RISK FACTORS FOR CARDIOVASCULAR DISEASE AMONG THE INMATES IN KUJE FEDERAL PRISON, FEDERAL CAPITAL TERRITORY, ABUJA

BY

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A DISSERTATION SUBMITTED TO THE POSTGRADUATE SCHOOL, AHMADU BELLO UNIVERSITY ZARIA, IN PARTIAL FUFILLMENT FOR THE AWARD OF MASTERS DEGREE IN PUBLIC HEALTH IN FIELD EPIDEMIOLOGY (MPH Field Epid) DEPARTMENT OF COMMUNITY MEDICINE FACULTY OF MEDICINE AHMADU BELLO UNIVERSITY ZARIA

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ATTESTATION

I declare that the work in the thesis entitled "**Risk Factors for Cardiovascular Disease among the Inmates in Kuje Federal Prison, Federal Capital Territory, Abuja**" was performed by me in the Department of Community Medicine under the supervision of Prof K. Sabitu. The information derived from the literature has been duly acknowledged and a list of references provided. No part of this project has been previously presented for another degree or diploma at any university.

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Damaris Amarachukwu Osunkwo Date

CERTIFICATION

I certify that the work of this dissertation entitled "**Risk Factors for Cardiovascular Disease among the Inmates in Kuje Federal Prison, Federal Capital Territory, Abuja**"by Damaris Amarachukwu Osunkwo meets the regulations governing the award of the degree of Masters in Public Health Field Epidemiology of Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

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LIST OF ACRONYMS

AOR	–	Adjusted Odds Ratio
BMI	–	Body Mass Index
BP	–	Blood Pressure
BRFSS	–	Behavioral Risk Factors Surveillance System
CDC	–	Centers for Disease Control and Prevention
CDI	–	Chronic Disease Indicators
CHD	–	Coronary Heart disease
CI	–	Confidence Interval
CVD	–	Cardiovascular Disease
DBP	–	Diastolic Blood Pressure
JNC	–	Joint National Committee (*on Prevention, Detection, Evaluation and Treatment of High Blood Pressure*)
LMIC	–	Low and Middle Income Countries
NCCDPHP	–	National Center for Chronic Disease Prevention and Health Promotion
NCD	–	Non-Communicable Diseases
OR	–	Odds Ratio
SBP	–	Systolic Blood Pressure
SPSS	–	Statistical Package for Social Sciences
SSA	–	Sub-Saharan Africa
WHO	–	World Health Organization
UN	–	United Nations
χ^2	–	Chi-square

SUMMARY

The global burden of cardiovascular disease (CVD) is increasing and is among the leading cause of death, disability and loss of productivity. This may be caused by high blood pressure, smoking, diabetes, lack of exercise, obesity, high blood cholesterol, poor diet, and excessive alcohol consumption, among others.

The objectives were to determine the prevalence of hypertension, overweight and obesity, tobacco use, alcohol use, physical activity, diabetes and to assess the knowledge of the inmates about the cardiovascular risk factors.

This study on risk factors for cardiovascular disease was carried out among the inmates in Kuje Federal Prison, Federal Capital Territory, Abuja.

A cross sectional descriptive study design was used with a calculated sample size of 180. Systemic sampling was used to select the respondents. Data was collected with semi-structured interviewer administered questionnaire after obtaining consent and analyzed with Epi info version 7 and SPSS version 18.

The study showed that prevalence of hypertension was 18.8% which had significant association with age, marital status, ethnicity, Religion, first degree relative with hypertension and BMI. Prevalence of overweight and obesity were 33.4% and 7.2% respectively. Age, ethnicity, marital status, educational status, prison status, knowledge category and physical activity are significantly associated with body mass index. The prevalence of other risk factors was diabetics 0.5%, tobacco use 41%, alcohol use 0.0% and physical activity 94.4% (sufficient 52.8%, insufficient 41.7%). The general knowledge of the respondents about the cardiovascular risk factor was low. The percentage with high knowledge category was 37%, fair knowledge 35% and low knowledge 28%. However the

most known risk factor was stress 86.1%, followed by smoking 77.8%, then high blood pressure 71.7%, inactivity 71.1% and then Diabetes 69.4%.

Although the prevalence of hypertension, overweight and obesity and tobacco use were high, they were not higher than general population especially hypertension. In any case the prevalence of diabetes and alcohol use were very low.

However since most of these risk factors are modifiable it is therefore recommended to reduce the tobacco use by teaching tobacco cessation to the inmates. Regular blood pressure and blood sugar check will also help to detect the development of hypertension and diabetes. The knowledge of the inmates can be improved by organizing regular health education on cardiovascular risk factors by the health workers in the prison clinic.

KEY WORDS: Cardiovascular disease; cardiovascular risk factors; incarceration; prisoners

CHAPTER ONE

INTRODUCTION

1.1 Background

Cardiovascular disease (CVD) is a group of diseases involving the heart or blood vessels.[1] Cardiovascular disease includes coronary artery diseases (CAD) such as myocardial infarction and angina (commonly known as a heart attack).[1] The other cardiovascular diseases (CVDs) are stroke, rheumatic heart disease, hypertensive heart disease, heart arrhythmia, cardiomyopathy, congenital heart disease, carditis, valvular heart disease, aortic aneurysms, venous thrombosis and peripheral artery disease.[1,2]

Depending on the disease in question, the underlying mechanisms vary. Coronary artery disease, stroke, and peripheral artery disease involve atherosclerosis. This may be caused by high blood pressure, diabetes, smoking, obesity, poor diet, lack of exercise, high blood cholesterol and excessive alcohol consumption, among others. High blood pressure results in 13% of CVD deaths, while tobacco results in 9%, diabetes 6%, lack of exercise 6% and obesity 5%. Rheumatic heart disease may follow untreated streptococcal throat infection.[1] The global burden of cardiovascular disease (CVD) is on the increase and remains one of the leading causes of death, disability and loss of productivity.[3]

It is estimated that 17.3 million people died from CVD worldwide in 2008, accounting for almost 30% of all deaths. Approximately 80% of deaths from CVD occur in lower and middle income countries. A decline has been observed in the incidence rates of CVD in developed countries, however some evidence still point to the fact that CVD is still on the increase in developing countries.[3] It is estimated that in 2030, almost 23.6 million people will die from CVD and Africa as a developing continent seem to be the most vulnerable region[1].

An estimated 17.5 million people died from CVDs in 2012, this is according to global status report on non-communicable diseases 2014, representing 31% of all global deaths[1]. Of these deaths, an estimated 7.4 million were as a result of coronary heart disease and 6.7 million were due to stroke[1]. Over three quarters of CVD deaths take place in low and middle income countries. Out of the 16 million deaths under the age of 70 due to non-communicable diseases, 82% are in low and middle income countries and 37% are caused by CVDs. A report by the World Health Organization in 2002 showed that cardiovascular diseases are near epidemic proportion in Africa.[4] According to WHO, the number of disability adjusted life years lost to cardiovascular disease in sub-Sahara Africa increased from 5.3 million in Men and 6.3 million in women in 1990 to 6.5 million and 6.9million in 2000, and may further increase to 8.1 million and 7.9 million in 2010.[5]

In Africa, the rate of lifestyle changes and urbanization continues to increase especially in the past four decades; these factors have played a glaring role in increasing the incidence of non-communicable diseases particularly cardiovascular diseases.[5] Hypertension remains the most life threatening risk factor according to WHO 2002 report, with national prevalence ranging between 15% and 30% in adults. Other risk factors like obesity, smoking, inappropriate diet, heavy drinking, inactivity, are all relevant in Africa.[5] People often have multiple risk factors as reported in a publication from South Africa where 32.1% of men and 18.9% of women over 30 had a 20% or higher likelihood of developing hypertension in the next 10 years.[4]

Some persons stand a higher risk of cardiovascular disease than others. Several factors linked to an increased risk of CVD include the following; family history, age, cigarette smoking, sex, high blood pressure, excessive alcohol consumption, abnormal lipid and lipoproteins, physical inactivity, Obesity, high blood glucose and Overweight.[5] These cardiovascular risk factors which include hypertension, Diabetes Mellitus and obesity alongside their

complications accounted for 27% of all deaths in Nigeria, in 2008, and this keeps increasing rapidly on an annual basis.[6]

Knowledge about CVD,[7] behavioral risk factors[8] as well as Lifestyle impacts on the incidence and mortality rates of CVD among people. The Risk factors for CVD are widely classified as modifiable risk factors (e.g., obesity, hypercholesterolemia, smoking, hypertension, physical inactivity,[9] and non-modifiable risk factors (e.g. gender, age and heredity).Additionally, the link between psychosocial and socioeconomic factors with CVD[10] has also been explored. These findings therein have implications for preventive health service in correctional environments, known for their high incidence of stress, mental health challenges.

Population subgroups, such as ethnic minorities,[11] women[12] and prisoners[13] all seem to carry an irregular burden of CVD. A history of incarceration has been independently associated with disparities in access to health care and chronic diseases.[14] The prison environment is contributory to stress and as a result, this brings about a range of psychological as well as physical reactions such as depression, anxiety, hypertension, nervousness and hopelessness, all factors associated with the pathogenesis of CVD.[15]

Studies in the U.S,[16] the UK,[17] and Australia[18] seeking to address the health of incarcerated people have demonstrated that CVD is a common health problem among prisoners and that they are irregularly affected by it when put into comparison with the general population. In an integrative review, it was found that CVD was among the most commonly reported health conditions in older prisoners.[19] CVD among prisoners is also associated with a high mortality rate,[20] which in some cases exceeds national averages in some parts of the world, such as North America . In the U.S., between 2001 and 2009, 26% of all deaths were as a result of CVD and alongside cancer (23%) is regarded as the single cause of illness-related deaths in

prisons.[21] CVD among prisoners accounts for almost 34% of deaths and is one of the most common causes of death among prisoners[22] in places such as Canada;[23] Europe;[24] Russia;[25] and Australia[18]. In addition, a number of studies that have investigated the prevalence of lifestyle behaviors among prisoners such as smoking or tobacco use, exercise, obesity,[26] and psychological factors[27] demonstrated alarming high incidence rates of these behavioral factors. These studies are predominantly from North-American countries and Australia and very few have specifically investigated the link between these behavioral and lifestyle factors and CVD risk. Prisoners, as a result of certain conditions and characteristics in prisons, seem to be at a notably higher risk for CVD risk factors.

1.2 Problem Statement

Worldwide CVDs are the leading cause of death and disability in adults[3]. It increasingly affects people from developed as well as developing 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 at year.[4]

Over the coming decades the burden from CVDs is projected to rise particularly fast in the developing world, Nigeria inclusive.[28] An increasing burden of cardiovascular disease (CVD) is occurring in low- and middle-income countries (LMICs) as a result of urbanization and globalization. Low rates of awareness and treatment of risk factors worsen the prognosis in these countries.[29] Despite cardiovascular disease (CVD) being the leading cause of adult mortality in low-income countries, data on the prevalence of its risk factors are scarce, especially in sub-Saharan Africa (SSA).[30] The INTERHEART and INTERSTROKE studies showed that modifiable risk factors such as hypertension, obesity, smoking, dyslipidemia and diabetes, account for the majority of CVD in LMIC.[31,32]

Incarceration impacts the cardiovascular health of prisoners in significant ways while CVDs affect people of all nationalities, ages, and classes, unambiguous inequalities exist in the burden of these diseases between and within countries, affecting especially those in vulnerable situations (e.g. in prisons or detention).[33] Most of the 9.8 million people imprisoned worldwide[34] are from the poorest and most marginalized sections of society[35] and are therefore likely to be at greater risk for CVDs.[35] The key behavioral risk factors are tobacco use, unhealthy diet, physical inactivity and harmful use of alcohol. Cardiovascular diseases are common among prisoners because prisoners are more likely to smoke and to drink harmful amounts of alcohol than the general population. In the Nigerian prison system, prisoners are faced with problem of congestion, poor Medicare, long remand, over-stay and deplorable prison condition to mention but a few. The primary prevention and treatment of CVDs in prisons has largely been neglected and there have not been adequate studies in Nigeria.

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. Most of the information on the prevalence of CVD in prisons comes from high-income countries despite the fact that globally 80% of deaths from these diseases are in low-and middle-income countries including Nigeria. Prison populations contain a high prevalence of people with serious and often life-threatening conditions. Sooner or later most prisoners will return to the community, carrying back with them new diseases and untreated conditions that may pose a threat to community health and add to the burden of disease in the community. Thus there is a compelling interest on the part

of society that this vulnerable group receives health protection and treatment for any ill health. It is a fact that the majority of prisoners come from the poorest parts of society, with deficiencies in education and employment experience. In addition to this cardiovascular risk communication and awareness is poor in the prisoners. Although the population health burden from cardiovascular disease is highly considerable, there have not been adequate studies in prisoners in Nigeria and Prison setting favors most of the risk factors for CVD. Failure to promptly detect and treat prisoners' health problems leads to higher long-term public health consequences and healthcare costs. 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 prisoners and will provide a basis for setting up control measures to tackle CVDs effectively.

1.4 Research Questions

The following are my research questions

1. What is the prevalence of hypertension among inmates in Kuje prison?
2. What is the prevalence of overweight and obesity among Kuje prison inmates?
3. What is the prevalence of other risk factors, like tobacco use, physical activity and alcohol use in the study population?
4. What is the baseline knowledge of cardiovascular disease risk factors in the study population?

1.5 General and Specific Objectives

1.5.1 General objective

This study is aimed at assessing risk factors for cardiovascular disease among inmates in Kuje prison in Federal Capital Territory.

1.5.2 Specific objectives

1. To assess baseline knowledge on cardiovascular disease risk factors among inmates in Kuje prison.
2. To determine the prevalence of high blood pressure among inmates in Kuje prison.
3. To determine the prevalence of overweight and obesity among inmates in Kuje prison.
4. To determine the prevalence of tobacco use, physical activity and alcohol use among inmates in Kuje prison.

CHAPTER TWO

LITERATURE REVIEW

2.1 Background Information

Cardiovascular disease (CVD) has become the single most important cause of death worldwide in the past decade. In 2010, CVD caused an estimated 16 million deaths and led to 293 million disability-adjusted life-years (DALYs) lost[36] — accounting for approximately 30% of all deaths and 11% of all DALYs lost in that year. Like many high-income countries (HICs) during the past century, now low- and middle-income countries (LMICs) are seeing an alarming and accelerating increase in CVD rates. Deaths as a result of CVD, between 1990 and 2010, increased from 26% to 29.5% of all global deaths—a pointer to the rapidity of the epidemiologic transition — particularly in low- and middle-income regions. Known as the epidemiologic transition, this shift is fueled by urbanization, industrialization, and resulting lifestyle changes. The total increase in the global burden of CVD result in part from the epidemiologic transition, which includes four basic stages; pestilence and famine, receding pandemics, degenerative and man made diseases and delayed degenerative diseases.[37,38]

A fifth stage, characterized by an epidemic of inactivity and obesity, may be emerging in some countries. Increased longevity and the impact of smoking, diets high in fat and carbohydrates, and other risk factors for chronic diseases, have now combined to make CVD and cancer the leading causes of death in most countries. This shift in disease burden changes began in higher-income countries, but as they gradually have spread to LMICs, mortality rates as a result of CVDs have risen globally. In absolute numbers, CVD causes four to five times as many deaths in LMICs as in HICs.[38]

2.2 Current variations in the Global Burden of Cardiovascular Disease

Between 1990 and 2010, the number of CVD deaths increased by 31% globally. Pre 1900, malnutrition and infectious diseases constituted the most common causes of death the world over, and less than 10% of all deaths were as a result of CVD. In 2010, CHD accounted for 13.3% of all deaths worldwide. The second largest cause of death was stroke, at 11.1%[39]. An estimated 12.9 million people died from CHD and stroke, which together accounted for nearly a quarter of all deaths worldwide in 2010.[39]

According to an estimate by W.H.O. in 2002, 16.7 million people around the globe die of cardiovascular diseases each year. This represents about 113 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[42]. LMICs have a high degree of variety relating to the phase of the epidemiologic transition. First, LMIC sub regions differ by age-adjusted CVD death rates, as well as by trends over the past 20 years. CVD mortality rates are on the increase in most LMICs but are decreasing in HICs. Next, LMIC sub regions are unique, as illustrated by the different CVD disease rates by cause in each region. In the East Asia and Pacific and sub-Saharan regions, stroke still surpasses CHD as a cause of CVD death. Countries in the East Asia and Pacific region appear to be following more of a Japanese-like transition, with relatively high stroke rates. Higher stroke rates in Africa, on the other hand, may mirror these countries' positions in an earlier stage of the epidemiologic transition. Hypertensive heart disease is the largest single contributor among remaining causes of CVD morbidity and mortality.[44]

Variability in disease prevalence among various regions probably comes as a result of multiple factors. First, the countries are in various phases of the epidemiologic transition. Second, there may be disparities; genetic and/or cultural that leads to varying levels of CVD

risk. For instance, per capita consumption of dairy products (and thus consumption of saturated fat) is much higher in India than in China, although it is rising in both countries. Third, certain additional competing pressures exist in some regions, such as war or infectious diseases (human immunodeficiency virus infection/acquired immunodeficiency syndrome [HIV/AIDS]) in sub-Saharan Africa. As a result of how CHD afflicts a younger population in LMICs, an increased number of deaths affect the working population. For some LMICs, the severity of the epidemiologic transition has appeared to follow a reverse social gradient, with members of lower socioeconomic groups suffering the highest rates of CHD and the highest levels of various risk factors.[40]

Accounting for over 4 million deaths each year, CVD is the leading cause of death in Europe. Almost 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.[118] 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.[118]

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 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.[42]

The INTERHEART study data showed that rates of CVD have risen remarkably in low-income and middle-income countries with about 80 percent of the burden occurring in these countries. Approaches to prevention have the potential to prevent premature cases of MI.[42] 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, CVD will account for about 35% of all deaths in these nations[44]. Hence, educational efforts to reduce exposure to risk factors for CVD and, at the same time, treat those who already are affected are very crucial. The resources in developing nations are limited; consequently, implementation of health policies depends on cost and effectiveness.[43]

Systemic arterial hypertension, a major risk factor for stroke and heart disease, causes approximately 50% of CVD morbidity and mortality worldwide[119]. 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.[44] 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.[44]

Cardiovascular disease has a multi-factorial 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[43]. Various ethnic groups may show 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.[44]

The INTERHEART study assessed the usefulness 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.[42] Smoking, history of hypertension or diabetes, physical activity, waist hip ratio, dietary pattern, 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.[42]

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. Also found by The British Regional Heart Study was that smoking, blood pressure and cholesterol accounted for 90% of attributable risk of coronary heart.[44,41] 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.[44]

2.3 Cardiovascular Risk Factors and Incarceration

This review shows that the cardiovascular health of prisoners is affected in significant ways by incarceration and sometimes if not often, predisposes prisoners to particular health risks. CVD at 35% is one of three most prevalent health conditions found in prisoners, along with psychiatric (45%), musculoskeletal (24%), and respiratory diseases (15%).[21]

Evidence from a review of incarceration literature,[45] shows that prisoners are significantly affected by CVD risk factors and that some prisoner cohorts, such as women (SMR: 14.8, 95% CI: 8.0 to 27.7), older prisoners,[19] young offenders (prevalence rates of 30% to 40%;[46]

and some ethnic minorities, particularly Aboriginal and Black prisoners[45,47] are affected disproportionately.

Additionally, some literature shows a notable association between an incarceration history and some CVD risk factors, such as incident hypertension among groups with a high prevalence of prior incarceration[48]. Risk factors for CVD most prevalent among prisoners include: hypertension, smoking, blood glucose and diabetes, physical inactivity and obesity, hypercholesterolemia and diet, psychological stress and the role of inflammatory markers[49].

2.4 Knowledge of Cardiovascular Diseases

The knowledge and awareness of risk factors of CVDs are essential for behavioral change.[86,87] CVD prevention is the most efficient as well as effective way of combating the CVD epidemic in the resource poor nations. A proper awareness of the predisposing risk factors is a pertinent step in the modification of lifestyle behaviors conducive to optimal cardiovascular health in developing countries.[88,89] Educational programs for the elderly were effective in improving health promotion knowledge and behaviors; this has been shown in previous studies. Although knowledge alone is insufficient, it is assumed to be a key component of behavioral change decision making,[90,91] and provides plans 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 CVD.

The level of knowledge of risk factors for CVD varies among different populations.[92,93] Investigations in the western world, for instance; 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 CVD.[94] 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.[95,96] A similar study in Saudi Arabia shows that physically inactive people were least aware of their risk of CVD.[97] 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.[98]

In neighboring India, a study done 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.[99] Among prisoners, high self efficacy levels associated with enhanced knowledge about one's risk for an adverse event[16] has lead to better engagement with health promoting behaviors and improved health during incarceration.

2.5 Hypertension

Hypertension was the most common CVD risk factor found among prisoners.[48] Relying on similar data using comparisons of prevalence estimates in two separate prisoner samples from 1996 and 2001,[50] found a statistically significant difference of a 3% higher prevalence for hypertension among prisoners in the 2001 group with a standardized morbidity ratio (SMR) of 1.7 (95% CI 1.39Y2.18). When put into comparison with the general population, prisoners were found to have a higher odds of hypertension (OR Jail 1.19, (95% CI 1.08Y1.31; OR prison 1.17, (CI 95% 1.09Y1.27).

Furthermore, the data suggests that particular subgroups within prison samples are also at a significantly higher risk for incident hypertension, such as young offenders (AOR, 1.6 [95% CI, 1.0Y2.6])[48] African American men (AOR, 1.9 [95% CI, 1.1Y3.5]); less educated people[13] and Indigenous people.[48] Other studies in Nigeria recorded a prevalence of hypertension in prison 16.1%[7] in Sokoto, North west Nigeria and 14.8% in western Nigeria.[51,52] Thus, hypertension is an appropriate target for primary prevention efforts among at-risk prisoners, such as young offenders, and women prisoners, because such efforts have the potential of influencing the incidence and prevalence rates of several CVDs among them.

2.6 Overweight and Obesity

Obesity and overweight represent a rapidly growing threat to the health of populations in an increasing number of Countries world-wide; this is according to the findings of an expert group convened by the WHO in June 1997. The WHO recognized obesity as a disease that is prevalent in both developing and developed countries and that affect children and adults alike.[63] The current prevalence of overweight and obesity has reached unprecedented levels, and the annual rate of increase in most developing regions is significant.[43] There are more than 1 billion overweight adults worldwide and at least 300 million who are clinically obese.[42]

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.[10] According to the latest GBD study, nearly 1.46 billion adults were overweight (BMI) ≥25 kg/m2) in 2008; of these, approximately 502 million were obese (BMI ≥30 kg/m2).[64] Explanations for this rapid trajectory are complex and include changes in dietary patterns, urbanization and physical activity. There was a report that the use of edible oils, caloric sweeteners, and animal-source foods is increasing.[65] Unlike data from the 1980s, which showed that obesity affected predominantly the higher-income group in LMICs, a recent analysis shows a shift to the poor in the burden of overweight and

obesity. Although higher-income groups still have the highest prevalence of overweight and obesity, rates are increasing faster in lower-income groups.[66]

As a developing country's GNP approaches the middle-income range, the poor have relatively more susceptibility to obesity.[66] It is predicted by the WHO that unless action is taken, by 2020 up to 5 million deaths will be attributable to overweight and obesity, compared to 3 million now.[42] In India, recent rates of increase indicate that, the proportion of people overweight (including those who are obese) will increase from 9% to 24% between 1995 and 2025. In China, overweight is also set to increase. Projections indicate that by 2025, 37% of men and 40% of women will be overweight, compared to 8% and 12% in 1995.[42]

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. There was insufficient power in the ability of the review to detect differences in morbidity or mortality outcomes.[67] Some 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.[68] 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.[63]

Findings in the reviewed literature on obesity among prisoners demonstrate that prison inmates compared to jail inmates had a significantly higher odds of obesity (AOR 1.14, 95% CI 1.04Y1.25) or being overweight (AOR 1.19, 95% CI 1.09Y1.29).[13] Another study found that if a prisoner was classified as ‘‘obese,’’ they had an eight times higher odds of having diabetes (OR 8.2, 95% CI 1.9Y34.5).[50] On the contrary, a UK study found that only 189 (44%) out of a sample of 430 women with data on BMI had a healthy BMI. In fact, this study points out that women tended to gain weight following imprisonment. Among those women (n = 220) still in prison after 1 month of imprisonment, they found a mean weight increase from 65.3 kg to66.8 kg (mean change 1.5 kg, 95%CI 1.0Y2.0; p G 0.001).[56]

2.7 Smoking

Public health strategies and medical treatment have led to improved cardiovascular health among some populations of developed countries, like the U.S., Australia and Canada, resulting in reduced rates of mortality. One such strategy focusing on tobacco use in the general population as in Australia has lowered daily tobacco use to 17%.[53,53] This trend however, is not reflected in some marginalized populations such as prisoners. Smoking was identified as the second most common cardiovascular risk factor among prisoners. The prevalence of smoking in prisoner populations is up to three times that of the general populations with estimates ranging between 84% and 88% [49,55] and with 96% smoking rolled cigarettes.[52]

A study pointed out a SMR of 0.89 (95% CI, 0.83Y0.96) in one prison sample.[50] An Australian study found that the rate of smoking among prisoners was 2.5 times higher than the equivalent groups within the community.[55] The mean age that the majority of male prisoners had their first cigarette, was before the age of 15 years.[55] The average tobacco use was 23.5 g/day, which amounts to an equivalent of just over 20 cigarettes. Some studies[50,56] demonstrated that smoking among certain prison subgroups such as women (mean 85.3%

[95% CI, 81.9Y88.1]) and Indigenous people (mean 82.3% [95% CI, 76.8Y87.0]) also indicated a higher smoking prevalence. In a UK based study with a female sample indicated that Caucasian women younger than 30 years, those who left school aged 16 years or less, and those who prior to imprisonment were unemployed were all more likely to smoke.[56]

Another study demonstrated that older inmates, those who prior to incarceration were employed and those with higher levels of education were all less likely to smoke, which is consistent with community data.[55] In fact the study pointed out that ‘‘increased time in prison was associated with a reduced likelihood of being a smoker’’.

Looking at the time of imprisonment and smoking, a study demonstrated that the proportion of women smoking during their time of incarceration did not change much from the pre-imprisonment period (81.2%) compared to those still smoking 1 month after imprisonment (80.3%).[56] In contrast, similar data from the U.S [53] on tobacco use in inmates in the month of their arrest shows a reduced incidence of 37.8% for state inmates and 38.6% for federal inmates. Additionally, the use of tobacco among state inmates and federal inmates who met clinical criteria for substance abuse disorders had even higher rates of 66.5% and 51.5%, respectively in the month of their arrest. Despite meaningful efforts to reduce the incidence of smoking among prisoners, smoking among particular prisoner subgroups such as women and young prisoners remains unacceptably high and poses not only a threat to their health, but also that of all other individuals among the correctional population. In all efforts to reduce cigarette smoking in prisons there is need to take into consideration the specific factors influencing smoking habits in prisons. Therefore, a wholesome and more integrated approach to the prevention and reduction of smoking in prisons among young offenders and women is imperative.

2.8 Physical Inactivity

According to World Health Organization in 2013, physical inactivity accounted for 6 % of all global deaths and was the fourth leading risk factor for global mortality.[57] In addition, physical inactivity was the main cause for approximately 21–25% of breast and colon cancers, 27% of diabetes and 30% of ischemic heart disease burden.[57] Regular physical activity such as walking, cycling, or the physical activities of daily living has significant benefits for health.[58] Low levels of physical activity are now a major public health problem, affecting both children and adults. The public health impact of inactivity is as great as other unhealthy lifestyle choices such as smoking or unhealthy eating leading to long term lifestyle related illness such as type 2 diabetes, osteoarthritis, hypertension, etc[58] Persons of all ages, both men and women, achieve health benefits by exercising, and greater physical activity is important to improve well-being and quality of life.

Many people with lifestyle diseases who engage in exercise have recorded remarkable improvements in their health sometimes to the point that medications are reduced or even no longer necessary. From the public health perspective, promoting physical activity among all people will produce the greatest health gain, with groups who are least physically active having the most gain.[58] More than 2 million deaths are attributable to physical inactivity annually the world over. 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.[59] Physical activity has been defined as any bodily movement that results in energy expenditure. The effects of regular activity has both preventive and therapeutic effects on many chronic conditions such as CHD, cancer, stroke, obesity, diabetes musculoskeletal disorders and mental illness.[41]

Some 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.[41]

A 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[61]. Similar results were reported for leisure time activity. This suggests that the risk of a coronary event can be reduced by physical activity, when all other major risk factors are controlled for, by as much as half. The evidence in the literature on the levels of physical activity or inactivity among prisoners varied considerably. A study found that 87% of men (n = 620) and 73% of women (n = 107) reported that they had exercised in a 4-week period. The mean (TSD, range) exercise time per week was found to be 73.2 (85.5, 0Y621.4) minutes. Furthermore, only 66% of men (n = 471) and 51% of women (n = 75) in the same study re- ported daily exercises.[60] Another study also reported that 71% of prisoners did not have a regular exercise schedule, which they hypothesized was partly contributory to obesity among them.[49]

There is indisputable evidence provided by international literature on the relationship between physical exercise and people's physiological health.[61] Especially with older people or those who are currently inactive, increasing the amount of regular physical exercise has been shown to have a positive relationship to decreased risk of developing a chronic illness, such as CVD.[62] The evidence in the literature on the levels of physical activity or inactivity among prisoners varied considerably. Another study, [60] found that 87% of men (n = 620) and 73% of women (n = 107) reported that they had exercised in a 4-week period. The mean (TSD, range) exercise time per week was found to be 73.2 (85.5, 0Y621.4) minutes.

Furthermore, only 66% of men (n = 471) and 51% of women (n = 75) in the same study reported daily exercises. Similar, low levels of physical activity in a cohort of a women only study[56] were found. A study[49] also reported that in their study 71% of prisoners did not have a regular exercise schedule, which they hypothesized partly contributed to obesity among them. The link between obesity, type 2 diabetes and CVD has been extensively studied in the landmark longitudinal, multigenerational cohort study of CVD risk factors known as the Framingham Heart Study (FHS). This study demonstrated that the prevalence of obesity(BMI> 30 kg/m^2) has risen in the past 30 to 40 years from just a few percent to between 25% and 30% among men in the general population.[60] Findings in the reviewed literature on obesity among prisoners demonstrate that prison inmates compared to jail inmates had a significantly (p< 0.001) higher odds of obesity (AOR 1.14, 95% CI 1.04Y1.25) or being overweight (AOR 1.19, 95% CI 1.09Y1.29)(13). Study[48] found that if a prisoner was classified as ‘‘obese,’’ they had an eight times higher odds of having diabetes (OR 8.2, 95% CI 1.9Y34.5).

On the contrary, a UK study[56] found that only 189 (44%) out of a sample of 430 women with data on BMI had a healthy BMI. This study shows that following imprisonment, women tended to gain weight. Among those women (n = 220) still in prison after 1 month of imprisonment, they found a mean weight increase from 65.3 kg to 66.8 kg (mean change 1.5 kg, 95% CI 1.0Y2.0; p G 0.001). At the start of their incarceration, 37.6% women in[56] study sample were overweight or obese and this percentage increased to 39.5% after 1 month of incarceration. Given mixed findings in the literature on the link between incarceration and obesity, highlights the need for further research in this area. However, that does not negate the possible benefits of structured exercise programs for cardiovascular health among prisoners.

2.9 Alcohol Use

From time immemorial, alcoholic beverages and the problems they cause, has been a familiar feature in human societies. To a good extent, research has contributed to the understanding of the association of drinking to specific disorders, and has shown that the relationship between alcohol consumption and health outcomes is complex and multidimensional. Alcohol is commonly related to more than 60 different medical conditions. Overall, 4% of the global burden of disease is attributable to alcohol, which accounts for about as much death and disability globally as tobacco and hypertension.[69] A study among urban workers in Ibadan revealed regular and moderate alcohol consumption was associated with hypertension (chi 2 = 4.8, $P < 0.05$).[70] Studies of incarcerated populations indicate that inmates have a tendency to drink more heavily prior to entering prison than does the general population.[71] In the Lithuanian prison study, 92.1% of prisoners reported having used alcohol at least once in their lives.[72] A Study in a Nigerian prison found that in terms of lifetime use of any substance, alcohol use was reportedly the highest (77.5%) among prisoners.[81]

2.10 Diet

Nutrition is a major modifiable determinant of cardiovascular diseases. A healthy diet is essential for the prevention of all major chronic non-communicable diseases in midlife and beyond, both directly, through the effect of individual macro- and micronutrients and indirectly, through the control of body weight.[73] Type 2 diabetes mellitus is best prevented or managed by restricting the total amount of carbohydrate in the diet and by deriving carbohydrate energy from whole-grain cereals, fruits and vegetables. The substitution of saturated and trans-fatty acids by mono-unsaturated and omega-3 fatty acids is the most important dietary intervention for the prevention of cardiovascular diseases.[73]

Dietary changes are shifting universally toward a diet dominated by higher intakes of animal and partially hydrogenated fats and lower intakes of fiber.[2] This shift towards a high fat,

particularly saturated fat diet, low in carbohydrate, fruits and vegetables, along with a high salt intake, leads to the emergence of chronic diseases.[74] As low-income countries move towards economic development and industrialization, there are similar pressures towards high calorie intake.[75] There is a notable nutritional transition especially in urban areas from the traditional diets which are low in fat and high in unrefined carbohydrate to high fat and sugar, marked increases in animal products, and a decline in unrefined cereals and thus in fiber intakes.

There is nutritional, epidemiological and demographic transition going on in Africa. In an ecological study on dietary trends in the Middle East and North Africa over a period of 47 years (1961 to 2007), the authors examined the availability of energy and different food items in 15 countries within the regions. The Food and Agriculture Organization (FAO) food balance sheet from the organization's database for nine countries from the Middle East and six from North Africa was used. It was found that over the studied 47 years, energy and food availability (apart from animal fats and alcoholic beverages) increased in the two regions. The proportion of energy derived from meat and vegetable oils increased significantly while that from cereals decreased significantly. Energy proportion from milk, dairy products and vegetables ascended in North Africa while a decline in energy from fruits in the Middle East was observed. A summary of their findings was the unfavorable trend towards a Westernized diet in both regions; more in the Middle East.[76]

In a study on the implications from and for food cultures for cardiovascular disease; diet, nutrition and cardiovascular diseases in China showed that diet and nutrition play important roles in the occurrence of CVD and hypertension in the Chinese population.[77] In a Nigeria survey conducted among staff of the Federal Airport Authority of Nigeria in 2000, their food consumption pattern revealed that 23.2% consumed cereals daily while only 5.6% of the respondents consumed fruits and only 10.9% affirmed to consuming vegetables daily. Most

of the respondents (84.3%) had as their lunch, snacks which was majorly pastries and carbonated drinks.[78] Eating fruit and vegetables can prevent cardiovascular diseases, however low intake is responsible for 31 percent of CHD and 11 percent of stroke worldwide.[41]

Currently, the 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. It is only an inconsequential minority of the world's population that presently consumes 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.[42] 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, regular intake of oily fish and the restriction of dietary sodium may enhance this effects.[79]

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 ($p<0.00l$ 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).[79] 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: $p<0.05$).[80]

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, encouragement and

support.[80] 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.[80]

Diets which are found to be rich in fruit and vegetables also tend 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).[81] The diets analyzed in prisons were high in carbohydrates and had an excess of percentage energy intake as fat: findings that were buttressed by qualitative data from UK prisoners.[81]

The problem of these unhealthy diets could be further compounded by the fact that prisoners in high-income countries can purchase extra snacks, which tend to be energy-dense and salt-rich.[82]

In a study in prisoners in western Nigerian their diet was predominantly carbohydrate with no fruits and vegetables. The study suggests that the prisoners might be undernourished with lower serum proteins than controls, within an average of seven months of confinement. The picture appears worse in those awaiting trial and with prolonged duration of confinement.[52]

2.11 Blood Glucose and Diabetes

Metabolic syndrome, also known as insulin resistance is a cluster of abnormalities such as Type-2 diabetes and CVD risk factors that act synergistically to greatly increase the risk for CVD.[83] Insulin resistance has been linked to a number of cardiovascular risk factors, such as high very low density lipoprotein (VLDL), low HDL-C, and a shift in LDL particle size from

large buoyant to small dense LDL.[84] The latter are powerful indicators of coronary heart disease. Although a causal relationship has not been established between hyperglycemia, diabetes and CVD, some evidence has shown an association between them. In the FHS metabolic syndrome has been shown to increase the 7Y11 year risk for CVD in men by about threefold relative to those without metabolic syndrome, and for type-2 diabetes, the increase is about sevenfold.[83] CVD is more prevalent among patients with type 1 or type-2 diabetes, than among those without diabetes, although it is not specific to diabetes. Over 80% of individuals with type2diabetes are overweight or obese and a similar percentage are insulin resistant.[84, 85] A study,[13] demonstrated after adjustment for age and sex, that jail and prison inmates had a higher odds of diabetes than non- institutionalized adults (OR 1.06, 95% CI; 0.92Y1.23).

A study[50] showed that Indigenous status among prisoners was associated with six times higher odds of having diabetes (OR 6.2; 95% CI 2.1Y18.0) and two times higher odds for elevated random glucose (OR 2.4; 95% CI 1.2Y4.8). If a prisoner was classified as ‘‘obese,’’ they had an eight times higher odds of having diabetes (OR 8.2; 95% CI 1.9Y34.5) and three times higher odds for elevated random glucose (OR 3.4; 95% CI 1.5Y8.0). With age increment, there was a steep increase in the odds of diabetes and elevated random glucose. However, although this review of the literature demonstrates that prisoners have higher odds of hyperglycemia and diabetes, it remains unclear, the link between incarceration, hyperglycemia, diabetes, and CVD among prisoners. Although a pronounced and statistically significant relationship between incarceration and hypertension among African American men and less educated individuals, subgroups of the CARDIA study sample[48] was found, the results for diabetes (2% vs. 3%; $p = 0.81$) did not differ between participants with and without a history of incarceration, respectively.

A limitation in the latter study pointed out a lack of information on the duration of incarceration, hence it cannot be ascertained accurately whether such observed differences are associated with incarceration or not. Furthermore, comparisons of the characteristics among incarcerated women were relative to other low-income and underinsured/uninsured women. Thus, further research, inclusive of multiethnic minorities and age groups are required to investigate the link between incarceration, diabetes, and CVD among prisoners.

CHAPTER THREE

METHODOLOGY

3.1 Study Area

This study was carried out in FCT, Abuja. The FCT is located in the North Central geo-political zone of Nigeria. FCT Abuja is the capital of Nigeria. It occupies a land area of about 7,753.9 sq. km. It is bounded in the north by Kaduna State, on the west by Niger State, on the east and south-east by Plateau State and on the south-west by Kogi State. Based on the 2006 census, FCT had a population of 1.4 million people with an annual growth rate of 9.28% (National Population Commission, 2006 census).

FCT is currently made up of six local councils, comprising the City of Abuja and five Local Government Areas, namely: Abaji, Gwagwalada, Kuje, Bwari and Kwali.

Crime rate in FCT has been on the increase in the past decade. Common crimes include assault, armed robbery, drug trafficking, vandalism, theft, bribery and corruption.

The Nigerian Prisons Service has a total of 240 holding facilities comprising of Maximum Security Prisons, Medium Security Prisons, Satellite Prisons, and Borstal Institutions for juveniles, Farm Centres, Open Prison Camp, Female Prison.

The origin of modern Prisons Service in Nigeria was in 1861. That was the year when conceptually, Western-type prison was established in Nigeria. The Prison regulation was published in 1917 to prescribe admission, custody, treatment and classification procedures as well as staffing, dieting and clothing regimes for the prisons. It was not until 1934 that any meaningful attempt was made to introduce relative modernization into the Prison Service. The abolition of Native Authority prisons in 1968 and the subsequent unification of the Prisons Service in Nigeria marked the beginning of Nigerian Prisons Service as a composite reality. In 1972, a decree spelt out the goals and orientation of the Nigerian Prisons Service.

The Nigerian Prisons has undergone some reorganization from its modest three Directorates in 1980 to six Directorates in 1993. It now has a command structure that boast of 8 Zonal commands, 36 State commands, 1 FCT command, 155 prisons including farm centers and 83 Satellite Prisons. It also has four training schools and one Staff College.

3.2 Study Site

The Kuje prison is a medium security prison located in Kuje, Kuje Area Council of the Federal Capital Territory (FCT). It is one of the famous prisons in Nigeria established in 1989. It is a male only convict prison with an installed capacity for 320 prison inmates but currently caters for about 809 inmates (674 awaiting trial and 135 Convicts) by Kuje prison serves offenders in Abuja mainly and also those from other states in the country.

The prison has 4 different custodies with various categories of crime:

- Custody 1 -Robbery related cases Awaiting trial inmates
- Custody 2 -Convicts
- Custody 3 -Drug related offences Awaiting trial inmates
- Custody 4 -Terrorism Awaiting trial inmates

The 4 custodies accommodate different number of inmates ranging from 2 per cell to 150 depending on the type of crime committed and the custody remanded.

The Kuje prison clinic is a 4 bedded with 2 doctors, 2 pharmacists,4 laboratory scientists,10 nurses, and other healthcare workers.

3.3 Study Populations

The study population was all Kuje prison inmates at the time of study. A total of 809 inmates (674 awaiting trial and 135 Convicts) were in custody as of the time of study.

3.4 Study Design

This was a descriptive cross-sectional study that utilized quantitative (semi-structured questionnaire) methods of data collection.

This study was designed to ascertain the prevalence of cardiovascular risk factors among prison inmates in Federal Capital Territory, Abuja Nigeria. The presence or absence of the risk factors was determined in each member of the study population.

3.4.1 Inclusion Criteria

- A prison inmate (regardless of age) must be in custody in Kuje Federal prison.
- Must voluntarily give informed consent to participate in the study.

3.4.2 Exclusion Criteria

Those whom the prison officers regards as a threat to the researcher's safety or whom the officers knows to be severely mentally ill were excluded.

3.5 Sample Size Determination

The sample size was calculated using the Leslie and Kish formula[115] used in estimating the sample size for the cross-sectional study.

$$n = \frac{Z^2 * p * q}{d^2}$$

Where n = minimum sample size

Z_α at 5% significant level put together = 1.96

p = prevalence of hypertension at 16.1%, (prevalence of hypertension among prisoners Sokoto North West Nigeria[51]

d = level of precision (5%)

q = 1- p

$$n = \frac{(1.96)^2 \times 0.16 \times 0.84}{(0.05)^2}$$

$$n = 206$$

Finite population correction

$$N = \frac{n_o}{1 + \frac{(n_o - 1)}{N}}$$

n_o= calculated minimum sample size, 206

N= population size, 809

The sample size will be 164 respondents. After accounting for non-response (10%), the sample size will be 180 respondents

3.6 Sampling Techniques

Stratified sampling technique was used in this study.

Kuje inmates were stratified into convict and awaiting trial stratum.

Probability proportionate to size (PPS) was used to calculate the participant in each stratum.

The sample selection for each stratum was allotted based on probability proportionate to size (PPS).

Calculating number of respondents in each stratified group (PPS) =

Total population of the Convicts (or Awaiting trial) X estimated sample size
Total population of prison inmates

In the prison a list of all the prisoners was used as the sampling frame. The first prisoner in each stratum was selected randomly from the list by balloting. Subsequent prisoners were selected via systematic random sampling interval (k=4).

3.7 Study Instruments

a. Questionnaire: The World Health Organization (WHO) STEPwise approach was used[116] adopting the Centers for Disease Prevention and Control (CDC) Behavioral Risk Factor Surveillance System.[117] The WHO STEPwise approach to chronic disease risk factor surveillance (STEPS) focuses on obtaining core data on established risk factors that determine major disease burden. The instrument covers three different levels of "steps" of risk factor assessment, that is, questionnaire on socio-demographics, physical measurements and biochemical. The Chronic Disease Indicators (CDI) on the other hand is a set of indicators developed to allow for uniform definition, collection, and reporting of chronic disease data that are important in public health. The CDI represent a wide spectrum of conditions and risk factors such as physical activity and nutrition, tobacco and alcohol use, cancers, cardiovascular disease, and diabetes.

For the purpose of the study, the first two WHO steps were used. The first part of our study instrument collected data on respondents' demographic, socioeconomic and behavioral history. The second part took respondents' physical body measurements (anthropometry).

b. Height meter: The standing height assessed the maximum vertical size of the respondents. Standing height was measured using a modified stadiometer with a fixed vertical backboard.

c. Weighing machine: Omron body composition monitor BF511

d. Sphygmomanometer: Omron M3 Automatic Blood Pressure Monitor

e. Glucometer: Manufactured by Roche Diagnostic GmbH, Sandhofer Strasse 116,68305 Mannheim, Germany. Accu-chek (2011 model no CE 0088) machine was used to measure the blood sugar.

3.8 Data Collection Methods

3.8.1 Training of research assistants

Fifteen research assistants which included ten nurses, three laboratory scientist and two others with a minimum of Ordinary National Diploma were trained over two days; to administer the questionnaire and those with health-care background took the blood pressure measurement and anthropometry. Performance of research assistants was assessed affect during questionnaire administration and accuracy in measurement taking, before they went to field to commence data collection. Only the research assistants with health knowledge background took the blood pressure measurement and anthropometry in order to ensure consistency and avoid inter-observer errors.

3.8.2 Administration of questionnaire

Data was collected using semi-structured interviewer administered questionnaire. Questions were adapted from the CDC Behavioral Risk Factor Surveillance System (BRFSS) questionnaire. The questions covered aspects stated under the specific objectives. The

Interviewer administered structured questionnaire had open and closed ended questions.

Questionnaire Outline

Section A: Socio-Demographic Characteristics

This section consists of questions on the age, occupation, ethnicity, marital status, educational status, religion of the respondents.

Section B: Assessment of Behavioral Factors

1. Assessment of Physical Activity/Exercise

Physical activity was assessed by asking if the inmates engaged in physical activities 30 days prior to the study. Their job description was also determined; whether mostly sitting, standing

or walking around. The type of physical activities engaged in by the inmates, how often and duration were assessed.

The assessment was based on:

a) Exercise intensity: Physical activity intensity was categorized as either moderate or vigorous. Examples of moderate intensity physical activities include walking, gardening and so on, while the vigorous ones include jogging, swimming, football and so on.

b) Frequency of exercise per week: This determines the number of days in a week the respondents engage in the identified physical activity.

c) Duration of each exercise performance: The time measured in minutes spent on each session of exercise was also determined.

Thus a physically active inmate was one who reported moderate physical activity for ≥ 30 minutes, ≥ 5 times/week or one who reports vigorous physical activity for ≥ 20 minutes ≥ 3times/week.

2. Tobacco use

Tobacco use was assessed by asking question on use of tobacco before and in prison, estimated number of cigarettes a day and how long the inmate been smoking in years , and current frequency of smoking; daily or sometime in a week.

3. Alcohol Consumption

Alcohol consumption was assessed by asking questions on whether the inmates take alcohol at all or not, what quantity was taken at each sitting and the maximum quantity taken at a sitting.

4. Assessment of dietary habits

Dietary habit was assessed by the frequency of intake of certain foods; these food items include vegetables, fruits, and foods containing refined sugar, fries and so on. The respondents were asked if they eat the food on daily basis; if not, how often in a week do they eat such food item.

Section C: Individual medical and family history

The inmates were asked if they have first degree siblings or parent(s) with diagnosed hypertension, diabetes and obesity. They were also asked if they themselves have been diagnosed with hypertension prior to the study or were on anti-hypertensive drugs.

Step 2: Blood pressure and anthropometry

Blood Pressure Measurement

Blood pressure was measured using (Omron M3 Automatic BP Monitor) digital blood pressure machines, with expandable cuff for those 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.

Weight measurement

In order to obtain an accurate weight measurement of the respondents:

1. The research assistant at every time of taking anthropometry introduced the examination to the respondents. Each respondent was also asked to empty his pocket in order to avoid objects within the pocket constituting additional weight to that of the respondents.

2. The weighing scale was positioned on the floor in front of the study participant. Before each study participant mounted the weighing scale, the research assistant ensured the weighing scale pointer was on zero. This, the research assistant viewed by standing in front of the scale and bending down to avoid error due to parallax.

3. Positioning the study participant: The respondents stood with their two feet on the sides of the scale platform facing the recorder, with their hands at the sides, and looking straight ahead.

4. Recording the result: After the study participant had been correctly positioned and the pointer on the measurement device becomes stable, the recorder/research assistant took the measurement to the nearest 1kg.

5. BMI was classified based on WHO classification as normal (BMI 18.5-24.9 kg/nr'), underweight (BMI < 18.5 kg/rrr'), overweight (BMI 25-29.9 kg/rrr') and obese (BMI 30 kg/m'').

Standing Height

The standing height assessed the maximum vertical size of the respondents. Standing height was measured using a modified stadiometer with a fixed vertical backboard.

1. Positioning the study participants

Each study participant was directed to the stadiometer platform. The study participant then stood up straight against the backboard with the body weight evenly distributed and both feet flat on the floor. He was then instructed by the research assistant to stand with the heels together and toes apart. The toes should point slightly outward at approximately a 60^{o}angle. The research assistant checked at every time that the back of the head, shoulder blades, buttocks, and heels of the study participant made contact with the backboard.

NOTE: Depending on the overall body conformation of the respondent/study participant, all four contact points – head, shoulders, buttocks, and heels – sometimes did not touch the stadiometer backboard. In situations where some overweight respondents could not stand straight while touching all four contact points to the backboard, the best measurement possible was obtained.

2. The study participant's head was aligned in the Frankfort horizontal plane. The head is in the Frankfort plane when the horizontal line from the ear canal to the lower border of the orbit of the eye is parallel to the floor and perpendicular to the vertical backboard. Many people naturally assume this position, but for some respondents, the research assistant needed to gently tilt the head up or down to achieve the proper alignment; instructing the study participant to look straight ahead.

3. Next, the head piece was put in a horizontal position so that it rested firmly on top of the participant's head, with sufficient pressure to compress the hair. The study participants were instructed to stand as tall as possible, take a deep breath, and hold this position. The act of

taking a deep breath helps straighten the spine to yield a more consistent and reproducible stature measurement.

3.9 Data Management

3.9.1 Study variables

The study variables comprise independent and dependent variables.

Dependent variables: The major dependent/outcome variables are presence or absence of hypertension, overweight and obesity.

Independent variables: Some of the independent variables are age, sex, occupation, education -status, behavioral factors such as unhealthy diet, physical inactivity, harmful alcohol use and cigarette smoking.

3.9.2 Definitions of study variables

The Chronic Disease Indicators (CDI) of the National Center for Chronic Disease Prevention and Health Promotion was adapted[117].

1) **Physical Inactivity**: - This was defined as inmates who in 30 days prior to the study had no form of physically demanding activity, or engaged in moderate activities less than 30 minutes 5 times in a week, or had vigorous physical activity less than 20 minutes 3 times a week. This was assessed based on the reported exercise intensity, frequency and duration (CDC, Chronic Disease Indicators: National Center for Chronic Disease Prevention and Health Promotion)[117].

a) Exercise intensity – Classified as either moderate or vigorous. Moderate exercise included walking, gardening while vigorous exercise entails jogging, football and swimming.

b) Duration of each exercise performance. the study irrespective of measured blood pressure (The-JNC-8-report).

c) Frequency of exercise per week.

2) **Unhealthy diet**: Absence of vegetables and fresh fruits in the daily meals of the civil servants.

3) **Hypertension**: Defined as a measured blood pressure ≥140 mmHg systolic and/or ≥90 mmHg diastolic or self-reported use of drug treatment for hypertension in two weeks prior to the conduct of study.

4) **Body Mass Index BMI** was defined based on the WHO Classification[120].

Underweight <18.5kg/m^2

Normal range BMI (healthy weight) = 18.5-24.9kg/m^2

Overweight = 25.0 – 29.9kg/m^2

Obesity ≥ 30.0kg/m^2

3.10 Statistical Analysis

Data were entered, cleaned and edited for inconsistencies before analyzing with SPSS version 19 and Epi info version 7. Descriptive and analytical statistics were used in summarizing the data. Descriptive statistics involved the use of frequencies, proportions and tables. Analytical statistics through bivariate analysis and multivariate logistic regression were performed to identify factors associated with the occurrence of hypertension, overweight and obesity. Odd's ratio and chi square test was used in determining statistically significant associations while factors with p values <0.05 were included in the logistic regression model. Adjusted

odds ratios (AORs) were determined with 95% confidence interval (CI) to identify statistically significant independent factors.

3.11 Ethical Consideration

Approval for the study was obtained from Health Research Ethic Committee, Federal Capital Territory, Abuja. (attached as appendix) Informed consent was taken from individual respondent before administering questionnaire or anthropometry and confidentiality of the information was assured that the name of the respondents did not appear on any of the documents of the study. The result was made available to respondents after testing the blood samples immediately before leaving the venue. Respondents that were found to be hypertensive or diabetic without prior knowledge of their health status were provided with medications to reduce the blood pressure level and blood sugar level and were eventually referred to the hospital for further review and management. Participants had an opportunity of a briefed one-to-one discussion on health implications of risk behaviours and measures to reduce the risk of CVDs. Soap, slippers, tooth brush and tooth paste were given to the prisoners.

3.12 Limitations

- The invasive procedure hindered the respondents from giving their consents but this was overcome by educating the respondents.
- The elicited risk behaviours were self-reported as such respondents might tend to give answers that convey more favourable social behavior.
- The prison health system which could be a predisposing factor was not assessed.

CHAPTER FOUR

RESULTS

Table 4:1 Socio-demographic characteristics of inmates in Kuje prison (n=180)

Variable	Frequency	Percent (%)
Age group(years)		
≤ 24	21	11.7
25 – 34	90	50.0
35 – 44	49	27.2
45 – 54	20	11.1
Mean age(±SD)	33(±9)	
Marital status		
Ever married	89	49.4
Never married	91	50.6
Ethnicity		
Hausa	52	28.9
Igbo	44	24.4
Yoruba	9	5.0
Other	75	41.7
Occupation category		
Self employed	123	68.3
Nongovernment employee	27	15.0
Unemployed	16	8.9
Government employee	14	7.8
Educational status		
No formal education	25	13.9
Primary school	22	12.2
Secondary	97	53.9
Tertiary	36	20.0
Religion		
Christianity	116	64.4
Islam	64	35.6
Prisoner status		
Awaiting trial	150	83.3
Convict	30	16.7
Number of inmates living in a room		
<=20	118	65.6
20-59	16	8.9
>=60	46	25.6
Average number (±SD)	51(±62)	

There were 180 respondents, all males; of which 150(83.3%) were awaiting trials and 30(16.7%) were convicts. Fifty percent were within the age group 25-34 years while 20(11.1%) and 21(11.7%) were in age group 45-54 and 24 years or less respectively. The average age of inmates was 33±9 years. Two-thirds 123 (68.3%) of the respondents were self-employed and 97(53.9%) had secondary education. 116(64.4%) were Christians while 64(35.6%) were Muslims. Inmates in the ever married and never married categories were of similar proportions; 89(49.4%) and 91(50.6%) respectively. 118(65.6%) of the inmates were living with at most 20 other inmates in a room while 46(25.6%) were staying in rooms with 60 or more inmates. The mean number of inmates living together in a room was 51±62

Table 4:2 Religious activity attendance before and in prison among inmates in Kuje prison (n=180)

Variable	Before prison n (%)	In prison n (%)
Importance of religion		
Not important	6(3.3)	3(1.7)
Somewhat important	13(7.2)	1(0.6)
Very important	161(89.4)	176(97.8)
Religious service attendance		
Not at all	7(3.9)	0(0.0)
Everyday	72(40.0)	131(72.8)
Occasionally	101(56.1)	49(27.2)

Most of the respondents considered religious activity very important both before 161(89.4%) and in prison 176(97.8%), although the proportion was higher in prison. Religious service attendance was never missed while in prison.

Table 4.3: Substance use among inmates before and in prison (n=180)

Variable	Before prison n (%)	In prison n (%)
Smoking		
Yes	108(60.0)	74(41.0)
No	72(40.0)	106(59.0)
Type	**n=108**	**n=74**
Both	33(30.0)	14(18.9)
Cigarette	66(60.0)	56(75.7)
Marijuana	9(10.0)	4(5.4)
Alcohol use		
Yes	78(43.3)	0(0.0)
No	102(56.7)	180(100.0)

108(60%) of the respondents were smoking before prison while 74(41%) in-prison. Out of the 108 that smoked before prison most 66(60%) were taking only cigarette while 33(30%) were taking both cigarette and marijuana and in prison. Out of 74 that took substance 56(75.7%) took only cigarette. No alcohol use before prison was found among 102(56.7) inmates while in-prison were 180(100%) inmates.

Table 4.4 Physical activity among inmates before and in prison (n=180)

Variable	Before prison n (%)	In prison n (%)
Physical activity		
None	63(35.0)	10(5.6)
Insufficient	83(46.1)	75(41.7)
Sufficient	34(18.9)	95(52.8)
Participation in exercises		
Yes	117(65.0)	170(94.4)
No	63(35.0)	10(5.6)
Frequency of exercises	**n=117**	**n=170**
Daily	36(30.8)	96(56.5)
At least once a week	76(65.0)	67(39.4)
At least once a month	5(4.3)	7(4.1)
Mean exercise duration in minutes(±SD)	63.9(±32.3)	88.5(±42.7)

83(46.1%) of the respondent had insufficient physical activity before prison while in prison majority 95(56.5%) had sufficient physical activity. Majority of the inmates participated in exercise both before prison 117(65%) and in- prison 170 (94.4%). Frequency of the exercise before prison was mainly once a week 76(65%) while in Prison was daily 96(56.5%).

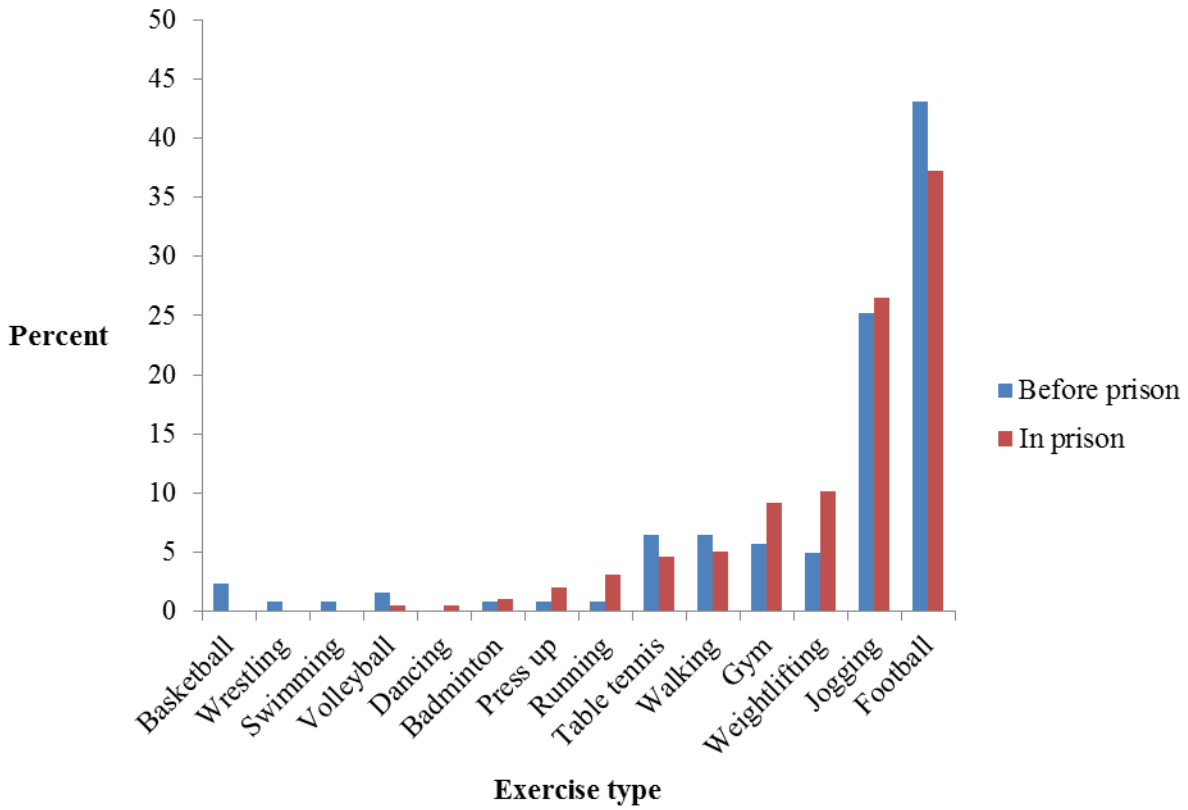

Figure 1: Type of physical activity performed by inmates before and in- prison (n=180)

The most practiced exercise was football both before and in-prison, followed by jogging.

Table 4.5: Fruits, vegetable and salt intake among the inmates before and in prison (n=180)

Variable	Before prison n(%)	In prison n(%)
Eat fruits		
Every day	44(24.4)	1(0.6)
Some days	125(69.4)	126(70.0)
Not at all	11(6.1)	53(29.4)
Eat vegetables		
Everyday	24(13.3)	7(3.9)
Some days	146(81.1)	135(75.0)
Not at all	10(5.6)	38(21.1)
Add additional salt to meals		
No	155(86.1)	170(94.4)
Yes	25(13.9)	10(5.6)

More than half of the respondents took fruits on some days, both before prison 125 (69.5%) and in-prison 126 (70%), while 146 (81.1%) and 135 (75.0%) took vegetables before and in-prison respectively. Majority of the respondents 155 (86.1%) before prison and in-prison 170 (94.4%) did not add salt to meals.

Table 4.6: Pastry, sweets and meat intake by inmates before incarceration in Kuje prison (n=180)

Variable	n(%)
Takes pastries	
Everyday	35(19.4)
Some days	112(62.2)
Not at all	33(18.3)
Takes sweets	
Everyday	28(15.6)
Some days	81(45.0)
Not at all	71(39.4)
Takes soft drinks	
Everyday	51(28.3)
Some days	109(60.6)
Not at all	20(11.1)
Takes fried meals	
Every day	29(16.1)
Some day	129(71.7)
Not at all	22(12.2)
Takes fast foods	
Everyday	13(7.2)
Some day	96(53.3)
Not at all	71(39.4)
Takes red meat	
Everyday	97(53.9)
Some days	64(35.6)
Not at all	19(10.6)

Before incarceration, 112 (62.2%) took pastries, 81 (45%) sweets, 109 (60%) soft drinks, 129 (71.7%) fried meals and 96 (53.3%) took fast foods on some days. Most of respondents, 97 (53.9%) took red meat every day before incarceration.

Table 4.7 Previous measurement and knowledge on blood pressure and blood sugar Level among inmates in Kuje prison (n=180)

Variable	n(%)
Blood pressure ever measured	
Yes	113(62.8)
No	67(37.2)
Hypertensive	
Yes	17(9.4)
No	151(83.9)
Don't know	12(6.7)
On antihypertensive (n=17)	
Yes	11(64.8)
No	6(35.2)
First degree relative has hypertension	
Yes	24(13.3)
No	156(86.7)
Blood sugar ever measured	
Yes	50(27.8)
No	130(72.2)
Are you a known diabetic	
Yes	1(0.6)
No	171(95.0)
Don't know	8(4.4)

113(62.8) of the respondents had ever measured their blood pressure while 17(9.4%) were hypertensive, out of which 11(64.8%) were on antihypertensive drugs. The first degree relatives were not hypertensive for most respondent 156(86.7%). 130(72.2%) of the respondents had never measured their blood sugar and only one (0.6%) was a known diabetic.

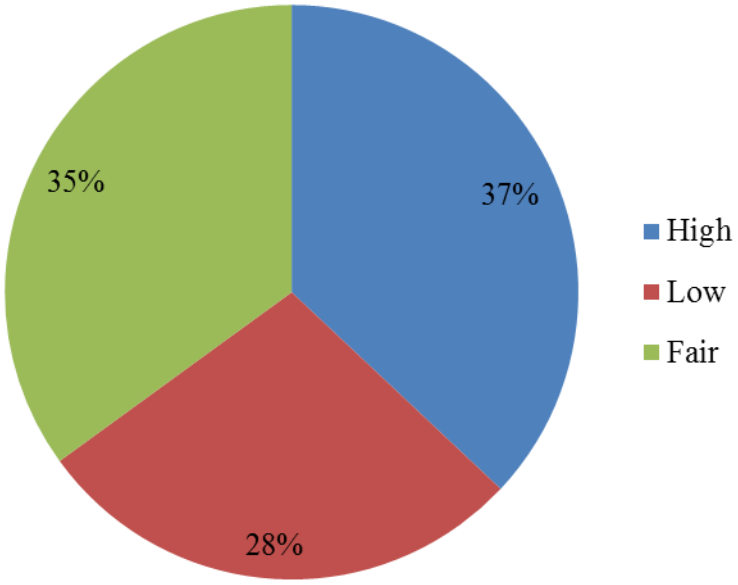

Figure 2: Knowledge category of inmates in Kuje prison on cardiovascular disease risk factors (n=180)

Overall, 66 (36.7) had high knowledge of cardiovascular risk factors while 66 (35%) had fair knowledge and 51 (28.3%) had low knowledge.

Table 4.8: Cardiovascular risk factors prevalence among inmates in Kuje prison (n=180)

Variable	n (%)
Current physical activity	
Insufficient	85(47.2)
Sufficient	95(52.8)
Current tobacco use	
Yes	70(38.9)
No	110(61.1)
Mean weight in kg (±SD)	72.9(±12.2)
Mean height in m (±SD)	1.7(±0.14)
BMI (kg/m2)	
Normal	107(59.4)
Overweight	60(33.4)
Obese	13(7.2)
Mean BMI	24.8(±3.6)
RBS (mg/dl)	
Diabetic	1(0.6)
Normal	179(99.4)
Mean RBS	97.1(±21.8)
Systolic BP (mmHg)	
Hypertensive	33(18.3)
Normal	147(81.7)
Mean systolic BP	131(±15)
Diastolic BP (mmHg)	
Hypertensive	33(18.3)
Normal	147(81.7)
Mean diastolic BP	81(±12)

Current physical activity was sufficient in half 95 (52.8%) and tobacco was not currently used by 110 (61.1%) respondents. The BMI is normal in 107 (59.4%) of the inmates. Blood sugar levels were normal in 179 (99.4%); Systolic BP and Diastolic BP were normal in 147 (81.7%) of respondents.

Table 4.9: Prisoner's characteristics associated with elevated blood pressure (n=180)

Variable	Systolic BP				Diastolic BP			
	Hypertensive	Normal	O.R.(C.I.)	p-value	Hypertensive	Normal	O.R.(C.I.)	p-value
Age group (years)								
≤ 34	8	103	1.0	P < 0.001	6	105	1.0	P < 0.001
35 – 44	16	33	6.2(2.5-15.9)		17	32	9.3(3.4-25.6)	
≥45	9	11	10.5(3.4-32.9)		10	10	17.5(5.3-58.2)	
Marital status								
Ever married	23	66	2.8(1.3-6.4)	0.012	24	65	3.4(1.5-7.7)	0.004
Never married	10	81			9	82		
Educational status								
No formal education	1	24	1.0	0.234	1	24	1.0	0.033
Primary school	5	17	7.1(0.76-66.0)		6	16	9.1(1.0-82.0)	
Secondary	19	78	5.8(0.74-46.0)		15	82	4.3(0.55-35.0)	
Tertiary	8	28	6.9(0.80-58.8)		11	25	10.6(1.3-88.2)	
Prisoner's status								
Awaiting trial	20	130	0.20(0.08-0.48)	P < 0.001	24	126	0.44(0.18-1.1)	0.065
Convict	13	17			9	21		

First degree relative has hypertension								
Yes	13	11	8.0(3.2-20.4)	P < 0.001	13	11	8.0(3.2-20.4)	P < 0.001
No	20	136			20	136		
BMI								
Overweight/obese	29	44	17.0(5.6-51.2)	P < 0.001	26	47	7.9(3.2-19.5)	P < 0.001
Normal	4	103			7	100		
Physical activity								
Insufficient	26	59	5.5(2.3-13.6)	P < 0.001	23	62	3.2(1.4-7.1)	0.004
Sufficient	7	88			10	85		

Following bivariate analysis, a dose-response relationship was noticed between age and both systolic BP and diastolic BP; the older the age, the higher the odds of hypertension. Inmates who were ever married were more likely to be more hypertensive; they were 2.8 (95%CI: 1.3-6.4) times more likely to have hypertensive SBP and 3.4 (95%CI: 1.5-7.7) times to have hypertensive DBP levels than those who were never married. Inmates who had a first degree relative with hypertension, were overweight/obese and physically inactive were more likely to be hypertensive also. Prisoners awaiting trial were less likely to be hypertensive. Respondents with tertiary education were more likely (OR: 10.6, 95%CI: 1.3-88.2) to have elevated DBP than those with no formal education. The same association was noted for hypertensive SBP (OR: 6.9, 95%CI: 0.80-58.8); the association was however not statistically significant (p-value: 0.234).

Table 4.10: Prisoner's characteristics of respondents associated with elevated BMI and insufficient physical activity (n=180)

Variable	BMI				Physical activity			
	Overweight/ Obese	Normal	O.R.(C.I.)	p-value	Insufficient	Sufficient	O.R.(C.I.)	p-value
Age group (years)								
≤ 24	3	18	1.0	P < 0.001	8	13	1.0	0.082
25 – 34	22	68	2.0(0.52-7.2)		36	54	1.1(0.41-2.9)	
35 – 44	31	18	10.3(2.7-40.0)		29	20	2.4(0.83-7.2)	
≥45	17	3	34.0(6.0-192.2)		12	8	2.4(0.69-8.6)	
Marital status								
Ever married	47	42	2.8(5.2-1.5)	0.001	44	45	1.2(0.66-2.1)	0.654
Never married	26	65			41	50		
Educational status								
No formal education	4	21	1.0	0.033	11	14	1.0	0.322
Primary school	12	10	6.3(1.6-24.5)		14	8	2.2(0.69-7.2)	
Secondary	40	57	3.7(1.2-11.6)		46	51	1.1(0.47-2.8)	
Tertiary	17	19	4.7(1.3-16.5)		14	22	0.81(0.29-2.3)	
Prisoner's status								
Awaiting trial	52	98	0.23(0.10-0.53)	P < 0.001	63	87	0.26(0.11-0.63)	0.002
Convict	21	9			22	8		

	BMI				
Variable	**Overweight/ Obese**	**Normal**	**O.R.(C.I.)**	**p-value**	
Physical activity					
Insufficient	41	44	1.8(1.0-3.3)	0.050	
Sufficient	32	63			

There was a dose response relationship between increasing age and being overweight/obese; the higher the age, the higher the odds of the inmate being overweight/obese (for 35-44 years OR: 10.3, 95%CI: 2.7 - 40.0; for ≥45 years OR: 34.0, 95%CI: 6.0-192.2). Inmates that were ever married (OR: 2.8, 95%CI: 5.2-1.5) and had insufficient physical activity (OR: 1.8, 95%CI: 1.0-3.3) were also more likely to be overweight/obese. As the education level increased, the odds of being overweight/obese also increased ($P < 0.001$). Prisoners that were awaiting trial were less likely to be overweight and less likely to be physically inactive.

Table 4.11: Prisoner's characteristics associated with cigarette smoking (n=180+)

Variable	Smoking			
	Yes	No	O.R.(C.I.)	p-value
Age group (years)				
≤24	15	6	1.0	P < 0.001
25 – 34	40	50	0.32(0.11-0.90)	
35 – 44	13	36	0.14(0.04-0.45)	
≥45	2	18	0.04(0.01-0.25)	
Educational status				
No formal education	19	6	1.0	P < 0.001
Primary school	10	12	0.26(0.08-0.91)	
Secondary	33	64	0.16(0.06-0.45)	
Tertiary	8	28	0.09(0.03-0.30)	
Prisoner status				
Awaiting trial	62	88	1.9(0.81-4.6)	0.154
Convict	8	22		
Number of inmates in a room				
≤20	38	80	1.0	0.006
20-59	5	11	0.96(0.31-2.9)	
≥60	27	19	3.0(1.5-6.0)	

As age and education level increased, the odds of an inmate smoking cigarette decreased (p-value: 0.000). Inmates who were staying in a room with at least other 60 inmates were more likely (OR: 3.0, 95%CI: 1.5-6.0) to smoke.

Table 4.12: Modeling of inmates' characteristics associated with cardiovascular risk factors (n=180)

Factor	OR	95%CI	p-value
Elevated systolic BP			
Has a first degree relative with hypertension	5.6	1.6-19.9	0.0086
Is overweight-to-obese	9.1	2.7-31.1	0.0004
Has none-to-insufficient physical activity	4.30	1.5-12.5	0.0079
Elevated diastolic BP			
Has a first degree relative with hypertension	5.7	1.7-19.6	0.005
Age group (years)			
≤34	1.0		
35 – 44	4.2	1.3-14.2	0.019
≥45	7.5	1.6-35.9	0.012
Overweight/Obesity			
Age group (years)			
≤24	1.0		
25 – 34	1.3	0.32-5.4	0.7056
35 – 44	5.6	1.2-26.8	0.0295
≥45	16.9	2.4-120.4	0.0048
Insufficient physical activity			
Prisoner awaiting trial	0.33	0.13-0.83	0.018
Currently smoking			
Age group (years)			
≤24			
25 – 34	0.54	0.17-1.71	0.2959
35 – 44	0.36	0.10-1.31	0.1207
≥45	0.11	0.02-0.73	0.0218
Education			
No formal	1.0		
Primary	0.36	0.09-1.4	0.1374
Secondary	0.16	0.05-0.48	0.0013
Tertiary	0.13	0.03-0.49	0.0028
Number of inmates in room			
<20	1.0		
20-59	1.23	0.37-4.09	0.7319
>60	3.10	1.38-7.00	0.0063

Following modeling, it was determined that prisoners with a first degree relative were more likely to be hypertensive. However being overweight and having insufficient physical activity were associated with hypertensive systolic BP, while older age groups were more likely to have hypertensive diastolic BP. Prisoners aged 35 years old or more were more likely to be overweight or obese. Respondents that were awaiting trial were less likely to be physically inactive. Regarding current cigarette use, inmates with at least secondary level of education and at least 45 years old were less likely to smoke while those living in room with >60 inmates were more likely to smoke.

CHAPTER FIVE

DISCUSSION

The prevalence of hypertension which is one of the risk factors of cardiovascular disease from this study was 18.3%. This is lower than overall estimated prevalence in Nigeria of 28.9% (25.1, 32.8); with a prevalence of 29.5% (24.8, 34.3) among men and 25.0% (20.2, 29) among women.[101] The higher prevalence in the overall population of adults could be due to higher aged population in the country than in prison (18-54 years). Another study[102] in Nigeria showed the overall crude prevalence of hypertension ranged from 0.1% (95% CI:-0.1 to 0.3) to 17.5% (95% CI: 13.6 to 21.4) in children and 2.1% (95% CI: 1.4 to 2.8) to 47.2% (95% CI: 43.6 to 50.8) in adults. The result from this study is also lower than what was gotten for civil servants 27.1%[103] and market workers 42.2%[104] in Nigeria and a study in Accra, Ghana found a prevalence of 28.3%.[105] Inmates in USA prison also had a higher prevalence of 24.7%,[13] this may be attributable to the kind of food consumed by them.

However study done among staff and students of a tertiary institution Benue state Nigeria showed a lower prevalence of 15.7%.[104] This may be due to the fact that it was a younger community. Another study done among all-male inmates in Nigeria showed a lower prevalence of 14.2%.[52] Other studies that recorded a lower prevalence in prison were 16.1%[51] in Sokoto, North west Nigeria and 2.1%[114] in Mexico. However there was similar prevalence as recorded 18.8% [106] from inmates in the Texas prison USA. Variables such as age, marital status, ethnicity, religion, first degree relative with hypertension and BMI were statistically associated with systolic and diastolic blood pressure. The association between age and BMI hypertension was linear such that with increasing age and BMI, the prevalence of hypertension also increased. Similar findings have been recorded in Nigeria and Pakistan.[102, 104, 107, 108] The ever married had higher prevalence of hypertension than never married in this study, it could be due to the fact that the never married were likely to be younger, a similar result had been documented.[104, 107] There

was significant association with ethnicity. This has also been reported in a study, were the crude prevalence of hypertension by geopolitical zones North-east 60.4%, south-east 41.0%, south-south 34.2%, North-west 51.5%, South-west 40.1%, North-central 39.5%. Also, the distribution of hypertension differed highly significantly across geopolitical zones in Nigeria, χ^2 (df, 5) = 375.656, $p < 0.0001$.[102] Christians were more affected with hypertension, this could be due to the fact that most of the respondents were Christians; significant association of hypertension with religion was also demonstrated in a study.[107].A study had also showed similar finding, where persons with first degree relatives who had hypertension were also more likely to be hypertensive.[108] There was no significant association between educational status and systolic hypertension, this was also documented in a study in Benue State Nigeria.[104] This study found significant association between educational status with diastolic hypertension, another study also showed difference with hypertension.[107]

This study also looked at prevalence of overweight and obesity as cardiovascular disease risk factor and it showed overweight and obesity of 33.4% and 7.2% respectively. This is close to prevalence in Nigeria with overweight and obesity ranging from 20.3% – 35.1%, and 8.1% – 22.2%,[109] respectively. It is higher than obesity of 4.3% found in the inmates in a study done in1996 and this could be due change in lifestyle or better feeding of the inmates. However higher obesity prevalence of 22.6%,[104] 24.7%[13] and overweight of 47%[13] were documented in other studies done among market workers in Nigeria and inmates in USA respectively. Another study done in USA showed prevalence of overweight and obesity as 66% in adults.[77] That of USA could be due to their lifestyle and better feeding in the jail and prisons. There was no underweight found in this study while other studies done documented underweight of 0.4%[13] and 6.4%.[51] It was also noted in this study that they lacked adequate food rich in fruits and vegetables since only 0.6% and 3.9% of the inmates were able to consume fruits and vegetables respectively on daily basis. Age, ethnicity, marital status, educational status, prison status, knowledge

category and physical activity are significantly associated with body mass index. The higher the age the more the overweight and obesity. Similar result has been reported in a study done in Nigeria.[109] The significant association with ethnicity was also recorded in a study.[110]

The other cardiovascular risk factors considered in this study were diabetes, tobacco use, alcohol use and physical activity. This study had only 0.5% that was diabetic as against record of 4.2%[106] in a study done in inmates in Texas. This low prevalence of diabetes in this study may likely be due the younger age group, the type of food given to the inmates and the finding that majority of the respondents do not have the family history of diabetes. However this result is similar to that of study done in prison inmates of Sokoto North west Nigeria which also reported a prevalence of 0.5%.[51]

Smoking was identified as the second most common cardiovascular risk factor among prisoners. Prisoner populations have a smoking prevalence that is up to three times that of the general populations with estimates ranging between 84 and 88%.[107] However the prevalence of tobacco use among the inmates in this study was 41%. Another study in Nigerian prison showed a prevalence of 66.7%, [52] and a study in Kenyan prison showed a prevalence of 66.1%.[111] The lower prevalence found in this study may be due to the fact that there could be some restriction to tobacco use in prison since about 60% were using it before coming to prison or they could not afford it with limited or no finance. Age, ethnicity, educational status, religion, level of knowledge and number of inmates in a room were significantly associated with smoking. Significant association with higher level of education was also identified in another study.[111] There was no record of alcohol consumption among the inmates in prison, although 43.3% of them were taking alcohol before coming to prison. This may be due to the fact that drinking is prohibited in Kuje prison. However findings in Southern part of Nigeria[52] and Kenya[111] found an alcohol consumption rate of 77.8% and 65.1% respectively.

Physical activity was another cardiovascular risk factor that was considered in this study. It has been shown from literature that increasing the amount of regular physical exercise has been shown to have a positive relationship to decreased risk of developing a chronic illness, such as CVD.[83] This study showed that during incarceration most carry out physical activity 94.4% (sufficient 52.8%, insufficient 41.7%) and 56.5% do it on daily basis and majority being football and jogging. However before incarceration lesser number of respondents participated in physical activity 65% (Sufficient 46.1%, insufficient 18.9%). This could be due to the fact that, it may be the only recreation and it helps them to socialize. It may have be made compulsory or always asked to come out during the period of exercise which is a very good practice since it will give them opportunity to refresh and reduce mental stress. A study among prisoners in Australia also showed performance of regular exercise among 87% of men and 73% of women and only 66% of men and 51% women indulge in daily exercise,[60] in another study done in Pakistan 71% of prisoner did not have regular exercise which is contrary to the findings of this study.[49]

The knowledge of the participants on cardiovascular risk factor was also assessed in this study and few respondents had high knowledge on cardiovascular risk factors. The study also showed the most known risk factor in order of stress, smoking, high blood pressure, inactivity and Diabetes. Similar low knowledge about risk factors were found in a study where 48% of participants were able to acquire a score of 20 and above from a total of 25, where as 52% of participants scored below 20, However the order was overweight was considered as a major risk factor (100%) for heart disease by the participants followed by high cholesterol level (98%), high blood pressure level (94%) and Smoking (92%).[112] Another study showed 45% had average level of knowledge regarding ischemic heart disease, whereas 35% had below average and 20% above average level of knowledge while knowledge of risk factors was 70% high cholesterol diet, 60% obesity causes Ischemic Heart Disease and few 30% answered stress.[113] The

awareness of hypertension was low. The study done among market workers in Enugu State, Nigeria also recorded low awareness 29.4% of hypertension.[104] Only 27.8% had ever measured blood sugar level. The practice of checking blood sugar level is still very low.

CHAPTER SIX – CONCLUSION AND RECOMMENDATIONS

6.1 Conclusions

The prevalence of hypertension (18.3%) among the inmates prison was high and poor knowledge of risk factors of cardiovascular disease were also found among the inmates of Kuje prison in Nigeria. The prevalence of hypertension, overweight and obesity was 18.3%, 33.4% and 7.2% respectively. Increasing age, body mass index and family history of first degree relative with hypertension were positively associated with hypertension.

However there was no alcohol use among the inmates which is a good practice. Almost all the inmates were involved in physical activity. The food given to them lacked vegetables and fruits since most of them indicated that they do not take daily. The knowledge of the inmates about risk factors was low; however most of them identified some risk factors like stress, smoking, high blood pressure, physical inactivity and diabetes.

6.2 Recommendations

Based on the findings the following recommendations were made:

Prison authorities:

1. Screening of prisoners for cardiovascular risk factors both at entry and during incarceration by the health workers in the Prison clinic to detect early hypertension and diabetes among the inmates.
2. Health Education on the cardiovascular disease risk factors should be given regularly to the inmates by the Health workers in the prison clinic.
3. Organized physical activities and various sports programmes should be made an integral component of the administration and the management of prisons.
4. There is need to increase patients' level of risk factor knowledge, and ultimately develop interventions to effect behavior change, reduce risk, and improve cardiovascular health in prisoners.

5. Effective smoking cessation services should be introduced in the prison to assist cigarette smokers quit smoking.

Federal government:

6. Adopt legislation and enforcement of laws on Smoking and alcohol use among the inmates.
7. Provide healthy food to the inmates, through the ministry of interior and Nigerian Prison Service.
8. Employ professional physical training instructors to conduct physical activities programmes and educate prisoners about the health benefits of physical activities and the negative effects of inactivity.

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APPENDICES

Appendix 1

Questionnaire

The Prevalence of Cardiovascular disease Risk factors among Inmates in Kuje Federal Prison, Federal Capital Territory, Abuja.

Introduction

My name is ……..... I am a resident with the Nigerian Field Epidemiology and Laboratory Training programme I am carrying out a study to determine the prevalence of cardiovascular risk factors among inmates in Kuje Federal prison. The study will be used to make recommendations, policy and plan interventions.

Confidentiality and Consent. All data will be handled with strict confidentiality. None of the information you provide will be given to the prison authority, law enforcement or court system. You will not be persecuted because of the answer you provide.

Participation is voluntary. Should a participant choose to no longer participate this will not affect his/her rights and will not result in him/her being treated differently by the prison Authorities? This study has been approved by the Health research ethics committee of Federal capital Territory.

Do I have your consent to continue with the interview? Yes { } No { }

Questionnaire number……..

Interviewer ID/Name……..

Date

Background Characteristics

√ Tick as appropriate

Convict { }

Awaiting Trial { }

SECTION A: Socio-Demographics		
1. Sex		
2. What was your age last birthday?		
3. What is your date of birth?		
4. What is your occupation?	1.Government employee 2.Nongovernment employee 3.Self employed 4.Student 5.Retired 6.Unemployed 7.Other: specify	
5. What ethnic group are you from?	1. Hausa (Northerner) (If a northerner, pls. specify tribe) 2. Igbo 3. Yoruba 4.Others (please specify)	…….

6. What is your marital status?	1 .Single (never married) 2. Married 3. Divorced 4. Widowed 5. Separated 6. Co-habiting	
7. What is the highest class or year of school you completed?	1. No formal education 2. Arabic school 3. Primary school 4. Secondary 5. Tertiary 6. Postgraduate (PGD, masters, PhD)	
8. Which is your religion?	1. Christianity 2. Islam 3. Traditional 4. Others (pls specify) ……..	
9. How often do you attend religious congregational services?	1 Everyday 2More than once a week 3 once a week 4Less than once a week 5 Not at all	

10. How important is religion to you in helping you deal with problems?	Very important Somewhat important Not important Others Specify	
11. How many times have you been in prison including this one?	Once Twice 3-5times More than 5 times	
12. How long have been in this place for this episode(Kuje prison)	**Less than 1 week** **1week-less than 1 month** **1month-less than 1 year** **1year-3years** **More than 3years-6years** **More than 6years-9years** **More than 9years**	

13. What is the number of inmates in your cell?

Behavior's before you came to prison

Physical activity	**Options**	**Response**
15. During the past month, did you participate in any physical activities or exercises such as football, jogging, tennis, gardening, or walking for exercise?	1. Yes 2. No	
16. If yes, which exercise did you engage in?		
17. How long do you usually spend on the average exercising during each session?		
18. If yes, how often do you engage in this kind of exercise?	1. Daily 2. 1 – 3 times per week 3. Once weekly 4. 1- 3 times per month	
Tobacco Use		
19. Do you currently smoke tobacco products or chew tobacco snuff by mouth or snuff by nose.	Yes No Specify one	
20 On the average how many sticks of cigarette do you smoke in a day	1. 2.Don't know	

22. Do you **now** smoke cigarettes every day, some days, or not at all?	1. Every day 2. Some days 3 .Not at all	
23. How long have you been smoking in years?		
24. During the past 12 months, have you stopped smoking for one day or longer because you were trying to quit smoking?	1. Yes 2. No 3.Not applicable	
25. Do you drink any alcoholic beverage such as beer, wine, spirit or liquor?	1. Yes 2. No	
26. How many days per week or per month did you have at least one drink of any alcoholic beverage?	(0) Not applicable (1) Monthly or less (2) 2 to 4 times a month (3) 2 to 3 times a week (4) 4 or more times a week	
27. What is the largest number of drinks you had on any occasion?	1. Number of drinks 2. Don't know / Not sure 3. Not Applicable	

DIET		
28 In a typical week, on how many days do you eat fruit?	1 . Every day 2. Some days 3 .Not at all	
29. In a typical week on how many days do you eat Vegetable?	1. Every day 2. Some days 3 .Not at all	
30. Do you add additional salt to your food	1. Yes 2. No	

How often do you eat/drink the following (State the number of times in **ONE** box only**)**

Item	Per Day	Per Week	Per Month	Per Year	Never	Don't Know
31 Pastries e.g. meat-pies, cakes, biscuits)						
32. Fried foods e.g. dodo, yam						
33. Soft drinks e.g. coke, fanta,						
34. Sweets e.g. chocolates, toffee etc						
35. Fast foods e.g. Mr Biggs, tantalizers						
36. Red meat e.g. beef, pork						

Behaviours In Prison

Physical activity	Options	Response
37. Do you participate in any physical activities or exercises such as football, jogging, tennis, gardening, or walking for exercise?	1. Yes 2. No	
38. If yes, which exercise do you engage in?		
39. How long do you usually spend on the average exercising during each session?		
40. If yes, how often do you engage in this kind of exercise?	1. Daily 2. 1 – 3 times per week 3. Once weekly 4. 1- 3 times per month	
Tobacco Use		
41. Do you currently smoke tobacco products or chew tobacco snuff by mouth or snuff by nose.	Yes No Specify one	
42.On the average how many sticks of cigarette do you smoke in a day	1. 2. Don't know	

44. Do you **now** smoke cigarettes every day, some days, or not at all?	1. Every day 2. Some days 3 .Not at all	
45. How long have you been smoking in years?		
46. During the past 12 months, have you stopped smoking for one day or longer because you were trying to quit smoking?	1. Yes 2. No 3.Not applicable	
47. Do you drink any alcoholic beverage such as beer, wine, spirit or liquor?	1. Yes 2. No	
48. During the past 30 days, how many days per week or per month did you have at least one drink of any alcoholic beverage?	(0) Not applicable (1) Monthly or less (2) 2 to 4 times a month (3) 2 to 3 times a week (4) 4 or more times a week	
49. During the past 30 days, what is the largest number of drinks you had on any occasion?	1. ____ Number of drinks 2. Don't know / Not sure 3. Not Applicable	
DIET		

50. In a typical week, on how many days do you eat fruit?	1 . Every day 2. Some days 3 .Not at all	
51. In a typical week on how many days do you eat Vegetable?	1. Every day 2. Some days 3 .Not at all	
52. Do you add additional salt to your food	1. Yes 2. No	

53. Can you state the meals you ate yesterday?

Breakfast: ……..

Lunch: ……..……

Supper: ……..…….……..

Snacks: ……..……

54. Have you ever had your blood pressure measured by a doctor or other health worker?		
55. Are you a Known hypertensive	Yes No Don't Know	
56. Are you taking any drug for Hypertension, If yes what are the drugs?		
57. Which of the cardiovascular diseases are you aware of?	1. Hypertension 2. Stroke 3. Diabetes 4. Heart disease	
58. Do you have any first degree relative who is hypertensive/Diabetes/Stroke/Heart Disease	Yes No	
59. Which of the Cardiovascular disease risk factors are you aware of?	. Obesity Sedentary lifestyle Smoking Family history High dietary salt intake Excessive alcohol consumption stress	
62. Have you ever had your blood sugar measured by a doctor or other health worker?		
63. Are you a known diabetic?	Yes No Don't know	

64. Are you taking any drug for diabetes? If yes what are the drugs?		

Physical Measurement.		
67. Height in Meter		
68. Weight in Kg		
69. Blood pressure	Systolic	
	Diastolic	
70. Waist Circumference		
71. Hip Circumference		
72. Abdominal Circumference		
73. Random Blood sugar		

These next questions ask about heart disease. Please circle false; if you are unsure about the correct answer you may circle “don’t know”.

1. A person always knows when they have heart disease:

a. True b. False c. I don’t know

2. If you have a family history of heart disease you are at risk heart disease:

a. True b. False c. I don’t know

3. The older a person is, the greater their risk of having heart disease:

a. True b. False c. I don’t know

4. Smoking is a risk factor for heart disease:

a. True b. False c. I don’t know

5. A person who stops smoking will lower their risk of developing heart disease:

a. True b. False c. I don’t know

6. High blood pressure is a risk factor for heart disease:

a. True b. False c. I don’t know

7. Keeping blood pressure under control will reduce a person's risk

a. True b. False c. I don’t know

8. High cholesterol is a risk factor for developing heart disease: Blood cholesterol is a fatty substance found in the blood

a. True b. False c. I don’t know

9. Eating fatty foods does not affect blood cholesterol levels:

a. True b. False c. I don’t know

10. Overweight increases a person's risk for heart disease:

a. True b. False c. I don’t know

11. Regular physical activity will lower a person's chance of getting heart disease:

a. True b. False c. I don’t know

12. Diabetes is a risk factor for developing heart disease:

a. True b. False c. I don’t know

13. High blood sugar makes the heart work harder:

a. True b. False c. I don’t know

14. A person who has diabetes can reduce their risk of developing heart disease if they keep their blood sugar levels under control:

a. True b. False c. I don’t know

15. Abdominal Obesity (fat belly) is a risk factor for developing heart disease:

a. True b. False c. I don’t know

16. Stress may cause an increase in blood sugar, blood pressure and cholesterol levels:

a. True b. False c. I don’t know

THANK YOU VERY MUCH FOR YOUR TIME AND RESPONSE

Appendix 2

FEDERAL CAPITAL TERRITORY
HEALTH RESEARCH ETHICS COMMITTEE

Research Unit, Room 10, Block A Annex, HHSS
FCT Secretariat No. 1 Kapital Street Area 11, Garki, Abuja - Nigeria

Name of Principal Investigator	Dr. Osunkwo Damaris
Address of Principal Investigator:	Nigeria Field Epidemiology & Laboratory, No. 50 Haile Sellaise Street, Asokoro – Abuja
Date of receipt of valid application:	20/11/2015

Notice of Research Approval

Protocol Approval Number: FHREC/2015/01/77/30-11-15

Study Title: Cardiovascular Risk Factors among Inmates in Federal Capital Territory Prisons

This is to certify that the FCT Health Research Ethics Committee (FCT HREC) has fully approved the research described in the above stated protocol.

Approval Date: - 30/11/2015
Expiration Date: - 29/11/2016

Note that no activity related to this research may be conducted outside of these dates. Only the FCT HREC approved informed consent forms may be used when written informed consent is required. They must carry FCT HREC assigned protocol approval number and duration of approval of the study.

The National Code of Health Research Ethics requires you to comply with all institutional guidelines, rules and regulations, and with the tenets of the code. The FCT HREC reserves the right to conduct compliance visit to your research site without prior notification.

Modifications: Subsequent changes are not permitted in this research without prior approval by the FCT HREC.

Problems: All adverse events or unexpected side effects arising from this project must be reported promptly to FCT HREC.

Renewal: This approval is valid until the expiration date. If you are continuing your project beyond the expiration date, endeavor to submit your annual report to FCT HREC early, and request for renewal of your approval to avoid disruption of your project.

Closure of Study: At the end of the project, a copy of the final report of the research should be forwarded to FCT HREC for record purposes, and to enable us close the project.

Desmond Emereonyeokwe
For: Secretary, FCT HREC
November 30, 2015