, Deribew A, et al. The impact of dietary risk factors on the burden of non-communicable diseases in Ethiopia: findings from the Global Burden of Disease study 2013. *Int J Behav Nutr Phys Act* 2016; 13: 122. 2016/12/17. DOI: 10.1186/s12966-016-0447-x.

83. World Health Organization. Diet, nutrition and the prevention of chronic diseases, report of a joint WHO/ FAO expert In: consultation, (ed.). 1 ed. Geneva : WHO2003, p. 1-160.

84. Nour M, Sui Z, Grech A, et al. The fruit and vegetable intake of young Australian adults: a population perspective. *Public Health Nutr* 2017; 20: 2499-2512. 2017/06/28. DOI: 10.1017/s1368980017001124.

85. Oluyombo R, Akinwusi PO, Olamoyegun MO, et al. Clustering of cardiovascular risk factors in semi-urban communities in south-western Nigeria. *Cardiovasc J Afr* 2016; 27: 322-327. 2016/11/03. DOI: 10.5830/cvja-2016-024.

86. Olack B, Wabwire-Mangen F, Smeeth L, et al. Risk factors of hypertension among adults aged 35-64 years living in an urban slum Nairobi, Kenya. *BMC Public Health* 2015; 15: 1251. 2015/12/19. DOI: 10.1186/s12889-015-2610-8.

87. Koma MP and Lebelo SL. Prevalence of hypertension and associated risk factors among rural Bapedi Women in Sekhukhune Area, Limpopo Province, South Africa. *Ecology of food and nutrition* 2017; 56: 31-44. 2016/11/15. DOI: 10.1080/03670244.2016.1247702.

88. Oluyombo R, Olamoyegun MA, Olaifa O, et al. Cardiovascular risk factors in semi-urban communities in southwest Nigeria: patterns and prevalence. *Journal of epidemiology and global health* 2015; 5: 167-174. 2015/04/30. DOI: 10.1016/j.jegh.2014.07.002.

89. Okpechi IG, Chukwuonye, II, Tiffin N, et al. Blood pressure gradients and cardiovascular risk factors in urban and rural populations in Abia State South Eastern Nigeria using the WHO STEPwise approach. *PLoS One* 2013; 8: e73403. 2013/09/17. DOI: 10.1371/journal.pone.0073403.

90. Kufe NC, Ngufor G, Mbeh G, et al. Distribution and patterning of non-communicable disease risk factors in indigenous Mbororo and non-

autochthonous populations in Cameroon: cross sectional study. *BMC Public Health* 2016; 16: 1188. 2016/11/25. DOI: 10.1186/s12889-016-3837-8.

91. Awoke A, Awoke T, Alemu S, et al. Prevalence and associated factors of hypertension among adults in Gondar, Northwest Ethiopia: a community based cross-sectional study. *BMC Cardiovasc Disord* 2012; 12: 113. 2012/11/29. DOI: 10.1186/1471-2261-12-113.

92. Wolf RL, Lepore SJ, Vandergrift JL, et al. Knowledge, barriers, and stage of change as correlates of fruit and vegetable consumption among urban and mostly immigrant black men. *Journal of the American Dietetic Association* 2008; 108: 1315-1322. 2008/07/29. DOI: 10.1016/j.jada.2008.05.011.

93. John JH and Ziebland S. Reported barriers to eating more fruit and vegetables before and after participation in a randomized controlled trial: a qualitative study. *Health education research* 2004; 19: 165-174. 2004/03/20. DOI: 10.1093/her/cyg016.

94. Sedibe HM, Kahn K, Edin K, et al. Qualitative study exploring healthy eating practices and physical activity among adolescent girls in rural South Africa. *BMC Pediatrics* 2014; 14. DOI: 10.1186/1471-2431-14-211.

95. Aaron KJ and Sanders PW. Role of dietary salt and potassium intake in cardiovascular health and disease: a review of the evidence. *Mayo Clinic proceedings* 2013; 88: 987-995. 2013/09/05. DOI: 10.1016/j.mayocp.2013.06.005.

96. Malta D, Petersen KS, Johnson C, et al. High sodium intake increases blood pressure and risk of kidney disease. From the Science of Salt: A regularly

updated systematic review of salt and health outcomes (August 2016 to March 2017). *J Clin Hypertens* 2018; 20: 1654-1665. 2018/11/08. DOI: 10.1111/jch.13408.

97. Lear SA, Hu W, Rangarajan S, et al. The effect of physical activity on mortality and cardiovascular disease in 130 000 people from 17 high-income, middle-income, and low-income countries: the PURE study. *Lancet* 2017; 390: 2643-2654. 2017/09/26. DOI: 10.1016/s0140-6736(17)31634-3.

98. Franco OH, de Laet C, Peeters A, et al. Effects of physical activity on life expectancy with cardiovascular disease. *Arch Intern Med* 2005; 165: 2355-2360. 2005/11/17. DOI: 10.1001/archinte.165.20.2355.

99. Minder CM, Shaya GE, Michos ED, et al. Relation between self-reported physical activity level, fitness, and cardiometabolic risk. *Am J Cardiol* 2014; 113: 637-643. 2013/12/24. DOI: 10.1016/j.amjcard.2013.11.010.

100. Borrell LN. The effects of smoking and physical inactivity on advancing mortality in U.S. adults. *Annals of Epidemiology* 2014; 24: 484-487. DOI: https://doi.org/10.1016/j.annepidem.2014.02.016.

101. Shortreed SM, Peeters A and Forbes AB. Estimating the effect of long-term physical activity on cardiovascular disease and mortality: evidence from the Framingham Heart Study. Heart (British Cardiac Society) 2013; 99: 649-654. 2013/03/12. DOI: 10.1136/heartjnl-2012-303461.

102. Pathak RK, Middeldorp ME, Meredith M, et al. Long-term effect of goal-directed weight management in an atrial fibrillation cohort: a long-term follow-

up study (LEGACY). *J Am Coll Cardiol* 2015; 65: 2159-2169. 2015/03/21. DOI: 10.1016/j.jacc.2015.03.002.

103.   Onyango MJ, Kombe I, Nyamongo DS, et al. A study to determine the prevalence and factors associated with hypertension among employees working at a call centre Nairobi Kenya. *The Pan African medical journal* 2017; 27: 178. 2017/09/15. DOI: 10.11604/pamj.2017.27.178.13073.

104.   Mathunjwa ML, Semple SJ and du Preez C. A 10-week aerobic exercise program reduces cardiometabolic disease risk in overweight/obese female African university students. *Ethnicity & Disease Journals* 2013; 23: 143-148. 2013/03/28.

105.   Rasiah R, Thangiah G, Yusoff K, et al. The impact of physical activity on cumulative cardiovascular disease risk factors among Malaysian adults. *BMC Public Health* 2015; 15: 1-9. DOI: 10.1186/s12889-015-2577-5.

106.   John B, Todd J, Mboya I, et al. Physical activity and associated factors from a cross-sectional survey among adults in northern Tanzania. *BMC Public Health* 2017; 17: 1-8. DOI: 10.1186/s12889-017-4512-4.

107.   Afrifa–Anane E, Agyemang C, Codjoe SN, et al. The association of physical activity, body mass index and the blood pressure levels among urban poor youth in Accra, Ghana. *BMC Public Health* 2015; 15. DOI: 10.1186/s12889-015-1546-3.

108.   Ogunmola OJ, Olaifa AO, Oladapo OO, et al. Prevalence of cardiovascular risk factors among adults without obvious cardiovascular

disease in a rural community in Ekiti State, Southwest Nigeria. *BMC Cardiovasc Disord* 2013; 13: 89. 2013/10/22. DOI: 10.1186/1471-2261-13-89.

109.   Akarolo-Anthony SN and Adebamowo CA. Prevalence and correlates of leisure-time physical activity among Nigerians. *BMC Public Health* 2014; 14: 529. 2014/06/03. DOI: 10.1186/1471-2458-14-529.

110.   Capingana DP, Magalhaes P, Silva AB, et al. Prevalence of cardiovascular risk factors and socioeconomic level among public-sector workers in Angola. *BMC Public Health* 2013; 13: 732. 2013/08/09. DOI: 10.1186/1471-2458-13-732.

111.   Bloomfield GS, Mwangi A, Chege P, et al. Multiple cardiovascular risk factors in Kenya: evidence from a health and demographic surveillance system using the WHO STEPwise approach to chronic disease risk factor surveillance. *Heart (British Cardiac Society)* 2013; 99: 1323-1329. 2013/07/23. DOI: 10.1136/heartjnl-2013-303913.

112.   Tachebele B, Abebe M, Addis Z, et al. Metabolic syndrome among hypertensive patients at University of Gondar Hospital, North West Ethiopia: a cross sectional study. *BMC Cardiovasc Disord* 2014; 14: 177. 2014/12/08. DOI: 10.1186/1471-2261-14-177.

113.   World Health Organisation. Global recommendations on physical activity for health. Switzerland2010, p. 1-60.

114.   Sabzmakan L, Morowatisharifabad MA, Mohammadi E, et al. Behavioral determinants of cardiovascular diseases risk factors: A qualitative directed content analysis. *ARYA Atherosclerosis* 2014; 10: 71-81. 2014/08/28.

115.   Veldhuijzen van Zanten JJCS, Rouse PC, Hale ED, et al. Perceived barriers, facilitators and benefits for regular physical activity and exercise in patients with rheumatoid arthritis: a review of the literature. *Sports Med* 2015; 45: 1401-1412. DOI: 10.1007/s40279-015-0363-2.

116.   Quiroz-Mora CA, Serrato-Ramírez DM and Bergonzoli-Peláez G. Factors associated with adherence to physical activity in patients with chronic non-communicable diseases. *Rev Salud Publica (Bogota)* 2018; 20: 460-464. DOI: 10.15446/rsap.V20n4.62959.

117.   Mbambo SW, Tlou B and Dlungwane TP. Factors associated with physical activity amongst patients with hypertension in two community health centres in uMgungundlovu health district, KwaZulu-Natal, 2018. *South African Family Practice* 2019; 61: 234-238. DOI: 10.1080/20786190.2019.1664085.

118.   Caleyachetty R, Echouffo-Tcheugui JB, Tait CA, et al. Prevalence of behavioural risk factors for cardiovascular disease in adolescents in low-income and middle-income countries: an individual participant data meta-analysis. *Lancet Diabetes Endocrinol* 2015; 3: 535-544. 2015/05/11. DOI: 10.1016/s2213-8587(15)00076-5.

119.   Selvarajah S, Haniff J, Kaur G, et al. Clustering of cardiovascular risk factors in a middle-income country: a call for urgency. *Eur J Prev Cardiol* 2013; 20: 368-375. 2012/02/22. DOI: 10.1177/2047487312437327.

120.   Li C, Ford ES, Mokdad AH, et al. Clustering of Cardiovascular Disease Risk Factors and Health-Related Quality of Life among US Adults. *Value Health* 2008; 11: 689-699. DOI: https://doi.org/10.1111/j.1524-4733.2007.00307.x.

121. Barutha M, Addya CL, Wilcoxa S, et al. Clustering of risk behaviours among African American adults. *Health Education Journal* 2011; 71: 565-575.

122. Aminde LN, Takah N, Ngwasiri C, et al. Population awareness of cardiovascular disease and its risk factors in Buea, Cameroon. *BMC Public Health* 2017; 17: 545. 2017/06/07. DOI: 10.1186/s12889-017-4477-3.

123. Boateng D, Wekesah F, Browne JL, et al. Knowledge and awareness of and perception towards cardiovascular disease risk in sub-Saharan Africa: A systematic review. *PLoS One* 2017; 12: e0189264. 2017/12/13. DOI: 10.1371/journal.pone.0189264.

124. Akintunde AA, Akintunde T and Opadijo OG. Knowledge of heart disease risk factors among workers in a Nigerian University: A call for concern. *Niger Med J* 2015; 56: 91-95. 2015/04/04. DOI: 10.4103/0300-1652.150688.

125. Tran DT, Zimmerman LM, Kupzyk KK, et al. Cardiovascular risk factors among college students: Knowledge, perception, and risk assessment. *J Am Coll Health* 2017; 65: 158-167.

126. Awad A and Al-Nafisi H. Public knowledge of cardiovascular disease and its risk factors in Kuwait: a cross-sectional survey. *BMC Public Health* 2014; 14: 1131. 2014/11/05. DOI: 10.1186/1471-2458-14-1131.

127. Zuhaid M, Kazmi S, Farooq U, et al. Knowledge of modifiable risk factors of cardiovascular diseases among patients with acute myocardial infarction. *Journal of Ayub Medical College Abbottabad* 2014; 26: 364-367. 2015/02/13.

128. Khan, Khoory A, Al Zaffin D, et al. Exploratory study into the awareness of heart diseases among Emirati women (UAE) and their health seeking behaviour- a qualitative study. *BMC Womens Health* 2016; 16: 71. 2016/11/09. DOI: 10.1186/s12905-016-0350-2.

129. Surka S, Steyn K, Everett-Murphy K, et al. Knowledge and perceptions of risk for cardiovascular disease: Findings of a qualitative investigation from a low-income peri-urban community in the Western Cape, South Africa. *Afr J Prim Health Care Fam Med* 2015; 7: 891. 2016/02/05. DOI: 10.4102/phcfm.v7i1.891.

130. Gill R and Chow CM. Knowledge of heart disease and stroke among cardiology inpatients and outpatients in a Canadian inner-city urban hospital. *Can J Cardiol* 2010; 26: 537-540. 2010/12/18.

131. Khan MS, Jafary FH, Faruqui AM, et al. High prevalence of lack of knowledge of symptoms of acute myocardial infarction in Pakistan and its contribution to delayed presentation to the hospital. *BMC Public Health* 2007; 7: 284. 2007/10/10. DOI: 10.1186/1471-2458-7-284.

132. Wagner J, Lacey K, Chyun D, et al. Development of a questionnaire to measure heart disease risk knowledge in people with diabetes: the Heart Disease Fact Questionnaire. *Patient Educ Couns* 2005; 58: 82-87. DOI: https://doi.org/10.1016/j.pec.2004.07.004.

133. Burger A, Pretorius R, Fourie CMT, et al. The relationship between cardiovascular risk factors and knowledge of cardiovascular disease in African men in the North-West Province. *Health SA Gesondheid* 2016; 21: 364-371. DOI: https://doi.org/10.1016/j.hsag.2016.07.003.

134. Tovar E and Clark MC. Knowledge and health beliefs related to heart disease risk among adults with type 2 diabetes. *J Am Assoc Nurse Pract* 2015; 27: 321-327. 2014/09/30. DOI: 10.1002/2327-6924.12172.

135. Chinju G and Andhuvan G. A population - based study on awareness of cardiovascular disease risk factors. *Indian J Pharm* 2014; 7: 23-25.

136. Andhuvan G, Ayyappan P, Sahana C, et al. Knowledge of modifiable risk factors of heart disease among patients with cardiovascular risk. *Asian J Pharm Clin Res* 2017; 10: 99-102.

137. Lechowicz M, Wilinski J, Kameczura T, et al. Awareness of cardiovascular risk factors in ambulatory cardiology patients. *Folia Medica Cracoviensia* 2015; 55: 15-22. 2016/02/04.

138. Almas A, Hameed A and Sultan FA. Knowledge of coronary artery disease (CAD) risk factors and coronary intervention among university students. *Journal of the Pakistan Medical Association* 2008; 58: 553-557. 2008/11/13.

139. Khan, Shehnaz SI, Guruswami GK, et al. Knowledge of warning signs, presenting symptoms and risk factors of coronary heart disease among the population of Dubai and Northern Emirates in UAE: a cross-sectional study. *Nepal Journal of Epidemiology* 2017; 7: 670-680. 2017/11/29. DOI: 10.3126/nje.v7i2.17973.

140. Soroush A, Komasi S, Saeidi M, et al. Coronary artery bypass graft patients' perception about the risk factors of illness: Educational necessities of

second prevention. *Annals of Cardiac Anaesthesia* 2017; 20: 303-308. 2017/07/14. DOI: 10.4103/aca.ACA_19_17.

141.   Maruf FA, Ojukwu CC and Akindele MO. Perception, knowledge, and attitude toward physical activity behaviour: implications for participation among individuals with essential hypertension. *High Blood Press Cardiovasc Prev* 2017; 25: 53-60. 2017/10/31. DOI: 10.1007/s40292-017-0235-y.

142.   Gebrihet TA, Mesgna KH, Gebregiorgis YS, et al. Awareness, treatment, and control of hypertension is low among adults in Aksum town, northern Ethiopia: A sequential quantitative-qualitative study. *PLoS One* 2017; 12: e0176904. 2017/05/11. DOI: 10.1371/journal.pone.0176904.

143.   Aaby A, Friis K, Christensen B, et al. Health literacy is associated with health behaviour and self-reported health: A large population-based study in individuals with cardiovascular disease. *Eur J Prev Cardiol* 2017; 24: 1880-1888. 2017/09/01. DOI: 10.1177/2047487317729538.

144.   Swanoski MT, Lutfiyya MN, Amaro ML, et al. Knowledge of heart attack and stroke symptomology: a cross-sectional comparison of rural and non-rural US adults. *BMC public health* 2012; 12: 283-283. DOI: 10.1186/1471-2458-12-283.

145.   Ike SO, Aniebue PN and Aniebue UU. Knowledge, perceptions and practices of lifestyle-modification measures among adult hypertensives in Nigeria. *Trans R Soc Trop Med Hyg* 2010; 104: 55-60. 2009/09/08. DOI: 10.1016/j.trstmh.2009.07.029.

146. Alzaman N, Wartak SA, Friderici J, et al. Effect of patients' awareness of CVD risk factors on health-related behaviors. *South Med J* 2013; 106: 606-609. 2013/11/07. DOI: 10.1097/smj.0000000000000013.

147. Abed MA, Khalil AA and Moser DK. Awareness of modifiable acute myocardial infarction risk factors has little impact on risk perception for heart attack among vulnerable patients. *Heart Lung* 2015; 44: 183-188. DOI: 10.1016/j.hrtlng.2015.02.008.

148. Monsuez JJ, Pham T, Karam N, et al. Awareness of individual cardiovascular risk factors and self-perception of cardiovascular risk in women. *Am J Med Sci* 2017; 354: 240-245. 2017/09/19. DOI: 10.1016/j.amjms.2017.05.008.

149. de Lima MM, Jr., da Silva GR, Filho SSJ, et al. Association between perceived lifetime risk of cardiovascular disease and calculated risk in a male population in Brazil. *Vasc Health Risk Manag* 2016; 12: 279-286. DOI: 10.2147/VHRM.S107874.

150. Alwan H, William J, Viswanathan B, et al. Perception of cardiovascular risk and comparison with actual cardiovascular risk. *Eur J Cardiovasc Prev Rehabil* 2009; 16: 556-561. 2009/07/10. DOI: 10.1097/HJR.0b013e32832d194d.

151. Mohd Azahar NMZ, Krishnapillai ADS, Zaini NH, et al. Risk perception of cardiovascular diseases among individuals with hypertension in rural Malaysia. *Heart Asia* 2017; 9: e010864. 2018/02/23. DOI: 10.1136/heartasia-2016-010864.

152.   Mazalin P, Sonicki Z and Reiner Z. Cardiovascular disease (CVD) risk factors in older adults - Perception and reality. *Arch Gerontol Geriatr* 2015; 61: 88-92. 2015/05/07. DOI: 10.1016/j.archger.2015.04.001.

153.   Saffi MA, Polanczyk CA and Rabelo-Silva ER. Lifestyle interventions reduce cardiovascular risk in patients with coronary artery disease: a randomized clinical trial. *Eur J Cardiovasc Nurs* 2014; 13: 436-443. 2013/09/12. DOI: 10.1177/1474515113505396.

154.   Blokstra A, van Dis I and Verschuren WM. Efficacy of multifactorial lifestyle interventions in patients with established cardiovascular diseases and high risk groups. *Eur J Cardiovasc Nurs* 2012; 11: 97-104. DOI: 10.1016/j.ejcnurse.2010.10.005.

155.   Ebireri J, Aderemi AV, Omoregbe N, et al. Interventions addressing risk factors of ischaemic heart disease in sub-Saharan Africa: a systematic review. *BMJ open* 2016; 6: e011881. 2016/07/07. DOI: 10.1136/bmjopen-2016-011881.

156.   Harting J, van Assema P, van Limpt P, et al. Effects of health counseling on behavioural risk factors in a high-risk cardiology outpatient population: a randomized clinical trial. *Eur J Cardiovasc Prev Rehabil* 2006; 13: 214-221. 2006/04/01. DOI: 10.1097/01.hjr.0000194416.39508.e9.

157.   González B, Lupón J, Domingo MdM, et al. Educational level and self-care behaviour in patients with heart failure before and after nurse educational intervention. *European journal of cardiovascular nursing : journal of the*

Working Group on Cardiovascular Nursing of the European Society of Cardiology 2014; 13: 459-465. 2013/10/25. DOI: 10.1177/1474515113510810.

158.   Hailu FB, Hjortdahl P and Moen A. Nurse-Led Diabetes Self-Management Education Improves Clinical Parameters in Ethiopia. *Front Public Health* 2018; 6: 302-302. DOI: 10.3389/fpubh.2018.00302.

159.   Fikru T, Peter B and Stig W. Population based prevalence of high blood pressure among adults in Addis Ababa: uncovering a silent epidemic. *BMC Cardiovasc Disord* 2009; 9: 39.

160.   Gebremichael GB, Berhe KK and Zemichael TM. Uncontrolled hypertension and associated factors among adult hypertensive patients in Ayder comprehensive specialized hospital, Tigray, Ethiopia, 2018. *BMC Cardiovasc Disord* 2019; 19: 121. 2019/05/24. DOI: 10.1186/s12872-019-1091-6.

161.   Kamran S, Bener AB, Deleu D, et al. The level of awareness of stroke risk factors and symptoms in the Gulf Cooperation Council countries: Gulf Cooperation Council stroke awareness study. *Neuroepidemiology* 2007; 29: 235-242. 2008/01/08. DOI: 10.1159/000112856.

162.   CSA. Ethiopia Demographic and Health Survey 2016. In: MOH, 1 ed. Addis Ababa 2016.

163.   Glanz K, Barbara KR and Viswanathth K. *The Health Belief Model, Health Behavior and Health Education, Theory, Research and Practice*. Edt 4 ed. 1997.

164.   Tariq S and Woodman J. Using mixed methods in health research. *JRSM Short Rep* 2013; 4: 2042533313479197. DOI: 10.1177/2042533313479197.

165.   Patrcia MD. *Mixed methods research for nursing and the health sciences*. 1 ed. Sydney: Willey-Blackwell, 2009.

166.   World Health Organization. STEPS Surveillance Manual Geneva 2017, p. 260-269.

167.   Booth M. Assessment of physical activity: an international perspective. *Res Q Exerc Sport* 2000; 71: 114-120.

168.   WHO. Global recommendations on physical activity for health. Switzerland 2010.

169.   Creswell JW. *Qualitative inquiry and research design: Choosing among five traditions*. 3rd ed. Thousand Oaks, CA: Sage, 1998.

170.   Moser A and Korstjens I. Series: practical guidance to qualitative research. Part 3: sampling, data collection and analysis. *Eur J Gen Pract* 2018; 24: 9-18. 2017/12/04. DOI: 10.1080/13814788.2017.1375091.

171.   Negesa LB, Magarey J, Rasmussen P, et al. Cardiovascular risk behaviour is an emerging health issue in developing countries: a cross-sectional study. *Eur J Cardiovasc Nurs* 2019: 1474515119861772. 2019/07/05. DOI: 10.1177/1474515119861772.

172.   Tong A, Sainsbury P and Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus

groups. *International journal for quality in health care : journal of the International Society for Quality in Health Care* 2007; 19: 349-357. 2007/09/18. DOI: 10.1093/intqhc/mzm042.

173.   Braun V and Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006; 3: 77-101. DOI: 10.1191/1478088706qp063oa.

174.   174.   Lincoln y and Guba E. *Naturalistic inquiry*. CA: Sage, 1985, p.416.

175.   Cappuccio FP and Miller MA. Cardiovascular disease and hypertension in sub-Saharan Africa: burden, risk and interventions. *Intern Emerg Med* 2016; 11: 299-305. 2016/03/21. DOI: 10.1007/s11739-016-1423-9.

176.   Yeates K, Lohfeld L, Sleeth J, et al. A global perspective on cardiovascular disease in vulnerable populations. *Can J Cardiol* 2015; 31: 1081-1093. 2015/09/01. DOI: 10.1016/j.cjca.2015.06.035.

177.   Ojji DB, Lamont K, Ojji OI, et al. Primary care in the prevention, treatment and control of cardiovascular disease in sub-Saharan Africa. *Cardiovasc J Afr* 2017; 28: 251-256. 2017/07/28. DOI: 10.5830/CVJA-2016-082.

178.   Chikafu H and Chimbari MJ. Cardiovascular disease healthcare utilization in Sub-Saharan Africa: a scoping review. *Int J Environ Res Public Health* 2019; 16: 419. DOI: 10.3390/ijerph16030419.

179.   Mosleh SM and Darawad M. Patients' adherence to healthy behavior in coronary heart disease: risk factor management among Jordanian patients. *Journal of cardiovascular nursing* 2015; 30: 471-478. DOI: 10.1097/JCN.0000000000000189.

180.	Coorey GM, Neubeck L, Mulley J, et al. Effectiveness, acceptability and usefulness of mobile applications for cardiovascular disease self-management: systematic review with meta-synthesis of quantitative and qualitative data. *Eur J Prev Cardiol* 2018; 25: 505-521. 2018/01/09. DOI: 10.1177/2047487317750913.

181.	Chiang C-Y, Choi K-C, Ho K-M, et al. Effectiveness of nurse-led patient-centered care behavioral risk modification on secondary prevention of coronary heart disease: a systematic review. *Int J Nurs Stud* 2018; 84: 28-39. 2018/04/22. DOI: 10.1016/j.ijnurstu.2018.04.012.

182.	Marissa B, Nancy F, Marie N, et al. Smoking prevalence and attributable disease burden in 195 countries and territories, 1990-2015: a systematic analysis from the Global Burden of Disease Study 2015. *Lancet* 2017; 389: 1885-1906. 2017/04/10. DOI: 10.1016/s0140-6736(17)30819-x.

183.	Wakabayashi M, McKetin R, Banwell C, et al. Alcohol consumption patterns in Thailand and their relationship with non-communicable disease. *BMC Public Health* 2015; 15: 1297. 2015/12/26. DOI: 10.1186/s12889-015-2662-9.

184.	Ayano G, Yohannis K, Abraha M, et al. The epidemiology of alcohol consumption in Ethiopia: a systematic review and meta-analysis. *Subst Abuse Treat Prev Policy* 2019; 14: 26-26. DOI: 10.1186/s13011-019-0214-5.

185.	Mega TA and Dabe NE. Khat (Catha Edulis) as a risk factor for cardiovascular disorders: systematic review and meta-analysis. *Open Cardiovasc Med J* 2017; 11: 146-155. DOI: 10.2174/1874192401711010146.

186.   Paratz ED, Mariani J and MacIsaac AI. First reported case of khat cardiomyopathy and malignant hypertension in Australia. *Intern Med J* 2016; 46: 1455-1456. DOI: 10.1111/imj.13283.

187.   Pengpid S, Vonglokham M, Kounnavong S, et al. The prevalence and social determinants of fruit and vvegetable consumption and its associations with noncommunicable diseases risk factors among adults in Laos. *Asia Pac J Public Health* 2019; 31: 157-166. 2019/03/10. DOI: 10.1177/1010539519830824.

188.   Lee-Kwan SH, Moore LV, Blanck HM, et al. Disparities in state-specific sdult fruit and vegetable consumption - United States, 2015. *MMWR Morb Mortal Wkly Rep* 2017; 66: 1241-1247. DOI: 10.15585/mmwr.mm6645a1.

189.   Lee IM, Shiroma EJ, Lobelo F, et al. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet* 2012; 380: 219-229. DOI: 10.1016/S0140-6736(12)61031-9.

190.   Sandberg C, Wadell K, Gradmark A, et al. Physical activity level in adults with congenital heart disease: effects of gender and complexity of heart lesion. *Eur Heart J* 2013; 34. DOI: 10.1093/eurheartj/eht308.P2141.

191.   Hallal PC, Andersen LB, Bull FC, et al. Global physical activity levels: surveillance progress, pitfalls, and prospects. *Lancet* 2012; 380: 247-257. DOI: 10.1016/S0140-6736(12)60646-1.

192.   Winzer EB, Woitek F and Linke A. Physical activity in the prevention and treatment of coronary artery disease. *J Am Heart Assoc* 2018; 7: e007725. DOI: 10.1161/JAHA.117.007725.

193.   Oerkild B, Frederiksen M, Hansen JF, et al. Self-reported physical inactivity predicts survival after hospitalization for heart disease. *Eur J Prev Cardiol* 2011; 18: 475-480. 2011/02/09. DOI: 10.1177/1741826710389379.

194.   Bruthans J, Mayer O, Jr., De Bacquer D, et al. Educational level and risk profile and risk control in patients with coronary heart disease. *Eur J Prev Cardiol* 2016; 23: 881-890. 2015/08/19. DOI: 10.1177/2047487315601078.

195.   Gonzalez B, Lupon J, Domingo Mdel M, et al. Educational level and self-care behaviour in patients with heart failure before and after nurse educational intervention. *Eur J Cardiovasc Nurs* 2014; 13: 459-465. 2013/10/29. DOI: 10.1177/1474515113510810.

196.   Celentano A, Palmieri V, Arezzi E, et al. Cardiovascular secondary prevention: patients' knowledge of cardiovascular risk factors and their attitude to reduce the risk burden, and the practice of family doctors. The "Help Your Heart Stay Young" study. *Ital Heart J* 2004; 5: 767-773. 2005/01/01.

197.   Everett B, Salamonson Y, Rolley JX, et al. Underestimation of risk perception in patients at risk of heart disease. *Eur J Cardiovasc Nurs* 2016; 15: e2-9. 2014/10/23. DOI: 10.1177/1474515114556712.

198.   Jeet G, Thakur JS, Prinja S, et al. Community health workers for non-communicable diseases prevention and control in developing countries:

evidence and implications. *PloS One* 2017; 12: e0180640. DOI: 10.1371/journal.pone.0180640.

199.   Uthman OA, Hartley L, Rees K, et al. Multiple risk factor interventions for primary prevention of cardiovascular disease in low- and middle-income countries. *Cochrane Database Syst Rev* 2015; 2015: CD011163. DOI: 10.1002/14651858.CD011163.pub2.

200.   Hendriks JM, de Wit R, Crijns HJ, et al. Nurse-led care vs. usual care for patients with atrial fibrillation: results of a randomized trial of integrated chronic care vs. routine clinical care in ambulatory patients with atrial fibrillation. *Eur Heart J* 2012; 33: 2692-2699. 2012/03/29. DOI: 10.1093/eurheartj/ehs071.

201.   Oppenheimer GM. Becoming the Framingham Study 1947-1950. *American journal of public health* 2005; 95: 602-610. 2005/03/31. DOI: 10.2105/ajph.2003.026419.

9. Appendixes

Appendix A1: Participant information sheet for quantitative study;

English version

Project title: Lifestyle conditions causing heart disease and patients' understanding of these in Ethiopia.
Human Research Ethics Committee Approval Number: H-2018-074
Principal Investigator: Judy Magarey
Student Researcher: Lemma Negesa
Student's Degree: PhD in Nursing

Dear participant,

You are invited to participate in the research project described below.

What is the project about?

The research project is about heart disease and ways of life that cause heart disease in Ethiopia. The aims of the project is to investigate ways of life that causes heart disease and patients' understanding of these. In particular, the study emphasis on; ways of life of patients with heart disease, awareness of patients regarding heart disease and lifestyle conditions that cause the disease, and considering whether having good understanding of lifestyle conditions that cause heart disease is associated with healthy ways of life. The study finding will identify ways of life that cause heart disease in Ethiopia, and it will help to inform policy makers to prevent heart disease.

Who is undertaking the project?

This project is being undertaken by Mr. Lemma Negesa, Assoc. Prof. Judy Magarey, Assoc. Prof. Philippa Rasmussen and Dr. Jeroen Hendriks. This research will form the basis of Mr. Lemma Negesa's PhD in Nursing, at the University of Adelaide, under the supervision of Assoc. Prof. Judy Magarey, Assoc. Prof. Philippa Rasmussen and Dr. Jeroen Hendriks. This PhD study is being funded by the University of Adelaide, Beacon of Enlightenment PhD Scholarship, which is found in Australia, South Australia.

Why am I being invited to participate?

You are being invited as you are eligible to participate in the study. The researcher recruits heart disease patients aged between 18-64 years and attending regular follow up unit of the hospital.

What am I being invited to do?

There are questions developed for the study, and the questionnaire has four parts including socio-demographic, behavioural risk factors, heart disease risk knowledge and cardiovascular risk perception. We will interview you face to face.

How much time will my involvement in the project take?

The study involves face to face interview, which takes about 30 minutes, and you will be interviewed only once for the study. There will be no reimbursement for participation.

Are there any risks associated with participating in this project?

The risk of participating in this study is minimal, the interview takes approximately 30 minutes and may create minimal emotional distress which we can reduce by selecting appropriate time and quite place for interview.

What are the potential benefits of the research project?

By participating in this study, you will not get immediate benefit, but the outcomes of this study may be useful in understanding the behavioural cardiovascular risk factors and help the policy makers and health administrators to design intervention measures to avert the burden of heart disease.

Can I withdraw from the project?

Participation in this project is completely voluntary. If you decide to withdraw this will not affect your care in this hospital in anyway.

What will happen to my information?

Privacy and Confidentiality: The survey is anonymous, no any personal identifiers will be recorded on the questionnaire and the information which you provide us will be confidential. The questionnaire will be coded and no references will be made in oral or written reports that could link you to the research.

Storage: The survey data will be stored properly in hard copy and electronic copy. The completed questionnaire will be stored in locked box, and the electronic copy data will be stored in password protected University of Adelaide computer. Only the investigators of this project will have access to the recorded data.

Publishing: The finding of the study will be general for the study population and will not reflect anything particular of individual person. The finding of the research will be reported in PhD thesis, published on journal article, and will be presented on conference.

Sharing: You will not have access to interview transcript as we could not identify you back, and the data will not be used for future research.

Your information will only be used as described in this participant information sheet and it will only be disclosed according to the consent provided, except as required by law.

Who do I contact if I have questions about the project?

If you have any questions or enquiries at any time about the study or the procedures, please contact and communicate with the investigators through phone or email address below.

Name	Telephone	Email
Assoc. Prof. Judy Magarey	0883136055	judy.magarey@adelaide.edu.au
Mr. Lemma Negesa	0883139002	lemma.bulto@adelaide.edu.au
Assoc. Prof. Philippa Rasmussen	0883133866	philippa.rasmussen@adelaide.edu.au
Dr. Jeroen Hendriks	082222723	jeroen.hendriks@adelaide.edu.au

What if I have a complaint or any concerns?

The study has been approved by the Human Research Ethics Committee at the University of Adelaide (approval number H-2018-074). This research project will be conducted according to the NHMRC National Statement on Ethical Conduct in Human Research (2007). If you have questions or problems associated with the practical aspects of your participation in the project or wish to raise a concern or complaint about the project, then you should consult the Principal Investigator. If you wish to speak with an independent person regarding concerns or a complaint, the University's policy on research involving human participants, or your rights as a participant, please contact the Human Research Ethics Committee's Secretariat on:

Phone: +61 8 8313 6028

Email: hrec@adelaide.edu.au

Post: Level 4, Rundle Mall Plaza, 50 Rundle Mall, ADELAIDE SA 5000

Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome.

If you wish to contact local independent person for complaint, please contact Haramaya University, College of Health and Medical sciences, Chief Executive Office on:

Haramaya University, College of Health and Medical sciences

Chief Executive Office

Local independent contact address for complaint

Haramaya University, College of Health and Medical Science, chief executive office

Telephone: +25125-666-74-39

Fax: +251-666-80-81

Post: 235, Harar, Ethiopia

Email: chms@hararmaya.edu.et

If I want to participate, what do I do?

If you want to participate, I will read the consent form for you and you will sign it to show your voluntary participation. Then, you will be interviewed face to face.

Yours sincerely,

Assoc. Prof. Judy Magarey

Lemma Negesa

Assoc. Prof. Philippa Rasmussen

Dr. Jeroen Hendriks

Appendix A2: Participant information sheet for quantitative study; Amharic version

ቅጽ 1፤ የተሳታፊዎች መረጃ ቅጽ-አማርኛ እትም

የጥናት ርእስ፤ ለልብ በሽታ አጋላጭ የሆኑ ባህርዮች

የሰዉ ምርምር ስነምግባር ኮምቴ ፍቃድ ቁጥር: H-2018-074

ዋና ተመራማሪ፤ ጁዲ ማገረይ

የጥናቱ ተማሪ፤ ለማ ነገሶ

የተማሪ ድግሪ፤ ፒ. ኤች. ዲ በነርስንግ

ዉድ ተሳታፊ

ከዝህ በታች በተገለጸ ጥናት እንድሳተፉ ተጋብዚል

ጥናቱ በምን ዙርያ ነዉ?

ጥናቱ ስለልብ በሽታ አጋላጭ ባህርዮች ስሆን፤ የጥናቱ ዋና እላማ የልብ በሽታ አጋላጭ ባህርዮች ስረጭትን በሽተኞች ስለ አጋላጭ ባህርዮቹ ያላቸዉ ግንዛቤ ማጥናት ይሆናል። የጥናቱ እላማዎች፤ 1) የአጋላጭ ባህርዮች በልብ በሽተኞች ላይ ምንያህል ተስፋፍቶ እንደምታይ መዳሰስ 2) የልብ በሽተኞች ስለአጋላጭ ባህርዮች ያላቸዉን እዉቀት መዳሰስ 3) የልብ በሽተኞች ስለአጋላጭ ባህርዮችና ስለልብ በሽታ ያላቸዉን ግንዛቤ መዳሰስ፤ 4) የልብ በሽታ አጋላጭ ባህርዮች ግንዛቤና የበሽተኞች ትክክለኛ ተጋላጭነት ያላቸዉ ግንኙነት ማጥናት ናቸዉ። የጥናቱ ግኝት በእትዮጵያ ለልብ በሽታ አጋላጭ ባህርዮችን የምለይ በመሆኑ ፖልሲ አዉጭ አካላትን ለመጠቆምና በሽታዉን ለመከላከል ይጠቅማል።

ጥናቱን የምሰረ ማነዉ?

ኤሄን ጥናት የምሰሩት አቶ ለማ ነገሶ፤ አሶስ.ፕሮ. ጁዲ ማገረይ፤ ዶ. ር ፍሊፓ ራስሙሴን እና ዶ. ር ጆሮእን ሄንድሪክስ ናቸዉ። ጥናቱ አቶ ለማ ነገሶ በአዴለእድ ዩኒቨርስቲ ፒ. ኤች. ዲ ድግሪአቸዉን ለማጠናቀቅ ከ አሶስ.ፕሮ. ጁዲ ማጋረይ፤ ዶ. ር ፍሊፓ ራስሙሴን እና ዶ. ር ጆሮእን ሄንድሪክስ ጋር የምሰሩት ነዉ። ኤሄ ፒ. ኤች. ዲ ጥናት በአዴለእድ ዩኒቨርስቲ በእኮን ኦፍ እንላይትሜነት ፒ. ኤች. ዲ ስኮላርሽፕ ስፖንሰርነት የምሰራ ነዉ።

እኔ እንድሳተፍ ለምን ተጋበዝኩ?

የተጋበዙት ለጥናቱ መስፈርት ስለምያሟሉ ነዉ። ተመራማሪዎቹ ለምርምሩ የምመረጡት ከ 18-64 እድሜ ያላቸዉ የልብ ችግር ያለባቸዉና ክትትላቸዉን በሆስፒታሉ በማካታታል ላይ የምገኙ ታማሚዎችን ነዉ።

ለመስራት ተጋበዝኩት ምንድነዉ?

ለምርምሩ ተዘጋጁ ጥያቄዎች አሉ፤ ጥያቄዎቹ በ 4 ተከፍሎ የተዘጋጁናቸዉ፤ ማህበራዊ ሁኔታ፤ አጋላጭ ባህርዎች፤ ለልብ በሽታ አጋላጭ ባህሮች እዉቀት እና ለልብ በሽታ አጋላጭ ባህሮች ያላቸዉ አመለካከት ናቸዉ። ለተሳትፎ ፍትለፍት ቀለመጠየቅ ማድርግ ይሆናል።

በጥናቱ መሳተፍ ምንህል ግዜ ወስዳል?

የጥናቱ ተሳትፎ ፍትለፍት ቀለመጠየቅ ማድረግ ነዉ። ቀለመጠየቁ በግምት 30 ደቂቃ ይወስዳል፤ መጠየቁን አንዴ ብቻ ትጠየቃለህ። ለተሳተፎ የምስጥ/የምከፈል ምንም የለም።

በትናቱ መሳተፍ የምአስከትል ጉዳት አለ?

በትናቱ መሳተፍ የምአስከትል ጉዳት ያንየህል አይደለም፤ ነገርግን ቃለመተየቁ ከግዜህ በግምት 30 ደቂቃ ይዋስዳል።

ጥናቱ ልአስገኝ የምችል ጥቅም ምንድናቸዉ?

በዝህ ትናት በመሳተፍህ የምትአገኘዉ ጥቅም አይኖርም፤ ግን የጥናቱ ግኝት የልብ በሽታ አጋላጭ ባህርዎች ስርጭትን ለመረዳት፤ የመከላከል ስራዎችን ለመስራት እና በሽታዉን ለመከላከል ለፖልሲ አዉጪ አካላት ጠቃሚ ነዉ።

ተሳትፎዬን ማቋረጥ እችላለሁ?

በጥናቱ ተሳትፎ ሙሉበሙሉ ፍቃደኝነት ላይ የተመሰረተ ነዉ። ተሳትፎዋን ለማቋረጥ ከወሰኑ ከሆስፒታሉ የምአገኙ ማንኛዉንም አገልግሎት አይጎዳም።

መረጃዬ ምን ይደረጋል?

ምስጥራዊነት፤ ጥናቱ ተሳታፊዎችን በስም አይለይም። ማንኛዉም የሰዉ ማንነት ልለይ የምችል መረጃ በመጠየቅያ ቅጽ ላይ አይመዘገብም፤ የምሰጡን መረጃ ምስጥራዊነቱ ይጠበቃል። መጠየቅ ቅጹ መለያ ቁጥር ይሰጠዋል፤ በማንኛዉም የቃል ወይም የጽሁፍ ዘገባ ላይ የግል ማንነቶ አይጠቀስም።

መረጃ ማስቀመጥ፤ የጥናቱ መረጃ በወረቀትና ኤሌክትሮንክ ኮፒ በትንቃቄ ይቀመጣል። የተሰበሰበዉ መጠየቅያ ቅጽ ቁልፍ ባለዉ ሳጥን ዉስጥ ይቀመጣል፤ ኤሌክትሮንክ መረጃ በፓስዎርድ በታሰረ

በአዴለእድ ነክሬስቲ ኮምፒዉተረ ላይ ይቀመጣል። መረጃዉን ልአገኙ የምቾሉ ተማራማሪዎቹ ብቻ ናቸዉ።

ማተም፤ የጥናቱ ግኝት ለሁሉም ተሳታፊዎች አጠቃላይ ይሆናል፤ ምንም አይነት ስለግልሰብ የምገልጽ/የምጸፍ አይኖርም። የጥናቱ ግኝት በ ፒ. ኤች. ዲ ጽሁፍ ዉስጥ ይጻፋል፤ በምርምረ ጽሁፍ በምአሳትሙ ጆርናል ላይ ይታተማል፤ በኮንፍራንስ ላይ ይቀርባል።

መረጃ መጋራት፤ ከጥናቱ ቦሃላ መልሰን ልንአቅዎት ስለማንቸል የጽሁፉን ስክርፕት ማየት አይቾሉም። መረጃዉን ወደፍት ለሌላ ጥናት የማንጠቀምም መሆኑ እንገልጽሎታለን።

የምሰዉን መረጃህ በዝህ መረጃ ቅጽ ላይ በተገለጸ መሰረት ብቻ የምንጠቀም ስሆን፤ አሳልፎ ለሌላ የምሰጡ በህግ ስፈለግ ብቻ ነዉ።

ጥያቄ ብኖረኝ ማንን ልአናግር?

ስለጥናቱ ማንኛዉም ጥያቄ ካለህ በማንኛዉም ሰአት ከዝህ በታች በተጻፈ ስልክ ቁጥርና እሜእል ተመራማሪዎቹን ማናገr ትቾለለህ።

ስም	ስልክ	እሜእል
አሶስ.ፕሮ. ጁዲ ማገረይ	0883136055	judy.magarey@adelaide.edu.au
አቶ ለማ ነገሰ	0883139002	lemma.bulto@adelaide.edu.au
ዶ. ር ፍሊፓ ራስሙሴን	0883133866	philippa.rasmussen@adelaide.edu.au
ዶ. ር ጄሮእን ሄንድriክስ	082222723	jeroen.hendriks@adelaide.edu.au

ቅሬታ ካለኝ ምንአረጋለሁ?

ጥናቱ በ አዴለእድ ዩኒቨርስቲ የሰዉ ጥናት ስነምግባረ ኮምቴ (approval number H-2018-074) እና በሀረማያ ዩኒቨርስቲ የሰዉ ጥናት ስነምግባረ ኮምቴ ጸድቋል። ኤሄ ጥናት የምሰራ በ NHMRC National Statement on Ethical Conduct in Human Research (2007), አዉስትራልአ መሰረት ነዉ። በጥናቱ ላይ ማንኛዉንም ጠያቄ ካለ የጥናቱ ዋና ተመረማሪ ያናግሩ። ስለጥናቱ ማንኛዉን ጥያቄ ወይም ቅሬታ ከሎትና ሌላ አካል ማናገr ከፈለጉ የአዴለእድ ዩኒቨርሲቲ የሰዉ ምርምረ አጠሪ ኮምቴ ጸሪ ና ሀረማያ ዩኒቨርስት ጤና ህክምና ሳይንስ ኮሌጅ ቺፍ ኤክስኩትቭ ዳይሬክተር ቢሮ ያናግሩ ከዝህ በታች በተጻፈ አድራሻ ያነጋግሩ። ማንኛዉም ቅሬታ በመተማመን ይጠራል። ዉጤቱን እናሳዉቆታለን።

አደለእድ ዩኒቨርሲቲ፤ የሰዉ ምርምረ አጠሪ ኮምቴ ጸፈ አድራሻ

ስልክ፤ +61883136028

እሜእል፤ hrec@adelaide.edu.au

ፖስታ፤ 4ኛ ፎቅ ረንድል ሞል ፕላዛ 50 ረንድል ሞል አዴላኢድ ደቡብ አዉስትራልአ 5000

ሀረማያ ዩኒቨርስቲ ጤናና ህክምና ሳይንስ ኮሌጅ፤ ቺፍ ኤክስኩትቭ ዳይሬክተር ቢሮ

ስልክ: +25125-666-74-39

ፋክስ: +251-666-80-81

ፖስታ: 235, Harar, Ethiopia

እሜእል: <u>chms@haramaya.edu.et</u>

መሳተፍ ከፈለግኩ ምነድነዉ የምአደርግ?

መሳተፍ ከፈለጉ የስምምነት ቅጹን አነብሎታለሁ፤ በመቀጠል ፍቃደኝነትን ለማረጋገጥ ከፈርሙ ቦሃላ ፍትለፌት ቃለመተቅ እናዳረጋለን።

ከምስጋና ጋር፤

አሶስ.ፕሮ. ጁዲ ማገረይ

አቶ ለማ ነገሰ

ዶ. ር ፍሊፓ ራስሙሴን

ዶ. ር ጆሮእን ሄንድሪክስ

Appendix A3: Participant information sheet for qualitative study;

English version

Project title: Understanding of heart disease and its causes among patients with hypertension in Ethiopia

Human Research Ethics Committee Approval Number: H-2018-074

Principal Investigator: Judy Magarey

Student Researcher: Lemma Negesa

Student's Degree**:** PhD in Nursing

Dear Participant,

You are invited to participate in the research project described below.

What is the project about?

The research project is about heart disease. The aim of the project is to investigate patients' perceptions of heart disease and its causes. The study findings will identify perceptions of patients regarding heart disease, and it may help to inform policy makers in the design of prevention strategies.

Who is undertaking the project?

This project is being undertaken by Mr. Lemma Negesa, Assoc. Prof. Judy Magarey, Assoc. Prof. Philippa Rasmussen and Dr. Jeroen Hendriks. This research will form the basis of Mr. Lemma Negesa's PhD in Nursing, at the University of Adelaide, under the supervision of Assoc. Prof. Judy Magarey, Assoc. Prof. Philippa Rasmussen and Dr. Jeroen Hendriks. This PhD study is being funded by the University of Adelaide, Beacon of Enlightenment PhD Scholarship, which is found in Australia, South Australia.

Why am I being invited to participate?

You are being invited as you are eligible to participate in the study. The researcher aims to recruit hypertensive patients aged between 18-64 years and attending a regular follow up unit of the hospital to participate in the project.

What am I being invited to do?

Open ended questions have been developed for the study, and these are related to perceptions about heart disease. You will be interviewed face to face. During interview audio record will be taken. The interview will be conducted in the hospital Outpatient Unit, in a quiet private room.

How much time will my involvement in the project take?

The study involves a face to face interview, which will take about 45 minutes, and you will be interviewed only once for the study. There will be no reimbursement for participation.

Are there any risks associated with participating in this project?

The risk of participating in this study is minimal, the interview takes approximately 45 minutes and may create minimal emotional distress which we can reduce by selecting an appropriate time and quiet place for the interview. If you feel emotional distress during interview you will be able to seek assistance and support from the Hospital Counselling Service.

What are the potential benefits of the research project?

There will not be any immediate benefit to you as a participant in this study, but the outcomes may be useful in informing policy makers and health administrators regarding patients' perceptions about heart disease and therefore assist in the design of interventions to reduce the burden of heart disease.

Can I withdraw from the project?

Participation in this project is completely voluntary. If you decide to withdraw this will not affect your care in this hospital in anyway. You can withdraw at any time up until the completion of the interview and the researcher leaving the site.

What will happen to my information?

Privacy and Confidentiality: The findings of the study will be reported in a way that does not personally identify individuals. As the number of participants is small, it is difficult to guarantee confidentiality. De-identified codes will be used, and no personal references will be made in oral or written reports that could link you to the research.

Storage: The electronic copy of all data including audio will be stored on a password protected computerised shared file at the University of Adelaide. Only the investigators of this project will have access to the recorded data.

Publishing: The findings of the study will be published, reported in a PhD thesis and presented at conferences in a way that does not personally identify individuals.

Sharing: You will not have access to interview transcript as we cannot re-identify you and the data will not be used for future research. Your information will only be used as described in this participant information sheet and it will only be disclosed according to the consent provided, except as required by law.

Who do I contact if I have questions about the project?

If you have any questions or enquiries at any time about the study or the procedures, please contact and communicate with the investigators through phone or email address below.

Name	Telephone	Email
Assoc. Prof. Judy Magarey	0883136055	judy.magarey@adelaide.edu.au
Mr. Lemma Negesa	0923190110	lemma.bulto@adelaide.edu.au
Assoc. Prof. Philippa Rasmussen	0883133866	philippa.rasmussen@adelaide.edu.au
Dr. Jeroen Hendriks	082222723	jeroen.hendriks@adelaide.edu.au

What if I have a complaint or any concerns?

The study has been approved by the Human Research Ethics Committee at the University of Adelaide (approval number H-2018-074). This research project will be conducted according to the NHMRC National Statement on Ethical Conduct in Human Research (2007). If you have questions or problems associated with the practical aspects of your participation in the project or wish to raise a concern or complaint about the project, then you should consult the Principal Investigator. If you wish to speak with an independent person regarding concerns or a complaint, the University's policy on research involving human participants, or your rights as a participant, please contact the Human Research Ethics Committee's Secretariat on:

Phone: +61 8 8313 6028

Email: hrec@adelaide.edu.au

Post: Level 4, Rundle Mall Plaza, 50 Rundle Mall, ADELAIDE SA 5000

Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome.

If you wish to contact local independent person for complaint, please contact Haramaya University, College of Health and Medical sciences, Chief Executive Office on:

Haramaya University, College of Health and Medical sciences

Chief Executive Office

Local independent contact address for complaint

Haramaya University, College of Health and Medical Science, chief executive office

Telephone: +25125-666-74-39

Fax: +251-666-80-81

Post: 235, Harar, Ethiopia

Email: chms@hararmaya.edu.et

If I want to participate, what do I do?

If you want to participate, please contact the student researcher (Mr. Lemma Negesa) to schedule an interview time.

Yours sincerely,

Assoc. Prof. Judy Magarey

Lemma Negesa

Assoc. Prof. Philippa Rasmussen

Dr. Jeroen Hendriks

Appendix A4: Participant information sheet for qualitative study; Amharic version

ቅጽ 1፤ የተሳታፊዎች መረጃ ቅጽ-አማርኛ እትም

የጥናት ርእስ፤ የደም ግፍት ያለባቸዉ ሰዎች ሰለለልብ በሽታ ያላቸዉ ግንዛቤ፤ በእትዮጵያ

የሰዉ ምርምር ስነምግባር ኮሚቴ ፍቃድ ቁጥር: H-2018-074

ዋና ተመራማሪ፤ ጁዲ ማገረይ

የጥናቱ ተማሪ፤ ለማ ነገሳ

የተማሪ ድግሪ፤ ፒ. ኤች. ዲ በነርስንግ

ዉድ ተሳታፊ

ከዚህ በታች በተገለጸ ጥናት እንድሳተፉ ተጋብዚል

ጥናቱ በምን ዙርያ ነዉ?

ጥናቱ ስለልብ በሽታ ነዉ። የጥናቱ እላማ የደም ግፍት በሽተኞች ስለ ልብ በሽታ ና መንስኤዎቹ ያላቸዉ ግንሃቤ ና አመለካከት ማጥናት ነዉ። ጥናቱ የደም ግፍት በሽተኞችን ግንዛቤ ስለምአጠና ለፖልሲ አዉጪ አካላት ጠቃሚ ነዉ።

ጥናቱን የምሰረ ማነዉ?

ኤኔን ጥናት የምሰሩ፤ አቶ ለማ ነገሳ፤ አሶስ.ፕሮ. ጁዲ ማገረይ፤ ዶ. ር ፍሊፓ ራስሙሴን እና ዶ. ር ጆርጀን ሄንድሪክስ ናቸዉ። ጥናቱ አቶ ለማ ነገሰ በአዴለእድ ዩኒቨርስቲ ፒ. ኤች. ዲ ድግሪአቸዉን ለማጠናቀቅ ከ አሶስ.ፕሮ. ጁዲ ማጋረይ፤ ዶ. ር ፍሊፓ ራስሙሴን እና ዶ. ር ጆርጀን ሄንድሪክስ ጋር የምሰሩት ነዉ። ኤኔ ፒ. ኤች. ዲ ጥናት አዉሰትራልያ፤ በደቡብ አዉስትራልያ በምገኘ፤ በአዴለእድ ዩኒቨርስቲ፤ በእኮን አፍ እንላይትሜንት ፒ. ኤች. ዲ ስኮላርሽ ስፖንሰርነት የምሰራ ነዉ።

እኔ እንድሳተፍ ለምን ተጋበዝኩ?

የተጋበዙት ለጥናቱ መስፈርት ስለምአሟሉ ነዉ። ተመራማሪዎቹ ለምርምሩ የምመረጡት ከ 18-64 እድሜ ያለቸዉ የደም ግፍት ችግር ያለባቸዉና ክትትላቸዉን በሆስፒታሉ በማካታል ላይ የምገኙ ታማሚዎችን ነዉ።

ለመስራት ተጋበዝኩት ምንድነዉ?

ለምርምሩ ተዘጋጁ ጥያቄዎች አሉ። ጥያቄዎቹ ስለልብ በሽታ ግንዛቤ ናቸዉ። ፍትለፍት ቃለምልልስ ኢናረጋለን፤ በቃለምልልሱ ግዜ ድምፅ ይቀዳል። ቃለምልልሱ ሆስፐተታል ፀትታ ባለዉ ክፍል ነዉ የምዳረግ።

በጥናቱ መሳተፍ ምንህል ግዜ ወስዳል?

የጥናቱ ተሳትፎ ፍትለፍት ቀለመጠየቅ ማድረግ ነዉ። ቀለመጠየቁ በግምት 45 ደቂቃ ይወስዳል፤ ለጥናቱ መጠየቁን አንዴ ብቻ ትጠየቃለህ። ለተሰተፎ የምሰጡ/የምከፈል ምንም የለም።

በትናቱ መሳተፍ የምአስከትል ጉዳት አላ?

በትናቱ መሳተፍ የምአስከትል ጉዳት ያንየህል አይደለም፤ ነገረግን ቃለመተየቁ ከጋዜህ በግምት 45 ደቂቃ ይወስዳል። በዝህም ትንሽ የመጨናነቅ ስሜት ልሰሞት ይችላል፤ ነገር ግን ቃለምልልሱን ፀጥታ ባለዉ ቦታ በማካሄድ መቀነስ እንችላለን።

ጥናቱ ልአስገኝ የምችል ጥቅም ምንድናቸዉ?

በዝህ ትናት በመሳተፍህ የምትአገኘዉ ጥቅም አይኖርም፤ ግን የጥናቱ ግኝት የደም ግፍት ታማሚዎች ሰስለየልብ በሽታ ያላቸዉን ግንዛቤ ለመረዳት፤ ለፖልሲ አዉጪ አካላትና ጤና አስተዳሮች ጠቃሚ ነዉ።

ተሳትፎዬን ማቋረጥ እችላለሁ?

በጥናቱ ተሳትፎ ሙሉበሙሉ ፍቃደኝነት ላይ የተመሰረተ ነዉ። ተሳትፎዋን ለማቋረጥ ከወሰኑ ከሆስፐታሉ የምአገኙ ማንኛዉንም አገልግሎት አይጎዳም። ተሳትፎትን ማቋረጥ ከፈለጉ፤ ቃለምልልሱ ከማለቁ በፍትና፤ መረጃ ሰብሳቢዉ ከመሄዳቸዉ በፍት ማቋረጥ ይችሉ።

መረጃዬ ምን ይደረጋል?

ምስጥራዊነት፤ ጥናቱ ተሳታፈዎችን በስም አይለይም። ማንኛዉም የሰዉ ማንነት ልለይ የምችል መረጃ በመጠየቃ ቅጽ ላይ አይመዘገብም፤ የምሰጡን መረጃ ምስጥራዊነቱ ይጠበቃል። መጠየቅቅ ቅጹ መለያ ቁጥር ይሰጠዋል፤ በማንኛዉም የቃል ወይም የጽሁፍ ዘገባ ላይ የግል ማንነቶ አይጠቀስም።

መረጃ ማስቀመጥ፤ የጥናቱ መረጃ፤ ኤሌክትሮንክ ኮፒ በትንቃቁ በአደላእድ ዩኒቨርሲቲ በፓዋርድ በተዘጋ መሰርጃ ማስቀመጫ ይቀመጣል። መረጃዉን ልአገኙ የምችሉ ተማራማሪዎች ብቻ ናቸዉ።

ማተም፤ የጥናቱ ግኝት ለሁሉም ተሳታፊዎች አጠቃላይ ይሆናል፤ ምንም አይነት ስለግልሰብ የምገልጽ/የምጸፍ አይኖርም። የጥናቱ ግኝት በ ፒ. ኤች. ዲ ጽሁፍ ዌስት ይጻፋል፤ በምርምረ ጽሁፍ በምአሳትሙ ጆርናል ላይ ይታተማል፤ በኮንፍራንስ ላይ ይቀረባል።

መረጃ መጋራት፤ ከጥናቱ ቦሃላ መልሰን ልንአቅዎት ስለማንችል የጽሁፉን ስክርፕት ማየት አይችሉም። መረጃዉን ወደፍት ለሌላ ጥናት የማንጠቀምም መሆኑ እንገልጽሎታለን።

የምሰዉን መረጃህ በዝህ መረጃ ቅጽ ላይ በተገለጸ መሰረት ብቻ የምንጠቀም ስሆን፤ አሳልፎ ለሌላ የምሰጡ በህግ ስፈለግ ብቻ ነዉ።

ጥያቄ ብኖረኝ ማንን ልአናግር?

ስለጥናቱ ማንኛዉም ጥያቄ ካለህ በማንኛዉም ሰአት ከዝህ በታች በተጸፈ ስልክ ቁጥርና እሜእል ተመራማሪዎቹን ማናገር ትችላለህ።

ስም	ስልክ	እሜእል
አሶስ.ፕሮ. ጄዲ ማገረይ	0883136055	judy.magarey@adelaide.edu.au
አቶ ለማ ነገሰ	0883139002	lemma.bulto@adelaide.edu.au
ዶ. ረ ፍሊፓ ራስሙሴን	0883133866	philippa.rasmussen@adelaide.edu.au
ዶ. ረ ጄሮእን ሄንድሪክስ	082222723	jeroen.hendriks@adelaide.edu.au

ቅሬታ ካለኝ ምንአረጋለሁ?

ጥናቱ በ አዴለእድ ዩኒቨርስቲ የሰዉ ጥናት ስነምግባረ ኮምቴ (approval number H-2018-074) እና በሀረማያ ዩኒቨርስቲ የሰዉ ጥናት ስነምግባረ ኮምቴ ጸድቋል። ኤሄ ጥናት የምሰራ በ NHMRC National Statement on Ethical Conduct in Human Research (2007), አዉስትራልአ መሰረት ነዉ። በጥናቱ ላይ ማንኛዉንም ጠያቄ ካለ የጥናቱ ዋና ተመረማሪ ያናግሩ። ስለጥናቱ ማንኛዉን ጥያቄ ወይም ቅሬታ ከሎትና ሌላ አካል ማናገር ከፈለጉ የአዴለእድ ዩኒቨርሲቲ የሰዉ ምርምር አጠሪ ኮምቴ ጸሬ ና ሀረማያ ዩኒቨርስቲ ጤና ህክምና ሳይንስ ኮሌጅ ቺፍ ኤክስኪዉትቭ ዳይሬክተር ቢሮ ያናግሩ ከዝህ በታች በተጸፈ አድራሻ ያነጋግሩ። ማንኛዉም ቅሬታ በመተማመን ይጠራል። ዉጤቱን እናሳዉቆታለን።

አደለእድ ዩኒቨርስቲ፤ የሰዉ ምርምር አጠሪ ኮምቴ ጸሬ አድራሻ

ስልክ፤ +61883136028

እሜእል፤ hrec@adelaide.edu.au

ፖስታ፤ 4ኛ ፎቅ ረንድል ሞል ፕላዛ 50 ረንድል ሞል አዴለእድ ደቡብ አዉስትራልአ 5000

ሀረማያ ዩኒቨርስቲ ጤናና ህክምና ሳይንስ ኮሌጅ፤ ቺፍ ኤክስኩትቭ ዳይሬክተር ቢሮ

ስልክ: +25125-666-74-39

ፋክስ: +251-666-80-81

ፖስታ: 235, Harar, Ethiopia

እሜእል: chms@haramaya.edu.et

መሳተፍ ከፈለግኩ ምንድነዉ የምአደርግ?

መሳተፍ ከፈለጉ፤ ለቃለምልልሱ ቀጠሮ፤ ጥናቱን የምአካሄዱትን ተማሪ (አቶ ለማ ነገሰ) ያናግሩ።

ከምስጋና ጋር፤

አሶስ.ፕሮ. ጁዲ ማገረይ

አቶ ለማ ነገሰ

ዶ. ር ፍሊፓ ራስሙሴን

ዶ. ር ጆርጀን ሄንድሪክስ

Appendix B1: Consent form for quantitative study; English version

1. I have read the attached Information Sheet and agree to take part in the following research project:

Title:	Behavioural risk factors contributing to cardiovascular disease in Ethiopia
Ethics Approval	H-2018-074

2. I have had the project, so far as it affects me, and the potential risks and burdens fully explained to my satisfaction by the research worker. I have had the opportunity to ask any questions I may have about the project and my participation. My consent is given freely.

3. I have been given the opportunity to have a member of my family or a friend present while the project was explained to me.

4. Although I understand the purpose of the research project is to improve the quality of health/medical care, it has also been explained that my involvement may not be of any benefit to me.

5. I agree to participate in the activities as outlined in the participant information sheet.

6. I agree my doctor can be provided with the results of questionnaire. Yes ☐ No ☐

7. I understand that as my participation is anonymous, I can withdraw any time during interview before submission of the questionnaire. I am aware that if I decide to withdraw this will not affect medical advice in the management of my health, now or in the future.

8. I have been informed that the information gained in the project may be published in a journal article, thesis and conference presentations

9. I have been informed that in the published materials I will not be identified, and my personal results will not be divulged.

10. My information will only be used for the purpose of this research project and it will only be disclosed according to the consent provided, except where disclosure is required by law.

11. I am aware that I should keep a copy of this Consent Form, when completed, and the attached Information Sheet.

Participant to complete:

Name: _____Signature: _____
Date:_____

Researcher/Witness to complete:

I have described the nature of the research
to_____
(print name of participant)
and in my opinion, she/he understood the explanation.
Signature : _____Position : _____
Date:_____

Appendix B2: Consent form for quantitative study; Amharic version

የስምምነት ቅጽ

1. የተዘያዘዉን የተሳታሪ መረጃ ቅጽ አንብቤ ከዚህ በታች በተገለጸ ምርምር ለመሳተፍ ፈቃደኛ ነኝ

ርእስ:	ለልብ በሽታ አ ጋላጭ የሆኑ ባህርዮች
Ethics Approval Number:	H-2018-074

2. ጥናቱ እንደምነዳኝ ተነበልኛል፤ ጥናቱ ልአመጣ የምችሉ ጉዳቶች በረዳት ተመራማሪዉ በቂ በሆነ ሁኔታ ተገልጾልኛል፡፡ ስለምርምሩ ጥያቄ ና ስለ ተሳትፎዬ ለመጠየቅ እድል ተሰቶኛል፡፡ ስምምነቴ በነጻነት የተሰጠ ነዉ፡፡

3. ስለምርምሩ ስገለጽልኝ ቤተሰቦቼ ወይም ጉደኞቼ ከእኔ ጋር እንድሆኑ ተፈቅዶልኛል፡፡

4. ምርምሩ የጤና አገልግሎት ለማሻሻል የምረዳ ብሆንም፤ ተሳትፎዬ ምንም አይነት ጥቅም እንደማይሰገኝልኝ ተነግሮኛል፡፡

5. በመረጃ ቅጽ ላይ በተገለጸ መሰረት ለመሳተፍ ፍቃደኛ ነኝ፡፡

6. ህክሜ የተሞላዉ ቃለምልልስ እንድአይ እፈዳለሁ፡ አዎ ☐   አልፈቅድም ☐

7. ተሳትፎዬ ማንነት የማይገለጽ መሆኑ ተረድቼለሁ፤ ከምርምሩ የመረጃ መሰበሰብያ ቅጽ እስክገባ ድረስ ተሳትፎዬን ለማቋረጥ እችለሁ፤ ተሳታፎዬን ማቋረጤ አሁንም ሆነ ወደፍት የምአገኘዉን የጤና አገልግሎት አይጎዳም፡፡

8. የጥናቱ ግኝት በ ፒ.ኤች. ዲ ጽሁፍ ዉስጥ እንደምጸፈ፤ የምርምረ ጽሁፍ በምአሳትሙ ጆርናል ላይ እንደምታተም፤ በኮንፍራንስ ላይ እንደምቀርብ ተነግሮኛል፡፡

9. ጽሁፉ ስታተም ማንኛዉም እኔነቴን የምገልጽ መረጃ አይኖርም/አብሮ አይታተምም፡፡

10. መረጃዬ ለዝህ ጥናት ብቻ የምዉል ስሆን፤ በህግ ከተፈለገ በስተቀር ለማንም አሰልፎ አይሰጥም፡፡

11. ኤሄን የስምምነት ቅጽና የተሳታፈ መረጃ ቅጽ ግልባጨን መያዝ እንደምኖረብኝ ተረድቼአለሁ፡፡

ተሳታፊ የምሞላ:

ስም_____ፈርማ_____

ቀን_____

ተመራማሪ/ መረጃ ሰብሳቢ የምሞላ:

የምረምሩ ሁኔታ ለ (ስም)---------------------------ገልጨለሁ፤ በእኔ እይታ ገለጸዉን ተረድቷል፡፡

ፈርማ _____ስራ ድርሻ : _____ ቀን : --------------------

Appendix B3: Consent form for qualitative study; English version

1. I have read the attached Information Sheet and agree to take part in the following research project:

Title:	Perceptions towards heart disease and its causes among patients with hypertension in Ethiopia
Ethics Approval Number:	H-2018-074

2. I have had the project, so far as it affects me, and the potential risks and burdens fully explained to my satisfaction by the research worker. I have had the opportunity to ask any questions I may have about the project and my participation. My consent is given freely.
3. I have been given the opportunity to have a member of my family or a friend present while the project was explained to me.
4. Although I understand the purpose of the research project is to improve the quality of health/medical care, it has also been explained that my involvement may not be of any benefit to me.
5. I agree to participate in the activities as outlined in the participant information sheet.
6. I agree to be audio recorded   Yes ☐   No ☐
7. I understand that as my participation will be de-identified, I can withdraw at any time up until the completion of the interview and the researcher leaving the site. I am aware that if I decide to withdraw this will not affect medical advice in the management of my health, now or in the future.
8. I have been informed that the information gained in the project may be published in a journal article, thesis and conference presentations
9. I have been informed that in the published materials I will not be identified, and my personal results will not be divulged.
10. My information will only be used for the purpose of this research project and it will only be disclosed according to the consent provided, except where disclosure is required by law.
11. I am aware that I should keep a copy of this Consent Form, when completed, and the attached Information Sheet.

Participant to complete:
Name: Signature: _____ Date: _____
Researcher/Witness to complete:
I have described the nature of the research to_____
(print name of participant)
and in my opinion, she/he understood the explanation.
Signature : _____   Position: _____
Date: _____

Appendix B4: Consent form for qualitative study; Amharic version

የስምምነት ቅጽ

1. የተያያዘዉን የተሳታፊ መረጃ ቅጽ አንብቤ ከዝህ በታች በተገለጸ ምርምር ለመሳተፍ ፈቃደኛ ነኝ

ርእስ:	የደም ግፊት በሽተኞች ስለልብ በሽታና መንስኤዎቹ ያላቸዉ አመለካከት
Ethics Approval Number:	H-2018-074

2. ጥናቱ እንደምነዳኝ ተነበልኛል፤ ጥናቱ ልአማጣ የምችሉ ጉዳቶች በረዳት ተመራማሪዉ በቂ በሆነ ሁኔታ ተገልጸልኛል። ስለምርምሩ ጥያቄ ና ስለ ተሳትፎዬ ለመጠየቅ እድል ተሰቶኛል። ስምምነቴ በነጻነት የተሰጠ ነዉ።

3. ስለምርምሩ ስገለጽልኝ ቤተሰቦቼ ወይም ጉደኞቼ ከእሌ ጋር እንድሆኑ ተፈቅዶልኛል።

4. ምርምሩ የጤና አገልግሎት ለማሻሻል የምረዳ ብሆንም፤ ተሳትፎዬ ምንም አይነት ጥቅም እንደማይአሰገኝልኝ ተነግሮኛል።

5. በመረጃ ቅጽ ላይ በተገለጸ መሰረት ለመሳተፍ ፍቃደኛ ነኝ።

6. በዉይይት ግዜ ድምሴ እንድቀዳ ፍቃደኛ ነኝ   አዎ ☐ አይደለም ☐

7. ተሳትፎዬ ማንነት የማይገለጽ መሆኑ ተረድቻለሁ፤ ከምርምሩ የመረጃ መሰበሰብያ ቅጽ እስክገባ ድረስ ተሳትፎዬን ለማቋረጥ እችላለሁ፤ ተሳትፎዬን ማቋረጤ አሁንም ሆነ ወደፊት የምአገኘዉን የጤና አገልግሎት አይጎዳም።

8. የጥናቱ ግኝት በ ፒ.ኤች. ዲ ጽሁፍ ዉስጥ እንደምጻፈ፤ የምርም ጽሁፍ በምአሳትሙ ጀርናል ላይ እንደምታተም፤ በኮንፍራንስ ላይ እንደምቀርብ ተነግሮኛል።

9. ጽሁፉ ስታተም ማንኛዉም እኔነቴን የምገልጽ መረጃ አይኖርም/አብሮ አይታተምም።

10. መረጃዬ ለዝህ ጥናት ብቻ የምዉል ስሆን፤ በህግ ከተፈለገ በስተቀር ለማንም አሰልፎ አይሰጥም።

11. ኤኜን የስምምነት ቅጽና የተሳታፊ መረጃ ቅጽ ግልባጨን መያዝ እንደምኖረብኝ ተረድቻለሁ።

ተሳታፊ የምሞላ:
ስም_____ፈርማ_____ ቀን_____

ተመራማሪ/ መረጃ ሰብሳቢ የምሞላ:
የምረምሩ ሁኔታ ለ (ስም)_____ገልጨለሁ፤ በእኔ እይታ ገለጻዉን ተረድቷል።
ፍርማ : _____ስራ ድርሻ : _____ ቀን :_____

Appendix C1: Survey questionnaire; English version

A. Socio-demographic		
S.No	Questions	Response and code
101	Sex	1=Male 2=Female
102	How old are you?	_____years
103	Where is your residence?	1=Urban 2=Rural
104	What is the highest level of education you have completed?	1=No formal schooling 2=Less than primary school 3=primary school completed 4=Secondary school completed 5=College/university completed 6=Postgraduate degree 7=Refused
105	What is your ethnic background?	1=Oromo 2=Amhara 3=Somali 4=Tigre 5=Hadare 6=Other_____(specify) 7=Refused
106	What is your religion?	1=Orthodox 2=Muslim 3=Protestant 4=Catholic 5=Other_____(specify) 6=Refused
107	What is your marital status?	1=Never married 2=Currently married 3=Separated 4=Divorced 5=Widowed 6=Cohabitating 7=Refused
108	Which of the following best describes your main work status over the past 12 months?	1=Government employee 2=Non-government employee 3=Private employee 4=Private skilled worker 5=Farmer 6=Trader 7=Student 8=Homemaker/Housewife 9=Unemployed 10=Retired 11=Other_____(specify) 12=Refused
109	What is your average monthly income in Ethiopian Birr?	_____

	B. Behavioural Risk Factors	
	2. Smoking	
201	In the past have you ever used any tobacco product?	1=Yes 2=No→209
202	Did you smoke daily?	1=Yes 2=No
203	How many cigarette do you smoke daily?	_____
204	Do you currently use any tobacco products such as cigarettes, cigars and gaya?	1=Yes 2=No→209
205	Do you smoke daily?	1=Yes 2=No
206	How many cigarette do you smoke daily?	_____
207	During the past 12 months, have you tried to stop smoking?	1=Yes 2=No→209
208	How long ago did you stop smoking?	_____ Years _____ Months
209	In the last 30 days did someone smoke in your home?	1=Yes 2=No
	3. Alcohol Consumption	
301	Have you ever consumed any alcohol such as Beer, tej, tela....?	1=Yes 2=No→401
302	During the past 7 days, did you consume any homebrewed alcohol, such as tella, tej, katikalla, bordie?	1=Yes 2=No
303	Have you consumed any alcohol such as Beer, tej, tela.... within the past 12 months?	1=Yes 2=No
304	Have you consumed alcohol within the past 30 days?	1=Yes 2=No→401
305	During the past 30 days, on how many occasions did you have at least one standard alcoholic drink?	_____
	4. Diet, Fruit and Vegetables Consumption	
401	In a typical week, on how many days do you eat fruit?	_____ days
402	How many servings of fruit do you eat on one of those days?	_____ servings
403	In a typical week, on how many days do you eat vegetables?	_____ days
404	How many servings of vegetables do you eat on one of those days?	_____ servings
405	What type of oil or fat is most often used for meal preparation in your household?	1=Vegetable oil 2=Homemade oil product 3=Butter 4=Margarine 5=Solid fat 6=Other_____ specify 7=Don't know

406	Do you use extra top added salt on plate?	1=Yes 2=No→408
407	How often do you add salt to your food right before you eat it or as you are eating it?	1=Always 2=Often 3=Sometimes 4=Rarely 5=Never 6=Don't know

5. Khat chewing		
501	Have you ever chewed Khat?	1=Yes 2=No→601
502	Do you currently chew Khat?	1=Yes 2=No
503	During the past 12 months, how frequently did you chew Khat?	1 =Daily 2 =5-6 days per week 3 =3-4 days per week 4 =1-2 days per week 5 =1-3 days per month 6 = Less than once a month

6. Physical Activity		
Vigorous Intensity		
601	During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, cutting fire, running, football, digging, aerobics, or fast bicycling?	_____ Days per week No vigorous physical activities →603
602	How much time did you usually spend doing vigorous physical activities on one of those days?	_____ Hours per day _____ Minutes per day Don't know/Not sure
Moderate intensity		
603	During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, washing clothes, swimming, playing volley ball, bicycling at a regular pace, or doubles tennis? Do not include walking.	_____ Days per week No moderate physical activities →605
604	How much time did you usually spend doing moderate physical activities on one of those days?	_____ Hours per day _____ Minutes per day Don't know/Not sure
Walking		
605	During the last 7 days, on how many days did you walk for at least 10 minutes at a time?	_____ Days per week No walking→607
606	How much time did you usually spend walking on one of those days?	_____ Hours per day _____ Minutes per day Don't know/Not sure
607	During the last 7 days, how much time did you spend sitting on a week day?	_____ Hours per day _____ Minutes per day Don't know/Not sure

608	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, cutting fire and other wood for at least 10 minutes continuously?	1=Yes 2=No

C. Heart disease risk knowledge	Response and code
701	A person always knows when they have heart disease	1. True 2. False 3. Don't know
702	If you have a family history of heart disease, you are at risk for developing heart disease	1. True 2. False 3. Don't know
703	The older a person is, the greater their risk of having heart disease	1. True 2. False 3. Don't know
704	Smoking is a risk factor for heart disease	1. True 2. False 3. Don't know
705	A person who stops smoking will lower their risk of developing heart disease	1. True 2. False 3. Don't know
706	High blood pressure is a risk factor for heart disease	1. True 2. False 3. Don't know
707	Keeping blood pressure under control will reduce a person's risk for developing heart disease	1. True 2. False 3. Don't know
708	High cholesterol is a risk factor for developing heart disease	1. True 2. False 3. Don't know
709	Eating fatty foods does not affect blood cholesterol levels	1. True 2. False 3. Don't know
710	If your 'good' cholesterol (HDL) is high you are at risk for heart disease	1. True 2. False 3. Don't know
711	If your 'bad' cholesterol (LDL) is high you are at risk for heart disease	1. True 2. False 3. Don't know
712	Being overweight increases a person's risk for heart disease	1. True 2. False 3. Don't know
713	Regular physical activity will lower a person's chance of getting heart disease	1. True 2. False 3. Don't know
714	Only exercising at a gym or in an exercise class will lower a person's chance of developing heart disease	1. True 2. False 3. Don't know
715	Walking and gardening are considered exercise that will help lower a person's chance of developing heart disease	1. True 2. False 3. Don't know
716	Diabetes is a risk factor for developing heart disease	1. True 2. False 3. Don't know

Appendix C2: Survey questionnaire; Amharic translation

	A. የማህበራዊ ሁኔታ	
ተ. ቁ	ጥያቄዎች	መልስና ኮድ
101	ጾታ	1=ወንድ 2=ሴት
102	እድሜህ/ሽ ስንት ነዉ?	_____አመት
103	መኖርያ/ሽ የት ነዉ?	1=ከተማ 2=ገጠር
104	ያጠናቀቀዉ ከፍተኛ የትምህርት ደረጃ ምንድነዉ?	1=መደበኛ ትምህረት ያልተከታተለ 2=ከአንደኛ ደረጃ በታች 3=አንደኛ ደረጃ ያጠናቀቀ/ች 4=ሁለተኛ ደረጃ ያጠናቀቀ/ች 5=ኮሌጅ/ዩኒቨርስቲ ያጠናቀቀ/ች 6=ድህረ ምረቃ ትምህረት ያጠናቀቀ/ች 7=መመለስ አልፈልግም
105	ብሄርህ ምንድነዉ?	1=ኦሮሞ 2=አማረ 3=ሶማሊ 4=ትግራይ 5=ሀረሪ 6=ሌላ_____(ይጠቀስ) 7=መልስ አልሰጥም
106	ሀይማኖትህ ምንድነዉ?	1=ኦረቶዶክስ 2=ሙስሊም 3=ፕሮቴስታንት 4=ካቶሊክ 5=ሌላ_____(ይጠቀስ) 6=መልስ አልሰጥም
107	የጋብቻ ሁኔታ ምንድነዉ?	1=ያላገባ/ች 2=ያገባ/ች 3=የተለያዩ 4=የተፋቱ 5=የሞቴችበት/የሞቴባት 6= ሳይጋቡ አብሮ የምኖሩ 7=መልስ አልሰጥም
108	የትኛዉ ያለፉት የ 12 ወራት የስራ ሁኔታህን/ሽን በትክክል ይገልፃል?	1=የመንግስት ስራተኛ 2=መንግስታዊ ልሆነ 3=የግል ስራተኛ 4=የግል ሙያ ስራተኛ 5=ገበሬ 6=ነጋዴ

		7=ተማሪ 8=የቤት እመቤት 9=ስራ አጥ 10=ጡረተኛ 11=ሌላ_____(ይጠቀስ) 12=መልስ አልሰጥም
109	በአማካኝ ወራዊ ገብህ/ሽ፤ በእትዮጵያ ብር ስንት ነዉ?	_____

B. አጋላጭ ባህርዮች		
2. ስጋራ ማጨስ		
201	ከዝህ በፊት ማንኛዉንም ትምባዎ አይነት ተጠቅመህ/ሽ ታዉቃለህ/ሽ?	1=አዎ 2=ተጠቅሜ አላቅም→209
202	በየቀኑ ታጨስ/ሽ ነበር?	1=አዎ 2=አይደለም→204
203	በቀን ስንት ስጋራ ታጨስ/ሽ ነበረ?	_____
204	አሁን ማንኛዉንም የትምባዎ አይነት፤ እንደ ስጋራ፤ ስጋረና ጋያ ትጠቀማለህ/ ትጠቀምያለሽ?	1=አዎ 2=አልጠቀምም→209
205	በየቀኑ ታጨሳለህ/ ታጨሻለሽ?	1=አዎ 2=አይደለም→207
206	በቀን ስንት ስጋራ ታጨሰለህ?	_____
207	ባለፉት 12 ወራት ስጋራ ማጨስ ለማቆም ምክረህ/ሽ ነበረ?	1=አዎ 2=አይደለም→209
208	ስጋራ ማጨስ ካቆምክ/ሽ ምንያህል ግዜ ሆኖሀል?	_____ አመት _____ ወር
209	ባለፉት 30 ቀናት ዉስጥ በቤትህ/ሽ ዉስጥ ሰዉ አጨሶ ያዉቃል?	1=አዎ 2=አይደለም
3. አልኮል መጠጣት		
301	ከዝህ በፊት እንደ ቢራ፤ ጠጅ፤ ጠላ…. አይነት አልኮል መጠጦችን ጠጥተህ/ሽ ታዉቃለህ/ሽ?	1=አዎ 2=አይደለም→401
302	ባለፉት 7 ቀናት ዉስጥ ቤት ዉስጥ ምሰሩ እንደ ጠላ፤ ጠጅ፤ ካትካላ፤ ቦርዴ…. ጠጥተህ/ሽ ታዉቃለህ/ሽ?	1=አዎ 2=አይደለም
303	ባለፉት 12 ወራት ዉስጥ ማንኛዉንም የመጠጥ አይነት እንደ ቢራ፤ ጠጅ፤ ጠላ… ጠጥተህ/ሽ ታዉቃለህ/ሽ?	1=አዎ 2=አይደለም
304	ባለፉት 30 ቀናት ዉስጥ አልኮል ጠጥተሃል?	1=አዎ 2=አይደለም→401
305	ባለፉት 30 ቀናት ዉስጥ፤ በስንቱ የመጠጥ ቀናት 1 ስታንደረድ አልኮል ጠጣ/ሽ?	_____
4. ፍራፍሬና ቅጠላቅተል መመገብ		
401	በሳምንት ዉስጥ ስንት ቀን ፍራፍሬ ትመገባለህ?	_____ ቀን

402	በእነዝህ ቀናት፤ በአንድ ቀን ስንት ፍራፍሬ ሰረሽንግ ትመገባለህ?	_____ ሰረሽንግ
403	በሳምንት ዉሰጥ ስንት ቀን አትክልት ትመገባለህ?	_____ ቀን
404	በእነዝህ ቀናት፤ በአንድ ቀን ስንት ሰረብንግ አተክልት ትመገባለህ?	_____ ሰረብንግ
405	በቤት ዉሰጥ፤ ምግብ ለማዘጋጀት ምንአይነት ዘይት አዘውትሮ ይጠቀማሉ?	1=ሽጅተብል ዘይት 2=ቤት የምዘጋጁ ዘይት 3=ቅቤ 4=መርጋሪን 5=የምረጋ ዘይት 6=ሌላ_____(ይጠቀስ) 7=አላዉቅም
406	ምግብ ስትበላ/ይ ምግብ ላይ ተጨማሪ ጨዉ ትጨምራለህ/ሽ?	1=አዎ 2=አልጨምርም→408
407	ምንያህል ግዜ ምግብ ከመብላተህ በፍት/ስትበላ ተጨማሪ ጨዉ ትጨምራለህ/ሽ?	1=ሁልግዜ 2=ብዙ ግዜ 3=አንድአንዴ 4=አልፎአልፎ 5=በፍጹም አልጨምርም

5. ጨት መቃም

501	ከዝህ በፍት ጨት ቅመህ/ሽ ታዉቃለህ/ሽ?	1=አዎ 2=አላዉቅም→601
502	አሁን ጨት ትቅማለህ?	1=አዎ 2=አልቅምም
503	ባለፉት 12 ወራት ዉስጥ ምንያህል ግዜ ጨት ቅመሃል?	1 =በየቀኑ 2 =በሳምንት 5-6 ቀን 3 = በሳምንት 3-4 ቀን 4 =በሳምንት 1-2 ቀን 5 =በወር 1-3 ቀን 6 =በወረ ከ 1 ቀን በታች

6. የአካል እንቅስቃሴ

ከባድ እንቅስቃሴ

601	ባለፉት 7 ቀናት ዉሰጥ ስንት ቀን ከባድ የአካል እንቅስቃሴ እንደ ከባድ እቃ ማንሳት፤ እንጨት መቁረጥ፤ መሮጥ፤ እግረ ኳስ መጨወት፤ መቆፈረ፤ አኤሮብክስና በፍጥነት ባይስክል መንዳት አይነት ሰረተሃል?	_____ ቀናት በሳምንት ምንም አይነት ከባድ የአካል እንቅስቃሴ አልሰራም →603
602	ከእነዛ ቀናት፤ በአንዱ ቀን ምንያህል ግዜ ከባድ የአካል እንቅስቃሴ በመስራት አሳልፈሃል?	_____ ሰአት በቀን _____ ደቂቃ በቀን አላዉቅም/እረግጠኛ አይደለዉም

መከከለኛ እንቅስቃሴ

603	ባለፉት 7 ቀናት ዉስጥ ስንት ቀን መከከለኛ የአካል እንቅስቃሴ እንደ መጠነኛ እቃ መሸከም፣ ልብስ ማጠብ፣ ዋና፣ የእጅ ኳስ መጫወት፣ ባይስክል በመጠነኛ ፍጥነት መንዳትና ደብል ቴኒስ ሰረተሃል? የእግር ጉዞን አያካትትም	_____ ቀናት በሳምንት ምንም አይነት መከከለኛ የአካል እንቅስቃሴ አልሰራም →605
604	ከእነዚ ቀናት፣ በአንዱ ቀን ምንያህል ግዜ መከከለኛ የአካል እንቅስቃሴ በመስራት አሳልፈሃል?	_____ ሰአት በቀን _____ ደቂቃ በቀን አላዉቅም/እረግጠኛ አይደለዉም

የእግር ጉዞ መድረግ		
605	ባለፉት 7 ቀናት ዉስጥ ስንት ቀን ብያንስ ለ 10 ደቂቃ በእግር ተጉዘሃል?	_____ ቀናት በሳምንት የእግር ጉዞ አላደረኩም→607
606	ከእነዚ ቀናት፣ በአንዱ ቀን ምንያህል ግዜ የእግር ጉዞ በማድረግ አሳልፈሃል?	_____ ሰአት በቀን _____ ደቂቃ በቀን አላዉቅም/እረግጠኛ አይደለዉም
607	ባለፉት 7 ቀናት ምንያህል ግዜ በመቀመጥ አሳልፈሃል?	_____ ሰአት በቀን _____ ደቂቃ በቀን አላዉቅም/እረግጠኛ አይደለዉም
608	ስራህ/ሽ ከባድ የአካል እንቅስቃሴ፣ ትንፈሽና ልብ ምት እንድቻምር የምአደርጉ እንደ ከባድ ክብደት ማንሳት፣ መቆፈር፣ የግንባታ ስራ፣ ለተከታታ 10 ደቂቃ እንጨት መቁረጥን ያካትታል?	1=አዎ 2=አይደለም

	C. ለልብ በሽታ አጋላጭ ነገሮች ያለቸዉ አዉቀት	**መልስና ኮድ**		
701	ብዙ ግዜ ሰዉ በልብ በሽታ ስያዝ ያዉቃል	1. እዉነት	2. ዉሸት	3. አላዉቅም
702	ቤተሰብህ/ሽ ዉስጥ የልብ በሽታ ያለዉ ሰዉ ካለ፣ በልብ በሽታ የምያዝ እድል ይኖረሃል/ሻል	1. እዉነት	2. ዉሸት	3. አላዉቅም
703	ሰዉ እድሜዉ እየጨመረ ስሄድ በልብ በሽታ የምያዝ እድሉ እጨመረ ይሄዳል	1. እዉነት	2. ዉሸት	3. አላዉቅም
704	ማጨስ ለልብ በሽታ ያጋልጣል	1. እዉነት	2. ዉሸት	3. አላዉቅም
705	ማጨስ የምአቆም ሰዉ በልብ በሽታ የምያዝ እድሉን ይቀንሳል	1. እዉነት	2. ዉሸት	3. አላዉቅም
706	ከፍተኛ ደም ግፈት ለልብ በሽታ ያጋልጣል	1. እዉነት	2. ዉሸት	3. አላዉቅም
707	ደም ግፈት መቆጣጠር የሰዉ በልብ በሽታ የምያዝ እድል ይቀንሳል	1. እዉነት	2. ዉሸት	3. አላዉቅም
708	ከፍተኛ ኮሌስትሮል ለልብ በሽታ ያጋልጣል	1. እዉነት	2. ዉሸት	3. አላዉቅም
709	ቅባት የበዛበት ምግብ መብላት ደም ዉስጥ ያለዉን የኮሌስትሮል መጠን አይጨዳም	1. እዉነት	2. ዉሸት	3. አላዉቅም

710	'ጥሩ ኮሌስትሮልህ' (HDL) ስጨምር ለልብ በሽታ ያጋልጠሃል	1. እውነት	2. ውሸት	3. አላዉቅም
711	'መጥፎ ኮሌስትሮልህ' (LDL) ስጨምር ለልብ በሽታ ያጋልጠሃል	1. እውነት	2. ውሸት	3. አላዉቅም
712	ከልክ በላይ መዉፈር ለልብ በሽታ ሰዉ ይበልጥ ተጋላጭ እንድሆን ያደርጋል	1. እውነት	2. ውሸት	3. አላዉቅም
713	በተከታታይ የአካል እንቅስቃሴ መስራት በልብ በሽታ የመያዝ እድልን ይቀንሳል	1. እውነት	2. ውሸት	3. አላዉቅም
714	ለልብ በሽታ ተጋላጭነት ለመቀነስ የምረይ የአካል እንቅስቃሴ ባአካል ማጎልበቻ ቤቶች/ስፍራ የምሰሩ ብቻናቸዉ	1. እውነት	2. ውሸት	3. አላዉቅም
715	የእግር ጉዞ ማድረግና ጉሮ ማንከባከብ ለልብ በሽታ ተጋላጭነትን ለመቀነስ ይረዳሉ	1. እውነት	2. ውሸት	3. አላዉቅም
716	የስኳር በሽታ ለልብ በሽታ ያጋልጣል	1. እውነት	2. ውሸት	3. አላዉቅም

Appendix D1: Interview guide; English version

1. What do you know about heart disease?

2. Who do you think develops heart disease? Are you concerned about developing a heart disease (is developing a heart disease something you worry about)? and why?

3. What do you think are the causes of heart disease?

4. Do you think your hypertension may cause you to develop heart disease in the future?

5. What can be done to reduce your risk of developing heart disease from high blood pressure?

6. What do you think are the possible consequences of heart disease?

7. What is healthy diet? What types of diets increase or decrease the risk of heart disease?

8. What is the relationship between heart disease and exercise?

9. Do you think there is something people can do to reduce their risk of developing heart disease?

Appendix D2: Interview guide; Amharic translation

1. ስለ ልብ በሽታዎች ምን የምታውቁው ነገር አለ?

2. የልብ ህመም ምን ይመስልዎታል? የልብ ህመም ሊያጋጥምዎት ይችላል?, እርስዎ የሚያስጨንቅዎ የልብ በሽታ አለው? ለምን?

3. የልብ በሽታ መንስኤዎች ምንድናቸው የሚመስለው?

4. የደም ግፊትዎ የልብ ህመም ሊያመጣ ይችላል ብለው ያስባሉ?

5. ከከፍተኛ የደም ግፊት የልብ በሽታ የመያዝን አደጋ ለመቀነስ ምን ማድረግ ይቻላል ብለው ያስባሉ?

6. የልብ ሕመም ሊያስከትል የሚችላቸው ውጤቶች ምንድነው ብለው ያሰቡት?

7. ጤናማ አመጋገብ ምንድነው? የልብ ህመም አደጋን የምጨመር ወይም የምቀንስ ምን ዓይነት ምግቦች ናቸው?

8. በልብ በሽታ እና በአካል ብቃት እንቅስቃሴ መካከል ያለው ግንኙነት ምንድነው?

9. ሰዎች የልብ በሽታ የመያዝ አደጋን ለመቀነስ ሊያደርጉት የሚችሉት ነገር አለ ብለው ያስባሉ?

Appendix E1: Poster for survey

> **We are looking for study participants for a research**

Research title: Lifestyle conditions causing heart disease and patients' understanding of these in Ethiopia.

Ethics approval number: H-2018-074

Investigators:

Assoc. Prof. Judy Magarey
Mr. Lemma Negesa
Assoc. Prof. Philippa Rasmussen
Dr. Jeroen Hendriks

Who is eligible to participate?
- ❖ Adult patients (age18-64) and with medical diagnosis of one or more of the followings:

  - Hypertension
  - Heart failure
  - Arrhythmias
  - Coronary artery disease
  - Ischemic heart disease and
  - Heart attack

If you interested in participating, contact us on the address written below, we will provide you details about the study.
Contact Address:
Research assistants' address
Hiwot Fana Specialised University Teaching Hospital: 0984111838
Dilchora Referral Hospital: 092280036

Appendix E2: Poster for qualitative study

Project title: Perceptions towards heart disease and its causes among patients with hypertension in Ethiopia

Your participation will involve a face to face interview, which will take about 45 minutes.

Ethics approval number: H-2018-074

Investigators:

    Assoc. Prof. Judy Magarey

    Mr. Lemma Negesa

    Assoc. Prof. Philippa Rasmussen

    Dr Jeroen Hendriks

Who is eligible to participate?

 ❖ Adult patients (age18-64) and with medical diagnosis of hypertension and attending follow up service

If you are interested in participating, contact us on the address written below, we will provide you details about the study.

Contact Address:

  Lemma Negesa

  Email: lemma.bulto@adelaide.edu.au

  Phone: +251923190110

Appendix F1: University of Adelaide, HREC approval letter

THE UNIVERSITY of ADELAIDE

RESEARCH SERVICES
OFFICE OF RESEARCH ETHICS, COMPLIANCE
AND INTEGRITY
THE UNIVERSITY OF ADELAIDE

LEVEL 4, RUNDLE MALL PLAZA
50 RUNDLE MALL
ADELAIDE SA 5000 AUSTRALIA

TELEPHONE +61 8 8313 5137
FACSIMILE +61 8 8313 3700
EMAIL   hrec@adelaide.edu.au

CRICOS Provider Number 00123M

Our reference 32839

18 April 2018

Associate Professor Judith Magarey
Nursing

Dear Associate Professor Magarey

  ETHICS APPROVAL No: H-2018-074
  PROJECT TITLE: Behavioural risk factors contributing to cardiovascular disease in Ethiopia

The ethics application for the above project has been reviewed by the Human Research Ethics Committee and is deemed to meet the requirements of the *National Statement on Ethical Conduct in Human Research (2007)*.

You are authorised to commence your research on: 18/04/2018
The ethics expiry date for this project is: 30/04/2021

NAMED INVESTIGATORS:

Chief Investigator:	Associate Professor Judith Magarey
Student - Postgraduate Doctorate by Research (PhD):	Mr Lemma Negesa Bulto
Associate Investigator:	Dr Philippa Rasmussen
Associate Investigator:	Dr Jeroen Hendriks

CONDITIONS OF APPROVAL: Thank you for the detailed response and revised application dated 13.4.18 and 17.4.18 to the matters raised by the Committee.

Ethics approval is granted for three years and is subject to satisfactory annual reporting. The form titled Annual Report on Project Status is to be used when reporting annual progress and project completion and can be downloaded at http://www.adelaide.edu.au/research-services/oreci/human/reporting/. Prior to expiry, ethics approval may be extended for a further period.

Participants in the study are to be given a copy of the information sheet and the signed consent form to retain. It is also a condition of approval that you immediately report anything which might warrant review of ethical approval including:

- serious or unexpected adverse effects on participants,
- previously unforeseen events which might affect continued ethical acceptability of the project,
- proposed changes to the protocol or project investigators; and
- the project is discontinued before the expected date of completion.

Yours sincerely,

Professor Paul Delfabbro
Convenor

The University of Adelaide

Appendix F2: Ethics approval letter from Haramaya University, Institutional Health Research Ethics Review Committee

Ref.No. IHRERC/157/2018

May 25/2018

To: Chief Executive Director, College of Health and Medical Sciences (COHMS), Haramaya University, Harar Campus.

From: Institutional Health Research Ethics Review Committee (IHRERC), College of Health and Medical Sciences, Harar Campus

Nega Baraki
Chair-person of the IHRERC

Subject: __Ethical approval of research proposal__

It is known that various research proposals are passing through the IHRERC for ethical reviews. To this effect **Lemma Negesa** who is Academic Staff of the COHMS and now studying for his PhD at the University of Adelaide, Australia, has submitted a PhD dissertation proposal entitled **"Behavioral cardiovascular risk factors among cardiovascular disease patients attending chronic follow up units of Dilchora Referral Hospital and Hiwot Fana Specialized University Hospital, Eastern Ethiopia"** through a letter written on Mach 29/2018 and directed to office of the IHRERC from your office. The IHRERC has scrutinized the proposal for ethical issues and made the investigator to correct and incorporate essential elements. The investigator has incorporated all elements as enquired by the committee. The committee has, therefore, approved the herewith attached and stamped 73 pages proposal unanimously through full consensus of all existing seven members of the IHRERC in its regular meeting convened on May 22/2018. The IHRERC congratulates the investigator for the concerted efforts he made to fulfill the recommendations of the Committee.

Finally the IHRERC requests your Office, to inform officially the investigator to commence his data collection process by contacting for permission of the concerned authorities in the respected study area/ settings. However, since the IHRERC is bestowed to make follow-up of the research process, the investigator is informed with a copy of this letter to report any changes in the research procedure and submit an activity progress report to the IHRERC **every three months**. A copy of the final report is also expected.

At the back of this letter is signed and stamped copy of the approval format of the IHRERC.

With Regards

CC

➢ **Lemma Negesa** (including one copy of the approved proposal)

Haramaya University, College of Health and Medical Sciences
Institutional Health Research Ethics Review Committee (IHRERC)
Address: Tel.0254662011, P.O.Box 235, Fax 025668081, Harar-Ethiopia
E-mail neggalemash@gmail.com

Institutional Health Research Ethics Review Approval Form

Name of the institution **Haramaya Universitys College of Health and Medical sciences**

Name of PI: **Lemma Negesa Tel +251923190110   E-mail: lemma.bulto@adelaide.edu.au   P.O.Box**

Title of the proposal /project: **Behavioral cardiovascular risk factors among cardiovascular disease patients attending chronic follow up units of Dilchora Referral Hospital and Hiwot Fana Specialized University Hospital, Eastern Ethiopia**

To: Chief Executive Director, College of Health and Medical Sciences, Haramaya University, Harar Campus

The IRERC has reviewed the aforementioned project proposal with special emphasis on the following points:

1. Are all ethical principles considered?

1.1 Respect for persons	Yes √	No
1.2 Beneficence	Yes √	No
1.3 Justice	Yes √	No

2. Are the objectives of the study ethically achievable?   Yes √   No

3. Is/ Are method(s) ethically sound?   Yes √   No

Based on the above mentioned ethical assessment the Institutional Research Ethics Review Committee has

a) **Approved**: the proposal for: i. Regional/National Review [ ]

   ii. Implementation [√]

   Expiry date of the review

   30   04   2019
   Date   Month   Year

b) **Conditionally approved** [ ]

c) **Not approved** [ ]

Finally we would like to take this opportunity to request your good office to facilitate his request for the proposed study.

With best regards

Chairperson: Negga Baraki   25/05/2018
               Name   Signature   Date

Secretary   Berhe G/Michael   25/05/2018
               Name   Signature   Date

N.B
For any information question and clarification don't hesitate to contact the Committee with the addresses specified in the heading.

Appendix G: Evidence of permission to conduct the study in Ethiopia

HARAMAYA UNIVERSITY
ሐረማያ ዩኒቨርሲቲ

COLLEGE OF HEALTH AND MEDICAL SCIENCE
ጤናና ህክምናሳይንስ ኮሌጅ

138, Dire Dawa, Ethiopia   235, Harar, Ethiopia 025-666-74-39
025-553-03/19/22/21   251-025-553-25/31/54   251-666-80-81ሐረርኢ.ትዮጵ.ዖ
ድሬዳዋኢ.ትዮጵ.ዖemail : Hararmaya.univ@ethio.netemail : chms@hararmaya.edu.et

ቁጥር
Ref. No___ /10.0/2449/18
ቀን
Date___ Feb 20, 2018

To: The University of Adelaide, Human Research Ethics Committee

Subject: Evidence of permission for Lemma Negesa

Mr. Lemma Negesa, a PhD candidate at the University of Adelaide, informed our office that he has a plan to conduct his PhD project in our hospital and he requested our office for permission to conduct his PhD project in our hospital.We are writing to provide him evidence of permission for his request, and we would like to confirm for your esteemed office that our office will permit and cooperate Mr. Lemma to conduct his research in our hospital.

With regards

Yadeta Dessie (PhD)
Chief Executive Director
College of Health & Medical Scien

In replying Please Quote Our Reference   ሲፅፋልን የእኛን ደብዳቤ ቁጥር

Appendix H: Poster presentation on Cardiac Society of ANZ

Scientific Meeting

Cardiovascular risk behaviour is an emerging health issue in developing countries

Lemma B Negesa,[1, 2] Judy Magarey,[1] Philippa Rasmussen,[1] Jeroen ML Hendriks,[3, 4*]

Background:
The global progress in CVD prevention is scarce particularly in developing countries, which are facing a high burden of CVD whilst there is limited availability of resources and evidence to educate and modify lifestyle behaviours in the population.

Aim:
The goal of the study was to quantify the prevalence of different cardiovascular risk behaviours among patients with known cardiovascular conditions in a developing country.

Methods:
A hospital based cross-sectional survey was conducted in two referral hospitals in Ethiopia. Outpatient unit patients who had a confirmed diagnosis of CVD were eligible for participation in the study. Data were collected through face-to-face interviews with patients using validated tools.

Results:
A total of 287 cardiovascular disease patients was recruited, of which 56.4% were women and 90.2% were urban residents.
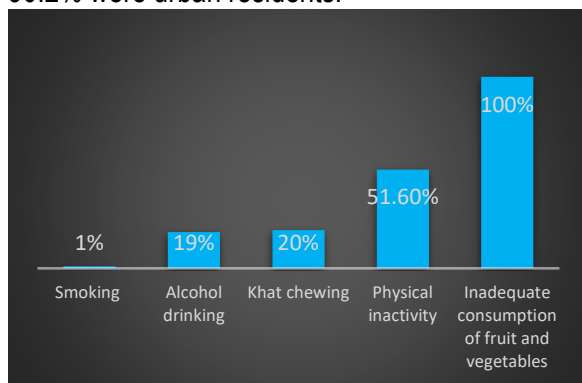
Fig 1. CV risk behaviours among CVD patients
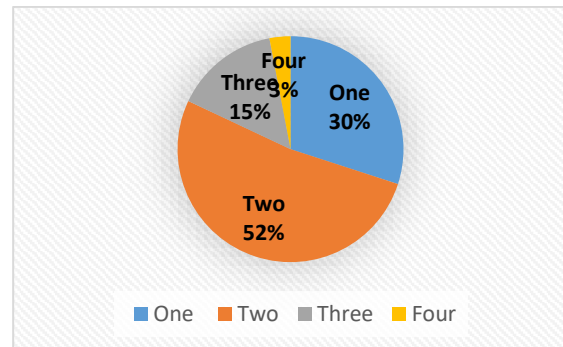
Fig 2. Cumulative CV risk behaviours

Conclusion:
The findings of this study demonstrate a high prevalence of physical inactivity, alcohol consumption and inadequate fruit and vegetable consumption in developing countries. Moreover, this study shows the existing follow-up care is ineffective and provides evidence for policy makers that health services reform is required. Implementation of lifestyle support programs should be considered for the disease prevention policy agenda in developing countries.

Acknowledgements:
The authors would like to thank the University of Adelaide for supporting this study. They are also grateful to the study participants, data collectors and healthcare workers who were directly or indirectly involved in this study.

References:
Amiri, M, Majid, HA, Hairi, F Prevalence and determinants of cardiovascular disease risk factors among the residents of urban community housing projects in Malaysia. BMC Public Health 2014; 14 (Suppl. 3): 1–9.
Alsheikh-Ali, AA, Omar, MI, Raal, FJ Cardiovascular risk factor burden in Africa and the Middle East: the Africa Middle East Cardiovascular Epidemiological (ACE) Study. PLoS One 2014; 9: 1–9

[1]The University of Adelaide, Adelaide Nursing School, Australia
[2]Haramaya University, College of Health and Medical Sciences, Harar, Ethiopia
[3]Centre for Heart Rhythm Disorders, South Australian Health and Medical Research Institute, the University of Adelaide and the Royal Adelaide Hospital, Australia
[4]Department of Medical and Health Sciences, Linköping University, Sweden

Appendix I: Slides for Rapid Abstract Presentation at European

**Society of Cardiology**

Study design and methods

- A hospital based cross-sectional survey, conducted in two referral hospitals in Ethiopia from June-September 2018

- Inclusion criteria:
  - ➢ confirmed CVD diagnosis: heart failure, hypertension, MI
  - ➢ aged 18-64 years

- Data collection through face-to-face patient interviews, using validated tools (WHO STEPs instrument and international physical activity questionnaire)

- Identification of CV risk behaviours (smoking, alcohol, khat chewing, fruit and vegetable intake, physical inactivity)

Results: multiple risk behaviours in majority of pts

Characteristics	Population (N=287)
Age – (mean ± SD) years	47± 11
Female sex – no. (%)	162 (56)
Hypertension – no. (%)	203 (71)
Heart failure – no. (%)	77 (27)
Myocardial Infarction – no. (%)	6 (2)
Urban residents– no. (%)	259 (91)
No formal education – no. (%)	153 (53)

Distribution of risk behaviours
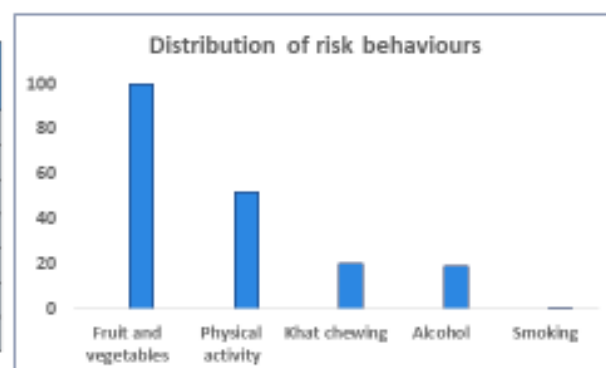
Two or more risk factors > 70% study population

Cardiovascular risk behaviour is an emerging public health challenge in developing countries

- High prevalence of physical inactivity, and significant inadequate fruit and vegetable consumption

- Current CVD follow-up care is ineffective in educating and motivating patients to achieve behavioural change; lack of resources and absence of prevention policy is a challenge

- Implementation of lifestyle support programs should be considered for the disease prevention policy agenda in developing countries

- Despite accent differences in risk factors, the emerging increase of CVD and related patients' risk behaviours is somewhat comparable with western countries, confirming the global issue

ESC Congress
Paris 2019
Together with
World Congress
of Cardiology

Thank you

ESC Congress
Paris 2019
Together with
World Congress
of Cardiology