PREVALENCE OF HIGH BLOOD PRESSURE AND ASSOCIATED FACTORS AMONG ADULTS IN METU TOWN, ILUBABOR, ETHIOPIA

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A THESIS SUBMITTED TO JIMMA UNIVERSITY, FACULTY OF PUBLIC HEALTH, DEPARTMENT OF EPIDEMIOLOGY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF PUBLIC HEALTH

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JIMMA, ETHIOPIA

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ABSTRACT

Background: High blood pressure is defined as a systolic blood pressure at or above 140 mmHg and/or a diastolic blood pressure at or above 90 mmHg. Hypertension is the most common **single risk factor** for cardiovascular related deaths and disability globally and in Sub-Saharan Africa, countries are experiencing an unexpected rise in the incidence of hypertension. It is being the root cause of the body system and organ failure, remains to be major public health challenge globally. Though the problem is huge in both developed and developing countries, data are limited in developing countries like Ethiopia. In Ethiopia, the prevalence of hypertension was estimated to be 16% in 2015. However, large number of patients (76.6 %) were never measured their blood pressure.

Objectives: The study aimed to assess the Prevalence and associated factors of high blood pressure among adults in Metu town, 2022.

Methods: The study employed community based cross sectional study design. A total of 608 study participants were included and selected by using multistage sampling technique. Data were collected by using a pretested structured questionnaire from June01- 30, 2022. Procedurally blood pressure was measured using adult size automatic Omron sphygmomanometer with patient appropriate sitting position. Have the patient sitting comfortably with their back supported, their feet uncrossed and flat on the floor. The data were entered in Epi Data v3.1 and analysed in SPSSv26. Descriptive statistical analyses such as frequency and cross tabulation was calculated to measure the prevalence for selected variables versus the prevalence of high blood pressure. . Binary logistic regression was used to examine the possible risk factors for high blood pressure and risk factors with p-value < 0.25 were included in the multivariate logistic regression model. Statistical significance was determined at P-value < 0.05.

Results: The respondents age ranged from 18 to 62 years and nearly half (50.5%) of them were male. The mean systolic and diastolic blood pressures were 125.61 millimetres of Mercury (mmHg) (14.25 SD) and 76.77 mmHg (8.82 SD), respectively which was normal. The prevalence of high blood pressure was 18.5%, 95% CI (15, 22.3). Male sex (AOR=2.3, 95% CI:1.2,4.7), chewing chat (AOR=10.6, 95% CI: 4.9, 23.1), smoking (AOR=7.2, 95% CI:2.5-20.5), Family history of hypertension (AOR=2.4, 95% CI:1.0-5.7)were statistically significant associated factors for high blood pressure in adults But regular physical exercise helps as protective against high blood pressure (AOR=0.04, 95% CI: 0.011-0.2).

Conclusion: This study indicated that high blood pressure was becoming higher. The study identified risk factors for high blood pressure in adults, and most are modifiable. Hence, stakeholders may use the finding to develop preventive and control strategies to decrease the burden of high blood pressure.

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ACRONYMS

AOR:	Adjusted Odds Ratio
BP:	Blood Pressure
BMI:	Body Mass Index
CI:	Confidence interval
COPD:	Chronic Obstructive Pulmonary Disease
COR	Crude Odd Ratio
CVD:	Cardiovascular Disease
DALYs	Disability Adjusted Life Years
DBP:	Diastolic Blood Pressure
EMoH	Ethiopian Ministry of Health
ETB:	Ethiopian Birr
HEWs:	Health Extension Workers
HH:	House hold
NCD:	Non-communicable Disease
NCDIs:	Non-communicable Disease and Injuries
OOP:	Out of Pocket
OPD:	Outpatient department
SBP:	Systolic Blood Pressure
SPSS:	Statistical package for social science
SSA:	Sub-Saharan Africa
STEPS	Stepwise approach to Surveillance
WHO:	World Health Organization

1. INTRODUCTION

1.1. Background

Hypertension is a state of elevated systemic blood pressure that causes marked increment of cardiovascular risk. It is one of the major but preventable risk factors of coronary artery disease, haemorrhagic and ischemic stroke, heart failure and chronic kidney disease in which 90-95% of cases, the cause is unknown and it is called essential hypertension(1).

High blood pressure causes the heart to have to work harder to push blood throughout the body(2). Hypertension is the most common single risk factor for cardiovascular related deaths and disability globally and in Sub-Saharan Africa, countries are experiencing an unexpected rise in the incidence of hypertension. Hypertension is one of the most common public health issues, affecting 972 million people worldwide(3).It is being the root cause of the body system and organ failure, remains to be major public health challenge globally. Though the problem is huge in both developed and developing countries, data are scarce in developing countries like Ethiopia(3).

Among NCD hypertension has shown a rapid increase in prevalence affecting significant numbers of individuals in sub- Saharan Africa (4) (with a prevalence in the range of 25.4% to 41.1% in men and 27.2% to 38.7% in women respectively (5). A study done in Tikur Anbessa specialized hospital on stroke patients identified hypertension as a major risk factor in 69.3% of patients in developing stroke(6).

Globally, 40% of people over 25 years of age have high blood pressure and an estimated 972 million (26%) people have hypertension, and the prevalence is expected to increase to 29% by 2025. Now a day, the prevalence of hypertension increasing in low- and middle-income countries; where 1 in 5 of the adult population has the condition. By 2025, it was estimated almost 3 out of every 4 people with hypertension were living in low and middle income countries(7).

The prevalence of hypertension has increased over the past three decades worldwide. In Sub-Saharan Africa, approximately 80 million adults live with hypertension in the year 2000 and this figure will rise to 150 million by 2025. A study in Sub-Saharan Africa countries (SSA) indicated that the prevalence of hypertension was 25.9% with large disparities based on their place of residence. Surprisingly, 50% of cases with hypertension were not aware of their high blood pressure(8).

In Ethiopia, a cross-sectional study conducted on adults aged ≥ 35 years in the rural and urban communities of Dabat district and Gondar town in 2012 showed that overall prevalence of hypertension was 27.9% with the proportion of the urban and rural residents being 30.7% and 25.3% respectively(9).

Based on the Global Burden of disease report 2019 on the globe, 57% of the deaths were attributable to one or more of behavioural risk factors, metabolic risk factors and environmental/occupational risk factors; and 50% of the disability adjusted life years

(DALY) lost was attributable to the above known risk factors. Of all deaths the same year, high systolic blood pressure, dietary risks, alcohol use, tobacco smoking and high body mass index (BMI) accounted for 7.5%, 6%, 3.5 %, 2.7% and 1.8% deaths respectively and from dietary risk factors diet high in sodium, diet low in fruits and diet low in vegetables contribute 1.4 %, 1.4 and 0.9% of the deaths, respectively (10).

Ethiopia has recognized the danger of the frightening burden of non-communicable diseases. The national NCD program was established in 2013, with incorporation of Hypertension an NCD Prevention and control strategic plan and a national NCD guideline were developed in 2014 and 2016 respectively. Evidences were gathered through the National WHO NCD STPES survey in 2015, prevalence of hypertension and associated factors was also included as study variables'(11).The national NCDI Commission was established in collaboration with Harvard University and University of Burgen in 2016 and produced its report in 2018. The NCDI Commission report summarized the burden of NCDIs with incorporation of hypertension and risk factors in Ethiopia, identified key gaps and challenges in the current delivery of services and undertaken a priority setting exercise to identify cost effective and equitable interventions(12).

1.2. Statement of the problem

Hypertension is one of the priority areas the Ethiopian Ministry of Health is focusing on, and integrated decentralized hypertension prevention and care is being implemented. In 2020, Only 2,509,921 individuals were screened for hypertension(13). However, the rate of screening and enrolment to care is still extremely low. There are more than 30 million eligible individuals awaiting screening for hypertension(14).

In Ethiopia, different studies indicate that 76.6% of hypertensive patients never measured their blood pressure before. About 18.7% of rural and 7.5% urban hypertensive cases visit traditional healers and also 14.1% rural and 5.5% urban hypertensive patients were taking herbal or traditional medicines. Similarly, 60% of those with high blood pressure were never diagnosed as having hypertension. Among those cases identified as having high blood pressure, only 28.4% were taking medications. Despite medications and follow-up, majority of patients 74% had poorly controlled hypertension(12).

Previous community-based and facility-based studies on hypertension and risk factors had several limitations. The age range studied was often older individuals(15).

Many of the studies were conducted several years ago and may not reflect the current socio demographic situation and, most of the studies were institution based. Hence, they lacked giving enough information for policy makers to recommend routine screening for hypertension at both facility and community level. And, since the Stepwise approach to Surveillance(STEPS) survey was conducted some years back and other studies are sparse additional studies are needed to fill the information gap especially on association between risk factors and hypertension(12).

1.3. Significance of the study

Hypertension has become a major public health problem especially in developing countries. Older adults are disproportionately affected by hypertension, which is an established risk factor for cardiovascular disease. Despite these facts, little attention has been focused on hypertension and associated factors among older adults in Africa. Moreover, the relatively limited available information on hypertension may lead to an increasing prevalence as well as poor detection, treatment and control rates.

This study tried to estimate the existing prevalence and determine associated factors of high blood pressure. The findings from this study will help to inform policy and decision makers to take relevant actions based on evidence. In so doing, the study is anticipating to contribute to designing better intervention strategies/programs on prevention and control of high blood pressure. Moreover, the study adds to the existing body of knowledge on high blood pressure and associated factors.

So, the aim of this study primarily focuses on encouraging the community to know the burden of high blood pressure and associated factors in order to seek health cares early as possible. Also help health professionals working at facilities to focus on health promotion, screening, early diagnosis, and primary prevention of hypertension targeting risk factors and management of hypertension.

CHAPTER 2: LITERATURE REVIEW

2.1. Socio Demographic Characteristics.

Different evidences indicated Ethiopia faces a triple burden of diseases which includes the already existing infectious diseases, increasing burden of non-communicable Diseases and injuries. World Health Organization indicated there were a total of 700,000 deaths in Ethiopia in 2016. Among these deaths 39 % was attributed to NCDs in which cardiovascular diseases accounted for 16% of all causes of death. According to NCDI Commission report 52% of deaths in 2016 occurred from NCDs and injuries and 46.1% of DALYs lost in Ethiopia were from NCDIs. More than half (51%) of the NCDI mortality occurred before age 40; 63% mortality occurred before age 50 and 70% before age 70(12).

According to systematic review on community and hospital-based studies on NCDs in Ethiopia, prevalence of CVDs was 7.2%, and it was highest in Addis Ababa while 24% deaths were attributed to CVDs. Hospitalization from CVD was 3% in Amhara and 12.6% in Oromia and also the prevalence of CVD has been increasing over time among hospitalized patients ranging from 4.4% in 1970s to12.6% in 2005(16).

According to EMoH 23% of total out of pocket (OOP) expenditures in Ethiopian households were due to NCDs in which renal failure accounts for 10%. Among CVD patients in Addis Ababa who visit health facilities 27% had experienced catastrophic health expenditures (12).

According to study done in sub Saharan Africa of the 1269 participants, 820 (64.6 %) were females, 671 (52.9 %) were aged 30 to 49 years, and 879 (69.3 %) had received up to secondary school education or at least 8 years of schooling(17).

According to the study done on teachers in Bahirdar, one hundred and forty-nine (67.1%) of the study participants were men and the rest 73 (32.9%) women with a male-to femaleratioof2.04:1.The majority of the study participants, 139(62.6%), were in the age category of 41 to 60 years. About 83(37.4%) of the study participants were in the age category of 20–40years.The majority of the teachers (52.3%) were in the middle income category earning between 6001 to10, 000 Ethiopian Birr ($160.52–$267.49) per month.(18).

The study done in Arbaminch reveals that totally 3,346 adults were enrolled in the study, with a response rate of 99.35%. Half of the participants were female (49.97%). The mean age of the participants was 44.59 (11.17) years with 44.80 (11.07) and 44.38 (11.27) years for men and women, respectively. Most of the study participants were married (87.90%),and most of study participants were from Gamo ethnic group (81.08%), and no formal education (69.75%(19).

According to the study done in rural Ethiopia, The majority of the respondents, 148 (36.9%), were in the age group of 70 years and above with the mean age of 65.51years, while, 208 (51.9%) of them were Muslim in religion and 187 (46.6%) were Oromo by ethnicity. Regarding their educational status more than half 213 (53.1%) of them were unable to read and write, while only 53 (13.2%) of them were holding a diploma and above(20).

2.2. Prevalence of Hypertension.

Globally, one in four men and one in five women of age 18 years and above had high blood pressure in 2015. However, prevalence of hypertension is lower in high income countries (18%) as compared to low-income countries (28%). A pooled meta-analysis of 1670 studies in 71 countries with 29.5 million participants indicated that the prevalence of hypertension ranges from 4% to 78% (21).

In one of the study done in India, Prevalence of tobacco and alcohol use was 32.8% and 15.9% respectively.(22). While in study done in Senegal, prevalence of high blood pressure was 46.0%(23).

According to study done in Vietnam the male population had higher prevalence of hypertension compared to female population (23.1%vs.14.9%) and the prevalence of hypertension also varied as a function of three NCD risk factors, among population with BMI less than 25, the prevalence of hypertension was 16.0% while among population with BMI greater than/equal to 25, it is 36.7%. About 22% people currently smoking and 21.6% people currently drinking were reported to have hypertension(24).

The WHO STEPS survey report in 2015 from 31 African countries indicated the prevalence ranging from 17% to 40%. The evidence, additionally, indicated that related complications of hypertension in particular stroke and heart failure are also becoming increasingly more common in this region. These trends have been strongly linked with changes in individual and societal lifestyle such as an increase in tobacco use, excessive alcohol consumption, reduced physical activity and adoption of "Western" diets that are high in salt, refined sugar and unhealthy fats and oils(15),(25).

According to a study done in **North west Ethiopia** the overall prevalence of hypertension is found to be **27.9%**.The proportion which is 166(15.2%) in rural areas is slightly higher than urban areas which is 128(12.2%). It was 133(13.6%) for male and 161(13.9%) for female. The proportion of isolated systolic blood pressure increased with increasing age.(9).

The prevalence of high blood pressure in Addis Ababa based on the STEPS survey was 22% . A community based study done in Northern Ethiopia, Addis Ababa , and Bedele Town indicated the prevalence of high blood pressure to be 18.1%, 19.1%, and 16.9% respectively. Community based studies done in Jigjiga City, Gonder Town, Dire Dawa City, and Durame Town indicated prevalence of high blood pressure as 28.3%, 27.9%, 24.43% and 22.4% respectively. In Ethiopia, according to a systematic meta-analysis study in 2020, the adult hypertension prevalence was 19.6 %.

In the community based study done in Addis Ababa overall prevalence of hypertension was 29.24% (95% CI: 27.75–30.74), slightly higher among men 30.13 than women 28.58 (26). Alcohol drinking, cigarettes smoking, khat chewing, body mass index ≥25kg/m2, and age ≥44 years old are major determinants identified for High blood pressure.

2.3. Modifiable Risk factors for High blood pressures.

According to the study done in India, More than one-third adults were physically inactive [41.3%), majority [98.4%) consumed less than 5 servings of fruits and / or vegetables per day and mean salt intake was 8 g/day. Proportion with high blood pressure and raised blood glucose were 28.5% and 9.3% respectively. 12.8% of adults (40–69 years) had ten-year CVD risk of30% or with existing CVD.(22).

In one of the study done in Nepal (Kathmandu), the prevalence of current smoking, alcohol consumption, low intake of fruits and vegetables and low physical activity was found to be 22%, 31%, 93.9% and 10.2% respectively. More than half (52.2%) of the participants were overweight or obese and the prevalence of high blood pressure was 27.8%.(27).

In one of the study done in Nigeria, The prevalence estimates of the risk factors were 6.5% for current smoking, 7.8% for harmful use of alcohol, 62.2% for low physical activity, 69.7% for insufficient fruit and vegetable intake, 37.1% for abdominal obesity, 57.3% for overweight and obesity, 33.1% for high blood pressure(28).

According to study done in Morocco Analysis of the behavioural data showed that 716 hypertensive subjects (77%) had between one and two risk factors. Physical activity was unsatisfactory in 243 cases (26%). The sodium diet was reported in 162 hypertensive patients (18%) and the non- adherence with diet and lifestyle habits is recorded in 826 cases (90%)(29) And study done in Arbaminch shows The likelihood of hypertension was higher among overweight(19).

In one of the study in sub Saharan Africa, The majority of participants (772 or 60.8 %) were over-weight with a body mass index (BMI) of 25 kilograms per square meter (kg/m2) or higher, including the 407 (32.1 %) that were obese (BMI≥30 kg/m2). Of the participants, 121 (9.5 %) reported current use of some form of tobacco and only 272 (21.4 %) reported physical activity levels that meet the WHO recommendation of at least 75 min of vigorous-intensity or 150 min of moderate-intensity physical activity per week significantly higher among participants reporting to use unfiltered tobacco, compared to those reporting to had never used tobacco(17). A study done in Bedele town revealed that hypertension is directly related to physical inactivity and the prevalence of hypertension is 16.9 %(30).

Another study done in Ethiopia on adults concerning what they eat about 49% of the study subjects eats meat and eggs at least two to four times a week. While 39% of the respondents eat oil and fats at least two to four times a week. Regarding the frequency of consumption of sugars and sweets; 89 (18.3%) eat two to four times per week, and only 43 (9%) eat at least once a day. Majority of the respondents 92.4, 98.2, and 85.2% eat breakfast, lunch, and dinner on daily basis respectively. Concerning the frequency of eating of deep fries; 327 (67.1%) eat sometimes, 130 (26.7%) had never eaten deep fries, and 30 (6.2%) eat daily. Two hundred forty one (49.5%) had never eaten any visible fat in a meat, while 234 (48.0%) eat any visible fat in a meat sometimes, and the rest 12 (2.5%) eat daily(31).

Research finding from Kenya showed that consuming harmful amounts of alcohol were 1.54 times more likely to be hypertensive(32). Another community based study in Uganda

revealed that men consuming ≥10 alcoholic drinks per month had 60% higher prevalence of hypertension compared to non-drinkers(33).

When we see facility based study in Felege-Hiwot Comprehensive Referral Hospitals, Hypertension was more prevalent in alcohol users (34). According to community based studies in Debre Markos Town, North West Ethiopia showed Alcohol consumers were 3.17 times more likely to develop hypertension than the counterparts(35).

According to the finding from federal Ministry civil servants in Addis Ababa, past or present cigarette smokers are 2.34 times more likely to have hypertension as compared to non-smokers (36).and A study done in Bedele town revealed that hypertension is directly related to physical inactivity and the prevalence of hypertension is 16.9 %.(30).

A study done in Durame town, Southern Ethiopia, participants who use top added salt on plate, were more likely to be hypertensive than their counter parts (37). A community based study in Debre Markos town shows that excess salt consumption is significant factors of hypertension(35).A research done at different sites shows salt intake as the most important risk factor for HTN.A high intake of sodium is common, in Africa mostly from salt used to preserve food or to make it tastier. Decreased salt intake not only reduces blood pressure and related CVD risk, but has other beneficial cardiovascular effects that are independent of and additive to its effect on blood pressure (7).

2.4. Non modifiable risk factors for high blood pressures.

The study done in Senegal reveals that high blood pressure was more frequent in females [47.9% than in males 41.7% and the mean age were significantly higher in the hypertensive participants 53.6, than in non-hypertensive participants 34.7 years. The prevalence of high blood pressure increased with age and high blood pressure tended to be more frequent in participants who had primary school level education (42.1%) than in those who had higher levels of education(23).

According to Cross-sectional Study done in Jimma University Specialized Hospital, 13.2% had hypertension during measurement or had history of hypertension among 734 study subjects, of which only 23.2% knew that they had hypertension , Family history of hypertension was reported in 24 (3.3%) of the participants, and in 19.6% of those with hypertension and it was found to be a strong risk factor of hypertension (29).

According to Cross-sectional Study done in Jimma University Specialized Hospital, 13.2% had hypertension during measurement or had history of hypertension among 734 study subjects, of which only 23.2% knew that they had hypertension ,Family history of hypertension was reported in 24 (3.3%) of the participants, and in 19.6% of those with hypertension and it was found to be a strong risk factor of hypertension (34).

According to report from 6th session of the African Union Conference of Ministers of health on NCD's, in comparison to countries like Ethiopia and Tanzania where showed the general trend of males having higher prevalence of high blood pressure than females (7). A study on Moroccan adults indicates hypertension is more prevalent in women than men(38). And a

study in Senegal indicates hypertension was highly prevalent in females than males. A community based study in revealed that gender was associated with hypertension which men were 1.3 times more likely to have hypertension than women(23).

2.5. Conceptual framework.

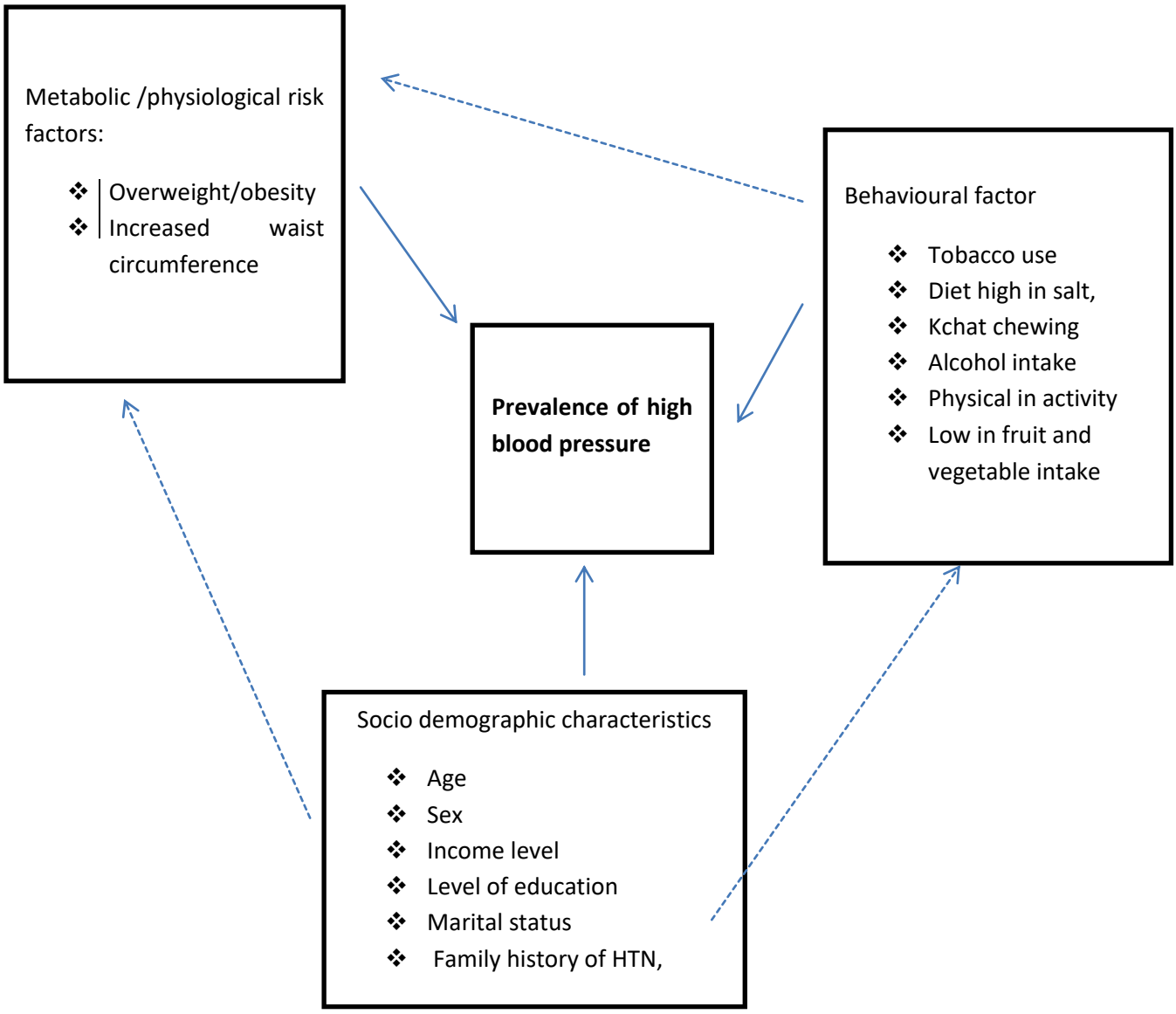

Figure 1: Conceptual framework: The Conceptual framework is based on previous literature that socio-demographic factors predispose to behavioural and metabolic factors and also directly contribute to high blood pressure (Kibret, Kelemu Tilahun Mesfin, Yonatan Moges, 2015).

CHAPTER 3: OBJECTIVES

3.1. General Objectives.

To assess the prevalence and associated factors of high blood pressure among adults in Metu town, 2022.

3.2. Specific Objectives.

- To determine the prevalence of high blood pressure among adults in Metu town, 2022.
- To identify associated factors of high blood pressure among adults in Metu town, 2022.

CHAPTER 4: METHODS AND MATERIALS.

4.1. Study area and periods

This community based cross sectional study was conducted at Metu town, Ilubabor zone, Oromia regional state, located in south west Ethiopia. It is a capital city of Ilubabor zone located 600kilometers from AddisAbaba. The town is located at an average altitude of 1700 metres above sea level. It falls in woina dega and the mean annual rain fall exceeds4749mm .Its mean annual temperature is 11.5c^{o} in most high land parts of the zone. Metu town has six kebeles with projected total population of 55,798 from which Male 28,457 and Female 27,341.The study was conducted from June 01-30, 2022. Metu town has 1 referral hospital (Metu Karl referral hospital) and 1 health center (Metu health center).

Figure 2.Map of Metu town from Google:

4.2. Study design

Community based cross-sectional study was conducted in Metu town south west Ethiopia 2022.

4.3. Population

4.3.1 Sources Population

The source population were all adults aged greater than eighteen year residing in Metu town.

4.3.2. Study Population

The study population were adults in Metu town who were randomly selected for the study.

4.4. Eligibility criteria

4.4.1 Inclusion Criteria

Adults who reside in Metu town during data collection and who were18 years and above.

4.4.2. Exclusion Criteria

Severely ill patients were excluded from this study.

4.5. Sample size

4.5.1. Sample size for the first Objective (prevalence of hypertension)

The required sample size for the first objective was determined using single population proportion formula by considering the following assumptions.

P: 16.9%, prevalence of hypertension according to community -based study conducted in Bedele town, 2015 (30).

d: 5 %, Margin of error or level of precision or maximum error to commit.

Zα/2: 1.96, Critical value at 95% confidence interval

n: Required sample size

$n= (Z\alpha/2)^2 * p * (1-p) / d^2$

$n= (1.96)^2 * 0.169* (1-0.169) / (0.05)2 = 216$

$\frac{(1.96)2*0.169*(1-0.169)}{(0.05)2}$=216 then N final after adding 5% of non-respondents is

N final = 336+11=227

N final =227

4.5.2. Sample size for the second objective (associated factors of high blood pressure).

The required sample size for the second objective was calculated using double population proportion formula by using Epi Info Version 7.2.0.1 software, using significantly associated factors from different articles.

The prevalence of hypertension of 16.9%(30)

Table 1: Calculation of required sample size for the second specific objectives for study done in Metu town, Ilubabor, Ethiopia, 2022.

S.no	Variable Name	Power (p)	CI	Ratio	OR	Exposed	Non Exposed	Sample size	When 5% non-response added	References
1	Physical in activities	80%	95%	1:1	2	28.9	16.9	386	437	(30)
2	Smoking	80%	95%	1:1	3.6	53.9	24.43	198	208	(36)
3	Obesity/over weight	80%	95%	1:1	2	48.6	32.1	300	315	(8)

Physical in activity has the largest sample size (386), based on the sample size of each risk factor. In addition, the sample size for physical activity is higher than that of sample size computed for prevalence using a single population proportion. The design effect of 1.5 was applied because the desired sampling technique is multistage sampling. As a result, after the non-response rate is considered, the final sample size was 608.

4.6. Sampling technique

Multistage sampling technique was used. There are **six kebeles** in Metu town for administrative purpose. At first stage the three kebeles were selected by using **simple random sampling**. At the second stage, HH of selected kebeles were selected using **systematic random sampling techniques** from their order of registration which is the list of HHs in the kebele found from HEWs. The value for sampling interval K^{th} was calculated by using the following Formula. K=N/n where n is the total sample size required for the study and N is total HHs of all selected kebeles and it was 4.At the third level individuals from HH selected by lottery method if individuals ≥ **18** years were more than one, if one individual in that HH we took him and if no in the house we jumped to the next house.

Schematic presentation of sampling procedures

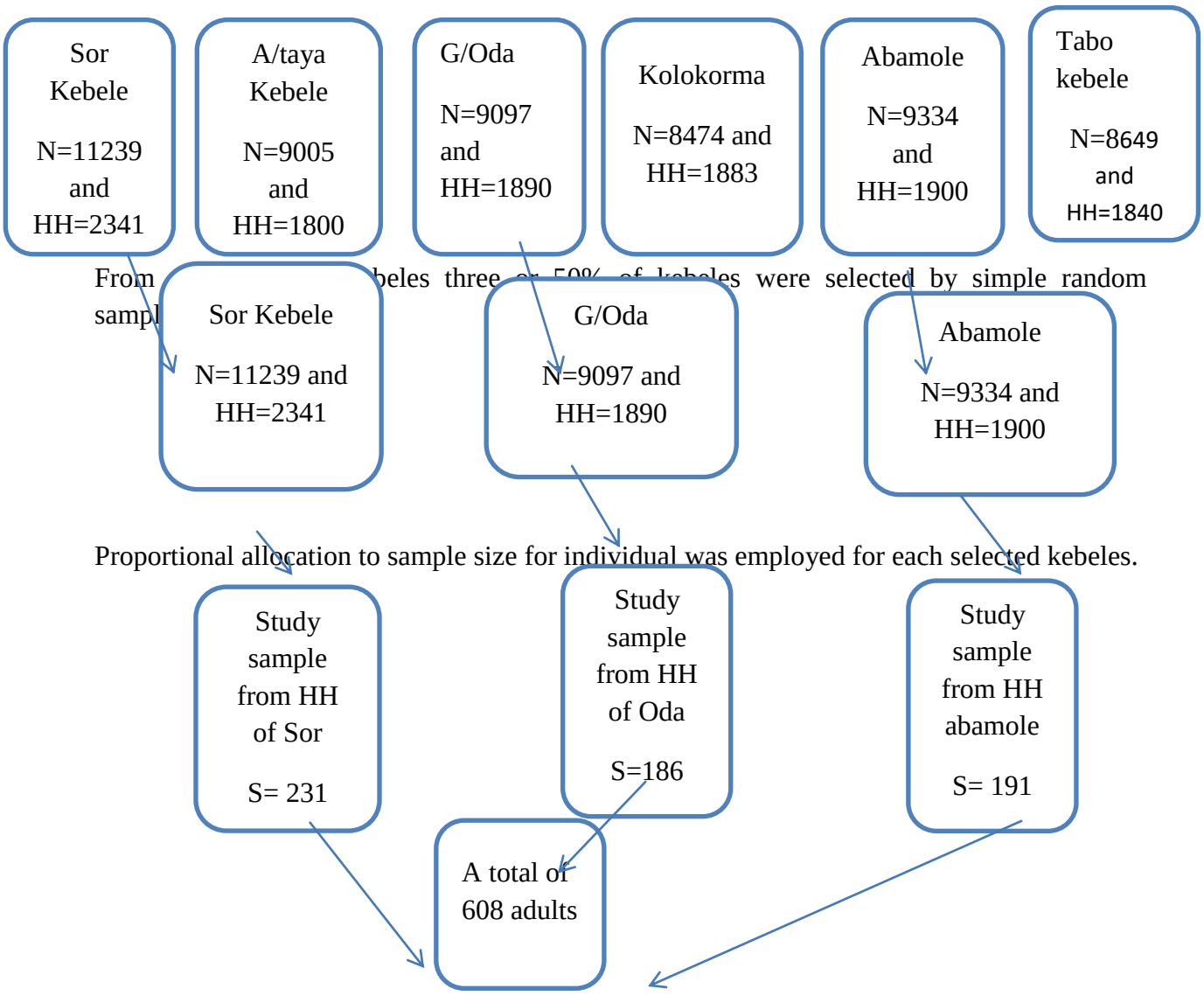

Figure 3: Schematic presentation of sampling procedure.

4.7. Data collection procedures and data collection tools.

Data collectors received two days training. Data collectors were clinical nurses ‘and they were trained in standard blood pressure (BP) measurement with practical learning demonstrations. Data was collected using a structured interview questionnaire and physical measurements which was adapted from “**WHO STEPS**” tool that contained socio-demographic characteristic, modifiable and non-modifiable risk factors for hypertension, and physical measurements (body weight, height, waist circumferences) .

All the questionnaires were translated from English into Afan Oromoand back translated to English for consistency. The questionnaires were pretested on 5% of Kolokorma kebeles of Metu town.After pre-test things that are unclear like income was corrected. Most respondents didn’t earn monthly and they have things in kind.so based on their response we took proxy indication and modified.

Data was collected through a face-to-face interview technique using a combination of a structured questionnaire and measurements of the Height, weight and waist circumference of participants was done. Data was collected from individual participants at home to home.

4.7.1. Blood Pressure Measurement Procedure

Blood Pressure was measured following the **International Society of Hypertension guidelines**(5). Procedurally blood pressure was measured using adult size automatic Omron sphygmomanometer with patient appropriate sitting position. Have the patient sitting comfortably with their back supported, their feet uncrossed and flat on the floor. The 1st measurement was taken after the patient rests for at least 5 min but if client is smoking or consuming any caffeine containing beverage, we measure BP by considering the time effect for 30 min and 2^{nd} measurement at least 1-2 minute apart from 1^{st}measurement. If the BP reading difference between two measurements was less than 10 mmHg, we took the 2^{nd} reading. But if the difference was greater than 10 mmHg, we took a 3^{rd} measurement as the last reading. Finally, Study participants who were found to have high blood pressure and those identified with risk factors were linked to respective health facilities.

4.7.2. Weight, Height and Waist circumference Measurement Procedure

Weight, Height and Waist circumference was measured following the Diabetes Education Training Manual For Sub-Saharan Africa (39). Weight and height was measured with clients in standing without shoes and wearing light clothing with digital weight and height scale. Waist circumference was measured by using a flexible tape meter with appropriate position. In all measurement the scale was calibrated to zero level before each measurement.

4.8. Study variables

4.8.1. Dependent variable

Prevalence of high blood pressure

4.8.2. Independent variables:

- Age, Sex, Income level
- Level of education

- BMI
- waist circumference
- Marital status
- Family history of HTN
- Tobacco use
- Chat chewing
- salt consumption,
- Alcohol intake, Physical in activity, fruit and vegetable intake

4.9. Operational definitions

High blood pressure or Hypertension : systolic BP level of ≥140mmHg and/or diastolic BP level of ≥90 mmHg on three occasion measurement of BP done by health care professional(14).

A current smoker: is defined as community who smoked at the time of the study or had stopped smoking in less than one year (1).

Daily smoker: is a smoker who smokes one or more cigarettes on daily basis.

A non-smoker: is defined as respondents who used no cigarette

Second hand smoker: is a non-smoker who inhales environmental tobacco smoke

Ever drinking alcohol: if the respondent has ever consumed any alcohol such as beer, Tella, Bordie, Tej, Arake, wine, spirits.(1).

Excess or Harmful alcohol intake: if the participant takes more than one standard unit for female and two standard units for male.

Heavy episodic alcohol drinker: if the respondent has drunk six or more standard drinks in a single drinking occasion

Standard unit of alcohol: a standard unit measures the amount of alcohol in any of alcoholic beverages. The standard drinks measure is a simple way to calculate how much pure alcohol an alcoholic beverage contains. It is calculated using a simple formula: Unit of alcohol=volume in ml*percentage of Alcohol/1000. A standard drink is often 300 ml of beer or 50 ml of whiskey or gin.(1)

A non-chewer an individual who used no chat.

Ever chewer: person or respondent who has ever consumed chat.

Excess chewer: who chew more than one zorba daily or greater than five days per week.

Physically active person: a person who is involved in physical activity, which includes exercise, a subcategory of physical activity that is planned, structured and repetitive, with the objective of improving or maintaining physical fitness(1).

Vigorous intensity physical activities: at least 75 minutes of physical activity (including vigorous gardening, running, fast cycling, fast swimming, or playing sport) spread throughout the week).

Moderate intensity physical activities: at least 150 minutes of physical activity (a mild increase in heart rate or breathing rate resulting from, for e.g.brisk walking, climbing stairs, and dancing, gardening or doing household chores) spread throughout the week.

Physically inactive: A person is said to be physically inactive if he is not engaged in moderate intensity physical activity for at least 150 minutes per week or vigorous intensity physical activity for at least 75 minutes per week.

Adequate vegetable and fruit consumption: if he/she takes 5 servings of vegetable and fruit per weekor 400gm of fruits per week.

Physical measurement: the measurement of height, weight, blood pressure and waist circumference.

Excessive salt consumption: is consumption of more than one tea spoon per day in food.

4.10. Data analysis procedures.

For data processing, master sheet or template was prepared, and the data was entered, categorized, coded, and summarized using EpiData4.6 and was transferred to SPSS version 23 for analysis. Descriptive statistics (mean and standard deviation) was calculated for continuous variables and frequencies and percentages were calculated to summarize categorical data. Both bivariate and multivariate logistic regression analysis were done to examine the association between the risk factors and presence of high blood pressure. A variable with $p < 0.25$ in bivariate logistic regression analysis were entered in multivariate logistic regressions to control for potential confounding. Adjusted odds ratios (AOR) with 95% confidence interval (CI) and P-value < 0.05 in the final model was used to determine significantly associated factors. Results were presented in the form of tables, figures, and summary statistics.

4.11. Data quality management.

Questionnaires were pretested on 5% of the sample size before actual data collection at Kolokorma kebeles of Metu town to ensure quality of data and further modification like income level was made. Three data collectors and one supervisor were trained for one day on each of items included in the study tools and the whole process of data collection, objectives, and relevance of the study. During data collection regular supervision and follow up was undertaken. The supervisor checked each questionnaire daily with further cross check by principal investigator for completeness and consistency of data. Incomplete data were not entered into Epi info. Data clean up and cross checking missing data was done before analysis.

4.12. Ethical consideration

Letter of ethical clearance was obtained from the institutional research review board of Jimma University Faculty of Public Health. Permission was also secured from the respective Kebeles, Metu town health office and HEWs. Informed verbal was gained from each respondent. Anonymity was maintained during data collection and use of data and each study participant was informed about the objective of the study.

4.13. Plan for Dissemination of the Result.

The result of this study was presented and submitted to Jimma University Faculty of Public Health, copy of the research was sent to advisors of this research and Metu town health office. Furthermore the findings will be submitted and presented on workshop and different seminars in local, national and international level and finally submitted to a relevant peer reviewed scientific journal for possible publication.

5. Results

5.1 Socio-demographic characteristics:

The response rate was 98.6%.Out of the total respondents, 303 (50.5%) were male. The mean age was 32.84 (7.58 SD) years and ranged 18 to 62 years. The respondents 357 (59.5%) were between the age group of 30 to 49 years. Married respondents accounted 527 (87.8%) and 314 (52.3%) were with secondary and above level of education. About 580(96.7%) of the participants were private workers, and more than half 352(58.7%) of the respondents had less than ETB 5,000 Monthly household income (Table 2).

Table 2:Socio-demographic characteristics of respondents among adults in Metu Town, Ilubabor, Ethiopia, 2022.

Variables	Frequency(n=600)	Percent (%)
Age category		
18-29	218	36.3%
30-49	357	59.5%
>=50	25	4.2%
Sex		
Male	303	50.5%
Female	297	49.5%
Education		
No formal Education	73	12.2%
Primary Education	213	35.5%
Secondary and above	314	52.3%
Marital status		
Unmarried	73	12.2%
Married	527	87.8%
Occupational status		
Private	580	96.7%
Governmental Employee	20	3.3%
Monthly Income		
<5000	352	58.7%
5000-10000	224	37.3%
>=10000	24	4.0%

The overall prevalence of high blood pressure was 18.5%, 95% CI (15, 22.3). The prevalence of high blood pressure among male was 26.4%, while prevalence among female was 10.4%. And the prevalence of high blood pressure was 16.9% among 18 to 29 years old whereas the prevalence of high blood pressure among age 30 to 49 was 18.2 %(Table 3).

Table 3: Blood pressure measurement among adults in Metu Town, Ilubabor, Ethiopia, 2022.

Variables	Frequency(n=600)	Percent (%)
High Blood pressure		
Yes (≥ 140/90)	111	18.5%
No (<140/90	489	81.5%
Systolic Blood Pressure		
≥140	111	18.5%
<140	489	81.5%
Diastolic Blood Pressure		
≥ 90	111	18.5%
≤ 90	489	81.5%

5.2. Behavioural characteristics

From 600 study participants, 64 (10.7%) were smokers of whom 43 (67.2%) were smoking cigarettes daily. Of the study participants, 121 (20.1%) and 250 (42.0%) respondents had history of exposure to second hand smoke at home and work place respectively.
Among all study participants, 50 (8.3%) had history of ever drinking alcohol. Among respondents who had history of alcohol drinking over the past 30 days, 15 (23.4%) and 50 (6.2%) had history of excess or harmful use of alcohol and heavy episodic drink respectively.

The mean numbers of days for eating fruit in a typical week were 2.74 with an average of 2.49 servings in those days. The mean numbers of days for eating vegetables in a typical week were 3.22 with an average of 3.03 servings in those days. On the other hand, only 5 (0.83%) of respondents met WHO recommendation for consumption of fruits and vegetables. More than three fourth 492 (82.0%) of study participants had history of excess salt intake.

Among all participants, 271(45.2%) perform regular exercise and 330 (55.0%) study participants did not engage in vigorous-intensity activity and also 268 (99.2) study participants did engage in moderate-intensity activity. And, 28(10.4%) involved in Walk or use a bicycle for at least 10 minutes. From study participants, 27 (10.0%) were engaged in vigorous sport activities and 148 (54.8%) were engaged in moderate sport activities. And, among those involved in vigorous and moderate sport activities only 8 (9.2%) fulfilled WHO recommendation in a typical week (Table 4).

Table 4: Behavioural characteristics of respondents among adults in Metu Town, Metu, Ethiopia, 2022 (n=600).

Variables	Frequency(n=600)	Percent (%)
Smoking status		
Yes	64	10.7%
No	536	89.3%
Which Type of smoking(n=64)		
Cigarette	60	93.75%
Pipes	4	6.25%
Chewing Chat(n=600)		
Yes	87	14.5%
No	513	85.5%
Ever drinking alcohol (n=600)		
Yes	50	8.3%
No	550	91.7%
In past 30 days standard alcoholic drink(n=50)		
Normal Range	35	70.0%
Excess amount	15	30.0%
Heavy episodic alcoholic drinking status in past 30 days (n=50)		
<6	46	92.0%
≥ 6	4	8.0%
Fruit eating status based on WHO recommendation (n=600)		
meet	9	1.5%
not meet	591	98.5%
Vegetable eating status based on WHO recommendation (n=600)		
Meet	6	1%
Not meet	594	99%
Excess salt intake (n=600)		
Yes	492	82.0%
No	108	18%
Performing Regular exercise		
Yes	271	45.2%
No	329	54.8%
Involvement in moderate activity (n=600)		
Yes		
No	269	44.8%
	331	55.2%
Involvement in Walk or use a bicycle for at least 10 minutes (n=600)		
Yes	269	44.8%
No	331	55.2%

5.3. Respondent's Medical History

From all respondents 85 (14.2%) had family history of hypertension. fifty-four respondents had their blood glucose measured previously; out of them 5 (9.2%) had history of high blood glucose level. From all participants 3 (0.5%) had previous history of chest pain (Table 5).

Table 5: Medical history of respondents among adult In Metu Town,Ilubabor, Ethiopia, 2022.

Variables	Frequency(n=600)	Percent (%)
Family history of High blood pressure (n=600)		
Yes	85	14.2%
No	515	85.8%
High blood sugar informed by Health worker (n=54)		
Yes	5	9.2%
No	49	90.8%
History of chest pain (n=600)		
Yes	3	0.5%
No	597	99.5%

5.4. Physical measurement status and high blood pressure prevalence.

The mean BMI of 23.57 (+1.382 SD) and respondents whose BMI of 25 or above was 64(10.7%) (Fig 3). Similarly, 113 (18.8%) of the study participants had increased waist circumference.

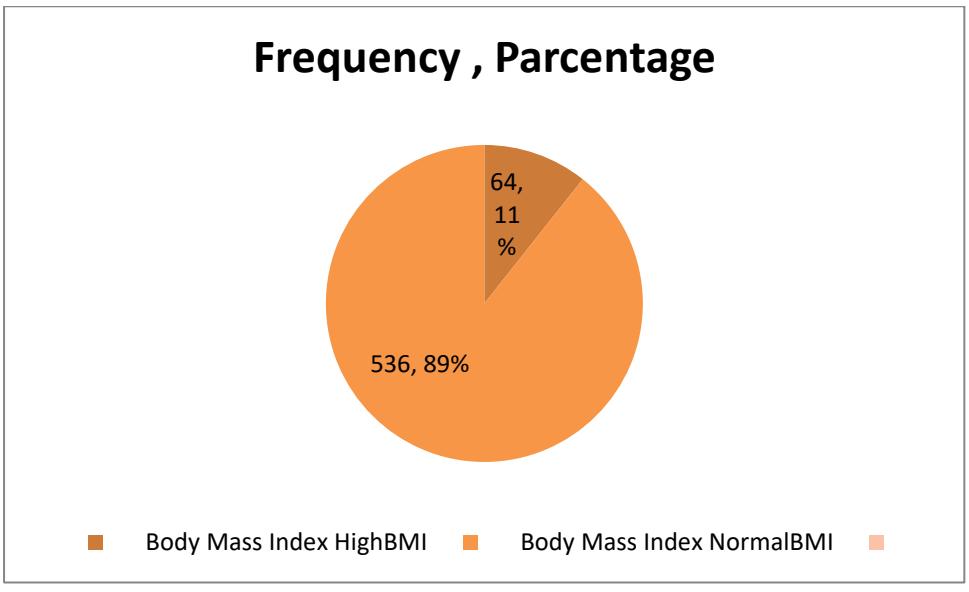

Figure 4: BMI status of the respondents among adults in Metu Town,Ilubabor, Ethiopia, 2022 (n=600).

5.5. Factors Associated with high blood pressure.

24 variables were tested in bivariate, then 10 variables were considered for multivariable analysis, and finally 5 remained significant at multivariable analysis.

The odds of having high blood pressure among males participants and Smokers was two times (AOR=2.3, 95% CI: 1.2, 4.68) and seven times (AOR=7.2, 95% CI: 2.55, 20.5), respectively, higher than among Females and cigarette smokers. Chewing chat (AOR= 10.6, 95% CI: 4.9, 23.1) and having Family History of HTN (AOR= 2.4, 95% CI: 1.0, 5.7) were found to be significantly associated with high blood pressure among adults. Similarly, the odds of high blood pressure among respondents doing regular exercise were statistically significantly lower among those who do not exercise regularly (AOR= 0.04, 95% CI: 0.01, 0.2)(Table 6).

Table 6: Bivariate and Multivariate logistic regression analysis for associated factors of high blood pressure among adult in Metu Town,Ilubabor, Ethiopia, 2022.

Variables	Blood Pressure Reading		COR at 95% CI	AOR at 95% CI	P value
	Yes(≥140/90)	No (<140/90)			
Age Category					
18-29	37(17.0%)	181(83.0%)	0.918(0.589,1.432)	0.763(0.372,1.563	0.459
30-49	65(18.2%)	292(81.8%)	1		
≥ 50	9(36.0%)	16(64.0%)			
Educational status					
	65(22.7%)	221(77.3%)	1.714(1.129,2.602)	1.315(0.676,2.559)	0.420
Primary education	46(14.6%)	268(85.4%)	1		
Secondary and above					
BMI					
≥ 25	18(28.1%)	46(71.9%)	1.864(1.034,3.359)	1.076(0.259,4.473)	0.919
<25	93(17.4%)	443(82.6%)	1		
Waist Circumference					
	36(31.9%)	77(68.1%)	2.568(1.612,4.093)	0.721(0.307,1.691)	0.452
≥ 86	75(15.4%)	412(84.6%)	1		

<86					
Alcohol Consumption					
Yes		8(16.0%)	36.598(16.493,81.211)	4.54(0.752,27.465)	0.099
No	42(84.0%)	481(87.5%)	1		
	69(12.5%)				
Sex					
Male	80(26.4%)	223(73.6%)	3.078(1.960,4.834)	2.23(1.145,4.376)	**0.018***
Female	31(10.4%)	266(89.6%)	1		
Smoking Cigarette					
Yes	57(89.1%)	7(10.9%)	72.683(31.572,167.325)	7.2(2.55,20.500)	**0.000***
No	54(10.1%)	482(89.9%)	1		
Chewing Chat					
Yes	71(81.6%)	16(18.4%)	52.473(27.915,98.638)	10.66(4.925,23.079)	**0.000***
No	40(7.8%)	473(92.2%)	1		
Regular Exercise					
Yes	3(1.1%)	268(98.9%)	0.023(0.007-0.073)	0.044(0.011,0.177)	**0.000***
No	108(32.8%)	221(67.2%)	1		
Family History of HTN					
Yes	58(68.2%)	27(31.8%)	18.725(10.935,32.064)	2.39(1.001,5.746)	**0.050***
No	53(10.3%)	462(89.7%)	1		

* P-value < 0.05

6. DISCUSSION

The study showed that the prevalence of high blood pressure among adult in Metu Town community, Metu, Ethiopia, 2022 was 18.5%, 95% CI (15, 22.3). A community based study done in, Addis Ababa (40), indicated the prevalence of high blood pressure to be 19.1%, which is nearly similar with our finding.But the finding of the study conducted in Bedele 16.9%(30),Jimma town 13.2%(34), Amhara region 11.4%(41) and Bahirdar 16.45%(42)was lower.The possible explanation for the difference might be the study done inthose three area included age group ≥15 years. On the other hand, community based studies done in Jigjiga City 28.3%(31), Gonder Town 27.9%(9), Dire Dawa City 24.43%(36) and Durame Town22.4%(37),indicated a higher prevalence of high blood pressure.The possible explanation for the difference might be the study done in Jigjiga City, Gonder Town, Dire Dawa City, and Durame included participants aged 25-65 years, ≥35 years, 25-64 years, and ≥ 31 years respectively, unlike this study which included individuals 18-62 years of age. In addition, these studies included known hypertensive cases unlike our study.

Similarly Facility based studies conducted in Yekatit 12 hospital showed a prevalence of 34.7% (43) and Felege Hiwot hospital 27.3%(44). These studies included primarily older participants and known hypertensive cases unlike our study.

The odds of having high blood pressure in males were two times higher than females. This is consistent with the study done in Jigjiga which is also two times higher(31), and community based study done in wolaita which was 1.4 times higher in male compared to female(45).Evidences from the National NCDs STEPS Survey, 2015, the odd is higher in females(46).The gender disparity in high BP is believed to be due to difference in biological and behavioural factors including hormonal difference, obesity, cigarette smoking, alcohol consumption and physical activities(46).

Smoking cigarette was one of the determinant factors for high blood pressure.in our study. Developing high blood pressure was seven times higher among smokers compared to non-smokers and was consistent with a study done in sub-Saharan Africa on burden of hypertension (8) and the study done in Nigeria(28), Kenya (32), DireDawa City (36) and Addis Ababa (40).Cigarette smoking causes activation of the sympathetic nervous system and oxidative stress associated with increased markers of inflammation leading to endothelial dysfunction, vascular injury, plague progression, and increased arterial stiffness leading to development of hypertension(36).

The odds of developing hypertension among those who had a family history of hypertension was two times higher compared with counterparts. This was supported by the study conducted in Durame which is also two times higher (37),in sub-Saharan Africa, three times(5), in Jigjiga five times(31) and Debremarkos which was five times(35).In this study, individuals with a positive family history of hypertension were more likely to be hypertensive. Those who had a family history of hypertension were 2.39 times higher than those who have no family history of high blood pressure. But very low when compared to study done in Jimma whose odds of having high blood pressure was3.3(47). This difference

may be due to Age distribution of the study participants as Jimma included≥ 15 years while our study limited itself to those≥18 years.

The odds of high blood pressure among khat chewers were ten times higher than among non-chewers. This is consistent with studies done in Bahirdar(18) and Arbaminch(19).

The study shows the odds of having high blood pressure was higher in those not performing regular exercise. This study shows regular physical activities was preventive against developing high blood pressure by 0.044 times when compared with those who do not perform regular exercise. This study results coincide with study done in different towns of Ethiopia like Durame which was 7.8 times higher risk of developing high blood pressure among those who do not perform regular exercise(37).

7. STRENGTHS AND LIMITATIONS:

7.1. Strengths:

We collected primary data from Individuals.

7.2. Limitations:

Only adults above the age of 18 years were included in the study, which could overestimate the prevalence of hypertension. Blood glucose level and blood cholesterol level measurements were not done. And some information was based on self-report which might lead to recall bias. The blood pressure measurement was taken on a single day this had also its own limitation.

8. Conclusion and Recommendation:

8.1. Conclusion:

This study indicated that high blood pressure is becoming higher in the study area. High blood pressure was significantly associated with sex, smoking, chewing Khat, physical in activities and having family history of hypertension. And most of the risk factors were modifiable. Hence, stakeholders may use the finding to develop preventive and control strategies to decrease the burden of high blood pressure and risk factors.

8.2. Recommendations:

Based on the study findings, the following actions are recommended to be done

8.2.1. Metu town Health Office:

- ❖ Advocate and promote healthy lifestyles.

- ❖ Mobilize all health institutions within the town to give health education about high blood pressure and risk factors at community level like smoking cigarette and chewing chat with town health extension workers.
- ❖ Mobilize different media to create awareness about hypertension and risk factors.

8.2.2 Town Health-extension workers:

- ❖ Town Health-extension workers should strengthen regular high blood pressure screening as well as interventions promoting healthy lifestyles in both static and outreach.
- ❖ Increase community demand for screening through health education.
- ❖ Town Health-extension workers should follow the implementation of high blood pressure screening, risk factor identification and healthy life style counselling.

8.2.3. Clients:

- ❖ Do regular physical exercise, regular fruit and vegetable intake.
- ❖ Avoid tobacco smoking and khat chewing.
- ❖ Regularly check your blood pressure at nearby health institution.
- ❖ Apply physician's instruction like how to avoid the risk factors like smoking and chat chewing.

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ASSURANCE OF PRINCIPAL INVESTIGATOR

The undersigned agrees to accept responsibility for the scientific ethical and technical conduct of the research project and for provision of required progress reports as per terms and conditions of the Faculty of Public Health in effect at the time of grant is forwarded as the result of this application.

Name of the student: _____

Date._____ Signature _____

APPROVAL OF THE FIRST ADVISOR

Name of the first advisor:_____

Date._____ Signature _____

APPROVAL OF THE SECOND ADVISOR

Name of the second advisor:_____

Date._____ Signature _____

9. ANNEXES

Annex I. English version Participants Information Sheet for Interview

Greeting

My name is———————————— . I come from Jimma University School of Public Health. I am Master's Degree student. I am doing my research paper on the title Prevalence and associated factors of high blood pressure among adults in Metu town, Ethiopia. The main objective of this study is to determine the prevalence of hypertension and to identify associated factors of hypertension among adults in Metu town.2022.

This study is principally useful to you to know your blood pressure measure reading and if you have high blood pressure reading it helps you to know the potential risk factor for your high blood pressure and have a great role for health workers to know the disease burden and to take the necessary measures to improve quality of care regarding prevention and control of hypertension and associated risk factors. It can also help the policy makers to take public health measures on prevention and control of hypertension and associated risk factors. This study will not have any harm to the study participants except spending time. It takes maximum 30 minute for interview and physical measurement. Your participation is voluntary and you have the right to be involved or not after being fully informed. Nothing will happen if you say "No". If you feel discomfort with the measurement, please be free to withdraw or discontinue at any time you want. The exposure data will not be accessible to anybody other than the study members. Any personal information given by you will be kept anonymously. The study has ethical approval from School of Public Health. Finally I will say thanks for important any kind of response on question and to talk measurements. If you have any question about the research you may contact Hawi Zinab (Principal Investigator) Jimma University, School of Public Health (Tel +251-911-59-76-83) ∷ Thus I understand about purpose of the study and I assured that there would be confidentiality of my response and collected data used only for the study. So

Agree ☐ Disagree ☐

Annex II. Afaan Oromoo version Participants Information Sheet for Interview

Nagaa

Maqaan koo———————————— . Kanin dhufe UniversitiiJimmaa muummee saayinsii fayyaahawaasaatti barataa digirii lammaffaati.Qorannookoo mataduree olka,uu dhiibbaa dhiigaafii sababoota isaan wolqabatan dargaggoota magaalaa mattuu irratti xiyyeeffata.Kaayyoon qorannoo kanaa olkauu dhibee dhiibbaa dhiigaa fii sababoota isaa dargaggoota magaalaa mattuu irratti bara 2022 gaggeessuudha.

Qorannoon kun jalqabarratti faayidaa olaanaa sadarkaa dhiibbaan dhiigaakee irra jiru baruufii yoo olkae immoo sababoota olkauu dhiibbaa dhiigaan wolqabatanii akka hubattuuf sigargaara.kanarra darbee ogeessonni fayyaas waan kanaan wolqabatee jiru qulqullinaan yaaluuf ittisuuf akka kaumsaatti gargaara. Kana malees seera baastota ittisaaf toannoo dhiibbaa dhiigaa fi sababoota isaa irratti akka kaumsaatti gargaara.yeroo nabiratti dhiibbaa dhiigaa kee safaruuf naannoo daqiiqaa soddomaa fudhatuun ala dhiibbaa ykn hama sirraan gahu hinqabu. Hirmaannaankee kan fedhiikee irratti hundaaee fii hirmaachuus dhiisuus mirga guutuu qabda.yooti lakki hin hirmaadhu jette wonti sirra gahu tokkollee hinjiru. Yoo sitti toluu dide yeroo feetetti addaan kutuu fii keessaa bahuu dandeessata. Ragaan gaafannoo kanaan ati nuuf kennitu qaama qorannocha keessatti hirmaatuun ala nama biraa kamittuu dabarfamee hin laatamu.Icitiin ragaawwan kanaa eegamaadha. Qorannochi raga mirkaneessaa naamusa quannoof qorannoo Universitii jimmaa muummee saayinsii hawaasaa irraa fudhateera.dhuma irratti gaafannoo kana irratti hirmaachuuf deebii barbaachisaa naaf laataa turteef sigalateeffataa yoo rakkoon jiraate nama qorannoo kana gaggeessu Haawwii Zinaab(Barataa Digirii lammaffaa universitii jimmaa muummee saayinsii hawaasaa) lakkoofsa bilbilaa Tel +251-911-59-76-83 kanaan qunnamuu dandeessa.Kanaaf wonti gaafatamu hundi dhimma qorannoo qofaaf akka ooluufii icitiin isaa eegamaadha.

Wolii galeera ——— lakki wolii hingalle———————

Annex III. English version Informed Consent

Detail information about the study was explained to me. I have understood that the main objective of this study is to determine the Prevalence and associated factors of high blood pressure among adults in Metu town, Ethiopia 2022. In addition, I understand about how the data collection is proceeding and the time it takes to complete the data collection. I also understand that the research imposes no risk on me. I assured that there was confidentiality of my response and collected data used only for the study. It also explained to me that I have the right to stop participation at any time. In addition, I understood that participating in this study is important for scientific knowledge and base for further study. Therefore, I have now consented to participate in the study by signing this form.

Signature of participants——————————date ——————————

Name and signature of data collectors——————————— date_____

Annex IV. Afaan Oromoo versionof informed consent

Unka wolii galtee

Waaee qorannochaa qaama qorannoo kana gaggeessu irraa argadhee hubadheera. Kanatti dabaluun ragaan ana irraa funaanamu anarratti dhiibbaa kamiyyuu akka hin geessinee fii icitiin ragichaa akka eegamu hubadheera.akkasumas qorannocha irratti hirmaachuuf fedhii yoo hinqabaanne mirga dhiisuufii garuu waaee olkauu dhiibbaa dhiigaa irratti yoon hirmaadhe qorannoon baayyeen kanaan booda hojjetamuu akka galteetti akka fayyadu hubadheera.kana waan taeef qorannoo kana irratti hirmaachuuf murteessuu koo maqaafii mallattookoon nan mirkaneessa.

Maqaa fii mallattoo hirmaataa _____ guyyaa _____

Maqaa fii mallattoo raga funaanaa _____guyyaa _____

Annex V. English Version Questionnaire

Questionnaire adapted from WHO step survey tools.

A questionnaire designed for Assessment of prevalence and associated factors of high blood pressure (Hypertension) among adult in Metu town.2022.

Date of Interview _____

Question code _____

Serial	Question	Responses	Skip
101	Sex	1. Male 2. Female	
102	How old are you? Age in years	_____	
103	What is your Educational level?	1. No formal schooling 2. primary education 3. Secondary education 4. Certificate and above	
104	What is your marital status?	1. Single 2. Married 3. Separated 4. Divorced 5. Widowed	
105	What is your current occupation?	1. House wife 2. Government employee 3. Private employee 4. Trader 5. Daily laborer	

		6. Others, specify _____	
106	Can you tell me what the average monthly income (Birr) of the household?	----	
Section II : Behavioral measurements			
Tobacco use			
107	Do you currently smoke any tobacco products, such as cigarettes, pipes, shisha within last 1 year..?	1.Yes 2.No	If No to Q107 skip to Q112
108	If Yes to Q107. which of the Three	1.Cigarette___ 2.Pipes_____ 3.Shisha_____	
109	Do you currently smoke tobacco products daily within last 1 year?	1. Yes 2. No	
110	How old were you when you first started smoking daily?	1. Years 2. Don't know	
111	On average, How many of the following do you smoke each day	1. Manufactured cigarettes └┘└┘ 2. Number of Shisha sessions └┘└┘ 3. Other, specify (_____	
112	If you had stopped smoking at what age you did?	------	
113	How long ago did you stop smoking daily?	Years ago └┘└┘ Or months ago └┘└┘ Or weeks ago └┘└┘	
114	During the past 30 days, on how many days did someone in your home smoke when you were present?	1. 2.	Number of days _____days Don't know
115	During the past 30 days, on how many days did someone smoke in closed areas in your workplace (in the building, in a work area or a specific office) when you were present?	1. 2.	Number of days_____days Don't know
Chat chewing			
116	Are you currently chew Khat?	Yes ---------- No ---------- Refused----------	
117	During the last 30 days, on average how many days did you chew Khat?	Daily ---------- Weekly ---------- Less than a month------ Monthly---------- Other---------- Other, specify----------	
118	How many Zurbas/"esire" do you chew on one of those days?	---------- Zurbas/"esire"	

119	How old were you when you first started chewing Khat?	Age in years---------- I don't know-------	
120	Do you remember how long ago it was, you have been started chewing Khat?	Weeks -------- Months --------- Years ----------	
121	In the past, did you ever chew Khat? (For currently non Khat chewer)	Yes------------------------- No------------------------- No response----------	
122	How old were you when you stopped chewing Khat?	Age in years--------	
123	How long ago did you stop chewing Khat?	Weeks -------- Months --------- Years ----------	
Alcohol Consumption			
124	Have you ever consumed any alcohol such beer, Tella, Bordie, Tej, Arake, wine, beherawi, ye bale zaf?	Tella a. Yes b. No Bordie a. Yes b. No Tej a. Yes b. No Areke a. Yes b. No Wine a. Yes b. No Behrawi a. Yes b. No Yebalazaf a. Yes b. No .	
125	Have you consumed an alcoholic drink within the past 12 months?	1.Yes 2.No	If No go to Q131
126	During the past 12 months, How frequently have you had at least one alcoholic drink?	1. Daily 2. 5-6 days per week 3. 1-4 days per week 4. 1-3 days per month 5. Less than once a month	
127	During the past 30 days, on how many occasions did you have at least one alcoholic drink?	1.Number of days _____days 2.Don't know	
128	During the past 30 days, when you drank alcohol, on average, how many standard alcoholic drinks did you have during one drinking occasion?	Number of days _____days Don't know	
129	During the past 30 days, what was the largest number of standard alcoholic drinks you had on a single occasion, counting all types of alcoholic drinks together?	Largest Number Don't know	

130	During the past 30 days, how many times did you have For men: five or more for women: four or more Standard alcoholic drinks in a single drinking occasion?	1.Number of times 2.Don't Know	

Diet			
The next questions ask about the fruits and vegetables that you usually eat. I have a nutrition card here that shows you some exampl local fruits and vegetables. Each picture represents the size of a serving. As you answer these questions, please think of a typical we last year.			
131	In a typical week, on how many days do you eat fruit?	1. Number of days…… 2.Don't Know ----	
132	How many servings of fruit do you eat on one of those days?(serving in this case refers to slice or one full fruit e.g. orange, banana, mango, ...)	1. Number of servings---------- 2. Don't Know--------	
133	In a typical week, on how many days do you eat vegetables?	Number of days ---------- Don't Know ------	
134	How many servings of vegetables do you eat on one of those days? (serving in this case refers to cups or "Chilfa") of vegetable stews)	Number of days ---------- Don't Know -----	
135	How often do you add salt or a salty sauce such as soya sauce to your food right before you eat it or as you are eating it?	1 Always 2 Often 3 Sometimes 4 Rarely 5 Never	

136	How much salt or salty sauce do you think you consume?	1Far too much greater than 2 Tsp 2 Too much 1 to 2 Tsp 3 Just the right amount less than 1 Tsp 4Too little less than 3 gram 5Far too little less than 2 gram Don’t know	
Physical Activity			
137	Do you perform regular physical exercise?	1. Yes 2. No	
138	In a typical week, on how many days do you do vigorous intensity activities as part of your work?	Number of days	
139	How much time do you spend doing vigorous-intensity activities at work on a typical day?	Hours : minutes ⌊_⌊_⌋ : ⌊_⌊_⌋ Hrs mins	

140	Does your work involve moderate-intensity activity that causes small increases in breathing or heart rate such as brisk walking [or carrying light loads] for at least 10 minutes continuously?	1. Yes 2. No	
141	How much time do you spend doing moderate-intensity activities at work on a typical day?	Hours : minutes ⌊_⌋⌊_⌋ : ⌊_⌋⌊_⌋ Hrs mins	
142	Do you walk or use a bicycle (pedal cycle) for at least 10 minutes continuously to get to and from places?	1. Yes 2. No	
143	In a typical week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places?	Number of days	
144	How much time do you spend walking or bicycling for travel on a typical day?	Hours : minutes ⌊_⌋⌊_⌋ : ⌊_⌋⌊_⌋ Hrs mins	
145	Do you do any vigorous-intensity sports, fitness or recreational (leisure) activities that cause large increases in breathing or heart rate like [running or football] for at least 10 minutes continuously?	1. Yes 2. No	
146	How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a typical day?	Hours : minutes ⌊_⌋⌊_⌋ : ⌊_⌋⌊_⌋ Hrs mins	
147	How much time do you usually spend sitting or reclining on a typical day?	Hours : minutes ⌊_⌋⌊_⌋ : ⌊_⌋⌊_⌋ Hrs mins	
History of HTN Blood Pressure			
148	Has any of your family members (biological parents, siblings or children) ever had HX of high blood pressure or hypertension?	1. Yes 2. No	
History of Diabetes			
149	Have you ever had your blood sugar measured by a doctor or other health worker?	1. Yes 2. No	
150	Have you ever been told by a doctor or other health worker that you have highblood sugar or Diabetes?	1. Yes 2. No	
History of Cardiovascular Diseases			
151	Have you ever had a heart attack or chest pain from heart disease (angina) or a stroke (cerebrovascular accident or incident)?	1. Yes 2. No	
152	Are you currently taking aspirin regularly to prevent or treat heart disease?	1. Yes 2. No	
153	Are you currently taking statins (Lovastatin/Simvastatin/Atorvastatin or any other statin) regularly to prevent or treat heart disease?	1. Yes 2. No	
Section III :Physical Measurements			

Height and Weight			
	Interviewer ID	☐☐	
	Device IDs for height and weight	Height ☐☐☐ Weight ☐☐	
154	Height	In Centimeters (cm) ☐☐☐.☐	
155	Weight	In Kilograms (kg) ☐☐☐.☐	
156	For women: Are you pregnant?	1. Yes 2. No	
Waist circumference			
	Device ID for waist	☐☐	
157	Waist circumference	In Centimeters (cm) ☐☐☐.☐	
Blood Pressure			
	Device ID for blood pressure		
	Cuff size used	Small 1 Medium 2 Large 3	
158	Reading 1	Systolic (mmHg) ☐☐☐ Diastolic (mmHg) ☐☐☐	
159	Reading 2	Systolic (mmHg) ☐☐☐ Diastolic (mmHg) ☐☐☐	
160	Reading 3	Systolic (mmHg) ☐☐☐ Diastolic (mmHg) ☐☐☐	

Annex VI. Afaan OromoVersion Questionnaire

Kutaa I: Gaaffiilee wolii gala			
Serial	**Gaaffii**	**Deebii**	**Irra darbi**
101	Saala	1. dhiira 2. dhalaa	
102	Umuriin kee meeqa? Umurii woggaadhaan	_____	
103	Sadarkaa barnoota kee maali?	1. Barumsa idilee hinqabu 2. Barnoota sad.1ffaa 3. Barnoota sad.2ffaa 4. Woraqaa ragaaf isaa oli	
104	Haalli Bultii ijaarrachuu kee maali?	1. Kophaa 2. Fuudheera 3. Adda baheera 4. Hiikeera 5. Narraa dueera	
105	Dalagaan kee maalidha?	1. Haadha worraa 2. Hojjetaa Mootummaa 3. Hojii dhuunfaa 4. Daldalaa 5. Dafqaan bulaa 6. Kan biroo, kanajedhi _____	
106	Kan bara darbe akka kaumsaatti fudhuutii galiikee jiddu galeessaan meeqa ta'a	----	
kutaa II : Safartuu amalummaa			

Tamboo xuuxuu			
107	Yeroo ammaa tamboo kanneen akka sigaaraa, pipes, fii shisha.ni aarsitaa.?	1.Eeyyee 2.Lakki	Lakki yoo tae lakk112
108	Yoo Gaaffiin 107. Eeyyee tae sadan keessaa isa kami	1.Tamboo___ 2.Payipii_____ 3.Shiishaa____	
109	Gosawwan tamboo jiran yeroo ammaa ni xuuxxaa	1. Eeyyee 2. Lakki	
110	Yeroo jalqaba tamboo xuuxuu eegaltu umuriin kee meeqa ture?	1. woggaa 2. lakki hinbeeku	
111	Jiddugaleessaan kanneen armaan gadii guyyaatti meeqa xuuxxaa?	1. Tamboo ⌊⌊⌊ 2. Shiishaa marsaan ⌊⌊⌊ 3. Garabiraa, tarreessi (_____	
112	Yoo tamboo aarsuu dhaabdeetta umurii meeqatti dhaabde?	------	
113	Erga dhaabdee hagam turteetta?	Woggaa dura ⌊⌊⌊ Ykn jia dura ⌊⌊⌊ ykn torbee dura ⌊⌊⌊	
114	Guyyoota 30 darbanitti osoo ati mana keessa jirtuu namni biraa guyyaa meeqa tamboo xuuxe?	1. Baayyina guyyaa 2. Lakki hinbeeku	
115	Guyyoota 30 darbanitti bakka ati dalagaa dalagdu ykn naannoo sanatti namni biraa guyyaa meeqa tamboo aarsee?	1. Baayyina guyyaa 2. Lakki hinbeeku	
116	Yeroo ammaa Jimaa niqaamtaa?	Eeyyee ---------- Lakk----------	Yoo miti tae gaaffii 121 dhaqi
117	Jiddugaleessaan guyyaa 30 darban keessa guyyaa meeqa jimaa qaamte?	Guyyaa guyyaan---------- Torbanitti---------- Jiaa gadi------ Jiaan---------- Kanbiroo---------- Kanbiroo, eeri----------	
118	Zurbas/” Hidhaa meeqa guyyoota kanatti qaamta”	Zurbas/”Hidhaa”----------	

119	yeroo duraaf jimaa qaamuu yoo eegaltu umuriinkee meeqa?	Umurii woggaan---------- Hinbeeku-------	
120	erga qaamuu eegalte hagam fagaateera?	Torban-------- Jia--------- Woggaa----------	
121	Kana dura qaamtee beektaa? (worra hinqamaaneef)	Eeyyee---------- Lakki---------- Yaada hinqabu----------	
122	Yeroo jimaa qaamuu dhaabdu umuriinkee meeqa ture?	Umurii woggaadhaan--------	
123	Erga jimaa qaamuu dhaabdee hagam tae?	Torbee -------- Jia --------- Woggaa ----------	
Dhugaatii dhuguu			
124	Kanaan dura dhugaatii garaagaraa kanneen akka biiraa, Tallaa, boordee, xajjii, Araqee, woyinii, beherawi, ye bale zaf dhugdee beektaa?	1.Biiraa a Eeyyee__ b Lakkii___ 2.Tallaa a, Eeyyee__ b Lakkii___ 3.Boordee a, Eeyyee__ b Lakkii___ 4.Xajjii a, Eeyyee__ b Lakkii___ 5.Araqee a, Eeyyee__ b Lakkii___ 6.Waynii a, Eeyyee__ b Lakkii___ 7.Beheraawii a, Eeyyee__ b Lakkii___ 8.Yebalazaf a, Eeyyee__ b Lakkii___	
125	Jioota 12n darban dhugdeettaa?	1. Eeyy 2. ee lakki	Yoo lakkii tae, gaaffii. 122dhaqi
126	Jioota 12n darban yoo xiqqaate alkoolii tokko hammamiin dhugde?	1. guyyaa guyyaan 2. torbeetti guyyaa5-6 3. torbeetti guyyaa 1-4 4. torbeetti guyyaa1-3 5. jiatti tokkoo gadi	
127	Guyyoota 30 darbanitti yoo xiqqaate alkoolii tokkoguyyaa meeqa dhugde?	1.baayyina guyyaa _____ 2.lakki hinbeeku	
128	Guyyoota 30 darbanitti yeroo dhugdu jiddugaleessaan sadarkaa isaa alkoolii eeggate yeroo meeqa argatta?	1. Baayyina guyyaa_____ 2. Lakki hinbeeku	
129	Guyyoota 30 darbanitti yeroo tokkotti alkoolota gosa garaagaraa dhugde yeroo	1. Lakk.guddaa 2. Lakki hinbeeku	

	wolitti idaatu lakkoofsi guddaan meeqa?		
130	Guyyoota 30 darbanitti During alkoolii sadarkaa isaa eeggate dhiiraaf 5 fi isaa ol Dubaraaf4 fi isaa ol yeroo meeqa?	1.baayyina yeroo_ 2.lakki hinbeeku	

Dhaangaa			
131	Kuduraa ni nyaattaa?	1. Eeyyee 2. Lakki	
132	Yoo eeyyee tae nyaata Torbeettii dhihaatu meeqa keessatti kuduraa nyaatta?	1. Lakkoofsa marsaa dhihaatuu 2. Lakki hinbeeku	
133	Nyaata nyaattu nyaachuun dura ashaboo yeroo meeqa itti naqxaa?	1 yeroo hunda 2 yeroo baayyee 3 darbee darbee 4 yeroo muraasa 5 takkaayyuu	

134	Ashaboo hagam nyaadha ykn fayyadama jettee yaadda?	1 baayyee hedduu falaana 2 fi isaa oli 2 hedduu fallaana 1 hanga 2 3 haguma barbaachisu fallana 1 gadi 4 xiqqoo giraama 3 5 baayyee xiqqoo giraama 2 gadi 6.hinbeeku	
Sosochii qaamaa			
135	Sochii qaamaa idileen ni hojjettaa?	1. Eeyyee 2. Lakki	
136	Torbanitti akka hojii idileetti guyyaa meeqa dalagaa cimaa hojjettta?	Baayyina guyyaa	
137	Sosochii cimaa qaamaa hojjechuutti torbanitti yeroo hagamii dabarsita?	saaatii : daqiiqaa └┘└┘ : └┘└┘ Hrs mins	
138	Sosochiin ati dalagaa qaamaaf gootu kun hafuura baafannaaf dhahannaa onneekee kan dabalanidhaa fkn such as suksukuu [ykn ba.aa ulfaatu] yoo xiqqaate daqiiqaa 10f wolitti aansuunii?	1. Eeyyee 2. Lakki	
139	Sosochii qaamaa giddugaleessa bakka hojiitti guyyaatti hagam dalagda?	saatii : daqiqaa └┘└┘ : └┘└┘ Hrs mins	
140	Yooxiqqaate miillaan deemuu ykn biskileettii daqiiqaa 10f wolitti aansitee nifayyadamtaa?	1. Eeyyee 2. Lakki	
141	torbanitti, Yooxiqqaate miillaan deemuu ykn biskileettii daqiiqaa 10f guyyaa meeqa hojii dhaquuf galuuf fayyadamta?	Baayyina guyyaa	
142	Miillaan sochouuf ykn biskileettiin yeroo hagam gubda guyyaatti?	Hours : minutes └┘└┘ : └┘└┘	

		Hrs mins	
143	Sosochii qaamaa kanneen akka fitnessi kanneen hafuura bafannaa fi dhahannaa onnee dabalan fiigichaaf kubbaa taphachuu yoo xiqqaate daqiiqaa 10 gootaa?	1. Eeyyee 2. Lakki	
144	Sosochii Qaamaa arifataa,jabeenya ykn sochii gammachiisoo guyyaatti yeroo meeqa dalagda?	Sa,atii : daqiqa ⌊_⌋⌊_⌋ : ⌊_⌋⌊_⌋ Hrs mins	
145	Guyyaatti yeroo baayyee taaumsaan yeroo hagam?	Sa,atii : Daqiiqaa ⌊_⌋⌊_⌋ : ⌊_⌋⌊_⌋ Hrs mins	
Seenaa Dhiibbaa Dhiigaa			
146	Miseensa maatii kanneen akka haadhaaf abbaa,obbolaa ykn ijoollee kee keessaa seenaadhaan namni dhiibbaa dhiigaa qabu?	1. Eeyyee 2. Lakki	
History of Diabetes			
147	Kanaan dura hanga sukkaaraa kee safaramtee?	1. Eeyyee 2. Lakki	
148	Doktorri ykn ogeessi fayyaa biraa kanaan dura dhiibbaan dhiigaa kee dabaluu ykn sukkaara qabaachuu sitti himee	1. Eeyyee 2. Lakki	
Seenaa Dhukkuba Onnee			
149	Kanaan dura dhahannaa onnee ykn woraansa qomaa onnee irraa tae ykn strokii siqabee beekaa?	1. Eeyyee 2. Lakki	
150	Yeroo ammaa yaalii onneetiifqoricha aspiriinii fudhachaa?	1. Eeyyee 2. Lakki	
151	Yeroo ammaa dhukkuba onnee ittisuuf ykn yaaluuf Qoricha Lovastatin/Simvastatin/Atorvastatin ykn gara biraa fudhachaa jirtaa?	1. Eeyyee 2. Lakki	
Section III :Safartuu fiizikaalaa			
<u>Dheerinaa fii Ulfaatina</u>			
	ID Nama gaafannoo gaggeessuu	⌊_⌋⌊_⌋	
	ID meeshaa dheerinaafii Ulfaatinaa	Dheerina ⌊_⌋⌊_⌋ Ulfaatina ⌊_⌋⌊_⌋	
152	Dheerina	sentimeetiriidhaan (cm) ⌊_⌋⌊_⌋⌊_⌋.⌊_⌋	
153	Ulfaatina	Kilograamiin (kg) ⌊_⌋⌊_⌋⌊_⌋. ⌊_⌋	
154	Dubartootaaf ati Ulfadhaa?	1. Eeyyee	

		2. Lakki	
Balina Mudhii			
	ID Safartuu Mudhiif	⌊__⌋	
155	Balina Mudhii	sentimeetiraan (cm) ⌊___⌋ . ⌊__⌋	
Dhiibbaa Dhiigaa			
	ID safartuu Dhiibbaa Dhiigaa		
	Safartuu dhiibbaa dhiigaa fayyadamne	Xiqqoo 1 Jiddugaleessa 2 Guddaa 3	
156	Dubbisa 1	Kan irraa (mmHg) ⌊___⌋ kanjalaa (mmHg) ⌊___⌋	
157	Dubbisa 2	Kan irraa (mmHg) ⌊___⌋ kanjalaa (mmHg) ⌊___⌋	
158	Dubbisa 3	Kan irraa (mmHg) ⌊___⌋ kanjalaa (mmHg) ⌊___⌋	