SCHOOL OF PUBLIC HEALTH
COLLEGE OF HEALTH SCIENCES
UNIVERSITY OF GHANA

THE HEALTH OF THE UNIVERSITY OF GHANA COMMUNITY I: PREVALENCE OF RISK FACTORS FOR CARDIOVASCULAR DISEASES AMONG WORKERS

BY

NINETTE YEMOLEY HAYIBOR
(10328822)

THIS DISSERTATION IS SUBMITTED TO THE SCHOOL OF PUBLIC HEALTH, UNIVERSITY OF GHANA, LEGON, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A MASTER OF PUBLIC HEALTH DEGREE

AUGUST 2010

DECLARATION

I hereby declare that with the exception of cited references to other people's work which has been duly acknowledged, this work is the result of my own research work done under supervision and has neither been presented elsewhere either in part or whole for another degree.

Resident

Ninette Y. Hayibor

Academic Supervisor

Prof. F. N. Binka

DEDICATION

This work is dedicated to my husband Mawuena and my children Sesi, Edem and Elikem.

ACKNOWLEDGEMENT

My sincere thanks go to the Almighty God for enabling me to finish this course.

My greatest thanks go to Prof F.N. Binka, my academic supervisor for all the encouragement and help he gave me, not forgetting his assistance to us during the dissertation clinics.

I am grateful to the lecturers of the School of Public Health especially Prof. E.A. Afari and Dr. Priscilla Nortey for the immense help they gave to the epidemiology group.

I acknowledge the support given by the Noguchi Memorial Institute for Medical Research during the biochemical assessment of the respondents.

I also wish to express my sincere gratitude to the authorities of the University of Ghana, Legon especially the Human Resource Department for the logistics provided which ensured a successful survey.

I am equally indebted to the field workers who worked tirelessly to make the survey a success, not forgetting the respondents without whom the survey would not be possible.

Last but not the least I would like to appreciate my husband for his support and encouragement throughout the entire duration of the master's programme.

Table of Contents

ABSTRACT

INTRODUCTION: Cardiovascular Diseases (CVD) are the class of diseases that involve the heart or blood vessels. Globally, CVDs are the largest killers, claiming 17.1million lives a year. Populations of Sub-Saharan African descent are at an increased risk of developing CVDs. In Ghana, there has been a documented increase in prevalence rates of hypertension and diabetes over the last fifty years. A study done in the University of Ghana in 2006 to screen all the workers, showed a prevalence of 13.8% and 61% of undiagnosed Hypertension and Diabetes respectively. This study was carried out to determine the prevalence of risk factors associated with Cardiovascular Diseases in workers of University of Ghana, Legon.

METHODS: A cross-sectional study was done. 383 respondents were randomly selected and data on demographic characteristics and potential risk factors for CVDs were collected through a structured questionnaire. Physical and biochemical measurements were taken and data entered and analyzed using Epi Info software.

FINDINGS: The prevalence of Hypertension and Diabetes were 25.8% and 4.2% respectively. 49.4% and 55.6%were undiagnosed for Hypertension and Diabetes respectively. 30% were overweight and 13.1% were obese. The prevalences of high fasting blood glucose, high total cholesterol, high LDL cholesterol, high triglyceride levels and low HDL cholesterol were 4.2%, 29.3%, 11.6%, 1.9%, and 10.2% respectively. Overall, 14.1% of respondents had a good knowledge of CVDs. 45.2% had partial knowledge and 40.7% did not know what CVDs were.

DISCUSSION AND CONCLUSION: The high level of ignorance about CVDs can be addressed by implementing effective education programmes for workers of the

University to increase their knowledge. Knowledge of these risk factors can help reduce the incidence of the disease. The high prevalence of Diabetes calls for regular screening of the workers to promote early detection and prompt treatment.

Keywords: prevalence, cardiovascular diseases, workers of University of Ghana, Legon

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

BMI - Body Mass Index

CVA - Cardiovascular Accident

CVD - Cardiovascular Diseases

DM - Diabetes Mellitus

HC - Hip Circumference

HDL - High Density Lipoprotein

HSE - Health Survey for England

LDL - Low Density Lipoprotein

NCD - Non Communicable Disease

WC - Waist Circumference

WHO - World Health Organization

WHR - Waist to Hip Ratio

CHAPTER ONE
INTRODUCTION

1.1Background

Cardiovascular Diseases (CVD) are the class of diseases that involve the heart or blood vessels (arteries and veins). CVD includes:

- Coronary Heart Disease – disease of the blood vessels supplying the heart muscle
- Cerebrovascular Disease - disease of the blood vessels supplying the brain
- Peripheral Arterial Disease – disease of blood vessels supplying the arms and legs
- Rheumatic Heart Disease – damage to the heart muscle and heart valves from rheumatic fever, caused by streptococcal bacteria
- Congenital Heart Disease - malformations of heart structure existing at birth
- Deep Vein Thrombosis and pulmonary embolism – blood clots in the leg veins, which can dislodge and move to the heart and lungs.

CVDs are an important group of diseases and one of the most common chronic conditions that the practicing physician sees in his office.

Globally, CVDs are the largest causes of death, claiming 17.1million lives a year (WHO, 2010). This is particularly so in Europe where CVDs have continued to maintain its lead for several decades. However, the prevalence of CVD and related risk factors vary among ethnic groups (Gill et al, 2007). Tobacco use, an unhealthy diet, physical inactivity, advancing age, high blood pressure, obesity, diabetes, abnormal blood cholesterol levels, gender, genetic factors and harmful use of alcohol increase the risk of CVD.

Low- and middle-income countries are disproportionately affected where 82% of CVD deaths occur. It has been projected that by 2030, almost 23.6 million people will die from CVDs, mainly from heart disease and stroke. These are projected to remain the single leading causes of death (WHO, 2009)

Ghana, like most developing countries, is experiencing rapid increases in hypertension, diabetes, obesity, tobacco use and CVDs. In Ghana, heart disease and stroke are the top five and six causes of death and their incidence is increasing rapidly (WHO Mortality, 2006). The economic growth occurring in Ghana and many other countries around the world has led to an increase in CVD risk factors. Nationally, 29% of adult Ghanaians are hypertensive, 14% are obese and 6% are diabetic (WHO Global Infobase, 2006). Seven percent of Ghanaian males smoke tobacco (UNDP, 2006). Academic institutions such as the University of Ghana which form part of Ghana contribute to this high prevalence rate.

The human resource of any institution is its greatest asset, and especially so in an educational institution like a university. The ability of any human resource to be productive and efficient is only if they have the capacity to do so. Capacity building includes provision of adequate health services to maintain a healthy staff. Skill and training in the absence of good health is a waste of scarce resources. Therefore to achieve the purposes for which this university exists, provision of health care is a very important part of conditions of service for each employee.

Over the years, financial resources committed by the university to healthcare have been escalating because of increasing population of staff with their dependants, higher

patient expectation and technological advances. As an institution, the university is therefore going to be faced with progressively increasing healthcare expenditure to maintain staff health for adequate output. It is therefore prudent and imperative that the university, faced with need that far outweigh the available resources, pursues health programs that do not just improve health but also cut costs in the long run (Legon Hospital, 2006).

The main objectives of this study is to assess the prevalence of Hypertension, Diabetes Mellitus, Hyperlipidaemia and Obesity and Overweight among staff so as to institute appropriate prevention and treatment promptly to increase survival and improve quality of life.

1.1 Statement of the Problem

CVDs are a major cause of death around the world striking rich and poor alike. Populations of Sub-Saharan African descent are at an increased risk of developing Cerebrovascular Accident (CVA) compared with European descent populations (Bindraban et al, 2008). In Africa, Hypertension is rapidly becoming a major public health burden particularly in urban centers and the increasing prevalence reflects well on the increasing CVD mortality in Africa (Agyemang et al, 2003).

It has been projected that by 2030, almost 23.6 million people will die from CVDs, mainly from heart disease and stroke. Low- and middle-income countries are disproportionally affected: 82% of CVD deaths take place in low- and middle-income countries (WHO, 2009). In order to stem the tide of CVD in low income countries such as Ghana, there is a need to promote primary prevention of CVD. Those who

survive a heart attack or stroke need to have long term medical treatment. Experience shows that CVD seriously affects not only the patient but also the family of the patient who have to care for them. The effects can even reach beyond the family to the community, yet so many CVDs can be prevented.

1.2 Justification

CVDs are mostly incurable but largely avoidable or preventable. It affects economically productive persons, their family, community and even their work. This can result in high economic burden and poverty.

In a study conducted in the University of Ghana, Legon to screen all the workers in 2006, it was found that 13.8% had Hypertension which had not yet been diagnosed. 61% had undiagnosed Diabetes. It was recommended in the study that Health screening be done every other year. No screening has yet been done (Legon Hospital, 2006).

This study is to find the current prevalence rates and to determine how much workers know about the risk factors of CVDs, which will help prevent the incidence of the disease.

1.3 Objectives

General Objective

"To determine the prevalence of risk factors associated with Cardiovascular Diseases in workers of University of Ghana."

Specific Objectives

i. To determine the prevalence of Hypertension in workers of the University of Ghana.

ii. To determine the prevalence of Overweight and Obesity in workers of the University of Ghana.

iii. To determine the abnormal serum lipids and fasting blood glucose levels of workers of the University of Ghana.

iv. To determine the knowledge and perception of risk factors of Cardiovascular Diseases among workers of the University of Ghana.

CHAPTER TWO
LITERATURE REVIEW

2.0 Risk factors common to Cardiovascular Diseases

The main risk factors which help predict the likelihood of CVDs are heredity, being male, advancing age, cigarette smoking, high blood pressure, Diabetes, Obesity (especially excess abdominal fat), physical inactivity, alcohol intake and abnormal blood cholesterol levels. The more the risk factors a person has, the greater the likelihood of developing CVDs (American Heart Association, 2010).

The most important behavioral risk factors of heart disease and stroke are unhealthy diet, physical inactivity and tobacco use. Behavioral risk factors are responsible for about 80% of coronary heart disease and cerebrovascular disease (WHO, 2009). Intermediate risk factors such as raised blood pressure, raised blood glucose, raised blood lipids, overweight and obesity show up in individuals as a result of the effects of unhealthy diet and physical inactivity. There are also a number of underlying determinants of CVDs. These are a reflection of the major forces driving social, economic and cultural change – globalization, urbanization, and population ageing. Other determinants of CVDs are poverty and stress (WHO, 2009).

CVDs are generally preventable and knowledge of the risk factors can help prevent the incidence of the disease. Of the risk factors, heredity, gender and age cannot be modified but the others can be influenced by the individual's behavior.

Several of the risk factors are interrelated. Obesity, lack of exercise, and cigarette smoking can raise blood pressure and adversely influence blood cholesterol levels.

Several studies suggest that exposure to environmental tobacco smoke (passive smoking) also increase the risk of developing CVD (American Heart Association, 2010).

2.1 Hypertension

Hypertension is an important disease and risk factor of CVDs. It is one of the common chronic conditions the practicing physician sees in his office. It is defined as a systolic blood pressure of more or equal to 140mmHg and a diastolic pressure of more or equal to 90mmHg.

It is generally accepted that essential hypertension has a number of causes and that both genetic and environmental factors contribute to the development of the condition. High blood pressure increases the heart's workload, causing the heart to thicken and become stiffer.

It also increases the risk of stroke, heart attack, kidney failure and congestive heart failure. When high blood pressure exists with obesity, smoking, high blood cholesterol levels or diabetes, the risk of heart attack or stroke increases several times (American Heart Association, 2010). Deaths from hypertension and its complications are included in the list of avoidable deaths. Hypertension is rapidly becoming a major public health burden particularly in urban centers.

The increasing prevalence of Hypertension reflects well on the increasing CVD mortality in Africa. The emerging data for 2004 show hypertension prevalence for urban Ghana to be 33.4% (Agyemang, 2006).

A cross-sectional study conducted on 1015 urban civil servants aged more or equal to 25 years from seven randomly selected central government ministries in Accra, Ghana to determine the prevalence of hypertension and establish the levels of detection, treatment, and control among urban civil servants in Ghana yielded the following results, the age-adjusted (world standard population) prevalence of hypertension was 27.4%, out of this only 54.1% had been previously detected. The study also noted that hypertension was positively associated with age and body mass index and negatively associated with physical activity (Addo et al, 2008).

2.2 Diabetes Mellitus

Diabetes seriously increases the risk of developing cardiovascular disease. Even when blood sugar levels are under control, diabetes increases the risk of heart disease and stroke, but the risks are even greater if blood sugar is not well controlled. About three-quarters of people with diabetes die of some form of heart or blood vessel disease (WHO, 2009).

High glucose levels of more than 5.55mmol/liter (100mg/dl) is a risk factor for CVAs. Glucose is also an important predictor of mortality in patients with established CVD. Above normal glucose levels have been shown to carry increased mortality risk for patients in an acute phase of Coronary Heart Disease (WHO, 2009).

In a recent Dutch report, the age-standardized prevalence of type II Diabetes in African Surinamese was 14.2% compared with 5.5% in White-Dutch individuals. The difference was more pronounced in the older age group. In the age-group 35 to 44 years, the sex-adjusted odds ratio was 1.9 (95% CI: 0.8, 4.6) for African Surinamese as compared to the White-Dutch group. In the age group 45 to 60 years, the sex-adjusted odds ratio was 2.7 (95% CI: 1.6, 4.6) for African Surinamese. Higher prevalence of diabetes has also been reported among African Americans than among White Americans in the USA. Evidence also suggests that the prevalence of diabetes is rising rapidly in Africa with prevalence rates ranging from 0.7% in Cameroon to 8.8% in South Africa among rural dwellers, and from 1.7% in Cameroon to 10.4% in Sudan among urban dwellers. In a recent review among Ghanaians and Nigerians, diabetes seemed rare in urban Ghana in 1963 (0.2%) and in urban Nigeria in 1985 (1.65%). However, in 1998, the prevalence of diabetes among Ghanaians was 6.3% and 6.8% among Nigerians (Abubakari & Bhopal, 2008).

Recently, the American Diabetes Association Expert Committee recommended the measurement of fasting glucose as a tool for screening and diagnosing diabetes, in order to identify patients with a mild form of the disease as well as to enhance the detection of undiagnosed type 2 diabetes. The significance of these criteria with respect to cardiovascular risk factors in native Ghanaians is unknown (American Heart Association, 2010).

2.3 Dyslipidemia

It has been observed that as blood cholesterol rises, so does the risk of coronary heart disease. When other risk factors (such as high blood pressure and tobacco smoke) are

present, this risk increases even more. A person's cholesterol level is also affected by age, sex, heredity and diet.

Populations of African descent, while having a high risk of Hypertension and Diabetes, however have a more favorable lipid profile. In a UK population-based study that compared the lipid profile of ethnic minority groups and the general population, African Caribbeans were demonstrated to have lower total cholesterol and triglycerides and higher levels of High Density Lipoproteins (HDL) cholesterol (Erens et al, 2001).

2.4 Overweight and Obesity

Excess weight has been identified as an important risk factor for many diseases including hypertension, DM, CVD and Rheumatologic problems. There is a worldwide increase in the prevalence of obesity, which contributes to a higher incidence of CVDs and type II diabetes mellitus.

Since the 1950s it has been recognized that apart from overall obesity the distribution of body fat can influence disease risk. In particular an abdominal fat distribution is associated with metabolic disturbances and increased risk of CVD and type II DM.

People who have excess body fat especially if a lot of it is at the waist are more likely to develop heart disease and stroke even if they have no other risk factors. Excess weight increases the heart's work. It also raises blood pressure and blood cholesterol and triglyceride levels, and lowers High Density Lipoprotein (HDL) cholesterol

levels. It can also make diabetes more likely to develop. Many obese and overweight people may have difficulty losing weight. But by losing even as few as 10 pounds, one can lower ones heart disease risk (American Heart Association, 2010).

A study was conducted to investigate the distribution of obesity and its association with pre-adult wealth and adult socio-economic factors in urban Ghanaian civil servants. The study yielded the following results. The prevalence of obesity [body mass index (BMI) more than or equal to 30.0 kg/m^2] was 10% in men and 36% in women. Men of higher pre-adult or current socio-economic position generally had higher mean BMI and waist circumference. In women, however, the mean waist circumference was higher in those of lower socio-economic position (lower education, less pre-adult wealth), but mean BMI did not differ significantly between socio-economic groups.

There was a positive graded association between pre-adult and adult levels of wealth (determined by the availability of selected household amenities) and the risk of obesity in men (P-trend=0.003), but weak suggestions of an inverse association between adult level of wealth and obesity in women under 45 years of age (Addo et al, 2008).

Overweight and obesity are highly prevalent among populations of African descent in Europe, especially among women. In the Health Survey for England (HSE) 2004, the prevalence of overweight and obesity were 32.4% and 32.1% in the African Caribbean women and 31.3% and 38.5% in the Sub-Saharan African women as compared with 33.9% and 23.2% in women in the general population. Higher rates of

raised waist to hip ratio (WHR) and waist circumference were also found among African Caribbean and Sub-Saharan African women than among women in the general population. By contrast, African Caribbean men had similar rates while Sub-Saharan African men had lower rates of overweight and obesity than their White male counterparts. The prevalence of raised WHR and raised waist circumference were lower in both African Caribbean and Sub-Saharan African men than in their UK general population counterparts. Higher rates of overweight have also been found among African Caribbean and Sub-Saharan African adolescents in the UK. Similar higher rates have also been reported among African descent women in other European countries (Health Survey for England, 2004).

In their study comparing the Ghanaian population in the Netherlands with their counterparts in rural and urban Ghana, Agyemang and colleagues found Ghanaian migrants in the Netherlands to have an overly higher prevalence of overweight and obesity (men 69.1%, women 79.5%) than their urban (men 22.0%, women 50.0%) and rural (men 10.3%, women 19.0%) counterparts in Ghana (Agyemang et al, 2008).

Recent USA studies also show a higher prevalence of overweight and obesity among African American men and women compared with their White American counterparts in the USA (Ogden et al, 2006). Evidence also indicates that overweight and obesity are on the increase in Africa especially among women. A recent systematic review found that the prevalence of obesity in urban West Africa more than doubled (114%) over 15 years, with the increase accounted for almost entirely in women (Abubakari et al, 2008).

A study done in Cameroon to find the association between socioeconomic status and adiposity showed that of the sample studied 33% of women and 30% of men were overweight, whereas 22% of women and 7% of men were Obese. Abdominal Obesity was present in 67% of women and 18% of men (Fezeu et al, 2006).

2.5 Tobacco use

Although many Cardiovascular Diseases (CVDs) can be treated or prevented, an estimated 17.1 million people die of CVDs each year (WHO, 2010). A substantial number of these deaths can be attributed to tobacco smoking, which increases the risk of dying from coronary heart disease and cerebrovascular disease 2–3 fold.

Smokers' risk of developing coronary heart disease is 2–4 times that of nonsmokers. Cigarette smoking is a powerful independent risk factor for sudden cardiac death in patients with coronary heart disease; smokers have about twice the risk of nonsmokers. Cigarette smoking also acts with other risk factors to greatly increase the risk for coronary heart disease. People who smoke cigars or pipes seem to have a higher risk of death from coronary heart disease (and possibly stroke) but their risk is not as great as cigarette smokers'. Exposure to other people's smoke increases the risk of heart disease even for nonsmokers (American Heart Association, 2010).

The risk increases with age and is greater for women than for men. In contrast, cardiac events fall 50% in people who stop smoking and the risk of CVDs, including acute myocardial infarction, stroke and peripheral vascular disease, also decreases significantly over the first two years after stopping smoking (WHO, 2009).

2.6 Alcohol consumption

Epidemiological studies have suggested that heavy drinking constitutes a severe risk for CVD, but that low levels of consumption can have a protective effect against CHD mortality (Maclure, 1993).

Drinking too much alcohol can raise blood pressure, cause heart failure and lead to stroke. It can contribute to high triglycerides levels. The risk of heart disease in people who drink moderate amounts of alcohol (an average of one drink for women or two drinks for men per day) is higher than in nondrinkers (American Heart Association, 2010).

2.7 Physical inactivity

An inactive lifestyle is a risk factor for coronary heart disease. A person not meeting any of the following criteria is considered being physically inactive and therefore at risk of chronic disease:

- 3 or more days of vigorous-intensity activity (such as running or playing football) of at least 20 minutes per day;

  OR
- 5 or more days of moderate-intensity activity or walking of at least 30 minutes per day; OR
- 5 or more days of any combination of walking, moderate- or vigorous intensity activities.

Regular, moderate-to-vigorous physical activity helps prevent heart and blood vessel disease. The more vigorous the activity, the greater the benefits. However, even

moderate-intensity activities help if done regularly and long term. Physical activity can help control blood cholesterol, diabetes and obesity, as well as help lower blood pressure in some people (American Heart Association, 2010).

Physical exercise is recommended to prevent CVDs and promote and maintain healthy living. A physically active lifestyle delivers significant physical and mental health benefit. Regular physical activity is recommended in the early school years and throughout life. However, the enablers and inhibitors of physical activity may differ between ethnic groups due to differences in social and cultural, factors. Engaging in physical activity for at least 30 minutes every day of the week will help to prevent heart attacks and strokes (WHO, 2009).

2.8 Dietary habits

Consumption of fruits and vegetables can protect against the development of CVDs. Eating at least 5 servings of fruits and vegetables a day can help prevent heart attacks and strokes. High fat intake raises cholesterol levels and high cholesterol levels have been associated with Obesity and type II DM (WHO, 2009).

CHAPTER THREE

METHODS

3.1 Study Area

The University of Ghana was founded in 1948 as the University College of the Gold Coast on the recommendation of the Asquith Commission, on Higher Education in the then British colonies. The University of Ghana was set up by an Act of Parliament on October 1, 1961 (Act 79). The then President of the Republic of Ghana, Dr. Kwame Nkrumah, became the first Chancellor of the University. It was founded for the purpose of providing for and promoting university education, learning and research. The University of Ghana is the oldest and largest of the five universities in Ghana. The campus of the University lies about 13 kilometers north east of Accra (the capital of Ghana), at an altitude of between 300 and 400 feet (92-122metres). It has a current student population of about 20,576 and staff strength of 4,989, consisting of academic staff of 947 and non-academic staff of 4,042. 23.04% of the staff population is female. It has 8 traditional halls of residence. It has sports fields, Central cafeteria, open-air theater as well as residential accommodation for staff. Across the Accra –Dodowa road from the main University gate (behind the police station) is the University Hospital with 60 beds and houses for members of the junior staff. It also has teaching departments and lecture halls.

3.2 Study Design

The study was a cross-sectional study. A sample representative of the population was used. Quantitative methods of data collection were used. The survey questionnaire developed was based on the WHO STEPwise Approach.

3.3 Study Population

The study population was made up of all staff of the University of Ghana on Legon Campus.

3.4 Sample Size

400 workers allowed the estimation of prevalence of diabetes mellitus of 3.7% within a 5% of the estimated prevalence, using a 95% Confidence Interval with 10% adjustment for non response using Epi Info. (Source: Legon Hospital, University of Ghana, Legon, Health Screening of Staff of the University of Ghana, 2006)

3.5 Sampling Techniques

The respondents were randomly selected using simple random sampling from each of the nine (9) faculties of the university.

3.6 Variables Studied

Age

Sex

Height

Weight

Waist circumference

Hip circumference

Alcohol consumption

Tobacco intake

Physical activity

Dietary patterns

Diastolic Blood pressure

Systolic Blood pressure

Fasting lipid levels

Fasting glucose levels

3.7 Data Collection Tools, Techniques and Protocol

3.7.1 Data Collection Techniques and Tools

Respondents were briefed on the study and survey procedure. The subjects rested quietly for more than 10 minutes before two BP readings at 3 minute intervals were taken. The questionnaires were filled out and anthropometric measures were performed. Those detected to have a high BP were advised and referred to the Legon Hospital for treatment.

3.7.2 Physical Measurement

Weight and height were measured with the participant wearing lightweight clothing and standing barefoot on instruments placed on a flat surface. Weight was measured to the nearest 0.1 kilograms using a Seca floor digital scale. Height was measured to the nearest 0.1 cm using a portable stadiometer. Waist circumference (WC) was measured in the middle between the 12^{th} rib and the iliac crest at the level of the umbilicus, at the end of expiration, while the hip circumference (HC) was measured at the fullest point of the buttocks using an inelastic tape.

OMRON (Digital Automatic Blood Pressure Monitor with the appropriate cuff size) was used to measure the blood pressure of participants. Two readings were taken at an interval of three minutes to allow subject to relax.

3.7.3 Biochemical Assessment

Each respondent had 10ml of blood taken for biochemical assessment at the various faculties of the university with the help of staff of the Noguchi Memorial Institute for Medical Research, Legon. Rooms and laboratories were provided at the various faculties for this exercise. Respondents were to report in the morning on a separate day at their departments for the biochemical assessment where fasting blood glucose and lipids were determined.

Blood samples were sent to Noguchi Memorial Institute for Medical Research, Legon for analysis. Glucose levels were determined after enzymatic oxidation in the presence of glucose oxidase. High blood glucose was defined as a fasting serum glucose level of more than 5.9 mmol/l. Total cholesterol was determined by enzymatic hydrolysis followed by oxidation. High total cholesterol levels were defined as a serum cholesterol level of more than 5.2 mmol/l.

Triglyceride levels were determined by enzymatic hydrolysis with lipoprotein lipases. High triglyceride levels were defined as more than 2.26 mmol/l. For HDL (good) cholesterol, higher levels are recommended. A range of 0.9 to 10.0 was considered normal. For LDL cholesterol, those who had more than 3.1 mmol/l were considered abnormal.

3.7.4 Training of Research Assistants

To standardize the survey measurements and procedures, the research team was trained with WHO guidance manual that conformed to recommended Non Communicable Diseases (NCD) survey protocols. The team of research assistants included four state-registered nurses and a laboratory technician. Research assistants

recruited were taken through a three day training exercise. All research assistants were taken through the completion of the questionnaire. Four of the research assistants were then trained on the appropriate taking of measurements including weight, height, waist and hip circumferences. They learnt to take accurate BP readings.

3.7.5 Pretesting

Before the main study, a pilot test was carried out to fine tune survey procedures. This was done at the College of Health Sciences, Korle-Bu Teaching Hospital.

3.7.6 Quality Control

Training and supervision of survey team was ensured. Pre-testing was done and the questionnaire revised appropriately. Incomplete and inconsistent data was excluded.

In the biochemical assessment the use of a General Chemical Control was employed. Regular analysis with a Normal and Elevated Controls monitors the accuracy and reproducibility of the test.

3.7.7 Ethical Considerations

The study was approved by the Ethical Review Committee Board of the Ghana Health Service. Permission was sought from the Registrar of the School of Public Health, College of Health Sciences, Korle Bu and the University of Ghana before the research was conducted. Informed consent, in the form of participants' signature and witnessed by the interviewer, were obtained from the participants. The objectives of the survey

and survey procedures were explained to all subjects. In addition, prospective subjects were made aware that participation was entirely voluntary and that they had the right to refuse to participate or to withdraw from the survey at anytime. Participants were informed of their BP readings. Subjects found to be hypertensive were counseled and given a written referral to the Legon Hospital for management.

3.7.8 Data processing and Analysis

Standardized structured, self-administered questionnaires were used to collect data from the randomly selected staff of the University of Ghana, Legon at their various departments. Data collected included basic demographic information such as age, sex, and educational background, were obtained using a structured questionnaire as a tool. Information about certain key risk factors (self-reported tobacco use, fruit and vegetable consumption, physical activity patterns, alcohol intake, history of hypertension, hyperlipidaemia and diabetes) were obtained based on the WHO approach to Surveillance (STEPS) for Non Communicable Diseases risk factors.

Data was independently double entered, frequencies run on variables using Epi info (version 3.4.1). Data was cleaned and analyzed using Epi Info version 3.4.1. Where appropriate, results were presented as means and standard deviation of the mean. Charts and tables were used in describing results where applicable. Statistical tests included the Chi-square test for discrete variables. Results were considered statistically significant if $P<0.05$.

Averages of the two blood pressure readings were computed and blood pressure was classified as high if systolic was more or equal to 140mmHg or diastolic was more or

equal to 90 or where both systolic and diastolic were high or both systolic and diastolic are normal but subject was currently taking antihypertensive drugs.

Logistic regression was run to calculate odds ratio at 95% CI.

The body mass index (BMI) is a statistical measure of the weight of a person scaled according to height. It is defined as the individual's body weight in kilograms divided by the square of the height in meters.

Current alcohol use was taken to be the consumption of alcohol within the past 3 months, at least 1-3 days per week.

Tobacco indicator that is associated with an increased risk of developing CVDs was taken to be current use of tobacco.

A BMI more or equal to 25kg/m^2 indicates that a person is overweight; while a BMI more or equal to30kg/m^2 indicates that the person is obese.

Normal WHR was defined as a ratio of waist circumference to that of hip circumference being less or equal to 0.90 for males and less or equal to 0.85 for females.

Physical activity was defined as:

- 3 or more days of vigorous-intensity activity (such as running or playing football) of at least 20 minutes per day;

OR

- 5 or more days of moderate-intensity activity or walking of at least 30 minutes per day; OR
- 5 or more days of any combination of walking, moderate- or vigorous intensity activities.

Fruit and vegetable consumption was defined as consuming 5 or more servings of fruit and vegetables a day. A serving of fruit was taken to be one banana, orange, mango, apple or other similar sized fruit, a palm size of melon or any other fruit in season. A serving of vegetables was taken to be a palm size of vegetables (3 heaped tablespoons of vegetables) of one's own choice.

Having full knowledge of CVDs was taken to be correctly defining CVDs as diseases of the heart and blood vessels and knowing at least one risk factor. Partial knowledge was defined as CVDs involving only the heart or only the vessels plus knowledge of a risk factor or more. Those who could not define at all or thought CVDs to be of any other organ aside the heart were classified as having no knowledge.

High blood glucose was defined as a fasting serum glucose level of more than 5.9 mmol/l. High total cholesterol levels were defined as a serum cholesterol level of more than 5.2 mmol/l. High triglyceride levels were defined as more than 2.26 mmol/l. For HDL (good) cholesterol, higher levels are recommended. A range of 0.9 to 10.0 was considered normal. For LDL cholesterol, those who had more than 3.1 mmol/l were considered abnormal.

CHAPTER FOUR
RESULTS AND FINDINGS

4.1 Demographic Characteristics

A total of 383 respondents were interviewed, consisting of 265(69.2%) males and 118(30.8%) females. Those who could not respond were 17 (4.25%) in number. This was expected as the university was about to go on recess. Of the respondents 84(21.9%) were academic staff and 299(78.1%) were non academic. Ages ranged from 21 years to 69 years with the mean age and standard deviation being 39.48 years (SD: 11.37) for males and 37.04(SD: 11.18) for females.

Table 1 below shows the demographic characteristics of the respondents in the study population.

Table 1: Demographic characteristics of workers of the University of Ghana, Legon, 2010.

Variable		Count N=383	Percentage
Age	Less than 40 years	223	58.2%
	More than 40 years	160	41.8%
Sex	Male	265	69.2%
	Female	118	30.8%
Education	No education	9	2.3%
	Some education	115	30%
	Tertiary education	259	67.6%

58.2% of respondents were in the below 40years age group and 41.8% were above 40years. 218(56.9%) respondents were married whilst 165(43.1%) were not married. 9(2.3%) respondents had no education, 115(30%) had some form of education (Primary, JHS and SHS). The rest, 259(67.6%) had tertiary education (vocational, university and postgraduate education).

4.2 Prevalence of Hypertension

Hypertension is defined as level of systolic blood pressure (SBP) above or equal to 140mmHg or diastolic blood pressure (DBP) above or equal to 90mmHg or both, or one who records a normal blood pressure but is on antihypertensive drugs. Table 2 below shows the overall prevalence of hypertension, prevalence of systolic and diastolic hypertension as well as hypertension by sex in the study population. The systolic and diastolic hypertension records below are exclusive of those who are on antihypertensives and recorded normal blood pressure.

Table 2: Prevalence of Hypertension of workers of the University of Ghana, Legon, 2010

Variable		Count N=383	Percentage
Hypertension	Yes	99	25.8%
	No	284	74.2%
Systolic Hypertension	Yes	63	16.4%
	No	320	83.6%
Diastolic Hypertension	Yes	47	12.3%
	No	336	87.7%
Hypertension by sex	Male	81	21.1%
	Female	18	4.7%

The overall prevalence was 25.8%. Those who had isolated systolic hypertension (with no diastolic component) were 24(6.3%) and those who had isolated diastolic hypertension (with no systolic component) were 8(2.1%). Those who had both diastolic and systolic Hypertension were 39(10.2%). Those who had normal BP but were on antihypertensive drugs were 28(7.3%). In satisfying my definition of hypertension the number of hypertensive's comes to 99 when all the four categories of respondents are put together. Of the overall prevalence males contributed 21.1 % (81) and females 4.7% (18). Males are seen to have a higher prevalence of hypertension than females. Existing prevalence of Hypertension (already diagnosed) was 13.1% (50). 7.1% (27) for males and 6.0% (23) for females. Almost half of the hypertensives (49, 12.7%) were undiagnosed. Only 50.5% of hypertensives knew of their condition. The undiagnosed hypertensive's was 49.5%.

4.3 Other Risk Factors for Cardiovascular Diseases

In this section, other risk factors other than hypertension are considered and they were defined as follows:

Table 3: Other risk factors of Cardiovascular Diseases among workers of the University of Ghana, Legon, 2010.

Variable		Count N=383	Percentage	Chi-square
Current alcohol use	Yes	57	14.8%	11.6*
	No	326	85.2%	11.6*
Current smoking	Yes	11	2.9%	5.0
	No	372	97.1%	5.0
Abnormal BMI	Overweight	115	30.0%	
	Obesity	50	13.1%	
Abnormal waist to hip ratio	Yes	247	64.5%	
	No	136	35.5%	
Physical inactivity	Yes	238	62.1%	195.5*
	No	145	37.9%	195.5*
No fruit and vegetable consumption	Yes	356	93.0%	301.1*
	No	27	7%	301.1*
Knowledge of CVDs	Yes	54	14.1%	59.5*
	No	329	85.9%	59.5*
Preventability of CVDs	Yes	237	61.9%	96.5*
	No	146	38.1%	96.5*

*P<.05

Overall current alcohol use was 57(14.8%). Current alcohol use in males 53(13.8%) is higher than females 4(1.0%). Overall current smoking was 11(2.9%). The study showed that no female smoked.

Overall, 56.9% of the respondents were of normal weight, 30.0% were overweight and 13.1% were obese.

Table 4 below shows the prevalence of overweight and obesity by sex.

Table 4 Prevalence of overweight and obesity by sex of workers of the University of Ghana, Legon, 2010.

Variable		**Count**	**Percentage**
Overweight(25≤BMI<30)	Male	67	17.5%
	Female	48	12.5%
Obesity(BMI≥30)	Male	27	7.0%
	Female	23	6.0%

N=383

Prevalence of overweight in males was 17.5% and that of females was 12.5%.

Prevalence of obesity in males was 7.0% and that of females was 6.0%.

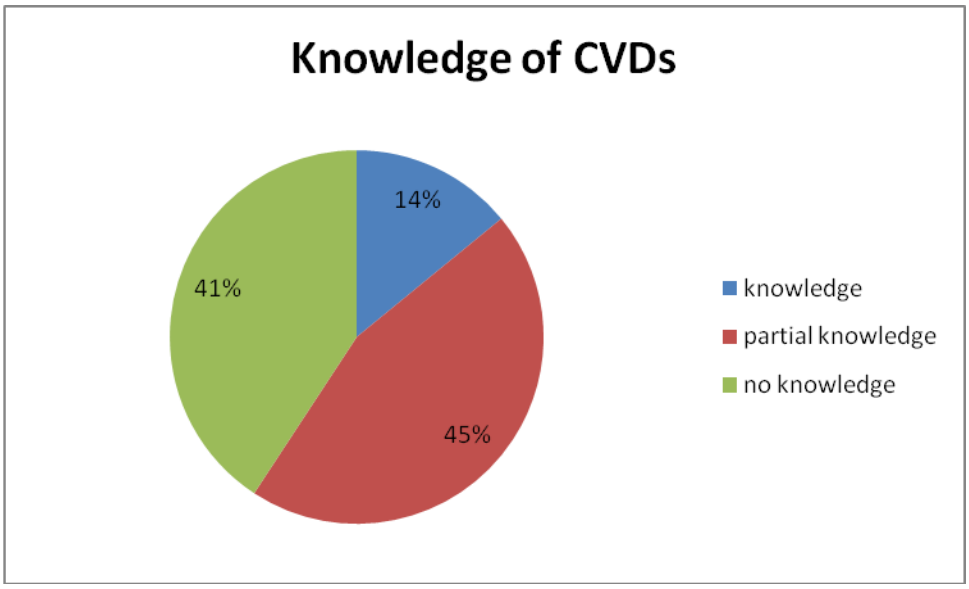
Using waist to hip ratio (WHR) 35.5% of subjects were normal in body size and 92(24.0%) of males had abnormal WHR while 155(40.5%) of females had abnormal WHR.

Results from the study showed that only 145(37.9%) engaged in physical activity while 238(62.1%) were not engaged in physical activity according to the definition.

The study showed that only 27(7%) ate fruit and vegetables. 356(93.0%) did not satisfy the requirement.

The pie chart below shows the level of knowledge of workers of the university.

Figure 1 Pie chart showing knowledge of CVDs of workers of the University of Ghana, Legon, 2010.



In the Figure 1 above 14% of respondents had a good knowledge of CVDs, 45% had partial knowledge and 41% did not know what CVDs were.

The knowledge of workers of the university by level of education is also shown below.

Table 5: Knowledge of CVDs and its preventability among workers of the University of Ghana, Legon, 2010.

Variable		No education	Some education	Tertiary education	Total
		Count (%)	Count (%)	Count (%)	Count (%)
Knowledge	Had knowledge	0(0%)	5(4.3%)	49(18.9%)	54(14.1%)
	Partial knowledge	1(11.1%)	34(29.6%)	138(36.0%)	173(45.2%)
	No knowledge	8(88.9%)	76(66.1%)	72(53.3%)	156(40.7%)
Preventability	Yes	1(11.1%)	42(36.5%)	194(74.9%)	237(61.7%)
	No	3(33.3%)	12(10.4%)	16(6.2%)	31(8.1%)
	Do not know	5(55.6%)	61(53.1%)	49(18.9%)	115(30.0%)

N=383 *P<.05

Table 5, above shows that the knowledge of CVDs increased as the level of education increased. None of the respondents who have not had any education had knowledge about CVDs. As much as 88.9% did not have any knowledge about CVDs. Only 11.1% had partial knowledge. For those with some form of education, only 5(4.3%) knew what CVDs were. Those who partially knew what CVDs were 34(29.6%) and those who did not know were 76(66.1%). Knowledge in those with tertiary education was four times that of those with some form of education (18.9%). Those who had partial knowledge were 138(36.0%). As many as 72(53.3%) with tertiary education

did not know what CVDs were. Knowledge of CVDs being preventable increased as the level of education increased. Overall, 237(61.9%) of the respondents knew that CVDs can be prevented. 31(8.1%) said it cannot be prevented whilst 115(30.0%) did not know what CVDs were and therefore do not know whether they can be prevented or not.

Respondents who took part in the biochemical assessment were 215 of which 156 were males and 59 were females.

4.4 Prevalence of high serum lipids and high fasting blood glucose

Table 6: Fasting blood sugar and fasting serum lipid levels among workers of University of Ghana, Legon, 2010

Variable		Frequency	Percentage
Fasting Blood Sugar	Normal	206	95.8%
	High	9	4.2%
Total Cholesterol	Normal	152	70.7%
	High	63	29.3%
Triglyceride	Normal	211	98.1%
	High	4	1.9%
LDL Cholesterol	Normal	190	88.4%
	High	25	11.6%
HDL Cholesterol	Normal	193	89.8%
	Low	22	10.2%

N=383

Respondents with high fasting blood glucose levels were 9(4.2%) of which 55.6% (5) were undiagnosed. Respondents with high total cholesterol levels were 63(29.3%), those with high LDL cholesterol were 25(11.6%), 4(1.9%) had high triglyceride levels while 22(10.2%) had low HDL cholesterol levels.

The prevalence of high total cholesterol, high triglycerides, high LDL cholesterol, low HDL cholesterol and high glucose levels by sex are shown in table 7 below

Table 7: Prevalence of high total cholesterol, high triglycerides, high LDL cholesterol, low HDL cholesterol and high glucose levels by sex of workers of the University of Ghana, Legon, 2010

Variable		**Count**	**Percentage**
High Total Cholesterol	Male	39	10.2%
	Female	24	6.3%
High LDL Cholesterol	Male	16	4.2%
	Female	9	2.3%
Low HDL Cholesterol	Male	16	4.2%
	Female	6	1.6%
High Triglycerides	Male	4	1.0%
High Fasting Blood Glucose	Male	7	1.8%
	Female	2	0.5%

N=383

In the table above generally it is seen that men have higher lipid and glucose levels than females. No female had a high triglyceride level. All those who had high triglyceride levels were males.

The coexistence of Hypertension and Diabetes was 4(1.0%)

The table below shows association of risk factors with the development of Hypertension.

Table 8: Logistic regression for risk factors of Hypertension among workers of the University of Ghana, Legon, 2010

Variable	Odds Ratio	P-Value	Confidence Interval
Age	1.08	0.000*	1.05-1.12
Total Cholesterol	3.32	0.005*	1.43-7.68
Triglycerides	0.88	0.913	0.10-8.13
LDL Cholesterol	0.64	0.430	0.21-1.95
HDL Cholesterol	1.52	0.429	0.54-4.31
Overweight and Obesity	1.51	0.227	0.77-2.97

In the table it is seen that there is no significant association between the levels of triglycerides, LDL and HDL cholesterol and Obesity and Overweight.

The association between age and Hypertension was strong. Total cholesterol also had a strong association with Hypertension.

When logistic regression was run for Diabetes for the same variables above, no significant association was observed.

CHAPTER FIVE
DISCUSSION

With Hypertension defined as level of systolic blood pressure above or equal to 140mmHg or diastolic blood pressure above or equal to 90mmHg or both, the results from the study showed the prevalence of Hypertension in the study population to be 25.8%. This means that one in four of the workers have abnormal blood pressure and it calls for concern. Only 50.5% of hypertensives were aware that they had high blood pressure. This clearly shows that as much as 49.5% of hypertensives are walking around not knowing their status. This is dangerous as they may die an untimely death because of ignorance. Those who know their status can seek medical attention and live normal lives.

These findings are consistent with a survey done on urban civil servants in Government ministries in Accra where the age-adjusted prevalence of hypertension was 27.4%, out of this only 54.1% had been previously detected (Addo et al, 2008).

A 2006 survey conducted among workers of the University of Ghana also showed similar results. The overall prevalence of hypertension was 28.9% and only 47.8% were aware of their condition (Legon Hospital, 2006).

The reasons for people going undiagnosed could be due to the fact that high blood pressure has no symptoms. It is assumed that once one feels well there is no need to go to hospital. Regular blood pressure checkups are however necessary for the early

detection of hypertension. On the other hand most people would rather opt for the use of herbs than to attend the hospital.

Of the overall prevalence males contributed 21.1% (81) and females 4.7% (18). Males are seen to have a higher prevalence than females. This trend was consistent with available literature. Being male is a risk factor for CVDs and it is not surprising that more males have hypertension than females (American Heart Association, 2010).
The more risk factors one has the greater ones chances of developing CVDs. Also, the greater the level of each risk factor, the more that factor affects ones overall risk. The prevalence of risk factors such as drinking and smoking are higher in males than in females which predisposes them more to CVDs. This study also shows that men drink and smoke more than women.

There was no significant association between the levels of triglycerides, LDL and HDL cholesterol and obesity and overweight with hypertension when logistic regression was run. The association between age and hypertension was strong. Total cholesterol also had a strong association with hypertension.

The effects of unhealthy diet, alcohol and physical inactivity, which accumulate with age, may show up in individuals as raised blood pressure, raised blood glucose, raised blood lipids, and overweight and obesity.

Four subjects (1.0%) had both hypertension and diabetes. These four (4) are exposed to at least two risk factors and are more likely to suffer CVDs.

Obesity is an important contributing factor to increased insulin concentrations and decreased insulin sensitivity. Evidence from prospective studies indicate that the risk of type II diabetes increases progressively from a BMI of > 20 kg/m^2 (Shaper, 1997). The total prevalence of overweight and obesity amongst the University workers was 43.1% which is high. Those who are overweight and obese are therefore predisposed to diabetes since their BMI are more than 20 kg/$m^{2.}$

The high prevalence of overweight and obesity could be accounted for by the high prevalence of inactivity among the workers (62.1%) and also by the fact that most workers eat outside their homes when they come to work. Workers have no control over what they eat when they come to work. They are forced to eat the junk food offered to them which is full of fats and oils, leading eventually to overweight and obesity.

In a study done by Agyemang and colleagues comparing the Ghanaian population in the Netherlands with their counterparts in rural and urban Ghana, it was found that Ghanaian migrants in the Netherlands had an overly higher prevalence of overweight and obesity (men 69.1%, women 79.5%) than their urban (men 22.0%, women 50.0%) and rural (men 10.3%, women 19.0%) counterparts in Ghana. In my study prevalence of obesity and overweight was 24.5% for males and 18.5% for females. This does not conform to the trends seen above where females are more obese than males (Agyemang et al, 2009). This could be explained by the fact that more males (69.2%) than females were interviewed in the study.

Overall, 56.9% of the respondents were of normal weight, 30.0% were overweight and 13.1% were obese. This is consistent with the study done on University of Ghana workers four years ago where 56.7% had normal BMI. Females were again observed to be more overweight and obese than males.

The possible reasons for the increased overweight and obesity among females are unclear. Obesity is, however, the result of an imbalance between energy intake and energy expenditure. Increases in the intake of fat and sugar as well as sedentary lifestyles have been linked to the rising epidemic of obesity. It is not surprising that in this study the level of physical inactivity was high (62.1%).

The prevalence of obesity in males (7%) was found to be comparable to that conducted on civil servants in Ghana which yielded 10%. On the other hand, prevalence of obesity in females (6%) was lower than that registered in the case of the civil servants which yielded 36%.

Fat concentrated around the abdomen is associated with a higher risk of disease especially CVDs. The percentage of males and females with abnormal WHR were 24.0% and 40.5% respectively. Of the respondents 35.5% were normal in body size using waist to hip ratio. This means that 65.5% are at risk of CVDs.

People who have excess body fat – especially if a lot of it is at the waist – are more likely to develop heart disease and stroke even if they have no other risk factors. Excess weight increases the heart's work. It also raises blood pressure and blood cholesterol and triglyceride levels, and lowers HDL ("good") cholesterol levels. It can

also make diabetes more likely to develop. Many obese and overweight people may have difficulty losing weight. But by losing even as few as 10 pounds, you can lower your heart disease risk.

Cultural perceptions regarding overweight and obesity may also play a role in the increasing prevalence of overweight and obesity among these populations. In most African societies, being overweight or obese was and still is, at least in some part, associated with prestige, happiness and good healthy living, especially in women. The increase in the patronage of fast foods in recent times is also a contributory factor to the increased prevalence of overweight and obesity. These problems can be curbed by educating the general population on healthy eating.

Diabetes seriously increases the risk of developing cardiovascular disease. High glucose levels of more than 5.55mmol/liter (100mg/dl) is a risk factor for CVAs. Respondents with high fasting blood glucose levels were 4.2%. This is high and must be addressed as this can affect the productivity of the workers. Four years ago the prevalence of diabetes among workers of the university was 3.7%. This shows that diabetes is on the rise therefore screening must be taken seriously. The percentage of diabetics undiagnosed was 55.6% as opposed to the 61% undiagnosed in 2006. The level of awareness is still low (only 44.4%) as in knowing one's condition one could seek medical attention and live a normal life.

Total cholesterol, LDL cholesterol, HDL cholesterol, triglycerides, age and overweight and obesity had no significant association with diabetes when logistic regression was run.

Lipid levels in general were seen to be raised in some of the respondents. Respondents with high total cholesterol levels were 63(29.3%), those with high LDL cholesterol were 25(11.6%), 4(1.9%) had high triglyceride levels. HDL ("good") cholesterol was found to be low in 22(10.2%) respondents. Generally more males were seen to have high lipid levels than females. This same trend was seen in those who were overweight and obese. Logistic regression run to see the association between diabetes and the lipids showed no association. However, total cholesterol had a strong association with Hypertension. This is not surprising since high cholesterol levels can lead to narrowing of the lumina of the blood vessels and thereby increase the pressure in the blood vessels.

Abnormal blood lipid levels, that is, high total cholesterol, high levels of triglycerides, high levels of LDL or low levels of HDL all increase the risk of heart disease and stroke. Changing to a healthy diet and exercise can modify one's lipid profile (Mackay, 2004).

Concerning knowledge of CVDs, only 14.1% of respondents had a good knowledge, 45.2% had partial knowledge while 40.7% did not know what CVDs were. This was not good enough as knowledge of CVDs is vital to its prevention and control. The study shows that the knowledge of CVDs increased as the level of education increased. None of the respondents with no education had knowledge about CVDs. This was not surprising as level of education impacts greatly on knowledge.

Knowledge of whether CVDs can be prevented or not is also vital. If it is known that it can be prevented then one would do something about it. Regarding knowledge of

whether CVDs can be prevented, 237(61.9%) of the respondents knew that CVDs can be prevented. Respondents who said it cannot be prevented accounted for 31(8.1%) whilst 115(30.0%) did not know what CVDs were and therefore did not know whether they could be prevented or not. This means that workers need more education on the disease.

Alcohol and tobacco use and abuse have been associated with a variety of disease conditions and mortalities all over the world of which CVDs are included. Overall current alcohol use was 14.8%. Current alcohol use in males (13.8%) is higher than females (1.0%).That for females is expected as most literature recorded lower values for females.

Overall current smoking was 2.9%. No female smoked. This is impressive as the national prevalence of tobacco is 7.3% (Ghana Demographic Health Survey, 2008). This could be accounted for by the fact that education on harmful use of tobacco is going down well with the general public. Cultural and religious differences in the perception of alcohol use and tobacco smoking may play a role. For example, Islam prohibits alcohol use and Christianity also abhors smoking and use of alcohol. Low prevalence of alcohol and tobacco use may also be due to the fact that some may drink but not report it for fear of stigmatization

Physical exercise is recommended to prevent CVDs and promote and maintain healthy living. A physically active lifestyle delivers significant physical and mental health benefit. Results from the study showed that only 37.9% engaged in physical activity while 62.1% were not engaged in physical activity according to the definition.

This could be explained by the fact that knowledge of the risk factors of CVDs is low and that coupled with people leading complex lifestyles do not make time to exercise.

Consumption of fruits and vegetables can protect against the development of CVD. Dietary habits differ considerably among ethnic groups. The available evidence seems to suggest that fruit and vegetable intake is higher in populations of African descent than their European counterparts in Europe. In the HSE 2004, African Caribbean men (32%) and women (31%) and Sub-Saharan African men (31%) and women (32%) were more likely than men (23%) and women (27%) in the general population to meet the recommended guidelines of consuming five or more portions of fruit and vegetables a day. My study showed that only 7% met the recommended guidelines of consuming five or more portions of fruit and vegetables a day. Knowledge about good eating habits would go a long way to improve the consumption of fruit and vegetables. Affordability of fruits and vegetables is another issue to battle with. If one knows their importance, then one would make it a point to include them in one's diet.

CHAPTER SIX
CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The prevalence of hypertension in the community is high (25.8%) as one in four of the respondents have Hypertension. Awareness of being hypertensive is low (50.5%). Prevalence of Diabetes is high 4.2% with undiagnosed being 55.6%.

Respondents with high total cholesterol levels were 29.3%, those with high LDL cholesterol were 11.6%, 1.9% had high triglyceride levels. HDL ("good") cholesterol was found to be low in 10.2% of the respondents.

Overall, only 14.1% of respondents had a good knowledge of CVDs, 45.2% had partial knowledge while 40.7% did not know what CVDs were.

Overall current alcohol use was 14.8% and that of current smoking was 2.9%.

Only 37.9% engaged in physical activity and only 7% ate fruit and vegetables.

6.2 Recommendations

1. There is a need to set up Non Communicable Diseases (NCD) control programmes and strengthen initiatives for the surveillance, prevention and management of NCDs by the Legon Hospital for the workers. It is therefore recommended that health screening of the workers be regular preferably on a

yearly basis to promote early detection and prompt treatment of CVDs to increase survival and improve quality of life.

2. It is important for the Hospital to develop and implement effective education programmes for workers of the University to increase their knowledge of Cardiovascular Diseases which hopefully will translate to behavior change so as to prevent the occurrence of CVDs.

3. It is recommended that the authorities of the University establish more fitness centers. The recently built one should be opened and workers of the University encouraged to use it so as to improve their physical activity.

6.3 Limitations

Blood pressure reading for those respondents detected to have high reading could not be repeated on a subsequent day. This could overestimate the prevalence of hypertension although using the measurement of two standard readings would minimize this.

The questionnaire was not designed to capture information on religion as this could have a bearing on the use of tobacco and alcohol intake.

REFERENCES

1. Abubakari A R, & Bhopal RS (2008) Systematic review on the prevalence of diabetes, overweight/obesity and physical inactivity in Ghanaians and Nigerians. *Public Health* **122**:173-82. PubMed Abstract

2. Abubakari AR, Lauder W, Agyemang C, Jones M, Kirk A, Bhopal RS (2008) Prevalence and time trends in obesity among adult West African populations: a meta-analysis. *Obes Rev* 2008, **9:**297-311.

3. Addo J, Smeeth L, & Leon DA. Prevalence, detection, management and control of hypertension in Ghanaian civil servants. Ethn Dis. 2008 Autumn;18(4):522.

4. Addo J, Smeeth L, & Leon DA. (2008) Obesity in urban civil servants in Ghana: association with pre-adult wealth and adult socioeconomic status. PMID: 19157257 [PubMed - indexed for MEDLINE]

5. Agyemang C, Addo J, Bhopal R, Aikins AD & Stronks K. (2009). *Globalization and Health*. http://www.globalizationandhealth.com/content/5/1/7

6. Agyemang C, Bhopal R (2003) Is the blood pressure of people from African origin adults in the UK higher or lower than that in European origin white people? A review of cross-sectional data. *J Hum Hypertens* 2003, **17:**523-534.

7.Agyemang C (2006) Rural and urban differences in blood pressure and hypertension in Ghana, West Africa. *Public Health*, **120**:525-33.

8. Agyemang C, de Munter J, van Valkengoed I, Born BJ, Stronks K (2008) Gender disparities in hypertension among different ethnic groups in Amsterdam, The Netherlands: the SUNSET study. *Am J Hypertens* 2008, **21:**1001-6.

9. American Heart Association (2010) Scientific Statement on Prevention of Coronary Heart Diseases and Stroke. March 2010

10. Bindraban NR, van Valkengoed IG, Mairuhu G, Holleman F, Hoekstra JB, Michels BP, Koopmans RP, Stronks K (2008) Prevalence of diabetes mellitus and the performance of a risk score among Hindustani Surinamese, African Surinamese and ethnic Dutch: a cross-sectional population-based study. *BMC Public Health* 2008, **8:**271.

11. Cardiovascular diseases, WHO Factsheet No 317, September 2009

12. Edwards R, Unwin N, Mugusi F, Whiting D, Rashid S, & Kissima J (2000) Hypertension prevalence and care in an urban and rural area of Tanzania. *J Hypertens* **18:**145-52

13. Erens B, Primatesta P, & Prior G (2001) Health of Minority Ethnic Groups. *Health Survey for England 1999: The* London, England: The Stationary Office; 2001

14. Fezeu L, Minkoulou E, Balkau B, Kengne AP, Awah P, Nnwin N, Alberti G K MM & Mbanya J C (2006). Association between socioeconomic status and adiposity in urban Cameroon. *International Journal of Epidemiology.* Vol **35**:1, February

15. Ghana Demographic Health Survey 2008. Ghana Health Service.

16. Gill PS, Kai J, Bhopal RS, Wild S (2007) Black and minority ethnic groups. In *Health Care Needs Assessment: The Epidemiologically Based Needs Assessment Reviews*. Edited by: Stevens A, Raftery J, Mant J. Abingdon, United Kingdom: Radcliffe Medical Press Ltd; 2007:227-239.

17. Health Survey for England 2004: **Health of Ethnic Minorities.** [http:/ / www.ic.nhs.uk/ webfiles/ publications/ hlthsvyeng2004ethnic/ HealthSurveyForEngland161205_PDF%20 .pdf] webcite

18. Legon Hospital, University of Ghana. Health screening of staff of University of Ghana, Legon. June-July 2006.

19. Mackay J, Mensah G, (2004) Atlas of Heart Disease and Stroke. World Health Organization. Geneva

20. Maclure M (1993) Demonstration of deductive meta-analysis: ethanol intake and risk of myocardial infarction. *Epidemiol Rev* 1993, **15:**328-51.

21. Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM (2006) Prevalence of Overweight and Obesity in the United States, 1999–2004. *JAMA* 2006, **295:**1549-1555.

22. Port S C, Boyle NG, Hsueh WA, Quinones M J, Jenneh R I & Goodarzi MO (2006). The predictive role of blood glucose for mortality in subjects with Cardiovascular Diseases. *American Journal of Epidemiology*. Vol **163**: 4, February 15, 2006. Pg 242-351

23. Shaper AG, Wannamethee SG, Walker M: Body weight (1997) Implications for the prevention of coronary heart disease, stroke, and diabetes mellitus in a cohort study of middle aged men. *BMJ* 1997, **314:**1311-17.

24. United Nations Development Programme. Human Development Report 2006. New York: UNDP, 2006 http://undp.org/en/reports/global/hdr2006

25. World Health Organization (2002). Diet, Nutrition and prevention of Chronic Diseases: Report of a joint WHO/FAO expert consultation. WHO technical report series. Geneva, Switzerland; p 916.

26. World Health Organization Global Infobase. Ghana: Most recent national survey for chronic, non-communicable risk factors.
www.who.int/ncd sueveillance/infobase/web/infobasepolicymaker/reports...

27. World Health Organization, Media Centre (2010). WHO/Geneva
Telephone: +41 22 791 2222 E-mail: mediainquiries@who.int

28. World Health Organization, Mortality Country Factsheet 2006—Ghana.

www.who.int/whosis/mort/profiles/mort afro gha ghana.pdf

29. Zimet p, Alberti KG, & Shaw J. (2001). Global and Social Implicators of the Diabetes Epidemic. Nature 2001.

APPENDICES

Appendix 1 Questionnaire

Questionnaire on Prevalence of Risk Factors for Cardiovascular diseases among workers of the University of Ghana, Legon

	Question	Response
1	Respondents ID	□ □ □

2	Department/Faculty	
3	Interviewer ID	□ □ □
4	Date of completion of the questionnaire	□ □ □ □ □ □ □ □ d d m m y y y y
	Consent	**Response**
5	Consent has been read and obtained	Yes □ No □ **IF NO END**
	Demographic Information	**Response**
6	Sex	Male □ Female □
7	Age	Years □ □
8	What is the highest level of education you have attained?	No formal schooling □ Primary school □ JHS completed □ SHS completed □ Vocational school completed □ University completed □ Postgraduate degree □
9	What is your marital status?	Never Married □ Currently Married □ Divorced □ Widowed □ Cohabiting □ Separated □
10	Which of the following best	Academic staff □

	describes your staff classification at the University?	Non-academic staff □
	Knowledge	
11	What are cardiovascular diseases?	Please explain…… …… …… …… …… …… ……
12	List any risk factors for (causes of) cardiovascular disease you know about	1. 2. 3. 4. 5. 6.
13	Are you aware that these risk factors are preventable?	Yes □ No □
	Socio-economic status	
14	Taking the past year, can you	Below GHC500 □

	tell me your average monthly income?	GHC500 – GHC1000 □ GHC1000 – GHC2000 □ Above GHC2000 □
	Tobacco Use	**Response**
15	Do you currently smoke any tobacco products, such as cigarettes, cigars or pipes?	Yes □ No □ If NO go to Question 18
16	Do you currently smoke tobacco products daily?	Yes □ No □ If NO go to Question 19
17	How may sticks of cigarette do you smoke daily	□ □
18	During the past 7 days, on how many days did someone in your home or in your workplace smoke when you were present?	□ Don't Know □
	Alcohol Consumption	**Response**
19	Do you consume alcohol (such as beer, wine, spirits, fermented cider, akpeteshie, pito, palm wine or bitters)	Yes □ No □ If NO go to Question 23
20	Have you consumed an alcoholic drink within the past 3 months?	Yes □ No □

21	In the past 3 months, how frequently have you had at least one alcoholic drink?	Daily □ 5-6 days per week □ 1-4 days per week □ 1-3 days per month □ Less than once a month □
22	During the past 30 days, how many occasions have you had at least one alcoholic drink?	□ Don't Know □
	Diet	**Response**
23	In a typical week, on how many days do you eat fruits?	□ Don't Know □
24	How many servings of fruit do you eat on one of those days?	□ Don't Know □
25	In a typical week, on how many days do you eat vegetables?	□ Don't Know □
26	How many servings of vegetables do you eat on one of those days?	□ Don't Know □
27	On average, how many meals per week do you eat that were not prepared at a home?	□ Don't Know □
28	If yes, how often? How many times per week?	□ □ Don't Know □

	Physical Activity	**Response**
29	Do your **daily activities** involve moderate to vigorous intense activity that causes large increases in breathing or heart rate like brisk walking for at least 10 minutes continuously? E.g. walking, cycling	Yes No □ If NO go to Question 30
30	In a typical week, how many days do you do moderate to vigorous-intensity activities as part of your **daily activities?**	Number of days □
31	How much time do you spend doing moderate-intense activities on a typical day?	Hrs □ □ Min□ □
32	Do you do any moderate to vigorous-intensity **sports, fitness or recreationa**l **(leisure) activities** that cause large increases in breathing or heart rate [like running or football] for at least 10 minutes continuously?	Yes □ No □ If NO go to Question 35

33	In a typical week, how many days do you do vigorous-intensity sports, fitness or recreational (leisure) activities?	Number of days □
34	How much time do you spend doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical day?	Number of hours □ □
	History of Raised Blood Pressure	**Response**
35	Have you ever had your blood pressure measured by a doctor or other health worker?	Yes □ No □
36	Do you have raised blood pressure or hypertension?	Yes □ No □
37	Have you been told in the past 12 months that you have high blood pressure or hypertension?	Yes □ No □
38	Are you currently taking any treatments /advice for raised blood pressure prescribed by a	Yes □ No □

	doctor or other health worker?	
	History of Diabetes	**Response**
39	Have you ever had your blood sugar measured by a doctor or other health worker?	Yes □ No □
40	Do you have raised blood sugar?	Yes □ No □
41	Have you been told in the past 12 months that you have raised blood sugar?	Yes □ No □
42	Are you currently receiving any treatments/advice for diabetes prescribed by a doctor or other health worker? Yes □ No □	

Physical Measurements

	Height and Weight	**Response**
43	Interviewer ID	□ □ □
44	Device IDs for height and weight	Height □ □ Weight□ □

45	Height	Centimeters □ □ □ .□
46	Weight	Kg □ □ □ .□
47	For women: Are you pregnant?	Yes □ No □ If YES go to Question 51
	Waist and Hip	**Response**
48	Device ID for waist and hip	□ □
49	Waist circumference	Cm □ □ □ .□
50	Hip circumference	
	Blood Pressure	**Response**
51	Interviewer ID	□ □ □
52	Device ID for blood pressure	□ □
53	Reading 1	Systolic (mmHg) □ □ □ Diastolic (mmHg) □ □ □
54	Reading 2	Systolic (mmHg) □ □ □ Diastolic (mmHg) □ □ □
55	Reading 3	Systolic (mmHg) □ □ □ Diastolic (mmHg) □ □ □

56	During the past two weeks, have you been treated for raised blood pressure with drugs (medication) prescribed by a doctor or other health worker?	Yes □ No □
	Biochemical Measurements	
	Blood Glucose	**Response**
57	During the past 12 hours have you had anything to eat or drink, other than water?	Yes □ No □
58	Technician ID	□ □ □
59	Device ID	□ □
60	Time of day blood specimen taken (24 hour clock)	Hrs □ □ Min □ □
61	Fasting blood glucose [choose accordingly: mmol/l or mg/dl]	mmol/l □ □ .□ □ mg/dl □ □ □ .□
62	Today, have you taken insulin or other drugs (medication) that have been prescribed by a doctor or other health worker for raised blood glucose?	Yes □ No □
	Blood Lipids	**Response**
63	Device ID	□ □
64	Total cholesterol [Choose accordingly: mmol/l or mg/dl]	mmol/l □ □ .□ □ mg/dl □ □ □ .□
65	During the past two weeks, have you been treated for raised cholesterol with drugs (medication) prescribed by a doctor or other health worker?	Yes □ No □
66	Triglycerides	mmol/l □ □ .□ □ mg/dl □ □ □ .□

67	HDL Cholesterol	mmol/l □ .□ □ mg/dl □ □ □ .□

Appendix 2 Consent Form

INFORMED CONSENT FORM

Project Title

PREVALENCE OF RISK FACTORS OF CARDIOVASCULAR DISEASES AMONG WORKERS OF THE UNIVERSITY OF GHANA, LEGON

Institutional affiliation

Department of Epidemiology, School of Public Health, College of Health Sciences, University of Ghana, Legon

Background

Hello! My name is Ninette Yemoley Hayibor. I am a student from the School of Public Health, University of Ghana. I am conducting a study on the prevalence of risk factors of Cardiovascular Diseases among workers of the University of Ghana, Legon. The purpose of the study is to determine the prevalence of Hypertension (high blood pressure), Diabetes (high sugar levels), Hyperlipidaemia (high fat and cholesterol levels) and overweight and obesity among the workers and also to determine the knowledge of risk factors of the diseases.

Procedures

The study will involve asking some questions about Cardiovascular Diseases. It will take you thirty minutes to answer the questionnaire. In addition, your blood pressure, height, weight, waist and hip circumferences will be measured to determine the degree of overweight and Obesity. It will also involve the taking of blood to check your lipid (fat) and sugar levels. The equipment used in taking the blood is clean and completely safe. It has never been used before and will be thrown away after each test. 10ML of blood will be taken from your veins and analyzed at the Noguchi laboratory. Left over blood will be kept in the fridge for two weeks and discarded when the analysis is over. I will very much appreciate your participation in this study. This is purely an academic research which forms part of my work for the award of a Masters Degree.

Risks and Benefits

Taking blood samples will cause a little discomfort. However, results obtained will reveal the status of your health in relation to Cardiovascular Diseases. The information you provide will contribute to knowledge on possible factors contributing to Cardiovascular Diseases. The findings of the study will inform the regional health directorate about what behaviours to promote among workers to guard against Cardiovascular Diseases.

Right to refuse

Participation in this study is voluntary and you can choose not to answer any individual question or all the questions or the sampling of blood. You are at liberty to withdraw from the study any time. However, I will encourage you to fully participate since your opinions are important to help determine the prevalence of the above diseases in the University.

Anonymity and Confidentiality

I would like to assure you that whatever information you will provide or measurement taken will be handled with strict confidentiality and will be used purely for research purposes. Your responses will not be shared with anybody who is not part of the study team. Data analysis will be done at the aggregate level to ensure anonymity.

Dissemination of Results

The results of this study will be mailed to you, if you provide your address below.

Before taking consent

Do you have any questions you wish to ask about the study? Yes ☐ ☐

(If yes, questions to be noted below)

_____

_____

_____

_____

If you have questions later, you may contact **Dr. Ninette Y. Hayibor 0244293350**

Consent

I _____, declare that the purpose, procedures as well as risks and benefits of the study have been thoroughly explained to me in English language and I have understood.

I hereby agree to answer the questionnaire

Signature of participant _____ Date

_____/_____/_____

I agree to take part in the blood test

Signature of participant_____ Date _____/_____/

Interviewer's statement:

I, the undersigned, have explained this consent form to the subject in the English language that she/he understands the purpose of the study, procedures to be followed, as well as the risks and benefits involved. The subject has freely agreed to participate in the study.

Signature of Interviewer _____

Date _____/_____/_____

Address----------