RISK FACTORS FOR CARDIOVASCULAR DISEASE AMONG ZAMFARA STATE GOVERNMENT EMPLOYEES

BY

BAKO BINTA SULE

MPH/N-FELTP/MED/00015/2010-2011

DEPARTMENT OF COMMUNITY MEDICINE

AHMADU BELLO UNIVERSITY, ZARIA

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BEING A THESIS SUBMITTED TO THE DEPARTMENT OF COMMUNITY MEDICINE, AHMADU BELLO UNIVERSITY ZARIA, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF PUBLIC HEALTH (FIELD EPIDEMIOLOGY) DEGREE

FEBRUARY, 2014

CERTIFICATION

This thesis entitled "Risk factors of cardiovascular diseases among Zamfara state government employees"meet the regulations governing the award of the degree of Master of Public Health (Field Epidemiology) of Ahmadu Bello University, Zaria.

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Dean, Postgraduate School Signature and Date

ATTESTATION

I declare that the work in the thesis entitled “Risk factors of cardiovascular disease among Zamfara state government employees” A descriptive cross sectional study was performed by me in the Department of Community Medicine under the Supervision of Dr Aisha Abubakar and Dr. Aliyu.

The information derived from the literature has been duly acknowledged in the text and list of references provided. No part of this dissertation has been previously presented for another Degree or Diploma at any University.

Bako Binta Sule _____ _____

Name of Student Signature Date

DEDICATION

This thesis is dedicated to my parents, especially my Mum, my Family, for inspiring and supporting me through all my hurdles in life. My dear friends Zubair Ima, Jamila Shehu, Aisha Gubio, Peter adewuyi, & Dr Basheer Kanoma a cohort three resident who has been supportive of this work. It is also dedicated to all victims of cardiovascular disease.

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LIST OF ACRONYMS

AHA/NHLBI	American Heart Association/National Heart, Lung, & Blood institute
AIDS	Acquired Immune Deficiency Syndrome
ATP	Adult Treatment Panel US National Cholesterol Education Program
BMI	Body Mass index
BP)	Blood Pressure
CHD	Coronary Heart disease
CI	Confidence Interval
CM	Centimeters
DALYS	Disability adjusted life years
EU	European Union
HDL	High Density Lipoprotein
HIV	Human Immune Deficiency Virus
IDF	International Diabetes Federation
LDL	Low density Lipoproteins
LVH	left ventricular hypertrophy
MI	Myocardial infarction
mm/Hg	Millimeters per mercury
NFELTP	Nigeria Field Epidemiology & Laboratory Training Programme
NHLBI	National Heart, Lung, & Blood institute
NHLBI	National Heart, Lung, and Blood institute
Odds Ratio	Odds Ratio
PAD	peripheral arterial disease
PE	Physical Exercise
RCTs	Randomized control trials
RR	Relative risk
SSG	Office of the secretary to the state
WC	Waist Circumference
WHO	World Health Organization

SUMMARY

Cardiovascular disease (CVD) has become a common cause of death and disability in developing countries. According to the WHO it is expected that by 2020, 35% of all deaths in these nations will be due to CVD.

A cross-sectional descriptive study was conducted in the workplace, among Zamfara state government employees. Five hundred and eighty one respondents were selected from 11 state Ministries.

Set of interviewers administered questionnaires adopting the WHO step down approach was adopted to collect subjects' socio demographic data and risk factors for CVD. Data were analyzed using Epi info versions 7.

Mean ages were 42 years, ± 8 years, and the overall prevalence of Hypertension was 19%, 42% for isolated systolic blood pressure,28% isolated diastolic blood pressure. Systolic blood pressure positively correlates with age, years of smoking, diastolic BP, and total cholesterol levels (r=0.774, P=0.0000), (r=0.242, P=0.004153) (r=0.098, P. <0.005). But negatively correlates with BMI (r = -0.326 P= 0.032102) Sitting at work for >6 hours was statistically associated with increased diastolic blood pressure (OR: 2.153; 95% CI: 1.38-3.315) but not with systolic blood pressure.

However, knowledge of CVD, having first degree relatives with cardiovascular disease, taking fruits and vegetables daily, physical activities, cigarette smoking, adding extra salt to meal did not have significant effect.

The prevalence of systemic hypertension was 19%, isolated systolic blood pressure 42%, isolated diastolic blood pressure 28%, overweigh 63%, cigarette 26% smoking, dyslipidaemia 10%, abdominal obesity in females 56% and males 11% respectively.

Prevalence of Hypertension was consistent with the national NCD survey; however prevalence of overweight, abdominal obesity and cigarette smoking was higher than the national NCD survey.

Zamfara state civil service union should discourage long sitting hours in workplaces, and encourage overweigh and obese employees to lose weight.

Key words: Zamfara State, CVD, Government Employees, Risk factors.

CHAPTER ONE - INTRODUCTION

1.1 BACKGROUND

Cardiovascular diseases are a group of disorder of the heart and blood vessels which include Coronary heart disease, cerebrovascular disease, rheumatic heart disease, congenital heart disease, Deep vein thrombosis and pulmonary embolism.[1]

Cardiovascular diseases have reached a near epidemic proportion in Africa, according to WHO report 2002, [2] The World Health Organization has reported that the number of disability adjusted life years lost to cardiovascular disease in sub-Saharan Africa rose from 5.3 million for men and 6.3 million for women in 1990 to 6.5 million and 6.9 million in 2000, and could rise to 8.1 million and 7.9 million in 2010.[2]

In the past four decades Africa has witnessed increasing urbanization and changing lifestyles, factors which have in turn raised the incidence of non-communicable chronic diseases, especially cardiovascular diseases.[3] According to WHO 2002 report, Hypertension remains the most life threatening risk factor, with national prevalence's ranging between 15% and 30% in adults. A study done in Nigeria has indicate that 5% of deaths could be due to hypertension and that the reduction in attributable risk associated with treatment could be 2%, over 10 times higher than in the United states.[2]

The usual risk factor of obesity, inappropriate diet, physical inactivity, smoking, heavy drinking are all relevant in Africa. People often have multiple risk factors as shown in a recent publication from South Africa which reported 32.1% of men and18.9% of women over 30 had a 20% or higher likelihood of developing hypertension in the next 10 years.[2]

Another study in Gambia found that poor recording of demographic data hindered the smooth execution of a project for people with CVD disease. Surprisingly Africa has the lowest output

in the world of cardiovascular research.[3]

According to a study done in Northwest Nigeria, hypertension is the most common form of CVD in North Western Nigerians within 40-49 years of age group had the highest incidence of CVD. Hypertension, closely followed by stroke, is the most prevalent CVD while CHD is the least prevalent CVD observed in North Western Nigeria.[4]

1.2. PROBLEM STATEMENT

According to WHO estimates, in 2002, 16.7 million people around the globe die of cardiovascular diseases each year. Today, men, women, and children are at risk, and 80 percent of the burden is in low- and middle-income countries. By 2020 heart disease and stroke will become the leading cause of both death and disability worldwide, with the number of fatalities projected to increase to over 20 million a year and by 2030 to over 24 million a year.[5]

Data from the INTERHEART study showed that rates of CVD have risen greatly in low income and middle-income countries with about 80 percent of the burden occurring in these countries. Nine potentially modifiable risk factors associated with MI were Identified, these varied by population.[5]

CVD is a major contributor to the global burden of disease among the NCDs. Coronary heart disease (CHD) is likely to be the most common cause of DALY loss in 2020 as compared with its fifth position in 1991.[6]

Africa is suffering from a triple burden of disease, a combination of poverty-related infectious diseases, including human immunodeficiency virus (HIV) infection and (AIDS), violence-related injuries, and an increase in lifestyle- related non-communicable diseases (NCDs), associated with the demographic transition.[7]

The Global Burden of disease Study projected that 6.4 million deaths would occur due to CVD in the developing countries in 2020, in the age group of 30–69 years1. In addition to the increasing incidence of CVD, the early age at which it manifests in these populations is also contributing to the high CVD burden. Thus in 1990, 46.7% of CVD-related deaths in developing countries occurred below the age of 70 years, in contrast to only 22.8% in the high-income industrial countries.[6]

Globalization continues to affect societies everywhere in Africa; the risk transition seems to be gaining speed. The fact is that so-called "Western" risks no longer exist as such. There are only global risks, and risks faced by developing countries.

Nigeria is not immune to the growing tailwind of the 20th century globalization, affecting everywhere, today more people than ever before are exposed to products and patterns of long-term risks to the cardiovascular system than ever and other NCDs. Clinical diagnosis is generally poor due to poor screening services and inadequate infrastructure for all NCDs, therefore diagnosis is made late, which will invariably affect the prognosis. There is a growing middle class in Nigeria, exposed to different western diets, fast foods, and way of life. There is also a huge evidence of diminished physical activities, especially in the urban areas, due to easy access to cars and motorcycles. All these practices are known to promote cardiovascular diseases.

1.3. JUSTIFICATION FOR THE STUDY

Good quality epidemiological data is lacking in Nigeria on CVD, even though the prevalence of CVD is on the increase, disease surveillance data is very scanty therefore with such inadequate data sources, it is inevitable that the epidemiology of CVD in Sub-Saharan Africa will be poorly understood. Also knowledge of the risk factors for cardiovascular disease is largely derived from developed countries.

Government employees are productive workforce and a strong backbone of the economy, working to support the various ministries, however most of the job descriptions requires sitting for long hours, except for few cases, sedentary lifestyle is a known risk factors for developing cardiovascular disease. In addition to this cardiovascular risk communication and awareness is poor in the Nigeria and at the state level.

This study will provide information on cardiovascular disease risk factors in a population with a dearth of knowledge on cardiovascular disease, it would stimulate further research in cardiovascular medicine, may inform policy makers on the need to pay more attention to Non communicable diseases among government employees and will provide a basis for setting up control measures to tackle CVDs effectively.

1.4. RESEARCH QUESTIONS

The following are my research questions

- What is the prevalence of hypertension among Zamfara government employees?
- What is the prevalence of high cholesterol level among the study population?
- What is the prevalence of abdominal obesity?
- What is the prevalence of obesity?
- What is the prevalence of other risk factors, like cigarette smoking, sedentary life style?

1.5 GENERAL OBJECTIVE AND SPECIFIC OBJECTIVES

1.5.1 General Objectives

To assess risk factors for cardiovascular disease among state government employees in Zamfara state

1.5.2 Specific Objectives

1. To determine the knowledge of cardiovascular diseases & their risk factors among employees.
2. To determine the prevalence of high blood pressure among the study group.
3. To determine the prevalence of overweight and obesity among the study group.
4. To assess the prevalence of high cholesterol level among apparently healthy subjects.
5. To study the effect of alcohol, cigarette smoking, fruits and vegetable intake, sedentary lifestyle, and family history among first degree relatives on CVD risk.

CHAPTER TWO- LITERATURE REVIEW

2.0 LITERATURE REVIEW

The global rise in CVD is the result of an unprecedented transformation in the causes of morbidity and mortality during the 20th century. Known as the epidemiologic transition, this shift is driven by industrialization, urbanization, and associated lifestyle changes, and it is taking place in every part of the world among all races, ethnic groups, and cultures. The transition is divided into four basic stages: pestilence and famine, receding pandemics, degenerative and human-made diseases, and delayed degenerative diseases. A fifth stage, characterized by an epidemic of inactivity and obesity, may be emerging in some countries. Cardiovascular disease (CVD) is now the most common cause of death worldwide. Before 1900, infectious diseases and malnutrition were the most common causes of death throughout the world, and CVD was responsible for <10% of all deaths. Today CVD accounts for ~30% of deaths worldwide, including nearly 40% in high-income countries and about 28% in low- and middle-income countries.[10]

According to WHO estimates, in 2002, 16.7 million people around the globe die of cardiovascular diseases each year. This represents about 1/3 of all deaths globally by 2020 heart disease and stroke will become the leading cause of both death and disability worldwide, with the number of fatalities projected to increase to over 20 million a year and by 2030 to over 24 million a year. CVD causes 8.5 million deaths among women annually. It's the largest single cause of mortality among women, accounting for one-third of all deaths in women worldwide. In developing countries, half of all deaths of women over 50 are due to heart disease and stroke.[11]

CVD is the leading cause of death in Europe, accounting for over 4 million deaths each year. Nearly half (49 percent) of all deaths are from CVD (55 percent of deaths in women and 43

percent of deaths in men). About half of all deaths from CVD are from CHD and nearly one-third are from stroke CVD is the leading cause of death in the European Union, accounting for over 1.5 million deaths each year. Nearly half (42 percent) of all deaths in the EU are from CVD 46 percent of deaths in women and 38 percent of deaths in men.[10] Between one-third and one-half of deaths from CVD are from CHD and over one-fourth are from stroke[11].CVD causes 8.5 million deaths among women annually. It's the largest single cause of mortality among women, accounting for one-third of all deaths in women Worldwide. In developing countries, half of all deaths of women over 50 are due to heart disease and stroke[12]

Projections suggest that for CHD, the mortality for all developing countries will increase by 120% for women and 137% for men. Predictions for the next two decades include tripling of CHD and stroke mortality in Latin America, the Middle East, and even sub-Saharan Africa, a rate of increase that exceeds that for any other region, except for Asian and Pacific Island countries. By contrast, the increase in more-developed nations, largely attributable to an expansion of the population of older people at risk, will range between 30% and 60 %[13].The WHO predicts 11.1 million deaths from coronary heart disease in 2020[14], about 21 percent of CHD globally is attributable to body mass index (BMI) above 21 kg/m2, about 22 percent of CHD globally is caused by physical inactivity.[12]

Data from the INTERHEART study showed that rates of CVD have risen greatly in low-income and middle-income countries with about 80 percent of the burden occurring in these countries. Nine potentially modifiable risk factors associated with MI were identified. These varied by populations. Approaches to prevention have the potential to prevent premature cases of MI.[10]

Sub-Saharan Africa remains largely in the first phase of the epidemiologic transition, with CVD rates half of those in high-income nations. Life expectancy has decreased by an average of five years since the early 1990s largely because of HIV/AIDS and other chronic diseases, according to the World Bank; life expectancies are the lowest in the world. While HIV/AIDS is the leading overall cause of death in this region, CVD is the third leading killer and is first among those over the age of 30. Hypertension is now a major public health concern and has resulted in stroke being the dominant form of CVD. Rheumatic heart disease remains an important cause of CVD mortality and morbidity.[14]

Cardiovascular disease (CVD) is no longer an entity of Western nations, but has become a common cause of death and disability in developing countries. It is expected that by 2020, 35% of all deaths in these nations will be due to CVD. Therefore, educational efforts to reduce exposure to risk factors for CVD and, at the same time, treat those who already are affected are imperative. The resources in developing nations are limited; consequently, implementation of health policies depends on cost and effectiveness.[14]

Systemic arterial hypertension, a major risk factor for stroke and heart disease, causes approximately 50% of CVD morbidity and mortality worldwide. It is known that left ventricular hypertrophy (LVH) is a strong risk marker for all-cause mortality, cardiovascular death, and incidence of coronary artery disease and ventricular arrhythmia in hypertensive patients.[15]

Cardiovascular risk is the product of the effect of several risk factors. Individual risk factors can cluster together in significant patterns and tend to have a multiplicative effect on an individual's total cardiovascular risk. Measuring any single risk factor will usually not adequately estimate total cardiovascular risk.[16]

Cardiovascular disease has a multifactorial etiology with a number of potentially modifiable risk factors. The classical Framingham risk factors, age, sex, cigarette smoking, blood pressure, total cholesterol and high density lipoprotein (HDL) cholesterol have proved consistent risk factors in every population studied. Various ethnic groups may display differences in population. The incidence and Mortality rates from acute myocardial infarction in those aged under 65 are higher in deprived areas than in more affluent areas.[16]

The INTERHEART study assessed the importance of risk factors for coronary artery disease worldwide, modifiable risk factors, accounted for more than 90% of the proportion of the risk for acute myocardial infarction. Smoking, history of hypertension or diabetes, waist hip ratio, dietary pattern, physical activity, alcohol consumption, blood lipoproteins and psychosocial factors were identified as the key risk factors. The effect of these risk factors was consistent in men and women Worldwide; the two most important modifiable cardiovascular risk factors are smoking and abnormal lipids. Hypertension, diabetes, psychosocial factors and abdominal obesity are the next most important but their relative effects vary in different regions of the world across different geographic regions and by ethnic group. The British Regional Heart Study also found that smoking, blood pressure and cholesterol accounted for 90% of attributable risk of coronary heart.[16, 17]

Ecologic analyses of major CVD risk factors and mortality demonstrate high correlations between expected and observed mortality rates for the three main risk factors—smoking, serum cholesterol, and hypertension—and suggest that many of the regional variations are based on differences in conventional risk factors.[15]

2.1 BEHAVIORAL RISK FACTORS FOR CARDIOVASCULAR DISEASE

2.1.1 Knowledge of Cardiovascular Diseases

Prevention of CVD is the most effective way of combating the CVD epidemic in the resource poor nations. Knowledge of the predisposing risk factors is an important method of targeting preventive educational strategies involves measuring and appropriately disseminating knowledge of the modifiable risk factors. Earlier studies have revealed that education programs for the elderly were effective in improving health promotion knowledge and behaviors. Although knowledge alone is insufficient, it is assumed to be a key component of behavioral change decision making, [18, 19] and provides cues for action. Estimating the level of knowledge of the population at large as well as those suffering from CVD can help to guide public health programs especially those directed towards reducing modifiable risk factors for CASHD. The level of knowledge of risk factors for CASHD varies among different populations.[20, 21]

In investigations in the western world, such as in Canada, shows that individuals at greater risk of cardiovascular disease are elderly and those with low education levels and are least able to recall risk factors associated with CASHD.[22]

Similarly, in the UK, South Asian families were less likely to take regular exercise, and had a lower awareness of cholesterol or dietary content (fiber, sugar, salt) compared to the native white population.[23, 24]

A similar study in Saudi Arabia shows that physically inactive people were least aware of their risk of CASHD.[25] A lack of cardiovascular health knowledge in the general population in Pakistan that reports limited knowledge of modifiable risk factors of heart disease in patients who had experienced an acute myocardial infarction. This Pakistani study isolated

specific demographic factors that correlate with lower knowledge of CVD risk factors, such as fewer than ten years of formal education, current usage of tobacco, and a nuclear family. [26]

A study done in neighboring India has also identified the poor knowledge among a sampled Indian population regarding modifiable risk factors of CVD, especially DM and study notably reveals certain characteristics that are significant predictors of poor knowledge levels of modifiable risk factors. Participants who reported low levels of routine exercise and who are current smokers had a significant poor knowledge level. [27]

2.1.2 Active Smoking

Every year, more than 5.5 trillion cigarettes are produced—enough to provide every person on the planet with 1,000 cigarettes. Worldwide, 1.2 billion people smoked in 2000, a number that is projected to increase to 1.6 billion by 2030. Tobacco currently causes an estimated 5 million deaths annually (9% of all deaths). If current smoking patterns continue, by 2030 the global burden of disease attributable to tobacco will reach 10 million deaths annually.[28]

The consumption of cigarettes and other tobacco products and exposure to tobacco smoke are the world's leading preventable cause of death. Tobacco use is responsible for about 5 million deaths a year, mostly in poor countries and poor populations.[17]

According to a study done by Framingham tobacco smoking is strongly and dose-dependently associated with all cardiovascular events, including CHD, stroke, peripheral arterial disease (PAD) and cardiovascular death. Men who smoke are three times more likely to die aged 45-64 years, and twice as likely to die aged 65-84 years than non-smokers[16].Smokers of all ages have death rates 2-3 times higher than nonsmokers.[17]

The additional risk of cardiovascular disease conferred by smoking is mediated by the number of cigarettes smoked. A large case control study noted the strong relation between

risks of Myocardial infarction (MI) and number of cigarettes smoked, with individuals who smoked over 40 cigarettes per day having almost ten times the relative risk of MI as non-smokers (odds ratio 9.16, 99% CI 6.18 to 13.58)[18]

According to estimates of the British Heart Foundation, about 22 percent of CVD deaths in men and 4 percent of CVD deaths in women living in Europe are due to smoking. The equivalent figures for the EU are 16 percent for men and 4 percent for women.[19]

A World Bank Study estimates that the health care costs associated with tobacco-related Illnesses result in a net loss of 200 billion U.S. dollars per year, half occurring in developing countries.[20]

The global tobacco epidemic is predicted to prematurely claim the lives of some 250 million, Children and adolescents, a third of who are in developing countries.[29]

A case control study involving 587 case subjects and 2,685 controls who smoked cigarettes with known tar yields indicated that smoking higher-yield cigarettes is associated with an increased risk of MI. The study revealed a dose-response relationship between total tar consumption per day and MI. The odds ratios for subjects smoking medium- and high compared with low-tar-yield cigarettes were 1.86 (95% CI 1.21 to 2.87) and 2.21 (95% CI 1.47 to 3.34), respectively.[30]

The impact of tobacco-related disease and death until recently has been a problem mainly for developed countries, but the WHO now estimates that by 2020, 7 of every 10 tobacco related deaths will be in the developing world[11]**.**

A unique feature of low- and middle-income countries is easy access to smoking during the early stages of the epidemiologic transition due to the availability of relatively inexpensive tobacco product.[14]

2.1.3 Physical Inactivity

Every year, more than 2 million deaths are attributable to physical inactivity worldwide. Physical inactivity doubles the risk of developing heart disease and increases the risk of hypertension by 30 percent. It also doubles the risk of dying from CVD and stroke.[12]

Physical activity has been defined as any bodily movement that results in energy expenditure. Physical activity can be categorized as occupational (physical activity at work), leisure time (non-occupational physical activity), exercise (physical activity that is structured and done for a specific reason) and active living (e.g. non-recreational walking, housework and gardening).Physical activity is commonly described as having three dimensions: duration (e.g. minutes, hours), frequency (e.g. times per week or month) and intensity (e.g. rate of energy expenditure).Regular activity has both preventive and therapeutic effects on many chronic conditions such as CHD, stroke, cancer, musculoskeletal disorders, obesity, diabetes and mental illness.[10]

From 60 to 85 percent of the world population from both developed and developing countries is not physically active enough to gain health benefits and about one-third of young people are active enough to benefit their health. The prevalence of inactivity is greater among teenage girls. In Europe only 3 countries offer at least 2 hours per week of physical education courses. In the United States, daily participation in high school PE classes dropped from 42 percent in 1991 to 29 percent in 1999.[12]

The increased mechanization that accompanies the economic transition leads to a shift from physically demanding, agriculture-based work to largely sedentary industry- and office-based work. In the United States, approximately one-quarter of the population does not participate in any leisure-time physical activity, and only 22% report engaging in sustained physical activity for at least 30 min on five or more days per week (the current recommendation).

In contrast, in countries like China, physical activity is still integral to everyday life. Approximately 90% of the urban population walks or rides a bicycle to work, shopping, or school daily.[14]

Ten observational studies that examined the effects of physical activity on CVD, after controlling for other key risk factors, were identified. All studies (or specific elements of the studies) confirmed an inverse relationship between physical activity and the risk of a coronary event. Effect sizes ranged from non-significant relationships for specific types of activity (e.g. active commuting; hazard ratio=1.08, 95% CI 0.95 to 1.23) to highly significant associations (e.g. men who ran for an hour or more per week had a 42% risk reduction, RR 0.58, 95% CI 0.44 to 0.77) compared with men who did not run.[10]

One well conducted case control study reported a multivariate odds ratio of 0.51 (95% CI 0.29 to 0.90) when comparing low levels of occupational physical activity against higher levels. Similar results were reported for leisure time activity. This suggests that physical activity can reduce the risk of a coronary event, when all other major risk factors are controlled for, by as much as a half.[10]

2.1.3 Overweight and Obesity

An expert group convened by the WHO in June 1997 found that overweight and obesity represent a rapidly growing threat to the health of populations in an increasing number of Countries worldwide. The WHO recognized obesity as a disease that is prevalent in both developing and developed countries and that affect children and adults alike.[29]

The current prevalence of overweight and obesity has reached unprecedented levels, and the annual rate of increase in most developing regions is substantial.[30]

There are more than 1 billion overweight adults worldwide and at least 300 million who are clinically obese[11].Obesity rates have tripled or more in some parts of North America, Eastern Europe, the Middle East, the Pacific Islands, Australia and China since 1980.[11]

In the 1990s CVD was the leading cause of death in China, accounting for one-third of total deaths. Despite lower BMI levels and rates of overweight, the prevalence of hypertension, high fasting serum glucose, high total blood cholesterol and low HDL cholesterol and their clustering were all raised with increases in BMI or waist circumference.[11]

The WHO predicts that unless action is taken, by 2020 there will be 5 million deaths attributable to overweight and obesity, compared to 3 million now.[31]

Recent rates of increase indicate that in India, the proportion of people overweight (including those who are obese) will increase from 9% to 24% between 1995 and 2025. Overweight is also set to rise in China. Projections indicate that by 2025, 37% of men and 40% of women will be overweight, compared to 8% and 12% in 1995.[11]

One systematic review of RCTs of diet to reduce weight which evaluated the effect on blood pressure was identified. Only small numbers of patients were included in the trials (six trials including 361 participants).Dietary interventions to reduce weight were moderately effective at reducing blood pressure. Diets producing weight loss in the range 3% to 9% body weight were partially associated with blood pressure reductions of about 3 mm Hg systolic and diastolic. The review had insufficient power to detect differences in morbidity or mortality outcomes.[32]

Other studies have shown that improvements in blood pressure, lipid profile and glucose handling are produced by maintained weight loss, and it is possible to extrapolate these to the reduction of the cardiac events that would be predicted by risk analysis.[33]

Obesity appears to coexist with under nutrition and malnutrition. Although the prevalence of obesity in low- and middle-income countries is certainly less than among high-income countries, it is on the rise in the former, as well. For example, a survey undertaken in 1998 found that as many as 58% of African women living in south Africa may be overweight or obese.[29]

2.1.4 Metabolic Syndrome

The metabolic syndrome is characterized by insulin resistance and visceral obesity and is associated with hypertension, impaired glucose handling, lipid abnormalities and a variety of more subtle metabolic and thrombotic anomalies.[16]

The lipid profile mirrors that of diabetes, with small, dense LDL, low HDL, and raised triglycerides, and is highly atherogenic .Individuals with the metabolic syndrome have a cardiovascular risk approaching that of full diabetes and should be treated accordingly the natural progression of untreated metabolic syndrome is to develop overt type 2 diabetes.[16]

The diagnostic criteria for metabolic syndrome vary, with different definitions available from the World Health Organization (WHO), International Diabetes Federation85 (IDF), and the US National Cholesterol Education Program Adult Treatment Panel86 (ATP). The ATP definitions were updated in 2005 by the American Heart Association/National Heart, Lung, and Blood institute 87 (AHA/NHLBI).[34] The AHA/NHLBI and IDF definitions are most recent and are very similar, identifying many of the same individuals.

The AHA/NHLBI and IDF define metabolic syndrome as any three of the following, increased waist circumference (≥102 cm in men and ≥88 cm in women; ≥90 cm for Asian men and ≥ 80 cm in Asian women), indicating central obesity elevated triglycerides (≥1.7 mmol/l) decreased HDL cholesterol (<1.03 mmol/l for men,<1.29 mmol/l for women) blood

pressure above 130/85 mm Hg or active treatment for hypertension fasting plasma glucose level above 5.6 mmol/l or active treatment for hyperglycemia.[34]

Asians have a genetic predisposition to the syndrome. Action to prevent or reverse excess weight gain will prevent or sometimes even reverse the metabolic abnormalities and hypertension. Weight reduction often requires an exercise programme as well as dietary intervention, since these individuals commonly have a low basal metabolic rate. Insulin sensitizing drugs (e.g., metformin, glitazones) are known to be effective in centrally obese patients with overt Diabetes, and may also be useful in patients with metabolic syndrome and at high risk.[35]

2.1.5 Diet

Availability of calories per capita from the mid-1960s to 1997-99 increased globally by about 450 kcal/capita/day and in developing countries by 600 kcal/capita/day. This change was not equal across regions. Per capita supply of calories remained almost stagnant in Sub-Saharan Africa and showed a decreasing trend in the transition countries. In contrast, the per capita supply of energy rose dramatically in East Asia (mainly in China) and in the near East/North Africa.[36]

Eating fruit and vegetables can prevent cardiovascular diseases, however low intake is responsible for 31 percent of CHD and 11 percent of stroke worldwide.[17]

The current production and consumption of vegetables vary widely among regions. The highest available vegetable supply is in Asia and the lowest in South America and Africa. Only a small and negligible minority of the world's population consumes at present the generally recommended high average intakes of fruits and vegetables. The availability of fruit generally decreased between 1990 and 1998 in most regions of the world.[11]

A dietary pattern low in total fat, saturated fatty acids, and dietary cholesterol, and rich in fruits, vegetables, and low-fat dairy products can produce blood pressure reductions exceeding 11/5 mm Hg in people at higher cardiovascular risk. Weight loss, the restriction of dietary sodium, and regular intake of oily fish may enhance these effects.[37]

A meta-analysis of 28 trials on the effect of moderate salt reduction on blood pressure demonstrated that a modest reduction in salt intake for four or more weeks has a significant effect on blood pressure in both hypertensive and normotensive individuals. The pooled estimates of blood pressure fall were 4.96/2.73 ± 0.40/0.24 mm Hg in hypertensive patients ($p<0.001$ for both systolic and diastolic) and 2.03/0.97 ± 0.27/0.21 mm Hg in normotensive individuals ($p<0.001$ for both systolic and diastolic). [37]

A reduction of salt intake of 6 g per day (100 mmol or 2.3 g sodium per day) predicted a fall in blood pressure of 7.11/3.88 mm Hg ($p<0.001$ for both systolic and diastolic) in hypertensive patients and 3.57/1.66 mm Hg in normotensive individuals (systolic: $p<0.001$; diastolic: $p<0.05$).[38]

A Cochrane review of advice to reduce salt intake lasting at least six months, also reported small but significant benefits to blood pressure. However long term maintenance of low sodium diets was difficult for individuals, even with considerable advice, support and encouragement .[38]

Another Cochrane review of salt restriction for the prevention of CHD cited too few cardiovascular events in the trials of at least six months duration to make a clear conclusion. It did report a small but significant reduction in systolic blood pressure in participants who had followed a salt-restricted diet and, reductions were greater in subgroups with hypertension.[39]

A Cochrane review of 27 trials (18,196 participants) examined the effect of reduction or modification of dietary fats for at least six months on reducing serum cholesterol levels and on total and cardiovascular mortality and morbidity. The review included trials of high (seven), moderate (six) and low risk (14) participants.[40]

Trials involving high risk participants included men only. There was no significant effect on total mortality (rate ratio 0.98, 95% CI 0.86 to1.12), a trend towards protection from cardiovascular mortality (rate ratio 0.91, 95% CI 0.77 to 1.07), and significant protection from cardiovascular events (rate ratio 0.84, 95% CI 0.72 to 0.99).[41]

Diets rich in fruit and vegetables tend also to be low in fat. Two systematic reviews of cohort studies examined the benefits of fruit and vegetable consumption for the reduction of CHD risk. There is evidence from cohort studies to support reduced CHD event rates from increased vegetable (risk ratio 0.77) and fruit (risk ratio 0.86).[42]

Intake in one review, 55 and 15% reduced relative risk of CHD in those consuming high levels of fruit and vegetables compared to those consuming low levels (equivalent to a four-fold increase in fruit and doubling of vegetables) in another.[3]

2.2 METABOLIC RISK FACTORS

2.2.1 Hypertension

Worldwide, high blood pressure is estimated to cause 7.1 million deaths; about 13 percent of the global fatality total.[11] Across WHO regions, research indicate that about 62 percent of Strokes and 49 percent of heart attacks are caused by high blood pressure. The WHO estimates that 600 million people with high blood pressure are at risk of heart attack, stroke and cardiac failure.[43]About 15-37 percent of the global adult population has hypertension. In those older than age 60, as many as one-half in some populations are hypertensive.[11] Women

with hypertension have a risk of developing CHD that is 3.5 times that of females with normal blood pressure.[12]

About 140 million people in the Americas suffer from hypertension. In Mexico (1997) female deaths from hypertension surpassed those for males, starting at age 35. The prevalence of hypertension in Latin America and the Caribbean has been estimated at between 8 and 30% In England, 37 percent of men and 34percent of women have high blood pressure (140/90mmHg or higher) or are being treated for hypertension. Almost 80 percent of men and 70 percent of women with HBP are not being treated. Of those being treated, over 60 percent remain hypertensive.[44]

In Africa the prevalence of hypertension is estimated at 20 million. Some 250,000 deaths could be prevented each year through effective case management. Hypertension-related Stroke rate is high in Africa, and victims are relatively young.[45] In South Africa, a 1998 survey found that 36.6% of women known to be hypertensive had their illness controlled with medication. In general, awareness of hypertension and use of medication increased with income. Hypertension was only half as common among rural as among urban women.[46]

In Asia, a steep increase in stroke mortality has accompanied a rapid rise in the prevalence of hypertension. Projections suggest that in China, hypertension will increase from 18.6% to 25% between 1995 and 2025. In India, the equivalent figures are16.3% to 19.4%.[11]

Elevated blood pressure (BP) increases the risk of CHD, heart failure, stroke and renal failure, systematic reviews of trials of antihypertensive drugs versus placebo have shown that blood Pressure lowering is associated with reductions in CHD, stroke, heart failure, and cardiovascular and total mortality.[47]

Lowering blood pressure has been shown to reduce the risk of both cardiovascular and total mortality, without adverse effect on quality of life. Trials of antihypertensive drugs show a similar relative reduction in coronary heart disease risk of 15-25% and reduction in ischemic stroke risk of 30-40%.[47]

2.2.2 High Cholesterol Level

High blood cholesterol is estimated to cause about 4.4 million deaths (7.9 percent of total).This amounts to 18 percent of strokes and 56 percent of global CHD. High blood cholesterol causes more than 4 million premature deaths a year.[11]

The link between cardiovascular risk and variation in blood lipid concentration was shown in a study of over 356,000 men aged 35-57 years who were followed up for six years. The study demonstrated a continuous, graded, strong relationship between serum cholesterol and six year age adjusted CHD mortality. This relationship persisted in smokers and non-smokers, people with and without hypertension and was evident irrespective of the presence or absence of vascular disease.[48]

Low density lipoprotein (LDL) cholesterol usually makes up 60-70% of total serum cholesterol and the strong relationship between total cholesterol level and CHD suggests that LDL cholesterol is a powerful risk factor[49] the role of LDL cholesterol in atherosclerosis is confirmed by studies carried out in individuals with genetic disorders that result in extreme elevations of cholesterol levels, such as familial hypercholesterolemia. These individuals tend to develop premature CHD with evidence of advanced atherosclerosis even in the absence of any other risk factor for coronary disease.[50]

Epidemiological evidence has shown that populations with higher cholesterol levels experience more atherosclerosis and CHD than populations with lower levels187 and the higher the level of cholesterol, the greater the risk of a coronary even.[48]

CHAPTER THREE – METHODOLOGY

3.1 BACKGROUND OF THE STUDY AREA

Zamfara state was created on 1st October 1996 by the then late General Sani Abacha government. It is located in the North-Western part of Nigeria, has a population of 3,815,888 and covers a land area of 38,418 sqkm representing about 4% of the land mass of Nigeria. It is situated towards the extreme northwest portion of Nigeria, lying between latitudes 10' 52" and 13' 10" to the north, as well as longitudes 4' 40"and 7' 10" to the east. It is bordered by Katsina state in the east, Niger state and partly Kebbi state on the south, and on the north by Sokoto state and republic of Niger. The state has 14 LGA's namely Anka, Bakura, Bukkuyum, Bugundu, Birnin magaji, Gummi, Gusau, Kaura namoda, Maradun, Maru, Shinkafi, Talata-mafara, Tsafe and Zurmi. The state has a mixed population of state government, employees and farmers. It has 147 wards, 17 emirate councils.

Gusau is the administrative capital of the state, currently experiencing economic transition and rapid lifestyle changes. Routine cardiovascular disease screening is not provided by the state. Zamfara State has a total of 513 Health Facilities (public and private) In 17 emirate councils. There are 22 ministries, in the state under Head of service of the state.

3.2 STUDY DESIGN

Cross-sectional descriptive study.

3.3 STUDY POPULATION

Zamfara state government employees in Gusau City.

3.3.1 Inclusion Criteria

Civil Servant Aged 25-65yrs who consented.

3.3.2 Exclusion Criteria

Civil servants not willing to participate.

- Pregnant women and Medical unfit persons with edema, ascites and those who cannot stand straight for weight and height measurement.

3.4 SAMPLE SIZE DETERMINATION

Leslie and Kish formula for cross-sectional survey[8]

$$n = \frac{Z\alpha^2 pq}{d^2}$$

Where: n = Minimum sample size

Zα at 5% significant level put together = 1.96

p = [prevalence of Hypertension at 39%]

Sample size determination

d = level of precision (5%)

q = 1- p

$$n = \frac{\left[1.96^2 \times 0.39 \times 0.6\right]}{0.05^2}$$

n= 0.08892/0.05²

n = 528

Adjusting for non-response rate of 10%;

n= 581

Sample size estimate = 581

- Our estimated sample size is 580 at 95% CI
- Sample Size = 581

3.5 SAMPLING TECHNIQUE

Two-stage sampling technique, there are 22 ministries under Head of service of the state.

- *first stage* **:**Simple Random Sampling to select 11 from the 22 Ministries,
- The following Ministries were selected at stage 1 [Women affairs & Children, Water resources, Works, Board of internal revenue ,Health, Local government & chieftaincy affairs, Environment, Land & Survey, Finance, Education, and SSG]
- *At second stage*: Probability proportionate to size to allocate the appropriate number of respondents to be recruited per ministry largest proportion of the respondents were from Ministry of Women and Children Affairs 19%, followed by Local Government Chieftaincy affairs 10%, Ministry of water resources 10%, Education 9.8%, office of the secretary of state 8%, Ministry of Environment 7.3%, Finance 7%, Works 7%, Health 6% and Ministry of Lands and survey 2.4%
- *At second stage* simple random sampling was used to select respondents using simple lottery method, participants were meant to draw ball wraps made from paper with either yes or no concealed inside the balls, those who chose yes were selected for the study, this was done across all ministries to select participants allocated to the ministries until our sample size was reached.

3.6 STUDY INSTRUMENT

A structured interviewer administered questionnaire adopting the WHO step-down questionnaire, was administered to the respondents, followed by anthropometric

measurement to determine blood pressure, BMI, abdominal obesity and total serum cholesterol.

3.7 SCORING OF CVDS AND MODIFIABLE RISK FACTORS

Knowledge of CVD and risks factors of respondents by using knowledge score of 0- 4, score of zero (0) as no knowledge, score of one (1) as knowledge of one disease or one risk factor, score of two (2) as knowledge of two diseases and risk factors, score of 3 as knowledge of 3 diseases and risk factors, and score of four (4) knowledge of 4 diseases or risk factors, then using the scores knowledge is graded into good knowledge when the score is ≥3 and poor knowledge when the score < 3.

3.8 DATA COLLECTION METHOD

A structured interviewer administered questionnaire adopting the WHO step-down questionnaire, was administered to the respondents. Respondents were asked about socio-demographic characteristics and risk factors.

3.9 BEHAVIOURAL RISK FACTORS

History of cigarette smoking (currently smoking, no of cigarette smoked per day, years of smoking), History of fruits and vegetable intake daily, History of soft- drink and beverage intake daily, vigorous physical activity in a week, sitting at work for greater than 6 hours, family history of CVD in first degree relatives, salt intake (using extra salt on cooked meals). and relevant medical histories (History of Diabetes, Hypertension, Heart attack)

- Questionnaire outline
- Step 1:
- Section 1: Socio-demographic characteristics of respondents

- Section 2: Knowledge on Cardiovascular disease
- risk factors for cardiovascular disease
- Section 3: Assessment of dietary habits
- Section 4: Assessment of physical activity/exercise
- Section 5: Assessment of dietary habits
- Section 6: Tobacco use
- Other Risk factors
- Section 7: Risk prevention behaviors

Step II**:**

- Anthropometry (body weight, height, abdominal circumference
- Blood pressure measurement
- Blood Collection (for total Cholesterol)

Then Physical measurements included blood pressure, weight and height (to derive body mass index [BMI]), Waist circumference and two drops of Blood was collected from the participants for serum Cholesterol.

A total of 581 questionnaires were administered to apparently healthy civil servants from 11 Ministries in Zamfara state, all respondents responded participated, giving a response rate of 100%.

Blood pressure was measured using (Omron BP785, 10 series) digital blood pressure machines, with expandable cuff for those whose who are overweight and obese. Prior to the

Blood pressure measurements, respondents were seated and rested for 5 minutes. Respondents were made to sit on a chair with their feet flat on the floor, the left arm relaxed and the forearm was supported at the cubical fossa, so that the cuff around the arm will be at the same level with the heart, then the cuff was placed just above the elbow, in relation to the brachial artery.

Then the START button was pressed, and the system light turns on and the unit starts monitoring the readings using a dual sensor and inflating the cuff. If the unit is accurate and functioning correctly, the calibration Check System light remains lit during the measurement. When the measurement is completed, the cuff deflates and the blood pressure and pulse rate appear on display.

Omron automatically takes three consecutive readings one minute apart and displays the average. Omron Blood pressure machine, automatically double check each reading, providing added reassurance that each reading is accurate. Blood pressure was then classified based on WHO classification as Mild, Moderate and severe.

Weight was classified based on WHO classification as normal (BMI 18.5-24.9 kg/m^2), underweight (BMI < 18.5 kg/m^2), overweight (BMI 25-29.9 kg/m^2) and obese (BMI $\geq$ 30 kg/m^2).

Weight was measured in kilograms with respondents standing barefooted in their minimal clothing with their pockets free of objects that might add to their weights, such as mobile phones, wallet, keys, and hand bags for the ladies.

Bathroom weighing (Hanson, China) which was validated daily using a known 10kg mass, checked for zero error after each measurement. A stadiometer was used to measure the height, the stadiometer was hanged against the wall, the respondents were barefooted and

without headgear, or caps were made to stand against the wall, with their occiput, Achilles and gluteus muscle touching the wall.

A pointer (ruler) was pressed against the scalp and the measurement was read from the hanged stadiometer corresponding to the pointer, the pointer was used as a guide for accurate readings.

Then the third next measurement, conducted on all respondents was waist circumference measurement to determine abdominal obesity. Waist circumference of all the respondents was measured using a measuring tape, waist circumference was measured in (cm). The respondents were made to stand straight, with their abdominal muscles relaxed, the tape was placed mid-way between the hip bone and the base of the ribs, and wrap around the waistline starting from 0cm, the tape was not too tight and not too loose, the number that will meet 0cm after the tape has circled the entire waistline is the waist measurement of the respondent.

Total cholesterol test was offered to every fourth respondent, after a brief explanation of the procedures to the respondents that are eligible for test. Then in this study serum cholesterol test was performed with a hand-held machine, named Multicare IN (Cholesterol kit 23950) which has been approved by the American society of heart (AHA) it uses same technology as the glucometer, to provide test results at the point of care. The multicare machine is switch on once the respondent is ready, the finger tips are swabbed with cotton ball soaked in alcohol, then and the test strip was placed into the slot provided on the multicare machine waiting for the multicare machine to indicate when to put the drop of blood on the strip. The finger is pricked with a sterile lancet and the first drop of blood is cleaned off, the machine then gives a signal (icon) that looks like a droplet of liquid and the second blood drop is placed on the strip.

The meter starts reading immediately given a countdown in seconds once the sample hits the strip and the meter detects it. It takes about 30-40 seconds to complete. Once it's done the meter makes a tone, or beep, when it has the reading ready, and the reading is shown in mg/dl on the screen. The reading is save until it is deleted, the machine goes off automatically once is not in use.

A total of 174 respondents had their serum cholesterol measured in this study. Then the Cholesterol levels were classified according to American Heart association.

3.10 DATA MANAGEMENT

Data was cleaned for consistencies and analyzed using Microsoft Office Excel 2007 and Epi Info version 7software.

3.11 MEASUREMENT OF VARIABLES

Using the structured questionnaires, data were collected on the following variables

Exposure variables	**Outcome variables**
Age	Systolic BP
Sex	Diastolic BP
Physical activity	Overweight
Educational status	Underweight
Salt intake	Systemic BP
Knowledge	Obesity
Job activity	Body mass index
Tobacco smoking	Blood pressure
Job cadre	High Cholesterol
Diet	Abdominal obesity

3.12 STATISTICAL ANALYSIS

Univariate analysis was carried out to obtain frequencies and proportions for data summary. Bivariate analysis and multiple linear regression analysis were conducted using 2 X 2 tables to examine the strength of associations from the odds ratios. Fischer's exact (P) values were used for statistical significance and inferences

3.13 ETHICAL CONSIDERATION

Ethical permit was obtained from the National Health research ethics committee of Nigeria (NHREC) and department Research and statistics, Zamfara state Ministry of Health. Informed consent was sought from the respondents.

3.14 LIMITATION

History of alcohol intake was not taken in this study, because of the sensitivity and controversy it may generate in a state guided by Islamic law (Sharia law). Cardiovascular disease risk ratio could not be calculated because High density lipoprotein and low density lipoprotein were not obtained. Awareness of history of CVD among first degree relatives, and dietary recalls could affect the completeness of data.

CHAPTER FOUR – RESULTS

A total of 581 questionnaires were administered and all the study participants responded appropriately giving a response rate of 100%. A total of 174 participants had their total cholesterol tested.

4.1 Table 1: Socio-demographic Characteristics of State government Employees in Zamfara State

Parameter	**Frequency**	**%**	**(n=581)**
Sex			
Female	64	11	
Male	517	89	
Age			
26-34	126	22	
35-44	206	35	
44-52	161	28	
53-61	85	15	
62-70	2	0.3	
>70	1	0.2	
Mean	42 (± 8.6)		
Educational Status			
College	191	33	
University	186	32	
Secondary School	110	19	
Primary School	99	17	
Normal Education	87	15	
PGD	52	9	
Marital Status	47	7	
Married	523	90	
Single	36	6	
Widowed	12	2	
Divorced	8	0.7	
Marital Status	47	7	

✱ **Missing value are not included**

Table 1: Majority of the respondents are males 89%, married 90%, within the age groups 26-34,22 %,35-44,35% ,44-52,28% and51-61,15% respectively**.** Majority of the respondents have had some of formal education 91%, only 9% of the respondents have no formal education, majority have attended college 33%, 19% have university degrees and 7% have post graduate degrees.

4.2 Table 2: Knowledge score on the number of cardiovascular diseases the respondents are aware of

Scores	n	%	n= 366
1	239	65	
2	44	12	
3	75	20	
4	8	2.19	

✱ Missing value are not included

Table 2: The mean knowledge score on the number of CVDs the respondents were aware of is 1.5056 ± 0.8854. Most of the respondents 65% were aware of one disease. Majority of the respondents 77% have poor knowledge (score <3) and 23 % have fairly good knowledge (≥3)

4.3 Table 3: Knowledge of modifiable risk factors among respondents

Scores	n	%	n=509
0	316	56	
1	206	35	
2	26	4	
3	40	7	
4	2	0.3	

✱ Missing value are not included

Table 3: The mean knowledge score of the respondents on modifiable risk factors is 0.763, ± 0.8736, among the respondents 93% have poor knowledge (score <3) and only 8% have good knowledge of cardiovascular disease risk.

4.4 Table 4: Distribution of BMI among Respondents

Parameters	n	Mean	Female	Male	p value
Age (Yrs)	581	42 ± 8.6	43.4±10	42.1 ± 8.5	0.01
Systole (mmHg)	577	137 ± 20.8	138 ±20	137 ± 20	0.95
Diastole (mmHg)	576	81.5 ± 4.7	84 ± 15	81 ± 14	0.44
Cholesterol mg/dl	174	48.9 ± 77.7	83 ± 92	45 ± 74	0.012
BMI (Kg/m2)	579	26.4 ± 4.7	28 ± 6	26 ± 5	**<0.001**
WC (cm)	573	86.25 ± 18.3	92 ± 22	85 ± 17	**0.0004**

✱ **Missing value are not included**

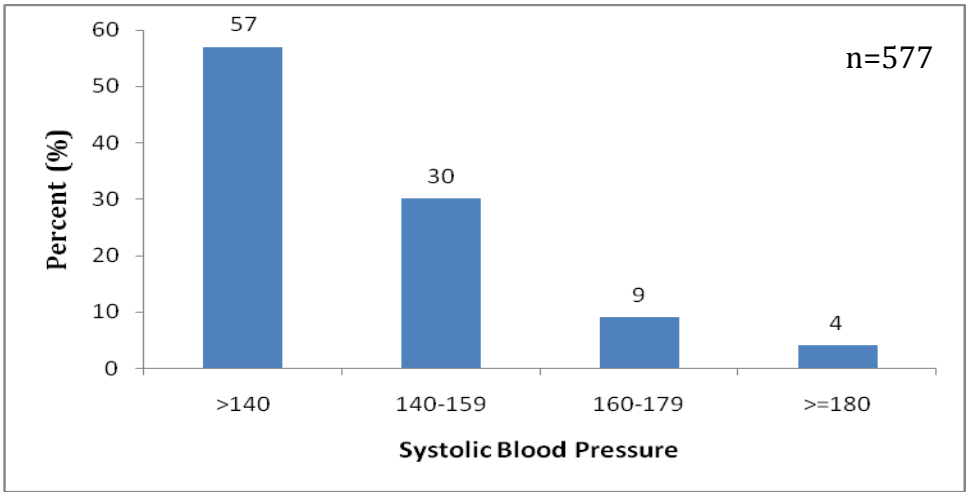
Table 4: Using 2-sampled t-test to to detect the gender difference among the participants, age, diastolic blood pressure, and systolic blood pressure were not statistically different between males and females. However females had a significantly higher BMI and waist circumference than males

4.5 Table 5: Distribution of Blood Pressure among respondents

Variables	Frequency	%	(n=577)
Systole<140mm/Hg	329	57	
Systole ≥ 140mm/Hg	248	42	
Diastole<90mm/Hg	410	71	
Diastole ≥90mm/Hg	165	28	
≥140/190mm/Hg	109	19	

✱ **Missing value are not included**

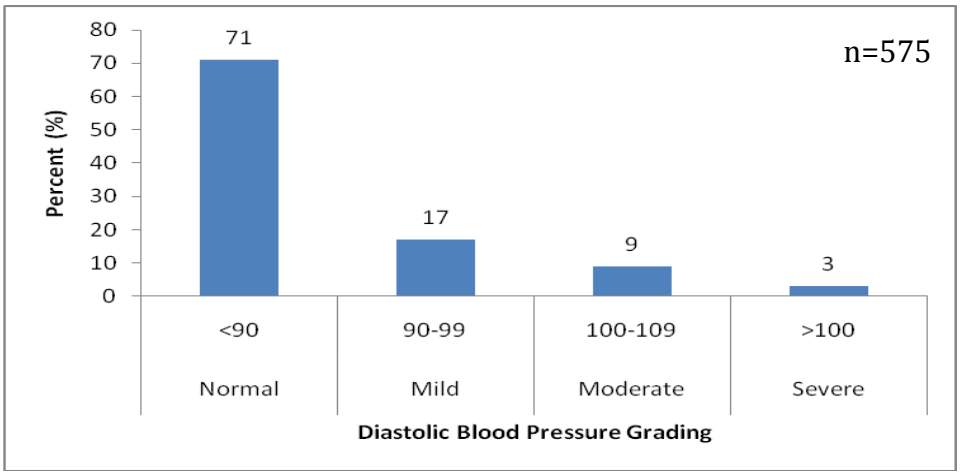
Table 5: Shows distribution of the575 respondents examined, 57% had normal systolic blood pressure, 71% had normal diastolic blood pressure, 42% had systolic blood pressure greater or equal to 140mm/Hg, 28% had diastolic blood pressure ≥90mm/Hg, and 19% of respondents had Blood pressure ≥ 140/90mm/hg among the state government employees.



✱ **Missing value are not included**

4.6 Fig 6: Systolic Blood Pressure Distribution among respondent

Based on WHO systolic blood pressure classification of the 577 Systolic blood pressure measured (57%) 329 had normal Blood pressure, 174 (30%) had mild systolic Hypertension, 51(9%) had moderate systolic blood pressure and 23 (4%) had severe systolic blood pressure**.**



✱ **Missing value are not included**

4.7 Fig 7: Distribution of Diastolic Blood Pressure among respondent

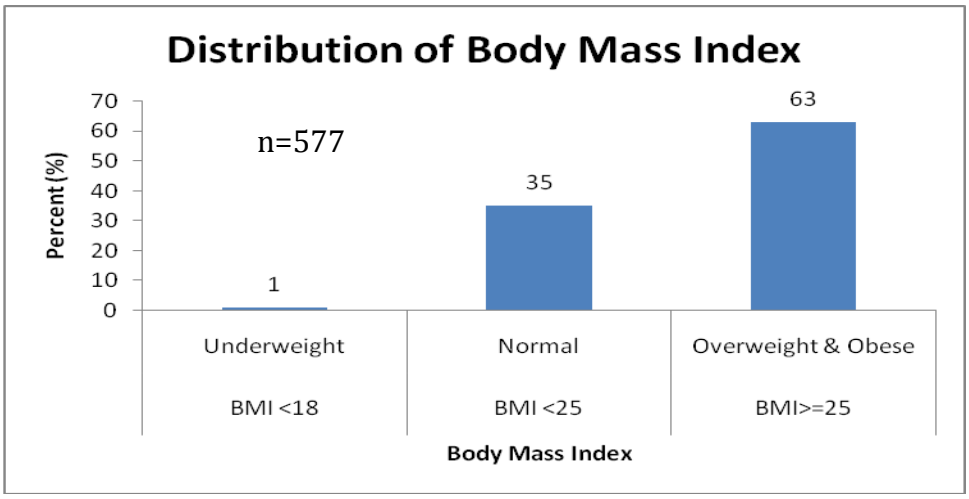
Based on WHO Diastolic blood pressure classification of the 576 diastolic blood measured 411 (71%) had normal Diastolic blood pressure, 100 (17%) 0f the respondents had mild diastolic blood pressure,52 (9%) had moderate diastolic blood pressure and (14) 2% had severe diastolic blood pressure.

4.8 Table 8: Classification of BMI among respondents

Weight	Female	Male	Total	p value	n=577
Normal BMI (BMI 18-25)	24	239	263	<0.00001	
Underweight (BMI<18.5)	0	7	7	<0.00001	
Overweight (BMI 25-30)	22	160	182	<0.00001	
Obesity (BMI 30-<39.9)	13	107	120	<0.00001	
Morbid Obesity BMI >40	4	1	5	<0.00001	

✱ **Missing value are not included**

Table 8: According WHO classification of BMI 46% of the respondents had normal weight, males were more likely to be underweight than females (P <0.0001) females were more like to be overweight, obese and morbidly obese (P <0.0001).



✱ Missing value are not included

4.9: Figure 9: Shows distribution of BMI

Of the 577 respondents examined 7 of 577 (1%) were underweight, 212 (35%) had BMI < 25 and 365 (63%) of 577 were either overweight or obese.

4.10: Table 10: Distribution of Waist Circumference among Females

Variable	Waist Circumference	Frequency	%	n=62
	WC < 88cm	27	43	
	WC >88cm	35	56	

✱ Missing value are not included

Table 4.10: Waist circumference of female respondent was classified according to American National institute of Heart (NIH) normal (<88 cm) abdominal obesity (>88 cm). The 62 female respondents, 37 (56%) had abnormally large waist circumference and 27 (43%) had normal WC.

4.11 Table 11: Distribution of Waist Circumference among Males

Variable	Waist Circumference	Frequency	%	n=509
	WC < 102	451	89	
	WC >102	58	11	

✱ Missing value are not included

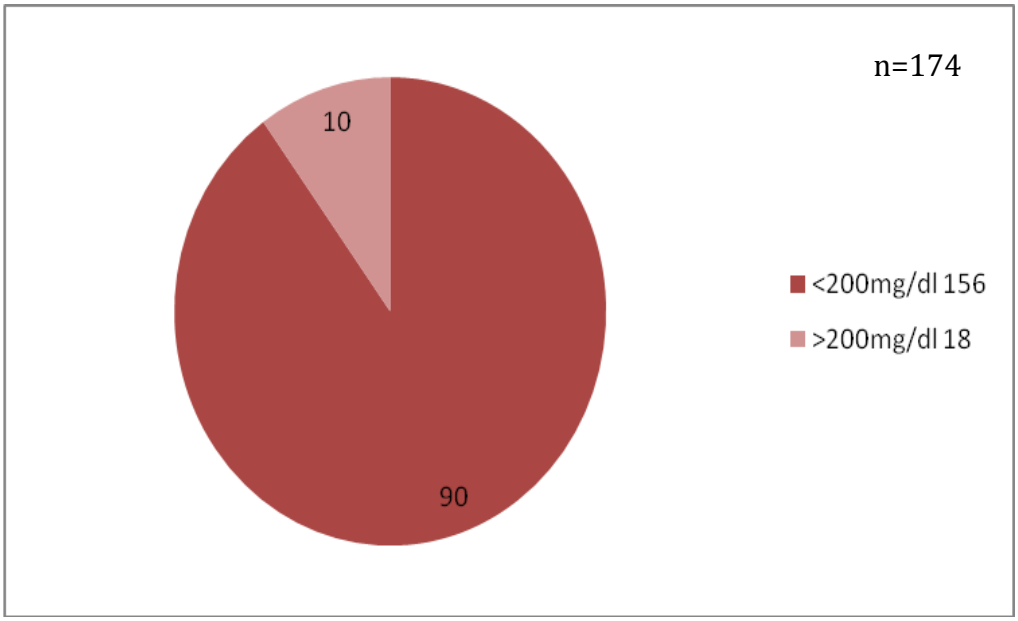
Table 11: Waist conference was classified as < 102cm normal and >102cm as abdominal obesity according to American national institute of Heart (NIH). The 509 respondents measured, 58 (11%) had abdominal obesity and 451 (89%) had normal waist circumference**.**

4.12: Table 12: Distribution of Waist circumference among males and Females

WC	Normal	%	Abnormal n=564
Male	451	51	11
Female	27	35	56

***Missing value are not included**

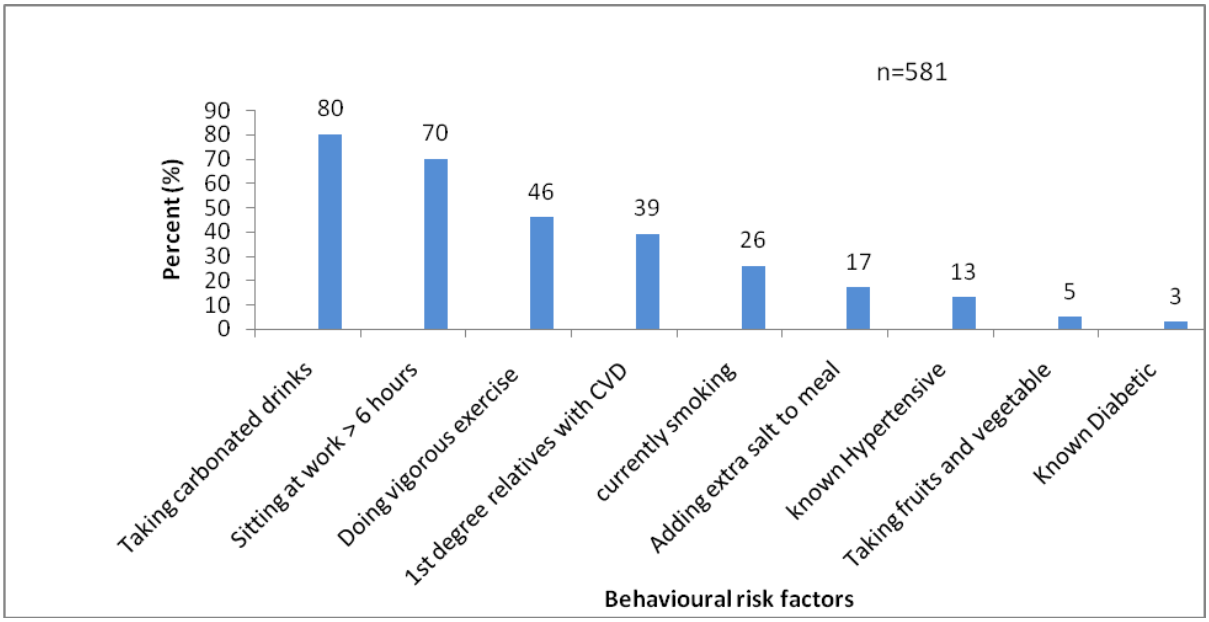
Table 12: Waist circumference of female respondent was classified according to American National institute of Heart (NIH) <102 cm normal for males and <88 cm normal for females, of the 62 female respondents 37 (56%) had abdominal obesity and only 11% (51) of 502 males had abdominal obesity.



✱ **Missing value are not included**

4.13 Figure 13: Distribution of Serum Cholesterol among respondents

Figure 13: Using American Heart association Cholesterol classification, 18 of 174 (10%) had high Cholesterol levels and 156 of 174 (90%) had normal Cholesterol.



✱ **Missing value are not included**

4.14 Figure: 14: Behavioral Risk Factors for CVD

Fig 14: Distribution of risk factors among 577 respondents, 80% take carbonated drinks daily, 70% sit at work for more than 6 hours daily, 46% are involved in vigorous exercise, 39% have first degree relative with CVD, 26% are currently smoking, 17% add extra salt to their meal, 13% are known hypertensive, and 3% are diabetics

4.15 Table 15: Bivariate Analysis of Cardiovascular Disease Risk Factors

Variable		Exposure & Outcome		OR	Lower 95% CI	Higher 95% CI	n	p value
	Age	Systole <140	Systole >=140					
Systole/Age	<40	95	188					
	>=40	32	162	**2.686**	**1.909**	**3.77**	577	0.001
		BMI						
	Age	<25	BMI >=25					
Age/BMI	<40	120	164	1.6242	1.1543	2.2855		0.006
	>=40	91	202				577	
	Age	<90mm/hg	>=90mm/hg					
Age	<40	179	46	2.0391	1.377	3.0181		0.001
Diastole	>=40	229	120				574	
	Cigarette	Systole <140	Systole >=140					
	<10	323	240					
							577	
Cigarette/Systole	>=10	6	8	0.1176	0.037	0.368		<0.000
Soft Drinks/Systole	Soft Dinks	Systole <140	Systole >=140					
	Yes	45	52	1.1538	0.7395	1.8003		0.563
	No	174	232				503	
	Knowledge	Diastole <90mm/hg	>=90mm/hg					
Knowledge/Diastole	<3	151	383					
	>=3	14	27	1.25	0.7213	2.1662	575	0.496

Table 15 Continue:

	Knowledge	Systole <140	Systole >=140					
	<3	118	162					
							362	
Knowledge/Systole	>=3	39	43	0.8031	0.49	1.3163		0.447
		Diastole <90mm/hg	>=90mm/hg					
	PA <3 /days	110	153	0.9169	0.6584	1.277		0.613
							577	
Physical activity/Diastole	PA>=3 /days	138	176					
		BMI<25	BMI>=25					
	Yes	21	10					
							492	
BMI/Fruits	No	129	332	1.2338	0.5694	2.6734		0.307
		Diastole <90mm/hg	>=90mm/hg					
	Yes	31	71					
Extra salt							563	
&Diastole	No	129	332	1.1237	0.7035	1.7905		
		Systole <140	Systole >=140					
		Systole <140	Systole >=140					
	Yes	49	53					
							564	
extra salt /Systole	No	193	269	1.2886	0.8381	1.9813		0.270
		Systole <140	Systole >=140					
		Diastole <90mm/hg	>=90mm/hg					

Table 15 Continue:

1st Degree relative/Diastole	Yes	61	162					
	No	96	244	0.957	0.6562	1.3959	563	0.895
		Diastole <90mm/hg	>=90mm/hg					
	Yes	135	265					
Sitting at work >6 hours/Diastole	No	31	132	**2.153**	**1.383**	**3.3515**	563	**0.0051**
	Sex	BMI<25	BMI>=25					
	F	49	14					
	M	318	196					
Sex/BMI				**2.0142**	**1.0822**	**3.7486**	577	**0.0127**
		Cholesterol >=200	Cholesterol <200					
Cholesterol/Sex	F	5	59					
	M	14	96	**3.2855**	**1.1314**	**9.5412**	174	**0.054**
		Systole <14 0	Systole >=140					
systole/fruits	Yes	230	30					
	No	41	33	0.7246	0.3404	1.5423	330	0.402

✱ Missing value are not included

4.15: Table 15: In this study bivariate analysis was used to determine statistical association between exposure and outcome variables. The exposure variables in this study were modifiable and none modifiable risk factors which include: Sitting at work for >6 hours, smoking > 10 sticks of cigarette per day (from a similar study among pregnant smokers) [51], adding extra salt to cooked meal, taking carbonated drinks daily, taking fruits & vegetables daily, physical activity, knowledge of CVDs and their risk factors, having first degree relatives with Cardiovascular disease, sex, cholesterol >200mg/dl, BMI >25 m/kg.

The outcome variables in this study were systolic blood pressure ≥140 / mm/Hg, diastole ≥90 mm/Hg, cholesterol ≥200mg/dl, BMI ≥25 m/kg. Based on bivariate analysis age was statistically associated with systolic Hypertension and higher BMI, those 40 years and older were more likely to have higher diastolic blood pressure, (OR: 2.039; 95% CI: 1.377-3.0181) Sitting at sitting at work for > 6 hours was statistically associated with diastolic Blood pressure (OR: 2.153; 95% CI: 1.38-3.315) Smokers were less likely to have BMI > 25m/kg (OR: 0.649; 95% CI: 0.4403-0.9555) Females were more likely to have a higher Cholesterol than their males counterparts (OR:3.2855:95% CI:1.1314-9.5412) Females were also more likely to be overweight and obese (OR: 2.0142; 95% CI: 1.08-3.7486)

However having first degree relatives with cardiovascular disease, taking fruits and vegetables daily, physical activities, cigarette smoking, taking carbonated drinks daily, adding extra salt to meal, knowledge of cardiovascular diseases were not statistical association with cardiovascular diseases measured in this study.

4.16 Table 16: Multiple Linear regression analysis

Variable	Coefficient	Std Error	F-test	p-value
Age	**0.774**	**0.082**	**89.6101**	**<0.0001**
BMI	-0.326	0.152	4.6158	0.032
Cholesterol	0.008	0.009	0.7039	0.402
Diastole	**0.711**	**0.051**	**194.5131**	**<0.0001**
Years of Smoking	0.242	0.119	4.1727	0.042
Waist Circumference	0.098	0.048	4.2157	0.041
CONSTANT	55.329	5.602	97.5539	<0.0001

✱ Missing value are not included

Table 16: Multiple linear Regressions showing the interrelationships between systolic blood pressure with the following variables (Age, BMI, Diastole, years of Smoking, and waist circumference) Age had a positive correlation with Systole,(r =0.774,P.0.0000) BMI and Systole were negatively correlated (r= - 0.326,P=0.0321) diastole, years of smoking, and waist circumference were positively correlated with systole.

CHAPTER FIVE – DISCUSSION

DISCUSSIONS

There is an emergence of chronic NCDs, including CVD in populations undergoing socioeconomic changes, and the rural sub-Saharan population is thought to be at an early stage of this epidemiological transition.[52] CVD and its risk factors can adversely affect quality of life. The presence and number of risk factors predict future cardiovascular events, especially heart attack and stroke in individuals with such risk factors.[53]

The overall prevalence of Hypertension (≥140/90mm/Hg) documented in this study was 19%, this study was similar to a study among lecturers in Port Harcourt teaching hospital, in Rivers state and in a rural communities in Edo state were 20.2%, 21.33% respectively.[9,54]

However the prevalent of isolated Systolic Hypertension was unfavorably high among civil servant 42% (≥140mm/Hg) this may be comparable with a study carried out in urban Lagos by the Nigerian Heart foundation in 2003 which document prevalence of 43.4%.[55]

In this study the prevalence of high systolic blood pressure of 42% and overall hypertension of 19% in this study may be explained by the advancing age of the respondents, mean ages of 41 years, This increase of blood pressure with age in the study is a known occurrence and has been reported elsewhere in Africa, [56] and also a recent study by Ejike et al in Kogi which showed that blood pressures increased with age and body mass index.[57]

In our study, 28% of respondents had isolated diastolic hypertension, this is similar to a study in Benin City among bike riders that documented prevalence of 25% of diastolic blood Pressure.[58] but dissimilar to a survey in urban Lagos supported by the Nigerian Heart foundation in 2003 by Onyemelukwe et al, which document prevalence of 40.5% .[55]

The high prevalence of isolated diastolic blood pressure may be explained by the high prevalence of systolic hypertension, because diastolic blood pressure positively correlates with systolic blood pressure, so the higher the systolic blood the higher the diastolic blood pressure as observed in this study. It may also be explained by age, because those 40 years and older were more likely to have higher diastolic blood pressure as seen in this study this may be explained in part to increased peripheral vascular resistance with increasing age. This may also be explained by the high prevalence of sitting at workplace for >6 which was found to be statistically associated with isolated diastolic pressure in our study.

High prevalence of overweight and obesity in this study may explained the high prevalence of hypertension, because available evidence also suggests that at any given level of arterial pressure, overweight patients with hypertension have a higher cardiac output and a **l**ower total peripheral vascular resistance than lean patients. The lower peripheral resistance associated with overweight patients may attenuate the rise in systolic blood pressure and modify the prevalence of isolated systolic hypertension with age by David et al, 2000.[59]

This high burden of high blood pressure in our study group may increase the risk of advanced cardiovascular activities which include coronary artery diseases, stroke, heart attack, and kidney failure which will put tremendous strain on the already stretched health system in this state.

In this study 80% of the government employees take carbonated drinks daily, this is dissimilar to another study in Lagos, by Onyemeluke et al, that documented 44.2%.[55] this may be due to poor dietary campaigns in this country as a whole. Also dissimilar to a study by Arulogu et al in 2011 that reported a lower prevalence 17.1% of consumption of carbonated drinks in a study among a younger population (undergraduates of the University of Ibadan, Nigeria).[60]

The high intake of carbonated drinks among the participants in this study may be explained by easy access to high energy drinks and foods, however the high intake of carbonated drinks in this study is of serious concern, considering the fact that apart from the increased impairment of glucose metabolism with advancement in age, epidemiological studies have provided evidence of a trend towards increased incidence and prevalence of type 2 African populations, linked to unhealthy eating habits and lifestyles (sequel to urbanization and industrialization), compared with the 1990s when it was considered a rare medical condition in sub-Sahara Africa according to Sobngwi et al.[61]

In this study 17% of the employees add extra salt to already cooked meal, this similar to the NCD, in Lagos by Oyemenluke et al, which documented 10% of extra salt.[55] The practice of adding extra salt to meal in this study may be attributed to the poor cardiovascular disease risk communication in the country as a whole which necessitate urgent need for strategic communication on the consequences of high salt intake, because studies have shown that reduction of salt intake is the most cost effective intervention in CVD prevention and management.

We also found 39% of the employees having first degree relatives with CVD this is similar to a study by Soyenkule et al in Lautech Ogbomoso where 35% of the participants had either of their first-degree relative (father or mother) hypertensive.[62] This is in contrast to the study by Oyemenluke et al, which reported 5% prevalence in Lagos state.[55] This may be attributed to the increasing prevalence in CVD noted across the globe.

The high prevalence of cardiovascular diseases among first degree relatives in this study may increase the prevalence of cardiovascular diseases in this population coupled with the high behavioral risk factors found because many reports have shown that essential hypertension is more common among the relatives of hypertensive patients, e.g. Studies in twins have shown

that a monozygotic twin of a hypertensive subject has a substantially greater risk of being hypertensive than a dizygotic twin, suggesting an important role for heredity in aetiology of blood pressure.[63]

This study has documented 26% prevalence of cigarette smoking among the employees, 10% were female which is (16% of females) and 90% were males (27% of males), the study also found lower risk of overweight and obesity among smokers. The prevalence of smoking among the study population was higher than the national prevalence from a World Bank survey in 2010 which documented prevalence of 10.4%.[64] however similar to a study among 11 to 16 year old adolescents in Boenos Aires, Argentina by Mulassi et al., in 2010 [65] which documented 29.4% prevalence of cigarette smoking, also comparable to what is obtainable in Eastern Mediterranean countries with prevalence of 28.8% in Morocco and Lebanon from a study by Kattab et al.[66]

This can be explained by the increase in cigarette smoking in the country as a whole, by Akinbode et al, which compare two surveys done in 2001 and 2008, which found prevalence of 9.1% in 2001 and 17-37% in 2008, the rise among one third was attributable to tobacco advertising, promotion and sponsorship, especially among the youth.[67]

High prevalence of cigarette smoking in this study may pose a higher cardiovascular risk because of second hand smoking among those exposed, which will inadvertently increasing the risk of CVD in this population because cigarette smoking hazards are extended beyond actual users, these exposure may lead to higher level of cardiovascular diseases among the entire population.

The prevalence of overweight (32%) and obesity (21%) recorded in the present study are comparable to 36.0% prevalence of overweight among senior civil servants in Kuala Lumpur and 33.4% for overweight reported among senior civil servants in Nepal,[68,69] and 22.4%

prevalence of obesity among lecturers in Port Harcourt teaching hospital.[9] Females were found to be more likely to be overweight and obese this is similar to a study found in Indian slum by Misra et al in India and Bakari et al in Northern Nigeria,[70,71] and dissimilar to a study by Oghagbon et al which reported a higher prevalence of overweight and obesity among males. [72]

In this study, older employees ≥40 years were more likely to be overweight and obese, compared to those <40 years this is comparable to a study by Lipowicz et al in Poland, which associated older age and weight. [73] The high prevalence of overweight and obesity among the study participants may be explained by high prevalence of sitting down among employees in their various workplaces and low physical activities, because 80% of the employees sit at work from 8am -4pm, but only 46% are involve in vigorous exercise, and of those who do not exercise 89% are females, this may also explain the higher Prevalence of overweight and obesity among females.

The high level of overweight and obesity coupled with high prevalence of behavioral risk factors may have serious Health impact on individuals, because carrying extra fat may have extra Health consequences in addition to Cardiovascular diseases, e.g. musculoskeletal disorders, cancers, leading to substantial disability.

This study has documented 10% elevated total serum cholesterol among the study population, females were found to be more likely to have a higher Cholesterol than their males counterparts this is dissimilar to population based survey among rural community in Southwest Nigeria which documented prevalence of 3.2% with little gender variation.[74] However this is similar to a study by Iloh et al, which documented prevalence of 7.8% among obsess patients attending a rural hospital in Imo state, southeastern Nigeria.[75]

This study has documented 10% elevated total serum cholesterol among the study population,

females were more likely to have a higher Cholesterol than their males counterparts, this is dissimilar to population based survey among rural community in Southwest Nigeria,[74] which documented prevalence of 3.2% with little gender variation. However this is similar to a study by Iloh et al, which documented prevalence of 7.8% among obese patients attending a rural hospital in Imo state, southeastern Nigeria, [75] this may be explained by high level of overweigh and obesity documented in this study. Our study has also documented positive correlation between total cholesterol and systolic Blood pressure.

The prevalence of abdominal obesity among the respondent was unfavorably higher among females, 56% among females (WC ≥ 88cm) and 11% among males (WC ≥ 102), this is similar to a study in Cameron which found higher abdominal obesity among females 66% (WC > 88 cm) was 18% in men (WC > 102 cm)[76] This is also similar to a study by Olajire et al, which found higher prevalence of abdominal obesity in females than males, 16.9% and 7.3%, respectively in a study conducted in rural southwest Nigeria.[74] The very high abdominal obesity documented among females in this study was similar a national Hypertension survey in Egypt , which documented 54.5% prevalence of abdominal obesity.[77]

High prevalence of abdominal obesity among females in this study may be explained by high prevalence of obesity and overweight among females coupled with lack of vigorous exercise among 89% of the female employees. High prevalence of abdominal obesity in this group especially among females may have detrimental health consequences because abdominal obesity has been linked to risk of dying prematurely, having diabetes and metabolic syndrome.

The study has demonstrates low level of knowledge of CVDs and their modifiable risk factors among the study participants. The poor knowledge of modifiable risk factors in this

study are consistent with the study by Iyalomhe et al in a cohort of Nigerian hypertensive's whose knowledge was found to be particularly poor.[78]

A relatively poor knowledge of modifiable risk factors for CVD disease was found in a study in Nigeria.[79] This is considerably different from what has been reported from a household survey in Canada where the knowledge base is high.[80] The poor knowledge seen among the study group may be explained by poor public enlightenment activities on CVDs in the country as a whole.

This study has demonstrated poor knowledge of cardiovascular diseases and their modifiable risk factors despite high prevalence of cardiovascular diseases and their risk factors among the study participants, this may lead to poor perception and delay in seeking care which in turn will increase cardiovascular disease mortality and morbidity in this population.

CHAPTER SIX – CONCLUSION AND RECOMMENDATIONS

CONCLUSION

The prevalence of systemic hypertension, isolated systolic blood pressure, isolated diastolic blood pressure overweigh, cigarette smoking, dyslipidaemia abdominal obesity in females and males was,19, 42%, 28%, 63%,26% ,10%, 56%, and 11% respectively.

In this study systolic blood pressure has shown consistent increase with age, diastole, years of smoking, and waist circumference. Diastolic blood pressure was higher among those living a sedentary life than those that are active, Females were more likely to be overweight, and obese and have higher cholesterol than their male's counterparts.

The study has highlighted a striking low level of CVD knowledge and its modifiable risk factors, The very low levels of knowledge despite the high prevalence of hypertension, overweight, abdominal obesity, dyslipidaemia and other behavioral risk factors is a matter of concern to the employers and the health sector.

6.2 RECOMMENDATIONS

1. Zamfara state civil service union and the state government should reduce sitting in the workplace through simple interventions (such as non-sweaty light activity during lunch breaks) for health and wellbeing.
2. Zamfara state civil service union and the state government should provide routine cardiovascular disease screenings for employee for early detection and referral of high risk employees.
3. Zamfara state civil service union should encourage overweight or obese individuals to lose weight through a combination of a reduced-energy diet (dietary advice) and increased physical activity.
4. Zamfara state civil service union and other stakeholders should create awareness of cardiovascular disease risk, prevention and management with a particular focus on behavioral risk factors, tailored to the needs of this population.

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Appendix i

Cardiovascular Disease Risk Assessment among Zamfara State Government Employees
Date:_____

		Response
	Questionnaire Number	
	Interviewer ID/Name	
1	Sex	M F
2	Age in Years	
4	Ministry	
5	Grade Level	
6	Marital Status	Single Married Separated Divorced Widowed Refused

7.	**Highest Level of Education Attained**
No formal schooling	
Less than primary school	
Primary school completed	
Secondary school completed	
High school completed	
College/University completed	
Post graduate degree	
Refused	

Appendix ii

Tobacco Use				
Question		**Response**		
8	Do you currently smoke tobacco products **daily or chew tobacco** Snuff, by mouth snuff by nose	Yes No Specify one		
9	How long have you been Smoking in Years			

10	On average how many sticks of cigarette do you smoke in a day	( ) Don't know	

CORE: Diet			
•			
Question		**Response**	
9	*Do you take fruits and vegetable daily*	Yes No	
10	In a typical week, on how many days do you **eat fruit**? From 0-5 days		
11a	What is your source of Protein	Beef, Chicken, Fish, Mutton	
11b	What is you Staple food	Tuwo Beans Rice Fura da nono	
12	What type of **oil or fat is most often** used for meal preparation in your household?	Vegetable oil G/Oil Palm Oil Others Don't know ***Appendix iii***	
	Do you take Mono sodium Glutamate/ Ajinomoto in your food	Yes No Don't Know	
13	On average, how many meals per week do you eat that were not prepared at a home? I mean breakfast, lunch and dinner.	**( )** **None** Don't know	
14a	Do you add additional salt to your food	Yes No	
14b	How many bottles of soft drinks do you take in a Day	**( )** **None** Don't know	

Appendix iv

EXPANDED: Physical Activity/ Sedentary behaviour			
15	Does your job entails sitting down all day?	Yes No	
16	How long do you have to sit at work daily in hours		
	Do you walk around for at least 30 minutes daily	Yes No	
17	Do you do any vigorous-intensity sports, fitness or recreational *(leisure)* activities that cause large increases in breathing or heart rate like *[running or football]* for at least 30 minutes continuously	Yes No	
18	typical week, on how many days do you do moderate-intensity sports, fitness or recreational *(leisure)* activities?	Number of days ( ) None	

History of Raised Blood Pressure/Diabetes			
20	Which of the Cardiovascular Diseases are you aware of	Hypertension Stroke Diabetes Atherosclerosis Heart Disease	
21	Do you have any First Degree relative who is Hypertensive/Diabetes/Stroke /Heart Disease	Yes No	
22	*Which of the cardiovascular Disease risk Factors are you aware*	Obesity Smoking Sedentary Life Style	
		Appendix v	
23	Are you are known Hypertensive	No Yes Don't Know	
24	Are you Taking any drug for Hypertension	No Yes	

25	If Yes which Drug are you taken for Hypertension		
26	Have you ever seen a traditional healer for raised blood pressure or hypertension?	Yes No	
27	Which Remedy are you Taken for High Blood Pressure		
28	*Are you are known Diabetic*	Yes No Don't Know	
	29. Are taken any drug for Diabetes	Yes No	
	30.Which Drug are you Taken for Diabetes		
	31. Have you ever seen a traditional healer for Diabetes?	Yes No	
	32. Which Remedy are you Taken for Diabetes		
	33.Do you have High Cholesterol	Yes No Don't Know	
	34 .Which Drug Are you taken for high Cholesterol		

35. **Physical Measurements**

Weight in Kg		
Height in Meter		
BMI		
Waist Circumference		
Cholesterol		

BP	
Systolic	
Diastolic	
Blood Pressure	

Appendix vii

Appendix viii