PREVALENCE AND CORRELATES OF CARDIOVASCULAR DISEASE RISK FACTORS AMONG JUNIOR NON-ACADEMIC STAFF IN THE UNIVERSITY OF BENIN

BY

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CERTIFICATION

This dissertation by Iwu Akachi Ann is accepted in its present form as satisfying the dissertation requirement of the degree of Bachelor of Physiotherapy of the School of Basic Medical Sciences, College of Medical Sciences of the University of Benin.

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DEDICATION

This dissertation is dedicated to God, my father, Mr. Victor A.B Iwu; my mother, Mrs. Caroline Nwayinma Iwu; my sister, Miss Victoria Iwu, and my brother, Mr Bismark Iwu, who made this work a reality.

ABSTRACTS

Background: Cardiovascular diseases (CVDs) remain a leading cause of morbidity and mortality globally, and their burden is increasing in developing countries like Nigeria due to lifestyle transitions. Junior non-academic staff face unique occupational risks like sedentary work and stress, yet a significant data gap exists regarding the prevalence and correlates of cardiovascular disease (CVD) risk factors among them.

Aim: This study investigated the prevalence and correlates of cardiovascular disease risk factors among junior non-academic staff in the University of Benin.

Methods: A descriptive cross-sectional design was used to collect data from junior non-academic staff through a structured and validated questionnaire assessing socio-demographics, behavioural risk factors, and physiological measures such as body mass index (BMI) and blood pressure. Data were analysed using descriptive statistics and inferential tests (Chi-square and independent t-tests/ANOVA) with a level of significance set at $p< 0.05$

Results: A total of 125 junior non-academic staff participated in the study, comprising 66 (52.8%) females and 59 (47.2%) males, aged 23 to 70 years; most were married 96 (76.8%). Most respondents, 112(89.6%) had a low risk of alcohol disorders, while 124(99.2%) did not smoke. 105 (84%) of respondents were hypertensive. Obesity was prevalent among 54 (43.2%) of respondents, while 52 (41.6%) reported low physical activity levels. There was no significant association between educational level ($p = 0.621$), income level ($p = 0.181$), and BMI, nor between age and CVD risk factors ($p > 0.05$). However, gender differences significantly influenced alcohol consumption ($p < 0.05$) and BMI, indicating a higher risk among male respondents.

Conclusion: It was concluded that junior non-academic staff of the University of Benin have high-level prevalence of CVD risk factors mostly obesity, hypertension, and physical inactivity, which are largely influenced by gender differences. There is an urgent need for workplace-based cardiovascular health education, regular medical screening, and gender-sensitive interventions to reduce future CVD burden among this group.

Keywords: Cardiovascular disease, Risk factors, Non-academic staff, Obesity, Physical inactivity

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CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The World Health Organization (WHO, 2021) defined Cardiovascular Diseases (CVDs) as a group of disorders of the heart and blood vessels. CVDs include coronary heart disease, cerebrovascular disease, rheumatic heart disease, and other conditions**.** And are the leading cause of death globally, causing, -an estimated 17.9 million deaths in 2019 alone, which represents 32% of all global deaths. Heart attacks and strokes account for more than four out of five deaths from CVDs, about of which one-third of these deaths happen prematurely among adults under the age of 70 years (World Health Organization, 2021).

In Africa, Non-Communicable Diseases (NCDs), particularly CVDs, are highly prevalent (Minja *et al.*, 2022). In addition to contributing to 22.9 million Disability-Adjusted Life Years (DALY) and 38.3% of fatalities associated with NCDs, CVDs have the highest burden among those under 30 years. Currently, the burden of CVDs has increased by about 50% in Africa (Ka *et al.*, 2024). Similarly, NCDs remains a leading cause of death, with an age-standardized rate of 567 deaths per 100,000 people in Nigeria. This figure has surpassed deaths from infectious diseases, maternal issues, new-born conditions, and malnutrition (Bollyky *et al.*, 2017).

Non-academic staff in universities are individuals who work in educational institutions but are primarily involved in administrative and support roles rather than teaching or research. Non-academic staff in a university include administrative staff,

secretariat staff, librarians, counsellors, maintenance staff (such as hostel porters and custodians), clerical staff, security officers, technicians, and information technology staff, among others. It is important to study this group as they are often overlooked. Also, their occupational characteristics, education, and income levels can predispose them to multiple risk factors of CVD, including sedentary lifestyles, obesity, and stress-related hypertension (Akintunde, Akintunde and Opadijo, 2015).

Several controllable behaviours and conditions significantly increase the risk of cardiovascular disease. These include hypertension, smoking, abdominal obesity, lipid abnormalities, diabetes, insufficient fruit and vegetable intake, and lack of exercise (The Global Cardiovascular Risk Consortium, 2023). Occupational demands, educational attainment, and income level have also been reported to correlate with health risks that could predispose to CVDs. For example, prolonged sedentary work by a security officer, coupled with affordable but unhealthy dietary choices due to income constraints and limited health awareness, increases his long-term cardiovascular disease risk (Stringhini *et al.*, 2010). Recent studies have also highlighted the importance of sleep duration and sleep quality to be linked to an increased risk for hypertension and metabolic syndrome (Dahlöf, 2010).

Furthermore, indices such as Socio-Economic Status (SES), which refers to the relative position an individual, a family, or a group holds within a societal hierarchy according to their access to or power over valued goods such as wealth or social recognition and privileges (McLoyd, 1998) have been linked to CVD incidents. Major component of SES include income, education, occupation, employment status and wealth as income and education alone do not fully define SES (Marrie, 2011).

While CVD is acknowledged as a significant and increasing health concern, the substantial role it plays in creating health disparities between rich and poor populations is often overlooked. Research in developing countries shows a strong link between low SES and higher CVD mortality. While once considered a "disease of affluence" (Panagiotakos et al., 2004), CVD now has a larger effect on lower SES groups due to unhealthy behaviours as well as systemic healthcare inequalities. Higher SES patients often access better hospitals and medications, while lower SES individuals face significant barriers, including limited rehabilitation services (Davari, Maracy & Khorasani, 2019). However, although these findings are robust, they are largely derived from broad national or regional data and may overlook the unique challenges of specific occupational groups, such as non-academic university staff. In Nigeria, these disparities are likely more severe due to underfunded and income-stratified health systems.

Given the rising burden of CVDs, the strong influence of socioeconomic factors on cardiovascular risk, and the unique occupational and lifestyle characteristics of non-academic staff, it is crucial to investigate the association between SES and CVD risk factors within this population at the University of Benin.

1.2 Statement of the Problem

The elevated prevalence of CVD risk factors among non-academic personnel in Nigerian universities is a significant public health concern. Multiple studies have highlighted the widespread incidence of hypertension, obesity, and physical inactivity within this group. For instance, a study conducted among non-academic

staff of the Federal Ministry of Agriculture in Abeokuta reported high rates of overweight and obesity (52%), pre-hypertension and hypertension (40%), and abdominal obesity risk (84%) (O *et al.*, 2023). Similarly, research by Anoshirike *et al.* (2019) identified poor dietary and lifestyle habits, alongside a high prevalence of overweight, obesity, and cardiovascular disease risk among staff at the University of Nigeria, Nsukka.

Non-academic staff within Nigerian universities constitute an understudied demographic concerning cardiovascular health. Individuals in positions such as hostel porters, receptionists, data entry personnel, administrators, and security officers frequently experience prolonged periods of physical inactivity. This sedentary nature of their administrative, maintenance, and clerical support duties directly exposes them to various CVD risk factors (Adedoyin *et al.*, 2018). Furthermore, disparities in educational attainment, job designation, and income level among non-academic personnel may also influence the prevalence and severity of CVD risk factors due to limited access to health services, health promotion programs, and medical screening (Dele-Ojo *et al.*, 2021).

Despite the growing concern about cardiovascular health in Nigeria, research has largely focused on the general population or academic professionals or both academic and non-academic staff, neglecting the distinct occupational exposures and vulnerabilities of non-academic university workers. This creates a significant gap in data-driven strategies aimed at preventing CVD among this group. In particular, no known study has comprehensively examined the prevalence and

correlates of cardiovascular disease risk factors among junior non-academic staff at the University of Benin. This study aims to fill this gap by assessing the prevalence and correlates of cardiovascular risk factors among junior non-academic staff at the University of Benin.

The following research questions were generated for this study:

i. What is the prevalence of cardiovascular disease risk factors among junior non-academic staff at the University of Benin?
ii. What is the association between age and cardiovascular disease risk factors, lifestyle behaviours, and body composition among junior non-academic staff at the University of Benin?
iii. What is the difference between gender and cardiovascular disease risk factors, lifestyle behaviours, and body composition among junior non-academic staff at the University of Benin?
iv. What is the association between educational level and cardiovascular disease risk factors, lifestyle behaviours, and body composition among junior non-academic staff at the University of Benin?
v. What is the association between income level and cardiovascular disease risk factors, lifestyle behaviours, and body composition among junior non-academic staff at the University of Benin?

1.3 Aim of study

To assess the prevalence of cardiovascular disease risk factors and examine the influence of demographic and socioeconomic factors (age, gender, educational level, and income level) among junior non-academic staff at the University of Benin.

1.3.1 Specific Objectives

i. To determine the prevalence of major cardiovascular disease risk factors (such as hypertension, obesity, smoking, physical inactivity, poor diet, and alcohol consumption) among junior non-academic staff at the University of Benin.

ii. To evaluate the association between age and cardiovascular disease risk factors, lifestyle behaviours, and body composition among junior non-academic staff.

iii. To determine the differences between gender and cardiovascular disease risk factors, lifestyle behaviours, and body composition among junior non-academic staff.

iv. To examine the association between educational level and cardiovascular disease risk factors, lifestyle behaviours, and body composition among junior non-academic staff.

v. To examine the association between income level and cardiovascular disease risk factors, lifestyle behaviours, and body composition among junior non-academic staff.

1.4 Hypotheses

1.4.1 Main hypotheses

i. There would be no significant association between age and cardiovascular risk factors, lifestyle, and body composition among junior non-academic staff at the University of Benin.

ii. There would be no significant difference between gender and cardiovascular risk factors, lifestyle, and body composition among junior non-academic staff at the University of Benin.

iii. There would be no significant association between educational level and cardiovascular risk factors, lifestyle, and body composition among junior non-academic staff at the University of Benin.

iv. There would be no significant association between income level and cardiovascular risk factors, lifestyle, and body composition among junior non-academic staff at the University of Benin.

1.4.2 Sub-hypotheses

i. There would be no significant association between age and the prevalence of cardiovascular disease risk factors (SBP) among junior non-academic staff at the University of Benin.

ii. There would be no significant association between age and the prevalence of cardiovascular disease risk factors (DBP) among junior non-academic staff at the University of Benin

iii. There would be no significant association between age and the Dietary habit (REAP-S) among junior non-academic staff at the University of Benin.

iv. There would be no significant association between age and the Alcohol disorder (AUDIT) among junior non-academic staff at the University of Benin.

v. There would be no significant association between age and the BMI among junior non-academic staff at the University of Benin.

vi. There would be no significant association between age and the Physical activity level among junior non-academic staff at the University of Benin.

vii. There would be no significant difference between gender and the SBP among junior non-academic staff at the University of Benin.

viii. There would be no significant difference between gender and the DBP among junior non-academic staff at the University of Benin.

ix. There would be no significant difference between gender and the Physical activity level among junior non-academic staff at the University of Benin.

x. There would be no significant difference between gender and the alcohol disorder (AUDIT) among junior non-academic staff at the University of Benin.

xi. There would be no significant difference between gender and the Dietary (REAP-S) among junior non-academic staff at the University of Benin.

xii. There would be no significant difference between gender and the BMI among junior non-academic staff at the University of Benin.

xiii. There would be no significant association between educational level and the BMI among junior non-academic staff at the University of Benin.

xiv. There would be no significant association between income level and the BMI among junior non-academic staff at the University of Benin.

xv. There would be no significant association between educational level and the physical activity level among junior non-academic staff at the University of Benin.

xvi. There would be no significant association between income level and the physical activity level among junior non-academic staff at the University of Benin.

xvii. There would be no significant difference in SBP between the educational level among junior non-academic staff at the University of Benin.

xviii. There would be no significant difference in DBP between the educational level among junior non-academic staff at the University of Benin.

xix. There would be no significant difference in SBP between the income level among junior non-academic staff at the University of Benin.

xx. There would be no significant difference in DBP between the income level among junior non-academic staff at the University of Benin

1.5 Significance of the study

I. **Enhancing Targeted Interventions:** Understanding the influence of both demographic and socioeconomic factors on cardiovascular disease risk factors among junior non-academic staff in the universities will support the development of targeted public health interventions. These may include

policies aimed at improving access to affordable healthcare services, promoting health education, and implementing employment incentives.

II. **Raising Awareness Among the Study Population:** The study aims to increase awareness among junior non-academic staff about how their socioeconomic characteristics, lifestyle choices, and health behaviours may contribute to the development of CVD. This awareness can empower individuals to adopt healthier lifestyles and seek timely medical care.

III. **Guiding Clinical Practice:** Findings from this study will provide clinicians with valuable insights into how socioeconomic and demographic background may affect patient health outcomes. This understanding can enhance clinical decision-making, improve patient-centred care, and inform strategies for patient education, especially in low-resource settings.

IV. **Identifying the most impactful determinant:** By determining which is most strongly associated with CVD risk factors, this study will guide the prioritization of preventive measures. Focused strategies can then be designed to address the most critical risk determinants within this population.

1.6 Scope of the study

This study was conducted among junior non-academic staff at the University of Benin, located in Benin City, Edo State, Nigeria. The study population comprised various categories of non-academic personnel, including security officers stationed at faculty entrances and hostel gates, hostel porters, administrative staff within faculties and departments, and cleaners. These individuals play essential support roles in the university system and represent a diverse range of socioeconomic backgrounds.

1.7 Limitations of the study

The limitation of this study include:

i. This study was carried out among junior non-academic staff in the University of Benin, Benin city, Edo state, South-South Nigeria, there should be caution in the application of the findings of this study to other staff categories and universities in other geographical regions.

ii. Data on lifestyle behaviors such as diet, alcohol consumption, smoking, and physical activity were based on self-reported information, which may be subject to recall bias and general reporting bias.

iii. There was no assessment of biochemical markers of cardiovascular risk (such as lipid profiles and blood glucose) due to logistical and financial constraints, which could have provided a more comprehensive picture of the participants' cardiovascular health.

1.8 Definition of terms

i. Cardiovascular diseases: Cardiovascular diseases are a group of disorders of the heart and blood vessels (World Health Organization, 2021).

ii. Cardiovascular disease risk factors: Cardiovascular disease risk factors are defined as characteristics, both modifiable and non-modifiable, that increase the risk of developing CVD (CDC, 2024). Here, they include obesity, hypertension, and physical inactivity.

iii. Socioeconomic status: refers to the relative position an individual, a family, or a group holds within a societal hierarchy according to their access to or power over valued goods such as wealth or social recognition and privileges (McLoyd, 1998). Here, it includes the income level, education level, and job cadres.

iv. Sex: Sex refers to "a person's biological characteristics, which is usually described as being either male or female" (Australian Bureau of Statistics, 2016).

1.9 Abbreviations

CDC- Centres for Disease Control and Prevention

CVD: Cardiovascular Disease

CVDs: Cardiovascular Diseases

NCDs- Non-Communicable Diseases

SES- Socioeconomic Status

GBD- Global Burden of Disease

DALYs- Disability-Adjusted Life Years

HDL- High Density Lipoprotein

LDL- Low Density Lipoprotein

BMI- Body Mass Index

LDL-c- Low Density Lipoprotein Cholesterol

HDL-c- High Density Lipoprotein Cholesterol

MACE- Major Adverse Cardiovascular Event

AUDIT- Alcohol Use Disorder Identification test

REAP-S - Rapid Eating Assessment for Participants - Shortened Version

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

With 20.5 million fatalities in 2021, cardiovascular diseases have remained the dominant cause of death around the world for more than 30 years, representing about one-third of global mortality (Megan Lindstrom *et al.*, 2022). Although high-income countries are seeing quicker reductions in their CVD death rates, over 80% of contemporary CVD-related fatalities occur in low- and middle-income countries. Central Asia and Central and Eastern Europe report the highest global death rates from the condition (Movsisyan *et al.*, 2020; Cesare *et al.*, 2024). Generally, women experience lower CVD mortality than men, but this trend is reversed in nearly 30% of countries across Sub-Saharan Africa (especially West African nations), the Middle East, and North Africa, where females have higher rates. This situation highlights the crucial requirement for greater investment in healthcare infrastructure, as there is a documented connection between CVD deaths and factors like health expenditure and patient out-of-pocket payments (Cesare *et al.*, 2024).

Hypertension is still the leading global contributor to CVD mortality, linked to approximately 10 million deaths in 2019. While factors like high blood pressure, physical inactivity, smoking, alcohol use, and diabetes are generally more prevalent in males, obesity is the only major CVD risk factor that is more common in females (Roth *et al.*, 2020). Given that each population faces unique cardiovascular disease (CVD) risk factors—whether it's the prevalence of tobacco and alcohol use, high sodium intake, greater exposure to air pollution, or lower levels of physical activity—it becomes crucial

for researchers and public health officials to study these specific risk factors prevalence's in different countries, regions and populations. This localized understanding is essential to inform targeted policy interventions and direct resources effectively, ultimately guiding cardiovascular health in the right direction for each population (Cesare *et al.*, 2024).

Prior research on CVD has largely overlooked non-academic university staff, focusing instead on the general population or academic personnel. This leaves a critical data gap regarding their distinct occupational risks and vulnerabilities, highlighting the need to specifically investigate this group to develop effective CVD prevention strategies. Furthermore, there is limited literature about SES as a correlate of cardiac disease risk elements among non-academic staff in universities, especially in Nigeria. Certain socioeconomic factors of this population can expose them to various risk factors of CVDs, thereby reducing productivity and quality of life.

2.2 The Cardiovascular System

The body's intricate transport system, known as the cardiovascular system, consists of the heart, acting as a pump, and its associated conduits (arteries, capillaries, and veins). The blood circulating through this system contains wastes, oxygen, nutrients, and immune/other specialized cells essential for supporting homeostasis and the basic performance of human cells and organs (Marieb and Hoehn, 2010; Noble, 2010). Circulation is maintained by a continuous system of blood vessels. Vessels that conduct blood away from the heart are called arteries, while those that bring blood back to the heart are called veins. The smallest vessels, called capillaries, deliver blood directly to

tissue cells and are where essential substances like nutrients, gases, and waste products are exchanged (Lilly, 2011).

2.2.1 The Heart

The heart is a pump composed of muscle tissue weighing from 250 to 350 grams that lies at an angle within the mediastinum. It lies posterior to the sternum and costal cartilages, with about two-thirds of its volume residing left of the midline, and its tip (apex) positioned against the superior surface of the diaphragm (Proschek and Vogl, 2015). The heart muscle receives its vital oxygen supply through the coronary arteries, which are essential for its continuous function. Once the oxygen has been utilized, the coronary veins then channel the deoxygenated blood back to the right atrium via the coronary sinus (Standring, 2020).

The heart wall is composed of three distinct layers (Standring, 2020): an outer layer (epicardium), a middle muscle layer (myocardium), and an inner smooth lining (endocardium). The bulk of the heart is the myocardium, which features specialized muscle cells that perform the essential function of pumping blood (Buddiga and Buddiga, 2025). Surrounding the heart and its major connecting blood vessels is the pericardium, a protective fibrous sac. This structure is double-layered, featuring an outer parietal layer and an inner visceral layer, separated by a fluid that provides lubrication. This fluid allows the heart to move and beat smoothly without friction (Buddiga and Buddiga, 2025).

The internal structure of the heart is partitioned into four compartments: the two atria (right and left) and the two ventricles (right and left). The thin-walled atria act as

collecting chambers for venous return. The thick-walled ventricles are the pumping chambers, designed for powerful expulsion of blood. The right atrium accepts deoxygenated blood from the systemic veins, and the left atrium receives oxygenated blood from the pulmonary veins (National Cancer Institute, 2025).

To maintain unidirectional blood flow, the heart is equipped with valves. These are categorized as atrioventricular (AV) valves (situated between the atria and ventricles) and semilunar valves (located where major arteries emerge from the ventricles). The tricuspid valve is the right AV valve, and the mitral (bicuspid) valve is the left AV valve. The pulmonary semilunar valve controls flow from the right ventricle into the pulmonary trunk, and the aortic semilunar valve controls flow from the left ventricle into the aorta. When the ventricles contract, AV valves seal to halt backflow to the atria. When the ventricles relax, semilunar valves close to impede blood from re-entering the ventricles (National Cancer Institute, 2025b).

The myocardium, is supplied with oxygenated blood by the right and left coronary arteries, which originate directly from the base of the aorta. Subsequently, deoxygenated blood is returned to the right atrium via the cardiac veins, chiefly through the large vein known as the coronary sinus (Standring, 2020).

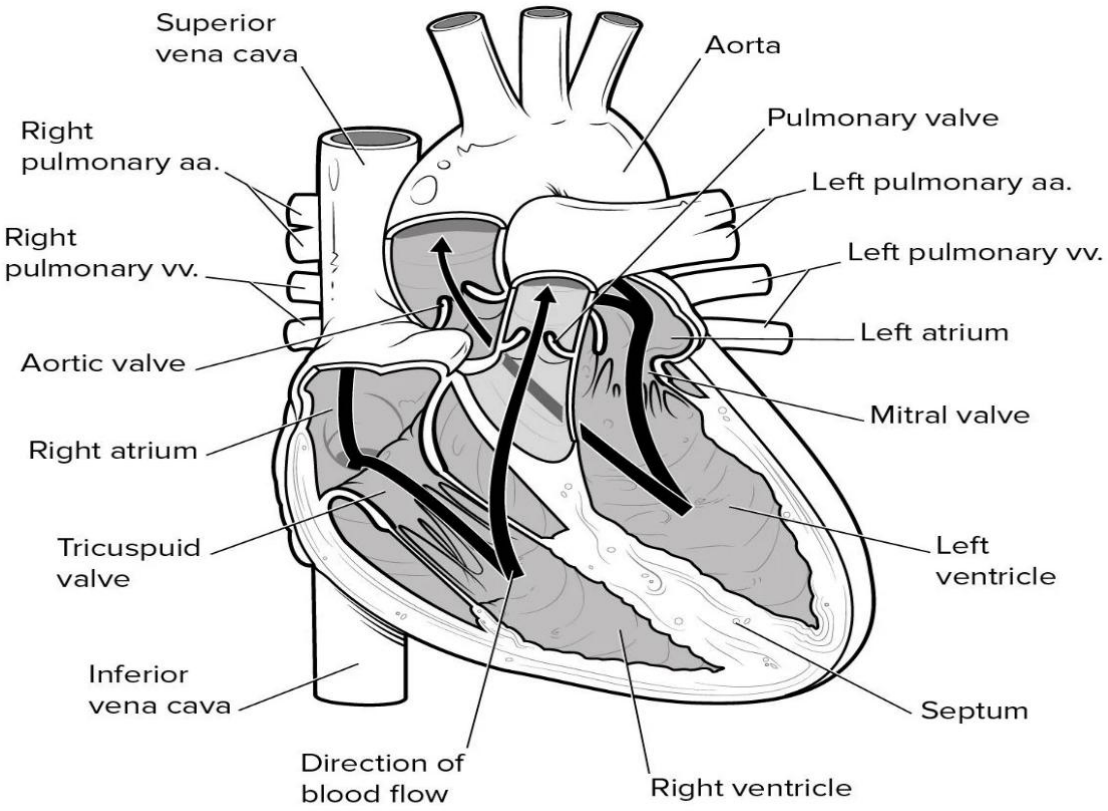

FIGURE 2.1 HEART ANATOMY

Source: https://emedicine.medscape.com/article/1948510-overview#showall

2.2.2 The Blood Vessels

Arteries, capillaries, and veins are the vessels that transport blood, categorized by their distinct structure and function. Together, they form two continuous , closed circulatory systems that connect with the heart: the pulmonary system, which shuttles blood from the right ventricle to the lungs and then to the left atrium; and the systemic system, which delivers blood from the left ventricle to all body tissues before it returns to the right atrium (National Cancer Institute, 2025a).

2.2.2.1 Arteries

The purpose of an artery is to transport blood out of the heart toward the organs and tissues. The vessel wall structure is tri-layered: the tunica intima (interna) is the innermost smooth lining; the tunica media is the large, muscular middle layer that modulates blood pressure and flow through changes in diameter; and the tunica externa (adventitia) is the outer connective tissue layer responsible for affixing the artery in place (National Cancer Institute, 2025a).

Pulmonary arteries are responsible for moving deoxygenated blood from the right ventricle toward the lungs, whereas systemic arteries distribute oxygenated blood from the left ventricle to the remainder of the body. Blood leaves the ventricles and first enters large, elastic arteries, which subsequently divide into smaller arteries, eventually becoming tiny arterioles. These arterioles are key in regulating the amount of blood that flows into the tissue capillaries (National Cancer Institute, 2025a).

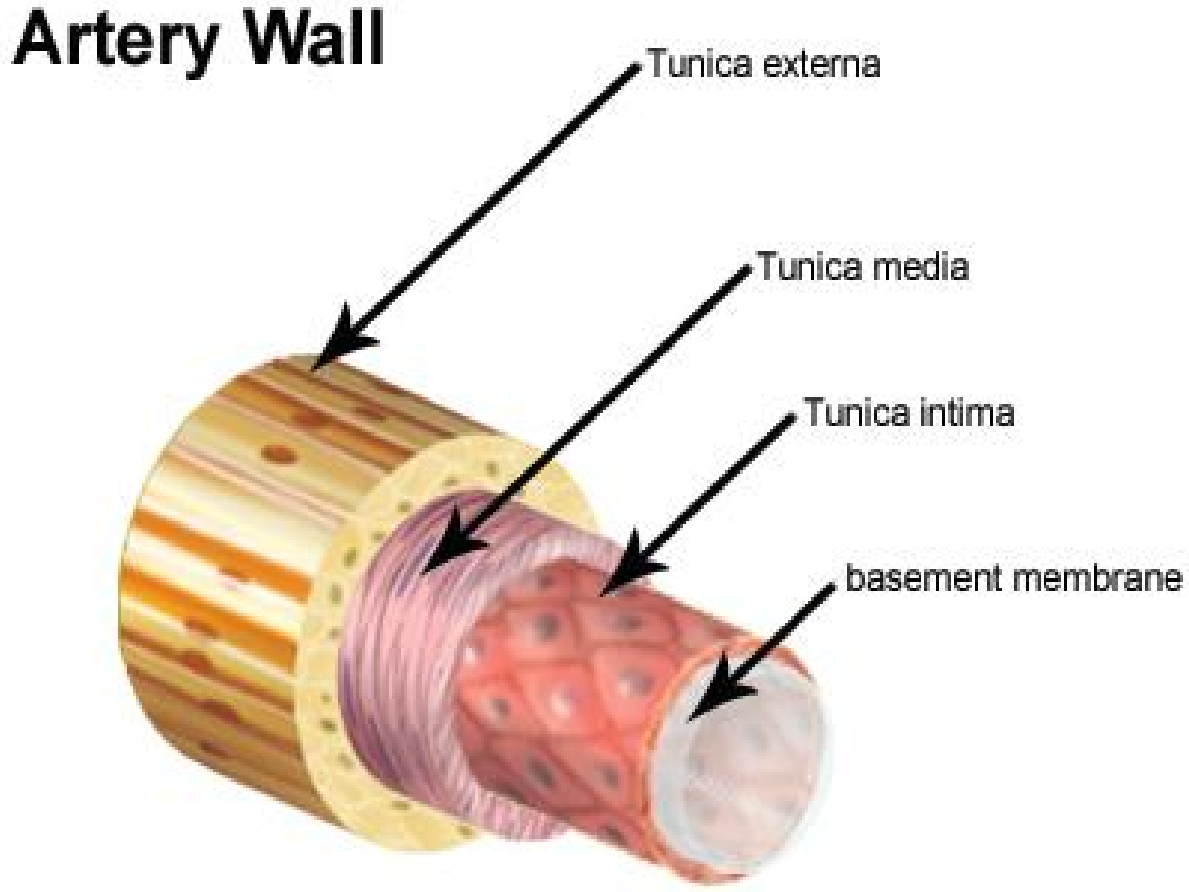

FIGURE 2.2 ARTERIAL WALL

Source:

https://training.seer.cancer.gov/anatomy/cardiovascular/blood/classification.html

Major arteries prone to cardiovascular disease include:

Coronary artery: The coronary arteries are the main vessels responsible for supplying the heart with blood. The two principal divisions, the right and left coronary arteries, originate at the root of the aorta and deliver essential oxygen to the myocardium, which enables it to contract and propel blood through the circulation (Chaudhry, Rahman and Law, 2025). These arteries further divide to supply specific regions like the atria, ventricles, and the SA/AV nodes. Narrowing of the coronary artery, often caused by the build-up of plaques (atherosclerosis), can result in a myocardial infarction (MI). When the oxygen and blood supply to the myocardium is inadequate for its demands, the consequence is the death of heart muscle cells (Chaudhry, Rahman and Law, 2025).

Internal Carotid artery: The Internal Carotid Artery (ICA) is an endpoint division of the common carotid artery that ensures the brain receives blood. After reaching the Circle of Willis, the ICA splits into the Middle Cerebral Artery (MCA), which irrigates the motor and sensory areas related to the face and upper limb, plus the Broca's and Wernicke's language centers, and the Anterior Cerebral Artery (ACA), which provides blood to the lower limb's motor and sensory cortices (Sethi, Gofur and Munakomi, 2025). Injury to the internal carotid artery or its branches, whether due to atherosclerosis (stenosis), an aneurysm, or blockages causing Transient ischemic attacks or strokes, directly compromises the brain's oxygen supply, often necessitating urgent monitoring and treatment (Sethi, Gofur and Munakomi, 2025).

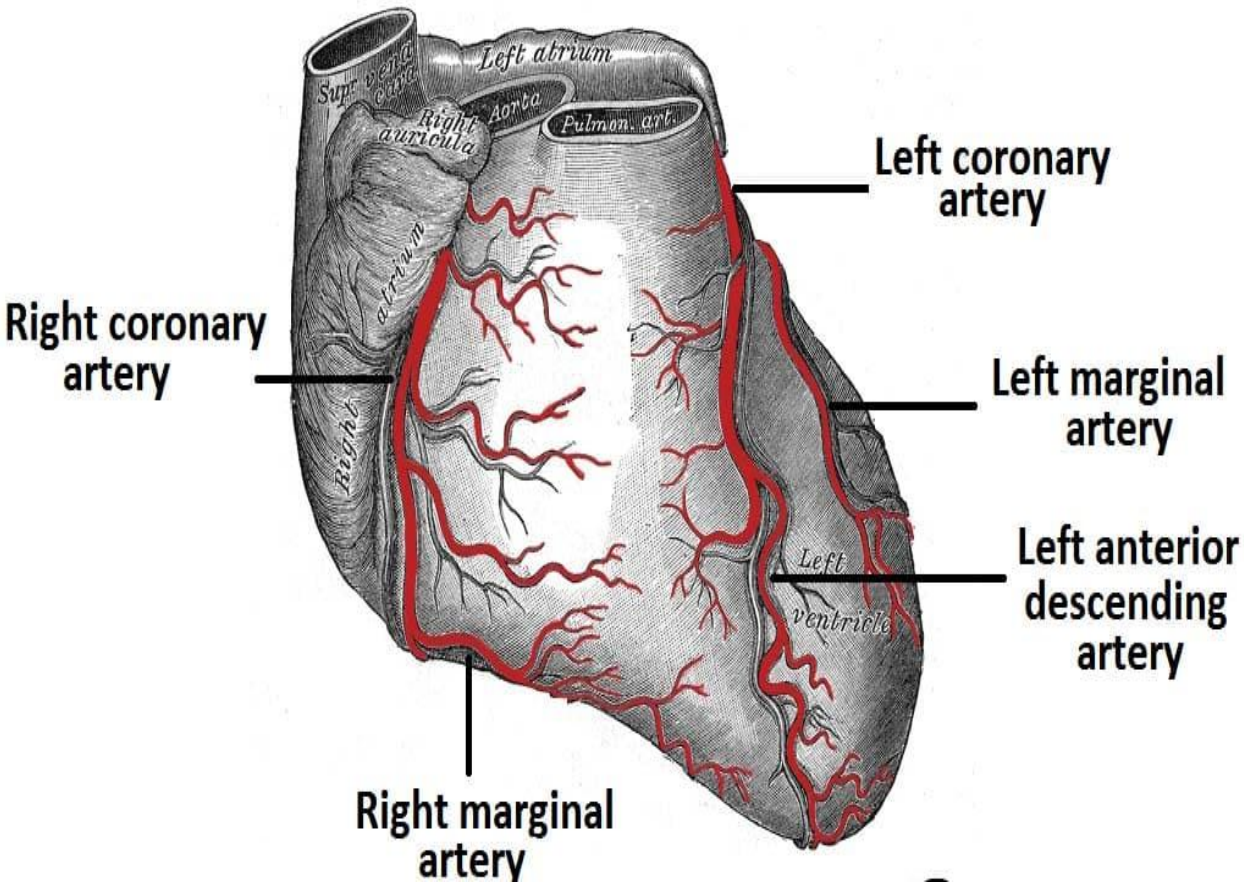

FIGURE 2.3: CORONARY ARTERIES

Source: https://teachmeanatomy.info/thorax/organs/heart/heart-vasculature/

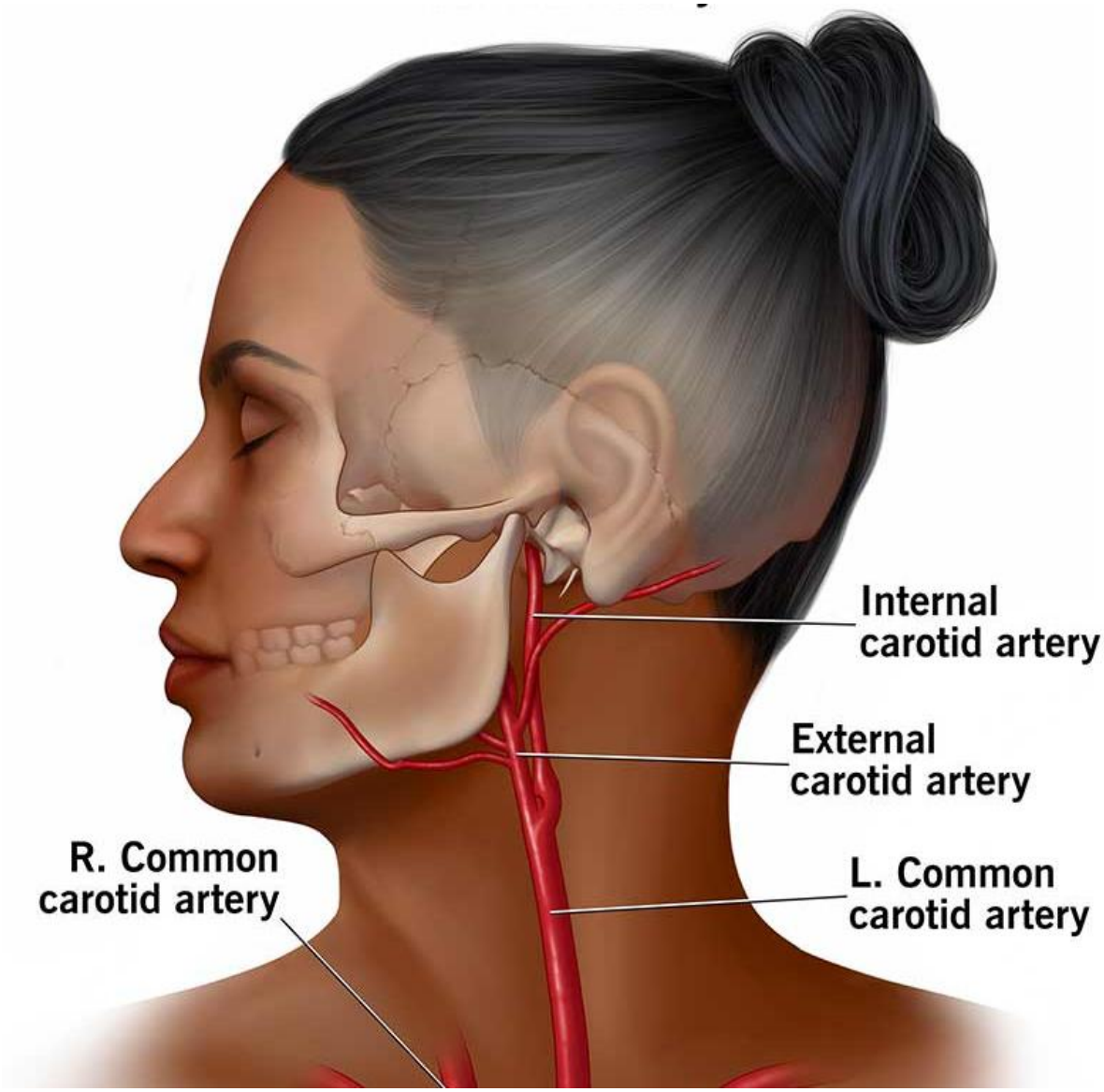

FIGURE 2.4: INTERNAL CAROTID ARTERY

Source: https://my.clevelandclinic.org/health/body/21492-carotid-artery

Capillaries

Capillaries, which are the smallest and most numerous blood vessels, serve as a connection between arteries and veins, primarily functioning to transfer vital materials between the blood and tissues (National Cancer Institute, 2025a).

The density of capillary networks varies depending on a tissue's metabolic activity; for instance, highly active tissues like skeletal muscle, liver, and kidneys have extensive capillary beds to meet their high demand for oxygen and nutrients, whereas less active tissues, such as some connective tissues, have fewer capillaries, and some tissues like the epidermis, lens, and cornea completely lack them (National Cancer Institute, 2025a).

Capillaries are classified into three types: continuous capillaries, the most common, found in tissues like muscles and skin, which have an uninterrupted lining for selective permeability; Porous (fenestrated) capillaries, located in sites with high exchange rates such as kidneys and endocrine glands, featuring pores for increased permeability; and sinusoidal capillaries, present in organs like the liver, spleen, and bone marrow, which possess larger pores allowing the passage of bigger molecules and cells (Standring, 2020).

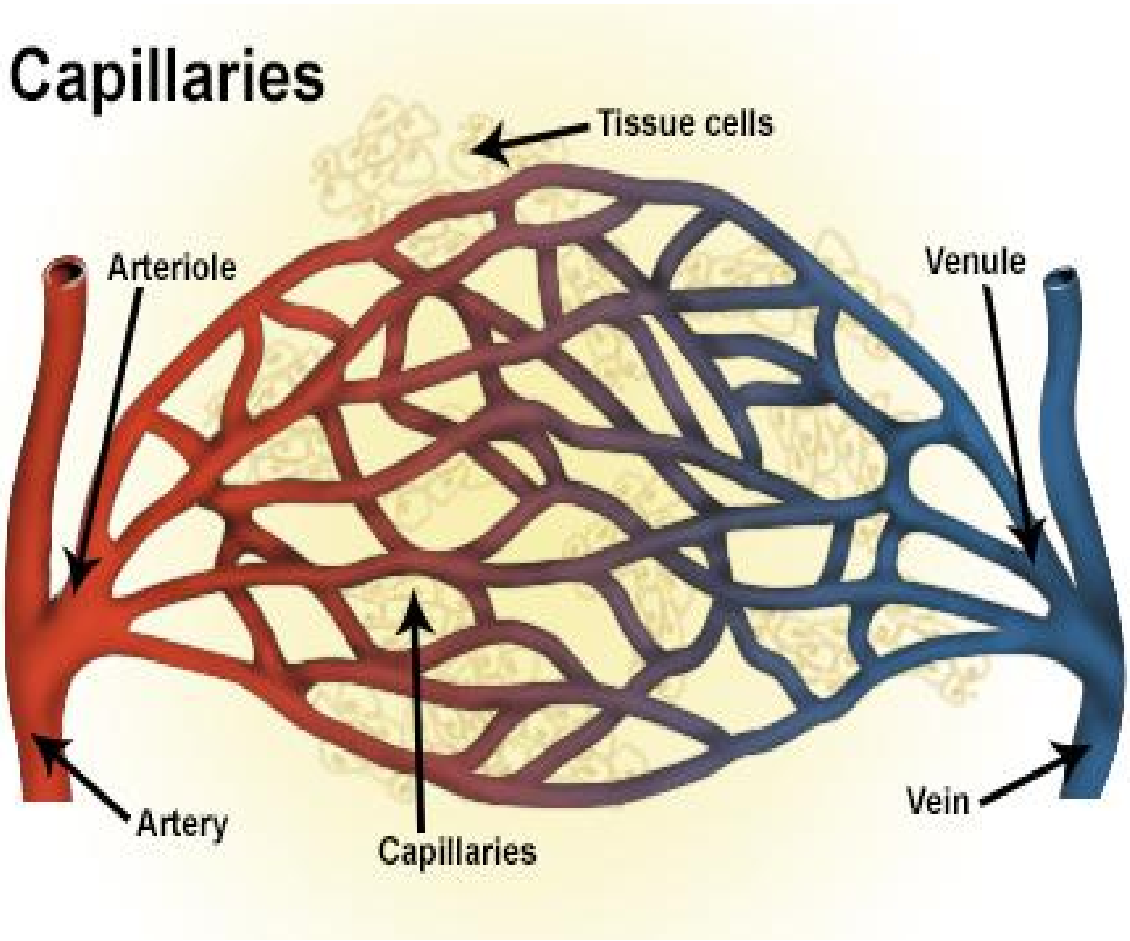

FIGURE 2.5: CAPILLARIES

Source:

https://training.seer.cancer.gov/anatomy/cardiovascular/blood/classification.html

Veins

Blood is returned to the heart by veins. Once blood has passed through the capillaries, it first enters small vessels called venules, which merge to form increasingly larger veins that finally connect to the heart. Pulmonary veins move oxygen-rich blood from the lungs to the left atrium, whereas systemic veins transport deoxygenated blood (after oxygen has been used for metabolism) from the tissues back to the right atrium (National Cancer Institute, 2025a).

Veins, like the arteries, also have three layers in their walls, but these layers contain less smooth muscle and connective tissue, making venous walls thinner and less rigid than arterial walls. This structural difference allows veins to accommodate a larger volume of blood, a capacity that is further aided by the lower blood pressure within veins compared to arteries. To ensure blood flows continuously towards the heart, particularly in the limbs against gravity, medium and large veins are equipped with venous valves, which function similarly to the heart's semilunar valves by preventing backflow (National Cancer Institute, 2025a).

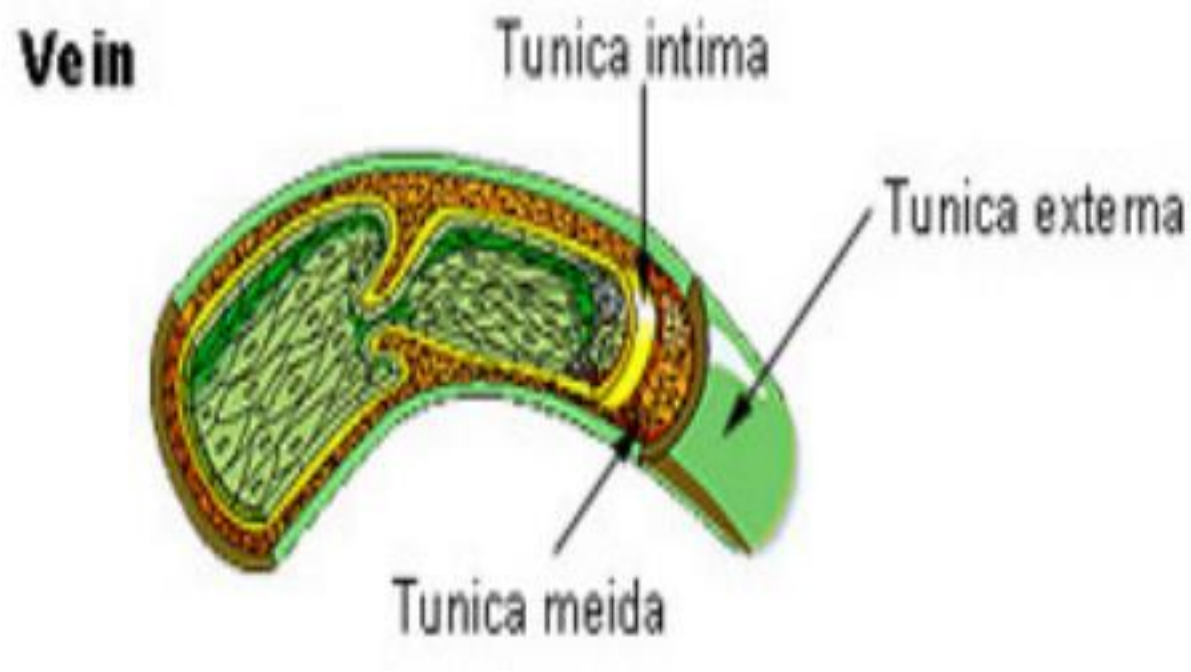

FIGURE 2.6: VEIN

Source:
https://training.seer.cancer.gov/anatomy/cardiovascular/blood/classification.html

2.2.3 Circulatory pathways

The blood vessels are organized into two separate circuits: the pulmonary circuit and the systemic circuit. The right ventricle of the heart powers the pulmonary circuit, which handles the circulation of blood through the lungs. In contrast, the left ventricle serves as the pump for the systemic circuit, which is responsible for supplying blood to the tissue cells across the entire body (National Cancer Institute, 2025a).

Pulmonary Circulation

The pulmonary circuit, on the right side of the heart, is dedicated to gas exchange. Deoxygenated blood returning from the body enters the right atrium via the superior vena cava, inferior vena cava, and coronary sinus. This blood then moves through the tricuspid valve into the right ventricle, and is subsequently ejected through the pulmonic valve into the pulmonary trunk. This trunk carries the oxygen-poor blood to the lungs for oxygenation. The now oxygen-rich blood then completes the circuit by returning to the left atrium via the pulmonary veins (Buddiga and Buddiga, 2025).

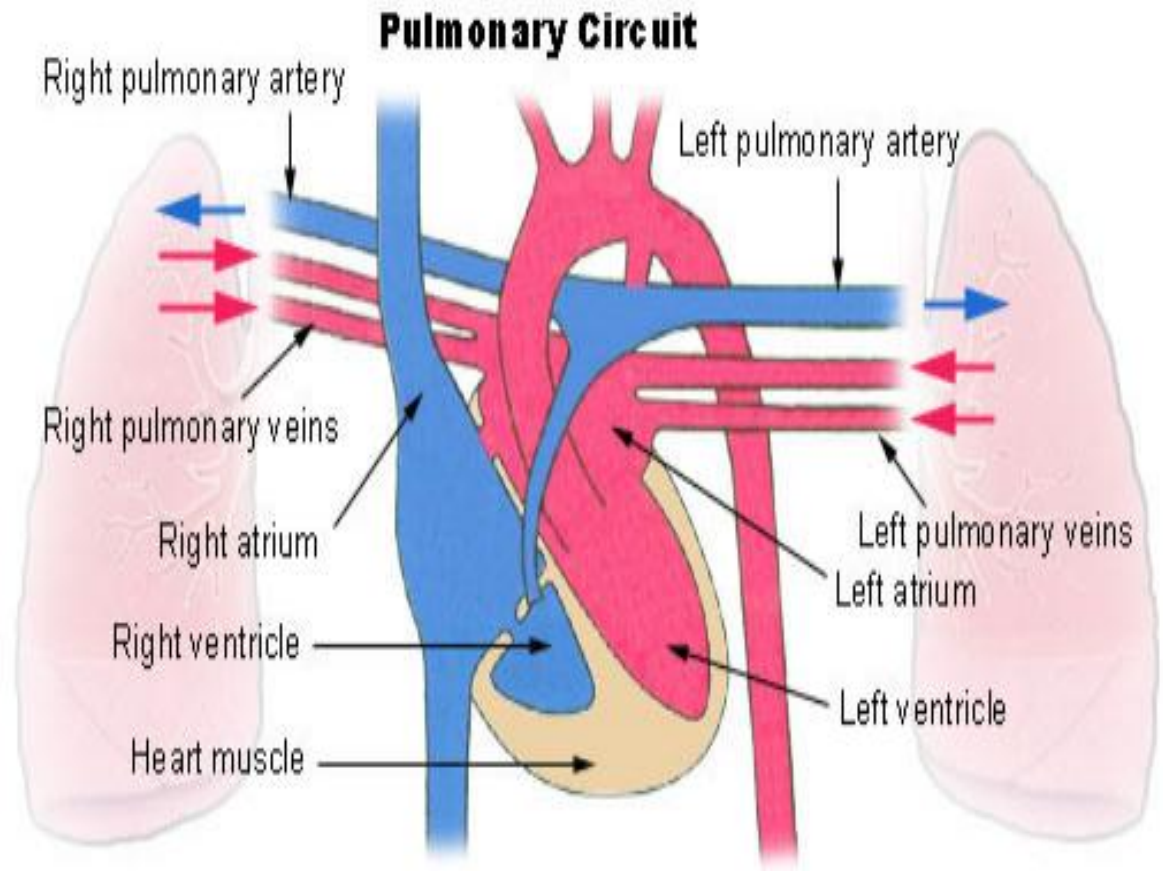

FIGURE 2.7: PULMONARY CIRCULATION

Source:

https://training.seer.cancer.gov/anatomy/cardiovascular/blood/pathways.html

Systemic Circulation

The systemic circulation serves a dual purpose: it conveys oxygen and essential materials to all cells throughout the body at the same time retrieving carbon dioxide and by-products of metabolism. This process initiates when oxygen rich blood is propelled out of the left ventricle and transmits via the arteries to the body's capillaries, where the actual exchange of materials takes place. Finally, deoxygenated blood returns from these tissue capillaries, which merge to form small veins called venules. These venules then combine to create progressively larger veins, eventually leading to either the superior vena cava or the inferior vena cava, both of which empty into the right atrium (National Cancer Institute, 2025a).

Every systemic artery branches, either directly or indirectly, from the aorta. The aorta originates at the left ventricle, curves initially to the back and left, and then continues downward through the chest and abdomen. This trajectory separates the aorta into three main parts: the ascending aorta, the aortic arch, and the descending aorta, which itself is subdivided into the thoracic aorta and the abdominal aorta.

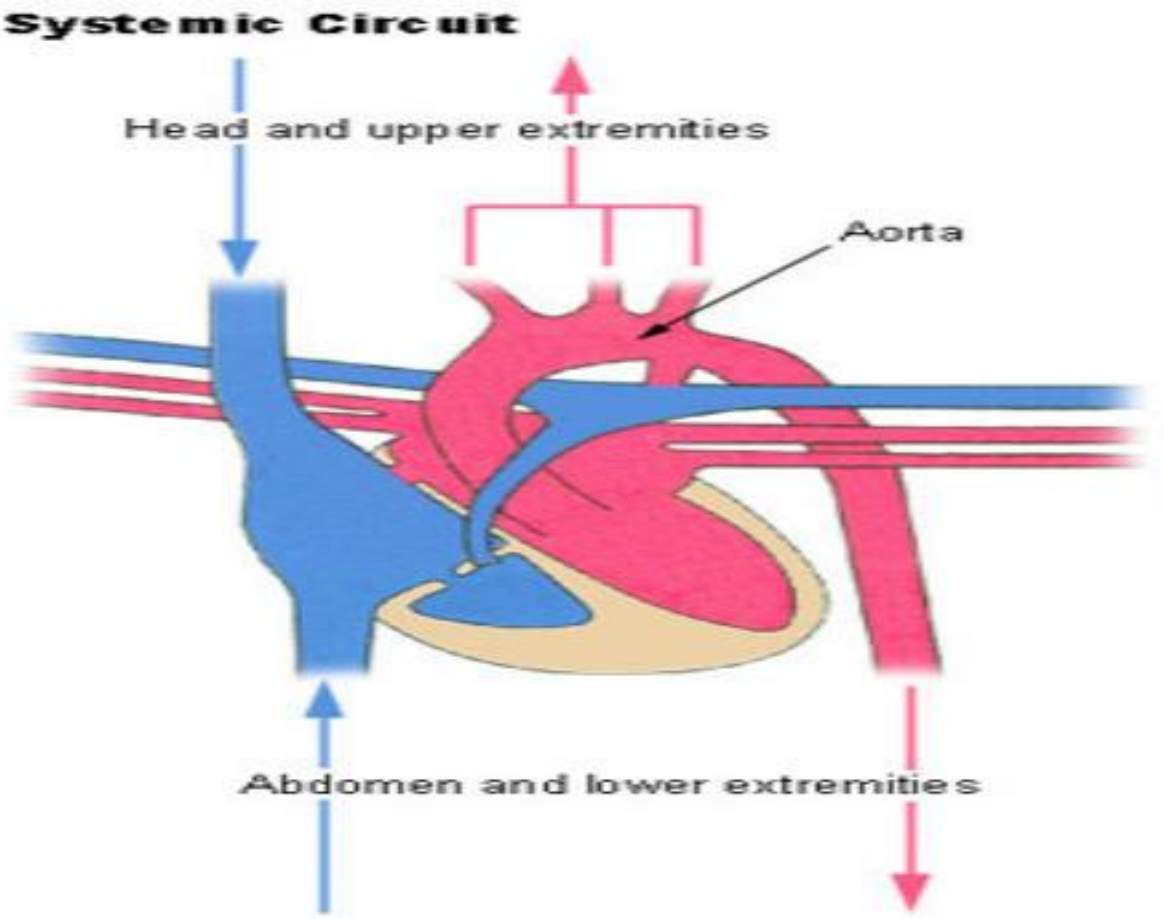

FIGURE 2.8: SYSTEMIC CIRCULATION

Source:

https://training.seer.cancer.gov/anatomy/cardiovascular/blood/pathways.html

2.3 Definition of cardiovascular disease

Cardiovascular diseases (CVDs) are a group of disorders of the heart and blood vessels (World Health Organization, 2021). According to the Heart Research Institute (2025), "CVD refers to all the diseases of the heart and circulation, including coronary heart disease, atrial fibrillation, heart attack, congenital heart disease, heart failure, and stroke".

2.3.1 Pathophysiology of Cardiovascular Diseases

Blood vessels get damaged from the accumulation of the consequences of a range of risk factors such as high blood pressure, smoking, high cholesterol, the aging process and so on. Damage to blood vessels primarily occurs in two ways: through atherosclerosis and aneurysms, and these conditions are either forms of cardiovascular disease themselves or can lead to other serious heart and blood vessel problems (Dattani, 2023).

Atherosclerosis is a condition where various materials, including fatty deposits and cholesterol, build up inside the walls of arteries. These arteries are the vessels in charge of conveying oxygenated blood from the heart to the organs. This build-up, called plaque, narrows the arteries, restricting blood flow and thus limiting the supply of blood to various organs (Dattani, 2023). Atherosclerosis is a complex process influenced by several factors, including dyslipidemia (abnormal lipid levels), inflammation, various immunologic phenomena, and endothelial dysfunction (impaired lining of blood vessels). These elements are believed to trigger the formation of the fatty streak, which is considered the fundamental precursor to the development of an atherosclerotic plaque. (Davies *et al.*, 1988). This progressive process can begin as early as childhood (McGill *et al.*, 2000). The process begins with the intima (innermost layer) thickening, followed by the gathering of lipid-filled macrophages (called foam cells) and extracellular matrix

material. Next, smooth muscle cells gather and multiply, resulting in the development of the atheroma plaque (Sata *et al.*, 2002). As these lesions continue to grow, apoptosis can occur in the deeper layers, prompting further recruitment of macrophages, which can then become calcified and evolve into atherosclerotic plaques (Stary *et al.*, 1995). Occasionally, this accumulated plaque can become unstable and detach from the blood vessel wall. This situation is hazardous because a detached fragment (of plaque) can circulate through the bloodstream and potentially become the focal point for a blood clot. If this resultant clot then lodges in a vessel of smaller diameter, it can impede blood flow to specific areas of the body. (Libby, 2021).

Aneurysms occur when blood vessel walls weaken, causing them to bulge outward and stretch thin. High blood pressure, atherosclerosis, injuries, and other risk factors can all contribute to the development of an aneurysm and in severe cases, an aneurysm can rupture or tear, leading to internal bleeding and reduced blood flow to organs, which can result in organ damage (Dattani, 2023).

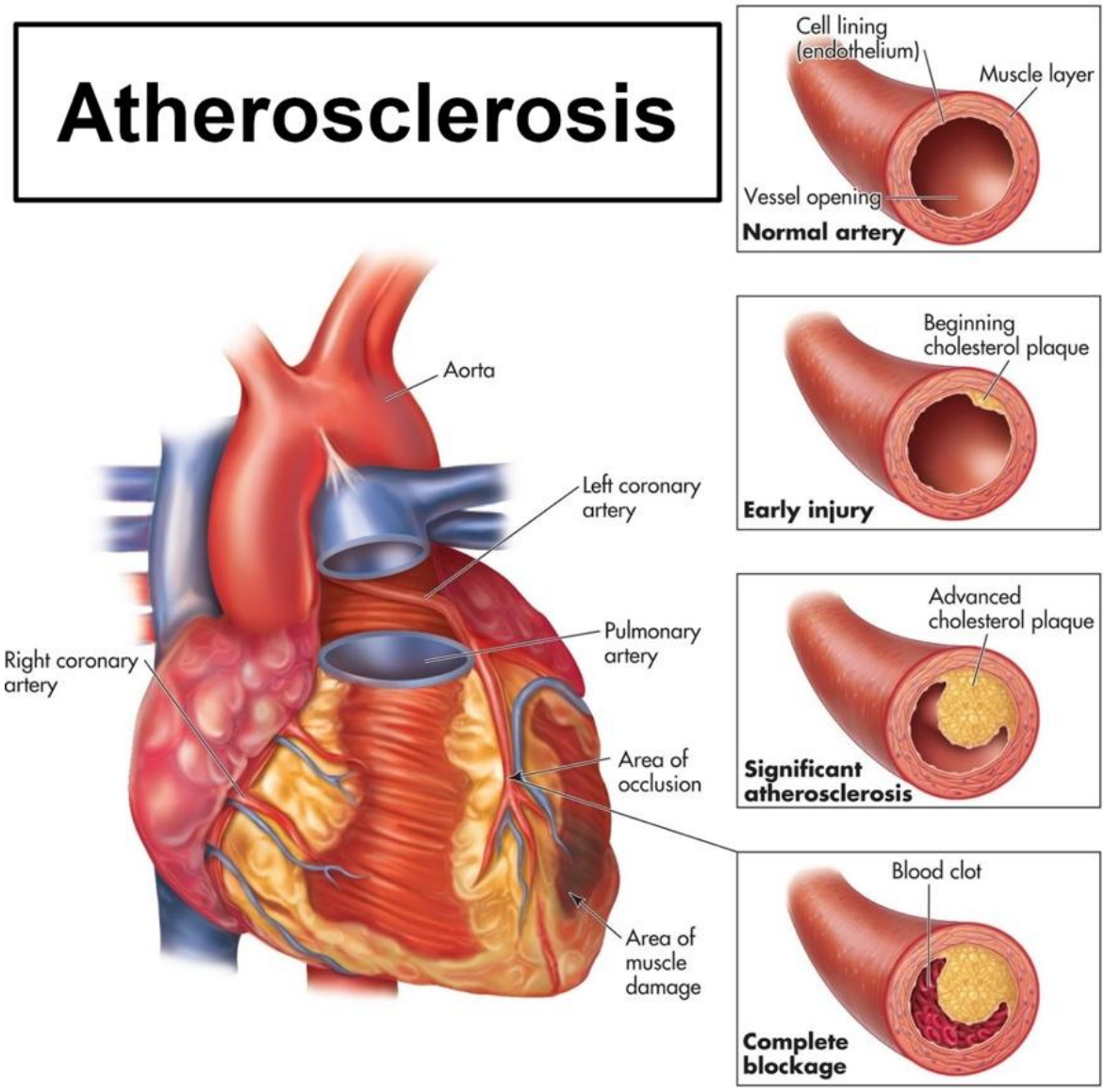

FIGURE 2.9: ATHEROSCLEROSIS

Source: https://healthjade.net/atherosclerosis/

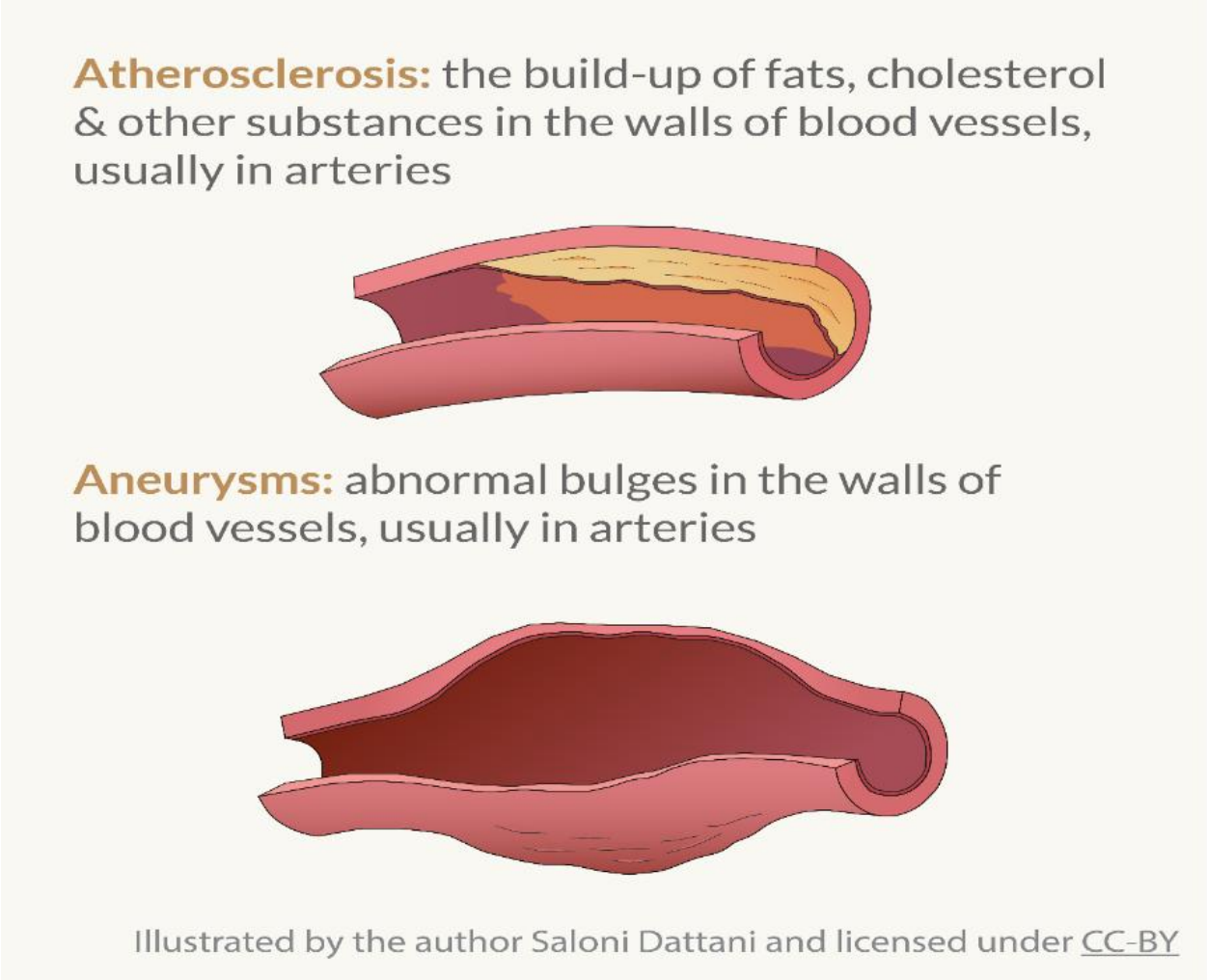

FIGURE 2.10: ATHEROSCLEROSIS AND ANEURYSMS

Source: https://ourworldindata.org/cardiovascular-diseases-types-and-death-tolls

2.3.2 Classification of Cardiovascular Diseases

Cardiovascular diseases, also known as heart disease, are often classified based on the specific part of the cardiovascular system they affect and refers to the following four entities: coronary artery disease (CAD) which is also referred to as coronary heart disease (CHD), cerebrovascular disease, peripheral artery disease (PAD), and aortic atherosclerosis (Olvera Lopez, Ballard and Jan, 2025).

2.3.2.1 Coronary Artery Disease

This situation arises when the blood vessels that supply the heart muscle become obstructed or narrowed, resulting in reduced myocardial perfusion (blood flow to the heart muscle). This decreased perfusion can lead to conditions such as angina, a myocardial infarction (MI), and/or heart failure, and it is responsible for roughly one-third to one-half of all cardiovascular disease (CVD) cases (Olvera Lopez, Ballard and Jan, 2025).

2.3.2.2 Peripheral artery disease

This is characterized by arterial occlusions that primarily affect the lower extremities. Clinical manifestations typically include intermittent claudication, presenting as dull or cramping leg pain exacerbated by ambulation and relieved by rest. Associated signs may include hair loss in the lower limbs, paraesthesia or weakness in the legs, and ulcerations of the feet and legs (National Health Service, 2017). The brain is a highly active organ that controls numerous bodily functions and demands a constant supply of oxygen and nutrients. Consequently, even a brief interruption of blood flow can impair cell function or lead to cell death, resulting in cognitive impairments (Dattani, 2023).

2.3.2.3 Cerebrovascular disease

This includes Stroke and Transient Ischaemic Attack (TIA) (Olvera Lopez, Ballard and Jan, 2025). A stroke occurs when blood supply to a part of the brain is interrupted, potentially leading to brain damage and even death, while TIA is a similar event, but the disruption of blood flow to the brain is only temporary (National Health Service, 2017).

2.3.2.4 Aortic Atherosclerosis

Aortic atherosclerosis is a type of general atherosclerosis characterized by the slow deposition of fats (cholesterol) and other lipids in the inner and middle layers of the aortic wall. This build-up initiates a secondary inflammatory response, followed by repeated layering of fibrous tissue, eventually causing erosions on the inner (luminal) surface. These erosions frequently result in the creation of mobile blood clots (thrombi) that project into the aortic channel (Saric and Kronzon, 2012). These aortic plaques are a significant origin point for two kinds of emboli: thromboemboli and atheroemboli (cholesterol crystal emboli). Thromboemboli are generally larger and often obstruct medium to large arteries, which can cause serious conditions such as strokes, transient ischemic attacks (TIAs), renal infarcts, and other forms of peripheral clotting. In contrast, atheroemboli are much smaller and usually obstruct small arteries and arterioles, potentially causing conditions such as "blue toe syndrome," new or worsening renal insufficiency, or gut ischemia (Saric and Kronzon, 2012). Aortic atherosclerosis is also associated with thoracic and abdominal aneurysms (Olvera Lopez, Ballard and Jan, 2025).

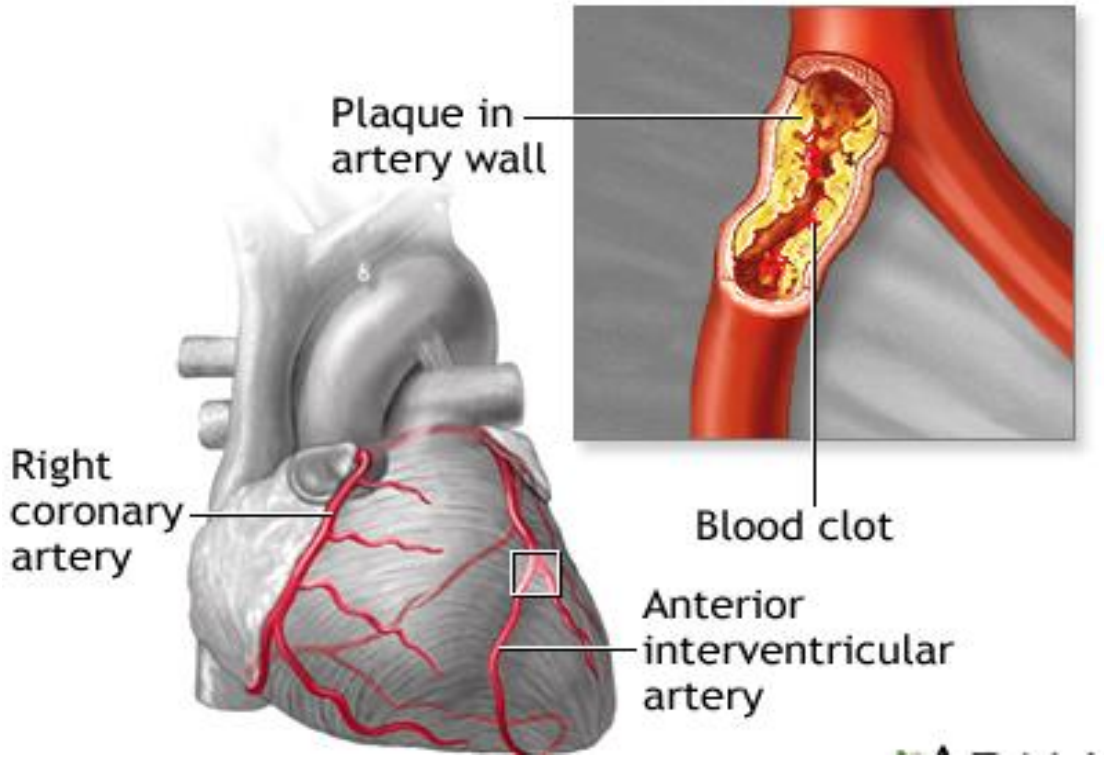

FIGURE 2.11: CORONARY ARTERY DISEASE

Source: https://medlineplus.gov/ency/article/007115.htm

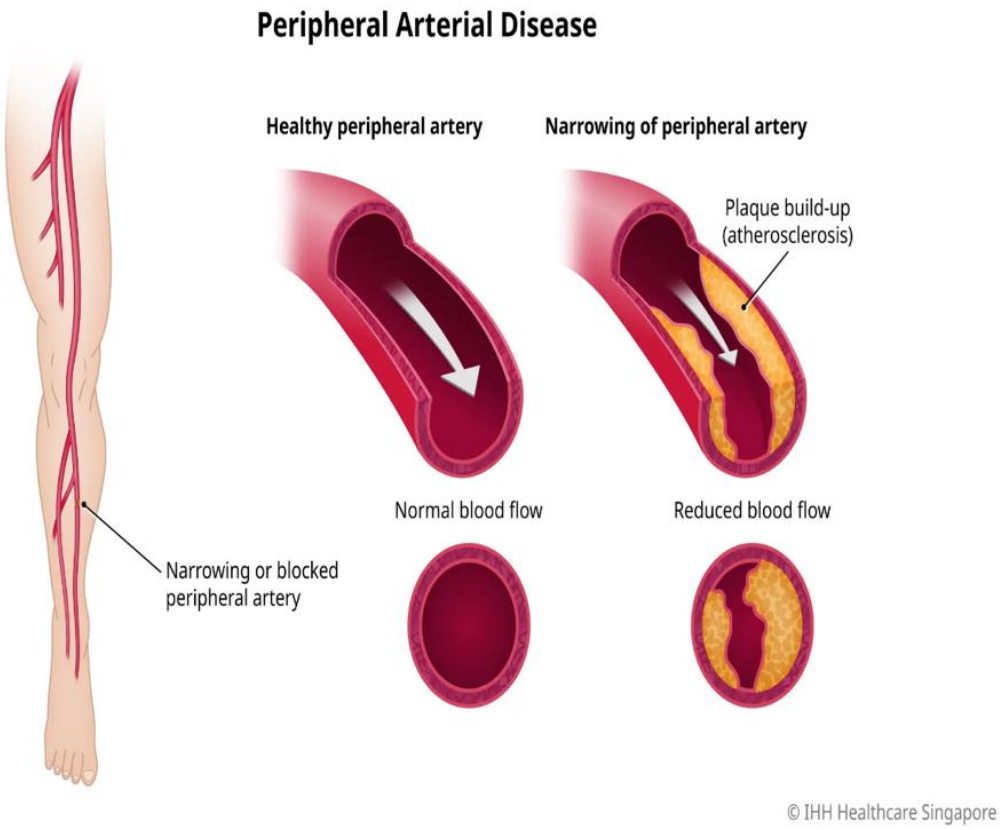

FIGURE 2.12: PERIPHERAL ARTERY DISEASE

Source: https://www.gleneagles.com.sg/conditions-diseases/peripheral-arterial-disease/symptoms-causes

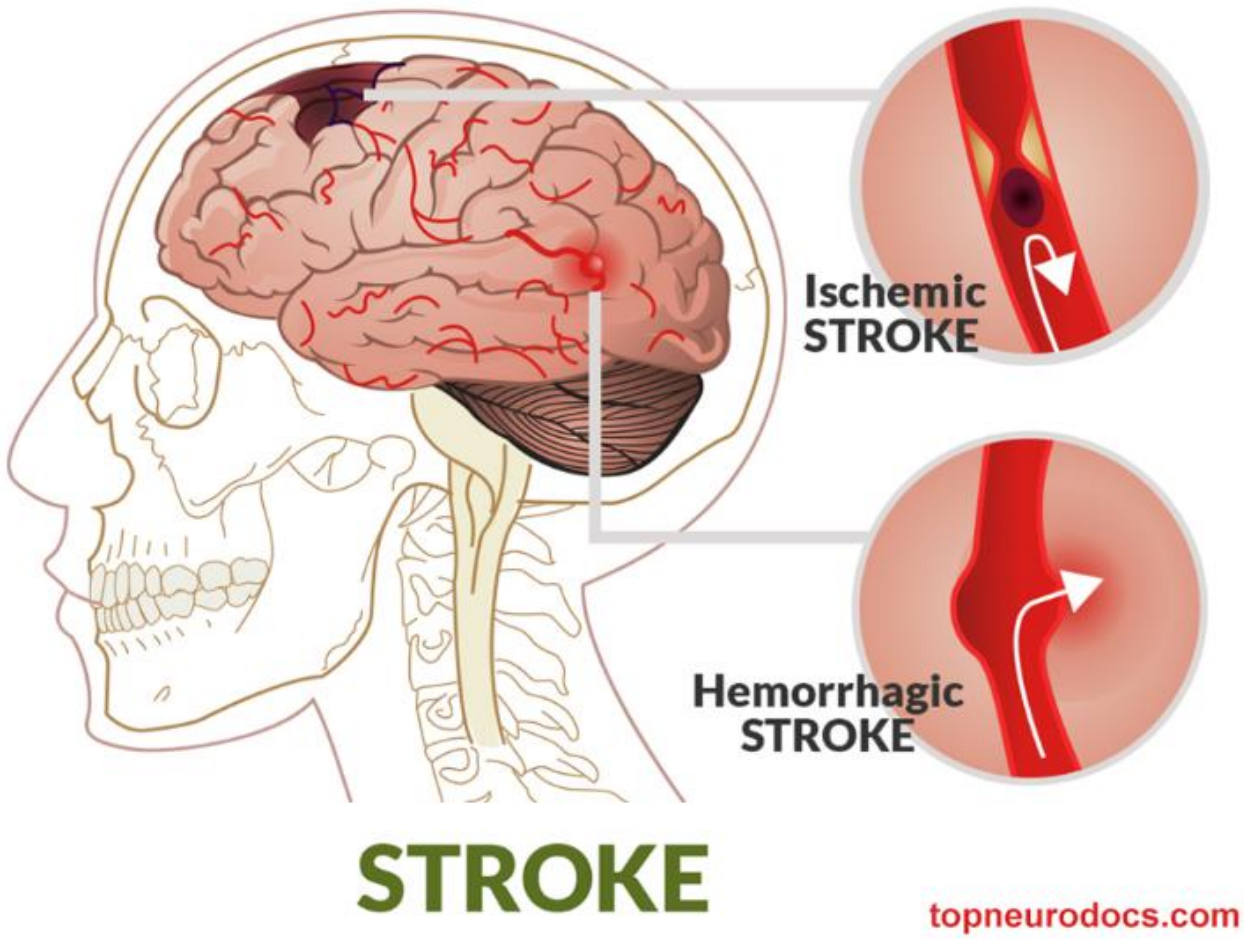

FIGURE 2.13: CEREBROVASCULAR DISEASE

Source: https://www.topneurodocs.com/stroke/

Other types of Cardiovascular diseases include:

i. **Hypertensive heart diseases** are conditions resulting from long-term high blood pressure, which places excessive strain on the heart. This sustained pressure causes structural changes in the heart, such as the thickening of its muscles, ultimately impairing its ability to effectively pump blood (Drazner, 2011). Estimated death rate from hypertensive heart diseases show that Africa and Asia generally experience significantly higher death rates from these conditions, largely due to fewer resources available for screening, prevention, and treatment (Dattani, 2023).

ii. **Cardiomyopathies** encompass a group of heart muscle abnormalities that cause the muscles to stretch, thicken, or become rigid, hindering the heart's normal function (Dattani, 2023). These are often genetically inherited but can also be triggered by factors like alcohol consumption (Burke *et al.*, 2016). Endocarditis and myocarditis are types of cardiomyopathies, and combined mortality rates from these conditions tend to be elevated in Russia, Eastern Europe, and Southern Africa (Dattani, 2023).

iii. **Rheumatic heart disease:** Untreated strep throat or scarlet fever, infections caused by Group A Streptococcus bacteria, can lead to rheumatic fever, which in turn may result in the development of rheumatic heart disease (RHD) (Marijon *et al.*, 2012). Rheumatic heart diseases affect children and young adults at a much higher rate than other forms of heart disease (Coffey *et al.*, 2021). Owing to factors like improved healthcare, greater access to antibiotics, and higher standards of living, these diseases' global prevalence has dropped significantly in

wealthy countries; however, they now mostly occur in developing nations (Dattani, 2023). Factors such as overcrowded living spaces, poor sanitation, and limited access to clean water, proper screening, and treatment in these regions contribute to the spread of Streptococcal infections while hindering prompt intervention and diagnosis (Woldu and Bloomfield, 2016).

iv. **Congenital heart diseases** are heart defects that exist at birth, occurring when the heart's structure develops improperly during foetal growth.(Bouma and Mulder, 2017).

2.4 Aetiology of Cardiovascular disease

CVD can arise from immediate causes, such as an embolus from atrial fibrillation causing an ischemic stroke, or rheumatic fever leading to damage to the heart valves. However, it's most important to concentrate on the risk factors associated with atherosclerosis because it is the central, shared mechanism responsible for the development of numerous types of CVD (Olvera Lopez, Ballard and Jan, 2025). The notable rise in CVD incidence observed in recent decades can be explained by the transition during economic industrialization from active jobs to more sedentary work. This change, combined with a technology- and consumption-focused culture, often requires longer working periods and commutes, thereby reducing the time available for leisure (Olvera Lopez, Ballard and Jan, 2025). The consequence of these modern habits is often inadequate physical activity and eating patterns characterized by high amounts of sugars, saturated fats, and calories. These elements fuel atherosclerosis and associated metabolic conditions, including hypertension, metabolic syndrome, and diabetes, often diagnosed in those with CVD (Fox, 2004; Benjamin *et al.*, 2018).

The global INTERHEART study, encompassing 52 countries, concluded that nine risk factors that can be altered account for 90% of an individual's risk of experiencing a first heart attack. These include smoking, dyslipidemia, hypertension, diabetes, abdominal obesity, psychosocial factors, insufficient fruit/vegetable intake, irregular consumption of alcohol, and physical inactivity. Smoking alone was responsible for contributing to 36% of the total myocardial infarction (MI) risk across the study population (Yusuf *et al.*, 2004). These results have been adopted by the American Heart Association (AHA) into their health promotion initiatives, which emphasize seven crucial guidelines for lowering cardiovascular disease risk: abstaining from smoking, regular physical activity, maintaining a healthy diet, and keeping blood pressure, body weight, blood glucose, and cholesterol levels within a normal range (Dm *et al.*, 2010; Greenland *et al.*, 2010).

Non-modifiable factors like family history, age, and gender also impact CVD risk. A family history of premature atherosclerotic disease (CVD or CVD-related death in a first-degree male relative under 55 or female under 65) is an independent risk factor (Goff *et al.*, 2014). Additionally, evidence suggests CVD risk factors may have varying effects based on gender (Fox, 2004).

2.5 Epidemiology of Cardiovascular Disease

CVD remain the top global cause of death, significantly contributing to worldwide mortality and disability. In 2021, CVDs were linked to 20.5 million deaths, which accounted for roughly one-third of all fatalities globally (Megan Lindstrom *et al.*, 2022). CVD deaths contribute substantially to early NCD mortality. Ischemic heart disease, in

particular, stands out as the main cause of premature fatality for men across 146 countries and for women across 98 countries (Bennett *et al.*, 2020).

In Sub-Saharan Africa, approximately 50% of cases of CVDs arise from non-atherosclerotic aetiologies. Despite limitations in data availability and quality, the Global Burden of Disease (GBD) 2010 Study provided pivotal figures of CVD-related death and illness for the region in 1990 and 2010. In 2010, stroke emerged as the predominant cause of CVD-related mortality and disability, while atrial fibrillation and peripheral arterial disease demonstrated the most significant relative increases in burden over the two decades. CVDs accounted for 8.8% of total mortality and 3.5% of DALYs, representing a substantially lower burden compared to high-income countries. Notably, the region exhibits a unique epidemiological pattern characterized by premature CVD mortality, with deaths occurring at comparatively younger ages (Morgan and Andrew, 2013).

NCDs are a significant public health concern in Nigeria, causing roughly 30% of all deaths (Bollyky *et al.*, 2017). Among Nigerians aged 30 to 69, there's a substantial 22% risk of premature death from major NCDs like CVDs, cancers, chronic respiratory diseases, and diabetes (World Health Organization, 2018). With an age-standardized mortality rate of 567 per 100,000, NCDs surpassed communicable, maternal, neonatal, and nutritional diseases to become the leading cause of death in Nigeria in 2019 (Bollyky *et al.*, 2017). Specifically, CVDs are a major contributor, accounting for approximately 10% of all deaths and 3.8% of DALYs in Nigeria. This highlights the growing burden of CVDs on the nation's health (Murray *et al.*, 2020).

TABLE 2. 1 AGE-STANDARDIZED AND ALL-AGE DALY PERCENTAGE CHANGE FROM 1990 TO 2017 FROM CVA IN SUB-SAHARAN AFRICA (GBD). (MINJA *ET AL.*, 2022)

Cardiovascular Disease	Percentage increase in Change (1990 -2017)
Rheumatic heart disease	6.5%
Ischemic heart disease	71.4%
Stroke	37.7%
Hypertensive heart disease	51.1%
Non-rheumatic valvular heart disease	38.9%
Cardiomyopathy and myocarditis	21.4%
Atrial fibrillation and flutter	106.4%
Aortic aneurysm	35.0%
Peripheral vascular disease	154.0%
Endocarditis	11.1%
Other cardiovascular and circulatory diseases	41.1%

Source: https://www.frontiersin.org/journals/cardiovascular-medicine/articles/10.3389/fcvm.2022.1008335/full

2.6 Cardiovascular Disease Risk Factors

Any characteristic or exposure that makes an individual more susceptible to developing a particular illness is called a risk factor (Heart Research Institute, 2025). These risk factors can be categorized as changeable (modifiable) and unchangeable (non-modifiable) risk factors. Although the presence of multiple risk factors increases an individual's vulnerability to cardiovascular disease, it should not be taken as an indication that CVD is unavoidable (Sunitha, 2021).

According to the Heart Research Institute (2025), the modifiable risk factors of cardiovascular diseases can be easily prevented and are explained as follows:

i. **Smoking:** Toxic chemicals present in a cigarette include carbon monoxide, ammonia, tar, and nicotine which are inhaled. Once in the bloodstream, the substances make the inner lining of the arteries adhesive. As a result, fatty deposits (plaques) are more likely to attach and gradually collect on the arterial walls. Blood carrying oxygen to vital organs of the body is restricted, leading to various cardiovascular diseases.

ii. **High Blood Pressure:** This occurs when the force exerted by the blood on the artery walls remains elevated for a prolonged duration. Elevated blood pressure makes the arteries work harder, and the heart pumps more forcefully to circulate blood. This can also accelerate the development of atherosclerosis, a condition where fatty deposits accumulate in your arteries, which is the primary driver of heart disease.

iii. **Elevated Cholesterol level:** Cholesterol is a fatty substance present in all body cells and transported in the bloodstream. It is mainly produced by the liver and other cells, and is also present in some foods. Cholesterol travels through the bloodstream in lipoproteins, primarily categorized as high-density lipoprotein (HDL) and low-density lipoprotein (LDL). Elevated levels of LDL, frequently referred to as "bad" cholesterol, can collect on arterial walls, resulting in the formation of plaques that constrict and stiffen the arteries causing blockages and restriction of blood flow to vital organs like the heart, leading to major cardiovascular disease.

iv. **Diabetes Mellitus:** Diabetes is a major medical condition characterized by the body's inability to maintain a normal blood sugar level. This difficulty arises because the body either produces an insufficient amount of insulin (the hormone responsible for regulating blood sugar) or no insulin at all. Elevated blood sugar concentrations can injuries to the walls of the arteries and promote the likelihood of atheroma (plaque formation). Should these fatty deposits develop within the coronary arteries, they may lead to coronary heart disease and subsequently, heart attacks. (Sunitha, 2021).

v. **Overweight and obesity:** Obesity usually develops when calorie intake from food exceeds the calories burned through physical activity. A healthy weight for adults is often assessed using Body Mass Index (BMI), which is detemined using the weight and height, with a normal range typically between 20 and 25. A BMI of 25 or above signifies overweight, while 30 or above depicts obesity. Being overweight or obese significantly raises the likelihood of developing

cardiovascular disease by increasing blood pressure, cholesterol level, and the risk of developing type 2 diabetes – all majorcontributing factors for heart attack and stroke. In addition, excess weight, especially fat around internal organs, can promote the accumulation of fatty material in arteries, further elevating the risk of these events.

vi. **Sedentary lifestyle:** Sedentary behaviour, which involves sitting, reclining, or lying down for extended periods with minimal energy expenditure (excluding sleep), poses significant health risks. Lack of physical activity reduces calorie expenditure, increasing excessive weight gain and potentially leading to obesity. Furthermore, prolonged sitting is associated with a higher propensity for cardiovascular disease, type-2 diabetes, and hypertension, as well as mental health issues like depression and anxiety. Sedentariness can also be responsible for decreased musclar strength and endurance, and negatively impact metabolism, potentially hindering the body's capability to process fats as well as sugars effectively. The immune system and bone strength can be compromised, and the body may experience increased inflammation and poorer blood circulation. While often not dangerous, prolonged sitting can also contribute to varicose veins, which, in rare instances, can lead to blood clots that may travel and obstruct blood flow elsewhere in the body. According to studies, a sedentary lifestyle involving over eight hours of daily sitting and no physical activity carries a mortality risk comparable to that of both smoking and obesity.

vii. **Poor Nutrition:** Consuming a diet deficient in essential nutrients but contains large amount of sugar, salt, and unhealthy fats (such as saturated fat, trans fat,

and LDL cholesterol) can lead to weight gain that increases the likelihood of developing heart and blood vessels diseases.

viii. **Excessive Alcohol consumption:** Alcohol, or ethanol, is produced by fermenting sugars in various crops. While it provides energy (7 calories per gram), it's a nutrient-poor source compared to carbohydrates, proteins, and fats. Alcohol is directly absorbed into the bloodstream, often taking digestion priority over other nutrients, and is either used for energy or stored as fat. Excessive alcohol consumption can elevate blood triglycerides, lower "good" HDL cholesterol, and raise blood pressure. Its high calorie content can contribute to weight gain, further promoting the tendency of developing type-2 diabetes and cardiovascular disease. Alcohol can also temporarily elevate heart rate, and repeated heavy drinking can lead to serious heart problems like heart failure and irregular heartbeat, or even dangerously slow heart rate in acute intoxication. The established link between regular excessive alcohol intake and high blood pressure significantly elevates the long-term risk of heart attack and stroke by straining the heart muscle.

ix. **Stress:** Stress triggers the release of cortisol, a crucial hormone for our "fight or flight" response, but excessive levels can be detrimental. Excessively high cortisol can lead to increased abdominal fat, greater appetite, elevated blood pressure, altered sleep, and heightened anxiety. Physically, stress can narrow blood vessels, contributing to higher blood pressure. This chronic stress is strongly linked to cardiovascular disease, and when combined with existing hypertension and elevated cholesterol level, the inclination towards serious

cardiac events like heart attack and stroke significantly increases due to further blood pressure elevation and the potential for blood vessel blockages.

Non-modifiable risk factors are the cardiovascular disease risk factors that cannot be changed and are described as follows by Sunitha (2021) as the following:

i. **Family History**: Since Cardiovascular Disease is hereditary, having a close relative who developed cardiovascular disease early in life, as well as a family history of hypertenstion, elevated cholesterol level, or type 2 diabetes, significantly predisposes an individual to developing cardiovascular disease due to genetic factors.
ii. **Age:** The likelihood of developing cardiovascular Diseases shows a marked increase as individuals age. While the aging process remains an inevitable factor, the adoption of a healthy lifestyle offers a valuable means of diminishing the elevated risk associated with older age and supporting long-term heart and circulatory health.
iii. **Gender:** Women generally, have a greater propensity to experience the onset of cardiovascular disease at a later age than men, a difference theorized to menopause-related changes in hormones

2.7 Prevalence of Cardiovascular Disease Risk Factors among University Staff

The leading global cause of mortality is CVD. This burden is intensified in Nigeria and across most of Africa due to a growing prevalence of cardiovascular risk factors (Wood and Eiselé, 2017). Research indicates that insufficient knowledge of CVD risk factors

significantly contributes to this rising prevalence (Ansa, Oyo-Ita and Essien, 2008; Dele-Ojo *et al.*, 2021). For example, a study conducted within staff in Ekiti State, Southwest Nigeria by Dele-Ojo *et al.* (2021) found that most participants (68.6%) had poor knowledge regarding cardiovascular risk factors, with a decent understanding present in less than one-third (31.4%) of the population. This study also highlighted an upsurge in various cardiac risk elements among the participants: hypertension (35.4%), overweight (31.8%), obesity (23.3%), diabetes (12.1%), physical inactivity (83%), and inadequate consumption of fruits and vegetables (67.7%). Furthermore, while most cardiac diseases determinants were more prevalent among those with limited knowledge, there was no statistical evidence for a difference (Dele-Ojo *et al.*, 2021). This suggests a disconnect between knowledge and practice, as even individuals with a good understanding of risk factors did not consistently adopt healthy behaviours. For instance, in this same study by Dele-Ojo *et al.* (2021), over 70% of participants acknowledged overweight as a cardiac risk element. Despite this awareness, the knowledge did not lead to improved behaviors, as over three-quarters of the studied group reported insufficient physical activity, and about one-third were classified as overweight. Additionally, participants with a family record of CVD had double the chance of exhibiting an excellent knowledge, yet they still faced a heightened likelihood of developing CVD in their later years.

A study conducted by Akintunde, Akintunde and Opadijo (2015) at Ladoke Akintola University of Technology in Nigeria investigated the prevalence of traditional CVD risk factors among university workers. The findings showed a very high occurrence of these risk elements within the surveyed population of "Hypertension 84 (40.8%), visceral obesity 92 (44.7%), generalized obesity 79 (38.3%), low high-density lipoprotein 113

(54.9%), impaired blood glucose 16 (7.8%), diabetes mellitus 3 (1.5%), hypercholesterolemia 102 (49.5%), left ventricular hypertrophy-ECG 24 (11.7%), elevated low-density lipoprotein-cholesterol 99 (48.1%)" (Akintunde, Akintunde and Opadijo, 2015). A significant concern highlighted in this study was that nearly three-quarters (72.3%) of the participants had more than one CVD risk factors occurring together. Additionally, the research showed that females were prone to both individual CVD risk elements and their combination compared to men.

2.8 Correlates of Cardiovascular Disease Risk Factors

Correlates are simply factors or variables that show a relationship or association with a particular outcome, meaning that changes in these factors tend to coincide with changes in the outcome. In this case of cardiovascular disease risk factors, this study identifies demographic factors (age and sex) and socioeconomic status (educational level, income level, and job cadre).

i. **Age:** The Collins English Dictionary (2025) defines age as the duration of time a person has lived. Aging, an unavoidable biological process, represents a crucial non-modifiable determinant of CVD. This demographic shift is linked to a progressive deterioration of numerous physiological functions, escalating susceptibility to various health complications and diseases (North and Sinclair, 2012). The impact of aging on the circulatory system is profound, leading to a greater occurence of conditions such as atherosclerosis, hypertension, myocardial infarction, and stroke (Lakatta and Levy, 2003a). Pathological alterations observed in aging cardiovascular tissues include hypertrophy, impaired left

ventricular diastolic function, diminished Left Ventricular systolic reverse capacity, increased arterial hardening, and compromised endothelial function (Lakatta and Levy, 2003a, 2003b). Projections signify that by 2030, roughly 20% of the global population will be aged 65 or older. Within this demographic, CVD is anticipated to account for 40% of all mortalities, establishing itself as the primary cause of mortality. Furthermore, the economic burden of treating CVD is projected to triple within this timeframe(Fleg, Aronow and Frishman, 2011; Heidenreich *et al.*, 2011). While acknowledging that increasing age is a sole risk marker of CVD, some researchers, such as Dhingra and Vasan (2012), propose that the CVD risk associated with advancing age can be partially mitigated through the modification of coexisting traditional CVD risk factors. This perspective suggests that despite age being non-modifiable, interventions targeting other established risk factors could alleviate the total impact of CVD on older populations.

ii. **Sex:** Sex designates an individual's biological traits, typically defined in terms of male or female (Australian Bureau of Statistics, 2016). A study by Lopez-Lopez *et al.* (2024) investigating sex differences in cardiovascular risk factors and the incidence of Major Adverse Cardiovascular Events (MACE) and diabetes in Colombian adults found that women experienced higher rates of hypertension, elevated BMI, and higher levels of total cholesterol, low-density lipoprotein cholesterol (LDL-c), and high-density lipoprotein cholesterol (HDL-c), while having lower triglyceride levels. Behavioural patterns also differed, with women being more sedentary but less likely to engage in smoking or active alcohol

consumption, and possessing higher levels of education. Despite these differing risk factor profiles, after a mean follow-up of 12 years, the composite incidence rate of MACE was greater in men. The strongest associations with MACE were identified as diabetes, followed by hypertension, low relative grip strength, smoking, and low physical activity. Notably, the study concluded that the composite MACE outcome was greater in men, even though they presented with a lower overall strain of the assessed cardiac risk elements. Although the rate of developing CVD is generally lower in women than in men, clinical data repeatedly shows that women face worse outcomes, including higher death rates and poorer prognoses, after experiencing an acute episode of cardiovascular illness (Gao *et al.*, 2019).

iii. **Educational level**: The connection between education and health is partly because more education often results in higher earnings and the adoption of healthier behaviours as well as the cognitive and non-cognitive skills that positively influence health outcomes (Baker, 2014). The knowledge and abilities gained through education can enhance a person's thinking skills, increase their understanding of health information, and improve their ability to interact with and utilize suitable healthcare services (Galobardes, 2006). In view of this, a systematic review in sub-Saharan Africa found that people generally had poor perception and understanding of heart disease elements. However, the study also showed that higher education and their living environments were linked to better knowledge of these diseases in the region (Boateng *et al.*, 2017). Furthermore, a study by Panagiotakos *et al.* (2004) suggested that individuals with lower

educational attainment were more inclined to engage in behaviours that increase CVD risk, such as smoking, leading a sedentary lifestyle, and suffering from hypertension, hypercholesterolemia, diabetes mellitus, and obesity. While education influences understanding of cardiovascular disease risk factors, adopting lifestyle modifications remains a challenge, even among educated individuals (Ansa, Oyo-Ita, and Essien, 2008). This is evident in a Nigerian study by Dele-Ojo *et al.* (2021), performed among tertiary institution staff. Despite over 70% of participants acknowledging overweight as a heart disease risk, this knowledge didn't translate into healthier habits, as over three-quarters of the sample group had sedentary behaviour, and roughly one-third were overweight.

iv. **Income level**: Income is generally defined as pre-tax earnings from one's occupation and is a proxy for an individual's purchasing capacity and health status, exhibiting a positive correlation with better health outcomes. This association arises from the fact that greater financial resources and income facilitate increased health expenditures, encompassing access to enhanced healthcare services (Baker, 2014). Beyond the advantage of improved healthcare access, greater income facilitates the acquisition of higher-quality housing in more desirable neighbourhoods, the consumption of more nutritious diets, and potentially alleviates psychosocial health risks such as stress and financial strain (Galobardes, 2006; Herd, Goesling and House, 2007; Baker, 2014). Finally, in comparison to other SES measures, income is a strong indicator of declining health as among those already experiencing poor health, having a higher income

appears to slow down the advancement of disease and is associated with living longer (Herd, Goesling, and House, 2007).

v. Job Cadre: Occupation can indicate a person's societal rank based on their social standing, income, and intellect, as well as the dynamics between employers and employees or, less commonly, define individuals as those who exploit or are exploited within a class system (Galobardes, 2006). Occupation significantly impacts health by influencing income and living standards. Higher-status jobs often provide better access to healthcare, education, and healthier environments. Additionally, occupations can affect health through work-related stress, social connections, and the degree of control or independence one has, all of which play a role in psychological well-being (Galobardes, 2006). A meta-analysis by Nyberg *et al.* (2013) across over 47,000 participants demonstrated a robust relationship between job strain and increased diabetes prevalence, regardless of lifestyle factors like smoking, alcohol, inactivity, or obesity. This implies that job strain directly contributes to disease risk, beyond promoting unhealthy behaviours, and also heightens the risk of diabetes. Moreover, job strain has a known link to subsequent coronary heart disease (Fransson *et al.*, 2012).

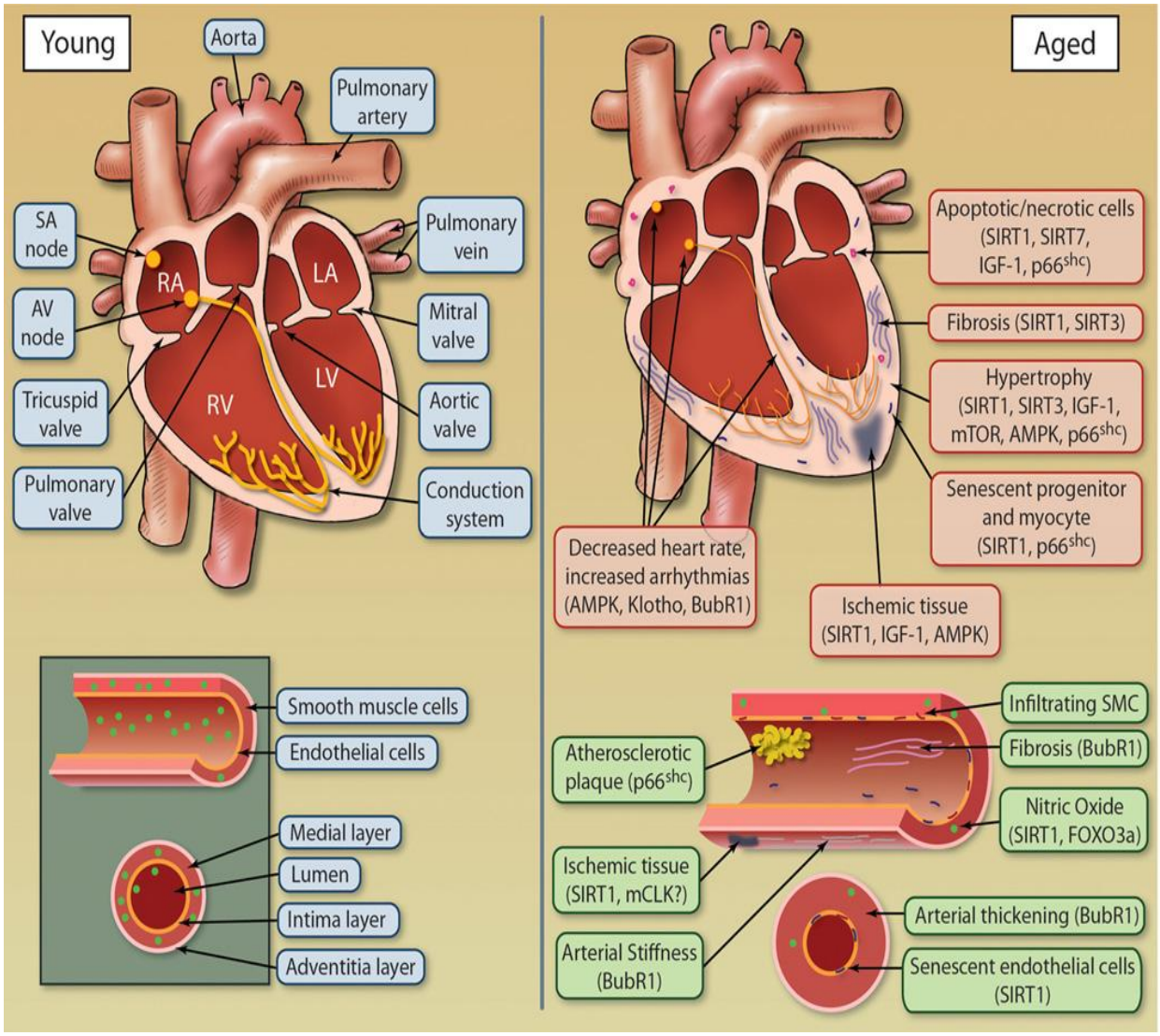

FIGURE 2.14 AGE CHANGES IN THE CARDIOVASCULAR SYSTEM

Source: https://pmc.ncbi.nlm.nih.gov/articles/PMC3366686/#S1

2.9 Empirical table

Authors and Year	Title	Aim of study	Research methods	Conclusion
Achidi and Tangoh, (2019)	Risk assessment of cardiovascular disease among staff of the University of Buea, South Western Cameroon	The primary goal of this research was to determine the distribution of the main cardiovascular disease (CVD) risk factors and assess the overall CVD risk among employees at the University of Buea.	The cross-sectional study in the University of Beau, located in Southwestern Cameroon, with a total of 313 participants consisting of 70 teaching staff and 243 support staff	Overall, employees at the University of Buea exhibit a low occurrence of most cardiovascular disease (CVD) risk factors. However, the findings highlighted overweight/obesity, alcohol intake, and reduced HDL cholesterol as relatively frequent concerns. The high incidence of overweight and obesity is likely attributable to a diet rich in carbohydrates and fats combined with minimal physical activity. Despite the presence of these factors, both the total CVD risk scores and the calculated 10-year absolute risk for coronary heart disease (CHD) remain low, possibly because other major risk factors are not widespread. Notably, the extent of alcohol consumption was found to be a significant determinant of the 10-year absolute CHD risk.
Akintunde, Akintunde and Opadijo (2015)	Prevalence of traditional cardiovascular risk factors among staff of Ladoke Akintola University of Technology, Ogbomoso,	The objective of this research was to establish the prevalence of conventional cardiovascular risk	This was a cross-sectional investigation involving 206 employees of LAUTECH in Ogbomoso, Nigeria. Each participant underwent an evaluation for nine	This research concludes that there is a high frequency of cardiovascular risk factors among the staff at LAUTECH, Nigeria, with female employees demonstrating a higher concentration (or 'clustering') of these risks. These results

	Nigeria	factors within a sample of employees at Ladoke Akintola University of Technology (LAUTECH)	established cardiovascular (CV) risk factors.	emphasize the urgent necessity for proactive measures, such as implementing educational campaigns and strategies for modifying risk factors, to minimize the future impact of cardiovascular diseases within this specific workforce.
Albert *et al.,* (2006)	Impact of Traditional and Novel Risk Factors on the Relationship Between Socioeconomic Status and Incident Cardiovascular Events	The goal of this research was to uncover the pathway by which SES influences CVD by investigating the longitudinal relationship between SES, newly identified inflammatory and haemostatic CVD risk markers, and the subsequent occurrence of CVD events.	This was a cohort study that tracked 22,688 female health professionals who were seemingly healthy and were part of the ongoing Women's Health Study.	This prospective analysis showed that as levels of education and income increased, the occurrence of new (incident) CVD events decreased. A distinction was found between the two socioeconomic indicators: the link between income and CVD events was largely accounted for by both traditional and novel CVD risk factors. However, these same risk factors only partially explained the observed relationship between education level and CVD events.
Ansa, Oyo-Ita and Essien (2008)	Perception of ischaemic heart disease, knowledge of and attitude to reduction of its risk factors	This study aimed to evaluate how employees at a Nigerian tertiary institution perceive ischemic heart disease (heart	This research was designed as a cross-sectional study and took place at the University of Calabar in Calabar, Nigeria. The study involved the random selection of 500 university	Even within academic environments, this study indicates a low level of awareness regarding ischemic heart disease as a primary cause of death, and poor knowledge of its risk factors (though education does have some influence). Crucially, the adoption of healthy

		attack) as a cause of death. It also sought to determine their current knowledge of its risk factors and the extent to which they have adopted preventive strategies.	employees, including both junior and senior-level staff members.	lifestyle changes remains uncommon, regardless of an individual's educational background. The findings stress the necessity of a coordinated public health campaign to both boost knowledge and motivate behavioral changes.
Davari *et al.,* (2019)	Socioeconomic status, cardiac risk factors, and cardiovascular disease: A novel approach to the determination of this association	The objective of this research was to examine the prevalence and interrelationships among specific cardiac risk factors, different types of cardiovascular disease (CVD), and socioeconomic status in patients hospitalized for heart disease in Isfahan, Iran.	This research employed an analytical, cross-sectional design and was carried out in Isfahan, Iran. The study population included all patients diagnosed with cardiovascular disease (CVD) who were admitted to a total of 11 hospitals (eight public and three private facilities). A sample size of 721 patients was achieved through a cluster sampling technique.	The findings indicated that cardiovascular disease (CVD) risk factors were more prevalent in groups with lower socioeconomic status (SES). Consequently, SES is a strong predictor of both the occurrence of CVD risk factors and the specific type of CVDs observed.
Dele-Ojo *et al.*, (2021)	Knowledge and Prevalence of Heart Disease Risk Factors Among Staff of a Tertiary Institution in Nigeria	The primary goal of this research was to assess the level of knowledge, and determine the occurrence of, cardiovascular risk factors among the employees of Ekiti	This was a cross-sectional study that included 223 staff members	The study revealed that Ekiti State University staff in Nigeria have poor knowledge of cardiovascular health alongside a growing frequency of associated risk factors. These results underscore the critical need for intensive awareness campaigns and the active encouragement of healthy lifestyle

		State University in Ado Ekiti, Nigeria.		adoption among this employee group.
Dhingra and Vasan (2012)	Age as a Cardiovascular Risk Factor	This review aims to analyze the role of age in CVD risk prediction, assess its modifiability, discuss CVD risk assessment methods, and examine the communication of age-stratified CVD risk and the impact age has on cardiac and vascular risk elements.	A review	The findings indicate that age independently increases CVD risk, even as traditional risk factors remain primary determinants. This age-related burden is partially modifiable by addressing existing risk factors. Also, ffective communication of CVD risk necessitates discussing both short- and long-term absolute and relative risks, leading to individualized management.
Fakunle, Ehuiken-Ayetin and Ademola (2024)	Dietary Pattern and Risk Factors Associated with Cardiovascular Diseases Among Non-Academic Staffs of Bowen University, Iwo, Nigeria	The goal of this research was to examine the specific dietary habits and related risk factors for cardiovascular diseases (CVD) among the non-academic staff at Bowen University.	This was a descriptive cross-sectional survey. Participants were selected from the non-academic staff department using simple random sampling.	The study showed that Most participants engage in inappropriate lifestyle practices, largely characterized by a sedentary lifestyle and infrequent physical activity. While most respondents consumed fruits and vegetables only 3-4 times weekly, a positive finding was that most never consumed alcohol, and less than half consumed fatty foods. The research also found that most respondents had a normal weight and exhibited normal blood pressure

Gupta *et al.,* (2012)	Association of Educational, Occupational, and Socioeconomic Status with Cardiovascular Risk Factors in Asian Indians: A Cross-Sectional Study	The goal of this research is to establish the relationship between various measures of socioeconomic status (SES) and cardiovascular risk factors across the population of India.	The research was carried out across eleven different cities and utilized cluster sampling. The total sample size included 6,198 subjects, specifically comprising 3,426 men and 2,772 women.	Asian Indians with lower socioeconomic, educational, and occupational status show a higher occurrence of key adverse health indicators. These indicators include truncal obesity, low HDL cholesterol, hypertriglyceridemia, tobacco use (including smoking), and reduced physical activity. Consequently, these individuals also exhibit a greater clustering of three or more major cardiovascular risk factors.
Lozano-Casanova *et al.*, (2023)	Prevalence of Cardiovascular Risk Factors in a University Population: Differences Between Faculty, Administrative Staff and Students	The study seeks to assess the frequency of CVD risk factors in the university population accessing nutrition counseling, and analyze how these factors differ by age in relation to CVD risk.	This was a cross-sectional study involving 98 participants. The sample consisted of teaching and research personnel (Faculty), administrative and services staff (ASS), and students.	Four-fifths of the sample had >1 CVD risk factor, and over half had ≥3. The Faculty group had a significantly higher clustering of three risk factors, while the ASS group was significantly more sedentary, illustrating varying risk profiles by university subgroup.

Nyberg *et al.*, (2013)	Job Strain and Cardiovascular Disease Risk Factors: Meta-Analysis of Individual-Participant Data from 47,000 Men and Women	This study investigated the connection between job strain and coronary heart disease (CHD), specifically examining the biological risk factors that might serve as mediating mechanisms in this link.	This study utilized data from 47,045 employed participants drawn from eight independent clinical examination studies conducted in Belgium, Germany, Sweden, and the UK between 1984 and 2003, as part of the IPD-Work Consortium. Participants with missing demographic or job strain data, or a previous record of myocardial infarction, were excluded.	The meta-analysis showed that job strain correlates with unhealthy lifestyles and diabetes, but not with clinic blood pressure or blood lipid levels.
Quispe *et al.,* (2016)	The Relationship Between Socioeconomic Status and CV Risk Factors: The CRONICAS Cohort Study of Peruvian Adults	The goal of this study was to delineate the association between cardiovascular risk factors and socioeconomic status (SES), using specific metrics like monthly family income, educational level, and assets index, across four sites in Peru.	This cross-sectional study utilized baseline data from the 2010 CRONICAS Cohort Study in Peru. The data were sourced from an age- and sex-stratified random sample of participants, all of whom were 35 years of age or older , across four Peruvian sites.	The study demonstrated that only obesity and elevated waist circumference were significantly and positively correlated with higher family income and asset ownership. Conversely, educational attainment was found to have a protective effect against risk.

Rosengren *et al.,* (2019)	Socioeconomic status and risk of cardiovascular disease in 20 low-income, middle-income, and high-income countries: the Prospective Urban Rural Epidemiologic (PURE) study	This study examined socioeconomic disparities in CVD (wealth and education) across income-country groups, their link to risk factors/disease management, and which marker (wealth or education) is more strongly associated.	Adults aged 35–70 from 20 countries (spanning 367 urban and 302 rural sites) were enrolled in this large-scale prospective study. SES was evaluated using education level and household wealth.	In LMICs, the less educated face higher CVD incidence and mortality due to poor healthcare access, despite having better risk factor profiles overall. Reducing global health inequity necessitates policies that address care barriers for this population.

2.9.1 Summary of the Empirical Studies

The reviewed studies highlight a high prevalence of traditional cardiovascular disease (CVD) risk factors including hypertension, obesity, physical inactivity, and poor dietary habits—among university staff populations in sub-Saharan Africa and other regions.

Multiple studies, such as those by Akintunde et al. (2015), Dele-Ojo et al. (2021), and Fakunle et al. (2024), emphasize the alarming clustering of risk factors among university staff. There is also a general low level of knowledge regarding these risks, despite working in academic environments. However, studies by Achidi and Tangoh (2019) found a low prevalence of CVD risk factors despite the presence of modifiable risk factors like obesity, low HDL-C, and excessive alcohol consumption, reason being that there is low prevalence of other risk factors among the group suggesting that not all exposure patterns translate to immediate high CVD events.

Furthermore, research shows that socioeconomic status (SES), including education, income, and job cadre, plays a significant role in both the prevalence and distribution of CVD risk factors. Studies by Gupta et al. (2012), Rosengren et al. (2019), and Davari et al. (2019) show that Lower SES groups were more vulnerable to multiple risk factors such as poor diet, sedentary lifestyle, tobacco use, and reduced healthcare access.

Additionally, Nyberg et al., (2013) revealed that occupational stress and job strain indirectly influence cardiovascular risk by promoting unhealthy behaviours such as poor dietary habits and reduced physical activity.

Overall, the empirical evidence indicates the need for targeted, context-specific preventive interventions, including workplace wellness programs, health education, and routine screenings. Such efforts should particularly prioritize non-academic staff and lower SES groups, who appear most vulnerable. Improving awareness, encouraging lifestyle modifications, and addressing social determinants of health are essential for mitigating the burden of cardiovascular disease in university and related occupational settings.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Materials

3.1.1 Population

This study comprised of Junior non-academic staff at the University of Benin, Benin City, Edo State, Nigeria. This group included individuals employed in administrative, maintenance, and support roles within the institution.

3.1.2 Selection Criteria

3.1.2.1 Inclusion Criteria

i. Junior non-academic staff members of the University of Benin, with at least 12 months of continuous employment.
ii. Both male and female Junior non-academic staff members aged 18 and above
iii. Junior non-academic staff who gave consent to participate in the study.

3.1.2.2 Exclusion Criteria

i. Any staff member holding an academic or teaching position, including those on joint appointments with non-academic roles.
ii. Known hypertensive non-academic staff
iii. Staff members on temporary or part-time employment.
iv. Individuals who declined to participate or failed to provide informed consent were excluded from the study.

3.1.3 List of Instruments

i. Demographic characteristics
ii. The Alcohol Use Disorders Identification Test (AUDIT)
iii. MacArthur Subjective Social Status Pictorial Ladder Tool
iv. International Physical Activity Questionnaire - Short Form
v. REAPS (Rapid Eating Assessment for Participants - Shortened Version)
vi. PMBC Smoking Questionnaire
vii. Standard digital weighing scale
viii. Generic carpenter's tape
ix. Omron digital sphygmomanometer

3.1.4 Description of Instruments

I. **Demographic characteristics** consist of items designed to obtain basic socio-demographic data of respondents, including:

a. **Age:** (completed in years)
b. **Gender:** Male / Female / Other
c. **Marital Status:** Single / Married / Divorced / Widowed
d. **Highest Educational Qualification:** No formal education / Primary education / Secondary education / Tertiary education (OND, HND, B.Sc., etc.) / Postgraduate education
e. **Monthly Income:** Less than ₦50,000 / ₦50,000 – ₦100,000 / ₦101,000 – ₦200,000 / ₦201,000 – ₦300,000 / Above ₦300,000

II. **The Alcohol Use Disorders Identification Test (AUDIT)** The Alcohol Use Disorders Identification Test (AUDIT) is a 10-question self-report assessment created by the World Health Organization (WHO). It is designed to screen individuals for hazardous or harmful drinking patterns, encompassing alcohol consumption levels, specific drinking behaviours, and existing alcohol-related issues. A total score of 8 or higher suggests problematic alcohol use. Because it has been verified for accuracy across diverse populations, including different genders and racial/ethnic groups, the AUDIT is a suitable and validated instrument for use in primary care.

Reliability and Validity

Test-retest reliability for the full AUDIT typically ranges from good to excellent, with correlation coefficients between 0.6 and 0.95 depending on the study and time interval (e.g., one month). For example, total score test-retest reliability was reported as 0.84 to 0.95 in various populations, indicating stability over time. Hence, Internal consistency is high, supporting the notion that the items measure a cohesive construct of alcohol use problems (Meneses-Gaya *et al.*, 2009). Meneses-Gaya *et al.,* (2009) also noted that the AUDIT and its short forms have demonstrated strong criterion validity in identifying harmful alcohol use, abuse, dependence, and risky drinking.

III. **MacArthur Subjective Social Status Pictorial Ladder Tool**: This method uses a pictorial ladder to evaluate participants' perceived social status within their community. Participants are shown a visual of a 10-rung ladder and are asked to select the rung that represents their current position. The top of the

ladder signifies having greater wealth, educational attainment, and superior employment, whereas the bottom represents having fewer financial resources, lower education levels, and poorer job prospects.

Reliability

Test-Retest Reliability: The MacArthur Scale demonstrates good stability over short intervals (7–14 days), with intra-class correlation coefficients ranging from 0.64 to 0.75 and weighted Kappa statistics between 0.58 and 0.67 depending on the reference group (society, community, or workplace) (Giatti *et al.*, 2012).

Validity

Construct Validity: The MacArthur Scale has strong construct validity, measuring both economic circumstances and social status as distinct but related constructs. It predicts health and well-being outcomes independently of traditional socioeconomic indicators (Galvan *et al.*, 2023).

IV. **International Physical Activity Questionnaire - Short Form:** This 7-item instrument is designed to evaluate the intensity and duration of both physical activity and sedentary behaviour (sitting time) in a person's daily life. It utilizes open-ended questions that prompt individuals to recall their activities over the preceding seven days. The data collected allows for the estimation of total physical activity, typically calculated in MET-minutes per week, alongside the total time spent sitting. Administration can be done via self-report (paper-and-pencil) or through an oral interview. A representative question is: "Over the past

week, on how many days did you engage in vigorous physical activities, such as fast bicycling, digging, heavy lifting, or aerobics?"

Reliability

Test-rest reliability indicated good stability High reliability (α <.80)

Validity

It has Predictive, Concurrent, Convergent, Criterion, and Discriminant validities.

V. **REAPS (Rapid Eating Assessment for Participants - Shortened Version):** The Rapid Eating Assessment for Participants - Shortened Version (REAP-S) is a brief diet quality assessment tool designed for quick use in clinical or research settings. It contains 13 scored questions related to food intake habits such as skipping breakfast, eating restaurant meals, consumption of whole grains, fruits, vegetables, milk, beef, fried foods, and high-fat foods. The REAP-S evaluates diet quality through simple frequency-based questions, scoring "usually/often" as 1 point, "sometimes" as 2 points, and "rarely/never" as 3 points. Responses are scored with higher points indicating better diet quality, with overall scores between 13 to 39. The REAP-S was developed to provide a rapid, low-cost measure correlating well with longer, more complex diet quality indexes like the Healthy Eating Index (HEI), enabling healthcare providers to assess diet quality efficiently and potentially use it for lifestyle counselling (Johnston *et al.*, 2018).

Reliability and Validity

A 2023 study on REAP-S v.2 found acceptable internal consistency (Cronbach's alpha = 0.71), supporting reliability. Construct validity was confirmed via factor analysis revealing three relevant dietary subscales, and criterion validity was shown through significant associations between REAP-S responses and nutrient intakes from 3-day food records. The study also identified score cut points useful for clinical dietary counselling decisions. This version is aligned with the 2020-2025 US Dietary Guidelines and easily integrated into electronic medical records (Fawcett, 2012; Shankar *et al.*, 2023).

VI. **PMBC Smoking Questionnaire:** This questionnaire assesses current and past smoking behaviours with focus on frequency, quantity, type of tobacco product, and quitting history.

Reliability and validity

The PMBC Smoking Questionnaire is a brief, multidimensional smoking assessment tool with high test-retest reliability and strong concurrent validity. Test-retest reliability scores ranged from moderate (55%) to very high (up to 100%) while concurrent validity was demonstrated through comparison with the BRFSS 2011 questionnaire, with agreement levels of 98%-100% (Ramo, Hall and Prochaska, 2011).

Anthropometric and Physiological Measurements

a. Height and Weight

Participants' weight was measured using a standard digital weighing scale, while

height were assessed using a generic carpenter's tape marked with a vertical measuring tape affixed to a stable wall surface. Participants were asked to stand upright without footwear for accurate measurements. These values were used to calculate the Body Mass Index (BMI) using the formula:

BMI = weight (kg) / height (m²).

BMI values were categorized using WHO standards into underweight, normal weight, overweight, and obese.

Validity and Reliability of carpenter's tape

European Commission standards classify tapes into three accuracy classes:

Class I: Most accurate, ±1.1 mm error over 10 meters, Class II: Moderate accuracy, ±2.3 mm over 10 meters, Class III: Least accurate, ±4.6 mm over 10 meters. A generic tape without certification may fall into Class II or III, implying potential measurement errors of a few millimetres over typical lengths used for height measurement. Studies on tape measurement methods (TMM) for body segment lengths, such as leg length discrepancy, show that tapes with a nearest reading of 5 mm can be reliable and accurate when used properly. One study comparing TMM to CT scanograms (gold standard) reported high inter-observer reliability (ICC > 0.9) and good accuracy (ICC ~0.8), with mean differences under 2 mm, supporting the validity of tape measures for anthropometric use (S *et al.*, 2011).

Validity and Reliability of the weighing scale

Digital weighing scales have been shown to have good validity in clinical settings. For example, a study comparing digital weighing scales (DWS) to a

standard device (MatScan) found good agreement and validity in measuring limb load, indicating that digital scales can provide accurate weight measurements suitable for clinical use (Sn *et al.*, 2014). The same study shows that digital weighing scales have excellent intra- and interrater reliability, with intra-class correlation coefficients (ICC) ranging from 0.94 to 0.97, indicating very high consistency of repeated measurements.

b. Blood Pressure

Blood pressure was measured using Omron digital sphygmomanometer with the participant in a seated position after at least 5 minutes of rest. Three readings were taken at one-minute intervals, and the average of the last two readings was recorded. Hypertension was classified based on the American Heart Association guidelines.

Validity

Studies indicate that digital devices tend to have greater mean differences from mercury readings than aneroid devices. For example, one study found that only about 44% of digital device readings were within 5 mmHg of mercury readings, compared to 89% for aneroid devices (Shahbabu *et al.*, 2016).

Reliability

Some studies report diminished reliability in digital devices for detecting hypertension and measuring blood pressure consistently across repeated measures or different observers (Mathew and Bahuleyan, 2024).

3.2 Method

3.2.1 Research Design

A cross-sectional survey research design was used for this study.

3.2.2 Sampling Technique

A stratified random sampling technique was used for this study.

3.2.3 Sampling Size

3.2.4 Sampling size calculation

The study was conducted among junior non-academic staff at the University of Benin, Benin City, Edo State, Nigeria.

The minimum sample size was calculated using the Cochran's sample size Formula.

$$\text{Unlimited population: } n = \frac{z^2 \times \hat{p}(1-\hat{p})}{\varepsilon^2}$$

$$\text{Finite population: } n' = \frac{n}{1+\frac{z^2 \times \hat{p}(1-\hat{p})}{\varepsilon^2 N}}$$

Therefore, the minimum sample size required for this study is approximately 125 participants.

3.2.4 Ethical considerations

Ethical approval for this study was obtained from the University of Benin (UNIBEN) Research Ethics Committee (CMS/REC/2024/798).

3.2.5 Procedure for Data Collection

Data collection was conducted within the University of Benin, targeting junior non-academic staff who meet the specified inclusion criteria. The process involved the following steps:

1. **Recruitment and inform consent**

   Eligible participants were identified through the university's non-academic staff directory, focusing on administrative, maintenance, and support units. The purpose of the study, confidentiality measures, and voluntary nature of participation was clearly explained to each potential participant. Those willing to participate were required to sign an informed consent form.

2. **Administration of Questionnaires**

   Participants were guided to complete a structured self-administered questionnaire, which consists of six sections:

   - Demographic characteristics.
   - The Alcohol Use Disorders Identification Test (AUDIT)
   - MacArthur Subjective Social Status Pictorial Ladder Tool
   - International Physical Activity Questionnaire - Short Form
   - REAPS (Rapid Eating Assessment for Participants - Shortened Version)
   - PMBC Smoking Questionnaire

   For participants with limited literacy or visual challenges, trained research assistants assisted in reading and interpreting questions without leading responses.

3. **Anthropometric and Physiological Assessments**

   After questionnaire completion, each participant proceeded to the measurement station for the following assessments:

   - **Height** was measured using a generic carpenter's tape affixed to a stable vertical surface. Participants were asked to stand without footwear, with heels and back firmly touching the wall, the head is stabilized in the Frankfort horizontal position.
   - **Weight** was measured using a standard digital weighing scale placed on a flat, hard surface. BMI was calculated and classified according to WHO standards.
   - **Blood pressure** was assessed using an Omron digital sphygmomanometer. Participants first rested in a comfortable, seated position for five minutes. Subsequently, three measurements were obtained at sixty-second intervals, and the mean value of the final two readings was documented.

3.2.6 Data Analysis

Data was analysed using the International Business Machine (IBM) Statistical Package for Social Sciences (SPSS) version 27.0. Descriptive statistics of frequencies, percentages, means, and standard deviations were used to summarize demographic data and prevalence rates. Inferential statistics of Chi-square association, Pearson test, independent t-test and one-way ANOVA were used to analyse the data. Statistical significance was set at $p < 0.05$.

CHAPTER FOUR

RESULTS

4.1 Introduction

The primary aim of this study was to assess the prevalence and correlates of cardiovascular disease risk factors among junior non-academic staff at the University of Benin. A total of 125 junior non-academic staff at the University of Benin were recruited for this study

4.1.1 Sociodemographic data of the participants

Out of the one hundred and twenty-five participants recruited for this study, sixty-six (52.8%) were females and fifty-nine (47.2%) were males. Ninety-six (76.8%) were married while sixteen (12.8%) were single. Twenty-seven (21.6%) were bursary staff and twenty-five (20.0%) were security staff. One hundred and eleven (88.8%) of the respondents had tertiary education. Ninety-one (72.8%) of the respondents earn above 150,000. The age of the respondents ranged from 23 to 70 years, with a mean age of 47.99 ± 9.40, as shown in Table 1.

TABLE 4. 1: SOCIODEMOGRAPHIC DATA OF THE PARTICIPANTS N=125

Variable	Frequency	Percentages
Gender		
Female	66	52.8
Male	59	47.2
Marital status		
Divorced	5	4.0
Married	96	76.8
Single	16	12.8
Widowed	8	6.4
Unit		
Bursary staff	27	21.6
G&C staff	8	6.4
ICT staff	18	14.4
Library staff	23	18.4
Security staff	25	20.0
Student affairs staff	24	19.2
Qualification		
Secondary education	14	11.2
Tertiary education	111	88.8
Monthly income		
<50,000	5	4.0
51,000-100000	11	8.8
101,000-150000	18	14.4
>150000	91	72.8
	Range	**Mean±SD**
Age	23-70	47.99±9.40

4.1.2 Anthropometric characteristics of the respondents

The mean height, weight, BMI, SBP, DBP were 166.46±9.28, 79.02±16.10, 28.59±5.77, 137.58±18.88, 83.38±15.03 respectively. 54(43.2%) of the respondents were obese, 32(25.6%) were overweight as shown in table 2.

TABLE 4. 2: ANTHROPOMETRIC CHARACTERISTICS OF THE RESPONDENTS
N=125

Variable	Range	Mean±SD
Height (cm)	150-189	166.46±**9.28**
Weight (Kg)	45-119	79.02±**16.10**
BMI (kg/m^2)	17.67-46.06	28.59±**5.77**
SBP (mmHg)	99-207	137.58±**18.88**
DBP (mmHg)	99-144	83.38±**15.03**
BMI categorization		
Underweight	3	2.4
Normal weight	36	28.8
Overweight	32	25.6
Obese	54	43.2

BMI=BODY MASS INDEX, SBP=SYSTOLIC BLOOD PRESSURE, DBP=DIASTOLIC BLOOD PRESSURE

4.1.3 Physical activity of the respondents

The MET (Metabolic Equivalent) score of the respondents was 2696.31±3260.343. 52(41.6%) of the respondents had low physical activity level, 48(38.4%) had high physical level as shown in table 4.

TABLE 4. 3: PHYSICAL ACTIVITY OF THE RESPONDENTS N=125

Variable	frequency	Percentages
IPAQ		
High	48	38.4
Low	52	41.6
moderate	25	20.0
	Range	**Mean±SD**
MET score	99-12119	2696.31±3260.343

4.1.4 Correlates of cardiovascular disease risk factors

The mean AUDIT, REAP-S, PMBC Smoking Status Score (SSS) of the respondents was 2.38±4.82, 27.48±3.72, 4.15±2.53 respectively. In the AUDIT category, 112(89.6%) had low-risk of alcohol disorders or even complete abstinence. 124(99.2%) of the respondents reported that they don't currently smoke cigarettes on a daily basis, 122(97.6%) reported that they have not at some point in their lifetime smoke cigarettes on a daily basis. 124(99.2%) of the respondents reported that they don't currently smoke cigarettes, cigars, or a pipe on a less than daily basis

TABLE 4. 4: CORRELATES OF CARDIOVASCULAR DISEASE RISK FACTORS N=125

Variable	Range	Mean±SD
AUDIT	00-26.00	2.38±4.82
REAP-S	19-39	27.48±3.72
SSS	1-10	4.15±2.53
	frequency	**Percentages**
AUDIT Category		
Low risk or abstinence	112	89.6
Hazardous drinking	6	4.8
Harmful drinking	4	3.2
Possible dependence	3	2.4
Smoking status		
Do you currently smoke cigarettes, cigars, or a pipe ON A DAILY BASIS		
No	124	99.2
yes	1	0.8
Did you EVER smoke cigarettes, cigars, or pipe on a daily basis		
No	122	97.6
yes	3	2.4
Do you currently smoke cigarettes, cigars, or pipe ON A LESS THAN DAILY BASIS		
No	124	99.2
yes	1	0.8

4.1.5 Association between age and prevalence of major cardiovascular disease risk factors

Table 5 showed the Pearson test conducted to examine the relationship between age and the prevalence of cardiovascular disease risk factors. The findings revealed there was no significant relationship between the age and SBP (p=0.246), DBP (p=0.670), Diet (REAP-S) (p=0.948), Alcohol (AUDIT) (p=0.595) and BMI (p=0.874) , Physical activity (p=0.740)

TABLE 4. 5: RELATIONSHIP BETWEEN AGE AND PREVALENCE OF MAJOR CARDIOVASCULAR DISEASE RISK FACTORS
N=125

variable	r	p
Age*SBP	0.105	0.246
Age*DBP	-0.038	0.670
Age* REAP-S	-0.006	0.948
Age*AUDIT	-0.048	0.595
Age* BMI	0.014	0.874
Age* physical activity	0.030	0.740

4.1.6 Independent t-test comparing the difference in cardiovascular disease risk factors between the gender of the respondents

Table 6 showed the independent t-test conducted to examine the difference in CVD risk factors between the male and female participants. The findings revealed there was no significant difference in the SBP (p=0.932), DBP (p=0.186), physical activity level (p=0.901), Diet (REAP-S) (p=0.225) and between male and female respondents. However, there was a significant difference in the alcohol disorder (AUDIT) (p=<0.001) and BMI (p=<0.001) between the male and female respondents.

TABLE 4. 6: INDEPENDENT T-TEST COMPARING THE DIFFERENCE IN CARDIOVASCULAR DISEASE RISK FACTORS BETWEEN THE GENDER OF THE RESPONDENTS

N=125

Variable	Gender	mean	t	P
SBP	Male	137.73	0.085	0.932
	Female	137.44		
DBP	Male	85.27	1.331	0.186
	Female	81.70		
Physical activity	Male	2734.88	0.125	0.901
	Female	2661.83		
AUDIT	Male	4.31	4.536	<0.001
	Female	0.67		
REAP-S	Male	27.05	-1.220	0.225
	Female	27.86		
BMI	Male	26.22	-4.696	<0.001
	Female	30.71		

4.1.7 Association between Educational level, income level and BMI of the respondents

Table 7 showed the chi-square test of association between the educational level, income level and the BMI of the respondents. The findings revealed that there was no significant association between the educational level (p=0.621), monthly income (p=0.181), and the BMI of the respondents.

TABLE 4. 7: ASSOCIATION BETWEEN EDUCATIONAL LEVEL, INCOME LEVEL AND BMI OF THE RESPONDENTS
N=125

variable		underweight	Normal weight	overweight	obese	X^2	p
Educational level	Secondary	0	6	3	5	1.722	0.621
	Tertiary	3	30	29	49		
Monthly income	<50,000	0	3	1	1	12.613	0.181
	101,000-150,000	1	6	1	10		
	51,000-100000	1	4	4	2		
	Above 150,000	1	23	23	41		

4.1.8 Association between Physical acivity level and each of Educational level and income level of the respondents

Table 8 showed the chi-square test of association between the educational level, income level and the physical activity level of the respondents. The findings revelled there was no significant association between the educational level (p=0.095), monthly income (p=0.496) and the physical activity levels of the respondents.

TABLE 4. 8: ASSOCIATION BETWEEN EDUCATIONAL LEVEL, INCOME LEVEL AND PHYSICAL ACTIVITY LEVEL OF THE RESPONDENTS N=125

Variable		High	Low	Moderate	X^2	p
Educational level	Secondary	9	4	1	4.697	0.095
	Tertiary	39	48	24		
Monthly income	<50,000	1	4	9	5.378	0.406
	101,000-150,000	9	7	2		
	51,000-100000	5	4	2		
	Above 150,000	33	37	21		

4.1.9 Independent t-test comparing the difference between SBP, DBP between the educational levels of the respondents

Table 9 showed the comparison in the SBP, DBP and the educational level of the respondents. The findings revealed there was no significant difference in the SBP (p=0.395), DBP (p=0.248) between the educational level of the respondents

TABLE 4. 9: INDEPENDENT T TEST COMPARING THE DIFFERENCE BETWEEN SBP, DBP BETWEEN THE EDUCATIONAL LEVEL OF THE RESPONDENTS
N=125

Variable	Educational level	Mean	t	p
SBP	Secondary	141.64	0.854	0.395
	Tertiary	137.06		
DBP	Secondary	79.00	-1.160	0.248
	Tertiary	83.94		

4.1.10 One-way ANOVA comparing the difference in the SBP, DBP and the income level of the respondent

Table 10 shows the comparison in the SBP, DBP and the income level of the respondents. The findings revealed there was no significant difference in the SBP (p=0.972), DBP (p=0.620) between the income level of the respondents

TABLE 4. 10: ONE-WAY ANOVA COMPARING THE DIFFERENCE IN THE SBP, SBP AND THE INCOME LEVEL OF THE RESPONDENT N=125

Variable		Sum of squares	Mean square	f	p
SBP	Between groups	84.01	28.00	0.077	0.972
	Within groups	44114.52	364.58		
DBP	Between groups	407.26	135.75	0.595	0.620
	Within groups	27614.31	228.22		

4.2 Hypothesis testing

1. There would be no significant relationship between age and the prevalence of cardiovascular disease risk factors (SBP) among junior non-academic staff at the University of Benin

Test: Pearson correlation

Alpha level: 0.05

Observed p-value: 0.246

Judgement: Since the observed p value is greater than 0.05, the null hypothesis is therefore NOT REJECTED

2. There would be no significant relationship between age and the prevalence of cardiovascular disease risk factors (DBP) among junior non-academic staff at the University of Benin

Test: Pearson correlation

Alpha level: 0.05

Observed p value: 0.670

Judgement: Since the observed p value is greater than 0.05, the null hypothesis is therefore NOT REJECETD

3. There would be no significant relationship between age and the Dietary habit (REAP-S) among junior non-academic staff at the University of Benin

Test: Pearson correlation

Alpha level: 0.05

Observed p value: 0.948

Judgement: Since the observed p value is greater than 0.05, the null hypothesis is therefore NOT REJECTED

4. There would be no significant relationship between age and the Alcohol disorder (AUDIT) among junior non-academic staff at the University of Benin

Test: Pearson correlation

Alpha level: 0.05

Observed p value: 0.595

Judgement: Since the observed p value is greater than 0.05, the null hypothesis is therefore NOT REJECTED

5. There would be no significant relationship between age and the BMI among junior non-academic staff at the University of Benin

Test: Pearson correlation

Alpha level: 0.05

Observed p value: 0.874

Judgement: Since the observed p value is greater than 0.05, the null hypothesis is therefore NOT REJECTED

6. There would be no significant relationship between age and the Physical activity level among junior non-academic staff at the University of Benin

Test: Pearson correlation

Alpha level: 0.05

Observed p value: 0.740

Judgement: Since the observed p value is greater than 0.05, the null hypothesis is therefore NOT REJECTED

7. There would be no significant difference between gender and the SBP among junior non-academic staff at the University of Benin

Test: Independent t test

Alpha level: 0.05

Observed p value: 0.932

Judgement: Since the observed p value is greater than 0.05, the null hypothesis is therefore NOT REJECTED

8. There would be no significant difference between gender and the DBP among junior non-academic staff at the University of Benin

Test: Independent t test

Alpha level: 0.05

Observed p value: 0.186

Judgement: Since the observed p value is greater than 0.05, the null hypothesis is therefore NOT REJECTED

9. There would be no significant difference between gender and the Physical activity level among junior non-academic staff at the University of Benin

Test: Independent t test

Alpha level: 0.05

Observed p value: 0.901

Judgement: Since the observed p value is greater than 0.05, the null hypothesis is therefore NOT REJECTED

10. There would be no significant difference between gender and the alcohol disorder (AUDIT) among junior non-academic staff at the University of Benin

Test: Independent t test

Alpha level: 0.05

Observed p value: <0.001

Judgement: Since the observed p value is less than 0.05, the null hypothesis is therefore REJECTED

11.There would be no significant difference between gender and the Dietary (REAP-S) among junior non-academic staff at the University of Benin

Test: Independent t test

Alpha level: 0.05

Observed p value: 0.225

Judgement: Since the observed p value is greater than 0.05, the null hypothesis is therefore NOT REJECTED

12. There would be no significant difference between gender and the BMI among junior non-academic staff at the University of Benin

Test: Independent t test

Alpha level: 0.05

Observed p value: <0.001

Judgement: Since the observed p value is less than 0.05, the null hypothesis is therefore REJECTED

13. There would be no significant association between educational level and the BMI among junior non-academic staff at the University of Benin

Test: chi-square

Alpha level: 0.05

Observed p value: 0.621

Judgement: Since the observed p value is greater than 0.05, the null hypothesis is therefore NOT REJECTED

14. There would be no significant association between income level and the BMI among junior non-academic staff at the University of Benin

Test: chi-square

Alpha level: 0.05

Observed p value: 0.181

Judgement: Since the observed p value is greater than 0.05, the null hypothesis is therefore NOT REJECTED

15. There would be no significant association between educational level and the physical activity level among junior non-academic staff at the University of Benin

Test: chi-square

Alpha level: 0.05

Observed p value: 0.095

Judgement: Since the observed p value is greater than 0.05, the null hypothesis is therefore NOT REJECTED

16. There would be no significant association between income level and the physical activity level among junior non-academic staff at the University of Benin

Test: chi-square

Alpha level: 0.05

Observed p value: 0.406

Judgement: Since the observed p value is greater than 0.05, the null hypothesis is therefore NOT REJECTED

17. There would be no significant difference in SBP between the educational level among junior non-academic staff at the University of Benin

Test: independent t test

Alpha level: 0.05

Observed p value: 0.395

Judgement: Since the observed p value is greater than 0.05, the null hypothesis is therefore NOT REJECTED

18. There would be no significant difference in DBP between the educational level among junior non-academic staff at the University of Benin

Test: independent t test

Alpha level: 0.05

Observed p value: 0.248

Judgement: Since the observed p value is greater than 0.05, the null hypothesis is therefore NOT REJECTED

19. There woud be no significant difference in SBP between the income level among junior non-academic staff at the University of Benin

Test: One-way ANOVA

Alpha level: 0.05

Observed p value: 0.972

Judgement: Since the observed p value is greater than 0.05, the null hypothesis is therefore NOT REJECTED

20. There would be no significant difference in DBP between the income level among junior non-academic staff at the University of Benin

Test: One-way ANOVA

Alpha level: 0.05

Observed p value: 0.620

Judgement: Since the observed p value is greater than 0.05, the null hypothesis is therefore NOT REJECTED

CHAPTER FIVE

DISCUSSION, CONCLUSION, RECOMMENDATIONS AND IMPLICATIONS

5.1 Discussion

This study aimed to assess the prevalence and correlates of cardiovascular risk factors among junior non-academic staff at the University of Benin.

There was a slightly higher number of female participants compared to males, which could be attributed to the unavailability of males at the time of data collection or their preference for other careers. The majority of participants were married, highly educated, and reported an income above 150,000 naira. The participants were generally middle-aged, with a mean age of 47.99 years.

The average anthropometric and blood pressure values of the respondents suggest a population at increased risk of cardiovascular diseases. From the BMI distribution, 43.2% of the staff were obese and 25.6% were overweight, which means that nearly 7 out of 10 respondents had excess body weight. This indicates a high burden of overweight and obesity within this group, which may be due to the nature of their job requiring them to sit for long hours from the time of office resumption to closure or high consumption of carbohydrates and fats (Achidi and Tangoh, 2019). These findings are similar to that obtained by Orji (2019) who reported the prevalence of overweight and obesity as 33.1% and 20.3%, respectively among Non-teaching staff of College of Medicine, University of Ibadan, Oyo State. Although, the prevalence of 43.2% for

obesity and 25.6% for overweight from this study is higher compared with a study by Fakunle, Ehuiken-Ayetin and Ademola, (2019), who reported that the majority had normal body mass index, and only 15.1% were obese among non-academic staff of Bowen University, Iwo, Nigeria. The difference may be attributed to socio-demographic variation as the two universities are located in two different geopolitical zones were dietary choices, cultural perceptions of body size, and lifestyle patterns varies across the regions. Another reason could be the differences in institutional setting and work demand. Bowen University being a private institution, may place stricter emphasis on work routines and lifestyle discipline compared to large public university like the University of Benin, which may have more sedentary work patterns, less structured wellness support, and greater exposure to occupational stress.

The mean SBP (137.58 mmHg) and DBP (83.38 mmHg) both fall above the normal threshold (≤120/80 mmHg) (*NHLBI, NIH*, 2024), suggesting that the respondents, on average, are in the pre-hypertensive to hypertensive range. This could be due to factors like inadequate stress management and overthinking, as many respondents reported experiencing significant personal life challenges.

Physical activity assessment revealed that 41.6 % of respondents exhibited low physical activity, whereas 38.4 % reported high activity, indicating a wide variation in activity levels across the group. This implies that over 40% of the population is physically inactive, which is a known modifiable risk factor for obesity and cardiovascular disease (Alodhialah, Almutairi and Almutairi, 2025). Differences in activity levels may be due

to the disparity in participant mobility patterns. Those who drive frequently exhibit lower activity levels than those who rely on walking for transportation.

The lifestyle and behavioural risk assessment showed generally favourable results among respondents. This study's finding showed a low risk for alcohol misuse indicated by low mean AUDIT score, and moderate adherence to healthy eating indicated by mean REAP-S score. However, the prevalence of overweight and obesity suggests that their apparent acceptable dietary habits are insufficient to maintain a healthy weight. This imbalance may be due to factors beyond basic food choice, such as portion control, food preparation methods, or a lack of physical exercise. In addition, the findings indicate that smoking prevalence among the respondents is extremely low. The low prevalence of tobacco use among this population implies that it is not a significant cardiovascular risk factor in this population, as both current and past smoking habits are rare. This may be due to sociocultural influences, awareness of the health risks of smoking, or workplace health policies that discourage tobacco use (Gao *et al.*, 2011; Wickramasinghe *et al.*, 2021).

The Pearson correlation analysis in the present study revealed no significant relationship between age and major cardiovascular disease risk factors such as SBP, DB, diet, Alcohol consumption, smoking, physical inactivity and BMI. However, a review by Dhingra and Vasan, (2012) showed that age independently increases CVD risk, even as traditional risk factors remain primary determinants. The variability could be due to the fact that this study focused on a relatively small, specific workforce population which may not yet exhibit strong age-related variations in cardiovascular risk factors, either

because many are still within a relatively healthy or working-age bracket. In contrast, the review by Dhingra and Vasan, (2012) seems to come from broader, large-scale epidemiological evidence across diverse populations and age ranges, where the cumulative effects of aging on vascular changes, metabolism, and organ function are more evident. Also, Adedoyin *et al.*, (2018) reported the presence of a statistical significant association between age and CVD risk level among senior staff members in the Obafemi Awolowo University, Ile-Ife, Nigeria. This disparity in results could as well be due to the difference in population, as Adedoyin *et al.*, (2018) used all senior academics and non-academic staff on the salary grade level of 7 and above, with a substantial amount of participants in age range greater than 55 years.

It was also observed from the present study, that there were no statistically significant gender differences in SBP, DBP, physical activity levels, or diet quality (REAP-S). This suggests that, for these particular risk factors, both male and female staff exhibit similar patterns. However, the analysis revealed significant gender differences in alcohol use disorders (AUDIT) scores and body mass index (BMI), with females having a higher mean for obesity and males having a higher mean for alcohol use disorders. Hence, male and female staff differ in their alcohol consumption patterns and weight status. This implies that gender may play an important role in shaping lifestyle-related CVD risk factors such as drinking behaviour and obesity, while having less influence on blood pressure, diet, and physical activity within this population. This agrees with Caglayan-Akay, Ertok-Onurlu and Komuryakan (2023), whose study also claims a body mass index gap among males and females as a result of differences in some potential socio-demographic and behavioural factors. A study conducted by Udobong (2024) at the

University of Uyo also revealed a significant difference in BMI among Education Faculty staff, finding that female staff members had a substantially higher average BMI than their male counterparts. In addition, a study by Ruisoto *et al.*, (2017) showed that problematic alcohol consumption was found to be significantly higher in men (19.1%) than women (6.8%), due to reported elevated perceived stress by the men.

The present study (also) shows no significant association between respondents' educational level, monthly income, and their BMI and Physical activity. Hence, the study results show that neither educational level nor income level had a significant influence on the BMI and the Physical activity of non-academic staff in the study population. This indicates that higher educational attainment doesn't automatically result in a healthier weight and activeness among non-academic staff. Even though tertiary education generally means better access to health information, this knowledge might not be effectively implemented in lifestyle choices regarding diet and physical activity. This aligns with Joseph-Shehu and Ncama (2018), who also reported high rates of overweight and obesity in their study among university staff in Nigeria. Similarly, Ansa, Oyo-Ita, and Essien (2008) revealed in their study that even in academic settings, important lifestyle changes are not widely adopted, regardless of educational background. Major contributors could be occupational factors like prolonged sitting and limited time, or lack of motivation to engage in exercises. The finding that income is not significantly associated with BMI implies that a high-income level does not guarantee a healthier body weight or increased physical activity. Staff across all income levels may be dealing with the same shared obstacles that affect their health, including high levels of job stress, time constraints, and a prevalence of unhealthy food options available at or near the

university campus irrespective of their socioeconomic status. However, this study's finding contrasts with evidence from more urbanized and diverse populations, such as studies by Gupta *et al.*, (2012); Davari, Maracy and Khorasani, (2019) and, Rosengren *et al.*, (2019) where higher income and education levels are associated with lower BMI and vice versa, likely due to better access to health-promoting resources and greater health consciousness.

The findings from this study indicate that educational level did not significantly influence blood pressure status among the non-academic staff, even though the mean SBP was slightly higher among those with secondary education, and DBP was somewhat higher among those with tertiary education. The fact that blood pressure readings are similar across all education levels in this study may be due to occupational hazards common to all non-academic staff. These shared workplace factors include sedentary tasks, psychological stress, and inconsistent eating habits, affecting employees regardless of their educational background. In contrast, studies in broader populations such as Liu *et al.* (2011), and Sun *et al.*, (2022) have reported lower blood pressure among the more educated, which may be due to better access to healthcare, health literacy, and income stability.

This study also reveals that the mean blood pressure levels were comparable across all income categories, suggesting that monthly income did not significantly influence the systolic or diastolic blood pressure of the non-academic staff. It is expected that higher income earners have an advantage in cardiovascular health because they have better access to healthcare, nutritious food, and exercise opportunities (Albert *et al.*, 2006;

Davari, Maracy and Khorasani, 2019). However, non-academic staff may often share workplace risk factors—like sedentary time, stress, and irregular meals—that can negate the health advantages typically associated with having a higher income.

5.2 Conclusion

In conclusion, there was a moderately high prevalence of certain cardiovascular disease risk factors, which include: Obesity, high blood pressure and low physical activity. Also, there was no significant correlation between age and socioeconomic status and cardiovascular disease risk factors among junior non-academic staff of the University of Benin. However, gender differences showed a significant influence on certain risk factors, particularly alcohol consumption and high body mass index (BMI), indicating that male and female staff exhibit differing patterns of lifestyle-related cardiovascular risks.

5.3 Recommendations

The University of Benin should implement regular workplace health promotion programs focusing on healthy weight management, blood pressure control, and increased physical activity by promoting short exercise breaks and fitness clubs to reduce sedentariness among junior non-academic staff.

Periodic cardiovascular health screenings (including blood pressure, BMI, and lifestyle assessments) should be conducted for all staff to enable early detection and management of risk factors.

In addition, since gender differences significantly influenced alcohol consumption and BMI, tailored interventions should be developed to address the specific lifestyle patterns of male and female staff for instance, targeted health talks or wellness challenges, as well as counselling services should also be made available to support behaviour change.

5.4 Implications for other study

For a more complete picture of CVD risk within the university, subsequent studies should use larger, more diverse staff samples and assess broader psychosocial and occupational variables. Future research should also explore the impact of occupational homogeneity (similar work routines and stress level) on the influence of socioeconomic differences in cardiovascular outcomes among university staff.

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APPENDICES

Appendix I: Informed consent

My name is IWU Akachi Ann, a final year student of the Department of Physiotherapy, School of Basic Medical Sciences, College of Medical Sciences, University of Benin, Benin City, Edo State. I am carrying out a research titled: **'PREVALENCE AND CORRELATES OF CARDIOVASCULAR DISEASES AMONG JUNIOR NON ACADEMIC STAFF IN THE UNIVERSITY OF BENIN'.** This research study will be conducted as part of the requirements for the award of Bachelor of Physiotherapy (B.PT). Your participation is voluntary, and you are permitted to ask questions about the study as well as withdraw at any time you desire. Your response will be strictly confidential and used solely for research purposes. Please kindly include your signature if you are willing to participate.

……... **……**

……..

PARTICIPANT'S SIGNATURE **RESEARCHER'S SIGNATURE**

Appendix II: Ethical Approval

RESEARCH ETHICS COMMITTEE
COLLEGE OF MEDICAL SCIENCES
UNIVERSITY OF BENIN, BENIN CITY, NIGERIA.

Chairman: Prof. F. A Imarhiagbe
MBChb, FMCP
Cert Clin Res and ethics (NIH), MD.
0803449092

P.M.B 1154, BENIN CITY
Email: researchethics.cms@gmail.com

Our Ref: CMS/REC/01/VOL.2/798 **Date: 13th July, 2025**

Re: PREVALENCE AND CORRELATES OF CARDIOVASCULAR DISEASE RISK FACTORS AMONG NON-ACADEMIC STAFF IN THE UNIVERSITY OF BENIN

Name of Principal Investigator: **IWU AKACHI ANN**
Department Of Physiotherapy,
School of Basic Medical Science,
College of Medical Sciences,
University of Benin.

REC Approval No: CMS/REC/2024/798

This is to inform you that the research described in the submitted proposal, the Informed Consent Forms and other participant information materials have been reviewed and approved by the College Research Ethics Committee, University of Benin.

This approval dates from **13th July, 2025 to 12th July, 2026.** In multi-year research, Endeavour to submit your annual report to the REC early in order to obtain renewal of your approval and avoid disruption of your research.

The National Code of Health Research Ethics requires you to comply with all institutional guidelines, rules and regulations and with the tenets of the code including ensuring that all adverse events are reported promptly to the REC. No, changes are permitted in the research without prior approval by REC except in circumstances outlined in the code. REC reserves the right to conduct compliance visit to your research site without prior notice. Thank you.

PROF. F.A IMARHIAGBE
Chairman, REC

Appendix III: Demographic characteristics

The instrument for this study is a structured, interviewer-administered questionnaire composed of three major sections.

I. **Demographic characteristics** consist of items designed to obtain basic socio-demographic data of respondents, including:

a. **Age:** (in completed years)
b. **Gender:** Male / Female / Other
c. **Marital Status:** Single / Married / Divorced / Widowed
d. **Highest Educational Qualification:** No formal education / Primary education / Secondary education / Tertiary education (OND, HND, B.Sc., etc.) / Postgraduate education
e. **Job Cadre:** Junior / Senior
f. **Monthly Income:** Less than ₦50,000 / ₦50,000 – ₦100,000 / ₦101,000 – ₦200,000 / ₦201,000 – ₦300,000 / Above ₦300,000

Appendix IV: The Alcohol Use Disorders Identification Test (AUDIT)

The Alcohol Use Disorders Identification Test: Self-Report Version

PATIENT: Because alcohol use can affect your health and can interfere with certain medications and treatments, it is important that we ask some questions about your use of alcohol. Your answers will remain confidential so please be honest. Place an X in one box that best describes your answer to each question.

Questions	0	1	2	3	4	
1. How often do you have a drink containing alcohol?	Never	Monthly or less	2-4 times a month	2-3 times a week	4 or more times a week	
2. How many drinks containing alcohol do you have on a typical day when you are drinking?	1 or 2	3 or 4	5 or 6	7 to 9	10 or more	
3. How often do you have six or more drinks on one occasion?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
4. How often during the last year have you found that you were not able to stop drinking once you had started?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
5. How often during the last year have you failed to do what was normally expected of you because of drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
6. How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
7. How often during the last year have you had a feeling of guilt or remorse after drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
8. How often during the last year have you been unable to remember what happened the night before because of your drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
9. Have you or someone else been injured because of your drinking?	No		Yes, but not in the last year		Yes, during the last year	
10. Has a relative, friend, doctor, or other health care worker been concerned about your drinking or suggested you cut down?	No		Yes, but not in the last year		Yes, during the last year	
					Total	

Appendix V: MacArthur Subjective Social Status Pictorial Ladder Tool

MacArthur Scale of Subjective Social Status - Adult Version

Age: Adult

Duration: < 3 minutes

Reading Level: 6th to 8th grade

Number of items: 2

Answer Format: 1-10 placement on the ladder

Scoring:

The Socioeconomic Status Ladder subscale item is Q1. The Community Ladder subscale item is Q2.

Each rung of the ladder corresponds with numbers from 1 through 10. If a participant marks an "X" on the bottom rung, their response is scored as *1*. If they mark an "X" on the middle rung, their response is scored as *5*. If they mark an "X" on the top rung, their response is scored as *10*.

Instructions: Think of this ladder as representing where people stand in the United States. At the **top** of the ladder are the people who are the best off – those who have the most money, the most education, and the most respected jobs. At the **bottom** are the people who are the worst off – those who have the least money, least education, the least respected jobs, or no job. The higher up you are on this ladder, the closer you are to the people at the very top; the lower you are, the closer you are to the people at the very bottom.

Where would you place yourself on this ladder?

Please place a large **"X"** on the rung where you think you stand at this time in your life relative to other people in the United States.

Instructions: Think of this ladder as representing where people stand in their communities. People define community in different ways; please define it in whatever way is most meaningful to you. At the **top** of the ladder are people who have the highest standing in their community. At the **bottom** are the people who have the lowest standing in their community.

Where would you place yourself on this ladder?

Please place a large **"X"** on the rung where you think you stand at this time in your life relative to other people in your community.

Appendix VI: International Physical Activity Questionnaire - Short Form

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the last 7 days. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the vigorous activities that you did in the last 7 days. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

1. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling?

_____ days per week

No vigorous physical activities Skip to question 3

2. How much time did you usually spend doing vigorous physical activities on one of those days?

_____ hours per day

_____ minutes per day

Don't know/Not sure

Think about all the moderate activities that you did in the last 7 days. Moderate

activities refer to activities that take moderate physical effort and make you breathe

somewhat harder than normal. Think only about those physical activities that you did

for at least 10 minutes at a time.

3. During the last 7 days, on how many days did you do moderate physical

activities like carrying light loads, bicycling at a regular pace, or doubles tennis?

Do not include walking.

_____ days per week

No moderate physical activities Skip to question 5

SHORT LAST 7 DAYS SELF-ADMINISTERED version of the IPAQ. Revised August 2002.

4. How much time did you usually spend doing moderate physical activities on one

of those days?

_____ hours per day

_____ minutes per day

Don't know/Not sure

Think about the time you spent walking in the last 7 days. This includes at work and at

home, walking to travel from place to place, and any other walking that you have done

solely for recreation, sport, exercise, or leisure.

5. During the last 7 days, on how many days did you walk for at least 10 minutes

at a time?

_____ days per week

No walking Skip to question 7

6. How much time did you usually spend walking on one of those days?

_____ hours per day

_____ minutes per day

Don’t know/Not sure

The last question is about the time you spent sitting on weekdays during the last 7

days. Include time spent at work, at home, while doing course work and during leisure

time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or

lying down to watch television.

7. During the last 7 days, how much time did you spend sitting on a week day?

_____ hours per day

_____ minutes per day

Don’t know/Not sure

Appendix VII: REAPS (Rapid Eating Assessment for Participants - Shortened Version)

REAPS (Rapid Eating Assessment for Participants - Shortened Version)

CJSegal-Isaacson, EdD RD, Judy-Wylie-Rosett, EdD RD, Kim Gans., PhD, MPH

In an average week, how often do you:	Usually/ Often	Sometimes	Rarely/ Never	Does not apply to me
1. Skip breakfast?	O	O	O	
2. Eat 4 or more meals from sit-down or take out restaurants?	O	O	O	
3. Eat less than 2 servings of whole grain products or high fiber starches a day? **Serving** = 1 slice of 100% whole grain bread; 1 cup whole grain cereal like Shredded Wheat, Wheaties, Grape Nuts, high fiber cereals, oatmeal, 3-4 whole grain crackers, ½ cup brown rice or whole wheat pasta, boiled or baked potatoes, yuca, yams or plantain.	O	O	O	
4. Eat less than 2 servings of fruit a day? **Serving** = ½ cup or 1 med. fruit or ¾ cup 100% fruit juice.	O	O	O	
5. Eat less than 2 servings of vegetables a day? **Serving** = ½ cup vegetables, or 1 cup leafy raw vegetables.	O	O	O	
6. Eat or drink less than 2 servings of milk, yogurt, or cheese a day? **Serving** = 1 cup milk or yogurt; 1½ - 2 ounces cheese.	O	O	O	
7. Eat more than 8 ounces (see sizes below) of meat, chicken, turkey or fish per day? ***Note:** 3 ounces of meat or chicken is the size of a deck of cards or ONE of the following: 1 regular hamburger, 1 chicken breast or leg (thigh and drumstick), or 1 pork chop.*	O	O	O	Rarely eat meat, chicken, turkey or fish O
8. Use regular processed meats (like bologna, salami, corned beef, hotdogs, sausage or bacon) instead of low fat processed meats (like roast beef, turkey, lean ham; low-fat cold cuts/hotdogs)?	O	O	O	Rarely eat processed meats O
9. Eat fried foods such as fried chicken, fried fish, French fries, fried plantains, tostones or fried yuca?	O	O	O	
10. Eat regular potato chips, nacho chips, corn chips, crackers, regular popcorn, nuts instead of pretzels, low-fat chips or low-fat crackers, air-popped popcorn?	O	O	O	Rarely eat these snack foods O
11. Add butter, margarine or oil to bread, potatoes, rice or vegetables at the table?	O	O	O	
12. Eat sweets like cake, cookies, pastries, donuts, muffins, chocolate and candies more than 2 times per day.	O	O	O	
13. Drink 16 ounces or more of non-diet soda, fruit drink/punch or Kool-Aid a day? ***Note:** 1 can of soda = 12 ounces*	O	O	O	
	YES			NO
14. You or a member of your family usually shops and cooks rather than eating sit-down or take-out restaurant food?	O			O
15. Usually feel well enough to shop or cook.	O			O
16. How willing are you to make changes in your eating habits in order to be healthier?	1 Very willing	2	3	4	5 Not at all willing

Appendix VIII: PMBC Smoking Questionnaire

SMOKING STATUS

1. Do you currently smoke cigarettes, cigars, or a pipe ON A DAILY BASIS?

O NO (SKIP TO# 2) O YES O *Don't know* O *Refused*

1a. On average, how many of EACH do you smoke per day?

_____ cigarettes

_____ cigars

_____ bowls of tobacco O *Don't know* O *Refused*

1b. How soon after you wake up do you usually smoke your first cigarette, cigar, or bowl of tobacco?

_____ minutes → (GO TO PHYSICAL ACTIVITY FORM)

O *Don't know* O *Refused*

[ASK QUESTIONS 2 TO 2b IF RESPONDENT DOESN'T CURRENTLY SMOKE ON A DAILY BASIS.]

2. Did you EVER smoke cigarettes, cigars, or a pipe on a daily basis?

O NO (SKIP TO# 3) O YES O *Don't know* O *Refused*

2a. When you were smoking your heaviest, how many of EACH did you smoke on an average day?

_____ cigarettes

_____ cigars

_____ bowls of tobacco O *Don't know* O *Refused*

2b. When did you quit smoking on a daily basis? (month and year)

_____ (NOW GO TO# 3 -- NEXT PAGE)

O *Don't know* O *Refused*

SMOKING STATUS

3. Do you currently smoke cigarettes, cigars, or a pipe ON A LESS THAN DAILY BASIS?

O NO (GO TO PHYSICAL ACTIVITY FORM) O YES O *Don't know* O *Refused*

3a. What do you smoke? [CHECK ALL THAT APPLY]

☐ cigarettes

☐ cigars

☐ pipe O *Don't know* O *Refused*

3b. On average, how often do you smoke? [CHECK ONE]

O at least once a week
O at least once a month
O less than once a month O *Don't know* O *Refused*