Addis Ababa University
Faculty of Medicine
Department of Community Health

Assessment of Risk Factors for Selected Chronic Diseases among Higher Education Students in Addis Ababa

By

Seblewengel Lemma, BSc.

A Thesis Submitted to the School of Graduate Studies of Addis Ababa University in a Partial Fulfillment for the Degree of Masters in Public Health

July 2007

Addis Ababa, Ethiopia

Addis Ababa University
School of Graduate studies

Assessment of Risk Factors for Selected Chronic Diseases among Higher Education Students in Addis Ababa

By

Seblewengel Lemma, BSc.

Approved by the examining board

_____ _____
Chairman, Dept. Graduate Committee

Dr. Fikru Tesfaye
Advisor _____

_____ _____
Examiner

Acknowledgments

I would like to express my gratitude to all people who have contributed to the successful completion of this research paper. Most importantly, I thank my advisor Dr. Fikru Tesfaye for his guidance and wholehearted support throughout the work of this study.

I greatly appreciate my family for their support and understanding since my childhood. I am also thankful to my friends for being there for me when I needed help. I am also thank full for administrative staffs in Addis Ababa University, Unity University College, Admas College and St. Mary College for facilitating the data collection process and instructors who have given me their class hours. I would like to appreciate the study participants for their willingness and participation in the study and also the data collectors for their undivided devotion during data collection processes.

Finally, I would like to thank the Swedish counsel for social and work life research (FAS) for providing financial support to the study and Ethiopian public health association for delivering the grant.

Table of contents

List of tables

List of abbreviations

AIHW- Australian institute of health and welfare

BMI- Body mass index

BP- Blood pressure

CI- Confidence interval

COPD- Chronic obstructive pulmonary disease

CVDs- Cardiovascular diseases

DALYs- Disability adjusted life years

GPAQ- Global Physical Activity Questionnaire

HIV/AIDS- Human immunodeficiency virus/Acquired immunodeficiency syndrome

MET- metabolic equivalent

MOH-Ministry of health

OR- Odds ratio

STEPS- Stepwise surveillance of risk factors for non-communicable diseases

WHO- World health organization

P.A level- total physical activity level

Abstract

Background: The health system in developing countries, such as Ethiopia, is overwhelmed by infectious diseases and malnutrition. However, the growing burden of diet and lifestyle related chronic diseases have recently been recognized with its contribution to the double burden on diseases in these countries.

Objective: The study was designed to assess the prevalence of common risk factors for chronic diseases among regular higher education students in Addis Ababa in 2007.

Methods: This study is an institution-based cross sectional survey that employed cluster sampling method. The WHO STEPS questionnaire was administered to collect data on socio-demographic characteristics, behavioral risk factors, and selected physical measurements, such as blood pressure, weight, height, waist and hip circumference.

Results: Prevalence of current cigarettes smoking was 9.5% in male and 3.4% in females. About 44% of participants reported alcohol consumption in 12 months prior to the survey, while 6.8% reported binge type of alcohol drinking. The prevalence of current khat chewing was 13.8% and 13.3% were daily khat users. Almost 99% of participants reported inadequate fruit and vegetable consumption, and 21% of participants added salt on their plate while they are eating their meal. About 31.6% of males and 47.8% of females were physically inactive or reported inadequate level of physical activity related to work, transport or leisure time. The overall prevalence of overweight or obesity was 5.5%, with 4.2% in males and 7.6% in females. Hypertension was detected in 10.4% of males and 6.7% of females. Adjusting to other variables, age, friend's history of smoking, current khat chewing and binge drinking were positively associated with current cigarette smoking status. Male sex, urban residence, friends' and father's khat consumption history were positively associated with current khat consumption. Sex, years of stay in college, living arrangement, and BMI were predictors of both systolic and diastolic blood pressure of the participants.

Conclusion and recommendations: Inadequate consumption of fruits and vegetables, along with physical inactivity, are widely prevalent risk factors of chronic diseases among college

students in Addis Ababa. Moreover, khat chewing, cigarette smoking, and alcohol consumption are common practice among the study population. The college, as a continuation of the high school, is a favorable (breading) environment for adoption and proliferation of substance use behavior. At the same time, it offers an opportunity for promotion of healthy life style and prevention of the risky behavior. The school administrative and members of the academic community should be aware of the prevailing situation and its potential consequences in order to curb the problem

Introduction

For centuries, communicable diseases were main cause of death around the world. With advancement of medical research and improvements of life conditions in industrialized countries, non-communicable diseases started to take the place of communicable diseases. At the same time, owing to demographic and life style change, these diseases started to occur in developing countries, resulting in the double burden of communicable and non-communicable diseases (1, 2).

According to the world health organization's statistics, chronic diseases such as CVDs, diabetes, cancers, obesity and respiratory diseases account for about 60 percent of 56.5 million deaths each year and almost half of the global burden of diseases. In 1990, 47 percent of all mortality related to non-communicable diseases was in developing countries. Moreover, the burden of non-communicable diseases in sub Saharan Africa is already substantial, and patients with these problems make significant demand on health care resources. (1, 2, 3)

Recent estimate indicate that 5 to 8 percent of urban adult population in Dar es Salaam and in South African townships are affected with diabetes, while 20 to 33 percent have hypertension. In addition, these conditions tend to affect economically active adults, on whom young and old members of the population are often dependent. (3)

Similar to other developing countries little is done to quantify the prevalence of chronic diseases and their risk factors in Ethiopia. Small-scale surveys of bank employers in Addis Ababa and Ethiopian medical patients at different times have revealed the existence of these diseases and their risk factors besides an increasing trend of myocardial infarction admission was also recorded from 1988 to 1997 (4, 5). A burden of disease analysis carried out in rural Ethiopia found that chronic diseases have contributed to 24% of DALYs lost compared to 72% for other health problems including communicable diseases. According to the ministry of health (MOH) report of health and

health- related indicators, hypertension without mention of heart was the ninth cause of death nationwide in 2003/04 (6, 7).

The major preventable risk factors are behavioral and biological risk factors. Given the difference between these classes of chronic diseases, they share common behavioral, environmental, and genetic risk factors that work together (2, 8).

These risk factors begin in adolescence or child hood, or even earlier during fetal development, and determine the risk of having chronic diseases later in adult life. Studies from developed countries have shown that habitual alcohol and tobacco use in older children and adolescents contribute to raised blood pressure and development of other risk factors in early life, most of which track into adulthood (9,10).

A limited number of risk factors likely to contribute to one or more of the chronic diseases and they often occur clustered together. This clustering of risk factors is also documented by a hospital-based study of patients with chronic diseases in Tikure Anbesa Hospital. The clustering creates an opportunity to address more than one risk factor at a time using the same intervention strategy (5, 9, 10).

College environment is the place where young adults experience independence in decision-making and financial utilization even though; most of them get their pocket money from their family or relatives. It is where the rapid transition from family influence to peer influence would take place. College environment creates the opportunity to explore and adapt new experiences or behaviors. Therefore, there is a good chance of being exposed to unhealthy life styles like substance abuse (11, 12).

According to a study in the USA, college is the main locus of substance abuse, with 40% of students reporting binge drinking at least once two weeks prior to the study, and tobacco and alcohol were the most abused drugs among college students in USA. Studies in Ethiopian college students also revealed the prevalent situation of substance use (13, 14, 15, 16).

The main determinants of chronic diseases can be addressed through relatively low primary interventions and surveillance of their risk factors. This study used the WHO

stepwise approach to surveillance of risk factors for non-communicable diseases (STEPS) methodology. This approach uses standardized instruments and protocols to monitor trends of risk factors within population and make comparison between populations. It has three major steps - self-report of risk factors using the steps questionnaire, physical measurements and biochemical assessment (17). In this study, we employed the first two steps.

The risk factors studied were alcohol consumption, khat chewing, cigarette smoking, physical inactivity, overweight and obesity, low fruit and vegetable intake, and elevated blood pressure. Even though these risk factors are the same in different population, the social, cultural and economic conditions that produce the risk factors most certainly do differ in different population. (2)

This study quantified the major risk factors and identified their determinants among higher education students in order to contribute to the national efforts in preventing morbidity and mortality in this special group of population.

Literature Review

It is becoming clearer that, the earlier labeling of chronic diseases as disease of affluence is increasingly a misnomer as they emerge both in poorer countries and in the poorer population groups in richer countries. Developing countries are increasingly suffering from high levels of public health problem related to chronic diseases. Although HIV/AIDS, malaria & tuberculoses along with other infectious diseases, still predominate in sub-Saharan Africa, 79% of all deaths worldwide that are attributable to chronic diseases are already occurring in developing countries.(9)

This epidemiological transition is due to a combination of factors like urbanization, dietary changes, increased physical inactivity, substance abuse, an aging population, changes in the environment and a "western life style". The main chronic diseases, which are contributing to the global burden of disease mortality & morbidity, are cardio vascular diseases, diabetes, chronic pulmonary diseases and cancers causing more than half of deaths each year. (1, 2, 18)

CVD has become a significant cause of chronic disease death; a total of 17million CVD deaths occurred in 2002. It is estimated to reach 24 million deaths, by 2030 of which 80% will occur in low-and middle-income countries because of life style changes. In 2005, CVDs were responsible for 3 million deaths in India and 3.3 million deaths in china and in South Africa in 1996 over 22% of all deaths was due to stroke and heart diseases. (1)

In 1990, 46.7% of the deaths attributable to CVD in the developing countries occurred below the age of 70 years compared to 22.8% of such deaths below that age in high-income countries. In South Africa, in 1995, stroke accounted for 4.8% and 2.3% of deaths in women and men respectively in 35-38 year old age. The problem is that, a relatively young population of middle-income countries is being exposed to risk factors for longer period resulting in CVD at relatively young ages. (3, 4, 19)

The most common type of diabetes is type 2; it accounts for about 90% of all diabetes and is largely the result of excessive weight and physical inactivity. Rapid increase in both the prevalence and incidence of type2 diabetes has occurred globally with significant increase, in societies in economic transition and in societies in which there have been major changes in type of diet consumed, reduced physical exercise, increased in over weight & obesity (9, 18).

World wide the number of diabetes cases is expected to increase from 194 million in 2003 to 330 in 2030 with three in four living in developing countries. Moreover, type2 diabetes has been a disease of the middle aged and elderly but recently, escalated in all age groups and now identified in younger age groups, including adolescent and children, especially in high-risk population (2, 9).

Cancer is a major cause of mortality through out the world generally exceeded by only cardiovascular diseases in developed world. The most important established cause of cancer is tobacco smoking & others like diet, alcohol and physical inactivity are important determinants (9, 18).

In 2000, over 10 million new cases and over 7million deaths from cancer occurred worldwide. The contribution of developing countries was 53% for incidence and 56% for deaths. Between 2000 & 2020, the total number of cases of cancer in the developing world is predicted to increase by 73% and, in the developed world, to increase by 29 % (2).

Chronic respiratory disease represents a major burden for the health systems worldwide. In 1990, the WHO/world bank global burden of diseases study estimated the global prevalence of chronic obstructive pulmonary disease to be 9.33/1000 for men and 7.33/1000 for women, while in sub Saharan Africa 4.4/1000 is for men & 2.49/1000 for women. It affects men more frequently than women, usually appears after 45 years of age, and increases in frequency with age. The single most important factor in the genesis of COPD is tobacco Smoking but other environmental factors are also contributors (3).

Risk factors - Not only is the burden of chronic disease, but the burden of risk factors is also increasing. This increase is expected to result, social and economic consequences & an impact on national development. There is increasing evidence that these risks begin in fetal life and continue in to old age. Thus, these risk factors are indicative of disease processes progressing through out the life course. And the adult chronic diseases, reflects cumulative differential life time exposure to damaging physical and social environment (9, 10).

In addition, chronic diseases are, themselves, a series of overlapping and complicated disease entities, some of which markedly amplify the likelihood of developing a further disease, and in that sense become risk factors them selves. This means a person at risk of one chronic disease is likely to have an underlying disorder predisposing to other diseases (9, 10).

Alcohol-In the last decade, problems of excessive alcohol consumption have increased dramatically in many societies both developed and developing. Worldwide, alcohol was responsible for 2 million deaths, representing 4% of the global disease burden. In sub-Saharan Africa, the prevalence of high risk drinking was 12% among males and 3% among females (2, 20, 21).

Alcohol related problems might be grouped in to two. The first consists of primary effects, which directly affect the health of the individual and impose economic costs of lost income or productivity resulting from premature death and illness due to alcohol related diseases & trauma. The second group is problem with external effects on the individual and society (20).

While moderate consumption of alcohol has protective effect over some chronic diseases, over consumption is associated with increased risk of stroke & coronary heart disease through its contribution to high blood pressure. In addition, many research studies have established the relationship between alcohol use and cancer. The strongest associations between Alcohol use and cancer are with mouth, esophageal, laryngeal, pharyngeal breast and liver cancer (3, 20).

Studies in different parts of the world have found increased prevalence of alcohol consumption and other substances in college students implying the influence of college environment. Alcohol is one of the most abused substances in college students (13, 15, 20, 22, 23).

Cigarette smoking - Tobacco remains the most important avoidable risk for the major classes of chronic diseases. In the 20th century, approximately 100 million people died worldwide from tobacco-associated diseases such as cancers, chronic lung disease, diabetes and CVDs. It increases the risk of dying from coronary heart disease and cerebro vascular disease 2-3 folds and the risk of lung cancer by 20-30 folds (2).

While tobacco consumption is falling in most developed countries, it is increasing in developing countries by about 3.4% per annum. Eight percent of the 1.2 billion smokers in the world live in poorer countries where smoking prevalence among men is nearly 50% and 50% of the 5 million deaths attributed to smoking in 2000 occurred in developing countries (2).

In Africa, prevalence of smoking is showing a rise especially in urban areas. Traditionally, only men were smokers but the proportion of women is now rising. Besides, smoking is also increasing among African children & adolescents. According to some studies; cigarette smoking rose steeply between 1967 and 1976 and actually doubled in Libya and Ethiopia. In the same year the volume of tobacco imported also almost doubled. Besides some African countries are expanding tobacco agriculture so that they can supply their own needs (8).

A Prevalence study in Saudi Arabia revealed that the over all prevalence of smoking was 6.7% in young people aged 15 to 20 years. Smoking prevalence among Turkish college students has been reported to be 42.5%. It is also documented that this prevalence of smoking has shown an increasing trend from first year to the last at colleges/universities (24, 25, 26).

A longitudinal study of high school students in Northern Virginia stated that 29% of adolescents currently smoke with rates increasing progressively from 24% among 9^{th} graders to 35% among 12^{th} graders and most cigarette smokers start smoking before 18 years of age and the prevalence of current smoking among college students in China was 44.7% (12, 27).

Khat chewing -Khat is one of locally dominating substance to which people are becoming addicted in Ethiopia. Previously khat was used widely in the Harar region, but now it is common in other parts of the country. A survey conducted in 1996 in Addis Ababa and twenty-four towns across Ethiopia estimated the prevalence of khat chewing 30% and this figure have increased to 50% in 2000 (14, 28).

Males predominantly consume khat however; the number of females who chew khat is significant. Students in high school and colleges used khat hoping it will keep them alert and reduce physical fatigues so that it will help them improve their academic performance (28, 29).

In 2001, prevalence of khat chewing among college students in Ethiopia was 26.7%. Moreover, according to some study in Ethiopia, over 23% of out of school youth used khat every day or once weekly while only 7.5% of in school youth did so (14, 22).

In addition to the known health hazards of khat related to psychological consequences, different studies have shown its importance in progression of certain chronic diseases. Different studies have found significant association as risk factor for Myocardial infarction some were implying the risk associated with long term and heavy consumption (28, 30, 31, 32).

Diet- due to economic development and urbanization, nutritional transition is occurring in the world and is contributing to the causal factors underlying chronic diseases even in the poorest countries with rapid pace, coupled with food insecurity and under nutrition. These adverse dietary changes include shift in the structure of the diet towards a higher energy density diet, with a greater role for fat and added sugars in foods; greater saturated fat intake, reduced intakes of complex carbohydrates and dietary fiber, and reduced fruits and vegetable intakes (9, 10).

These dietary factors are estimated to account for approximately 30% of cancers in developed countries and in developing countries, around 60% of cancers of the oral cavity, pharynx, and esophagus, which are thought to be a result of micronutrient deficiencies related to low fruits and vegetables. Daily intake of fresh fruit and vegetables in adequate quantity is expected to reduce the risk of coronary heart disease, stroke, and high blood pressure (9).

Moreover, studies have shown the effect of high intake of energy dense food and sugar sweetened drink in individual resulting weight gain and escalating to overweight and obesity (9, 10).

The recommended daily intake was 400 mg of fruit and vegetable, or the equivalent of five servings of these foods. A study of Brazilian adult reported daily fruit intake was 41% while 30% reported daily vegetable intake and only one in eight reported consumption of the recommended amount five or more servings of fruit and vegetable (33,34).

Physical inactivity – A progressive shift of life style towards more sedentary pattern is recognized as important determinate of health in developing countries as much as in developed countries. Together with physical fitness levels, physical activity provides a substantially reduced risk of cardiovascular diseases and all cause mortality (2, 9).

In addition epidemiological studies show smaller risk of weight gain, over weight and obesity among persons who currently engage regularly in moderate to large amounts of physical activity. Moreover, body weight together with physical inactivity estimated to account for approximately one fifth to one third of several of the most common cancer, especially cancers of the breast, colon, endometrium, Kidney & Esophagus (9, 10).

Worldwide, it is estimated that 60% of the world's population do not do enough physical activity. Data from Sao's Paulo Brazil indicate that 70% to 80% of the populations are remarkably inactive. Despite the known benefits of physical activity only a quarter of adults in USA do the recommended levels of physical activity; 30 to 40% of black South African adults were physically inactive. A study of young adults in Addis Ababa found that 8.4% were physically inactive, based on leisure time physical activity. The recommended level of physical activity is either 30 minutes of moderate intensity activity five or more days per week or 20 minutes of vigorous intensity physical activity three or more days per week (2, 5, 23, 35, 36).

Overweight /obesity- With a change in diet and more sedentary life style, almost all countries are experiencing an obesity epidemic. In low-income countries, obesity is more common in middle-aged women, people of higher socio economic status and those living in urban communities. World wide, overweight affects 1.2 billion people of which 300 million are clinically obese. In some developed countries like USA, the prevalence reaches 60% (2, 9).

Not only in middle age population, a significant increase in the prevalence of over weight among children has also taken places over the past 20 years in developing countries as diverse as India, Mexico, Nigeria and Tunisia (2, 9).

The South African demographic and health survey conducted in 1998 revealed that, 31.8% of African women age above fifteen were obese while 26.7% were overweight the prevalence among men was 6.0% with 19.4% being overweight (36).

Although total amount of body fat as estimated by the body mass index remains an important indicator of weight related illness, location of body fat is equally significant. Excessive body fat stored around the stomach and abdomen is a key risk factor for obesity related diseases. Waist circumference and waist to hip ratio are used to assess body fat distribution (37, 38).

In addition, the same study put that 6.4% of men and 43.3% of women had waist circumference $\geq$ 102cm and $\geq$ 88 cm respectively. In 2004, the prevalence of overweight among college students in China was 2.23% for females and 6.4% for males. Moreover, a population based study of young adults in Addis Ababa in 1997 found that prevalence of overweight or obesity based on BMI value was 3.8% (12, 23, 36).

Over weight and obesity lead to adverse metabolic changes such as insulin resistance, increasing blood pressure and cholesterol at same time, they promote CVDs, diabetes and many types of cancer. According to the International task force and the WHO 2002 report, about 60% of diabetes globally can be attributable to over weight and obesity (2, 37).

High blood pressure- is an important public health problem world wide because it is prevalent and is a major modifiable risk factor for coronary heart disease, stroke and chronic kidney disease. According to global burden of hypertension study, 26.4% of adult population in 2000 had hypertension and the number was predicted to increase in 2025 by 60 % (39).

The same study revealed that about two third of the total population with hypertension were in developing countries. In sub-Saharan Africa, South Africa the prevalence was

23.9% while in Cameron reported to be 15.4%; In general there was no difference in prevalence of hypertension by gender how ever, it was reported that at young age hypertension was higher in men than in women. A population-based study in Addis Ababa reported that the prevalence of hypertension was 1.4% among young adults age 15 to 24 (23, 39).

Being over weight and using excessive salt are the two avoidable risk factors, which contribute for the development of hypertension. Salt consumption is directly correlated with mean blood pressure levels and prevalence of hypertension. About one third of patients with high blood pressure are overweight. Studies suggested that, Age, attained weight and weight change as well as salt intake and alcohol consumption were predictors of blood pressure change (19, 40, 41, 42).

Ethiopian situation – little is known about the prevalence of chronic diseases and their risk factors in Ethiopia. However, the situations of other developing countries are indicators of the growing problem and no country is immune.

Some small-scale studies have shown the emergence and the growing trend of some chronic diseases like myocardial infarction and associated risk factors. Similar to other developing countries western life style adoption is one of the factors for the increase. This change is part of the worldwide epidemiological transition resulting in the double burden of both infectious and non-infectious diseases in many developing countries (4, 5, 14, 22, 23, 28).

According to Ethiopian national health survey report of 2003, the prevalence of heavy alcohol consumption was 7.6% in males and 0.3% in females. The overall prevalence of current daily smokers was 3%. Physical inactivity was documented in 6.8% of males and 16.4% of females while, overweight or obesity was 4%. In this survey, more than 80% of participants were rural residents (43).

Objectives

General objective

To assess common risk factors for selected chronic diseases and identify their determinants among regular higher education students in Addis Ababa

Specific objectives

To determine the prevalence of substance abuse such as Khat chewing, cigarette smoking, and alcohol drinking,

To assess the level of fruit and vegetable consumption,

To assess the prevalence of physical inactivity,

To examine the distribution of blood pressure, overweight and obesity,

To identify major determinants of chronic disease risk factors among the study population.

To contribute to future chronic disease risk factor surveillance activities in this special group of population.

Methods and materials

Study design- the study employed a cross-sectional design with internal comparison.

Study Area- Addis Ababa is the capital city of Ethiopia located in the Heart of the country. It covers an area of 540km^2 of which 18.2km^2 is rural. According to 1994 census, the population size of Addis Ababa is estimated to be 3 to 4 million. Of the total population, 51.6 % are female while 48.4% are male. Despite the difference in number all ethnic groups live in. however, the major ethnic groups are, Amahara 48.3%, Oromos 19.2 %, Gurage 17.5%, Tigrae 7.6 % and others together 7.4%. Regarding religion, 82 % of the populations are Orthodox Christians, 12.7 % Muslims and others constitute the rest 5% (44).

The city administration divided in to 10 sub cities each having 8 to 10 Kebeles. It is a major urban center of the country where diversity of service giving institutions are found concentrated compared to other cities of the country.

In the capital one of the biggest and the oldest university is found and serves greater number of students compared to other governmental and private universities and colleges. The two governmental institutions namely Addis Ababa University and Kotebe College receive students who were successfully completed 12th grade, while the private institutions receive students who did not fulfill the criteria to join government institutions.

According to 1997 E.C. Ministry of Education annual abstract, there were nine private institutions that were accredited by ministry of education out of which one was University College. Both government and private colleges receive students from all parts of the country who fulfill their criterion.

Source population – All regular higher education students both in government and private institution found in Addis Ababa. During 2005/06, academic year 20,422 students were registered as regular under graduate students in 15 faculties/colleges of AAU, 201 students in Kotebe College and in 2004/05, 6,058 students were enrolled as regular students in the above mentioned private colleges.

Recently, higher education students are defined as those students attending under graduate degree program and above, thus only colleges with degree program are included in the study. In addition, colleges that do not receive students directly from high school were not included. Further, those colleges with number of students more than 200 were taken as colleges and institutions outside Addis Ababa were excluded from the study. Finally, twelve colleges from government and five private were taken.

Study population- a sample of source population found in 12 government and 5 private colleges.

Sampling unit - students in each department in a given academic year in selected colleges.

Study unit - individual students found in the selected clusters.

Sample size- calculated using "formula for single population proportion" and a proportion, which could give maximum sample size, was chosen. Since the prevalence of physical inactivity in our community was unknown, 50% prevalence was used. With 95% confidence level, margin of error (absolute precision) to be 4% the required sample size becomes 600 and 20% non-response rate i.e. 120 was added. Since it was cluster sampling, it was multiplied by 2/design effect/ and the final sample size becomes 1,440.

Sampling procedure- a cluster sampling was used. 270 clusters were included taking the number of departments and three to four batches of each department. The mean number of student in each cluster was estimated to be 100. Finally, 15 clusters were selected

using a lottery method to get the final sample size. All students in the selected clusters were targeted for interview and physical measurements. See annex 2 for illustration of sampling procedure.

Data collection procedure- The WHO STEPS approach was employed to collect data (17). This approach uses standardized instruments and protocols to monitor trends within countries and make comparison between countries. It focuses on the continual collection of data on key risk factors associated with major chronic diseases. STEPS uses different levels of risk factor assessment including, collecting information using questionnaire (step1), taking measurement (step2), and taking blood samples for biochemical assessment (step3). (17)

The self-administered questionnaire had four parts; background information about the college/university, socio demographic characteristic, health related behavior and the measurements. It was modified and pre-tested in subjects out side of the study population.

There were eight data collectors, five have college diploma in statistics and doing their first degree in Addis Ababa university and three have completed high school. The supervisor was a fellow postgraduate student in the department of community health. The survey team was trained on how to conduct the measurements using standard procedures. The training included demonstration of interview as well as pre-testing of measurements. The questionnaires were distributed while the students were in the class usually 10 to 15 minutes before their free class or in the middle of the class depending on the instructor's willingness.

Blood pressure was measured using Omron *M4-I* digital BP apparatus, which use the oscillometric method of measuring BP. This instrument was validated in other studies elsewhere and it was found that it slightly underestimate the measurement compared to the sphygmomanometer (45). The blood pressure was measured while the study participants were filling the self-administered questionnaire. The individual seated

comfortably with back supported and the left arm was placed on a table. Three consecutive measurements were taken 3 to 5 minutes apart and finally the average of the last two measurements was used to calculate the mean blood pressure.

After the individuals completed filling the questionnaire, weight, height, waist circumference, and hip circumference were measured and we tried to make sex much while taking the anthropometric measurements. Height was measured using vertical measuring board. The individual removed his/her heavy jacket and stand on flat surface with weight distributed evenly on both feet, heels together maintaining a fully erect position and was recorded to the nearest 0.5 cm.

Weight was measured using an ordinary bathroom scale. The individual removed heavy closing and shoes. While standing in center of the platform with body weight evenly distributed between both feet, weight was recorded to the nearest 100 grams. BMI was calculated as the weight (kg) divided by the square of the height (m).

The waist circumference (cm) was taken with a tape measure. The individual stand comfortably with his/her feet about 25 – 30 cm apart and the measurement was taken mid-way between the inferior margin of the last rib and the crust of ileum. The waist circumference was recorded to the nearest 0.5 cm.

Hip circumference (cm) was measured at the widest point around the greater trochanter. The waist-to-hip ratio was calculated as the waist measurement divided by the hip measurement.

Operational Definitions:

Current smoking- reported current smoking at the time of the survey.

Past smoking- reported previous history of cigarette smoking but quit at the time of the survey.

Current khat use- reported consumption of khat at the time of the survey.

Alcohol consumption- reported consumption of alcohol twelve month prior the survey.

Binge consumption of alcohol- consumption of more than three drinks of alcohol for females and more than four drinks for males on one occasion seven days before the survey.

Adequate fruit and vegetable intake- daily consumption of fruit and vegetable at least five servings (9, 33, 34).

Low fruit and vegetable intake- consumption of fruit and vegetable intake less than the adequate consumption.

Overweight/obesity- body mass index level of $\geq$ 25 Kg/m2 (9)

Hypertension- mean systolic BP $\geq$ 140mmHg or mean diastolic BP $\geq$ 90mmHg or history of anti hypertensive treatment fifteen days before the survey.

High level of total physical activity- total physical activity MET-minutes per week >= 1500 minutes/week

Moderate level of total physical activity- total physical activity MET-minutes per week >= 600 minutes/week

Low level of total physical activity- total physical activity MET-minutes per week < 600 minutes/week

Data quality management- a thorough training of data collectors and supervisors was undertaken. During the process of data collection, supervisors and principal investigator conducted quality control monitoring. In addition, the principal investigator also held regular meeting with data collectors, so that difficulties were solved at the spot.

Ethical considerations- Ethical approval was obtained from the ethics committee at Addis Ababa University, Faculty of Medicine. Letter of permission was obtained from Addis Ababa University at each selected departments as well as administrative of private higher education institutions included in the study. In addition, each study participant enrolled in the study after giving written consent. The study participants were informed of their right to decline at any time from the study and not to answer question they were not willing to. Besides, they were not expected to write their name and the information was not used for other purposes than the research objective. In addition, the participants were informed of their BMI and blood pressure result based on their consent and advised those with increased blood pressure to get medical attention.

Data analysis - Data was entered to the Epi info version 6.04 statistical software and exported to SPSS. The data was cleaned for outliers and corrected. Continuous variables like age, income were recoded in to their respective category First descriptive statistics was performed for the prevalence of known risk factors and their possible determinants using simple frequencies. Bi-varite analysis was carried out using chi square and crud odds ratio. Moreover, multivariate analysis was used to identify the proximate determinants of the known risk factors by controlling the possible confounding effects of other variables

Dissemination of result – The study will be presented to community health department as a partial fulfillment of Masters Degree. It will be communicated to federal ministry of health, non-communicable diseases prevention and control office and it will be submitted to reviewed journal.

Results

Socio-demographic characteristics

A total of 1078 students both in private and government higher education institutions (671 male and 406 females) participated in the study with non-response rate of 4.4%. The mean age was 21years with SD $\pm$ 2.68. More than 90% of them were between the age 15 to 24, and 7.5% were married. All batches of students had almost equal share. Concerning their ethnic and religion distribution, Oromo and Amahara constitute 20.8% and 42.9% respectively. In addition, 69.5% were Orthodox Christians, 56.9% were Addis residents, and 11.2% were from rural area. The percentage of boarding participants was 42.2% and among non-boarding, 74.3% live with their parents while 9.7% live alone. Family is a major source of pocket money (75.3%) and some 4.6% do part time job to cover their expense. (table1&2)

Table 1. Socio demographic characteristics of study population /higher education Students/ in Addis Ababa January, 2007

Characteristics	Frequency	Percentage
Sex (n=1007)		
Male	671	(62.3)
Female	406	(37.7)
Age(n=1001)		
15 - 19	271	(27.1)
20 - 24	657	(65.6)
25 +	73	(7.3)
Class year(n=1077)		
1st year	384	(35.7)
2nd year	340	(31.6)
3rd year	353	(32.8)
Marital status (n=1062)		
Unmarried	982	(92.5)
Married	80	(7.5)
Ethnicity(n=1002)		
Amahara	430	(42.9)
Oromo	208	(20.8)
Tigrain	141	(14.1)
Gurage	121	(12.1)
Other	102	(10.2)
Religion(n=1061)		
Orthodox Christian	737	(69.5)
Protestants	165	(15.6)
Muslim	114	(10.7)
Other	45	(4.2)
Region (n= 1046)		
Addis Ababa	623	(59.6)
Oromia	140	(13.4)
Amahara	138	(13.2)
Tigray	61	(5.8)
SNNP	56	(5.4)
Others	28	(2.8)
Residence (n=1047)		
Rural	117	(11.2)
Urban	930	(88.8)

Table2. Income and other characteristics of higher education students in Addis Ababa January 2007

Characteristics	**Frequency**	**percentage**
Living arrangement(n=1053)		
Non boarding	611	(58.0)
Boarding	442	(42.0)
Source of income(n=1041)		
Family	784	(75.3)
Pocket money	124	(11.9)
Part time job	48	(4.6)
Relatives	40	(3.8)
Other	45	(4.3)
Pocket money/mo (n=897)		
1st quartile (49.93 birr)	152	(16.9)
2nd quartile (120.39)	249	(27.7)
3rd quartile (251.04)	270	(30.0)
4th quartile (805.39)	228	(25.4)

Note. Mean pocket money is presented in brackets.

Distribution of behavioral risk factors

Tobacco use

The percentage of current smoking was 7.2 % (male 9.5 % and females 3.4 %). From 78 current smokers, 67.9% were daily smokers, and from those who were not current smokers, 7.6 % (73) gave previous history of cigarette smoking. (Table 3) The mean age at which cigarette smoking first started was 18 (±2.4 SD) and 56.6 % of respondents first stared smoking while they were in high school.

Those who were daily smokers, on average smoked eight cigarettes per day ranging from two to thirty-five cigarettes. None of them reported use of hand rolled tobacco while two respondents reported use of shisha. The percentages of current smokers increased with increased years of stay in the college/university and the B-coefficient has revealed positive relationship however, the association was not significant. Besides, the odds of being current smoker increased with increasing age. Place of residence and boarding in campus have no significant association with current smoking status. (Table 4)

The odds of being current smoker were five times higher among participants who were in fourth quartile of pocket money category compared to those who were in the first quartile; adj. OR (95%CI)=4.8 (1.2, 18.7)

Moreover, the odds of being current smoker were almost five fold higher among those who gave positive history of their friends smoking status compared to those who do not have friends who smoke; adj. OR (95%CI)=4.6 (2.3, 9.0). The odds of current smoking were ten times higher among current khat users compared to none users; Adj. OR (95%CI) =10.6 (5.1, 22.3). Similarly, binge drinking of alcohol was significantly associated with current cigarette smoking; Adj. OR (95%CI) =11.8 (5.5, 25.4)

Table 3. Prevalence of behavioral risk factors among higher education students in Addis Ababa, January 2007

Risk factors	**Male**		**Female**		**Both sexes**	
	No	**%**	**No**	**%**	**No**	**%**
Current smoking	64	(9.5)	14	(3.4)	78	(7.2)
Past cigarette smoker	62	(10.5)	22	(5.7)	84	(8.6)
Current khat chewing	131	(19.5)	18	(4.4)	149	(13.8)
Binge drinking of alcohol	63	(9.4)	10	(2.5)	73	(6.8)
Current smoking and khat Chewing	49	(7.3)	6	(1.5)	55	(5.1)
Current smoking and binge drinking	35	(5.2)	11	(1.5)	41	(3.8)
Current khat chewing and binge drinking	39	(5.8)	4	(1.0)	41	(4.0)
Current smoking, khat chewing and binge drinking of alcohol	29	(4.3)	3	(0.7)	32	(3.0)

Table 4. Determinants of current cigarette smoking among higher education students in Addis Ababa, January 2007.

Characteristics	Smoking status		Odds ratio OR (95%CI)	
	Frequency	Percentage	Crude	Adjusted
Sex (n=1075)				
Male	64	9.5	2.95 (1.6, 5.3)	0.78 (0.32, 1.9)
Female	14	3.4	1.00	1.00
Age(n=1001)				
15 – 19	5	1.8	1.00	1.00
20 – 24	60	9.1	5.3 (2.1, 13.4)	**4.3 (1.3,14.8)**
25 +	9	14.1	7.5 (2.4, 23.0)	**9.0 (1.8, 44.8)**
Class year (n=1076)				
1st year	18	4.7	1.00	1.00
2nd year	26	7.6	1.68 (0.9, 3.1)	1.0 (0.40, 2.65)
3rd year	34	9.6	2.17 (1.2, 3.9)	0.9 (0.36, 2.21)
Residence(n=1048)				
Rural	7	5.9	1.00	1.00
Urban	69	7.4	1.27 (0.57, 2.8)	0.34 (0.11, 1.1)
Living arrangement (n=1052)				
Boarding	30	6.8	1.00	1.00
Non Boarding	45	7.4	1.1 (0.68, 1.77)	0.9 (0.42, 2.0)
Pocket money/m(n=899)				
1st quartile	5	3.3	1.00	1.00
2nd quartile	12	4.8	1.5 (0.51, 4.3)	1.6 (0.4, 6.3)
3rd quartile	17	6.3	2.0 (0.71, 5.5)	2.7 (0.7, 11.0)
4th quartile	38	16.7	5.9 (2.3, 15.3)	**4.8 (1.2, 18.7)**
Father history of smoking (n=1013)				
Yes	8	14.5	2.3 (1.03, 5.0)	1.67 (0.52, 5.4)
No	67	7.0	1.00	1.00
Friends (n= 1042)				
Smoker	59	77.6	6.6 (3.8, 11.6)	**3.6 (1.6, 7.9)**
Non smoker	17	22.4	1.00	1.00
Current Khat chewing (n=1078)	55	36.9	23.0 (13.5,39.2)	**10.6 (5.1, 22.3)**
Yes	23	2.5	1.00	1.00
No				
Binge alcohol consumption (n=1078)				
Yes	41	56.2	35.5(19.0, 59.1)	**11.8 (5.5, 5.4)**
No	37	3.7	1.00	1.00

Alcohol consumption

Almost 44% of participants (female 31.8 % and male 50.7 %) reported that they consumed alcohol during 12 months preceding the survey. From the 464 participants who reported history of alcohol consumption, 35.1% consumed 1 to 3 times per month and 12.5 %(58) of participant reported to drink alcohol at least 1 to 4 times per week. The mean units of alcohol consumed on a day they used alcohol was 4.41units ($\pm$4.9 SD). Besides 54.8 %(253) of participants who consumed alcohol 12 months before the survey, have reported alcohol consumption in 30 days before the time of data collection.

The percentage of binge drinking of alcohol was 6.8% and was higher in male participants. It has shown an increase with increasing age and years of stay at the college or university.

Less percentage of participants from rural (3.4%) and boarding students (5.9%) compared to their counter groups reported binge drinking. There was an increase in percentage of participants with binge type of alcohol consumption with increasing quartiles of pocket money. (15.8% of fourth quartile) (Table 5)

In addition, 7.2% of respondents who gave history of father's alcohol consumption and 11.6% of those who gave history of friend's alcohol consumption have reported binge type of alcohol consumption. Besides, 52.6% of current smokers and 28.9% of khat chewers reported binge type of alcohol consumption.

Table5.
Distribution of binge type of alcohol consumption by some characteristics of higher education students in Addis Ababa January 2007

Characteristics	Binge drinking of Alcohol		OR (95% CI)
	frequency	percentage	
Sex (n=1071)			
Male	63	9.4	**4.1 (2.1, 8.1)**
Female	10	2.5	1.00
Age(n=1001)			
15 – 19	9	3.3	1.00
20 – 24	52	7.9	**2.5 (1.2, 5.2)**
25+	8	11.0	**3.6 (1.3, 9.6)**
Class year(n=1072)			
First year	18	4.7	1.00
Second year	21	6.2	1.3 (0.7, 2.5)
Third year	34	9.6	**2.2 (1.2, 3.9)**
Residence(n=1043)			
Rural	4	3.4	1.00
Urban	67	7.2	2.2 (0.8, 6.2)
Living arrangement (n=1049)			
Boarding	26	5.9	1.00
Non –boarding	45	7.4	1.3 (0.8, 2.1)
Pocket money/month(n=1076)			
1st quartile	6	3.8	1.00
2nd quartile	10	4.0	1.0 (0.4, 2.9)
3rd quartile	17	6.3	1.6 (0.6, 4.2)
4th quartile	36	15.8	**4.6 (1.9, 11.1)**
Father history of alcohol			
(n=1078)	33	7.2	1.1 (0.7, 1.8)
Yes	40	6.5	1.00
No			
Friend's history of alcohol			
(n=1078)	63	11.6	**6.9 (3.5, 13.7)**
Yes	10	1.9	1.00
No			
Smoking status(n=1078)			
Yes	41	52.6	**33.5 (19.0, 59.0)**
No	32	3.2	1.00
Khat habit(n=1078)			
Yes	43	28.9	**12.2 (7.3, 20.2)**
No	30	3.2	1.00

*OR: odds ratio; CI: confidence interval

Khat use

The percentage of current khat chewing is 13.8 % (females 4.4 % and males 19.5%). Among current khat chewers 13.3 %, chew khat daily and two female have reported daily chewing of khat. 124 (13.3 %) non-users reported previous history of khat use. (Table 6)

The mean age at which khat first started was 18 years (± 2 SD) and the minimum age was 12 years. The odds of khat use were five folds higher among males compared to females; adj. OR (95%CI) =4.9 (2.3, 10.2) and three fold higher among participants age between 20 to 24 compared to 15 to 19 age group; adj. OR (95%CI=3.4 (1.5, 7.7). In addition, 63.9 %(92) of participant started khat chewing while they were in high school. The percentage of students who use khat increased with increasing year of stay in the college/university however, the association was not statistically significant.

Higher percentage of urban residents (14.4%) and boarding students (15.3%) were current khat chewers; the odds of khat use were three fold higher among those who come from urban area compared to those who are rural residents; adj.OR. (95%CI)= 2.9 (1.1, 7.7). Non-boarding students were less likely to be current khat chewers compared to those who were boarding Adj. OR (95%CI) =0.56 (0.3, 0.99).

Concerning pocket money the participants receive per month, it has no association with current khat use. Both father's and friend's history of khat use have shown significant association with participants current khat use adj. OR (95%CI) =2.97(1.5, 5.8) and Adj. OR (95%CI) =6.6 (3.4, 12.7) respectively.

The odds of khat use were 11 times higher among current smokers compared to non smokers adj. OR(95%CI)=10.8(5.0, 23.0) While, the odds of khat use were three fold higher among participants reported binge type of alcohol consumption compared those who did not; adj. OR (95%CI) =2.6(1.2, 5.7).

Table6. Determinants of khat chewing among higher education students in Addis Ababa January 2007

Characteristics	Khat chewing habit		Odds ratio 95%CI	
	Frequency	Percentage	Crude	Adjusted
Sex (n=1077)				
Male	131	19.5	1.00	**4.9 (2.3, 10.2)**
Female	18	4.4	5.2 (3.1, 8.7)	1.00
Age (n=1001)				
15-19	14	5.2	1.00	1.00
20-24	119	18.1	4.1 (2.29, 7.2)	3.4 (1.5, 7.7)
25+	8	11.0	2.3 (0.91, 5.6)	1.4 (0.4, 5.1)
Class year (n=1078)				
First year	33	8.6	1.00	1.00
Second year	49	14.4	1.79 (1.12, 2.9)	1.6 (0.8, 3.2)
Third year	67	19.0	2.5 (1.6, 3.89)	1.7 (0.8, 3.5)
Residence (n=1048)				
Rural	11	9.3	1.00	1.00
Urban	134	14.4	1.64 (0.86, 3.1)	**2.9 (1.1, 7.7)**
Living arrangement (n=10541)				
Boarding	68	15.3	1.00	1.00
Non –boarding	76	12.4	0.78 (0.55, 1.1)	0.56 (0.3, 0.99)
Pocket money/month (n=899)				
1st quartile	12	7.9	1.00	1.00
2nd quartile	38	15.3	1.58 (0.93, 2.67)	1.6 (0.69, 3.7)
3rd quartile	33	12.2	1.27 (0.74, 2.16)	1.2 (0.47, 2.9)
4th quartile	50	21.9	2.40 (1.44, 4.0)	1.8 (0.72, 4.3)
Father's history of khat chewing (n=1034)			2.7 (1.7, 4.3)	**2.97 (1.5, 5.8)**
Yes	29	27.9	1.00	1.00
No	116	12.5		
Friend's history of khat chewing (n=1056)			13.9 (8.2, 23..8)	**6.6 (3.4, 12.7)**
Yes	130	28.0	1.00	1.00
No	16	2.7		
Smoking status (n=1078)				
Yes	55	70.5	23 (13.6, 39.1)	**10.8 (5.0, 23.0)**
No	94	9.4	1.00	1.00
Binge alcohol consumption				
Yes	43	58.9	12.2 (7.3, 20.2)	**2.6 (1.2, 5.7)**
No	106	10.5	1.00	1.00

*OR: odds ratio; CI: confidence interval

Diet

Over all, 381 (36.2 %) participants ate their meals at student cafeteria while, 498 (47.3 %) at their home. Out of those students who have dormitory, 36 (8 %) were non-café users while 207 (46.7 %) used students' cafeteria five days per week, on average.

Concerning additional salt consumption, 30 (7.9 %) participants who use cafeteria, 131 (26.3 %) who went home for meal and 54 (41.2 %) students who purchase their meal from pastry, hotels or restaurants added salt on their plate while they were eating. There was significant association with place of meal with p-value <0.0001

Regarding fruit and vegetable intake,32 (3.0%) participants reported daily consumption of fruit at least once and 40(3.8%) reported daily consumption of vegetable more over 13 (1.2%) participants consumed fruit and vegetable daily at least once.

Physical activity

The percentage of low level of total physical activity was 37.7 %(406) while 30.4 %(328) and 31.9% (344) of participants had moderate and high level of total physical activity respectively. More females (47.8%) reported low level of total PA level compared to 31.6% (212) of males.

There was an increase in the percentage of participants with high level of total physical activity and decrease in the percentage of participants with low level of physical activity down the age category and the same was true with years of stay at the college/university.

Almost equal percentage of participants from rural 37.3% and urban 38 % reported to have low level of total physical activity. Greater number of participants who were non-boarding had low level of total physical activity compared to those who have dormitory at the college/university (36.3%); both residence and living arrangement were not significantly associated with level of total physical activity.

Over all, 47 (31.5%) of current khat users reported lower level of total physical activity and this was lower compared to those who are currently non-khat chewers. In addition, 28 (47.5 %) overweight/obese individuals reported to have low level of total physical activity.

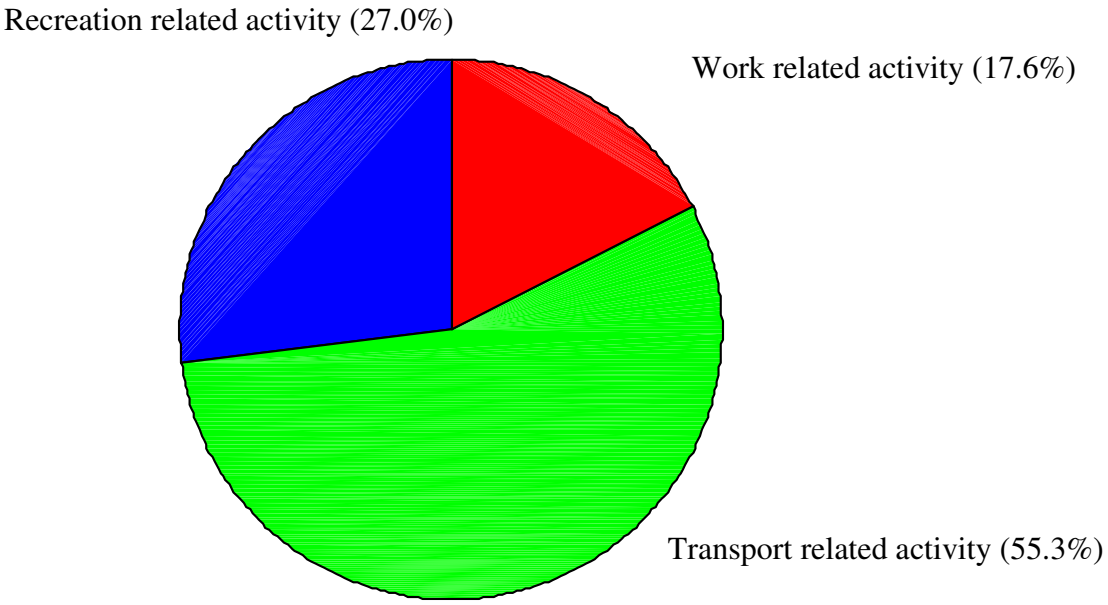


Figure1 percentage contribution of physical activities for total physical activity per week among higher education students in Addis Ababa, January 2007

Total transport related physical activity contributed more than 50% of total physical activity per week and only 17.6% was contributed by total work related physical activity. Total transport related physical activity was 65.8% for females and 49.3% for males.

Distribution of biological risk factor

Over weight/obesity

Percentage of underweight respondents was 27.5 %, while 67.1 %(723) were normal and 5.5 %(59) were over weight/obese. The mean BMI was 20kg/m² with SD ± 2.73; the maximum BMI recorded was 32.44. Relatively higher percentage of females (7.6 %) was overweight or obese. (Table 7)

The percentage of overweight/obese participant increase with increasing age category and higher percentage (7.8 %) of second year students were overweight or obese. In addition the percentage of over weight/obese was lower for those who come from rural area and those who live in the college/university and only living arrangement was significantly associated.

The mean value of waist circumference was 72.7 cm with SD± 8.2 cm and the median was 72; the value ranges from 48 cm to 117cm. (Table 7) Based on waist circumference 1.3 %(14) of participants had abdominal obesity. Only one male happen to have waist circumference ≥102 cm while, 3.2 %(13) females have waist circumference ≥ 88cm.

The mean value of waist to hip ratio was 0.79 with SD± 0.08; the actual value ranges from 0.6 to 1.47; based on waist to hip circumference ratio 4.9 %(52) participants were obese, (1.9 %(13) males and 9.8 %(39) females).

Table 7
Distribution of biological risk factors among college students in Addis Ababa Jan. 2007.

Physical measurements	**Male**	**Female**	**Both sexes**
	Frequency (%)	Frequency (%)	Frequency (%)
Body mass index (BMI)			
<18.50	182 (27.1)	114 (28.1)	296 (27.5)
18.5-24.99	461 (68.7)	261 (64.3)	722 (67.0)
25+	28 (4.2)	31 (7.6)	59 (5.5)
Waist circumference in cm			
Male >=102 cm; Female >= 88 cm	1 (0.1)	13 (3.2)	14 (1.3)
Waist to hip ratio			
Male >= 1.0; Female >=0.85	13 (1.9%)	39 (9.8)	52 (4.9)
Blood pressure			
Normal	601 (89.6)	379 (93.3)	980 (91.0)
High*	70 (10.4)	27 (6.7)	97 (9.0)
Mean (SD) BMI (Kg/m2)	20.0 (± 2.5)	20.4 (±3.1)	20.2 (± 2.7)
Mean (SD) waist circumference (cm)	74.4 (±7.5)	69.9 (±8.5)	72.7 (± 8.2)
Mean (SD) hip circumference (cm)	91.2 (± 6.9)	92.7 (± 7.3)	91.8 (± 7.1)
Mean (SD) waist-hip ratio	0.82 (±0.076)	69.9 (±8.5)	0.79 (± 0.08)
Mean systolic blood pressure (mm Hg)	118.3 (±12)	110.5 (±10.7)	115.4 (± 12.2)
Mean diastolic blood pressure (mm Hg)	75.5 (±9.2)	74.8 (±8.8)	75.2 (± 9.0)

* High blood pressure: SBP ≥ 140 or DBP ≥ 90 or history of anti hypertensive treatment in 15 days time during data collection

Blood pressure

The mean systolic and diastolic BP was 115.4 ± 12.2SD and 75.2 ± 9.04SD respectively. 70 (10.4%) males and 27 (6.7%) females had hypertension making the overall prevalence of hypertension 9%. (Table 7)

There was an increase in the percentage of participants with elevated BP with increasing age category and with increased years of stay in the college/university. Almost equal percentages of participants from rural and urban have elevated BP. Concerning living arrangement, 10.6 % (65) of non-boarding students had elevated BP and out of total non-boarding students, 12.9 % (12) of students who live alone had elevated blood pressure.

About 6.2 % of current smokers, 8 % of khat users and 13.5 % of heavy alcohol consumers reported to have elevated BP and 8.8 % of those who add salt on their plate while they are eating their meal had elevated blood pressure. Percentage of over weight/obese individuals with elevated blood pressure was 25.4 % (15) the percentage of participants with elevated blood pressure increase with increased BMI value.

Concerning level of total physical activity level, relatively lower percentage of participant with sedentary life style (8.1%) reported elevated blood pressure compared to those reported high or moderate level of total physical activity.

After fitting the variables in to multiple regression model for systolic and diastolic blood pressure, BMI, years of stay at college, living arrangement and sex were predictors of the change in systolic BP and diastolic blood pressure except that age was not significantly associated with the change in systolic blood pressure of the population. (Table 8)

Table 8

Determinants of blood pressure for higher education students in Addis Ababa Jan. 2007

Characteristics	Mean systolic BP			Mean diastolic BP		
	β coff.	t	p-value	β coff.	t	p-value
Sex (male, Female)	-0.375	-11.868	**<0.0001**	-0.086	-2.549	**0.011**
Age	0.041	1.256	0.209	0.088	2.531	**0.012**
Urban residence	-0.029	-0.929	0.353	0.015	0.441	0.659
Class year (1^{st} ,2^{nd} ,3^{rd})	0.087	2.809	**0.005**	0.118	3.577	**<0.0001**
Boarding	0.105	3.240	**0.001**	0.108	3.118	**0.002**
Smoking	-0.044	-1.192	0.234	0.013	0.327	0.744
Khat chewer	-0.025	-0.738	0.461	0.025	0.696	0.487
Binge drinker	0.015	0.442	0.658	0.04	1.071	0.285
Adding salt	-0.001	-0.038	0.970	-0.012	-0.385	0.700
BMI	0.228	7.595	**<0.0001**	0.146	4.537	**<0.0001**
P.A. level (high, moderate, low)	0.011	0.374	0.709	0.022	0.690	0.490

Note: both mean systolic and diastolic BP were calculated as averages of the second and third BP measurements.

Discussion

This study assessed the prevalence and determinants of common modifiable risk factors of selected chronic diseases in college or university students in Addis Ababa. Both private and government regular undergraduate students participated in the study.

More than half of the college students in our study were non-boarding (do not have dormitory in the college/university) the fact that private colleges were included in the study and Addis Ababa University does not usually provide dormitory service for students who come from Addis Ababa. Among non-boarding students, almost 84 percent live with their parents or relatives. Besides, family was the major source of finance for most of the students (75.3%).

Cigarette smoking is important risk factor for the four classes of chronic diseases. It causes increased risk of mortality from lung cancer, upper aero-digestive cancers, CVD and chronic respiratory diseases. According to the WHO 2002 report on risk factors, worldwide, 8.8 percent (4.9 million) of deaths were attributable to tobacco use (2, 17, 21)

In this study, the overall prevalence of current cigarette smoking was 7.2 percent, with males sharing higher percentage (9.5%). This value was higher than the 1.5 percent prevalence documented for senior secondary school students in rural Nigeria (16) and 5.4 percent prevalence among young adults in Addis Ababa. (23) Our finding was lower compared to 13.1percent reported among college students in North Ethiopia (14) and 42.5 percent among Turkish college students (25). On the other hand, a higher prevalence (26.3%) was reported in study of poly drug abuse among Ethiopian university students (46).

The reason for lower prevalence in our study population compared to the college students in North Ethiopia could be that the other study measured lifetime prevalence of cigarette smoking, including those who quit smoking at the time of the study, whereas we measured the prevalence of current cigarette smoking. In the study of poly drug abuse in

Ethiopian university students, more than eighty percent of study participants were males, compared to 62.3 percent in our sample, which might have inflated the overall prevalence (46).

The mean age for starting cigarette was 18 years and the majority (56.6%) started cigarette smoking while they were in high school. The percentage of cigarette smokers increased with increasing age and years of stay in college. However, only age was significantly associated with current cigarette smoking.

A study of college instructors in Ethiopia reported that majority of the instructors started smoking while they were in senior high school or during their first year in college (47). Another study of college students in USA also found that substance use in college increased with increasing years of stay in college (15). A similar progression of cigarette smoking was also documented by another longitudinal study of high school students who were followed from grade 9 to 12 (27, 48). Therefore, such findings may suggest that interventions against substance use should be initiated early in high school, before the students are exposed to the behaviors and subsequently sunk into addiction.

Being in the highest quartile of pocket money category and friends' history of smoking were important predictors of cigarette smoking. The economic status of students may reflect their family's economy. Since most of the students got their finances from their families, our findings suggest that students from economically better families have higher risk of being smoker. This finding is also supported by a study in Butajira town, which indicated significant increasing prevalence of smoking with increasing income group. (49)

In this study, friends' smoking status was significantly associated with current smoking status of the respondents. A study of college students in Iran found that friends were source of cigarette for the first time (25) and another study of university students in Jordan strengthens the same finding (36). This finding was also consistent with the study of young adults in Addis Ababa, which revealed association of friends smoking status

with current cigarette smoking of the respondents (23). The study of senior secondary school students in rural Nigeria revealed a significant association of friends' smoking status with current smoking (16). Therefore, this finding magnifies importance of the college, as continuum of high school environment, and a suitable ground for preventive interventions.

The odds of cigarette smoking were more than ten fold higher among binge type of alcohol consumers and current khat chewers compared to their counter parts. The study of young adults in Addis Ababa also documented the association between heavy alcohol consumption and cigarette smoking. (23). In our study, 5.2 percent of males and 1.5 percent of females reported current smoking and binge type of alcohol consumption, suggesting the clustering of risk factors in the same population. A strong association between smoking and khat chewing was also reported in the study from Butajira (25) and study of medical students in Ethiopia (46).

Alcohol is another important risk factor of chronic diseases. It causes 20 to 30 present of esophageal and liver cancer world wide at the same time, excessive alcohol intake is one of the main modifiable risk factors of high blood pressure (21). More than half of males and more than thirty percent of female respondents reported alcohol consumption in the 12 months preceding the survey. It is said that moderate alcohol consumption has health benefit in lowering the risk of coronary heart disease. However, the boundary between moderate and heavy consumption is not distinct and moderate consumption of alcohol may predispose oneself to heavy consumption.

Our prevalence of alcohol consumption was higher than the 31.1 percent reported for medical students in Ethiopia (46) and lower than the prevalence of Khat or alcohol use (10%) documented for in-school youth in Ethiopia (22). The prevalence of binge drinking was 6.8 percent for males and 2.5 percent for females. This was higher than the 2.4 percent reported for young adults in Addis Ababa (23).

The reason for higher prevalence of both alcohol consumption and binge drinking of alcohol among the study population may be, a true increase associated with advertisement of alcoholic beverages given wide media coverage in one national TV channel without explaining its hazard, by individuals who are meant to be role models for many of our young people.

Similar to cigarette smoking, increased prevalence of binge drinking was associated with increasing age and years of stay in our study. Moreover higher percentage of respondents with father or friends' history of alcohol consumption reported binge drinking. Since these risk factors are sharing similar determinants and occurring clustered together, their intervention may need integration so that the cost-effectiveness of interventions could be ensured.

Khat is known for its psycho stimulant effect and its effect in reproductive health. Studies have shown an increased risk of myocardial infarction among Khat users in a dose dependant manner (30, 31, 32). According to a study of university students in Jimma, college students commonly used khat hoping that it improves their academic performance. (29)

The prevalence of khat chewing was 13.8 percent among our study population. Higher prevalence (26.7%) was documented for college students in North West Ethiopia, 24.8 percent for male students of Jimma University and 22.3 percent for medical/paramedical students of Gonder College of medicine (46). The reason for lower prevalence in our study might be a real reduction of khat use in this population compared to North Ethiopian college students and Jimma university students. For medical students, more than eighty percent of study participants were males and according to our finding male sex was positively associated with current use of khat.

The mean age at which khat first started was almost the same as for cigarette smoking (18 years) and majority (63.9%) started in high school. Male sex and age 20-24 years were important determinants of current khat use in the study population.

Being from urban setting and having dormitory in the college/university have strong positive association with current khat use. Even though khat use is a widespread habit in this country (28), it is still less socially accepted behavior among many rural areas and even in some section of urban residents. In addition, unlike smoking and alcohol, khat is not consumed openly in public places like bars or cafeterias; instead, khat users usually prefer private places. Thus, those participants who have dormitory in the college might be having a conducive environment that offers the necessary privacy.

Similar to cigarette smoking, friends' khat chewing was significantly associated with current khat use, emphasizing the possible role of peer pressure for adapting the behavior. Father's history of khat use was also significantly associated with current khat use, which reveals the contribution of parental behavior, since family is the first environment shaping one's behavior. This finding was similar to other studies among college students in Ethiopia (29). This influence of the behavior of families and friends indicates the wider popularity of khat use in the community, and suggests that interventions should be multi directional involving different section of the population at the same time.

This study identified a strong association between khat and binge type of alcohol consumption. This was also supported by a study of medical students in Gonder University, which reported combined use of Khat, alcohol and cigarettes (46). Many khat chewers usually break the effects of khat (depression, insomnia, etc.) by consuming alcohol. Despite the fact that this study did not directly measure prevalence of alcohol consumption after khat chewing, the higher prevalence of binge drinking among khat chewers may support the above statement.

Considerable percentage of participants (21%) reported the habit of adding salt on their plate while eating. More percentage of participants who went home for meal and those who purchased or cooked their own meal in the dormitory reported additional salt consumption compared to those who used students' cafeteria in the college/university. This may be associated with the availability of salt at home or in areas where foods were purchased. The study did not try to quantify the excess salt consumption; instead, it tried

to assess the habit in qualitative terms, as excess salt consumption is one major avoidable risk factor for hypertension.

Fruit and vegetables are important foods in the composition of a healthy diet, since they have low energy density and are sources of micronutrients. According to WHO report in 2002, adequate consumption of fruit and vegetables can help prevent major diseases such as, CVD and certain cancers. The same report uncover that, worldwide, 4.9 percents of death was attributable to inadequate fruit and vegetables intake (44). Ethiopian national survey of adults aged above 18, in 2003 found that 19.5 percent of males and 16.4 percent of females took adequate fruit and vegetables (43). In our study, only 13 participants reported daily intake of fruits and vegetables.

This finding might be partly attributed to the lack of availability of fruits and vegetables at students' cafeteria, where almost half of the students eat five days of the week on average. The WHO report on availability and supply of fruit and vegetable in 2000 indicated the lowest supply of vegetable per capita per year for African region (52.1Kg/capita/year) (9).

Regular physical activity is believed to be associated with enhanced health and reduced risk of all cause mortality. It has significant protective effect against CVD, type 2 diabetes, breast cancer and colon cancer, in addition to its weight control effect (21, 35, 43). This study measured the total physical activity related to work, transport, and leisure time activity per week, revealing that 37.7% of college students were inactive or minimally active. This finding is similar to the report from the black South African population (36) and lower than that from Sao Polo Brazil and that of adults in USA (2, 5).

A study of young adult aged 15-24 years found sedentary life style in 8.4 percent of the study population (29). However, this study measured leisure time physical activity only, and has limited comparability to our study. According to the Ethiopian national health survey of 2006, physical inactivity among young adults aged 18 to 19 years was 8.2 percent. This was moderate physical activity related to work or occupation (43). A higher

percentage of physical inactivity was observed among khat users (31.5%) and overweight or obese individuals (47.5%) than the rest of the students. This finding is consistent with the finding in Addis young adults, which indicated higher prevalence of physical in activity among overweight or obese, compared to non-obese or overweight (23). In addition, in our study population physical activity related to transportation contributed majority of total physical activity per week.

Overweight or obesity is known to cause CVD and diabetes through its adverse metabolic changes at the same time; it is a risk factor for many types of cancer. Mortality is expected to increase with increasing degrees of overweight as measured by BMI (9, 21).

The prevalence of overweight and obesity, based on BMI value >= 25 Kg/m2, was 5.5 percent. Obesity (BMI>=30 Kg/m2) was found in only 11 (1%) participants. A study conducted among 154 medical students in South Africa found overweight and obesity to be 8.9 percent and 2.5 percent, respectively, for Indian and 19.2 percent and 4.6 percent for black students (50). Overweight and obesity among black female medical and nursing students was 30.6 percent (51).

For black South African adults aged above 15 years, overweight or obesity was 19.4 percent for males and 36.7 percent for females. (36) The prevalence of overweight or obesity for third year medical students in Crete Greece was 39.5 percent in male and 23.3 percent in female (52). The prevalence of overweight or obesity was lower compared to the above findings and it was higher compared to the prevalence reported for young adults in Addis Ababa (23). In addition, EDHS (Ethiopian demographic and health survey) 2005-reported prevalence of overweight or obesity 3 percent and 3.4 percent among females age 15 to 19 and 20 to 29 respectively, which is lower than our finding 4.9 percent and 7.1 percent in the respective age groups (53).

The reason for higher prevalence of overweight or obesity among college students compared to the Addis Ababa young adults might be associated with the higher prevalence of physical inactivity documented for this population even though, the study of young adults in Addis Ababa assessed physical inactivity in relation to leisure time physical activity. The higher prevalence of overweight and obesity in the EDHS is also associated with the level of physical inactivity (43). The college population is somewhat different in that they usually confined in one place most hours of the day usually sitting in class or library fully engaged in their education.

Although the purpose of this study was to assess the prevalence of overweight as a risk factor for chronic diseases, underweight was noted to be more prevalent (over 25%) among the study population. This finding was higher than that of the black South African (36) showing the double burden of under nutrition and over nutrition, indicating that under nutrition is also an unfinished agenda that we need to deal with.

Central obesity is an important predictor of obesity related diseases like cardiovascular diseases and our study assessed the prevalence of central obesity based on waist circumference and waist to hip ratio. The cut off point used was similar to the one used for black South African population. The percentage of central obesity based on waist circumference (M=1.3 & F= 3.2%) was much lower than for the black South African adults even though the cutoff point for waist circumference is not adopted for Ethiopian population the prevalence can be used to uncover the existence of central obesity in our young college community (9, 36).

Elevated blood pressure was found in 97 (9%) participants. This prevalence was higher than the prevalence documented for Tanzanian adolescents aged 15 to 19 years 0.4 percent (54), and the 1.4 percent prevalence among young adults in Addis Ababa (23). A study among third year medical students in Greece reported prevalence of hypertension to be 13.3 percent in males and 6.7 percent in females (52). The finding in this population was much higher than the prevalence documented for young adults in Addis Ababa and Tanzanian adolescents (23).

The reason for higher prevalence of hypertension in our population may include, relatively stressful college environment, and in our study, participants with history of anti hypertensive treatment 15 days before the time of data collection were taken, as having hypertension. In addition, for the Tanzanian finding, only those aged 15 to 19 years were included. As demonstrated in many studies including ours, age is a positive predictor of blood pressure and differences in age distribution of the study population may result in differences in the prevalence of hypertension (40, 41, 54).

Using multiple regression analysis, the male sex was a positive predictor of both systolic and diastolic blood pressure while age was only associated with diastolic blood pressure. In our study population, a unit increases in age was associated with an increase in diastolic blood pressure by 0.087 mmHg. A study of adolescents aged 6 to 17 years in Nigeria found that age was the only predictor of diastolic blood pressure. Another study of Nigerian adolescents also reported that age, sex, and body mass index were significantly correlated with both systolic and diastolic blood pressure, which is consistent with our findings. Years of stay in college, living arrangement and BMI were positive predictors of both systolic and diastolic BP in our study population (40, 55).

Strengths of the study

Strength:

The study employed a standard instrument for surveillance of risk factors for chronic disease. It is one of few studies conducted in this specific population, which incorporate physical measurements.

Conclusion and recommendations

Poor diet and physical inactivity were the most prevalent of all risk factors in this population.

The prevalence of substance use might seem lower compared to the findings in other African countries and other places, however, it was higher than the study in Addis Ababa young adults.

The strong association among different risk factors signifies the existence of at least two risk factors. Besides early exposure to these risk factors by itself is a risk resulting morbidity at early age.

The occurrence of substance use in high school and the progression with age and class year in the college indicate the importance of initiation of prevention early in high school and colleges.

The strong association of parental and friends substance use with the individuals substance use the importance of evolving the community at large for prevention work.

This study witnessed the co-existence of overweight and underweight with excess of underweight in college students. Both overweight and hypertension have shown an increase compared to a study in this country.

In general, the outcome of this study can serve as a baseline to make comparison of the trends of these risk factors in the same population in the future. It can be used as initiative to start the prevention and control program in this population.

The following recommendations are forwarded:

1. Prevention of these modifiable risk factors should be started early in high school through promoting healthy life style and healthy school environment.

2. As a continuation of the high school environment, colleges and universities should be considered as potential sites to implement programs for the prevention of substance use.

3. The college cafeterias should be supervised and improved since almost half of the students dines there and they could be appropriate sites for demonstrating and promoting healthy diet behaviors.

4. College environment should be made more conducive for physical activity through including physical education in the curricula, establishing sport fields and encouraging mass sport.

5. Raising awareness of the college community on regular screening for their blood pressure might help in introducing the habit of regular health checkup.

References

1. Nawing. *Chronic disease risk factors in transitional country*. Sweden: printing media, 2006.

2. Abdesslam B, Saber B. The burden of non-communicable diseases in developing countries *International journal of Equity in Health*.2005 (http://creative commons.org/licenses/by/2.0)

3. Nigel U, Philip S, Seif R. Non communicable disease in sub Saharan Africa. *International Journal of public health.* 2001, 79(10):947-953.

4. Frances T, Oli K. Chronic Non infectious Diseases of Adults. In:, Berehane Y, Hailemriam D, Helmut K. (eds). *The Ecology of Health and Disease in Ethiopia*, Shama Books: 2006:702-712.

5. Joseph M, Kebede O. Trends of acute myocardial infarction Admission over a decade, Tikure Anbesa Hospital. *Ethiop Med J*. 2001, 39(3): 193-202

6. MOH Ethiopia. *Non-communicable disease, injuries, Mental & oral health in Ethiopia.* Ethiopia. Unpublished.

7. MOH Ethiopia. *Health and Health related Indicators*. Ethiopia: MOH, 2003/2004

8. Taha A, Ball K. Smoking in Africa: the coming epidemic. *World smoking health.*1982, 72(2): 25-30

9. WHO. *Diet, Nutrition and the prevention of chronic diseases*. Geneva: WHO, 2003

10. Danton-Hill, Nishida C. and WPT James. A life course approach to diet, nutrition and the Prevention of chronic diseases. *Public health nutrition*. 2004, 7(1A), 101-121

11. Rauschhuber M, Lowry J, Etnyre A, Gilliland I. Hispanic and female college students: Evidence for increased risk for cardiac disease. *Journal of Hispanic higher education*. 2005, 4: 34 – 50.

12. Ping H. Johnson. Priority health behavior practice among Chinese undergraduate students. *International electronic Journal of health education*. 2004, 7:50 – 62.

13. Michael K, Danm Levy. Peer effects and alcohol use among college students. *Journal of Youth and adolescence.*1982, 11: 15-9

14. Yigzaw K. Cigarette smoking and Khat chewing among college students in North West Ethiopia. *Ethiop J Health Dev*. 2002, 16(1): 9-8.

15. Friend KG, Koushki PA. Students' substance use: stability and change across college years. *Int J Addict*.1984, 19:571-5.

16. Lawoyin TO, Ajunobi OO, Abdul Malik JO, Adegoke DA, Agbedeyi DA. Drug use among senior secondary school students in rural Nigeria. *Afr J Med Sci*. 2005, 34:355-9.

17. Bonita R, Decourten M, Dwyer T, Jamrozik K, Winkelmann R. *Surveillance of risk factors for non-communicable disease*: the WHO STEPwise approach. Geneva: World health organization 2002.

18. WHO. *Preventing chronic diseases a vital investment*: WHO global Report. Geneva: 2005 WHO document WHO/NMH/CCS/01.2002.

19. Ksrinath R, Martijn. Diet, nutrition and prevention of hypertension and cardiovascular diseases. *Public health nutrition*. 2004, 7: 167-186.

20. Cercone, James. Forthcoming, Alcohol-Related Problems: An Obstacle to Human Capital development? A Review of the problems and policy options.1993.

21. WHO, the World Health Report 2002: *Reducing Risks, Promoting Healthy* life. World Health, Geneva, 2002.

22. Kebede D, Alem A, Miteke G, et al. Khat and alcohol use and risky sex behavior among in school and out-school youth in Ethiopia. *BMC public health*. 2005, 5:109

23. Betre M, Kebede D, Kassaye M. modifiable risk factors for coronary heart disease among young people in Addis Ababa. *East Afr med J*. 1997, 74: 376-381.

24. Jamal S , Khalid A, Abdul R, Atallh A, Khalid A. Prevalence and determinants of smoking in three regions of Saudi Arabia. *tobaccocontrol.bmj.com*;2007.

25. Ghanizadeh A. Shiraz University students' attitude towards drugs: an explanatory study. *Eastern Mediterranean health journal*.2001, 7: 452-460.

26. Asian D, Bilir N, Ozcebe H, Stock C, Kukuk N. Prevalence and determinants of adolescent smoking in Ankara Turkey. *Turkish journal of cancer*.2006, 36: 49-56.

27. Janet A, Daniel R, and Howard B. Smoking progression and physical activity. *Cancer epidemiology, biomarkers and prevention*. 2003, 12: 1121-1129.

28. Nezar N, AL- Hebshi , Nils S. Khat-an updated review. *Addiction Biology*. 2005, 10, 299- 307.

29. Ayana AM, Mekonen Z. Khat chewing, socio-demographic description and its effect on academic performance, Jimma university students 2002. *Ethiop Med J*. 2004, 42:125-36.

30. Alkadi HO, Noman MA, AL-Thobhani AK, Al-Mekhlafi FS, Raja'a YA. Clinical and experiential evaluation of the effect of khat-induced myocardial infarction. *Saudi Med J*.2002, 23:1195-1198.

31. Al-Mamary M, Al-Kebsi M, Al-Adhi B, Broadley KJ. Khat chewing and acute myocardial Infarction. *Heart*.2002, 87:279-280.

32. Al-Motarreb A, Briancon S, Al-Adhi B, Al-Jailan F, Salek MS, Broadley KJ. Khat chewing is a risk factor for acute myocardial infarction: a case control study. *Br J Clin Pharmacol*. 2005, 59:574-581.

33. WHO. *Fruit and vegetables for health report of a joint FAO/WHO work shop*. Kobe, Japan. 2004.

34. Patricia Constante Jaime, Carlose Augsto Moteiro. Fruit and vegetable intake by Brazilian adults. *Artigo article*.2005, 19-24

35. Task Force on Community Preventive Services. Recommendation to increase physical activity in communities. *Am J prev. med*. 2002, 22: 67-72.

36. Lesley T, Estelle V, Krisela S. Where does the black population of South Africa stand on the nutrition transition? *Public health nutrition*. 2002, 5:157-162.

37. BAswinburn, ICaterson, Jcreidell , WPT James. Diet, nutrition and the prevention of excess weight gain and obesity. *Public health nutrition*. 2004, 7:123-146.

38. Fereidoun A, Ahmad E, Oaruin M, Elaheh A. Is there an independent association between waist to hip ratio and cardiovascular risk factors in overweight and obese women? *International journal of cardiology*, 2005, 101: 39-46.

39. Patricia M, Megan W, Kristi R, Paul M, Paul K, Jiang H. Global burden of hypertension: Analysis of worldwide data. *Lancet 2005*, 365: 217-223.

40. Adams C, Ukoli F, Young MP, Omen J, Nwankwo M, Haile GT, Kuller LH. An Epidemiological assessment of blood pressure determinants in adolescent population of

Nigerians. *J Hypertension*. 1987, 5:525-801

41. Kengne AP, Awah PK, Feze UL, Mbanya JC. The burden of high blood pressure and related risk factors in urban sub-Saharan Africa: evidences from Douala in Cameroon. *Afr Health Sci*. 2007, 7: 38-44

42. Nwankwo Mu, Adams-Campbell LL, Ukoli FA, Olomu CO, Ugwu E. Blood pressure in Nigerian college males. *J Hum Hypertens*. 1990, 4:72-3

43. Mekonen A, Fasil T. *Ethiopian National Health Survey Report*. Jimma Ethiopia, 2006.

44. Population and Housing census of Ethiopia, 1984: Analytical Report for results on Addis Ababa. Office of the population and Housing Commission 1987.

45. Dieterie T, Battegay E, Bucheli B, Martina B. Accuracy and range of uncertainty of Oscillometric blood pressure monitors around the upper arm and wrist. Blood Press Moit.1998, 3:339- 46.

46. Zein ZA. Poly drug abuse among Ethiopian university students with particular reference to Khat. *J Trop Med Hyg*.1988, 91:71-5.

47. Kebede Y. Cigarette smoking and khat chewing among university instructors in Ethiopia. *East Afr med J*. 2002, 79:274-8.

48. Haddad LG, Malak MZ. Smoking habits and attitudes towards smoking among university students in Jordan. *Int. J Nurs styd*. 2002, 796-802.

49. Niels S, Joroen H, Gail D. prevalence and predictors of smoking in Butajira town, Ethiopia. *Ethiop J Health dev*. 2005, 19: 182-187.

50. Morar N, Seedat YK, Naidoo DP, Desial DK. Ambulatory blood pressure and risk factors for coronary heart diseases in black and Indian medical students. *J Cardiiovasc Risk*. 1998, 5: 313.

51. Rasheed P, Abou-Hozaifa B and Khan A. Obesity among young Saudi female adults: a prevalence study on medical and nursing students. *Public health* 1994, 108:289-294.

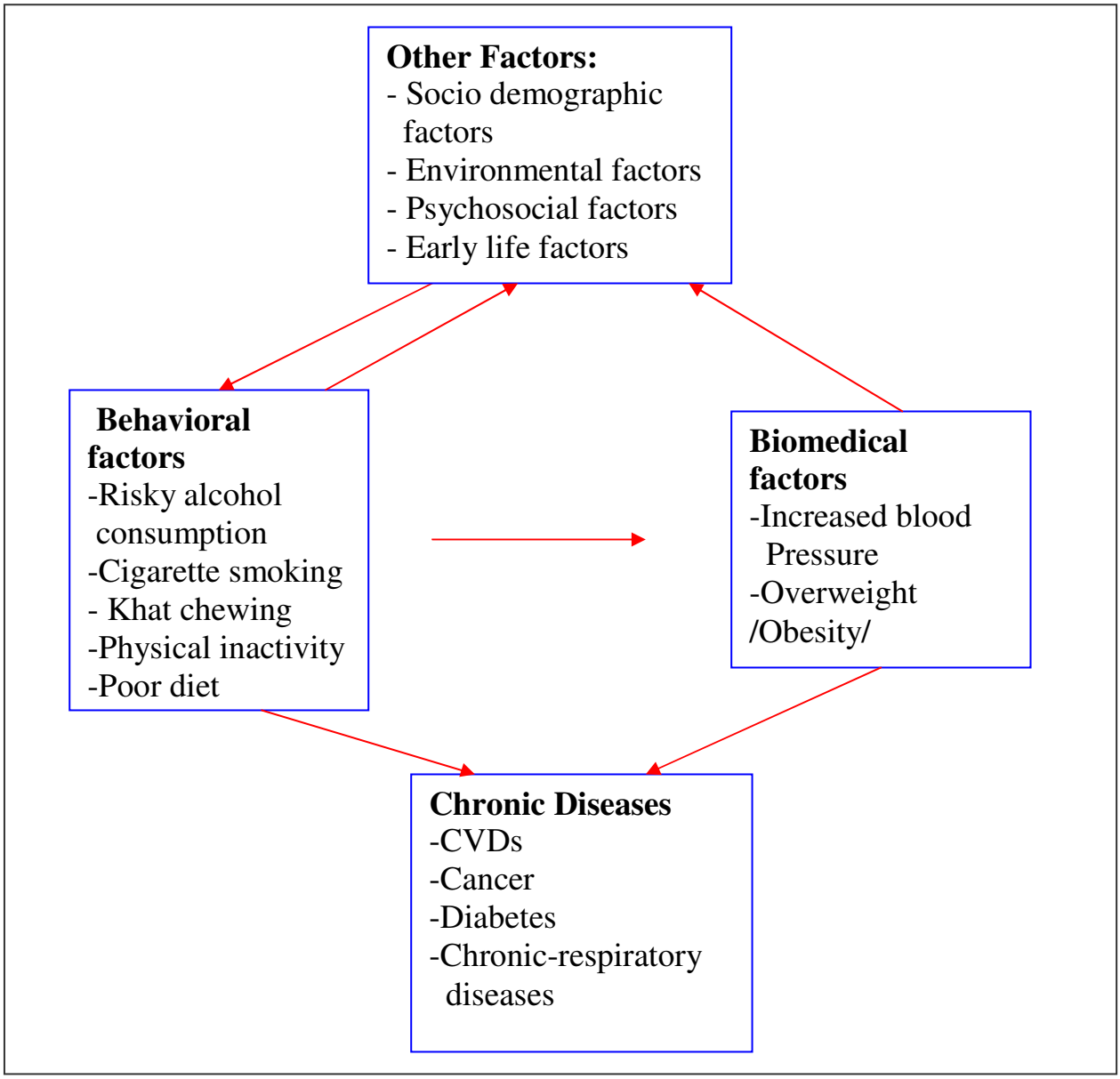
52. George B, Ioannis M, Manolis L and Anthony K. Overweight and obesity in relation to cardiovascular disease risk factors among medical students in Crete, Greece. *BMC public health*. 2003, 3:3.

53. Central statistics agency, ORC Macro. *Ethiopian Demographic and health survey*. Addis Ababa Ethiopia, 2005.

54. Kitange HM, Swai AB, Maswi G, Kilima PM, Alberti KG, Mclarty DG. Coronary heart disease risk factors in sub-Saharan Africa: studies in Tanzanian adolescents. *J Epidemial Community Health*. 1993, 47: 303-7.

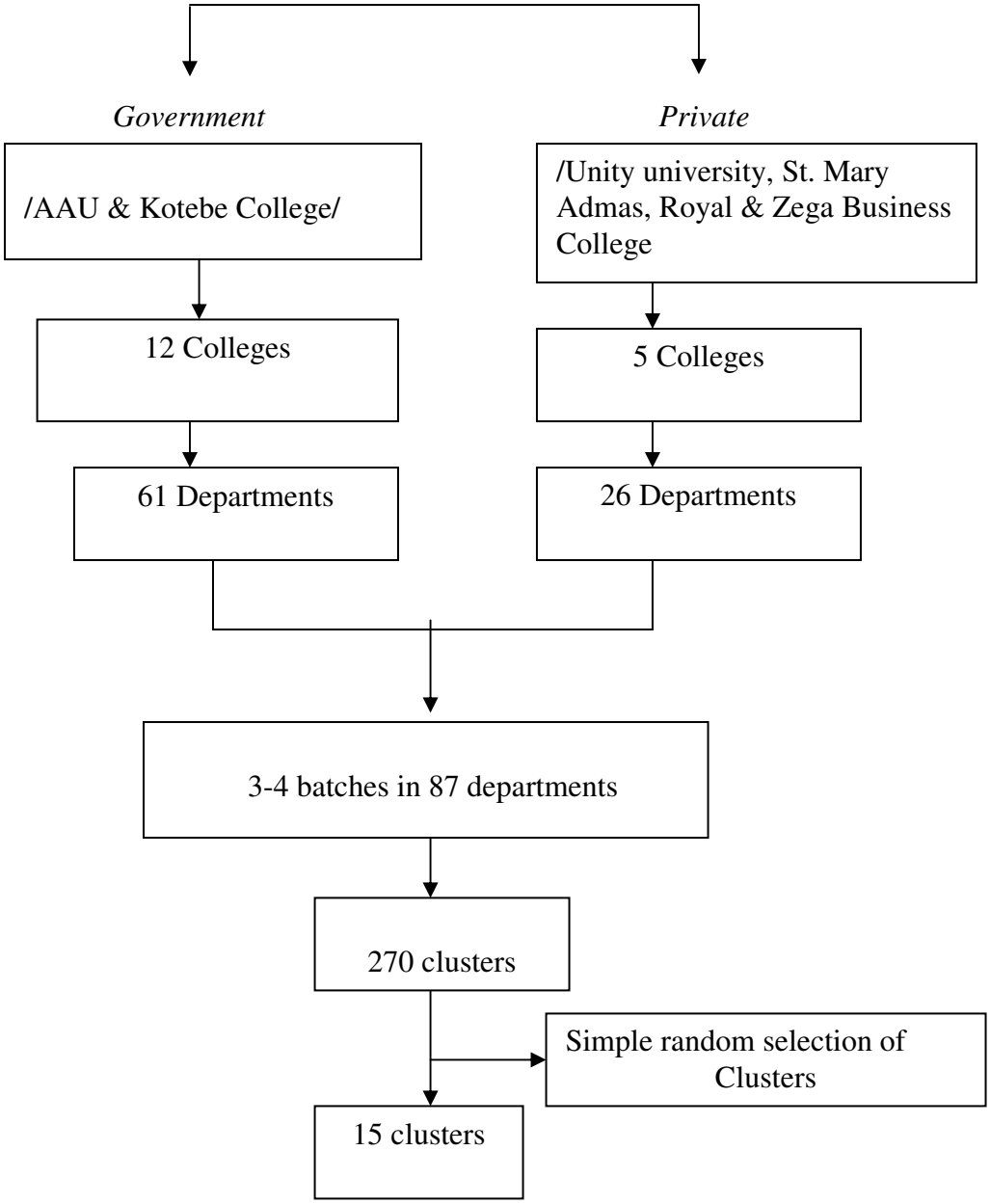
55. Akinkugbe FM, Akinwolere AO, Kayode CM. Blood pressure patterns in Nigerian Adolescents. *West Afr JMed*.1999, 8:196-202.

Annex 1. Conceptual framework



Annex II. Schematic presentation of sampling procedure

University/colleges



Annex III. Physical activity analysis guideline

Total physical activity MET-minutes/week (= the sum of the total MET minutes of activity computed for each setting)

Equation: Total Physical Activity = [(P2 * ((P3a * 60) + P3b) * 8) + (P5 * ((P6a * 60) + P6b) * 4) + (P8 * ((P9a * 60) + P9b) * 4) + (P11 *((P12a * 60) + P12b) * 8) + (P14 * (P15a * 60) + P15b) * 4)]

Level of total physical activity	Physical activity cutoff value
High	• IF:(P2 + P11) >= 3 days AND Total physical activity MET minutes per week is >= 1500 **OR** • IF: (P2 + P5 + P8 + P11 + P14) >= 7 days AND total physical activity MET minutes per week is >=3000
Moderate	• IF: (P2 + P11) >= 3 days AND ((P2 * P3) + (P11 * P12)) >= 60 minutes **OR** • IF: (P5 + P8 + P14) >= 5 days AND ((P5 * P6) + (P8 * P9) + (P14 * P15)>= 150 minutes **OR** • IF: (P2 + P5 + P8 + P11 + P14)>= 5 days AND Total physical activity MET minutes per week >= 600
Low	F: the value does not reach the criteria for either high or moderate levels of physical activity

Source: GPAQ and analysis, Department of Chronic Diseases and Health Promotion, World Health Organization.

Annex IV. English Questionnaire

Addis Ababa University

Faculty of medicine

Department of community Health

A questioner prepared to collect data on common risk factors of chronic diseases and their determinants among higher education students in Addis Ababa.

My name is _____ I am second year postgraduate student at Addis Ababa University, community health department. And I am doing a research as a fulfillment of my second degree. The study participants will be higher education students of both government and private colleges in Addis Ababa. The research focuses on health related behavior and ways of living that exposes one self for some selected chronic diseases like hypertension, diabetes, and so on.

To get the proper information this questioner is administered to you and a sample of your college higher education students. This study will contribute a lot for prevention and control of chronic diseases in all age groups. Therefore, your honest and genuine response is needed to full fill the research purpose.

All information you are giving will be kept completely confidential and you are not expected to write your name or identification number. Besides, you are free not to answer any of the questions if you are not willing to.

This questioner has four parts when you finish filling the first three parts; you are expected to do some measurement of height, weight, waist and, hip circumference and blood pressure which are part of the questioner. So, I kindly request to participant on the study.

Would you agree to participate in the study?

Yes_____

No_____

Signature_____

Thank you very much!

1. General information

No	Information	Response	Code
001	Name of college/university	_____	I1
002	Owner ship	1 Government 2 Private	I2
003	Name of departments	_____	I3
004	Class year	1 First year 2 Second year 3 third year 4 fourth year	I4
005	Date of completion of the instrument	⌊__⌋⌊__⌋ ⌊__⌋⌊__⌋ ⌊__⌋⌊__⌋⌊__⌋⌊__⌋ dd mm year	I5

2. Socio-demographic characteristics

Circle the number in front of your answer or write on the space provided

No	Questions	response	Code
1	Sex of study participant	1. Male 2. Female	C1
2	How old are you?	Years __ ___	C3
3	What is your marital status?	1. single 2. Married 3. Divorced 4. Widowed	D6
4	What is your Ethnicity?	1. Oromo 5. Sidamo 2. Amahara 6. Welayta 3. Tigrain 4. Gurage Other specify _____	C5
5	What is your Religion?	1. Orthodox 2. Muslim 3. Protestant 4. Catholic Other (S) _____	D7
6	From which region do you come?	1.Tigray 7. Gambela 2. Afar 8. Harare 3. Amahara 9. SNNP 4. Oromia 10. Dire-Dawa 5. Somalia 11. Addis Ababa 6. Ben-Gumeze	S1
7	Where do you come from?	1. Rural 2. Urban	S2
8	Do you have dormitory in the university campus?	1.Yes 2. No	S3
9	If no, With whom do you live?	1. Parents 2. Relatives	S4

		3. Alone(by your own) Other (s)_____	
10	What is your source of income/pocket money?	1. Family 2. Relatives 3. Part time Job 4. Fee from college Other (s) _____	S5
11	How much money do you get per month?	_____	S6
12	Do you currently pay fees to college or university?	1. Yes 2. No	S7
13	How much money do you spend for the following items per month?	1. Transportation _____ 2. Food _____ 3. Khat _____ 4. Cigarette _____ 5. Alcohol _____	S8
14	Which of the following best describes your mothers main work status over the last 12 months?	1. Government employee 2. Non-government employee 3. Has her own organization 4. House wife 5. Retired 6. Self employed 7. Unemployed (able to work) 8. Unemployed (unable to work) 9. Other _____	S9
15	Which of the following best describes your fathers main work status over the last 12 months?	1. Government employee 2. Non-government employee 3. Has his own organization 4. Self employed 5. Retired 6. Unemployed (able to work) 7. Unemployed (unable to work) 8. Other _____	S10
14	How much do your parents earn per month?	_____	S11
17	What is the highest level of education your father has completed?	1. No Education 2. Able to read and write 3. 1 to 6 grade completed 4. 7 to 12 grade completed 5. certificate(12+ 1) 6. Diploma 7. first degree and above	S12
18	What is the highest level of education your father has completed?	1. No Education 2. Able to read and write 3. 1 to 6 grade completed 4. 7 to 12 grade completed 5. certificate(12+ 1) 6. Diploma	S13

		7. first degree and above	

3. Health related behavioral factors

3.1. Tobacco use

No	Questions(tobacco use)	Response	Code
19	Do you currently smoke any **tobacco products**, such as cigarettes, cigars or pipes?	1. Yes 2. No If no go to T6	T1
20	**If Yes,** Do you currently smoke daily?	1. Yes 2. No If no go to T6	T2
21	How old were you when you **first started** smoking?	Age (years) __ ___	T3
22	Which class have you been when you first started cigarette smoking?	1. High school 2. College first year 3. Second year 4. Third year Other (s) _____	Tt4
23	On average, how many of the following do you smoke each day? (record for each type)	1.Manufactured cigarettes_____/_____ 2. Hand rolled cigarettes _____/_____ 3. Shisha _____/_____ 4. Other (specify)_____	T5a T5b T5c T5d
24	In the past, did you ever smoke?	1. Yes 2. No	T6
25	Does your father smoke cigarette?	1. Yes 2. No	T7
26	Does your mother smoke cigarette?	1. Yes 2. No	T8
27	Do you have a friend who smokes?	1. Yes 2. No	T9

3.2. Khat use

No	Questions	Response	Code
28	Do you currently chew khat?	1. Yes 2. No If no go to K5	K1
29	If yes, In the past 12 months how frequent have you had khat?	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	K2
30	How old were you when you **first started** chewing khat?	Age (years) __ ___	K3

31	In which class were you when started chewing khat?	1. High school 2. College first year 3. Second year 4. Third year Other (s) _____	K4
32	In the past, did you ever chew khat?	1. Yes 2. No	K5
33	Does your mother chew khat?	1. Yes 2. No Other(s) _____	K6
34	Does your father chew khat?	1. Yes 2. No Other(s) _____	K7
35	Do you have a friend who chews khat?	1. Yes 2. No Other(s) _____	K8

3.3. Alcohol consumption

No	Questions)	Response	Code
36	Have you consumed alcohol (such as beer, wine, Katikala, Tije, spirits) within the last 12 months?	1. Yes 2. No If no go to A7	A1
37	In the past 12 months**,** how frequently have you had at least one 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	A2
38	When you drink alcohol, on average, how many drinks do you have during one day?	Number ___ ___ Don't know 88	A3
39	Have you consumed alcohol (such as beer, wine, Katikala, Tege, spirits) within the last 30 days?	1. Yes 2. No If no go to A7	A4
40	During each of the **past 7 days**, how many standard drinks of any alcoholic drink did you have each day?	Monday ____ ____ Tuesday ____ ____ Wednesday ____ ____ Thursday ____ ____ Friday ____ ____ Saturday ____ ____ Sunday ____ ____	A5
41	Does your mother drink alcohol?	1. Yes 2. No	A7

42	Does your father drink alcohol?	1. Yes 2. No	A8
43	Do you have a friend who drinks alcohol?	1. Yes 2. No	A9

3.4. Diet

No	Questions	Response	Code
44	In a typical week, on how many days do you eat fruit?	Number of days __ __ If zero days, go to D3	D1
45	How many servings of fruit do you eat on one of those days?	Number of servings __ __	D2
46	In a typical week, on how many days do you eat vegetables?	Number of days __ __ If no go to P7	D3
47	How many servings of vegetables do you eat on one of those days?	Number of servings __ __	D4
48	Where do you usually eat your meal?	1. Student cafeteria 2. Home 3. Cooking own food 4. Student lounge 5. pastry 6. Hotel/Restaurant	D5
49	During the week, how many days do you eat your meals in the students cafeteria? (for those who have dormitory in the campus)	_____days/week	D6
50	Do you add table salt while you are eating (after the food is on the table)	1 Yes 2 No	D7

3.5. Physical Activity

No	Questions Activity at work and education	Response	Code
51	Does your work or education involve vigorous-intensity activity that causes large increases in breathing or heart rate for at least 10 minutes continuously?	1. Yes 2. No go to P4	P1
52	In a typical week, on how many days do you do vigorous intensity activities as part of your work?	Number of days _____	P2
53	How much time do you spend doing vigorous-intensity activities at work/education on a typical day?	____ ___ : ___ ___ Hours minutes	P3 a-b
54	Does your work involve moderate-intensity activity that causes small increases in breathing or heart rate such as brisk walking for at least 10 minutes continuously?	1. Yes 2. No go to P7	P4

55	In a typical week, on how many days do you do moderate intensity activities as part of your work or education?	Number of days _____	P5
56	How much time do you spend doing moderate-intensity activities at work or education on a typical day?	___ ____ : ____ _____ Hours minute	P6 a-b
	Travel to and from		
57	Do you walk or use a bicycle for at least 10 minutes continusly to get to and from places?	1. Yes 2. No go to P10	
58	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 ___	P8
59	How much time do you spend walking or bicycling for travel in atypical day?	Hour : Minutes ___: ____	P9 a-b
	Leisure time physical exercise		
60	Do you do any vigorous-intensity sports, fitness or leisure activities that cause large increases in breathing or heart rate for at least 10 minutes continusly?	1. Yes 2. No If no go to P13	P10
61	In a typical week, on how many days do you do vigorous intensity sports, fitness or leisure activities?	Number of days _____	P11
62	How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a typical day?	Hour : Minutes ____: ____	P12 a-b
63	Do you do any moderate-intensity sports, fitness or recreational *(leisure*) activities that cause a small increase in breathing or heart rate such as brisk walking, (*cycling, swimming, and volleyball*) for at least 10 minutes continuously?	1. Yes 2. No If no go to P16	P13
64	In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational (*leisure*) activities?	Number of days ___ ___	P14
65	How much time do you spend doing moderate-intensity sports, fitness or recreational (*leisure*) activities on a typical day?	Hour: Minutes ___: ___	P15
	Sitting or reclining		
66	How much time do you spend sitting or reclining on a typical day?	Hours: Minutes ___: ____	P16 a-b

4. Physical measurement

This part will be completed by the data collectors (please return the questioner)

No	Height and Weight	Response	Code
67	Height	In centimeter (cm) _____	M3
68	Weight	In kilogram (kg) _____	M4
69	(for women) Are you pregnant?	Yes 1 go to M11a No 2	M5

No		Response	Code
70	Waist circumference	In centimeter (cm) _____	M7
71	Hip circumference	In centimeter (cm) _____	M15

No	Blood Pressure	Response	Code
72	Reading 1	Systolic(mmHg) _____ Diastolic(mmHg)_____	M11a M11b
	Reading 2	Systolic(mmHg) _____ Diastolic(mmHg)_____	M12a M12b
	Reading 3	Systolic(mmHg) _____ Diastolic(mmHg)_____	M13a M13b
73	During the past two weeks, have you been treated for raised blood pressure with drugs (medication) prescribed by health worker?	Yes 1_____ No 2_____	M14

Annex V - Amharic questionnaire

Addis Ababa University

Faculty of medicine

Department of community Health

A questioner prepared to collect data on common risk factors of chronic diseases and their determinants among higher education students in Addis Ababa.

•• •• ••••••• •• •••••• ••••• ••• ••• ••• ••••• •• •••••:: •••
••••••• •••• ••• •••• ••••• ••••• •••• •••••• •••• ••••••• ••••
•••• ••••• ••••-•••• •••••(*chronic diseases*) ••••• •••• •• ••
•••••• •• ••••• •••••• ••••••::

••••••• ••• ••••• •• •••• •••• •• •••• ••• ••••• ••••• ••••• •••
••••• •••• •••••• ••• ••• ••• •••••• •••• •••• •••••• •••••• ••
••••• ••• ••••• ••••••• ••••••• ••••• •••• •••• •• •• ••• ••••
••• ••• ••••• •••• ••••• ••::

••••• ••• ••••••• •• ••• ••••• ••• •••• •• •••••• ••••• •••
•••••••••• •••••• •••• •••••••• ••• •••••• ••• ••••• ••:: ••• ••
•••• •••••• •••• ••• •••• •••• •••• •••••••

•• •••• ••• •••• •••• •••• •••• •••••• ••••• ••••• ••••
•••••••••••••••••• •••• ••••• ••• •••• •••• ••• •••• •••••
••••• ••••• ••••• ••••• (*measurements*) •••••• ••••• ••••••••
•••• ••••• •••• ••/•?

••: _____
••••••:_____

••••••• ••••• ••••••••• ••••••••

••••••••!

••••• ••• ••• ___/___/___/___

••• 1 ••••/••••••• •••

••••• •••• •••• ••• •••• •••• •••• ••• •• ••••• •••

•••2–••••• ••••• •••

•.•	••••	•••	••

•.•	••••	•••	••
001	••••••••/ •••• ••	_____	I1
002	••••••••/•••• •••••	1. •••• 2. •••••	I2
003	•••• •••• •••••• •••/•••••••	_____	I3
004	•••• •••• •••••• •••	1. •••• ••• 2. •••• ••• 3. •••• ••• 4. •••• ••• 5. ••••• •••	I4
005	•••• •••••• ••	____/_____/_____	I5

1	••	1.••• 2.••	C1
2	••• (••• •••)	_____ •••	C2
3	•••• •••	1. ••••/• 2. •••/• 3. •••/• 4. •••••/••	C3
4	••••• ••••• ••• ••/••?	1. ••• 2. ••• 3. •••• 4. ••• 5. ••• 6. •••• 7. ••; •••• _____	C4
5	••••• ••••• •••• ••/••?	1. •••••• 2. ••••• 3. ••••••• 4. •••• 5. ••; ••••_____	C5
6	••••• ••• •• ••••?	1. •••• 2. ••• 3. ••• 4. •••• 5. ••• 6. ••••• 7. •••• 8. ••• 9. ••• •••• 10. •••• 11. ••• •••	C6
7	••••• •••• •• •••• ?	1. ••• 2. •••	C7
8	•••••• •• ••• •••• ••• •••/•?	1. •• 2. •••••	C8

9	•••• ••• •••• •••• ••• ••••• ••• •• ••?	1. •••• •• 2. •••• •• 3. •••• 4. ••; •••• _____	C9
10	••• •••• (••• ••••) ••• •• ••••••?	1. ••••• •••• 2. •••• •••• 3. •••• ••• •• 4. ••• •••• ••/•• 5. ••; •••• _____	C10
11	••••• ••• •••••• ••• •••• ••• ••• ••• ••?	_____	C11
12	•••• ••• •••••• •• ••• •••••?	1. •• 2. •••••	C12
13	••• ••••••• •••• •• ••• •• ••• ••••• ••••?	••• ••• 1. ••••••••• _____ 2. ••••• _____ 3. •••• _____ 4. ••••• _____ 5. ••••• ••••_____	C13a C13b C13c C13d C13e
14	•••• 12 ••• •••• ••••• ••• ••• •••••• •••• ••?	1.••••••• •••• 2. •••••• •••• •••• •••• 3. ••• •••• •••• 4. ••• •••• 5. •••• 6. ••• ••••• •• 7. •• ••••(•••• •••••) 8 •• ••••(•••• •••••) 9. •• _____	C14
15	•••• 12 ••• •••• •••• ••• ••• •••••• •••• ••?	1. •••••• •••• 2. •••••• •••• •••• •••• 3. ••• •••• •••• 4. ••• ••••• •• 5. •••• 6. •• ••••(•••• ••••) 7. ••••••(•••• •••••) 8. •• _____	C15
16	••••• •••••• ••• •• •• ••• ••?	_____	C16
17	•••• •••••• •••• •••••• •••	1. ••••• 2. ••••• ••• 3. •1-6• ••• •••••• 4. •7-12• ••• •••••• 5. •••••• 6. •••• 7. ••••••/••• ••• •••	C17
18	•••• •••••• •••• •••••• •••	1. ••••• 2. ••••• •••	C18

		3. •1-6• ••• •••••• 4. •7-12• ••• •••••• 5. •••••• 6. •••• 7. ••••••/••• ••• •••	

••• 3 ••• •• •••••• •••• •••••

3.1 ••• •••• ••••••

•.•	••••	•••	••
19	•••• ••• •••••••••••••••• •••••• ••• ••••?	1. ••••• 2. ••••• ••••• 24 •••	T1
20	••••• ••• •••• ••• •••• ••••?	1. •••• ••••• 2. •••• ••••• •• ••• 24 •••	T2
21	••• ••• •••• •••• ••• •••?	_____	T3
22	••• ••• •••• •••• ••• •••?	1. 9-12• 2. 1• ••• 3. 2• ••• 4. 3• ••• 5. •• _____	T4
23	••••• ••• ••• •••••••••••• ••• •• ••••? (•••• ••• ••• ••••)	1. •••• _____/_____ 2.•••••_____/_____ 3. ••• _____/_____ 4. ••(••••)• _____	T5a T5b T5c T5d
24	•••• ••• ••••• ••• ••• ••• •••• ••••?	1. ••• 2. ••• •••••	T6
25	•••• ••• •••• ••• ••••?	1. ••• 2. •••••	T7
26	•••• ••• •••• ••• ••••?	1. ••• 2. •••••	T8
27	•••• ••• ••• ••••• ••• ••••• ••• •••?	1. ••• 2. •••••	T9

3.2 •• ••••••

•.•	••••	•••	••
28	•••• ••• •• ••••?	1. ••••• 2. ••••• ----- •• ••• 32 •••	K1
29	•••• ••• •••• 12 ••• ••••• •• ••••?	1. •••• 2. ••••• •5-6 •• 3. ••••• •1-4 •• 4. ••• •1-3 •• 5. ••• • ••• •• •••	K2
30	•• ••• •••• •••• ••• •••?	_____	K3
31	•• ••• •••• •••• ••• •••?	1. 9-12• 2. 1• •••	

		3. 2• ••• 4. 3• ••• 5. •• _____	K4
32	•••• ••• ••••• ••• ••• ••• ••• ••••?	1. ••• 2. •••	K5
33	•••/•••• •••• •• ••••?	1. ••• 2. •••	K6
34	•••/•••• •••• •• ••••?	1. ••• 2. •••	K7
35	•• •••• ••• ••••• ••• ••••?	1. ••• 2. ••••	K8

3.3 ••••• ••• ••••• ••••••

•.•.	••••	•••	••
36	•••• 12 ••• ••••• ••••• •••• •••••••••••••••• ••• •• ••••• •••• ••••?	1. ••• 2. ••• ••••• •• ••• 41 •••	A1
37	•••• 12 ••• ••• ••••• ••• ••••• ••• •••••?	1. •••• 2. ••••• •5–6 •• 3. ••••• •1–4 •• 4. ••• •1–3 •• 5. ••• • ••• •• •••	A2
38	••••• ••• •••••• •••••••• •••• •• •• ••• ••••?	•••_____	A3
39	•••• 30 ••• ••• ••••• •••• •••• •••?	1. ••• 2. •••••• •• ••• 41 •••	A4
40	•••• 7••• ••••••• •• •• ••• ••••• •••• ••? ••••• •••• •• ••• ••••• (•••••• ••• ••••• ••••• ••••• •••• ••• •.•• •••)	•••• •••• ••• •• _____ _____ •••• _____ _____ ••• _____ _____ ••• _____ _____ ••• _____ _____ ••• _____ _____ ••• _____ _____	A5a A5b A5c A5d A5e A5f A5g
41	•••/•••• •••• ••••• ••• ••••?	1. ••• 2. •••••	A6
		1. •••	

42	•••/•••• •••• ••••• ••• ••••?	2. •••••	A7
43	••••• ••• •••• ••• ••••• ••• •••?	1. ••• 2. ••••	A8

3.4 ••••••••• •••••• •••••• ••••• •••••• •••

•.•	••••	•••	••
44	•••••• •• ••••• ••• ••• •• ••••••• •••••?	••••• _____•• ••• ••• 00 •••--•• ••• 46 •••	D1
45	•••• ••••••• ••• •••• •• ••••• •••••• ••• ••• •• •••••?	•••_____••	D2
46	•••••• •• ••••• ••• ••• •• ••••• •••••?	••••• _____ •• ••• ••• 00 •••--•• ••• 48 •••	D3
47	••••• ••••••• ••• •••• •• ••••• •••••• ••• ••• •• •••••?	•••_____••	D4
48	•••••• ••••• •••••• •• ••? (••• ••• •• •••)	1. •••••• ••••• 2. •• 3. ••• •••• 4. •••••• ••• 5. ••/•• •• 6. •••/••••••	D5
49	••••• •• ••• •• •••••• ••••• •••••? (••••• •• ••• •••• ••••)	_____••/••••• ••• ••• 00 •••	D6
50	••••• ••••• •••• ••• •••• •• •••••?	1 •••••• 2. ••••••	D7

3.5 •••• ••••••• ••••••

•.•	•••• (•••• ••••• •• •••• ••••••)	•••	••
51	••• (•••••) •• •• ••••••• ••• ••• ••• •••••• ••• •••• ••••• ••• •••••• •••• • 10 ••• ••••• •••••?	1. •• 2. ••• •• ••• 54 •••	P1
52	••• (••••••)•• ••••• •••• ••• ••• •••• ••••• •••• ••••••?	_____•••	P2
53	••• •••• ••••• •••• •••••••• •• ••• ••• •••/••• •••••••?	____••• ____•••	P3 a-b
54	••• (•••••) ••••••• ••• •• •• •••• ••• ••••••• •••• •••• ••••• •••• •••• •10 ••• ••••• •••••?	1. •• 2. ••• •• ••• 57 •••	P4
55	••• (••••••)•• ••••• •••• ••• •••••••• ••••• •••• ••••••?	_____•••	P5
56	•••• •••• ••••• •••• •••••••• •• ••• ••• •••/••• •••••••?	___••• ____•••	P6 a-b
••• •• ••••••• ••••••			
57	••• •• •• ••••••• •••••• •••• •10 •••	1. •• 2. ••• •• ••• 60	P7

	••••• ••• •••••• ••••?	•••	
58	•••• ••••• •••• ••• •••• •10 ••• ••••• ••• •••••• ••••?	_____ •••	P8
59	••••• ••• •••••• •••• •• •• ••• •••/••• ••• •• •••••?	____••• ____•••	P9 a-b
	•••• •• •••• ••••••••• ••••••		
60	••••• ••• •••••• ••• ••••• ••• ••• •• ••• •• •• ••• •••• ••••• • •••••••• ••• ••••• •••• ••••• ••••••••• •••••• •••• • 10 ••• •••••?	1. •• 2. ••• •• ••• 63 •••	P10
61	••••• ••• ••• •••• ••••• ••••••••• •••• ••••• •••• ••• •••••?	_____•••	P11
62	•••• ••• •••• •• ••• •••/••• ••• •••• ••••• ••••••••• ••••• •••••?	____••• ____•••	P12 a-b
63	••••• ••• (•••••••• ••• ••••• •• •••• ••• •••••• ••• ••• ••••••••• ••••••• •• ••) •••• •••• ••••• •••••/••••• ••••••••• •••••• •••• • 10 ••• •••••?	1. •• 2. ••• •• ••• 66 •••	P13
64	••••• ••• •••• •••• ••••• ••••••••• •••• ••••• •••• ••• •••••?	_____•••	P14
65	•••• ••• •••• •• ••• •••/••• •••• •••• ••••• ••••••••• ••••• •••••?	____••• ____•••	P15 a-b
	••••• ••• ••••• ••••••		
66	••• ••• •••••• ••• •• ••••• ••• ••••• •• ••• •• •••••?	____••• ____•••	P16 a-b

••• 4 ••••• •••
••• ••• •• •••• ••••• ••••• ••• ••••• •• •••

•.•	••• •• ••••	•••	
67	•••(•.•)	_____	M1
68	••••(•.•)	_____	M2
	•••• •••		
69	(•••• •• ••• •••• ••• ••••• ••••• •••) •••• ••• ••••• •••	1. •• 2. ••• 3. ••••• •••••	M3
70	•••• ••• •••• •••	_____	M4
71	••• ••• •••• •••	_____	M5
	••• •••		
72	1•	••••• ••• ••• _____ ••••• ••• ••• _____	M6a M6b
	2•	••••• ••• ••• _____ ••••• ••• ••• _____	M7a M7b
	3•	••••• ••• ••• _____ ••••• ••• ••• _____	M8a M8b
73	•••• 2 ••••• •••• ••• ••• •••• ••• ••• ••• •••• •••• •••• ••• ••••• •••••	1. •• 2. •••	M9