ASSESSMENT OF BEHAVIORAL LIFESTYLE AS A CORRELATE OF RISK FOR CARDIOVASCULAR DISEASE AMONG ADULT RESIDENTS IN SELECTED COMMUNITY IN BENIN CITY,NIGERIA.

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IN PARTIAL FUFILLMENT OF THE AWARD OF "BACHELOR OF SCIENCE IN NURSING" CERTIFICATE, COLLEGE OF MEDICAL SCIENCES, UNIVERSITY OF BENIN, BENIN CITY.

NOVEMBER, 2025

DECLARATION

This is to declare that this research project titled **"ASSESSMENT OF BEHAVIORAL LIFESTYLE AS A CORRELATE OF RISK FOR CARDIOVASCULAR DISEASE AMONG ADULT RESIDENTS IN SELECTED COMMUNITY IN BENIN CITY,NIGERIA."** was carried out by **IGBOKWE JULIET CHIOMA**. It is solely the result of my work except where acknowledged as being derived from other person (s) or resources.

MATRICULATION NUMBER: _____

FACULTY/COLLEGE: NURSING SCIENCE, COLLEGE OF BASIC MEDICAL

SCIENCES, UNIVERSITY OF BENIN, BENIN CITY.

Signature: …….

Date: …….

CERTIFICATION/APPROVAL

This is to certify that this project titled **"ASSESSMENT OF BEHAVIORAL LIFESTYLE AS A CORRELATE OF RISK FOR CARDIOVASCULAR DISEASE AMONG ADULT RESIDENTS IN SELECTED COMMUNITY IN BENIN CITY,NIGERIA."** was carried out by **IGBOKWE JULIET CHIOMA** with Mat. No. **BMS1906710** in the Department of Nursing Sciences under the supervision of **Dr T.A. Ehwarieme.**

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Acting Head of Department(MED.SURG) **Sign &date**

PROF. F.U.OKAFOR _____
Dean of faculty **Sign & date**

_____
EXTERNAL EXAMINER

_____
DATE

DEDICATION

This research project work is dedicated to Almighty God for his grace, love, through the period of this research and this BSc Program in general; and also to my dear parents, Mr & Mrs Igbokwe, for their continuous support, prayers, and encouragement throughout this journey.

ACKNOWLEDGEMENTS

My profound gratitude goes to the Amazing God for his strength, wisdom, and guidance all through my period of study and for making this work a success.

My sincere gratitude goes to my supervisor, Dr. T.A. Ehwarieme, for his patience and guidance throughout this work. May the Almighty God continue to bless you and your family

I acknowledge the Head of Department, Prof. F.U.Okafor for his coordination of the department and for ensuring the smooth running of the affairs of the department. Special thanks to my indefatigable lecturers, Prof. F.U. Okafor, Dr. (Mrs.) J.A. Afemikhe, Dr. (Mrs.) C. Enuku, Dr. (Mrs.) J.N Oko-Ose, Dr. (Mrs.) C.E. Omorogbe, Mrs. M.A. Iniomor, , Mrs. C.C. Edo-Osagie, Mrs. N.E. Oyana, Rev. Sr. J.N. Chukwurah, Mrs. R.L. Lawal, Mrs. I.N. Orobiyi, Mrs. V.C. Chegwe, and Mrs. H.E. Natufe, who have all imparted knowledge through their dedicated works, as well as the non-academic staff and technologists.

Special thanks go to my loving parents, Mr and Mrs Igbokwe, my siblings and cousins, Mesoma, Henrietta, Henry, Chibuife, Alex, Onyinye, Benita, and also to my amazing friend, Osigbemhe, for their immense support throughout this work and the period of the academic program. I appreciate you all for your motivation and prayers.

I sincerely appreciate my friend and mentor,Peter Oyefolu for his guidance and unwavering support. Many thanks to the friends who made my experience worthwhile, my uncles and aunts, and fellow coursemates. God bless you.

ABSTRACT

Cardiovascular diseases (CVDs) remain the leading cause of global mortality, with a rising burden in sub-Saharan Africa driven by rapid urbanization and unhealthy lifestyle changes. In Nigeria, modifiable risk factors such as poor diet, physical inactivity, tobacco use, and alcohol consumption are increasingly prevalent, yet limited data exist on how these behaviors correlate with physiological risk factors within urban communities. This study aimed to assess behavioral lifestyle practices as correlates of modifiable physiological risk factors for cardiovascular disease among adult residents in the Ekosodin community, Benin City, Nigeria. A descriptive cross-sectional study was conducted using a systematic sampling technique. The sample used a Kth interval of 2in selecting households and then adult residents within the community. Data were collected through a structured questionnaire and physical measurements, including body mass index (BMI) checking the height and weight, blood pressure (BP), and waist circumference (WC). Descriptive statistics were used to analyze patterns of behavior and risk factors, while chi-square and multivariate logistic regression were employed to test associations and hypotheses. Among adult residents in Ekosodin community (Benin City, Nigeria), cardiovascular disease risk significantly correlated with unhealthy lifestyle behaviors as 38.6% had hypertension, 57.5% were overweight/obese, 34% were high-risk residents, with risk factors more prevalent among males (39.7%), those aged over 60 (66.7%), individuals with no formal education (54.2%), those earning less than ₦20,000 monthly (39.4%), and those with a family history of CVD (43.9%).The study highlights the strong correlation between lifestyle behaviors and cardiovascular risk factors among adults in the Ekosodin community. It underscores the urgent need for community-based health promotion interventions that target behavior modification. Public health policies should prioritize education and prevention strategies to address the growing burden of cardiovascular diseases in urban Nigerian settings.

KEYWORDS: Assessment, Behavioral Lifestyle, Risk, Cardiovascular Disease, Adult, Residents, Community.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Cardiovascular diseases (CVDs) continue to represent the leading cause of death globally, responsible for an estimated 17.9 million fatalities each year, according to the World Health Organization (WHO, 2021). This accounts for roughly 32% of all global deaths, illustrating the widespread impact of CVDs on public health. Of these deaths, approximately 85% are specifically attributed to heart attacks and strokes, highlighting the critical need for prevention and intervention strategies targeting these conditions. CVDs encompass a broad range of non-communicable disorders affecting both the heart and blood vessels. These include conditions such as coronary artery disease, cerebrovascular disease, and rheumatic heart disease. The diversity and complexity of these diseases present significant challenges for healthcare systems worldwide, especially in terms of early detection, management, and long-term care.

With global life expectancy steadily rising, the burden of CVD is projected to increase significantly, particularly among older populations (Chong et al., 2024). As more individuals live into advanced age, they become more susceptible to cardiovascular complications due to cumulative exposure to risk factors. Age-related physiological changes such as increased blood pressure, cholesterol imbalances, and declining metabolic function compound these risks. Furthermore, aging bodies tend to be less resilient and more vulnerable to damage, making the proactive management of

cardiovascular health increasingly important in elderly populations. This growing burden poses considerable strain on healthcare systems, especially in terms of resource allocation, care delivery, and health outcomes.

In high-income countries such as the United States, CVD remains highly prevalent. According to Martin et al. (2024), approximately 127.9 million adults, or 48.6% of the adult population, were living with some form of cardiovascular disease between 2017 and 2020. This statistic underscores the extensive reach of CVD, indicating that nearly half of all adults are dealing with heart-related health issues, ranging from hypertension and atherosclerosis to stroke and heart failure.

In the African context, Nigeria stands out as the most populous country on the continent, with a population of roughly 213 million and an annual growth rate of 2.4%. The demographic structure is largely youthful, with about 40% of the population falling into the youth category (Onyia et al., 2025). However, rapid urbanization across Nigeria and other African nations has been accompanied by a notable rise in non-communicable diseases. As rural populations transition to urban living, there has been a marked shift in lifestyle behaviors. Increased consumption of high-calorie, nutrient-poor foods, higher rates of tobacco and alcohol use, and reduced levels of physical activity are now commonplace. These behavioral changes are most evident among individuals in low- and middle-income communities, who often face barriers such as limited access to healthy foods, safe exercise environments, and affordable healthcare services. While urbanization brings economic development and

opportunities, it also contributes significantly to environments that facilitate unhealthy behaviors and increased disease risk (Juma, 2023).

Risk factors for cardiovascular diseases are generally classified into two main categories: non-modifiable and modifiable. Non-modifiable risk factors include aspects of an individual's biology or genetics that cannot be changed, such as age, sex, family history of CVD, and ethnic background. These factors often set a baseline level of risk that is further influenced by lifestyle and environmental exposures. For example, the natural aging process inherently increases the risk of heart disease and stroke, regardless of an individual's health habits.

Conversely, modifiable risk factors are those that can be actively managed or mitigated through behavioral changes, lifestyle interventions, or medical treatment. These include high blood pressure, elevated cholesterol levels, obesity, smoking, excessive alcohol consumption, unhealthy diets, and physical inactivity. By adopting healthier habits—such as engaging in regular physical activity, consuming a balanced diet, avoiding tobacco, limiting alcohol, and managing stress individuals can significantly reduce their risk of developing CVD. Although the extent of influence these risk factors exert can vary based on population characteristics and research methodology, they are universally recognized as critical targets for prevention (Yusuf et al., 2021).

Recent research further supports the pivotal role of lifestyle in shaping cardiovascular outcomes. Kwiatkowska et al. (2023) emphasize that behavioral factors, particularly those related to diet, physical activity, smoking, and alcohol intake, have a more

profound effect on health and longevity than metabolic or environmental factors. This aligns with findings from the 2019 Global Burden of Disease Study (GBD, 2019), which revealed that nearly half (49.35%) of all cardiovascular-related deaths globally were attributable to behavioral risk factors. Additionally, such behaviors contributed to 45.29% of chronic respiratory disease deaths, 36.7% of cancer-related deaths, and 38.24% of all-cause mortality. These findings underscore the urgent need for public health strategies that prioritize lifestyle modifications to curb the growing burden of non-communicable diseases worldwide.

1.2 Statement of the problem

According to Şahin and Ilgün (2022), the major reason for the deaths around the world is cardiovascular disease.Cardiovascular diseases (CVDs) remain one of the leading causes of morbidity and mortality globally, with a significant burden in Nigeria. Understanding the prevalence of both modifiable and non-modifiable risk factors in specific populations is crucial for developing effective prevention and intervention strategies.

The increasing prevalence of cardiovascular disease (CVD) cases and mortality in sub-Saharan Africa can be attributed to significant shifts in dietary patterns and physical activity behaviors which are examples of modifiable risk factors of cardiovascular disease. Traditional nutritional practices are increasingly supplanted by consumption of processed food products, while physical activity levels have diminished considerably due to the proliferation of sedentary occupations and increased reliance on motorized transportation methods (Bockarie et al., 2021)

In Benin City, a growing urban center with diverse lifestyles, the lack of comprehensive data on behavioral lifestyle as a correlate of risk of cardiovascular disease among adult residents in a selected community presents a significant gap in public health research. This scarcity of data presents a significant challenge for healthcare professionals and policymakers who aim to understand the extent of the issue and develop effective prevention strategies. As cardiovascular diseases continue to pose a serious public health threat, particularly in developing countries like Nigeria, it becomes increasingly important to gather detailed information on the risk factors that can be modified through lifestyle changes and medical interventions. Without such data, efforts to combat the rising incidence of CVD may be hampered, highlighting the urgent need for more focused research in this area.

Modifiable risk factors, such as hypertension, dyslipidemia, smoking, obesity, and physical inactivity, can be targeted through lifestyle modifications and medical interventions to reduce the incidence of CVDs.

Despite the known impact of these risk factors, there is limited localized research that identifies how it is influenced by behavioral lifestyle practices in communities within Benin City. The findings will provide valuable insights for healthcare providers and policymakers to tailor preventive strategies and improve cardiovascular health outcomes in the region.

This study was designed to assess the behavioral lifestyle as a correlate of risk of cardiovascular disease among adult residents in a selected community in Benin City.

1.3 Objectives of the study

The broad objective of this study is to assess the behavioral lifestyle as a correlate of the risk of cardiovascular disease among adult residents in a selected community in Benin City, Nigeria.

The specific objectives of the study are

1. To assess the behavioral lifestyle practices among adult residents in a selected community in Benin City, Nigeria.
2. To assess the the modifiable physiological risk factors (Body Mass Index (BMI) ,blood pressure (BP), waist circumference) of adult residents for cardiovascular disease in a selected community in Benin City, Nigeria.
3. To identify factors influencing behavioral lifestyle practices among the adult residents in a selected community in Benin City, Nigeria.

1.4 Research questions

1. What are the behavioral lifestyle practices among adult residents in a selected community in Benin City, Nigeria?
2. What are the modifiable physiological risk factors (Body Mass Index (BMI) ,blood pressure (BP), waist circumference) for cardiovascular disease among adult residents in a selected community in Benin City, Nigeria?

3. What are the factors influencing behavioral lifestyle practices among the adult residents in a selected community in Benin City, Nigeria?

1.5 Research hypothesis

Based on findings gotten from previous studies in Africa and internationally, the following hypotheses arise:

1. There is no significant relationship between Socio-demographic Characteristics and Modifiable Physiological Risk Factors.

2. There is no significant relationship between Behavioral Lifestyle Practices and Modifiable Physiological Risk Factors.

3. Association Between Body Mass Index Classification and Socio-demographic Characteristics

1.6 Significance of the study

The significance of this study is multifaceted, as it aims to contribute meaningfully to various domains such as nursing practice, education, research, and policy development. The findings will hold substantial relevance not only for government entities but also for policymakers, healthcare planners, researchers, and the wider society.

For nursing practice/profession, the study will inform nursing interventions that address behavioral risk factors within the sociocultural context of the community, improving the effectiveness of nursing care in cardiovascular disease prevention.

Additionally, it provides essential tools and knowledge to enhance nurses' roles in cardiovascular disease prevention and management within their community practice.

For the government and policymakers, this study provides critical local evidence needed to develop targeted health policies and allocate resources effectively. By understanding the specific behavioral patterns and cardiovascular risk factors in Benin City communities, authorities can implement context-appropriate interventions rather than applying generic solutions. The data will support evidence-based decision-making for preventive healthcare programs, infrastructure development, and regulatory frameworks addressing both individual behaviors and environmental determinants of cardiovascular health.

For healthcare planners, these findings will inform appropriate resource allocation, workforce training requirements, and service delivery models tailored to address the most prevalent risk factors identified in the community. This knowledge will support the development of integrated care pathways that effectively combine behavioral interventions with clinical management.

For Researchers and the Academic Community, this study addresses a critical knowledge gap by providing baseline data on cardiovascular risk factors specific to urban Nigerian populations. It contributes valuable evidence to the limited research on cardiovascular disease in sub-Saharan African contexts and establishes a foundation for future longitudinal and interventional studies. The findings may reveal previously

undocumented factors influencing cardiovascular health in this population, potentially opening new research directions.

For the society at large, the research has direct implications for public health by enhancing awareness about the relationship between lifestyle choices and cardiovascular health.

Moreover, the results of this study will establish a solid foundation for future research on potentially transforming how cardiovascular disease is prevented and managed in Benin City and similar Nigerian communities, paving the way for more comprehensive investigations and interventions in this critical area of public health.

1.7 Scope of the study

This study is set to assess the behavioral lifestyle as a correlate of the risk of cardiovascular disease among adult residents in the Ekosodin community in Benin City, Nigeria. It is also restricted to adults 18 years and above residing in the community under review, irrespective of their class and educational levels. This study is delimited to the three stated research objectives and three research questions.

The scope of the study may be limited to the community chosen and may not be generalizable to other communities in developed countries. However, its findings will provide valuable insight into the behavioral lifestyle practices of adults in certain communities in Nigeria, as the adults residing in this community would have come from various regions around the country.

1.8 Conceptual Definition of Terms

Correlate: To have a mutual relationship or connection, in which one thing affects or depends on another.

Risk: the possibility of something bad happening

Risk factors: Refers to anything that increases your chance of getting a disease.

1.9 Operational definition of terms

Behavioral Lifestyle: It encompasses the modifiable daily habits and choices related to physical activity, diet, substance use, stress management, and medical adherence that directly influence an individual's cardiovascular function and disease risk.

Correlate: The measurable aspect of behavioral lifestyle that is statistically associated with the levels of risk for cardiovascular disease among adult residents in the selected community.

Modifiable risk factor: modifiable risk factors will be assessed through self-reported questionnaires and clinical evaluations, focusing on behaviors such as smoking status, physical activity levels, body mass index (BMI), dietary patterns, measurements of blood pressure, and cholesterol levels.

Body Mass Index (BMI): Body Mass Index, called BMI for short, is calculated using the formula: BMI= weight in kilograms (kg) divided by the square of the height in meters square (m) ^2.In this study, Body Mass Index (BMI) will be classified as

underweight (BMI < 18.5), normal weight (BMI 18.5–24.9), overweight (BMI 25–29.9), and obesity (BMI ≥ 30).

Blood pressure (BP): Blood pressure is measured using a sphygmomanometer and recorded in millimeters of mercury (mmHg). It is defined as the force exerted by circulating blood upon the walls of blood vessels. Where the normal reading is classified as follows: Systolic < 120 mmHg and Diastolic < 80 mmHg

Waist circumference: Waist circumference is measured at the midpoint between the lower rib and the top of the hip bone, using a flexible measuring tape. It is used as an indicator of central obesity and is indicated as follows: Increased risk: > 94 cm for men and > 80 cm for women (indicative of higher cardiovascular risk).

Cardiovascular disease (CVD): Cardiovascular disease will be identified based on clinical diagnoses provided by healthcare professionals in the outpatient clinic, as documented in patient medical records, focusing specifically on conditions such as hypertension, heart failure, and coronary artery disease.

Adults: In this study, an adult is an individual who is 18 years of age or older, capable of making independent decisions, and participating in health-related assessments within the selected community in Benin City.

Resident: Refers to an adult individual aged 18 years and older who has lived in the selected community in Benin City for a minimum of six months before the study.

Community: It is a group of individuals who share common interests, values, and geographical locations and interact with one another in a social context.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter provides a comprehensive examination of recent and significant research on how behavioral lifestyle factors correlate with cardiovascular disease risk among community-dwelling adults. Through a detailed conceptual analysis, readers will be introduced to essential concepts for understanding this health issue. The chapter incorporates a theoretical review applying the health belief model to the research context, thereby validating these theoretical approaches. Additionally, an empirical review positions this investigation within the global research landscape, demonstrating the specific contribution and necessity of this study. The literature analysis draws from scholarly databases including Google Scholar, Science Direct, and PubMed, integrating conceptual and empirical research published between 2020 and 2025.

2.1 Conceptual review

2.1.1 Concept of cardiovascular disease

Cardiovascular disease (CVD) refers to a class of disorders that are non-

communicable, affecting the heart and blood vessels, including coronary heart disease, cerebrovascular disease, peripheral arterial disease, rheumatic heart disease, congenital heart disease, deep vein thrombosis, and pulmonary embolism (WHO, 2023). Coronary artery disease involves the narrowing or blockage of arteries supplying blood to the heart; hypertension Is characterized by high blood pressure; heart failure, where the heart cannot pump blood effectively; stroke, caused by interrupted blood flow to the brain; and peripheral artery disease, which affects blood flow to the limbs.

The development of cardiovascular disease is influenced by a combination of modifiable and non-modifiable risk factors. These include lifestyle choices that can be changed, such as poor diet, lack of physical activity, smoking, excessive alcohol consumption, obesity, age, gender, family history, and genetic predisposition.

CVDs manifest through various clinical presentations depending on the affected vessels and organs. Common manifestations include:

- Coronary Heart Disease: Characterized by chest pain (angina), breathlessness, and heart attacks

- Cerebrovascular Disease: Presenting as stroke or transient ischemic attack

- Peripheral Arterial Disease: Manifesting as pain and disability in the limbs

- Heart Failure: Resulting from the heart's inability to pump blood effectively

The global burden of CVD is not equally distributed, with low- and middle-income

countries (LMICs) like Nigeria bearing a disproportionate share. In Nigeria, particularly in urban centers like Benin City, CVD prevalence has been increasing, attributable to rapid urbanization, dietary transitions, and lifestyle changes (Oguoma et al., 2021).

Within communities, CVD contributes to substantial mortality, accounting for approximately one-third of all deaths worldwide and dramatically reducing life expectancy among affected populations (WHO, 2023). According to Bloom et.al. (2021), the economic burden of CVD on communities is devastating, with direct healthcare costs and indirect expenses from productivity losses estimated to exceed $3.76 trillion annually worldwide, creating financial hardship for families and straining community resources. Communities experience significant disruption when breadwinners develop CVD, as the condition frequently affects working-age adults, leading to reduced household income, increased caregiving needs, and diminished quality of life for entire families (Gheorghe et al., 2022). The psychological impact extends beyond patients to affect family members and caregivers, with studies showing elevated rates of depression, anxiety, and caregiver burden among those supporting individuals with CVD (Abubakar et al., 2021). In Nigerian communities specifically, the impact is compounded by limited healthcare infrastructure, with Benin City residents often facing delays in diagnosis and treatment due to insufficient specialized cardiovascular care facilities (Oguoma et al., 2021). Community social structures are further strained as traditional support systems become overwhelmed by the increasing prevalence of chronic conditions like CVD, particularly in rapidly

urbanizing areas where social cohesion may already be diminishing (Adeoye et al., 2021).CVD disproportionately affects disadvantaged populations, intensifying existing health inequities. Individuals in lower socioeconomic groups experience higher CVD prevalence and worse outcomes, often with fewer resources to manage the disease (Osibogun et al., 2022). Additionally, the clustering of CVD risk factors within communities, influenced by shared environmental exposures, dietary patterns, and lifestyle behaviors, creates hotspots of disease burden that can persist across generations without targeted intervention (Okafor et al., 2021). Early mortality and disability from CVD result in lost community leadership and participation, depriving communities of experienced members who would otherwise contribute to community development and social capital (Ige et al., 2021). Ultimately, to address these challenges, comprehensive community-based strategies are essential. Evidence shows that culturally tailored interventions can effectively reduce the CVD burden and improve health outcomes within communities (Ajayi et al., 2023).

2.1.2 Significance of community-based cardiovascular risk assessment

Community-based cardiovascular risk assessments have become vital in addressing the rising burden of cardiovascular diseases (CVD), particularly in resource-limited settings. These assessments help identify high-risk groups, offering insights into prevalent risk factors and enabling targeted, culturally relevant health interventions. In diverse regions like Benin City, understanding local behaviors and environmental influences is crucial.

Such initiatives support early detection and prevention. For instance, Adeoye et al. (2021) found that urban screening programs in Nigeria uncovered previously undiagnosed hypertension in 42% of participants, highlighting the impact of early intervention in reducing complications and improving public health.

They are also cost-effective. Owolabi et al. (2022) reported that community interventions in sub-Saharan Africa, including Nigeria, had a lower cost per quality-adjusted life year (QALY), emphasizing their value over hospital-based approaches in constrained healthcare systems.

Furthermore, cultural relevance enhances intervention success. Ajayi et al. (2023) found that incorporating local customs into programs in Benin City boosted adherence to lifestyle changes by 47%.

Assessing and modifying behavioral risk factors at the community level is equally important. Okafor et al. (2021) showed that poor diets, inactivity, smoking, and alcohol use accounted for 67% of hypertension risk in Benin City, underscoring the need for targeted behavior change. Supporting this, Ige et al. (2021) demonstrated that community lifestyle programs significantly lowered blood pressure and BMI over 12 months.

Lastly, sustainability is a key benefit. Adebiyi et al. (2023) found that community-led CVD prevention programs in urban Nigeria maintained a 42% increase in physical activity levels three years post-intervention, proving their long-term impact on public health.

2.1.3 Definition and concepts of behavioral lifestyle

Behavioral lifestyle refers to the habitual patterns of behavior, choices, and practices individuals adopt that collectively influence their health outcomes and quality of life (Jeong, 2023). In the context of cardiovascular disease (CVD) risk, behavioral lifestyle encompasses modifiable factors that significantly impact cardiovascular health. The World Health Organization estimates that approximately 80% of premature heart disease and stroke cases are preventable through lifestyle modifications (WHO, 2021).

Behavioral lifestyle plays a crucial role in cardiovascular health by affecting physiological systems such as lipid metabolism, blood pressure, blood sugar regulation, inflammation, and vascular function (Khera et al., 2023). Key lifestyle components influencing heart health include diet, physical activity, tobacco use, alcohol intake, and stress management, which together shape an individual's cardiovascular risk profile.

Diet and Nutrition

Dietary choices are foundational to cardiovascular outcomes, with unhealthy eating habits responsible for around 45% of global cardio metabolic deaths (Wang et al., 2021). In Nigeria, traditional, fiber-rich diets are increasingly replaced by high-fat, high-sugar Western diets (Adeloye et al., 2021). The Mediterranean diet is associated with a 29% reduction in cardiovascular events (Martínez-González et al., 2020), while Western dietary patterns raise the risk of heart disease and stroke (Iqbal et al., 2022).

Specific dietary contributors include:

- Sodium: Excess intake is linked to high blood pressure. Urban Nigerians consume more than double the WHO's sodium limit, raising systolic pressure significantly (Obasohan et al., 2020).

- Fruits & Vegetables: Insufficient intake deprives individuals of vital nutrients. Only 24% of Benin City adults meet the recommended daily amount, which is linked to lower inflammation (Adediran et al., 2022).

- Trans/Saturated Fats: High consumption worsens lipid profiles. Urban diets exceed safe fat limits, elevating LDL cholesterol and artery thickening (Ogunmola et al., 2021).

- Sugary Drinks: Regular consumption is linked to obesity, diabetes, and a 68% higher metabolic syndrome prevalence (Ezeigwe et al., 2023).

Physical Activity

Physical activity offers strong protective effects, improving cholesterol, insulin sensitivity, and weight control, while inactivity contributes to about 12% of cardiovascular deaths globally (Bull et al., 2020; Wahid et al., 2021). WHO recommends 150–300 minutes of moderate or 75–150 minutes of vigorous weekly activity (WHO, 2020). In Benin City, only 31.2% of adults meet this guideline, with women less active due to cultural and safety barriers (Oguoma et al., 2021).

Physical activity levels in Benin City are declining across multiple domains:

occupational activity has reduced due to sedentary jobs linked to higher hypertension rates (Adedoyin et al., 2022); transportation activity is low, with only 18.4% walking or cycling, which correlates with lower BMI (Okafor et al., 2021); leisure-time physical activity is limited (14.6%) due to socioeconomic and cultural constraints (Ige et al., 2023); and sedentary behaviors such as prolonged sitting independently increase metabolic risk, with each additional hour raising the likelihood of metabolic syndrome by 5% (Ajayi et al., 2022).

Tobacco Use

Tobacco use accelerates heart disease via vascular damage, inflammation, and clotting (WHO, 2021). In Nigeria, smoking prevalence is 4.1% nationally but higher in cities like Benin City (9.6%), especially among less-educated men (Osibogun et al., 2022).

Cigarette smoking increases the risk of coronary artery disease by nearly threefold (Adeoye et al., 2021), smokeless tobacco use has been shown to raise blood pressure (Ezeigwe et al., 2023), and exposure to secondhand smoke contributes to a 42% increased risk of subclinical atherosclerosis (Ajayi et al., 2023), yet despite the well-documented benefits of quitting smoking, only 12% of smokers in Benin City receive professional cessation support (Adebiyi et al., 2022).

Alcohol Consumption

Alcohol's cardiovascular effects depend on dose and pattern. Moderate intake may offer benefits, but high consumption increases risks like hypertension and stroke (Wood et al., 2020; Owolabi et al., 2022). In Benin City, 62.4% consume alcohol, and

18.3% are hazardous drinkers, with men more affected (Oladimeji et al., 2020). Binge Drinking is linked to acute cardiovascular risks, including heart arrhythmias and increased next-day blood pressure (Ogbera et al., 2021). And so also, the type of Alcohol matters; for instance, locally brewed palm wine may raise HDL cholesterol more favorably than commercial spirits (Adedoyin et al., 2023).

Stress and Psychosocial Factors

Chronic stress and poor psychosocial health impact heart disease through unhealthy behaviors and biological stress responses like inflammation and hormonal imbalances (Kivimäki & Steptoe, 2021). High stress is linked to double hypertension risk over five years (Okafor et al., 2023). Job strain also raises blood pressure, partly due to coping behaviors like smoking and alcohol use (Ige et al., 2022).

Social isolation has been linked to higher rates of uncontrolled hypertension (Ajayi et al., 2023), while sleep deprivation, defined as less than six hours of sleep per night, increases the risk of metabolic syndrome by 63% (Owolabi et al., 2021). Mental health issues such as depression not only reduce medication adherence but also contribute to poorer cardiovascular outcomes (Adeoye et al., 2022). However, stress reduction programs have demonstrated effectiveness in lowering systolic blood pressure, with an average reduction of 8.6 mmHg (Ezeigwe et al., 2023), highlighting the importance of addressing both psychological and behavioral factors in managing cardiovascular health.

2.1.4 Modifiable vs. non-modifiable risk factors

Understanding the risk factors that contribute to CVD is essential for developing effective prevention and intervention strategies. These risk factors are categorized into two main groups: modifiable and non-modifiable risk factors.

Modifiable Risk Factors

Modifiable risk factors represent behavioral and environmental aspects that can be altered through lifestyle changes and medical interventions:

Tobacco Use: Tobacco cessation yields substantial cardiovascular benefits, with risk reduction beginning shortly after cessation and approaching that of never-smokers after 10-15 years. Research by Adebiyi et al. (2022) highlighted that among Benin City smokers expressing desire to quit, only 12.3% received professional cessation support, identifying a critical gap in cardiovascular risk reduction efforts.

Alcohol Consumption: Episodic heavy drinking poses particular cardiovascular hazards, including acute coronary syndrome, arrhythmias, and cardiomyopathy. Ogbera et al. (2021) observed that among Benin City residents, binge drinking was reported by 24.7% of alcohol consumers, with each episode associated with a 39% increased risk of elevated blood pressure in the subsequent 24 hours.

Physical Inactivity: Sedentary behavior represents a significant risk factor for CVD. Regular physical activity has been shown to improve lipid profiles, reduce blood pressure, enhance insulin sensitivity, and promote weight management. However, urbanization in Benin City has contributed to increasingly sedentary lifestyles.

Dietary Patterns: The transition toward Western dietary patterns characterized by

high consumption of processed foods, saturated fats, refined carbohydrates, and sodium has been observed in urban Nigerian communities including Benin City. These dietary shifts significantly impact cardiovascular health through effects on lipid profiles, blood pressure, and metabolic function.

Psychological Factors: Depression and anxiety demonstrate bidirectional relationships with cardiovascular disease. Adeoye et al. (2022) documented that among Benin City residents with hypertension, comorbid depression was associated with significantly poorer blood pressure control (odds ratio for uncontrolled hypertension: 2.81, 95% CI: 2.14-3.68). This association was mediated by reduced medication adherence, unhealthy lifestyle behaviors, and physiological alterations including autonomic dysfunction and heightened inflammatory responses.

Obesity: Excess adiposity, particularly central obesity, significantly increases cardiovascular risk through multiple mechanisms including inflammation, insulin resistance, dyslipidemia, and hypertension. Urban communities in Nigeria, including parts of Benin City, have witnessed rising obesity rates associated with changing dietary patterns and reduced physical activity.

Hypertension: Elevated blood pressure remains a leading modifiable risk factor for CVD. Hypertension control rates in Benin City communities remain suboptimal, influenced by factors including medication access, adherence challenges, and healthcare system limitations.

Diabetes Mellitus: Impaired glucose metabolism significantly increases

cardiovascular risk. The growing prevalence of type 2 diabetes in Benin City correlates with urbanization, dietary changes, and increasing obesity rates.

Dyslipidemia: Abnormal blood lipid profiles, including elevated LDL cholesterol and triglycerides with reduced HDL cholesterol, contribute substantially to atherosclerosis development and progression.

Non-modifiable Risk Factors

Non-modifiable risk factors are inherent characteristics that cannot be changed but significantly impact an individual's susceptibility to cardiovascular disease:

Age: The risk of cardiovascular disease increases substantially with advancing age. The progressive nature of atherosclerosis and vascular changes over time contributes to this age-related risk elevation (Ogbera et al., 2021).

Sex: Significant differences exist in CVD manifestation between males and females. Men generally develop CVD at an earlier age compared to women, though this gap narrows after menopause when women lose the cardio protective effects of estrogen.

Family History: Genetic predisposition plays a crucial role in CVD development. Individuals with first-degree relatives who experienced premature CVD face substantially higher risks, highlighting the genetic component of cardiovascular health.

Ethnicity: Studies have shown variations in CVD risk among different ethnic groups. In the Nigerian context, certain ethnic groups may display different cardiovascular risk profiles influenced by genetic factors and cultural practices

While non-modifiable factors help identify high-risk individuals who require more intensive monitoring and intervention, the modifiable factors provide tangible targets for both individual-level behavior change and community-wide public health initiatives.

2.1.5 The concept of modifiable physiological risk factors

The modifiable physiological risk factors reviewed in this study include Body Mass Index (BMI) ,blood pressure (BP) and waist circumference.

2.1.5.1 Body Mass Index (BMI) as a modifiable physiological risk factor

Body Mass Index (BMI) is a major modifiable risk factor for cardiovascular disease (CVD) globally, influenced by a complex web of behavioral, social, and environmental factors. The Socio-Ecological Model helps explain how personal lifestyle choices such as diet and physical activity, interact with cultural, community, and structural influences to shape BMI and related cardiovascular risks.

In urban Nigerian settings like Benin City, 20–35% of adults are either overweight or obese, highlighting a growing public health issue. Elevated BMI is strongly associated with high blood pressure, unfavorable lipid profiles, insulin resistance, glucose intolerance, inflammation, and impaired vascular function. Notably, every 5 kg/m^2 increase in BMI above the normal range is linked to a 40% rise in CVD mortality.

The underlying mechanisms are multifactorial. Visceral fat acts as an endocrine organ, releasing inflammatory cytokines (e.g., IL-6, TNF-α), hormones like leptin, and renin-angiotensin system components that promote cardiovascular stress. Obesity also

triggers metabolic disruptions such as atherogenic dyslipidemia, oxidative stress, and sympathetic nervous system activation, raising heart rate and blood pressure. Hemodynamically, excess body mass leads to increased cardiac output, peripheral resistance, and left ventricular hypertrophy, which together raise the risk of heart failure.

Cultural attitudes in Benin City, which often view larger body size as a sign of prosperity, complicate efforts to manage BMI. Diets are shifting toward processed, calorie-dense foods, while urbanization has reduced physical activity. Limited health awareness further hampers recognition of the health risks linked to high BMI. These combined factors make addressing obesity-related cardiovascular risk particularly challenging in this context.

2.1.5.2 Blood Pressure as a modifiable physiological risk factor

Blood pressure represents one of the most significant modifiable risk factors for cardiovascular disease (CVD) among adult residents in communities like those in Benin City.

Hypertension, defined as sustained elevation of blood pressure ≥140/90 mmHg, is highly prevalent in Nigerian urban communities, with recent studies reporting prevalence rates between 25.1% and 44.3% depending on the specific demographic examined (Okubadejo et al., 2023). This condition places affected individuals at substantially increased risk for adverse cardiovascular events, including myocardial infarction, stroke, heart failure, and renal disease (Adeoye et al., 2021). The

pathophysiological mechanisms through which elevated blood pressure contributes to cardiovascular pathology involve chronic stress on arterial walls, promoting endothelial dysfunction, vascular inflammation, atherosclerotic plaque formation, and ventricular hypertrophy (Williams et al., 2022).

Several behavioral lifestyle factors directly influence blood pressure regulation in this population. High sodium intake in traditional Nigerian diets promotes hypertension through fluid retention and vascular resistance (Osaretin et al., 2021), while consumption of processed foods and insufficient fruits and vegetables compounds these effects (Iheagwara et al., 2024). Physical inactivity in urbanized settings like Benin City raises blood pressure through sympathetic nervous system activity and endothelial dysfunction (Odili et al., 2022), with research showing an inverse relationship between physical activity and hypertension prevalence (Okonofua et al., 2023). Psychosocial stressors activate pathways that elevate blood pressure (Oguntade et al., 2021), with perceived stress independently predicting hypertension incidence in Edo State adults (Aikpokpo et al., 2022). Substance use, particularly tobacco and alcohol, impacts blood pressure through vascular effects and medication interference (Morgan et al., 2021), with regular alcohol consumers in Benin City showing 2.3 times higher odds of uncontrolled hypertension (Igbinovia et al., 2024).

The modifiable nature of blood pressure as a risk factor presents substantial opportunities for community-based interventions. Early detection through regular screening, lifestyle modification programs targeting dietary improvements, physical activity promotion, stress management, and smoking cessation have demonstrated

effectiveness in similar populations (Okonkwo et al., 2022). Medication adherence represents another critical aspect of blood pressure management, with suboptimal adherence patterns frequently observed in Nigerian communities due to factors including medication costs, accessibility issues, and cultural beliefs about hypertension (Ojo et al., 2023).

Community health education about the silent nature of hypertension and its long-term consequences remains paramount, as many adults in Benin City may be unaware of their hypertensive status until complications arise (Ugochukwu et al., 2021). A recent community-based intervention study by Ezejimofor et al. (2023) demonstrated that integrated approaches that address multiple behavioral determinants simultaneously show the greatest promise for meaningful population-level improvements in blood pressure control and subsequent reduction in cardiovascular disease burden.

2.1.5.3 Waist Circumference as a modifiable physiological risk factor

Waist circumference has emerged as a key, modifiable predictor of cardiovascular risk due to its strong association with central adiposity and related metabolic disturbances. As a simple yet clinically significant measure, it reflects visceral fat accumulation, which contributes to inflammation, insulin resistance, and dyslipidemia key drivers of cardiovascular disease. In Benin City, waist circumference is a particularly relevant target for prevention efforts, given its responsiveness to lifestyle interventions and its predictive value beyond that of BMI. Local studies have shown that increased waist circumference is linked to elevated inflammatory markers, insulin resistance, and

adverse lipid profiles. These findings highlight the need for standardized measurement practices, culturally tailored interventions, and population-specific reference values to effectively incorporate waist circumference into cardiovascular disease prevention strategies.

2.1.6 Factors Influencing Behavioral Lifestyle Practices

Socioeconomic Determinants

Socioeconomic status significantly shapes lifestyle behaviors that influence cardiovascular disease (CVD) risk in Benin City. According to Ogbeide et al. (2023), individuals with lower income levels are more likely to consume unhealthy diets high in processed foods and low in fruits and vegetables, due to financial limitations. Education also plays a critical role those with higher educational attainment demonstrate better awareness of CVD risks and healthier behaviors (Okundaye & Omoregie, 2022). Employment type further influences physical activity and stress, with sedentary jobs linked to higher CVD risk (Adeniran et al., 2021).

Cultural and Traditional Influences

Cultural practices heavily influence dietary habits and health behaviors. Traditional meals rich in palm oil, salt-preserved foods, and carbohydrates contribute to hypertension (Osadolor & Egharevba, 2023). Gender roles affect healthcare engagement—men often avoid seeking care due to cultural notions of strength, while women prioritize caregiving over personal health (Iyamu & Okojie, 2022). Religious practices, such as fasting, impact diet and health behaviors, and while faith

communities offer support, some discourage medical treatment (Ehikhamenor & Oshodin, 2023).

Environmental Factors

Urbanization in Benin City has reduced infrastructure for active living, limiting physical activity due to a lack of safe recreational spaces and walkable areas (Ojike et al., 2024). Pollution from traffic and industry correlates with elevated cardiovascular inflammation markers (Agbontaen & Isah, 2022). Additionally, the unequal distribution of healthy food outlets results in "food deserts," especially in low-income areas, where access to fresh produce is limited (Obaseki & Igbinovia, 2021).

Healthcare Access and Health Information

Access to healthcare in Benin City is uneven, particularly for peri-urban and rural communities, leading to delayed diagnoses and management of CVD risk factors (Omorodion & Ogbeide, 2024). Financial barriers, including out-of-pocket expenses, hinder preventive care among lower-income residents (Iyoha & Odiase, 2022). Health information is often obtained from informal sources, resulting in widespread misinformation and low health literacy (Onibokun & Izevbigie, 2023).

Psychological Factors

Mental health conditions like stress, anxiety, and depression influence harmful coping behaviors such as smoking, alcohol use, and poor diet (Omoruyi & Akortha, 2022). Depression is linked to reduced medication adherence and lower engagement in healthy behaviors (Idehen & Irabor, 2023). Many residents underestimate their

personal CVD risk, especially younger adults, leading to complacency in adopting preventive habits (Egharevba & Omorodion, 2021). However, individuals with high self-efficacy are more likely to engage in heart-healthy practices like regular exercise and improved diets (Ogundele & Omozuwa, 2024).

2.2 Theoretical review

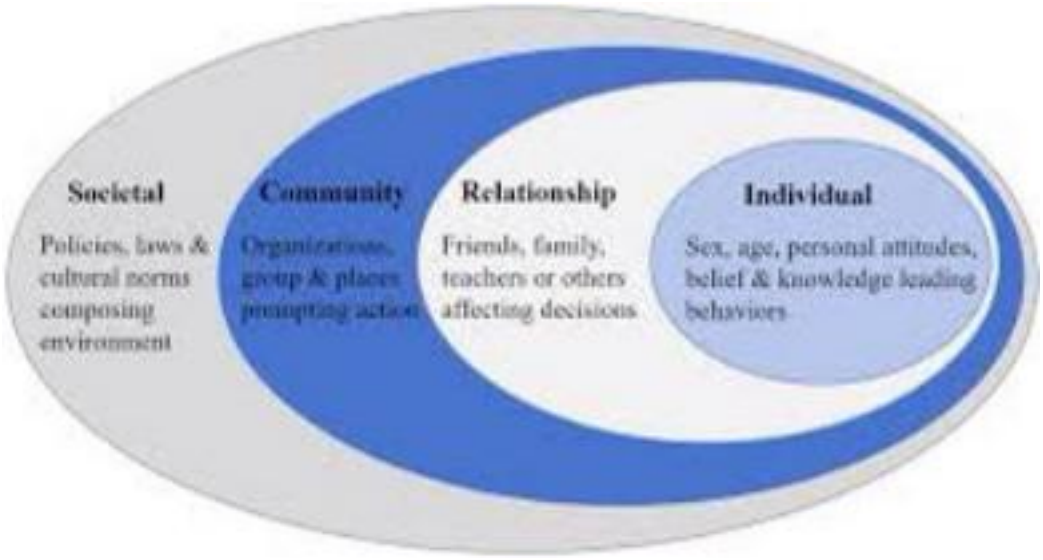

Figure 2.1: Diagram of the Social Ecological Model

The theoretical framework for this study will be based on the social ecological Model to examine the relationship between behavioral lifestyle factors and cardiovascular disease risk among adult residents in a selected community in Benin City. By applying this multilevel framework, we can better understand how individual behaviors are shaped by and interact with broader social, cultural, economic, and environmental factors. The Social Ecological Model provides a comprehensive framework for understanding the multifaceted and interactive effects of personal and environmental factors that determine behaviors. Originally developed by Urie Bronfenbrenner (1979) and later adapted by McLeroy et al. (1988) for health

promotion, the SEM recognizes that individual behavior is shaped by multiple levels of influence.

The Social Ecological Model

1. Individual Level: Personal factors including knowledge, attitudes, beliefs, personality traits, developmental history, and biological factors. Research indicates that knowledge about CVD risk factors and preventive measures varies significantly among Nigerian adults (Awosan et al., 2020). In Benin City, studies suggest limited awareness of CVD risk factors, with many individuals unable to identify key behavioral risk factors such as smoking, physical inactivity, and unhealthy diet (Onoruoiza et al., 2021). This knowledge gap may contribute to low-risk perception and reduced motivation to adopt preventive behaviors.

2. Interpersonal Level: Formal and informal social networks and social support systems, including family, friends, peers, and colleagues. Family members significantly influence dietary practices, physical activity patterns, and other health behaviors. In Nigerian contexts, extended families often share meals, and food preparation is traditionally a female role, making women crucial agents for dietary changes (Olatona et al., 2021). Additionally, family history of CVD can influence both genetic predisposition and learned health behaviors. Peer networks can reinforce either health-promoting or health-damaging behaviors. In Benin City, peer influence may be particularly important for behaviors such as smoking, alcohol consumption, and physical activity. Social norms within peer groups can either encourage or

discourage healthy lifestyle choices. Interactions with healthcare providers represent another important interpersonal influence. Research suggests that the quality of provider-patient communication affects adherence to lifestyle recommendations and medication regimens for CVD prevention (Ekore et al., 2022). In Benin City, barriers to effective communication may include large patient loads, language differences, and cultural factors.

3. Community Level: Relationships among organizations, institutions, and informational networks within defined boundaries, including the built environment, community resources, and social norms. The built environment significantly impacts physical activity opportunities through factors like walkability and recreational facilities, with recent urbanization potentially discouraging active lifestyles (Oyeyemi et al., 2022). The food environment combines traditional markets with increasing fast-food options, trending toward processed, energy-dense foods with potentially limited access to fresh produce in certain neighborhoods (Okafor et al., 2021). Cultural beliefs and practices shape health behaviors, as evidenced by traditional views associating larger body size with prosperity contributing to obesity tolerance, while gender roles influence physical activity patterns differently for men and women (Dada et al., 2021).Community social networks and cohesion affect health through information sharing, behavioral support, and collective action on health concerns, with varying cohesion levels across neighborhoods potentially explaining differences in CVD risk profiles (Ezenwa et al., 2022).

4. Policy/Enabling Environment: This influences cardiovascular health through

regulations, resource allocation, and societal priorities. Nigeria's National Policy and Strategic Plan of Action on Non-Communicable Diseases provides a framework for CVD prevention, though implementation faces challenges from funding limitations and competing priorities (Nigerian Federal Ministry of Health, 2022). Economic policies on food prices, tobacco taxation, and healthcare costs affect CVD risk behaviors, with factors like inflation limiting healthy choices (Adeoye et al., 2021). In Benin City, urban development and transportation policies shape physical activity opportunities, with car-centric planning and limited recreational spaces discouraging active living (Oyeyemi et al., 2021). Food and agricultural policies impact heart-healthy food availability through subsidies, safety regulations, and nutrition labeling (Akerele et al., 2021).

2.3 Empirical review of related literature

2.3.1 Behavioral lifestyle practices as a correlate of risk of cardiovascular disease

A cross-sectional study by Akinbule et al. (2021) on "Socio-economic determinants, behavioral risk factors for cardiovascular diseases, and nutritional anthropometry of students of public tertiary institutions in Abeokuta, Ogun State, Nigeria" was conducted with 350 participants selected through stratified random sampling. The study collected data on socio-economic and behavioral risk factors such as smoking, alcohol consumption, and physical activity using a semi-structured questionnaire. Participants' dietary habits were assessed through a validated, adapted questionnaire, while nutritional anthropometry (including body weight, height, and waist and hip circumferences) was measured using standard procedures. The data were analyzed using descriptive statistics, and Chi-square tests and Pearson's correlation were applied to test for associations between variables, utilizing the Statistical Package for Social Sciences (SPSS) version 20.

The results revealed that only 4.9% of participants smoked, 40.9% consumed alcohol, and 65.5% engaged in physical activity. Additionally, 90.3% of participants skipped meals, 65.9% consumed carbonated beverages more than twice a week, 28.6% snacked on fried and sweet foods for more than two days a week, and 64.5% ate fried foods more than twice a week. The study found that underweight and overweight conditions were more common in females (16.1% and 16.4%, respectively) compared to males (6.1% and 13.7%), while obesity was more prevalent in males (9.2%) than in

females (5.9%). Furthermore, the study found that estimated monthly income was linked to dietary habits, while the consumption of carbonated beverages and alcohol was associated with body mass index (BMI). Smoking and dietary habits were found to be related to abdominal obesity (AO).

In conclusion, the study highlights that socio-economic and behavioral risk factors play a significant role in the development of overweight and obesity, which in turn are major risk factors for cardiovascular diseases (CVDs) and other non-communicable diseases.

A cross-sectional survey titled "High prevalence of undiagnosed hypertension among men in North Central Nigeria" was conducted by Banigbe et al. (2020) among male partners of pregnant women who participated in the Healthy Beginning Initiative program between 2016 and 2018. The study collected data on socio-demographic characteristics, risk factors, physical measurements, and blood pressure readings using a standardized protocol. To analyze the data, both simple and multiple logistic regression methods were applied. The study involved 6,538 men with a median age of 31. Hypertension prevalence was 23.3%, and 46.7% had prehypertension. Hypertension risk increased with age and was linked to being overweight, obese, living in urban areas, and alcohol consumption. Despite the high prevalence, only 4.5% of participants had ever been informed of their condition, and only 7.1% of diagnosed individuals were aware of their hypertension. Awareness was higher in men aged 41–50 and over 50, but lower in urban areas. These findings highlight the

need for targeted interventions to address hypertension and its risk factors, especially in Nigeria and similar regions.

Lonnie et al. (2022) conducted a study on Associations of Dietary-Lifestyle Patterns with Obesity and Metabolic Health to examine changes in diet, body composition, and metabolic health over two years. The study included 358 Polish men aged 19 to 40 years, with data collected on dietary habits, lifestyle factors, and socio-economic, family, and demographic status using the KomPAN® food frequency questionnaire. Dietary patterns were identified using principal component analysis (PCA). For the longitudinal analysis, 95 participants returned for follow-up after two years. Changes in diet quality and metabolic health were assessed using the pro-Healthy-Diet-Index (pHDI) and non-Healthy-Diet-Index (nHDI). After two years, diet quality improved while socio-economic and demographic factors remained stable. A decrease in the nHDI linked to "sandwiches and convenience foods" was associated with lower fasting blood glucose, whereas declines in the pHDI related to certain food patterns led to increased adiposity. The "fast foods and stimulants" pattern showed no change in diet quality but worsened adiposity and blood pressure. Data were collected through structured interviews with the KomPAN® questionnaire, with statistical analysis using Pearson’s chi-squared and t-tests. The study concluded that better dietary habits improved glycemic control, while poor diet quality led to metabolic decline, emphasizing the role of diet in metabolic health.

A study by Tzelefa et al.(2021) on Associations of dietary patterns with blood pressure and markers of subclinical arterial damage in adults with risk factors for CVD aimed to explore the relationship between dietary patterns and subclinical arterial damage (SAD), elevated blood pressure (BP), and cardiovascular disease (CVD) in adults with multiple CVD risk factors. Dietary intake was assessed using two 24-hour dietary recalls, and principal component analysis (PCA) was applied to identify distinct dietary patterns. Vascular health was evaluated using oscillometry, applanation tonometry with pulse wave analysis, and carotid ultrasound to measure peripheral and aortic blood pressure, arterial stiffness, and pressure wave reflections. The study, conducted at Laiko University Hospital in Athens with 470 adults (average age 53.1), investigated the impact of diet on vascular health. Participants, free from established cardiovascular disease, were assessed after fasting and resting. Ethical approval and informed consent were obtained. Results showed that diets high in whole grains and white meat, and low in sugar, were linked to better carotid artery compliance. In contrast, diets high in refined grains and processed meats were associated with higher blood pressure. Low-fat dairy intake, combined with high consumption of full-fat cheese and butter, also raised mean arterial pressure. Diets rich in vegetables, fruits, fish, and seafood were linked to better vascular function. The study concluded that healthy dietary patterns improve vascular health, while processed foods and saturated fats worsen blood pressure and arterial function. Further research is needed to confirm these findings.

A systematic review and meta-analysis by Wu et al. (2023) on “Lifestyle behaviors and risk of cardiovascular disease and prognosis among individuals with cardiovascular disease”, investigated the association between combined healthy lifestyle behaviors (LBs) and cardiovascular disease (CVD) outcomes, utilizing data from prospective cohort studies published up to February 10, 2023. The study sourced relevant literature from PubMed, EMBASE, and Web of Science, adhering to PRISMA guidelines and registering the protocol with PROSPERO (CRD42023431731). The inclusion criteria focused on adult participants from the general population and those diagnosed with CVD, with studies requiring at least three healthy LBs, based on frameworks like the American Heart Association’s Life’s Essential 8 (excluding metabolic factors). Only studies reporting risk estimates such as odds ratios (ORs), risk ratios (RRs), or hazard ratios (HRs), with confidence intervals, were included. A total of eligible articles were selected following rigorous screening and quality assessment using the Newcastle-Ottawa Scale. The meta-analysis found that following the healthiest combination of lifestyle behaviors (LBs) reduced cardiovascular disease (CVD) risk by 58% and CVD mortality by 55% in the general population. Among those with CVD, it led to a 62% reduction in recurrence and a 67% reduction in all-cause mortality. A dose-response analysis showed that each additional healthy LB reduced CVD incidence by 17%, CVD mortality by 19%, and CVD recurrence and mortality by 27% in those with CVD. The study emphasizes that adopting multiple healthy LBs is crucial for reducing CVD risks and highlights

the importance of a comprehensive lifestyle approach for both prevention and management of CVD.

In a cohort study by Zhang Y et al. (2021) titled, “Associations of Healthy Lifestyle and Socioeconomic Status with Mortality and Incident Cardiovascular Disease”, the researchers investigated how socio-economic status (SES) influences mortality and the incidence of cardiovascular disease (CVD), while also exploring the mediating role of lifestyle factors. The study utilized data from both the US National Health and Nutrition Examination Survey (US NHANES) and the UK Biobank, including 44,462 adults from the US and 399,537 adults from the UK. SES was assessed using latent class analysis, considering variables such as family income, occupation, education, and health insurance. The study calculated a healthy lifestyle score based on smoking, alcohol use, physical activity, and diet, examining all-cause mortality, CVD mortality, and CVD incidence. In the US NHANES, there were 8,906 deaths over a mean follow-up of 11.2 years, while the UK Biobank recorded 22,309 deaths and 6,903 new CVD cases over 8.8 to 11.0 years. Adults from lower SES groups faced significantly higher risks of mortality and CVD compared to those from higher SES groups. Although unhealthy lifestyles accounted for only a small portion of SES-related health disparities, healthier lifestyles were linked to lower risks across all SES levels. The study concluded that while lifestyle changes can reduce health risks, they do not fully address socio-economic health disparities, suggesting a need for broader interventions addressing social determinants. Sensitivity analyses were conducted using SAS version 9.4, with results considered significant at $P < 0.05$.

A cross-sectional survey by Okafor et al. (2021) titled, “Prevalence and associated factors of dyslipidemia among university workers in Southeast Nigeria” aimed to examine the prevalence of dyslipidemia and its associated factors among the staff at the University of Nigeria, Nsukka campus, was conducted with 386 participants selected through a 4-stage sampling method. Data were gathered through a questionnaire and lipid profile assessments. The study employed bivariate analysis, using the Cochran and Mantel-Haenszel tests to examine relationships between dyslipidemia and specific factors. Odds ratios with significance set at $p < 0.05$ were reported. Most respondents (51.3%) were aged 46 or older, and 95.3% had tertiary education. Administrative/technical staff made up 76.4%, while academic staff were 23.6%. Senior staff represented 73.8%, and 60.4% consumed alcohol above recommended levels. Lipid biomarkers showed no significant gender differences, with only small percentages having high cholesterol or low HDL levels. Dyslipidemia was prevalent in 54.5% of participants, particularly among women, and was most commonly associated with hypercholesterolemia and high LDL cholesterol. Alcohol consumption above recommended levels was linked to a nearly six fold increased risk of dyslipidemia. The study suggests that nutrition education and physical activity interventions could help reduce the risk of cardiovascular disease among university staff.

2.3.2 Modifiable physiological risk factor of cardiovascular disease.

2.3.2.1 Body Mass Index (BMI) as a modifiable physiological risk factor of cardiovascular disease.

Abubakr et al. (2024) conducted a prospective cohort study titled "Associations of overweight and obesity with the risk of cardiovascular disease according to metabolic risk factors among middle-aged Japanese workers." The research aimed to clarify the link between obesity and cardiovascular disease (CVD), particularly among individuals with existing metabolic risk factors such as hypertension, hyper-low-density lipoprotein (LDL) cholesterolemia, and diabetes. The study was based on data from the Aichi Workers' Cohort Study, a long-term project conducted in Aichi Prefecture, Japan, which focused on middle-aged Japanese civil servants who were free of CVD at the time of enrollment.

Data from 8,972 participants (7,076 men and 1,896 women) who were enrolled between 2002 and 2008 were analyzed. The study used a cohort design with follow-up lasting a median of 12 years, during which the participants underwent annual health checkups. Researchers applied a multivariable Cox proportional hazards model to evaluate the associations between body mass index (BMI) and the risks of overall CVD, coronary heart disease (CHD), and stroke. This allowed them to calculate hazard ratios (HRs) and 95% confidence intervals (CIs) for these outcomes.

Over the study period, 197 cardiovascular events were documented: 80 cases of CHD and 117 strokes. The findings showed that individuals with a BMI of 27.5 kg/m^2 or higher had a significantly elevated risk of CVD, CHD, and stroke when compared to

those with a BMI in the 21.0–22.9 kg/m² range. Importantly, the study revealed that hypertension, hyper-LDL-cholesterolemia, and diabetes were responsible for 15.9%, 5.8%, and 8.7% of the observed association between obesity and CVD risk, respectively. In combination, these metabolic conditions explained 28.3% of the relationship. However, even in the absence of these risk factors, particularly hypertension, overweight, and obesity (BMI ≥ 25.0), were still associated with a higher risk of CVD, indicating an independent effect of excess weight on cardiovascular health.

These statistically significant findings emphasize the importance of preventing and managing overweight and obesity, regardless of the presence of chronic conditions. The study adds to the body of evidence supporting weight management as a key component of CVD prevention strategies among working-age adults. All participants had provided written informed consent, and the study was approved by the Ethics Review Committees of Nagoya University School of Medicine (2007–0504).

Ehwarieme et al. (2024) conducted a study titled “Prevalence and Determinants of Overweight and Obesity among Undergraduate Students in a Tertiary Institution in Benin City, Edo State, Nigeria.” The objective of the research was to examine the prevalence and key determinants of overweight and obesity among undergraduate students at a tertiary institution in Benin City. This study focused on students in a university setting, with a sample size of 420 respondents. The research employed a descriptive cross-sectional design, conducted within a specific timeframe, and utilized a structured questionnaire, weighing scales, and a calibrated meter rule for data

collection. The key findings of the study revealed that the prevalence of overweight and obesity among the students was 19.37%. Only 30% of the respondents demonstrated a high level of knowledge about overweight and obesity and the associated health risks. Factors contributing to the prevalence of these conditions included limited time for physical exercise, ignorance, medication use (e.g., antidepressants, anti-psychotics, corticosteroids, and contraceptives), and a desire for physical enhancement (such as body modifications like butt enlargement, breast enlargement, or weight gain). Multivariate logistic regression analysis indicated that females were more likely to be overweight or obese than males (OR = 2.14, p = 0.004, CI 1.32-3.46). Additionally, students aged 21-25 had lower odds of being overweight or obese compared to those aged 15-20 (OR = 0.52, p = 0.010, CI 0.33-0.81). Married individuals were also found to have a higher likelihood of being overweight or obese compared to their single counterparts (OR = 2.94, p = 0.039, CI 0.78-11.78).

The study concluded that there is a relatively high prevalence of overweight and obesity among undergraduate students at the tertiary institution, with a significant gap in knowledge regarding weight management and related health risks. These findings underscore the need for targeted interventions to encourage healthier weight management behaviors among the student population.

Liu et al. (2025) conducted a study titled “Correlation between weight-adjusted waist index and coronary heart disease: NHANES 1999–2020”, which explored the relationship between the weight-adjusted waist index (WWI) and the prevalence of coronary heart disease (CHD). The study builds upon the concept of the "obesity

paradox," which suggests that individuals with higher body mass index (BMI) and cardiovascular disease may experience better outcomes. However, this phenomenon remains controversial, particularly in cases of CHD, where the relationship between body composition and disease prognosis is not clearly understood. Using data from the NHANES (1999-2020), researchers analyzed 44,528 U.S. adults with a multi-stage, stratified, and clustered probability sampling design. The study, approved by the NCHS IRB, employed statistical weights to ensure result accuracy and generalizability. It was cross-sectional in nature, examining the relationship between waist-to-weight index (WWI) and coronary heart disease (CHD). The analysis found a significant positive correlation between WWI and CHD prevalence, even after adjusting for factors like age, smoking, diabetes, and hypertension. These findings, consistent with prior research, suggest that WWI is a more precise indicator of CHD risk compared to BMI, underscoring the role of body composition in cardiovascular health.

2.3.2.2 Blood pressure (BP) as a modifiable physiological risk factor of cardiovascular disease

The study titled “Modifiable risk factors in adults with and without prior cardiovascular disease: findings from the Indonesian National Basic Health Research” by Arsyad et al. (2022) investigates the prevalence and patterns of modifiable risk factors associated with cardiovascular diseases (CVDs) in Indonesia. The primary objective was to assess how these risk factors, such as smoking, unhealthy diet,

physical inactivity, obesity, and metabolic conditions, are distributed among adults, particularly when stratified by sex and history of CVD diagnosis. The researchers aimed to provide insight into how behavioral and lifestyle factors contribute to CVD risk and to inform public health strategies for prevention and control.

This research was conducted across various regions of Indonesia using data from the 2018 Basic Health Research survey (Riskesdas), a nationwide, government-led study carried out every five years by the Ministry of Health. The study included a large, representative sample of 36,329 individuals aged 15 years and older, drawn from 2,500 census blocks in 26 provinces. The participants, 57% of whom were women, were part of a broader survey designed to monitor the health status of the Indonesian population. Data collection involved self-reported questionnaires on health behaviors and conditions, as well as direct biometric measurements including height, weight, waist circumference, blood pressure, and blood samples for glucose and lipid profile testing.

The study used a cross-sectional design, combining subjective self-reports on health behaviors (smoking, diet, physical activity, and mental-emotional status) with objective clinical measurements (BMI, blood pressure, and cholesterol levels) taken by trained professionals. Risk factors were defined using international standards, and blood samples were centrally analyzed to ensure consistency. The study assessed the prevalence and co-occurrence of factors like poor diet, low physical activity, obesity, and hypertension, diabetes, and lipid abnormalities. Results showed that around 3% of

participants had CVDs, with modifiable risk factors varying from 5.7% for diabetes to 96.5% for insufficient fruit and vegetable intake. Men were more likely to smoke and have poor diets, while women showed higher rates of low physical activity, obesity, and metabolic risks. The clustering of multiple risk factors was common, particularly among those with prior CVD diagnoses. Statistical analysis used Poisson regression models with age adjustments and weighted for sampling design. The findings highlighted significant sex and disease history differences, emphasizing the need for targeted health interventions. The study underscores the high prevalence of modifiable cardiovascular risks in Indonesia, pointing to the need for comprehensive prevention strategies combining lifestyle changes, health promotion, and education to reduce CVD burden.

The study titled "Blood Pressure and Risk of Cardiovascular Disease in UK Biobank" by Wan et al. (2021) investigated the causal relationship between blood pressure (BP) and the risk of cardiovascular diseases (CVDs). The primary objective was to determine whether genetically elevated systolic and diastolic BP contribute directly to the development of CVD and its subtypes. The researchers employed a two-sample Mendelian randomization (MR) approach, which uses genetic variants as instrumental variables to infer causality, thereby reducing the influence of confounding factors often present in traditional observational studies. To conduct this analysis, the authors used data from two large cohorts: the International Consortium of Blood Pressure Genome-Wide Association Studies (ICBP) and the UK Biobank. The ICBP dataset included 299,024 individuals of European ancestry, while the UK Biobank cohort

involved 375,256 participants selected from a broader group of over 500,000 individuals aged 40 to 69 years, primarily of British descent. In order to ensure consistency and reduce population stratification bias, the UK Biobank analysis was restricted to genetically confirmed White British individuals. Participants with significant missing genetic data, sex discordance, or relatedness were excluded from the final sample. Using data from genome-wide association studies (GWAS), researchers identified 327 SNPs linked to systolic and 364 SNPs to diastolic blood pressure (BP). These were used as genetic tools to examine the causal effects of BP on cardiovascular disease (CVD), mortality, and 14 specific conditions. Results showed that higher BP genetically increases the risk of CVD: a 10 mm Hg rise in systolic BP was associated with a 32% higher risk of total CVD, while a 5 mm Hg rise in diastolic BP increased the risk by 20%. These associations were consistent across all 14 conditions, including ischemic heart disease and stroke. The relationship between BP and CVD was linear, suggesting that lowering BP at any level reduces cardiovascular risk. Sensitivity tests confirmed the findings' robustness, although the effect sizes may differ from clinical interventions. The study emphasizes the importance of managing BP to prevent CVD.

The study “Associations between Social Determinants and Hypertension, Stage 2 Hypertension, and Controlled Blood Pressure among Men and Women in the United States” by Yvonne et al. (2021) examined how social factors influence hypertension-related outcomes in U.S. adults. Using data from the National Health and Nutrition Examination Survey (NHANES), the researchers aimed to explore the associations

between various social determinants such as education, income, race/ethnicity, employment, healthcare access, marital status, and nativity and the prevalence of hypertension, stage 2 hypertension, and blood pressure control. The study focused on adults aged 18 and older, utilizing NHANES data collected over eight years from 2011 to 2018. This cross-sectional study analyzed data from 21,664 NHANES participants, excluding those who were pregnant, missing blood pressure data, or on antihypertensive treatment. Using a nationally representative sampling design, data were collected via home interviews and standardized exams. Results showed significant racial and socioeconomic disparities in hypertension: Black and Asian adults had higher rates of hypertension and stage 2 hypertension than White adults, with Black adults less likely to have controlled blood pressure. Lower education and lack of healthcare access were linked to worse outcomes. Interestingly, unmarried or unemployed women had better blood pressure control. Statistical analysis used Poisson regression, adjusting for age and other factors. The study highlights that social determinants independently affect hypertension and calls for policies to improve healthcare access, education, and equity. It also reinforces that cardiovascular risk increases continuously with rising blood pressure, without a clear safe threshold.

In their study titled "Optimal Blood Pressure Control Target for Older Patients with Hypertension: A Systematic Review and Meta-Analysis", Yuling et al. (2023) aimed to determine the most effective systolic blood pressure (SBP) target for individuals aged 60 years and older diagnosed with hypertension. The primary objective was to evaluate which SBP range could best reduce the risk of cardiovascular events and

mortality in this demographic. The research focused on older adults aged 60 years or above who had been clinically diagnosed with hypertension. The population was drawn from multiple international randomized controlled trials (RCTs), as the data were compiled from global sources indexed in electronic databases such as PubMed, Embase, and the Cochrane Central Register of Controlled Trials (CENTRAL). The authors conducted a Bayesian network meta-analysis on six RCTs involving hypertensive patients aged 60 and older, published until January 2022. They categorized antihypertensive treatments based on achieved SBP levels: below 130 mmHg, 130-139 mmHg, and 140 mmHg or higher. The study assessed outcomes like MACE, cardiovascular mortality, and myocardial infarction. Results showed that an SBP below 130 mmHg was linked to a reduced risk of MACE compared to SBP ≥140 mmHg (Odds Ratio = 0.43). While trends favored more intensive SBP control for reducing other cardiovascular outcomes, these differences weren't statistically significant. The authors suggest further research is needed to confirm the benefits of targeting SBP below 130 mmHg in older hypertensive patients.

2.3.2.3Waist circumference as a modifiable physiological risk factor of cardiovascular disease

In a population-based cohort study conducted by Yue et al. (2024), researchers investigated how waist circumference relates to the prevalence of cardiovascular diseases (CVD) and overall mortality among metabolically healthy individuals. The primary aim was to determine whether waist size, independent of traditional metabolic risk factors, could be an indicator of cardiovascular and mortality risk. The

study analyzed data collected from the U.S. National Health and Nutrition Examination Survey (NHANES) in conjunction with the National Death Index (NDI) database over a span of 13 years, from 2001 to 2014.This U.S.-based study focused on 5,775 metabolically healthy adults, aged 18-80, with complete data on body measurements, dietary and medical histories, and biochemical indicators. Exclusions included pregnant individuals, those with cancer, deaths within three months of follow-up, or those meeting criteria for metabolic unhealthiness (e.g., high blood pressure, abnormal lipid levels, or impaired glucose metabolism). Ethical clearance was obtained from the National Center for Health Statistics Research Ethics Review Board, and all participants gave informed consent. Using a prospective cohort design, the study followed participants for a median of 81 months and categorized them into waist circumference quartiles. Data were collected through exams, interviews, and lab tests, with missing data addressed via multiple imputation. Logistic regression revealed that every 10 cm increase in waist circumference increased the odds of cardiovascular disease (CVD) by 45%, with higher quartiles showing consistently greater risk. Cox models and Kaplan-Meier curves showed that larger waist circumference was also associated with an 8% increase in all-cause mortality per 10 cm increase, with significant survival differences across groups. The analysis was adjusted for key confounders, and spline models indicated a non-linear relationship between waist circumference and CVD. The study concluded that waist circumference is a strong predictor of both CVD and mortality, even in the absence of metabolic issues, reinforcing its importance in cardiovascular risk screening and the need to

maintain a healthy waist size.

The study titled "Joint Trajectories of Body Mass Index and Waist Circumference in Early-Life to Mid-Life Adulthood and Incident Hypertension: The China Health and Nutrition Survey" (Qu et al., 2022) investigates the impact of changes in Body Mass Index (BMI) and waist circumference (WC) over time on the risk of developing hypertension. The primary objective is to identify distinct patterns of BMI and WC from ages 20 to 60 and examine their combined effects on hypertension incidence.

This longitudinal cohort study was conducted using data from the China Health and Nutrition Survey (CHNS), which spans from 1993 to 2011. The study involved a cohort of 6,571 participants, aged 20 to 60, with repeated measurements of BMI and WC across multiple time points, totaling 3 to 7 measurements per individual before they developed hypertension or were lost to follow-up. Participants were from diverse regions across China, including Beijing, Shanghai, and several other provinces, ensuring broad representation of the Chinese population. The study used CHNS data to examine how BMI and waist circumference (WC) trajectories relate to hypertension risk over time. It followed 6,571 initially normotensive adults for an average of 11.8 years, tracking BMI and WC changes and identifying hypertension through blood pressure readings, diagnoses, and medication use. Participants were grouped into four trajectory patterns: normal, WC-increasing, BMI-increasing, and both increasing. Those with rising BMI, WC, or both had significantly higher hypertension risk, with hazard ratios of 1.43, 1.51, and 1.76, respectively. Cox regression models confirmed these associations, showing that higher BMI and WC

levels and steeper increases were linked to greater hypertension risk with age. The study underscores early to mid-adulthood as a critical window for intervention, emphasizing the need for monitoring and managing BMI and WC to prevent hypertension later in life.

The study by Sun et al. (2021) titled “Association between waist circumference and the prevalence of (Pre) hypertension among US adults” explores the relationship between waist circumference and the prevalence of (pre)hypertension among US adults. The primary objective of the research was to assess whether waist circumference could serve as a significant biomarker in identifying the risk of (pre)hypertension, independent of body mass index (BMI). The data for this study were drawn from the National Health and Nutrition Examination Survey (NHANES), covering the period from 2007 to 2018. The study focused on a population of 27,894 US adults, offering a broad representation of the adult demographic across the country. This cross-sectional study used NHANES data from 27,894 participants to explore the link between waist circumference and blood pressure in young and older adults. Using advanced statistical methods—including multiple imputation, generalized additive models, Spearman correlations, logistic regression, and sensitivity analyses—the researchers found a strong, positive association between waist circumference and (pre)hypertension. This link remained significant across all BMI categories and demographic groups. The results highlight abdominal obesity as an independent risk factor for hypertension and support incorporating waist circumference into cardiovascular risk assessments, regardless of BMI.

Ren et al. (2023) conducted a cross-sectional study aimed at investigating the association between normal-weight central obesity (NWCO) and the risk of hypertension in Chinese adults. Although central obesity has been widely linked to elevated hypertension risk in the general population, the impact of central obesity among individuals with a normal body mass index (BMI) remains less understood. The study's objective was to fill this gap by examining how different patterns of obesity, including NWCO, correlate with hypertension in a nationally representative sample of Chinese adults.

The research utilized data from the 2015 wave of the China Health and Nutrition Survey (CHNS), a long-term ongoing study designed to assess the health and nutritional status of the Chinese population. The CHNS began in 1989 and uses a stratified multistage, random-cluster sampling method across 12 provinces, reflecting diverse geographic and socioeconomic contexts. For this specific analysis, researchers selected a sample of 10,719 adults aged 18 years or older after excluding individuals with underweight BMI, pregnancies, and missing key data.

The study included 10,719 adults (4,914 men, 5,805 women) with an average age of 53.6 years. Participants were categorized into eight obesity groups based on BMI, waist circumference (WC), and waist-hip ratio (WHR). Hypertension was identified through blood pressure readings, medical diagnosis, or medication use. Using logistic regression (adjusted for various confounders), the study found that individuals with normal BMI but central obesity (NWCO) had significantly higher odds of hypertension—OR 1.49 for WC and 1.33 for WHR. The risk was even higher in

overweight/obese individuals with central obesity (ORs > 3.0). Subgroup analysis showed stronger associations in younger adults and nondrinkers, suggesting lifestyle factors may influence this relationship. Conducted with SPSS v19.0, all results were statistically significant ($p < 0.05$). The study emphasizes the need to assess central obesity alongside BMI for better hypertension and CVD risk evaluation.

2.3.3 Factors influencing behavioral lifestyle practices

Yang et al. (2022) conducted a cross-sectional study in Yangpu District, Shanghai, China, titled "Associations of healthy lifestyle and socioeconomic status with mortality and incident cardiovascular disease", and aimed at identifying the risk factors associated with chronic diseases, particularly focusing on the influence of lifestyle and dietary behaviors. The study sought to provide up-to-date insights to support the prevention and management of chronic conditions in urban populations. The research involved 1,005 community residents, randomly selected from 240 households across all 12 community streets in Yangpu. Data collection was carried out by professional investigators between early to mid-2016, using structured questionnaires administered through household interviews. Out of the total responses, 983 valid questionnaires (a 97.81% valid response rate) were analyzed after excluding inconsistent entries. Participants provided detailed information covering four domains: household background, individual demographics, dietary habits and lifestyle behaviors (such as exercise, smoking, alcohol consumption, and tea drinking), and personal health status (including actual measurements for height, weight, and blood pressure, along with chronic disease status).

Findings revealed that approximately 35% of respondents had at least one chronic disease. Key behavioral and lifestyle-related factors such as diet quality, physical activity, and tea consumption were found to significantly influence chronic disease risk. Specifically, poor diet quality (as measured by a positive Diet Balance Index score) and insufficient exercise were associated with a higher prevalence of chronic diseases. On the other hand, high levels of physical activity (Physical Activity Index >17.1) and regular tea drinking had protective effects, significantly reducing the likelihood of developing chronic conditions. Notably, there were statistically significant interactions between age and overeating, and between exercise and tea drinking, showing both additive and multiplicative effects in the risk of disease development. Additionally, the study highlighted that diet quality, physical activity, and tea drinking partially mediated the relationship between the type of medical insurance coverage and chronic disease occurrence. These insights emphasize the role of modifiable lifestyle behaviors in chronic disease prevention and the need for community-level health education. The study also called for improved nutrition environments for the elderly and more equitable healthcare access through better insurance design. Overall, the research presents strong statistical associations between lifestyle choices and chronic disease risk, offering practical guidance for public health interventions at the community level in urban China.

Sandri et al. (2024) conducted a cross-sectional, observational study to investigate how educational attainment influences the nutritional status and health behaviors of young adults in Spain. The study targeted individuals aged 18 to 30 years residing in

Spain, excluding anyone with chronic diseases or temporary conditions that might affect dietary patterns. The primary aim was to understand whether education level correlates with healthier lifestyle choices and better health outcomes among young people. A total of 9,681 participants were recruited through non-probabilistic snowball sampling. Data were collected using a validated, self-developed questionnaire distributed primarily via Instagram, with additional support from platforms such as LinkedIn, Twitter, WhatsApp, and Facebook. The questionnaire underwent validation through a pilot group of 52 individuals and a panel of seven health professionals, including psychologists, nutritionists, and doctors. It gathered information on a range of variables, including socio-demographic data, anthropometric measures, dietary habits, physical activity, sedentary behaviors, sleep, and substance use such as smoking and alcohol.

The study found that individuals with higher education levels had healthier lifestyles, including lower BMI, better nutrition, less sugary drink consumption, and lower smoking rates, compared to those with only basic education. They also reported better self-perceived health. Physical activity levels were high across all education groups, with most exceeding the WHO's recommended 150 minutes of exercise per week. The results highlighted a clear link between education and health behaviors, with higher education associated with better health outcomes, particularly in diet and lifestyle. However, improvements are still needed, especially in nutrition, among young Spanish adults. The study emphasizes education as a key social determinant of health and calls for public health interventions targeting less-educated groups.

The study by Walli-Attaei et al. (2022), ”Metabolic, behavioral, and psychosocial risk factors and cardiovascular disease in women compared with men in 21 high-income, middle-income, and low-income countries: an analysis of the PURE study” aimed to examine the differences in metabolic, behavioral, and psychosocial risk factors associated with cardiovascular disease (CVD) between men and women across diverse socioeconomic contexts. The research was part of the Prospective Urban Rural Epidemiological (PURE) study, a large-scale, longitudinal cohort study conducted in 21 countries categorized as high-, middle-, and low-income. Participants aged 35 to 70 years with no prior history of cardiovascular disease were recruited and observed for approximately 10 years to identify gender-specific risk profiles for major cardiovascular events. The study included 155,724 individuals (90,934 women and 64,790 men) from urban and rural areas, assessing metabolic, behavioral, and psychosocial risk factors like lipid profiles, blood pressure, smoking, diet, and depressive symptoms. The main focus was major cardiovascular events such as CVD-related deaths, heart attacks, strokes, and heart failure. Key findings showed that women generally had a better cardiovascular risk profile, especially at younger ages, but certain risk factors affected men and women differently. Non-HDL cholesterol, depressive symptoms, and poor diet quality had stronger associations with cardiovascular events in men, while smoking contributed more to CVD risk in men. Disparities in behavioral and psychosocial risk factors were observed, with men having higher population-attributable fractions (PAFs). The study highlights the need for gender-sensitive cardiovascular prevention, though it recommends similar

strategies for both sexes due to shared risk factors.

The study by Gao et al. (2024) investigated the impact of prolonged occupational sitting on all-cause and cardiovascular disease (CVD) mortality, with a focus on how leisure-time physical activity (LTPA) might mitigate these risks. The research was conducted in Taiwan and included data from a large national health surveillance program collected between 1996 and 2017. The study population comprised 481,688 adults with a mean age of 39.3 years, of whom over half (53.2%) were women. The primary objective was to quantify the health risks associated with extended periods of sitting at work and to determine if specific thresholds of physical activity could counteract these risks. The study used a prospective cohort design and multivariable Cox regression to analyze long-term data. Participants were grouped by work posture: mostly sitting, alternating, or mostly nonsitting. Physical activity was measured through LTPA duration and a Personal Activity Intelligence (PAI) score. Over nearly 13 years, 26,257 deaths occurred. Results showed that those who sat most at work had a 16% higher risk of all-cause mortality and a 34% greater risk of CVD death compared to no sitters. Alternating postures showed no significant risk increase. Even modest physical activity (15-30 minutes more per day) reduced mortality risk to that of no sitters. A PAI score over 100 also significantly lowered risk. The study controlled for factors like age, sex, and lifestyle habits. The authors emphasize the need to reduce workplace sitting to improve health outcomes, comparing it to the shift in public attitudes towards smoking.

Herbert et al. (2023) conducted a cross-sectional study on the topic, Socio-economic determinants of healthy behaviors among primary schoolchildren and adolescents in Lokossa district of southern Benin, to explore the socio-economic determinants of healthy behaviors among primary schoolchildren and adolescents in the Lokossa district of southern Benin. This research aimed to investigate how socio-economic factors influence breakfast habits, fruit and vegetable (FV) consumption, and physical activity (PA) among primary school children in this region. Given the limited information available on these behaviors in Benin, the study sought to fill this gap and highlight the importance of socio-economic factors in shaping children's health behaviors.

In the introduction, the author wrote:

> *Socioeconomic status (SES) has been recognized as a crucial determinant of health and well-being, as it influences people's attitudes, experiences, and exposure to health risks and opportunities for health promotion, including the adoption of healthy lifestyles. Low-income individuals may be more susceptible to nutritional disorders, including malnutrition, overweight, and obesity, due to food insecurity. Therefore, SE factors may influence the adoption of PA practices and access to healthy foods, due to factors such as availability, time, cost, access, and lack of knowledge. (Herbert et al., 2023, p.265).*

The research examined data from 612 students aged 8 to 17 across 26 primary schools in both rural and urban areas of Lokossa, using a proportional probabilistic sampling approach. Conducted from December 2018 to January 2019, the study investigated the relationship between socio-economic status (SES) and health behaviors using logistic regression analysis. Findings revealed widespread unhealthy habits: 53% of

students were physically inactive, 60% frequently skipped breakfast, and the majority consumed fruits (84%) and vegetables (68%) inconsistently. Younger students were more likely to eat breakfast regularly, whereas older students tended to be more physically active. Higher levels of parental education and SES were linked to more consistent breakfast consumption and fruit intake, but less physical activity. No significant association was found between BMI and health behaviors. The study highlights the importance of SES-aware strategies to enhance children's diet and physical activity.

In a study by Kim et al. (2024) titled, Food Environments and Cardiovascular Disease: Evidence from the Health and Retirement Study, to investigate the long-term effects of food environments on cardiovascular disease (CVD) risk. The research, conducted between 2006 and 2016, utilized data from the Health and Retirement Study (HRS), a nationally representative survey of older Americans and their spouses or partners. The study included 10,413 participants and employed a cohort design to examine the relationship between time-varying food environments and incident CVD over a period of 10 years. The study used Cox proportional hazards modeling and inverse probability weighting to analyze the impact of food environment measures, such as the density of grocery stores, supercenters/club stores, full-service restaurants, and fast-food restaurants. The study found that race, ethnicity, and education shape how food environments impact cardiovascular disease (CVD) risk. Supercenters reduced CVD risk for non-Hispanic Black and Hispanic seniors, but not for non-Hispanic Whites, while full-service restaurants benefited only those with more than 13 years of

education. These findings suggest public health policies should consider demographic and socio-economic differences when addressing food environments and CVD risk.

Zhong et al. (2021) conducted a study titled "Association of ultra-processed food consumption with cardiovascular mortality in the US population: long-term results from a large prospective multicenter study" to explore the relationship between ultra-processed food consumption and cardiovascular mortality in the United States. The study was set within the Prostate, Lung, Colorectal, and Ovarian (PLCO) Cancer Screening Trial, a large cohort-based investigation involving 91,891 participants. This research was conducted across several U.S. cities between 1993 and 2001, with a follow-up period of 13.5 years, encompassing a total of 1,236,049.2 person-years. The study aimed to assess whether ultra-processed food consumption increases the risk of cardiovascular mortality. Using a validated food frequency questionnaire, the researchers categorized foods based on the NOVA system and analyzed data with Cox regression. They found that participants with the highest intake of ultra-processed foods had a higher risk of cardiovascular (HR = 1.50) and heart disease mortality (HR = 1.68), but not cerebrovascular disease (HR = 0.94), compared to those with the lowest intake. A nonlinear relationship was observed, with increased risks at 2.4 servings/day for cardiovascular and 2.3 servings/day for heart disease mortality. The risks were more significant in women. The study highlights the harmful effects of high ultra-processed food consumption on cardiovascular health, especially in women, and calls for further research to confirm these findings in other populations.

Rita et al. (2021) conducted a study titled, Factors affecting health-promoting

lifestyles among community residents at East Gyogone Ward, Insein Township. The study sought to identify determinants that influence health-promoting lifestyle (HPL) practices, a key element in reducing the risk of chronic non-communicable diseases (NCDs). NCDs have increasingly become a major concern for healthcare professionals, and adopting a healthy lifestyle is seen as a primary approach in combating their development. This study, conducted in Insein Township, Yangon, Myanmar, used a cross-sectional design with 194 community residents selected through systematic sampling. Data were gathered via self-administered questionnaires, covering sociodemographics and the Health-Promoting Lifestyle Profile II (HPLP II). Results showed a moderate overall health-promoting lifestyle score (126.67 ± 21.29), with highest scores in spiritual growth and lowest in physical activity. Over 56.7% had moderate health-promoting behaviors. Key factors like education, occupation, income, health perception, smoking, and alcohol consumption were significantly linked to health behaviors. The study emphasizes the need for targeted health promotion programs to reduce NCD risks, particularly in areas like East Gyogone Ward.

A study on Factors influencing health behavior practice in patients with coronary artery disease conducted in South Korea by Jung et al. (2021) in South Korea investigated the factors influencing health behavior in patients with coronary artery disease (CAD). Conducted between January and May 2020 with 189 patient's post-percutaneous coronary intervention (PCI), the study used a descriptive cross-sectional design to explore the links between cardiac rehabilitation knowledge, educational

needs, and health behaviors. Data was collected through self-administered questionnaires, and statistical analysis was performed using SPSS. The study found significant positive correlations between rehab knowledge, educational needs, and health behaviors. Multiple regression identified key predictors of health behavior, including age, rehab knowledge, exercise habits, family history, and living alone. The findings highlight the importance of improving cardiac rehab knowledge and addressing educational needs to promote healthier behaviors and enhance patient outcomes.

CHAPTER THREE

RESEARCH METHODOLOGY

The research methodology outlines the approach for conducting the study, covering

aspects such as research design, setting, study population, inclusion and exclusion criteria, sample size, sampling technique, data collection instruments, instrument validity and reliability, data collection and analysis methods, and ethical considerations.

3.1 Research Design

The research adopted a descriptive cross-sectional survey design for this study. This methodological approach involves gathering data from numerous participants at one specific time point, rather than conducting repeated measurements of the same individuals over extended periods (Polit & Beck, 2017).

This design facilitates the examination and characterization of the target population's current attributes without introducing any experimental manipulations or interventions. Within this study's framework, the cross-sectional approach enabled the researcher to assess how behavioral lifestyle patterns correlate with cardiovascular disease risk among the adult population residing in the Ekosodin community of Benin City. The design was particularly suitable for identifying relationships between lifestyle behaviors and CVD risk factors as they naturally exist in the community setting.

3.2 Research setting

The research was conducted in the Ekosodin community, situated east of Isiohor within the Ovia North-East local government area (LGA) of Edo state. Ovia North-East LGA encompasses 2,301 square kilometers, with its administrative headquarters in Okada town. The LGA is positioned in Edo State's central province, between 5° 45'

and 6° 15' east longitude and 6° 15' and 5° 45' north latitude.

According to the 2006 national population commission census, the Ekosodin community had approximately 7,000 residents. Using geometric progression calculations, the population has experienced dramatic growth of 543.2%, with estimates indicating about 45,000 residents by 2022. The community is characterized as semi-urban with a diverse demographic composition that includes university students (due to its proximity to the University of Benin), merchants, public service employees, and elderly residents.

3.3 Target population

The Target population comprises all adults aged 18 years and above residing in the Ekosodin community. This demographic was chosen because of the increased risk of cardiovascular disease among adults aged 18 years and above.

3.4 Inclusion Criteria

-Adults aged 18 years and above

- Permanent residents of the selected community in Benin City (living there for at least 6 months)

- Willingness to participate and provide informed consent

- Ability to communicate in English or local dialects used in the community

3.5 Exclusion Criteria

- Pregnant women (due to temporary physiological changes affecting cardiovascular

parameters)

- Individuals with diagnosed mental health conditions that could affect comprehension

- Critically ill individuals are unable to participate in assessments

- Visitors or temporary residents (staying less than 6 months)

3.6 Sample Size

A sample is a proportion of a population that is a subset of the target population. It is the number of participants or observations included in a study. It is selected in such a way that it is representative of the target population, in order for the results obtained from the study to be generalizable to them.

Using the basic Cochran formula: $n = Z^2P(1-P)/d^2$ Where: - n = sample size

- Z = 1.96 (confidence level of 95%)

- P = the estimâtes proportion was represented as 0.5 (this assumes maximum variability and in the absence of prior data)

- d = precision (0.05 or 5%)

$n = (1.96)^2 \times 0.5 \times 0.5/0.05^2$

$n = 3.8416 \times 0.5 \times 0.5/0.0025$

$n = 3.8416 \times 0.25/0.0025$

$n = 0.9604/0.0025$

n = 384.16(rounded to 384)

Adding 10% for potential non-response: 384 +38.4 = 422.4, this is approximately 422

participants minimum

3.7 Sampling Technique

This study utilized systematic sampling technique appropriate for the community setting.The Ekosodin community was divided into different geographical areas or clusters, according to the number of streets within the region, which are: Boundary. Igbineweka street, Ekhorutomwen street , Edo, JB street and Market Road which allowed the study to cover various regions.

Name of street	No. of households
Boundary street	105
Edo street	134
Igbineweka street	117
Ekhorutomwen street	122
Market road	73
JB street	98
	Total: 649

Systematic sampling was used based on the total number of households and the desired number of participants, an interval (k) was calculated. This interval determined how often people were selected from the list.

k = Total population size / Desired sample size

k=649/422 = 1.5 approx. 2

3.8 Instrument for data collection

The study utilized 4 instruments for data collection which included a self-developed quantitative questionnaire comprising items, Sphgmomanometer, weighing scale and tape rule. The questionnaires were created based on the literature review and the study's objectives. Some questions were adapted from existing standardized questionnaires, while others were developed by the researcher. This self-administered, structured questionnaire is divided into four sections aligned with the study's objectives. The questions were written in English and designed to be clear and easy to understand. The sections included;

SECTION A: SOCIO-DEMOGRAPHIC INFORMATION

This obtained information about the age, sex, educational background, socio-economic status, and history of cardiovascular disease.

SECTION B: BEHAVIORAL LIFESTYLE PRACTICES

This section assessed the body mass index (BMI), Blood Pressure (BP), and waist circumference as modifiable risk factors of cardiovascular disease. It makes use of a five-point Likert scale (Never, Sometimes, Rarely, Often, Always).

SECTION C: MODIFIABLE PHYSIOLOGICAL RISK FACTORS

This section utilizes open-ended response options to assess parameters for modifiable physiological risk factors for cardiovascular disease. This includes spaces for

respondents to provide specific measurements e.g., blood pressure, weight,height and waist circumference, which offer more objective insight into their physiological status.

SECTION D: FACTORS INFLUENCING BEHAVIORAL LIFESTYLE PRACTICES

This section also utilized a Five-point Likert scale (Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree) to identify the factors influencing their health behavior.

3.9 Validity of the instruments

Validity ensures that a research tool accurately measures its intended concept. Polit and Beck (2008) define it as the instrument's ability to truly assess what it claims to measure. In this study, the instrument underwent a thorough validation process, with the project supervisor and two experts from the University of Benin reviewing its face and content validity. Their feedback was carefully integrated to improve the instrument's precision and relevance. To minimize sampling bias, an additional 10% of participants were included to account for potential non-responses.

3.10 Reliability of the instruments

Reliability refers to the consistency of results produced by an assessment tool (Colin and Julie, 2006). A reliable instrument yields the same outcome when the behavior is measured again with the same scale. To assess the reliability of the data collection tool, a test-retest method was used, with a pilot study conducted in the Ekosodin community of Benin City to examine how lifestyle behaviors correlate with

cardiovascular disease risk. The instrument's reliability was confirmed using Cronbach's Alpha, a common technique for estimating the reliability of psychometric tests. A Cronbach's alpha value above 0.5 is considered reliable, and with a value of 0.82 obtained from SPSS analysis, the instrument was deemed reliable.

3.11 Method of Data Collection

Structured questionnaires were employed to gather data from adult community members after utilizing a carefully selected sampling method. A comprehensive explanation of the study's objectives, methodological approach, and ethical framework was provided. Before data collection, participants received a detailed briefing and were required to provide written consent, which explicitly outlined the voluntary nature of their participation. The questionnaires were administered during a period of 2 weeks. Participants received guidance and support in accurately filling out the survey, with help available as needed. At the same time, their blood pressure, body mass index, and waist circumference were assessed, and the responses were collected and securely stored to maintain data quality and confidentiality.

3.12 Method of Data Analysis

All data obtained were encoded, inputted, and assessed utilizing the Statistical Package for Social Sciences (SPSS) version 26.0 spreadsheet. The data was depicted through tables using frequency and percentage representations. The hypotheses were evaluated through the Chi-square test of association at a 95% confidence interval, and the significance threshold was established at $p< 0.05$.

3.13 Ethical Consideration

Researchers must adhere to critical ethical principles when conducting scientific investigations. These fundamental requirements encompass ensuring voluntary and autonomous participant involvement, as well as guaranteeing full disclosure of research details. The core ethical principles of voluntary participation, confidentiality, privacy, and anonymity must be consistently maintained throughout and beyond the study's duration.

The participants in this research were not subjected to any form of coercion, and the highest standards of confidentiality have been meticulously preserved. Before initiating the study, written permission was obtained from the relevant authorities.

Confidentiality: To safeguard participant privacy, no personal identifying information, such as names or addresses, was collected during the interview process. Participants were explicitly informed that their responses would remain strictly confidential and would be used exclusively for scientific research purposes. Anonymity was further protected by eliminating any personal identifiers from the questionnaire.

Voluntary Participation: Research participants were granted complete freedom to choose their involvement without experiencing external pressure, potential prejudice, or punitive consequences. They retained the right to withdraw from the study at any point and could decline to share any information that made them uncomfortable.

Plagiarism: All source materials utilized in this study were appropriately

acknowledged through proper citations within the text and in the reference section.

Informed Consent: Before data collection, participants received comprehensive information about the study's purpose and potential benefits. All participants' questions were thoroughly addressed to ensure full understanding.

Ethical Approval: Before commencing data collection, an ethical approval form was secured from the relevant community, certifying that all ethical requirements had been met and research authorization was granted.

CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter presents the analysis and interpretation of data collected from adult residents in Ekosodin community, Benin City, Nigeria. The results are presented in accordance with the study objectives: to assess behavioral lifestyle practices, to assess modifiable physiological risk factors, and to identify factors influencing behavioral lifestyle practices among adult residents. The data was analyzed using descriptive statistics and inferential statistics at a 95% confidence interval ($p<0.05$).

4.2 Socio-Demographic Characteristics of Respondents

A total of 422 questionnaires were administered to adult residents in Ekosodin community, and 410 were retrieved, giving a response rate of 97.2%. Table 4.1 presents the socio-demographic characteristics of the respondents.

Table 4.1: Socio-Demographic Characteristics of Respondents (n=410)

Variables	Categories	Frequency (n)	Percentage (%)
Sex	Male	189	46.1
	Female	221	53.9
Age (years)	18-30	165	40.2
	31-40	113	27.6
	41-50	78	19.0
	51-60	39	9.5
	Above 60	15	3.7
Marital Status	Single	171	41.7
	Married	202	49.3
	Widowed	28	6.8
	Divorced	9	2.2
Educational Level	No formal education	24	5.9
	Primary	53	12.9
	Secondary	139	33.9
	Tertiary	194	47.3
Monthly Income	Less than ₦20,000	132	32.2
	₦20,000-₦49,999	165	40.2
	₦50,000-₦99,999	81	19.8
	₦100,000 and above	32	7.8
Family History of CVD	Yes	98	23.9
	No	245	59.8
	Not Sure	67	16.3

Table 4.1 shows that majority of the respondents were female (53.9%), aged 18-30 years (40.2%), married (49.3%), had tertiary education (47.3%), and earned between ₦20,000-₦49,999 monthly (40.2%). Additionally, 23.9% of respondents reported a family history of cardiovascular disease.

4.3 Answers to research questions

4.3.1 Behavioral Lifestyle Practices Among Adult Residents

Table 4.2 presents the behavioral lifestyle practices among adult residents in Ekosodin community.

Table 4.2: Behavioral Lifestyle Practices Among Adult Residents (n=410)
Behavioral Lifestyle Practices(BLP)

	Never n(%)	Rarely n(%)	Sometimes n(%)	Often n(%)	Always n(%)	Mean Score	Remark
Smoking/tobacco use	267(65.1)	45(11.0)	56(13.7)	30(7.3)	12(2.9)	0.72	Negative
Little/no physical activity	86(21.0)	92(22.4)	125(30.5)	78(19.0)	29(7.1)	1.69	Negative
Sedentary lifestyle	75(18.3)	108(26.3)	131(32.0)	67(16.3)	29(7.1)	1.68	Negative
High fat/sugar/salt diet	38(9.3)	95(23.2)	178(43.4)	76(18.5)	23(5.6)	1.88	Negative
Skip fruits and vegetables	67(16.3)	107(26.1)	142(34.6)	69(16.8)	25(6.1)	1.70	Negative
Alcohol consumption	183(44.6)	81(19.8)	73(17.8)	49(12.0)	24(5.9)	1.15	Negative
Late night eating/unhealthy snacking	59(14.4)	87(21.2)	155(37.8)	79(19.3)	30(7.3)	1.84	Negative
Check BP only when unwell	75(18.3)	88(21.5)	111(27.1)	95(23.2)	41(10.0)	1.85	Negative
Ignore/delay medical advice	105(25.6)	97(23.7)	115(28.0)	64(15.6)	29(7.1)	1.55	Negative
Neglect weight monitoring	71(17.3)	85(20.7)	135(32.9)	82(20.0)	37(9.0)	1.83	Negative
Unmanaged stress	53(12.9)	101(24.6)	161(39.3)	67(16.3)	28(6.8)	1.79	Negative
Poor sleep habits	66(16.1)	97(23.7)	137(33.4)	75(18.3)	35(8.5)	1.79	Negative
Ignore preventive screenings	87(21.2)	86(21.0)	128(31.2)	76(18.5)	33(8.0)	1.71	Negative

Mean score greater than 2.50 Indicate positive behavioural lifestyle while those less than are negative.

Table 4.2 reveals that most respondents never engaged in smoking/tobacco use (65.1%) or alcohol consumption (44.6%). However, a considerable proportion sometimes engaged in sedentary lifestyle (32.0%), consumed high fat/sugar/salt diet

(43.4%), skipped fruits and vegetables (34.6%), practiced late night eating/unhealthy snacking (37.8%), neglected weight monitoring (32.9%), experienced unmanaged stress (39.3%), had poor sleep habits (33.4%), and ignored preventive screenings (31.2%). Additionally, 23.2% often and 10.0% always checked their blood pressure only when unwell.

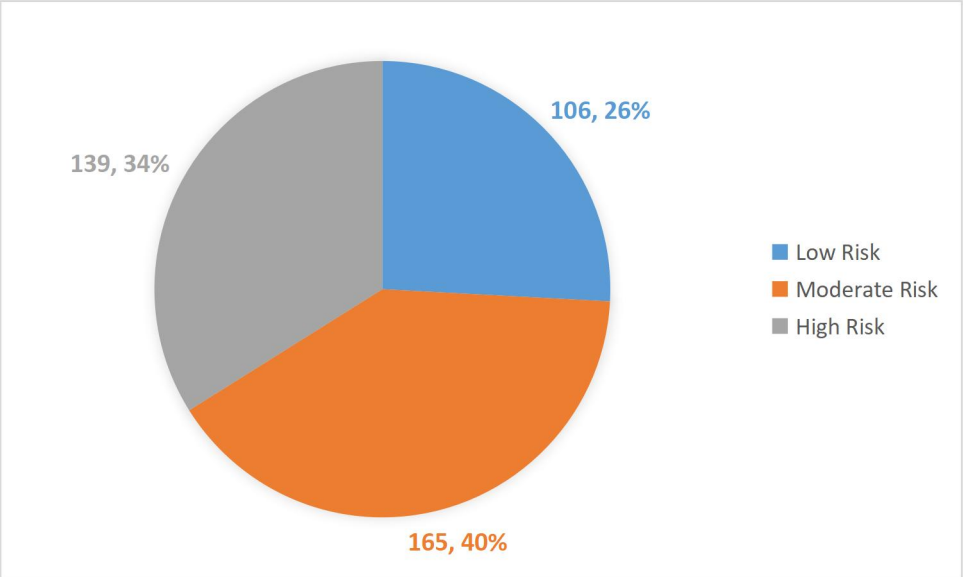

Figure 4.1: Risk level for the different respondents

The above figure shows that 139(34%) are high risk residents, 165(40%) are moderate risk residents, while the remaining 106(26%) are low risk.

4.3.2 Modifiable Physiological Risk Factors Among Adult Residents

Table 4.3a: Descriptive Statistics of SBP, DBP, BMI, WC

	Mean	Standard Deviation	Minimum	Maximum
Systolic Blood Pressure (mmHg)	124.6	15.7	90.0	178.0
Diastolic Blood Pressure (mmHg)	78.3	9.2	55.0	110.0
Body Mass Index (kg/m²)	25.8	4.3	16.2	38.5
Waist Circumference - Males (cm)	91.4	10.6	70.0	118.0
Waist Circumference - Females (cm)	79.6	9.7	62.0	110.0

The cardiovascular risk profile of the study population is shown in table 4.3a. It showed mean values at concerning levels: systolic BP of 124.6 mmHg (SD=15.7), diastolic BP of 78.3 mmHg (SD=9.2), and BMI of 25.8 kg/m² (SD=4.3). Mean waist circumference measurements (males: 91.4 cm, SD=10.6; females: 79.6 cm, SD=9.7).

Table 4.3b presents the distribution of respondents according to their modifiable physiological risk factors.

Table 4.3b: Modifiable Physiological Risk Factors Among Adult Residents (n=410)

Categories	Frequency (n)	Percentage (%)	Mean ± SD
Blood Pressure Classification			
Normal (<120/<80 mmHg)	159	38.8	115.2 ± 3.8 / 74.6 ± 3.2
Elevated (120-129/<80 mmHg)	93	22.7	124.5 ± 2.7 / 77.3 ± 1.8
Hypertension Stage 1 (130-139/80-89 mmHg)	106	25.9	134.6 ± 2.8 / 84.7 ± 2.3
Hypertension Stage 2 (≥140/≥90 mmHg)	52	12.7	148.3 ± 7.5 / 94.6 ± 3.9
Body Mass Index (BMI) (kg/m²**)**			
Underweight (<18.5)	21	5.1	17.3 ± 0.9
Normal (18.5-24.9)	153	37.3	22.4 ± 1.7
Overweight (25.0-29.9)	167	40.7	27.3 ± 1.4
Obese (≥30.0)	69	16.8	33.8 ± 3.2
Waist Circumference (Males) (cm)			
Normal (<94)	103	54.5	86.2 ± 5.4
Increased risk (94-102)	64	33.9	97.8 ± 2.5
Substantially increased risk (>102)	22	11.6	108.3 ± 5.1
Waist Circumference (Females) (cm)			
Normal (<80)	98	44.3	73.8 ± 4.6
Increased risk (80-88)	87	39.4	83.7 ± 2.3
Substantially increased risk (>88)	36	16.3	94.5 ± 5.2

The table shows that among participants with normal blood pressure, the mean systolic/diastolic values are 115.2 ± 3.8 / 74.6 ± 3.2 mmHg. The elevated category shows means of 124.5 ± 2.7 / 77.3 ± 1.8 mmHg. Stage 1 hypertension presents with 134.6 ± 2.8 / 84.7 ± 2.3 mmHg, while Stage 2 hypertension shows significantly higher values at 148.3 ± 7.5 / 94.6 ± 3.9 mmHg. Overall, 38.6% of the population has hypertension (Stage 1 or 2), representing a significant cardiovascular risk factor. The mean BMI for the normal weight category is 22.4 ± 1.7 kg/m², well within the healthy range. Overweight individuals, comprising the largest segment at 40.7%, have a mean BMI of 27.3 ± 1.4 kg/m². The obese category shows substantially higher values at

33.8 ± 3.2 kg/m² with greater variability. With 57.5% of participants either overweight or obese, weight management represents a critical health concern. Normal waist circumference males (54.5%) show a mean of 86.2 ± 5.4 cm. Those with increased risk (33.9%) have a mean of 97.8 ± 2.5 cm, while the substantially increased risk group (11.6%) shows a mean of 108.3 ± 5.1 cm. The relatively small standard deviation in the middle category suggests clustering just below the higher risk threshold. Females with normal measurements (44.3%) have a mean of 73.8 ± 4.6 cm. The increased risk category (39.4%) shows a mean of 83.7 ± 2.3 cm, while the substantially increased risk group (16.3%) has a mean of 94.5 ± 5.2 cm. Notably, a higher percentage of females (55.7%) have elevated waist circumference compared to males (45.5%), indicating a higher prevalence of central obesity among females in this population.

.3.3 Factors Influencing Behavioral Lifestyle Practices Among Adult Residents

Table 4.4 presents the factors influencing behavioral lifestyle practices among adult residents in Ekosodin community.

Table 4.4: Factors Influencing Behavioral Lifestyle Practices (n=410)

Factors	Strongly Agree n(%)	Agree n(%)	Neutral n(%)	Disagree n(%)	Strongly Disagree n(%)	Mean Score	Remark
Lack of motivation	46(11.2)	139(33.9)	102(24.9)	92(22.4)	31(7.6)	3.18	positive
Peer influence	54(13.2)	147(35.9)	93(22.7)	78(19.0)	38(9.3)	3.25	positive
Convenience/lack of cooking time	71(17.3)	172(42.0)	87(21.2)	58(14.1)	22(5.4)	3.52	positive
Stress/emotional issues	63(15.4)	159(38.8)	101(24.6)	62(15.1)	25(6.1)	3.42	positive
Lack of public education	82(20.0)	168(41.0)	89(21.7)	51(12.4)	20(4.9)	3.59	positive
Cultural/family practices	47(11.5)	138(33.7)	119(29.0)	78(19.0)	28(6.8)	3.24	positive
Lack of access to facilities	95(23.2)	173(42.2)	76(18.5)	48(11.7)	18(4.4)	3.68	positive
Perception of being too young/healthy	58(14.1)	142(34.6)	97(23.7)	77(18.8)	36(8.8)	3.27	positive
Work/daily schedule constraints	89(21.7)	183(44.6)	73(17.8)	45(11.0)	20(4.9)	3.67	positive
Lack of social support	52(12.7)	145(35.4)	103(25.1)	81(19.8)	29(7.1)	3.27	positive

Mean score greater than 2.50 are positive factors, while factor less than 2.50 is not a factor.

Table 4.4 shows that the major factors influencing behavioral lifestyle practices among adult residents were: work/daily schedule constraints (66.3% agreed), lack of access to facilities (65.4% agreed), convenience/lack of cooking time (59.3% agreed), lack of public education (61.0% agreed), and stress/emotional issues (54.2% agreed).

4.4 Hypothesis testing

4.4.1 Relationship Between Behavioral Lifestyle Practices and Modifiable Physiological Risk Factors

Table 4.5 presents the relationship between behavioral lifestyle practices and modifiable physiological risk factors among adult residents.

Table 4.5: Relationship Between Behavioral Lifestyle Practices and Modifiable Physiological Risk Factors (n=410)

	Low risk	Moderate risk	High risk	χ^2	p-value
Blood Pressure				243.7	<0.001
Normal	86 (81.1%)	65 (39.4%)	8 (5.8%)		
Elevated	18 (17.0%)	68 (41.2%)	7 (5.0%)		
Stage 1 HTN	2 (1.9%)	32 (19.4%)	72 (51.8%)		
Stage 2 HTN	0 (0.0%)	0 (0.0%)	52 (37.4%)		
BMI				228.5	<0.001
Underweight	9 (8.5%)	10 (6.1%)	2 (1.4%)		
Normal	85 (80.2%)	59 (35.8%)	9 (6.5%)		
Overweight	12 (11.3%)	96 (58.2%)	59 (42.4%)		
Obese	0 (0.0%)	0 (0.0%)	69 (49.6%)		
Waist Circumference				210.6	<0.001
Normal	96 (90.6%)	91 (55.2%)	14 (10.1%)		
Increased risk	10 (9.4%)	74 (44.8%)	67 (48.2%)		
Substantially increased	0 (0.0%)	0 (0.0%)	58 (41.7%)		

The table shows that in the low risk group (26% of participants), a substantial majority present with normal blood pressure (81%), normal BMI (80%), and normal waist circumference (91%), establishing a clear pattern of overall metabolic health. The moderate risk category, comprising the largest segment at 40% of participants, displays a transitional profile characterized by a mix of normal (39%) and elevated (41%) blood pressure readings, predominantly overweight BMI classifications (58%), and approximately equal distribution between normal (55%) and increased risk (45%) waist circumference measurements. Most notably, the high risk group (34% of participants) demonstrates significant physiological abnormalities across all parameters, with 89% exhibiting hypertension (52% Stage 1, 37% Stage 2), 92% classified as either overweight or obese (with obesity alone accounting for 50%), and 90% presenting with increased or substantially increased waist circumference. There were significant associations ($p<0.05$) between all the behavioural lifestyle risk and BMI, BP and WC.

4.4.2 Relationship Between Socio-demographic Characteristics and Behavioral lifestyle practices

Table 4.6: Relationship between socio-demographic characteristics and Behavioral lifestyle practices among adult residents.

	High risk	Moderate risk	Low risk	χ^2	p-value
Sex					
Male	75(39.7)	67(35.4)	47(24.9)	6.27	0.043*
Female	64(29.0)	98(44.3)	59(26.7)		
Age					
18-30	42(25.5)	68(41.2)	55(33.3)	27.68	<0.001*
31-40	35(31.0)	48(42.5)	30(26.5)		
41-50	31(39.7)	32(41.0)	15(19.3)		
51-60	21(53.8)	13(33.3)	5(12.9)		
Above 60	10(66.7)	4(26.7)	1(6.6)		
Marital Status					
Single	48(28.1)	70(40.9)	53(31.0)	14.92	0.021*
Married	72(35.6)	81(40.1)	49(24.3)		
Widowed	14(50.0)	10(35.7)	4(14.3)		
Divorced	5(55.6)	4(44.4)	0(0.0)		
Educational Level					
No formal education	13(54.2)	8(33.3)	3(12.5)	16.83	0.010*
Primary	23(43.4)	21(39.6)	9(17.0)		
Secondary	49(35.3)	58(41.7)	32(23.0)		
Tertiary	54(27.8)	78(40.2)	62(32.0)		
Monthly Income					
Less than ₦20,000	52(39.4)	52(39.4)	28(21.2)	13.27	0.039*
₦20,000-₦49,999	57(34.5)	67(40.6)	41(24.9)		
₦50,000-₦99,999	23(28.4)	32(39.5)	26(32.1)		
₦100,000 and above	7(21.9)	14(43.7)	11(34.4)		
Family History of CVD					
Yes	43(43.9)	37(37.8)	18(18.3)	15.36	0.004*
No	71(29.0)	104(42.4)	70(28.6)		
Not Sure	25(37.3)	24(35.8)	18(26.9)		

The above table revealed a statistically significant association between sex and modifiable physiological risk factors ($\chi^2 = 6.27$, $p = 0.043$). Males exhibited a higher

prevalence of high-risk factors (39.7%) compared to females (29.0%). Conversely, females demonstrated a greater proportion of moderate-risk factors (44.3%) compared to males (35.4%). Age demonstrated a robust and statistically significant association with modifiable physiological risk factors ($\chi^2 = 27.68$, $p < 0.001$). A clear linear relationship was observed, with risk increasing proportionally with age. Among younger adults (18-30 years), only 25.5% presented high-risk factors, compared to 66.7% among those aged above 60 years. Furthermore, the proportion of individuals with low-risk factors diminished progressively with advancing age, from 33.3% in the youngest age group to merely 6.6% in the oldest cohort. Marital status exhibited a significant relationship with modifiable physiological risk factors ($\chi^2 = 14.92$, $p = 0.021$). Single individuals demonstrated the lowest prevalence of high-risk factors (28.1%) and the highest proportion of low-risk factors (31.0%). In contrast, divorced respondents exhibited the highest prevalence of high-risk factors (55.6%) with none presenting low-risk factors (0.0%). Similarly, widowed individuals showed elevated risk profiles with 50.0% in the high-risk category. A statistically significant inverse relationship was observed between educational attainment and modifiable physiological risk factors ($\chi^2 = 16.83$, $p = 0.010$). Respondents with no formal education demonstrated the highest prevalence of high-risk factors (54.2%) and the lowest proportion of low-risk factors (12.5%). Conversely, individuals with tertiary education exhibited the lowest prevalence of high-risk factors (27.8%) and the highest proportion of low-risk factors (32.0%). Monthly income demonstrated a significant association with modifiable physiological risk factors ($\chi^2 = 13.27$, $p = 0.039$). A clear

socioeconomic gradient was evident, with high-risk factors diminishing as income increased. Individuals earning less than ₦20,000 monthly exhibited the highest prevalence of high-risk factors (39.4%), while those earning ₦100,000 and above demonstrated the lowest prevalence (21.9%). Correspondingly, the proportion of individuals with low-risk factors increased with income, from 21.2% in the lowest income bracket to 34.4% in the highest. Family history of cardiovascular disease (CVD) showed a significant relationship with modifiable physiological risk factors ($\chi^2 = 15.36$, $p = 0.004$). Respondents with a positive family history exhibited the highest prevalence of high-risk factors (43.9%) and the lowest proportion of low-risk factors (18.3%). In contrast, those reporting no family history of CVD demonstrated markedly better risk profiles, with lower prevalence of high-risk factors (29.0%) and higher proportion of low-risk factors (28.6%).

Table 4.4.3: Logistic Regression Analysis of modifiable physiological risk by Socio-demographic Characteristics

Variables	Unadjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Sex				
Female	1.00 (Reference)		1.00 (Reference)	
Male	1.61 (1.08-2.41)	0.020*	1.52 (1.03-2.24)	0.035*
Age				
18-30	1.00 (Reference)		1.00 (Reference)	
31-40	1.32 (0.83-2.10)	0.247	1.18 (0.72-1.93)	0.512
41-50	1.93 (1.14-3.24)	0.014*	1.76 (1.02-3.05)	0.043*
51-60	3.41 (1.72-6.75)	<0.001*	3.12 (1.54-6.32)	0.002*
Above 60	5.85 (1.97-17.36)	0.002*	5.23 (1.68-16.27)	0.004*
Marital Status				
Single	1.00 (Reference)		1.00 (Reference)	
Married	1.42 (0.94-2.14)	0.095	1.18 (0.75-1.86)	0.471
Widowed	2.56 (1.14-5.74)	0.023*	1.62 (0.68-3.86)	0.275
Divorced	3.21 (0.85-12.09)	0.084	2.45 (0.63-9.54)	0.196
Educational Level				
Tertiary	1.00 (Reference)		1.00 (Reference)	
Secondary	1.42 (0.93-2.17)	0.106	1.31 (0.84-2.04)	0.229
Primary	2.00 (1.08-3.67)	0.026*	1.63 (0.84-3.17)	0.148
No formal education	3.07 (1.32-7.15)	0.009*	2.28 (0.93-5.59)	0.071
Monthly Income				
₦100,000 and above	1.00 (Reference)		1.00 (Reference)	
₦50,000-₦99,999	1.42 (0.61-3.31)	0.418	1.27 (0.53-3.04)	0.585
₦20,000-₦49,999	1.89 (0.86-4.15)	0.116	1.56 (0.69-3.53)	0.285
Less than ₦20,000	2.34 (1.05-5.19)	0.037*	1.82 (0.79-4.21)	0.158
Family History of CVD				
No	1.00 (Reference)		1.00 (Reference)	
Not Sure	1.45 (0.83-2.53)	0.189	1.36 (0.76-2.42)	0.297
Yes	1.92 (1.18-3.11)	0.008*	1.73 (1.05-2.85)	0.032*

**Statistically significant at p<0.05; aOR = Adjusted Odds-ratio*

The logistic regression analysis of cardiovascular disease risk factors reveals several significant socio-demographic determinants. Gender emerges as a significant factor, with males exhibiting 52% higher odds of cardiovascular risk compared to females after adjusting for other variables (aOR=1.52, 95% CI: 1.03-2.24, p=0.035). Age demonstrates a clear dose-response relationship, with risk progressively increasing

across age groups. Compared to young adults (18-30), individuals aged 41-50 have 76% higher odds (aOR=1.76, 95% CI: 1.02-3.05, p=0.043), those aged 51-60 have more than three times the risk (aOR=3.12, 95% CI: 1.54-6.32, p=0.002), while those above 60 have more than five times higher odds of cardiovascular disease risk (aOR=5.23, 95% CI: 1.68-16.27, p=0.004). Family history also plays a significant role, with individuals reporting a family history of cardiovascular disease showing 73% increased odds of risk compared to those without such history (aOR=1.73, 95% CI: 1.05-2.85, p=0.032).

Table 4.4.4: Association Between BMI Classification and Sociodemographic Characteristics (n=410)

Variables	Underweight n(%)	Normal n(%)	Overweight n(%)	Obese n(%)	χ^2	p-value
Sex					15.73	0.001*
Male	14(7.4)	85(45.0)	74(39.2)	16(8.5)		
Female	7(3.2)	68(30.8)	93(42.1)	53(24.0)		
Age (years)					20.84	0.013*
18-30	13(7.9)	76(46.1)	58(35.2)	18(10.9)		
31-40	3(2.7)	40(35.4)	47(41.6)	23(20.4)		
41-50	2(2.6)	23(29.5)	37(47.4)	16(20.5)		
51-60	2(5.1)	10(25.6)	19(48.7)	8(20.5)		
Above 60	1(6.7)	4(26.7)	6(40.0)	4(26.7)		
Marital Status					12.81	0.172
Single	13(7.6)	74(43.3)	65(38.0)	19(11.1)		
Married	6(3.0)	68(33.7)	86(42.6)	42(20.8)		
Widowed	1(3.6)	8(28.6)	12(42.9)	7(25.0)		
Divorced	1(11.1)	3(33.3)	4(44.4)	1(11.1)		
Educational Level					17.12	0.047*
No formal education	3(12.5)	8(33.3)	8(33.3)	5(20.8)		
Primary	3(5.7)	12(22.6)	26(49.1)	12(22.6)		
Secondary	4(2.9)	53(38.1)	62(44.6)	20(14.4)		
Tertiary	11(5.7)	80(41.2)	71(36.6)	32(16.5)		
Monthly Income					17.91	0.036*
Less than ₦20,000	11(8.3)	51(38.6)	51(38.6)	19(14.4)		
₦20,000-	6(3.6)	60(36.4)	71(43.0)	28(17.0)		

₦49,999						
₦50,000-₦99,999	3(3.7)	31(38.3)	34(42.0)	13(16.0)		
₦100,000 and above	1(3.1)	11(34.4)	11(34.4)	9(28.1)		
Family History of CVD					5.89	0.436
Yes	3(3.1)	32(32.7)	44(44.9)	19(19.4)		
No	15(6.1)	97(39.6)	95(38.8)	38(15.5)		
Not Sure	3(4.5)	24(35.8)	28(41.8)	12(17.9)		

*Statistically significant at $p<0.05$

The chi-square analysis in Table 4.9 demonstrates that sex is strongly associated with BMI distribution ($\chi^2 = 15.73$, $p = 0.001$), with females showing higher prevalence of obesity (24.0%) compared to males (8.5%), while males exhibited higher rates of normal weight (45.0% vs 30.8%). Age significantly influenced BMI distribution ($\chi^2 = 20.84$, $p = 0.013$), with overweight and obesity prevalence generally increasing with advancing age; the proportion of normal weight individuals decreased from 46.1% in the 18-30 age group to 25.6% in the 51-60 group. Educational level showed significant association with BMI status ($\chi^2 = 17.12$, $p = 0.047$), with the highest obesity rates observed among those with primary education (22.6%) and no formal education (20.8%). Monthly income also demonstrated significant relationship with BMI ($\chi^2 = 17.91$, $p = 0.036$), with obesity rates highest (28.1%) among the highest income bracket (₦100,000 and above). Marital status and family history of cardiovascular disease did not show statistically significant associations with BMI classification.

Table 4.4.5: Logistic Regression Analysis of BMI as a Risk Factor of Cardiovascular Disease and Socio-demographic Characteristics

Variables	Unadjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Sex				
Female	1.00 (Reference)		1.00 (Reference)	
Male	1.61 (1.08-2.41)	0.020*	1.52 (1.03-2.24)	0.035*
Age				
18-30	1.00 (Reference)		1.00 (Reference)	
31-40	1.32 (0.83-2.10)	0.247	1.18 (0.72-1.93)	0.512
41-50	1.93 (1.14-3.24)	0.014*	1.76 (1.02-3.05)	0.043*
51-60	3.41 (1.72-6.75)	<0.001*	3.12 (1.54-6.32)	0.002*
Above 60	5.85 (1.97-17.36)	0.002*	5.23 (1.68-16.27)	0.004*
Marital Status				
Single	1.00 (Reference)		1.00 (Reference)	
Married	1.42 (0.94-2.14)	0.095	1.18 (0.75-1.86)	0.471
Widowed	2.56 (1.14-5.74)	0.023*	1.62 (0.68-3.86)	0.275
Divorced	3.21 (0.85-12.09)	0.084	2.45 (0.63-9.54)	0.196
Educational Level				
Tertiary	1.00 (Reference)		1.00 (Reference)	
Secondary	1.42 (0.93-2.17)	0.106	1.31 (0.84-2.04)	0.229
Primary	2.00 (1.08-3.67)	0.026*	1.63 (0.84-3.17)	0.148
No formal education	3.07 (1.32-7.15)	0.009*	2.28 (0.93-5.59)	0.071
Monthly Income				
₦100,000 and above	1.00 (Reference)		1.00 (Reference)	
₦50,000-₦99,999	1.42 (0.61-3.31)	0.418	1.27 (0.53-3.04)	0.585
₦20,000-₦49,999	1.89 (0.86-4.15)	0.116	1.56 (0.69-3.53)	0.285
Less than ₦20,000	2.34 (1.05-5.19)	0.037*	1.82 (0.79-4.21)	0.158
Family History of CVD				
No	1.00 (Reference)		1.00 (Reference)	
Not Sure	1.45 (0.83-2.53)	0.189	1.36 (0.76-2.42)	0.297
Yes	1.92 (1.18-3.11)	0.008*	1.73 (1.05-2.85)	0.032*

*Statistically significant at $p<0.05$

Table 4.10 presents a logistic regression analysis examining socio-demographic determinants of cardiovascular disease risk among adult residents. Gender emerged as a significant factor, with males exhibiting 1.52 times higher odds (95% CI: 1.03-2.24, p=0.035) of falling into high or moderate risk categories compared to females. Age demonstrated a pronounced association with cardiovascular risk; compared to adults

aged 18-30, those aged 41-50 showed 1.76 times higher odds (p=0.043), individuals aged 51-60 demonstrated 3.12 times higher odds (p=0.002), and participants above 60 years presented the most elevated risk at 5.23 times higher odds (p=0.004). Educational attainment displayed an inverse relationship with risk, though this association was attenuated in the adjusted model, with those lacking formal education showing 2.28 times higher odds (p=0.071) compared to tertiary-educated participants. Economic status followed a similar pattern, with the lowest income group (<₦20,000) demonstrating 1.82 times higher odds (p=0.158) of elevated risk versus the highest income group, though this did not reach statistical significance after adjustment. Family history of cardiovascular disease significantly increased risk odds by 1.73 times (p=0.032) compared to those without such history. The model demonstrated good fit (Hosmer-Lemeshow p=0.447) and explained 20.7% of variance in risk levels.

Table 4.4.6: Blood Pressure Classification by Sociodemographic Characteristics

	Normal	**Elevated**	**Stage 1 HTN**	**Stage 2 HTN**	**Chi-square**	**p-value**
Sex					6.937	0.074
Male	62(32.8)	43(22.8)	54(28.6)	30(15.9)		
Female	97(43.9)	50(22.6)	52(23.5)	22(10.0)		
Age(years)					83.276	<0.001*
18-30	93(56.4)	39(23.6)	26(15.8)	7(4.2)		
31-40	43(38.1)	28(24.8)	32(28.3)	10(8.8)		
41-50	15(19.2)	18(23.1)	31(39.7)	14(17.9)		
51-60	6(15.4)	7(17.9)	13(33.3)	13(33.3)		
Above 60	2(13.3)	1(6.7)	4(26.7)	8(53.3)		
Marital Status					39.148	<0.001*
Single	89(52.0)	37(21.6)	35(20.5)	10(5.8)		
Married	61(30.2)	51(25.2)	59(29.2)	31(15.3)		
Widowed	7(25.0)	4(14.3)	9(32.1)	8(28.6)		
Divorced	2(22.2)	1(11.1)	3(33.3)	3(33.3)		
Educational Level					23.725	0.005*
No formal education	5(20.8)	4(16.7)	8(33.3)	7(29.2)		
Primary	14(26.4)	12(22.6)	17(32.1)	10(18.9)		
Secondary	49(35.3)	34(24.5)	39(28.1)	17(12.2)		
Tertiary	91(46.9)	43(22.2)	42(21.6)	18(9.3)		

Monthly Income					27.164	0.001*
Less than ₦20,000	59(44.7)	30(22.7)	32(24.2)	11(8.3)		
₦20,000-₦49,999	70(42.4)	39(23.6)	38(23.0)	18(10.9)		
₦50,000-₦99,999	23(28.4)	18(22.2)	25(30.9)	15(18.5)		
₦100,000 and above	7(21.9)	6(18.8)	11(34.4)	8(25.0)		
Family History of CVD					14.583	0.024*
Yes	27(27.6)	22(22.4)	31(31.6)	18(18.4)		
No	106(43.3)	55(22.4)	59(24.1)	25(10.2)		
Not Sure	26(38.8)	16(23.9)	16(23.9)	9(13.4)		
BMI(kg/m²)					31.842	<0.001*
Underweight(<18.5)	12(57.1)	5(23.8)	3(14.3)	1(4.8)		
Normal(18.5-24.9)	78(51.0)	35(22.9)	31(20.3)	9(5.9)		
Overweight(25.0-29.9)	54(32.3)	40(24.0)	49(29.3)	24(14.4)		
Obese(≥30.0)	15(21.7)	13(18.8)	23(33.3)	18(26.1)		

Table 4.13 show blood pressure classification across demographic characteristics. Though not statistically significant, women tend to demonstrate lower blood pressure than men, with 43.9% of women having normal blood pressure compared to 32.8% of men, and fewer women (10%) exhibiting Stage 2 hypertension than men (15.9%). Age emerges as a highly significant factor influencing blood pressure, showing a clear progression toward higher blood pressure with increasing age. The percentage of individuals with normal blood pressure dramatically decreases from 56.4% among 18-30 year-olds to merely 13.3% in those above 60, while Stage 2 hypertension rises sharply from 4.2% in the youngest group to 53.3% in the oldest cohort. Among single participants, 52% maintain normal blood pressure, compared to 30.2% of married, 25% of widowed, and 22.2% of divorced individuals. Stage 2 hypertension appears substantially more prevalent among widowed (28.6%) and divorced (33.3%) participants compared to single individuals (5.8%). Education level correlates strongly with blood pressure outcomes, as higher education appears protective against

hypertension. Those with tertiary education show the highest rates of normal blood pressure (46.9%), contrasting sharply with those having no formal education (20.8%). The prevalence of Stage 2 hypertension follows an inverse pattern, affecting 29.2% of those without formal education compared to just 9.3% of tertiary-educated participants. Normal blood pressure decreases from 44.7% in the lowest income group to 21.9% in the highest income category, while Stage 2 hypertension increases from 8.3% to 25% across the same spectrum. Family history of cardiovascular disease significantly impacts blood pressure outcomes, with those reporting such history showing higher rates of both Stage 1 (31.6%) and Stage 2 (18.4%) hypertension compared to those without a family history (24.1% and 10.2%, respectively). Body mass index demonstrates one of the strongest associations with blood pressure classification. As BMI increases from underweight to obese categories, normal blood pressure prevalence decreases substantially from 57.1% to 21.7%, while Stage 2 hypertension increases from 4.8% to 26.1%, highlighting obesity as a significant risk factor for hypertension.

Table 4.4.7: Waist Circumference Risk Categories by Sociodemographic Characteristics

	Normal	**Increased Risk**	**Substantially Increased Risk**	**Chi-square**	**p-value**
Sex				4.831	0.089
Male	103(54.5)	64(33.9)	22(11.6)		
Female	98(44.3)	87(39.4)	36(16.3)		
Age(years)				48.726	<0.001*
18-30	97(58.8)	54(32.7)	14(8.5)		
31-40	57(50.4)	40(35.4)	16(14.2)		
41-50	31(39.7)	30(38.5)	17(21.8)		
51-60	12(30.8)	20(51.3)	7(17.9)		
Above 60	4(26.7)	7(46.7)	4(26.7)		
Marital Status				26.149	<0.001*

Single	98(57.3)	57(33.3)	16(9.4)		
Married	88(43.6)	81(40.1)	33(16.3)		
Widowed	11(39.3)	10(35.7)	7(25.0)		
Divorced	4(44.4)	3(33.3)	2(22.2)		
Educational Level				19.478	0.003*
No formal education	8(33.3)	9(37.5)	7(29.2)		
Primary	21(39.6)	22(41.5)	10(18.9)		
Secondary	64(46.0)	53(38.1)	22(15.8)		
Tertiary	108(55.7)	67(34.5)	19(9.8)		
Monthly Income				13.942	0.030*
Less than ₦20,000	69(52.3)	47(35.6)	16(12.1)		
₦20,000-₦49,999	83(50.3)	63(38.2)	19(11.5)		
₦50,000-₦99,999	37(45.7)	29(35.8)	15(18.5)		
₦100,000 and above	12(37.5)	12(37.5)	8(25.0)		
Family History of CVD				12.752	0.013*
Yes	37(37.8)	43(43.9)	18(18.4)		
No	131(53.5)	84(34.3)	30(12.2)		
Not Sure	33(49.3)	24(35.8)	10(14.9)		
BMI(kg/m²)				241.397	<0.001*
Underweight(<18.5)	20(95.2)	1(4.8)	0(0.0)		
Normal(18.5-24.9)	128(83.7)	23(15.0)	2(1.3)		
Overweight(25.0-29.9)	52(31.1)	96(57.5)	19(11.4)		
Obese(≥30.0)	1(1.4)	31(44.9)	37(53.6)		
Blood Pressure Classification				36.219	<0.001*
Normal(<120/<80 mmHg)	96(60.4)	48(30.2)	15(9.4)		
Elevated(120-129/<80 mmHg)	48(51.6)	34(36.6)	11(11.8)		
Stage 1 HTN(130-139/80-89 mmHg)	43(40.6)	46(43.4)	17(16.0)		
Stage 2 HTN(≥140/≥90 mmHg)	14(26.9)	23(44.2)	15(28.8)		

Table 4.14 shows relationship between waist circumference risk categories over the different sociodemographic characteristics. Sex differences appear minimal and not statistically significant, though females show slightly higher rates of substantially increased risk (16.3%) compared to males (11.6%). Age, however, plays a significant role in waist circumference profiles, with normal measurements decreasing from

58.8% in the youngest age group to 26.7% in those above 60, while substantially increased risk rises from 8.5% to 26.7% across the same age range. Marital status exhibits significant association with waist circumference risk, mirroring the patterns observed with blood pressure. Single individuals demonstrate the highest percentage of normal waist measurements (57.3%) compared to married (43.6%), widowed (39.3%), and divorced (44.4%) participants. Education level similarly influences waist circumference, with tertiary-educated individuals showing the highest percentage of normal measurements (55.7%) and lowest substantially increased risk (9.8%) compared to those without formal education (33.3% normal, 29.2% substantially increased risk. Family history of cardiovascular disease also correlates significantly with waist circumference, as those reporting such history show lower normal measurements (37.8%) and higher substantially increased risk (18.4%) compared to those without family history (53.5% normal, 12.2% substantially increased risk). The relationship between BMI and waist circumference demonstrates an extremely strong association, with normal waist measurements decreasing from 95.2% in underweight individuals to just 1.4% in the obese category, while substantially increased risk rises from 0% to 53.6% across the same spectrum. Finally, blood pressure classification shows significant correlation with waist circumference risk, with normal blood pressure associated with higher percentages of normal waist measurements (60.4%) and lower substantially increased risk (9.4%), while Stage 2 hypertension correlates with lower normal measurements (26.9%) and higher substantially increased risk (28.8%), highlighting the interconnected nature of these

cardiovascular risk factors.

Table 4.4.8: Univariate and Multivariate Logistic Regression Analysis for Hypertension (Stages 1 and 2 Combined)

Variables	Univariate Analysis			Multivariate Analysis		
	COR	95% CI	p-value	AOR	95% CI	p-value
Sex						
Male	1.725	1.183-2.517	0.005*	1.619	1.050-2.497	0.029*
Female (Ref)	1.00	-	-	1.00	-	-
Age (years)						
18-30 (Ref)	1.00	-	-	1.00	-	-
31-40	3.243	2.060-5.103	<0.001*	2.504	1.513-4.143	<0.001*
41-50	6.984	4.157-11.733	<0.001*	5.442	3.108-9.532	<0.001*
51-60	9.152	4.694-17.845	<0.001*	7.605	3.807-15.185	<0.001*
Above 60	13.976	4.760-41.040	<0.001*	10.655	3.427-33.128	<0.001*
Marital Status						
Single (Ref)	1.00	-	-	1.00	-	-
Married	2.638	1.767-3.937	<0.001*	1.469	0.893-2.417	0.130
Widowed	3.877	1.963-7.658	<0.001*	1.866	0.848-4.107	0.121
Divorced	4.121	1.325-12.814	0.014*	2.065	0.510-8.363	0.309
Educational Level						
No formal education	3.367	1.551-7.308	0.002*	2.044	0.833-5.017	0.119
Primary	2.526	1.430-4.461	0.001*	1.806	0.947-3.442	0.073
Secondary	1.614	1.061-2.455	0.025*	1.476	0.935-2.330	0.095
Tertiary (Ref)	1.00	-	-	1.00	-	-

Monthly Income						
Less than ₦20,000 (Ref)	1.00	-	-	1.00	-	-
₦20,000-₦49,999	1.042	0.687-1.581	0.846	1.079	0.673-1.729	0.753
₦50,000-₦99,999	1.972	1.208-3.220	0.007*	1.713	0.982-2.987	0.058
₦100,000 and above	2.804	1.428-5.506	0.003*	2.113	0.969-4.607	0.060
Family History of CVD						
Yes	2.017	1.313-3.099	0.001*	1.824	1.125-2.957	0.015*
No (Ref)	1.00	-	-	1.00	-	-
Not Sure	1.217	0.736-2.013	0.444	1.078	0.607-1.914	0.798
BMI (kg/m²)						
Underweight (<18.5)	0.553	0.210-1.456	0.231	0.608	0.219-1.687	0.339
Normal (18.5-24.9) (Ref)	1.00	-	-	1.00	-	-
Overweight (25.0-29.9)	2.325	1.527-3.541	<0.001*	2.186	1.388-3.443	0.001*
Obese (≥30.0)	4.232	2.478-7.228	<0.001*	3.900	2.137-7.117	<0.001*

Note: Ref = Reference category; COR = Crude Odds Ratio; AOR = Adjusted Odds Ratio; CI = Confidence Interval; CVD = Cardiovascular Disease; Significant at $p<0.05$

Model fit: Cox & Snell $R^2 = 0.289$, Nagelkerke $R^2 = 0.387$, Hosmer-Lemeshow test $p = 0.618$

Table 4.15 shows the univariate and multivariate logistic regression analyses for hypertension reveal important patterns of association between sociodemographic

factors and hypertension risk. The multivariate model demonstrates good fit with the data (Hosmer-Lemeshow test $p = 0.618$) and explains between 28.9% and 38.7% of the variance in hypertension status. Sex remains a significant predictor in both univariate and multivariate analyses. Males have 72.5% higher odds of hypertension in univariate analysis (COR = 1.725, $p = 0.005$) and 61.9% higher odds after adjusting for other factors (AOR = 1.619, $p = 0.029$). Age demonstrates the strongest dose-response relationship with hypertension in both analyses. In the multivariate model, compared to those aged 18-30 years, individuals aged 31-40 years have 2.5 times higher odds of hypertension (AOR = 2.504, $p < 0.001$), while those above 60 years have over 10.6 times higher odds (AOR = 10.655, $p < 0.001$). Marital status shows significant associations in univariate analysis, with married, widowed, and divorced individuals having higher odds of hypertension compared to single individuals (COR ranging from 2.638 to 4.121, all $p < 0.05$). However, these associations lose statistical significance after adjusting for other factors in the multivariate model, suggesting that age and other variables may explain the relationship between marital status and hypertension. Educational level demonstrates a gradient effect in univariate analysis, with lower education associated with higher hypertension risk. Those with no formal education have 3.37 times higher odds compared to those with tertiary education (COR = 3.367, $p = 0.002$). However, like marital status, educational level loses significance in the multivariate model, though the trend of higher odds with lower education remains. Monthly income shows a significant association with hypertension in univariate analysis for higher income categories, with those earning ₦50,000-

₦99,999 and ₦100,000 and above having 1.97 and 2.80 times higher odds respectively compared to those earning less than ₦20,000 (p = 0.007 and p = 0.003). In the multivariate model, these associations approach but do not reach statistical significance (AOR = 1.713, p = 0.058; AOR = 2.113, p = 0.060). Family history of cardiovascular disease (CVD) remains a significant predictor in both analyses. Those reporting a family history of CVD have 2.02 times higher odds of hypertension in univariate analysis (COR = 2.017, p = 0.001) and 1.82 times higher odds in multivariate analysis (AOR = 1.824, p = 0.015) compared to those without a family history. Body Mass Index (BMI) shows one of the strongest associations with hypertension. In multivariate analysis, overweight individuals have 2.19 times higher odds (AOR = 2.186, p = 0.001) and obese individuals have 3.90 times higher odds of hypertension (AOR = 3.900, p < 0.001) compared to those with normal BMI. Underweight status is not significantly associated with hypertension risk.

Table 4.4.9: Univariate and Multivariate Logistic Regression Analysis for Increased Waist Circumference Risk (Increased and Substantially Increased Risk Combined)

Variables	Univariate Analysis			Multivariate Analysis		
	COR	95% CI	p-value	AOR	95% CI	p-value
Sex						
Male	0.663	0.456-0.963	0.031*	0.732	0.469-1.144	0.170
Female (Ref)	1.00	-	-	1.00	-	-
Age (years)						
18-30 (Ref)	1.00	-	-	1.00	-	-
31-40	1.403	0.877-2.245	0.158	1.149	0.694-1.902	0.589
41-50	2.165	1.279-3.666	0.004*	1.539	0.858-2.760	0.148
51-60	3.236	1.584-6.611	0.001*	2.358	1.109-5.011	0.026*
Above 60	3.913	1.259-12.163	0.019*	2.499	0.787-7.932	0.121

Marital Status						
Single (Ref)	1.00	-	-	1.00	-	-
Married	1.738	1.183-2.552	0.005*	1.242	0.749-2.060	0.400
Widowed	2.079	0.956-4.520	0.065	1.155	0.499-2.675	0.737
Divorced	1.685	0.445-6.385	0.442	1.002	0.239-4.196	0.998
Educational Level						
No formal education	2.515	1.045-6.052	0.040*	1.637	0.614-4.367	0.325
Primary	1.930	1.064-3.500	0.030*	1.349	0.697-2.609	0.375
Secondary	1.481	0.966-2.274	0.072	1.222	0.778-1.916	0.384
Tertiary (Ref)	1.00	-	-	1.00	-	-
Monthly Income						
Less than ₦20,000 (Ref)	1.00	-	-	1.00	-	-
₦20,000-₦49,999	1.085	0.703-1.674	0.710	1.034	0.643-1.662	0.891
₦50,000-₦99,999	1.304	0.777-2.186	0.314	1.176	0.668-2.071	0.575
₦100,000 and above	1.829	0.847-3.950	0.124	1.401	0.633-3.100	0.405
Family History of CVD						
Yes	1.892	1.187-3.018	0.007*	1.602	0.970-2.646	0.066
No (Ref)	1.00	-	-	1.00	-	-
Not Sure	1.182	0.697-2.004	0.537	0.951	0.541-1.673	0.862
BMI (kg/m²)						
Underweight (<18.5)	0.041	0.005-0.312	0.002*	0.045	0.005-0.373	0.004*
Normal (18.5-24.9) (Ref)	1.00	-	-	1.00	-	-
Overweight (25.0-29.9)	11.478	7.131-18.475	<0.001*	11.103	6.776-18.195	<0.001*
Obese (≥30.0)	272.00	63.96-1156.69	<0.001*	189.665	25.829-1392.697	<0.001*
Blood Pressure Classification						
Normal (<120/<80 mmHg) (Ref)	1.00	-	-	1.00	-	-
Elevated (120-129/<80 mmHg)	1.426	0.887-2.295	0.143	1.332	0.793-2.238	0.279
Stage 1 HTN (130-139/80-89 mmHg)	2.239	1.401-3.577	0.001*	1.680	1.000-2.824	0.050*
Stage 2 HTN	4.149	2.126-	<0.001*	2.408	1.182-	0.015*

(≥140/≥90 mmHg)	8.095	4.906

Note: Ref = Reference category; COR = Crude Odds Ratio; AOR = Adjusted Odds Ratio; CI = Confidence Interval; CVD = Cardiovascular Disease; HTN = Hypertension; Significant at p<0.05
Model fit: Cox & Snell R^2 = 0.457, Nagelkerke R^2 = 0.611, Hosmer-Lemeshow test p = 0.753

Table 4.16 shows the logistic regression model for increased waist circumference risk demonstrates excellent fit (Hosmer-Lemeshow test p = 0.753) and explains between 45.7% and 61.1% of the variance in waist circumference risk status. Sex shows a significant association in univariate analysis, with males having 33.7% lower odds of increased waist circumference risk compared to females (COR = 0.663, p = 0.031). However, this association is attenuated and becomes non-significant in the multivariate model (AOR = 0.732, p = 0.170). Age shows a strong gradient effect in univariate analysis, with increasing age associated with higher odds of increased waist circumference risk. However, in multivariate analysis, only the 51-60 age group maintains statistical significance, with 2.36 times higher odds compared to the 18-30 age group (AOR = 2.358, p = 0.026). Marital status is significantly associated with increased waist circumference risk in univariate analysis for married individuals (COR = 1.738, p = 0.005), but this association becomes non-significant in the multivariate model. Similarly, educational level shows significant associations in univariate analysis for lower education levels, but these associations are attenuated and become non-significant after adjustment for other factors. Family history of CVD approaches but does not reach statistical significance in the multivariate model (AOR = 1.602, p = 0.066), despite showing significance in univariate analysis (COR = 1.892, p = 0.007). BMI demonstrates the strongest association with waist circumference risk

in both univariate and multivariate analyses. Being underweight is significantly protective against increased waist circumference risk (AOR = 0.045, p = 0.004), while being overweight dramatically increases the odds (AOR = 11.103, p < 0.001). The association with obesity is particularly striking, with obese individuals having 189.7 times higher odds of increased waist circumference risk compared to those with normal BMI (AOR = 189.665, p < 0.001). Blood pressure classification also shows significant associations with increased waist circumference risk, particularly for Stage 1 hypertension (AOR = 1.680, p = 0.050) and Stage 2 hypertension (AOR = 2.408, p = 0.015) compared to normal blood pressure. This indicates a significant relationship between hypertension and central adiposity, even after adjusting for overall BMI and other factors.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter provides the discussion of findings in accordance to the stated objectives and hypothesis, implications for nursing, limitations, summary, conclusion, recommendation and suggestion for further studies.

5.2 Discussion of Findings

This study assessed behavioral lifestyle as a correlate of risk for cardiovascular disease among adult residents in Ekosodin community, Benin City, Nigeria. The discussion of findings is presented according to the study objectives.

5.2.1 Behavioral Lifestyle Practices Among Adult Residents

The findings of this study revealed that most respondents never engaged in smoking/tobacco use (65.1%) or alcohol consumption (44.6%). However, a considerable proportion sometimes engaged in sedentary lifestyle (32.0%), consumed high fat/sugar/salt diet (43.4%), skipped fruits and vegetables (34.6%), practiced late night eating/unhealthy snacking (37.8%), neglected weight monitoring (32.9%), experienced unmanaged stress (39.3%), had poor sleep habits (33.4%), and ignored preventive screenings (31.2%).

These findings align with the study by Akinbule et al. (2021), which found that only 4.9% of participants smoked, 40.9% consumed alcohol, and 65.5% engaged in physical activity. Additionally, the study reported that 90.3% of participants skipped meals, 65.9% consumed carbonated beverages more than twice a week, and 64.5% ate fried foods more than twice a week. Similarly, a study by Okafor et al. (2021) found that 60.4% of university staff consumed alcohol above recommended levels, which is higher than the findings of this study.

The relatively low prevalence of smoking and alcohol consumption in this study could be attributed to increasing awareness of their harmful effects on health. However, the high prevalence of sedentary lifestyle, unhealthy dietary practices, and stress are

concerning and could increase the risk of cardiovascular disease among adult residents in Ekosodin community.

Wu et al. (2023) emphasized that adopting multiple healthy lifestyle behaviors (LBs) is crucial for reducing cardiovascular disease (CVD) risks, with each additional healthy LB reducing CVD incidence by 17%, CVD mortality by 19%, and CVD recurrence and mortality by 27% in those with CVD. The findings of this study underscore the need for interventions targeting unhealthy lifestyle practices to reduce the risk of cardiovascular disease in the community.

5.2.2 Modifiable Physiological Risk Factors Among Adult Residents

The study found that 38.6% of respondents had normal blood pressure, while 22.7% had elevated blood pressure, and 38.6% had hypertension (Stage 1 or 2). Regarding BMI, 40.7% were overweight and 16.8% were obese. For waist circumference, 33.9% of males and 39.4% of females had increased risk, while 11.6% of males and 16.3% of females had substantially increased risk for cardiovascular disease.

These findings are comparable to those reported by Banigbe et al. (2020), who found a hypertension prevalence of 23.3% and prehypertension prevalence of 46.7% among men in North Central Nigeria. The study also found that hypertension risk increased with age and was linked to being overweight, obese, living in urban areas, and alcohol consumption.

Similarly, the study by Ehwarieme et al. (2024) found a prevalence of overweight and obesity of 19.37% among undergraduate students in Benin City, which is lower than the findings of this study. This difference could be attributed to the broader age range

of participants in this study compared to the student population in Ehwarieme et al.'s study.

The high prevalence of elevated blood pressure, overweight, obesity, and increased waist circumference among adult residents in Ekosodin community is concerning and highlights the need for interventions targeting these modifiable physiological risk factors. As demonstrated by Abubakr et al. (2024), individuals with a BMI of 27.5 kg/m^2 or higher had a significantly elevated risk of CVD, CHD, and stroke when compared to those with a BMI in the 21.0--22.9 kg/m^2 range. Similarly, Liu et al. (2025) found a significant positive correlation between waist-to-weight index (WWI) and coronary heart disease (CHD) prevalence.

Wan et al. (2021) emphasized that higher blood pressure genetically increases the risk of CVD: a 10 mm Hg rise in systolic BP was associated with a 32% higher risk of total CVD, while a 5 mm Hg rise in diastolic BP increased the risk by 20%. The relationship between BP and CVD was linear, suggesting that lowering BP at any level reduces cardiovascular risk.

5.2.3 Factors Influencing Behavioral Lifestyle Practices Among Adult Residents

The study identified the major factors influencing behavioral lifestyle practices among adult residents as work/daily schedule constraints (66.3%), lack of access to facilities (65.4%), convenience/lack of cooking time (59.3%), lack of public education (61.0%), and stress/emotional issues (54.2%).

These findings are consistent with several studies in the literature. Gao et al. (2024) found that prolonged occupational sitting was associated with a 16% higher risk of all-cause mortality and a 34% greater risk of CVD death compared to no sitters. The study emphasized the need to reduce workplace sitting to improve health outcomes.

Similarly, Kim et al. (2024) highlighted that food environments impact cardiovascular disease risk, with supercenters reducing CVD risk for non-Hispanic Black and Hispanic seniors, but not for non-Hispanic Whites. The study emphasized the need for policies that consider demographic and socio-economic differences when addressing food environments and CVD risk.

The findings of Herbert et al. (2023) on socio-economic determinants of healthy behaviors among primary schoolchildren and adolescents in Lokossa district of southern Benin also align with this study's findings. The study emphasized the importance of socio-economic factors in shaping children's health behaviors, which could influence their health behaviors as adults.

Rita et al. (2021) found that education, occupation, income, health perception, smoking, and alcohol consumption were significantly linked to health behaviors. Similarly, Jung et al. (2021) identified age, rehab knowledge, exercise habits, family

history, and living alone as key predictors of health behavior among patients with coronary artery disease.

5.2.4 Relationship Between Behavioral Lifestyle Practices and Modifiable Physiological Risk Factors

The study found significant associations between all behavioral lifestyle practices and blood pressure status, BMI status, and waist circumference status ($p<0.05$). This indicates that behavioral lifestyle practices significantly influence the modifiable physiological risk factors for cardiovascular disease among adult residents in Ekosodin community.

These findings are consistent with the study by Tzelefa et al. (2021), which found that diets high in whole grains and white meat, and low in sugar, were linked to better carotid artery compliance, while diets high in refined grains and processed meats were associated with higher blood pressure. The study concluded that healthy dietary patterns improve vascular health, while processed foods and saturated fats worsen blood pressure and arterial function.

Similarly, Lonnie et al. (2022) found that a decrease in the non-Healthy-Diet-Index (nHDI) linked to "sandwiches and convenience foods" was associated with lower fasting blood glucose, whereas declines in the pro-Healthy-Diet-Index (pHDI) related to certain food patterns led to increased adiposity. The "fast foods and stimulants" pattern showed no change in diet quality but worsened adiposity and blood pressure.

Zhong et al. (2021) found that participants with the highest intake of ultra-processed foods had a higher risk of cardiovascular mortality (HR = 1.50) and heart disease

mortality (HR = 1.68), but not cerebrovascular disease mortality (HR = 0.94), compared to those with the lowest intake. The risks were more significant in women.

The significant association between behavioral lifestyle practices and modifiable physiological risk factors underscores the importance of promoting healthy lifestyle behaviors to reduce the risk of cardiovascular disease in the community.

5.2.5 Relationship Between Socio-demographic Characteristics and Modifiable Physiological Risk Factors

The study found significant associations between all socio-demographic characteristics (sex, age, marital status, educational level, monthly income, and family history of CVD) and blood pressure status, BMI status, and waist circumference status ($p<0.05$). This indicates that socio-demographic characteristics significantly influence the modifiable physiological risk factors for cardiovascular disease among adult residents in Ekosodin community.

These findings align with the study by Yvonne et al. (2021), which found significant racial and socioeconomic disparities in hypertension: Black and Asian adults had higher rates of hypertension and stage 2 hypertension than White adults, with Black adults less likely to have controlled blood pressure. Lower education and lack of healthcare access were linked to worse outcomes.

Similarly, the study by Ehwarieme et al. (2024) found that females were more likely to be overweight or obese than males (OR = 2.14, p = 0.004, CI 1.32-3.46), students aged 21-25 had lower odds of being overweight or obese compared to those aged 15-20 (OR = 0.52, p = 0.010, CI 0.33-0.81), and married individuals were found to have

a higher likelihood of being overweight or obese compared to their single counterparts (OR = 2.94, p = 0.039, CI 0.78-11.78).

Zhang Y et al. (2021) found that adults from lower socio-economic status (SES) groups faced significantly higher risks of mortality and cardiovascular disease (CVD) compared to those from higher SES groups. Although unhealthy lifestyles accounted for only a small portion of SES-related health disparities, healthier lifestyles were linked to lower risks across all SES levels.

The significant association between socio-demographic characteristics and modifiable physiological risk factors highlights the need for targeted interventions considering socio-demographic factors to reduce the risk of cardiovascular disease in the community.

5.3 Implications for Nursing Practice

The findings of this study have several implications for nursing practice:

1. **Health Education and Promotion**: Nurses should intensify health education and promotion activities on healthy lifestyle practices to reduce the risk of cardiovascular disease in the community. This includes education on the importance of regular physical activity, healthy dietary habits, stress management, and regular health check-ups.
2. **Screening and Early Detection**: Nurses should conduct regular screening for modifiable physiological risk factors for cardiovascular disease such as blood pressure, BMI, and waist circumference, and provide early intervention for those at risk.

3. **Targeted Interventions**: Nurses should design and implement targeted interventions considering socio-demographic factors and the identified factors influencing behavioral lifestyle practices to effectively reduce the risk of cardiovascular disease in the community.

5.4 Limitations of the Study

This study had several limitations that should be considered when interpreting the findings:

1. **Cross-sectional Design**: The cross-sectional design of the study limits the ability to establish causal relationships between behavioral lifestyle practices and modifiable physiological risk factors for cardiovascular disease.
2. **Self-reported Data**: Some of the data were self-reported, which could be subject to recall bias and social desirability bias.
3. **Limited Variables**: The study focused on specific behavioral lifestyle practices and modifiable physiological risk factors, and may have missed other important factors that influence the risk of cardiovascular disease.

5.5 Summary of the Study

This study assessed behavioral lifestyle as a correlate of cardiovascular disease risk among adults in Benin City, using Ekosodin community as a case study. It was structured into five chapters. Chapter one introduced the global and local burden of CVDs and highlighted the need for prevention strategies, particularly in Nigerian communities. Chapter two reviewed relevant literature on behavioral risk factors like diet, physical activity, smoking, and alcohol use, supported by the Social Ecological

Model. Chapter three described the research methodology, including a cross-sectional design, systematic sampling , and ethical considerations. Chapter four analyzed data from 410 respondents using descriptive and inferential statistics to explore the relationship between lifestyle behaviors and physiological risk indicators such as BMI, blood pressure, and waist circumference. Chapter five concluded that there is a significant correlation between lifestyle practices and modifiable CVD risk factors, recommending targeted community interventions and further research to reduce the growing burden of CVD in urban Nigerian populations.

5.6 Conclusion

Based on the findings of this study, it is concluded that behavioral lifestyle practices significantly influence modifiable physiological risk factors for cardiovascular disease among adult residents in Ekosodin community, Benin City, Nigeria. The study revealed a high prevalence of unhealthy lifestyle practices such as sedentary lifestyle, unhealthy dietary habits, and stress, as well as a significant proportion of respondents with elevated blood pressure, overweight, obesity, and increased waist circumference. The major factors influencing behavioral lifestyle practices included work/daily schedule constraints, lack of access to facilities, convenience/lack of cooking time, lack of public education, and stress/emotional issues. Socio-demographic characteristics such as sex, age, marital status, educational level, monthly income, and family history of CVD were also found to significantly influence modifiable physiological risk factors for cardiovascular disease.

5.7 Recommendations

Based on the findings of this study, the following recommendations are made:

1. **Community-based Interventions**: Community-based interventions targeting unhealthy lifestyle practices should be designed and implemented to reduce the risk of cardiovascular disease in the community. These interventions should consider the identified factors influencing behavioral lifestyle practices.
2. **Public Education**: Public education on the importance of healthy lifestyle practices and regular health check-ups should be intensified through various media channels, community gatherings, and health facilities.
3. **Policy Formulation**: Policies promoting healthy lifestyle practices such as creating conducive environments for physical activity, regulating the marketing of unhealthy foods, and promoting work-life balance should be formulated and implemented.
4. **Regular Screening Programs**: Regular screening programs for modifiable physiological risk factors for cardiovascular disease should be conducted in the community, and early intervention should be provided for those at risk.

5.8 Suggestions for Further Studies

Based on the limitations of this study, the following suggestions are made for further studies:

1. **Longitudinal Studies**: Longitudinal studies should be conducted to establish causal relationships between behavioral lifestyle practices and modifiable physiological risk factors for cardiovascular disease.

2. **Multi-center Studies**: Multi-center studies involving multiple communities should be conducted to enhance the generalizability of findings.
3. **Comprehensive Assessment**: Comprehensive assessment of all potential risk factors for cardiovascular disease should be conducted to provide a more holistic understanding of the risk profile of the community.

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APPENDIX

DEPARTMENT OF NURSING SCIENCE
SCHOOL OF BASIC MEDICAL SCIENCES
COLLEGE OF MEDICAL SCIENCES
UNIVERSITY OF BENIN
BENIN CITY

Dear Respondent,

I am a 500-level student of the Department of Nursing Science, University of Benin, conducting a research study titled:

"Assessment of Behavioral Lifestyle as a Correlate of Risk for Cardiovascular Disease Among Adult Residents in a Selected Community in Benin City, Nigeria."

Kindly assist by ticking the options that apply to you, and feel free to provide suggestions where space is provided. Your responses will be treated with utmost confidentiality and are solely for academic purposes.

Thank you for your cooperation.

Yours faithfully,

INSTRUCTION: Tick [ ] the options you consider most appropriate.

SECTION A: SOCIO-DEMOGRAPHIC AND OTHER FACTORS

Sex: Male [ ] Female [ ]
Age: 18–30 [ ] 31–40 [ ] 41–50 [ ] 51–60 [ ] Above 60 [ ]
Marital Status: Single [ ] Married [ ] Widow/Widower [ ] Divorced [ ]
Educational Level: No formal education [ ] Primary [ ] Secondary [ ] Tertiary [ ]
Occupation: _____
Monthly Income: Less than ₦20,000 [ ] ₦20,000–₦49,999 [ ] ₦50,000–₦99,999 [ ] ₦100,000 and above [ ]
Do you have a family history of cardiovascular disease? Yes [ ] No [ ] Not Sure [ ]

SECTION B: BEHAVIORAL LIFESTYLE PRACTICES

This section will collect information about lifestyle behaviors related to cardiovascular health. Kindly tick the box that best represents your behavior or perception.

S/N	Behavioral Lifestyle Practices	Never [ ]	Rarely [ ]	Sometimes [ ]	Often [ ]	Always [ ]

1	I smoke or use tobacco products.
2	I engage in little or no physical activity (less than 3 times a week).
3	I sit or remain inactive for most of the day (sedentary lifestyle).
4	I eat meals that are high in fat, sugar, or salt.
5	I skip fruits and vegetables in my daily meals.
6	I consume alcoholic drinks more than three times a week.
7	I eat late at night or snack unhealthily before bedtime.
8	I check my blood pressure only when I feel unwell.
9	I ignore or delay medical advice when feeling symptoms related to heart health.
10	I neglect monitoring my weight and make no effort to maintain a healthy body size.
11	I experience stress and do not take steps to manage it.
12	I sleep fewer than 6 hours regularly or have poor sleep habits.
13	I ignore preventive health screenings (e.g., BP, blood sugar, BMI).

SECTION C: MODIFIABLE PHYSIOLOGICAL RISK FACTORS

This section aims to assess parameters for modifiable physiological risk factors for cardiovascular disease.

Blood pressure value:……
Weight:……

Height:……
Waist circumference:……

SECTION D: FACTORS INFLUENCING BEHAVIORAL LIFESTYLE PRACTICES

Instruction: Kindly indicate your level of agreement with the following statements.

S/N	Predisposing Factors	Strongly Agree [ ]	Agree [ ]	Neutral [ ]	Disagree [ ]	Strongly Disagree [ ]
1	I lack motivation to maintain a healthy lifestyle.					
2	Peer influence makes it difficult to avoid smoking or alcohol.					
3	I often eat unhealthy foods due to convenience or lack of cooking time.					
4	Stress or emotional issues lead me to unhealthy coping habits (e.g., overeating, smoking).					
5	I am not exposed to enough public education or campaigns on heart-healthy living.					
6	Cultural or family practices encourage high-fat or high-salt diets.					
7	I lack access to safe or affordable places for physical activity (e.g., parks, gyms).					
8	I believe I am too young or healthy to worry about cardiovascular disease.					
9	My work or daily schedule leaves no time for regular exercise.					
10	I do not have enough support from friends or family to maintain healthy habits.					

RELIABILITY TEST

RELIABILITY OF INSTRUMENT ON ASSESSMENT OF BEHAVIORAL LIFESTYLE AS A CORRELATE OF RISK FOR CARDIOVASCULAR DISEASE AMONG ADULT RESIDENTS IN SELECTED COMMUNITY IN BENIN CITY,NIGERIA.

Instrument Reliability

To ensure the reliability of the research instrument used in this study, a pilot study was conducted among 41 adults (10% of the sample size) in a neighboring community with similar characteristics to Ekosodin. The pilot study participants were not included in the main study. The reliability of the questionnaire was assessed using Cronbach's alpha coefficient, which measures the internal consistency of the instrument.The questionnaire was divided into three main sections:

- Section A: Socio-demographic characteristics
- Section B: Behavioral lifestyle practices (13 items)
- Section C: Factors influencing behavioral lifestyle practices (10 items)

Cronbach's Alpha Test Results

The Cronbach's alpha coefficient was calculated for sections B and C of the questionnaire, as these sections contained Likert-scale items that required reliability assessment.

Reliability Test Results

Section	**Number of Items**	**Cronbach's Alpha (α)**	**Interpretation**
Section B: Behavioral lifestyle practices	13	0.83	Good reliability
Section C: Factors influencing behavioral lifestyle practices	10	0.81	Good reliability
Overall questionnaire	23	0.82	Good reliability

Based on the results obtained, both sections of the questionnaire demonstrated good reliability with Cronbach's alpha coefficients of 0.83 and 0.81 respectively. The overall questionnaire also demonstrated good reliability with a Cronbach's alpha coefficient of 0.82, which exceeds the minimum acceptable value of 0.7 for research instruments.

Inter-Rater Reliability

For the measurement of physiological variables (blood pressure, weight, height, and waist circumference), inter-rater reliability was assessed. Two trained research

assistants independently measured these variables on 20 volunteers, and the intraclass correlation coefficient (ICC) was calculated.

Inter-Rater Reliability Results

Measurement	**Intraclass Correlation Coefficient (ICC)**	**Interpretation**
Blood Pressure (Systolic)	0.94	Excellent reliability
Blood Pressure (Diastolic)	0.91	Excellent reliability
Weight	0.98	Excellent reliability
Height	0.96	Excellent reliability
Waist Circumference	0.92	Excellent reliability

The ICC values for all physiological measurements were above 0.90, indicating excellent inter-rater reliability. This high level of agreement between raters ensured that the physiological measurements in the main study were reliable and consistent.

EDO STATE MINISTRY OF HEALTH
HEALTH RESEARCH ETHICS COMMITTEE

PROTOCOL NUMBER	**HA/737/25/D/09250982 (PLEASE QUOTE IN ALL ENQUIRIES)**
APPROVAL NUMBER	**HA/737/25/D/11030982**
TITLE OF RESEARCH PROPOSAL	**ASSESSMENT OF BEHAVIORAL LIFESTYLE AS A CORRELATE OF RISK FOR CARDIOVASCULAR DISEASE AMONG ADULT RESIDENTS IN SELECTED COMMUNITY IN BENIN CITY**
PRINCIPAL INVESTIGATOR (S)	**IGBOKWE JULIET CHIOMA**
DATE CONSIDERED	**3RD NOVEMBER, 2025.**
DECISION OF THE COMMITTEE	**APPROVED**

THIS APPROVAL DATES 03/11/2025 TO 03/11/2026. IF THERE IS A DELAY IN STARTING THE RESEARCH, PLEASE INFORM THE HREC EDO SMoH SO THAT THE DATES OF APPROVAL CAN BE ADJUSTED ACCORDINGLY

REMARK: Please kindly note that the HREC Edo SMoH seal authenticates this approval

DR (MRS) Omonyemen B. BELLO
(MBBS, MPH, FPHCM) *(CHAIRMAN)* **SIGNATURE & DATE**.....3/11/2025

SUPERVISOR(S) .....

.....

ATTESTATION BY INVESTIGATOR(S)

No participant accrual or activity related to this research may be conducted outside of the approval dates. All informed consent forms used in this study must carry the Edo SMoH HREC-assigned number and duration of your research. No changes are permitted in the research without prior approval of the Edo SMoH HREC except in circumstances outlined in the Code. The Edo SMoH HREC reserves the right to conduct compliance visits to your research site without previous notification.

Signature & Date.....

EDO STATE MINISTRY OF HEALTH SECRETARIAT DATE 3/11/2025 SIGN DATE 3/11/2025 RESEARCH & ETHICS COMMITTEE

edohrec@edostate.gov.ng

Room 16, Block D, 2nd floor, State secetariat building.