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PREVALENCE OF HYPERTENSION AND ASSOCIATED RISK FACTORS AMONG HEALTH WORKERS IN TWO REFERRAL HOSPITALS IN THE EASTERN REGION, GHANA

SUBMITTED BY

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DECLARATION

Candidate's Declaration

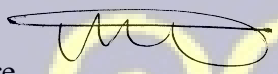
I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this College or elsewhere.

Candidate's Signature……  …… Date: 3rd December 2025

Name: Kwame Ofori-Koramoah

Supervisors' Declaration

I hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of the thesis laid down by University of Ghana.

Principal Supervisors' Signature……  Date: 3rd December 2025

Name: Dr Ibrahim Issah

DEDICATION

This thesis is dedicated to my family, friends, and loved ones for their unwavering support, encouragement and great love shown me throughout this journey.

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ABSTRACT

Background: High blood pressure is a primary factor contributing to illness and death worldwide, and it is increasingly recognized as an important issue in medicine and public health. This notwithstanding, the burden of hypertension and associated risk factors among health workers in referral hospitals considering the high-stress environment of hospitals, combined with long working hours, irregular shifts, and the demanding nature of the job remains prevalent.

Aim: To determine the prevalence of hypertension and associated risk factors among health workers in two referral hospitals in the Eastern Region, Ghana

Method: A cross-sectional design was be used to measure the prevalence of hypertension and associated risk factors among health workers in two referral hospitals in the Eastern Region of Ghana. Semi-structured questionnaires was used to collect data on background characteristics, awareness and risk factors of hypertension. Blood pressure levels were measured using a digital blood pressure monitor. Descriptive statistics such as means, standard deviation, frequencies and percentages were used to summarize data on background characteristics and risk factors. The chi-square test was used to determine the association between hypertension and independent variables. Multiple variable logistic regression was used to determine factors associated with hypertension.

Results: The majority of health workers 115 (70.1%) were from Eastern Regional Hospital, while 49 (29.9%) were from St. Dominic Hospital. Prevalence of hypertension was 13 (7.9%) while 46.3% of health workers were pre-hypertensive. Of the 13 participants with hypertension, 30.4% had stage 1 hypertension while 69.6% had stage 2 hypertension. The prevalence was higher

among nurses compared to other cadre. Nurses were 1.78 times more likely to have hypertension compared to physicians [AOR=1.78 (95% CI: 1.05 – 12.10); p=0.006]. In addition, health workers who are obese were 2.04 times more likely to develop hypertension compared to those with normal BMI [AOR=2.04 (95% CI: 1.51 – 2.77); p=0.025]. However, health workers with moderate salt intake were 32% less likely to have hypertension compared to those with high salt intake [AOR=0.68 (95% CI: 0.19 – 0.99); p=0.011].

Conclusion: The study found low prevalence of hypertension among healthcare workers, with a significant proportion classified as pre-hypertensive. Nurses were 1.78 times more likely to have hypertension compared to physicians. Also, health workers who are obese were 2.04 times more likely to have hypertension compared to those with normal BMI. However, health workers with moderate salt intake were 32% less likely to have hypertension compared to those with high salt intake.

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LIST OF ABBREVIATIONS

BMI	Body Mass Index
CT	Computed Tomography
DALYs	Disability Adjusted Life Years
DSMB	Data Safety Monitoring Board
FDA	Food and Drug Authority
HTP	Hypertension Prevention
MRI	Magnetic Resonance Imaging
NCDs	Non-Communicable Diseases
NHANES-III	National Health and Nutrition Examination Survey
WHO	World Health Organization

CHAPTER ONE
INTRODUCTION

1.1Background

Hypertension is often asymptomatic but continuously damages the cardiovascular system, increasing the risk of stroke, myocardial infarction, chronic renal disease, and other cardiovascular conditions. Hypertension is characterized by a blood pressure (BP) reading of 140/90 mm Hg or higher. Individuals with blood pressure exceeding ideal levels (systolic BP of 140 mm Hg or greater, or diastolic BP of 90 mm Hg or higher) are regarded as having hypertension (Flack & Adekola, 2020). Historically seen as a disease of wealth, hypertension now affects more people in Africa than in Europe and the USA, with a growing prevalence among poorer populations (van de Vijver, 2010). By 2008, nearly one billion individuals globally developed hypertension, primarily in resource-poor countries (Peer, 2013). In 2019, there were 640,239 fatalities and 2,717,474 years lived with disability (YLDs) due to cardiovascular diseases (CVDs) related to hypertension among young adults worldwide, marking a 43.0% and 86.6% increase since 1990, respectively. During the same timeframe, the mortality rate saw a reduction of 10.5%, while the YLD rate experienced an increase of 16.8% (Liu et al., 2021).

Hypertension, once thought to be a disease of urban settlements, is now also increasing in rural areas in Africa (Sola et al., 2013). High blood pressure is a common cardiovascular condition that impacts at least 20% of adults in numerous nations and is a primary contributor to cardiovascular-related deaths, responsible for 20-30% of deaths (Patil, 2014). It poses a major challenge for global public health because of its widespread occurrence and the related dangers of cardiovascular incidents and kidney disorders. Hypertension is the leading risk factor for death and ranks third in its contribution to disability-adjusted life years. In 2002, approximately 600 million individuals

worldwide suffered from hypertension, resulting in 7.1 million deaths each year, which accounts for 13% of total worldwide fatalities, and leading to 57 million Disability Adjusted Life Years (DALYs) (Ahmed et al., 2014). In Ghana, the prevalence of hypertension among individuals was estimated to be 27.3% after screening over 3000 individuals. Two-thirds of the hypertensives were unaware of their hypertension status, and only 49.5% with a history of hypertension on medication were controlled (Tannor et al., 2022). In another study, 53.7% of adults were hypertensive, and the prevalence tends to increase with increasing age (Dai et al., 2022).

Numerous risk factors contribute to the development of hypertension: age, geographic location, genetic predisposition, ethnicity, and dietary habits (Kurtul et al., 2020a; Moussouni et al., 2022; Ogunniyi et al., 2021; Reddy et al., 2021; Sharma et al., 2021). Job-related factors are also considered major risk factors for high blood pressure (Barbini et al., 2017). The occurrence of hypertension has been observed to differ across different occupational categories; certain studies have indicated that the prevalence among bankers is 52.4%, while for police officers, it stands at 22% (Kumar et al., 2023; Shitu & Kassie, 2021). However, one study found consistent prevalence among rural and urban population (Bosu & Bosu, 2021) while others reported a prevalence of 3% to 40% among hospital employees (Mwale et al., 2024). Job stress, known as work-related or occupational stress, is described by the National Institute for Occupational Safety and Health (NIOSH) as the detrimental physical and emotional responses that occur when the demands of a job surpass the capabilities, resources, or needs of workers (Punnett, 2022).

The workplace plays a significant role in influencing the well-being and health of employees. Exposure to stressful working conditions, or job stressors, can adversely affect workers' health (Trudel et al., 2018). Studying hypertension prevalence and associated factors among health

workers has become crucial, following its significant implications for overall well-being and job performance. By understanding the prevalence of hypertension, healthcare facilities can implement preventive measures and interventions to reduce the risk among their staff. Additionally, identifying the associated factors enables healthcare professionals to take necessary steps to mitigate these risks and promote a healthier work environment. Comprehensive reviews are essential to provide a thorough understanding of the prevalence of hypertension and its associated factors among healthcare workers, especially considering the increasing burden of hypertension and the heightened exposure to work-related stressors in this group. The research objectives include determining the current prevalence rate of hypertension among healthcare staff and identifying the specific risk factors contributing to hypertension within this population.

1.2 Problem Statement

Hypertension poses a major public health challenge globally and is one of the primary contributors to cardiovascular diseases, stroke, and various other health issues. Healthcare professionals face a variety of stress-related risk factors, including long shifts, high workloads, tight deadlines, complicated tasks, inadequate breaks, repetitiveness, and unfavorable working conditions (AlMuammar et al., 2022; Babapour et al., 2022; Marković et al., 2024; Odonkor & Adams, 2021; Portoghese et al., 2014). Moreover, throughout treatment processes, they face challenges such as extended hours on their feet, sleeplessness from night shifts, and inconsistent eating habits caused by their workload (Wickwire et al., 2017). Hospitals, which encompass many occupational risk factors, are classified as very dangerous workplaces (Ekrami et al., 2024). In Ghana, as in many other countries, the burden of hypertension is substantial and continues to rise. National data indicate that

hypertension prevalence in the general adult population ranges between 30–34% (Awuah et al., 2019; Bosu et al., 2021). While numerous studies have explored hypertension in various populations, there is a gap in understanding its prevalence and associated factors among healthcare workers.

Hypertension remains a significant and growing concern among healthcare workers in referral hospitals, particularly in developing countries. The prevalence of this condition highlights a critical challenge to health within the medical community itself. For instance, a study by Gyang et al. (2018) in Nigeria found that approximately 41.9% of health workers were affected by hypertension. Similarly, research conducted in Ghana revealed that 29.3% of healthcare workers in a referral hospital were diagnosed with hypertension, with only 8.6% of those diagnosed being aware of their hypertensive status (Agyemang Pambour et al., 2023). This low awareness underscores the urgent need for improved screening and health education programs targeting healthcare workers to address this hidden burden effectively.

Despite advancements in healthcare and increased awareness, hypertension remains a significant concern among healthcare workers (Tannor et al., 2022). However, comprehensive data on hypertension prevalence among health workers are scant. This knowledge gap hinders the development of targeted interventions to effectively address hypertension among healthcare workers. Without a clear understanding of the problem's scope and the underlying factors influencing the prevalence of hypertension, efforts to prevent and manage this condition may be suboptimal.

Therefore, it is imperative to conduct a thorough investigation into the prevalence of hypertension among workers in high-stress facilities such as referral hospitals. Uncontrolled hypertension inadvertently results in cardiovascular diseases, stroke, myocardial infarction, and end-stage renal failure (Khanam et al., 2019). In previous years, hypertension and cardiovascular diseases were thought to affect only men (Gudmundsdottir et al., 2012). However, recent literature proves otherwise. Deaths resulting from hypertension and cardiovascular diseases have been documented to be on the rise among women (Gudmundsdottir et al., 2012).

This condition can also cause higher absenteeism and reduced productivity, complications during pregnancy for female workers, and mental health issues such as stress and depression (Marwaha, 2022). Additionally, the economic burden of treating hypertension-related complications can be substantial, and the overall quality of patient care may decline. Ultimately, unmanaged hypertension can significantly increase morbidity and mortality rates among health workers, underscoring the importance of proper management and intervention. Also, given the differences in institutional features, work-related pressures, and healthcare access between Eastern Regional Hospital and St. Dominic Hospital, a comparative study on hypertension among medical staff is important. Eastern Regional Hospital, a government referral hospital, might be subject to more administrative demands and patient loads, while St. Dominic, a mission hospital, might provide a distinct work atmosphere and resources. These differences may have an impact on the prevalence of hypertension and staff members' health-seeking habits.

1.3 Justification

The rising prevalence of hypertension is mirrored in the increasing rates of stroke and cardiovascular disease mortality in developing countries like Ghana. Data reveals that awareness, treatment, and control of hypertension are unacceptably low, as healthcare resources are often overwhelmed by other priorities. Additionally, most research focuses on the general population, with limited attention to healthcare workers. Therefore, understanding the prevalence of hypertension in various occupational subgroups is essential for developing prevention and treatment plans. Therefore, the current study was conducted in one of Ghana's largest hospitals, employing staff in diverse roles. The study determined the prevalence of hypertension and explored the relationship between hypertension, socio-demographic factors, and stress. By addressing these research gaps, this study aims to contribute valuable insights to the field of occupational health and hypertension management, specifically for healthcare workers at the Eastern Regional Hospital. The findings would be valuable in designing targeted health education and intervention programs to address hypertension in this specific group. Also, findings would be valuable to the Ghana Health Service as well as other institutions in prioritizing interventions to support healthcare workers with hypertension.

1.4 Study Objectives

1.4.1 General Objective

To assess the burden of hypertension and identify the key sociodemographic, lifestyle, and occupational factors contributing to its occurrence among healthcare workers in two referral hospitals in the Eastern Region of Ghana.

1.4.2 Specific Objectives

1. To determine the prevalence of hypertension among health workers
2. To assess risk factors associated with hypertension among health workers

1.5 Conceptual Framework

Non-modifiable factors like age and sex play a critical role in the occurrence of high blood pressure. Aging may cause the blood vessels to narrow and the walls to stiffen due to a condition called atherosclerosis and this could lead to increased blood pressure. Engaging in physical activity offers advantages for heart function, helps combat insulin resistance and inflammation within the body, encourages vasodilation, and decreases blood resistance. Moreover, weight loss associated with physical activity can aid in lowering blood pressure. It supports cardiovascular health, facilitates weight reduction, and enhances peripheral arterial resistance, potentially clarifying the link between physical activity and hypertension prevalence. Furthermore, physical exercise may alleviate stress-related mental health issues such as anxiety and depression, thus assisting in blood pressure management and lowering the risk of hypertension. However, a high sodium diet can play a role in the onset of hypertension, and sodium excretion, which serves as an indirect measure of sodium intake, is strongly associated with blood pressure levels in individuals with hypertension. An increase in dietary sodium can result in greater sodium retention, subsequently elevating venous tone and overall blood volume, which contributes to the onset of hypertension.

To effectively address hypertension in the proposal, it is imperative to integrate contextual factors such as socioeconomic status, healthcare access, cultural dietary norms, and environmental stressors. These factors not only shape the prevalence and management of hypertension but also determine the success of intervention strategies. By considering these elements, the proposal ensures a comprehensive approach that aligns with the lived realities of the target population,

thereby enhancing the likelihood of impactful outcomes.

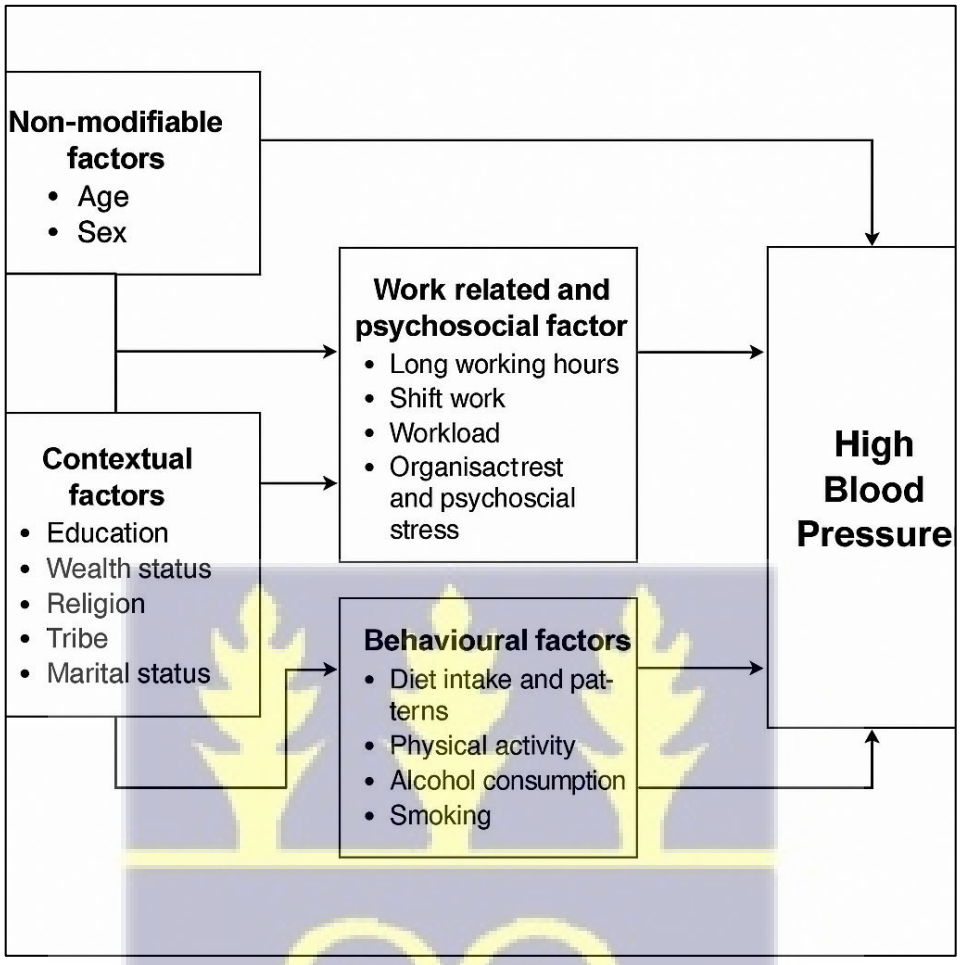

Figure 1: Conceptual Framework

CHAPTER TWO
2.0 LITERATURE REVIEW

2.1 Overview of hypertension

With approximately 9.4 million deaths annually, hypertension stands as one of the leading causes of premature mortality globally, and the situation is worsening. In the WHO AFRO Regions, it accounts for about 1.5 million deaths each year, making it the primary cause of death (Aldemir, Pektas, Parlar, & Emren, 2015). Despite its rising prevalence worldwide, hypertension is often called a "silent killer." The American Association of Public Health defines hypertension as arterial blood pressure exceeding "120/80mmHg," considered normal blood pressure (Abebe et al., 2024). Elevated blood pressure leads to excessive pressure in the arteries, causing the heart to work harder and beat more rapidly. Most studies have shown that lifestyle factors significantly contribute to hypertension, highlighting the importance of early intervention to manage these risk factors before they accumulate over time (Burnier & Egan, 2019; Valenzuela et al., 2021; van Oort et al., 2020). It's crucial for the general population to be informed about the causes, long-term effects, and control measures for high blood pressure. In Africa, the risk of non-communicable diseases, including hypertension, is increasingly significant. Reports from WHO African regions estimate the prevalence to be between 30% and 40% (Okello et al., 2020). However, data from national surveys are often insufficient, underscoring the need for more comprehensive research.

Non-communicable diseases (NCDs) are a significant cause of illness, disability, and mortality in Ghana. As the population ages, urbanization accelerates, and unhealthy lifestyles become more common, the burden of NCDs is expected to increase (Ministry of Health, 2011). Ofori-Asenso and Garcia (2015) reported that the percentage of women aged 15 to 49 who are overweight or obese rose from 13% in 1993 to 30% in 2008. With this in mind, it's not surprising that 9% of

adults in Ghana have diabetes and up to 48% have hypertension. However, Charles and Agyemang (2006) found that awareness, access, and control of hypertension are severely lacking in both urban and rural areas of Ghana.

2.2 Prevalence of hypertension among healthcare workers

The effects of hypertension on healthcare workers are especially profound, given the high demands of their roles and the additional stress they encounter in their work environments. A recent systematic review indicated that the occurrence of hypertension in healthcare workers varies between 13% and 40% (Nkhama et al., 2021). An earlier systematic review conducted in 2015 reported a prevalence of 17.5 to 37.5% (Bosu et al., 2015). This prevalence is higher than those reported in previous studies in India (9.20%), Iran (8.60%), and Ghana (16.07%) (Sahebi, Vahidi and Mousavi, 2010; Ahmed, Jadhav and Sobagaiah, 2018; Osei-Yeboah et al., 2018). This could be due to earlier research involving participants younger than 30, which omitted individuals with hypertension and diabetes, and was carried out in various environments, particularly primary care facilities in rural areas.

In other cross-sectional studies, a prevalence of 20.1% was observed among healthcare workers in Nigeria (Owolabi et al., 2015), 35.3% in Nepal (Ghimire et al., 2020), 28.9% in China (Zhao et al., 2019) and 21.8% in Singapore (Pereira et al., 2021), 25.4% among doctors in India (Hegde et al., 2015), and 13.5% in Kenya (Onyango et. al., 2017). A much lower prevalence however observed of 14.8% was observed in Turkey (Kurtul et al., 2020b). A much higher prevalence of hypertension was reported in Thailand (39.3%) (Sirinara, et al.,2019) and 52% in South Africa (Monakali et al., 2018).

2.3 Behavioral risk factors associated with hypertension

According to Pradeepa (2013), hypertension affects seven out of ten patients with diabetes and is twice as common in those with the disease compared to those without it. By age 40, about 40% of individuals with type 2 diabetes will experience hypertension; by age 75, this figure rises to 60% (MI, 2000). The third National Health and Nutrition Examination Survey (NHANES-III) reported that nearly 60% of diabetics with a prior diagnosis of hypertension and 31% of all diabetics cannot manage their blood pressure below 140/90 mmHg (Lim, 2009). Similarly, research conducted in Gondar, northern Ethiopia by Awoke and colleagues revealed that out of 679 respondents, 47 had diabetes, indicating a prevalence rate of 6.9%. Approximately 70% of these diabetics also had hypertension. The harmful use of alcohol is one of the main global risk factors for premature deaths and disabilities (WHO, 2009).

A significant portion of this burden is due to liver cirrhosis, cardiovascular disease, and cancer. Over time, alcoholics have shown a higher likelihood of developing hypertension (HPT), which may be the most frequent cause of secondary HPT. While excessive alcohol consumption raises the risk of HPT, there is still debate regarding the link between light and moderate drinking (Briasoulis et al., 2012). A recent study by Manimunda and colleagues, conducted among a specific tribe on Nicobar Island, India, between 2007 and 2009, found that 54% of the 1,270 respondents were alcoholics and exhibited a connection between alcohol use and hypertension (Manimunda et al., 2011). In a similar vein, Briasoulis et al.'s systematic review and meta-analysis study, which involved 33,904 men and 193,752 women, found that the risk of HPT in men varies from 14% to 35% based on daily alcohol use. Additionally, Bissa and associates showed that 41.2% of alcoholics had HPT, and that the likelihood of hypertension was 2.84 times higher for

alcohol users than for non-users (Bissa et al., 2012). In a similar vein, Steyna's research conducted in South Africa discovered that alcohol users had a 1.34 times higher chance of developing HPT than non-users (Steyna, 2005).

In a study conducted in Uganda, Wamala JF and colleagues examined the common factors associated with high blood pressure in the Rukungiri district. Their findings revealed that individuals who currently consumed alcohol had a 1.6-fold increased risk of hypertension compared to those who had never consumed alcohol. Additionally, former alcohol users had a 2.3-fold increased risk of developing hypertension (Wamala et al., 2006).

2.4 Predisposing and Contextual Factors Influencing Hypertension

Contextual factors (e.g. age, sex) that influence hypertension among the adult population as well as health workers, are numerous. Some have been documented to include urbanization and modernization (Addo et al., 2006). In studies conducted in Ethiopia, increasing age was isolated as a factor that influenced the development of hypertension (Shukuri et al., 2019). In the Eastern Mediterranean and Middle Eastern regions, a high prevalence of hypertension has been attributed to rapid social and socio-economic changes (Eghbali et al., 2018). Some studies have discovered that the prevalence of hypertension increases with increasing age (Dosoo et al., 2019). It has been explained that arterial stiffening, which happens as a result of aging is the contributing factor to the development of the disease condition among the elderly (AlGhatrif et al., 2013). Among women, determining factors that influence the development of hypertension have been noted to include the black race, lower socioeconomic status, overweight and obesity, and history of cardiovascular disease (Gudmundsdottir et al., 2012). Some factors influence the development of hypertension which are non- modifiable, such as race and age. However, among the identified

influences, some factors are modifiable, such as obesity, dietary intake, physical activity/exercise, and socioeconomic status. Overall, it is noteworthy that individual characteristics are determinants of blood pressure levels, as well as environmental exposures including the individual's place of work (Vinholes et al., 2017).

2.5 Occupational and Work-Related Risk Factors for Hypertension

Long working hours, shift work, a heavy workload, and workplace stress have all been identified as significant risk factors for hypertension among healthcare workers. A cross-sectional study conducted at the 37 Military Hospital in Accra, Ghana, found that 7% of healthcare professionals had hypertension, with 48% working shifts. The study discovered a strong link between high job strain and hypertension, implying that work-related stress is a contributing factor to high blood pressure in this population. Furthermore, a systematic review and meta-analysis of the association between workplace noise exposure and hypertension risk discovered that being exposed to high levels of industrial noise increases the chance of developing hypertension (Bolm-Audorff et al., 2020). A comprehensive study of occupational risk factors for hypertension also revealed workplace stress, shift work, and noise exposure as major contributions to elevated hypertension risk. The study emphasised the importance of targeted interventions to prevent hypertension in the working population by targeting these modifiable risk factors (Kang, 2022).

2.6 Awareness, Screening, and Management of Hypertension Among Healthcare Workers

Effective prevention and management of hypertension require an understanding of healthcare staff's knowledge, attitudes, and screening practices. Giving patients consistent and pertinent information is crucial, according to a study evaluating nurses' and primary care doctors' knowledge, attitudes, and practices about hypertension. According to the study, improving hypertension control necessitates that all primary healthcare providers have a common set of fundamental information, have a positive outlook, and place a high focus on managing

hypertension (Myanganbayar et al., 2019). Furthermore, a Ghanaian study on hypertension knowledge, attitudes, and practices discovered that positive attitudes towards screening and early health-seeking behaviours depend heavily on having good knowledge. According to the study, there is a strong perception of the medication's involvement in managing hypertension. This suggests that awareness efforts should focus on areas where perceptions are poor, like blood pressure monitoring, dietary and lifestyle changes, risk factor comprehension, and the effect of stress (Singh et al., 2024).

Effective blood pressure control requires healthcare providers who are also patients to follow hypertension management recommendations. Studies have revealed that adherence is frequently below ideal, though. For example, just 19.5% of patients were managed in accordance with the standards, according to a study on compliance with hypertension management guidelines. For 62.0% of patients, the majority of medical professionals followed pharmacological antihypertensive therapy procedures; 38.0% did not (Ataro et al., 2023). Suboptimal blood pressure control is a result of physicians' noncompliance with clinical standards for managing hypertension, according to another study (Burnier, 2024).

2.7 Health System and Policy Interventions for Hypertension Control

In order to reduce the risk of hypertension among healthcare professionals, it is essential to implement workplace wellness programs and policies. Such programs are excellent ways to reduce significant risk factors for cardiovascular illnesses, such as hypertension, according to a thorough assessment. Employee health outcomes are enhanced by these programs, which frequently include stress management, health tests, and lifestyle modifications (Carnethon et al., 2009). Employer-sponsored wellness programs supervised by chemists have shown significant decreases in blood

pressure and cholesterol levels, highlighting the importance of targeted interventions in healthcare settings (Misher et al., 2019). Furthermore, a study on workplace-based primary preventive interventions found that lifestyle changes could successfully lower blood pressure and prevent or delay the onset of hypertension, highlighting the value of such programs in the workplace (Hu et al., 2023).

Several interventions have been implemented at the global and regional levels to prevent hypertension in high-risk occupations. The World Health Organisation (WHO) has established a global aim of reducing hypertension prevalence by 33% between 2010 and 2030, demonstrating a commitment to addressing this vital health issue. These global initiatives are supplemented by regional efforts, such as workplace wellness programmes, which have successfully improved blood pressure control among workers in a variety of settings, indicating the efficacy of focused interventions in lowering hypertension risk.

CHAPTER 3
3.0 METHODOLOGY

3.1 Introduction

This chapter provides a concise overview of the study design and area, study population, sample size determination, sampling methods, data collection, data analysis, and ethical considerations.

3.2 Study Design

This study employed a cross-sectional design to assess the prevalence and determinants of hypertension among healthcare workers in two referral hospitals in the Eastern Region of Ghana. The study population comprised clinical healthcare workers across various professional cadres. Data were collected using a structured questionnaire and standardized anthropometric and blood pressure measurements. A multistage sampling procedure was used to select respondents, and both descriptive and inferential statistical analyses were conducted to address the study objectives.

3.3 Study sites

The study was conducted at the Eastern Regional Hospital in Koforidua and St Dominic Hospital in Akwatia. The Eastern Regional Hospital, referred to as Koforidua Regional Hospital, is a regional facility and a proposed teaching hospital located in Koforidua, within Ghana's Eastern region. Founded in 1926, the hospital is positioned in the New Jauben Municipality in the Eastern Region and has a capacity of 600 beds. The hospital is situated in the administrative capital of the Eastern Region of Ghana, located in the southeastern part of the country. The region spans 19,323 square kilometers, making up 8.1% of Ghana's total land area. Operating under the Ghana Health Service (GHS), the hospital offers comprehensive primary and specialist care across various medical disciplines, including Obstetrics and Gynaecology, Internal Medicine, Paediatrics, General Surgery, Dental Care, and Ophthalmology. It also serves as a referral centre for approximately 16 district hospitals, including those in the New Juaben Municipality. St. Dominic

Hospital (SDH) in Akwatia, a 357-bed not-for-profit Catholic medical facility in the Denkyembour district of the Eastern Region, functions as the primary referral centre for surrounding district hospitals. It started as a small clinic by The Dominican Sisters in 1960 and has developed into one of the largest mission hospitals in the country currently. The facility provides Internal medicine, general surgery, child health, Obstetrics and gynaecology, dental and ophthalmology services. In addition, it provides radiology services including CT scan and MRI services.

3.4 Study Population

The study population was derived from the broader pool of clinical healthcare workers employed at the Eastern Regional Hospital in Koforidua and St. Dominic Hospital in Akwatia. The target population consisted of all clinical health workers in these facilities, including physicians, physician assistants, nurses, midwives, and laboratory personnel. From this target population, a proportionately selected sample of healthcare workers was drawn using a multistage sampling procedure. This sampled group rather than all workers constituted the actual study population that participated in the survey and measurements.

3.5 Inclusion and exclusion criteria

3.5.1 Inclusion criteria

Clinical healthcare workers who:

1. **Are physicians, physician assistants, nurses, midwives, or laboratory personnel.**
2. **They are eighteen (18) years and above.**
3. **Have worked in the selected health facilities for more than six (6) months.**
4. **Provide informed consent to participate.**

3.5.2 Exclusion criteria

The following individuals were excluded from the study:

1. Health workers who meet the inclusion criteria but do not consent to participate.
2. Health workers who are unable to participate due to medical or physical conditions that would interfere with data collection or study procedures (e.g., severe illness or disability).

3.6 Sample size calculation

The sample size was calculated using the formula by Cochran (1977) using the following:

$$n = \frac{\frac{Z^2 P(1-P)}{e^2}}{1 + \left(\frac{Z^2 P(1-P)}{e^2 \times N}\right)}$$

1. Where N is the population size (i.e. the number of clinical staff is 882)
2. e represents the margin of error (5%),
3. z means the z-score at a 90% confidence interval
4. z = 1.645, p = 0.5,
5. q = (1-P) = 0.5.
6. The calculated sample size using the above equation was 163.763
7. Therefore, the sample of workers to be enrolled into this study is 164 (i.e. n = 164).

From a total of 882 clinical staff, the sample size (n) recruited from each hospital is:

Table 1: Distribution of samples in the study site

Hospital	**Total number of health workers**	**Proportionate sample**	**Total sample per hospital**
St Dominic Hospital	262	262/882 *164	49
Eastern Regional Hospital	620	620/882* 164	115
Total	**882**	-	**164**

3.7 Sampling

A multistage sampling approach was used to select participants for the study.

Stage 1

First, the two referral hospitals Eastern Regional Hospital (Koforidua) and St. Dominic Hospital (Akwatia) were purposively selected because they serve as major referral centers in the region and have a diverse mix of clinical staff.

Stage 2

In the second stage, an updated staff list was obtained from each hospital to form the sampling frame. This list included all clinical healthcare workers who met the eligibility criteria.

Stage 3

In the third stage, the staff were stratified according to their professional categories such as medical doctors, nurses, midwives, and laboratory personnel. This ensured that each group was adequately represented in the study.

Final Stage

In the final stage, simple random sampling was carried out within each professional category to select participants proportionate to the size of each cadre in the two hospitals. Sampling continued within each stratum until the required sample size was achieved. This multistage approach helped ensure fair representation of the different clinical groups while reducing selection bias.

3.8 Data collection methods and instruments

Data collection was done using WHO STEPWISE approach for non-communicable disease surveillance (HTP). Step 1 involved capturing information related to nutritional habits, sedentary

lifestyle, socio-demographic characteristics, and other factors using a questionnaire administered through face-to-face interviews. Step 2 gathered data on weight, height, waist-to-hip ratio, blood pressure, and BMI using tools such as an electronic weighing scale, stadiometer, tape measure, and digital blood pressure monitor, in addition to the information from Step 1.

3.8.1 Anthropometric measurements

The respondents' heights were recorded using a Stadiometer (SECA Leicester height measure with a fixed footplate and adjustable headboard, produced in the United Kingdom) to the nearest 0.1 centimeters. Weight was assessed with a digital scale (Bed and Bathroom model BB-3018A® made by Conair Company, USA) while respondents wore light clothing, measured to the nearest 0.1 kilograms. All anthropometric measurements were conducted in triplicate by WHO standard anthropometry protocols.

3.8.2 Measurement and classification of Blood Pressure

The blood pressure levels of respondents were assessed using a digital blood pressure monitor (Omron M2 Basic, produced in India by Omron Company). Respondents were instructed to rest for a minimum of 10 minutes prior to having their blood pressure measured. Blood pressure was recorded twice, and the average of the two readings was noted. Hypertension was categorized according to the recommended thresholds (WHO, 2016) as follows: Normal (Systolic BP <120 and Diastolic BP <80); Pre-hypertension is defined as having a Systolic BP between 120 and 139 and/or a Diastolic BP between 80 and 89 mmHg; Stage I hypertension is characterized by a Systolic BP ranging from 140 to 159 and/or a Diastolic BP from 90 to 99 mmHg, while Stage II hypertension is identified by a Systolic BP exceeding 160 and/or a Diastolic BP greater than 100 mmHg.

3.9 Quality control

To ensure data quality and accuracy, data collection tools were validated through pre-testing. Before this, experienced research assistants underwent a week-long training conducted by the principal investigator. After each data collection session, questionnaires were validated, and any errors were corrected. Pre-testing of data collection tools was conducted at the end of the training to prevent misinterpretation and to refine ambiguous questions. Respondents' information was kept confidential during and after data collection. All questions were translated into the local language or another appropriate language for participants who cannot read, speak, or comprehend English. Data was gathered utilizing the Kobo Collect Toolbox, a complimentary open-source application for mobile data collection and was later extracted to Microsoft Excel 2019 and Stata 16/MP for analysis. Field supervisors at the hospital conducted regular monitoring to ensure that research assistants adhered to the guidelines. The data collection instruments were pre-tested at the 37 Military Hospital.

3.11 Study variables

Dependent variables

The dependent variable in this study was hypertension

Independent variables

The independent variables are age, sex, ethnicity, religion, tobacco consumption, physical inactivity, body Mass Index, family history of hypertension, and self-reported medical history of diabetes. Standard WHO definitions were employed to measure the prevalence of tobacco use, alcohol consumption, and physical activity.

3.12 Data analysis

After completing the fieldwork, electronic data was downloaded into a single master database

using Microsoft Excel 2019. Stata Version 16 was used for the analysis. The dataset was processed by verifying the consistency and suitability of the responses. To summarize the data, descriptive statistics such as frequencies, proportions, and means along with standard deviations (SD) were employed. The chi-square test was used to assess the relationship between explanatory variables and hypertension. A multivariable logistic regression model was used to determine the association between explanatory variables and hypertension. Odds ratios with their 95% confidence intervals (95% CIs) were estimated.

3.13 Ethical Considerations

3.13.1 Ethical Approval

Approval for the study was obtained from the Ethics Review Committee (ERC) of the Ghana Health Service (GHS). Further approval was requested from the medical director of both hospitals. After outlining the study's aims, objectives, benefits, risks, and procedures, written consent was acquired from all eligible participants.

3.13.2 Informed Consent

Each respondent signed an informed consent after being told the purpose of the study and how it would benefit him/her. Participants were also informed that their participation in the study is voluntary and their right to refuse or withdraw from the study at any given time is allowed.

3.13.3 Confidentiality and anonymity

All health workers were informed and assured of the privacy and anonymity of the information they provided. They were notified that the data collected would be stored in secure cabinets, accessible only to the principal investigator. Names of health workers were not required for any analysis. All interviews were conducted in a private location with only the study participant and

the data collector present.

3.13.4 Voluntary Participation

Health workers were informed that participation in this study is entirely voluntary. Those who do not wish to participate would not be coerced, enticed, or convinced to do so against their will.

CHAPTER FOUR
4.0 RESULTS

4.1 Background characteristics of participants

Table 4.1 presents background characteristics, history of blood pressure, dietary behaviour and physical activity among health workers. The majority of respondents 115 (70.1%) were from Eastern Regional Hospital, while 49 (29.9%) were from St. Dominic Hospital. Females constituted the majority (81.1%), with a higher proportion at Eastern Regional Hospital (89.6%) compared to St. Dominic Hospital (61.2%). Regarding age distribution, about half of health workers were aged between 29–39 years (57.3%), with a higher proportion at St. Dominic Hospital (67.4%) compared to Eastern Regional Hospital (53.0%). Marital status was evenly distributed, with 54.6% married and 45.4% single across both hospitals and majority of health workers were Christian (86.6%). In terms of professional cadre, midwives were the largest group (34.8%), followed by nurses (32.7%), physicians (8.5%), physician assistants (6.1%), and phlebotomists (1.2%). Midwives were more prevalent at Eastern Regional Hospital (39.1%) compared to St. Dominic Hospital (24.5%), while physician assistants were more common at St. Dominic Hospital (14.3%) than at Eastern Regional Hospital (2.6%) (Table 2).

The majority of health workers (38.4%) reported eating fruit once per day, with a higher proportion at St. Dominic Hospital (55.1%) compared to Eastern Regional Hospital (31.3%). The majority of health workers (56.7%) reported eating vegetables four days per week, with a higher proportion at St. Dominic Hospital (73.5%) compared to Eastern Regional Hospital (49.6%). Eating vegetables once per week was reported by 14.6%, with a higher proportion at St. Dominic Hospital (26.5%) than at Eastern Regional Hospital (9.6%). The majority of respondents (60.9%) described their salt intake as moderate, with a higher proportion at Eastern Regional Hospital (76.5%) compared to

St. Dominic Hospital (51.0%). None of the health workers described their salt intake as high (Table 2).

A majority of respondents (56.1%) reported that their work involves vigorous-intensity activity that causes a large increase in breathing or heart rate for at least 10 minutes continuously. This was more prevalent at Eastern Regional Hospital (87.8%) compared to St. Dominic Hospital (42.6%). Most of the heath workers engage in moderate activity four days per week (34.2%), with similar proportions at both hospitals (Eastern Regional Hospital: 34.8%; St. Dominic Hospital: 32.7%). One day per week was reported by 20.1% of health workers, with a higher proportion at St. Dominic Hospital (26.5%) than at Eastern Regional Hospital (17.4%) (Table 2).

A majority of health workers (78.4%) reported having their blood sugar measured in the past year, with similar proportions at both hospitals (Eastern Regional Hospital: 78.3%; St. Dominic Hospital: 79.0%). About 21.6% of respondents had not had their blood sugar measured. About half (58.5%) reported no family history of hypertension or diabetes, with a higher proportion at St. Dominic Hospital (65.3%) compared to Eastern Regional Hospital (55.7%). About 7.9% of health workers were known hypertensives, with a higher proportion at St. Dominic Hospital (12.2%) than at Eastern Regional Hospital (6.1%). The largest proportion of respondents were overweight (37.2%), with similar proportions at both hospitals (Eastern Regional Hospital: 37.4%; St. Dominic Hospital: 36.7%). Normal weight was reported by 29.9%, with a higher proportion at Eastern Regional Hospital (31.3%) than at St. Dominic Hospital (26.5%). Only 0.6% of respondents were underweight (Table 2).

Table 2: Background characteristics of study participants

Characteristics	Eastern Regional Hospital	St Dominic Hospital	Total
	115 [70.1%]	49 [29.9%]	N=164
Sex			
Male	12 (10.4)	19 (38.8)	31 (18.9)
Female	103 (89.6)	30 (61.2)	133 (81.1)
Age in years			
<29	31 (27.0)	16 (32.6)	47 (28.7)
29 – 39	61 (53.0)	33 (67.4)	94 (57.3)
40 – 49	23 (20.0)	0 (0)	23 (14.0)
Mean (±SD)	**33.12±6.82**	**31.65±5.12**	**32.68±6.38**
Marital status			
Single	52 (45.2)	22 (45.8)	74 (45.4)
Married	63 (54.8)	26 (54.2)	89 (54.6)
Religious affiliation			
Christian	102 (88.7)	40 (81.6)	142 (86.6)
Muslim	13 (11.3)	9 (18.4)	22 (13.4)
Cadre			
Physician	7 (6.1)	7 (6.1)	14 (8.5)
Midwife	45 (39.1)	12 (24.5)	57 (34.8)
Nurse	38 (33.1)	14 (28.6)	52 (32.7)
Physician Assistant	3 (2.6)	7 (14.3)	10 (6.1)
Phlebotomist	2 (1.7)	0 (0)	2 (1.2)
In a typical week, how per day do you eat fruits?			
One	36 (31.3)	27 (55.1)	63 (38.4)
Two	30 (26.1)	1 (2.0)	31 (18.9)
Three	15 (13.0)	0 (0.0)	15 (9.2)
Four	34 (29.6)	21 (42.9)	55 (33.5)
In a typical week on how many days do you eat Vegetables?			
One	11 (9.6)	13 (26.5)	24 (14.6)
Two	30 (26.1)	0 (0)	30 (18.3)
Three	17 (14.8)	0 (0.0)	17 (10.4)
Four	57 (49.6)	36 (73.5)	93 (56.7)
Which of the following best describes your salt intake ability.			
Low	27 (23.5)	24 (49.0)	51 (31.1)
Moderate	88 (76.5)	25 (51.0)	113 (60.9)
High	0 (0)	0 (0)	0 (0)
Does your work involve vigorous-intensity activity that causes large increase in breathing or heart rate for at least 10 minutes continuously?			
No	66 (57.4)	6 (12.2)	72 (43.9)
Yes	49 (42.6)	43 (87.8)	92 (56.1)
In a typical week, how many days do you do moderate-intensity activities as part of your work?			
One	20 (17.4)	13 (26.5)	33 (20.1)
Two	20 (17.4)	1 (2.0)	21 (12.8)
Three	19 (16.5)	19 (38.8)	38 (23.2)
Four	40 (34.8)	16 (32.7)	56 (34.2)
All day	16 (13.9)	0 (0)	16 (9.8)

Table 2. Background characteristics continued

	Eastern Regional Hospital	St Dominic Hospital	Total
	115 [70.1%]	49 [29.9%]	N=164
Have you had your blood sugar measured in the past 12 months?			
No	25 (21.7)	8 (21.0)	33 (21.6)
Yes	90 (78.3)	30 (79.0)	120 (78.4)
Is any member of your family having HBP or Diabetes?			
No	64 (55.7)	32 (65.3)	96 (58.5)
Yes	51 (44.3)	17 (34.7)	68 (41.5)
Are you aware of your hypertensive status?			
No	17 (14.8)	3 (6.1)	20 (12.2)
Yes	98 (85.2)	46 (93.9)	144 (87.8)
What is your hypertension status			
Known	7 (6.1)	6 (12.2)	13 (7.9)
Unknown	108 (93.9)	43 (87.8)	151 (92.1)
BMI			
Normal	36 (31.3)	13 (26.5)	49 (29.9)
Underweight	1 (0.9)	0 (0.0)	1 (0.6)
Overweight	43 (37.4)	18 (36.7)	61 (37.2)
Obese	35 (30.4)	18 (36.7)	53 (32.3)

4.1.1 Smoking and drinking status of health workers

All respondents across both hospitals reported never smoking, with 100% indicating no history of smoking. The majority of respondents (98.2%) reported never drinking alcohol, with 100% of health workers from Eastern Regional Hospital and 97.4% from St. Dominic Hospital falling into this category. A small proportion (0.6%) of health workers reported current drinking (Figure 2).

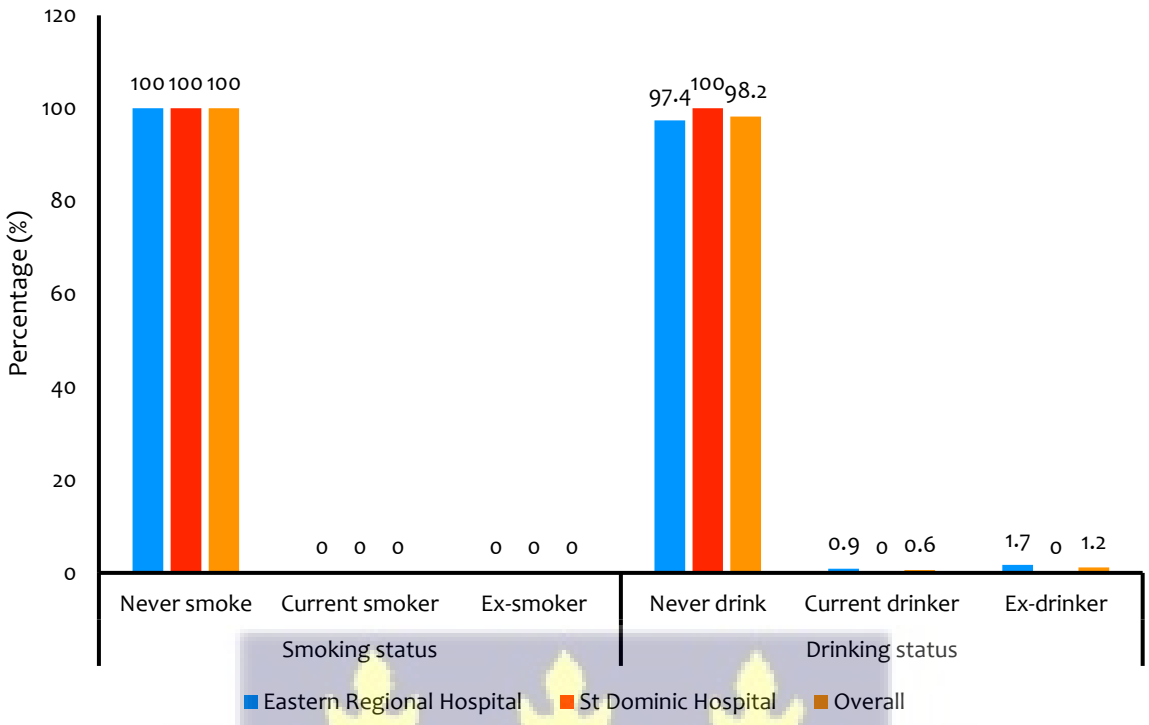

Figure 2: Smoking and drinking status of health workers

4.2 Prevalence of hypertension

The findings of this study indicate that only 13/164 (7.9%) of the healthcare workers were classified as hypertensive. In addition, a substantial proportion of participants 75/164 (45.7%) were identified as pre-hypertensive, while 76/164 (46.3%) of the participants had normal blood pressure levels (Figure 3).

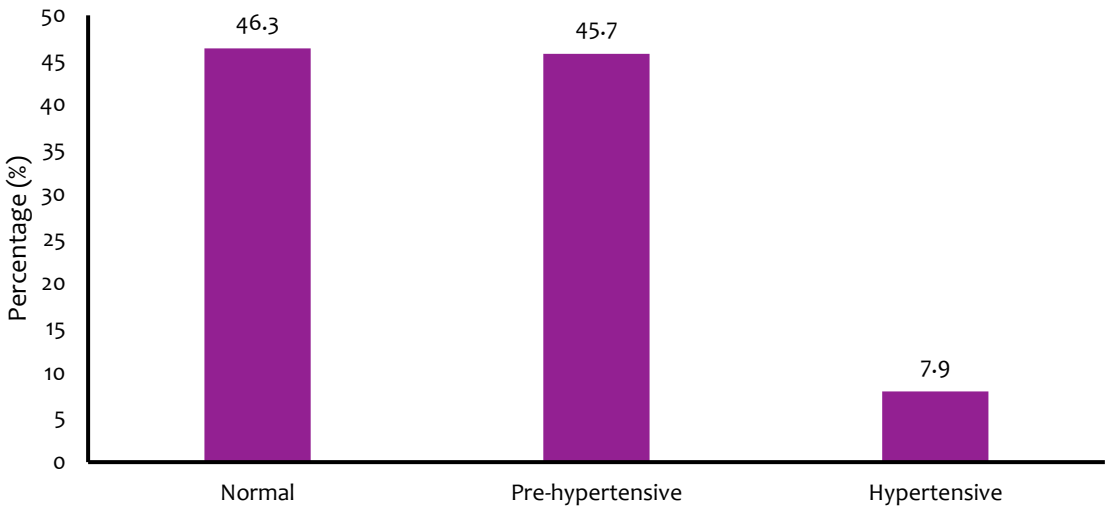

Figure 3: Prevalence of hypertension

4.2.1 Prevalence of stage hypertension among health workers

Prevalence of the different stages of hypertension is presented in figure 4. Of the 13, 30.4% had stage 1 hypertension whiles 69.6% had stage 2 hypertension.

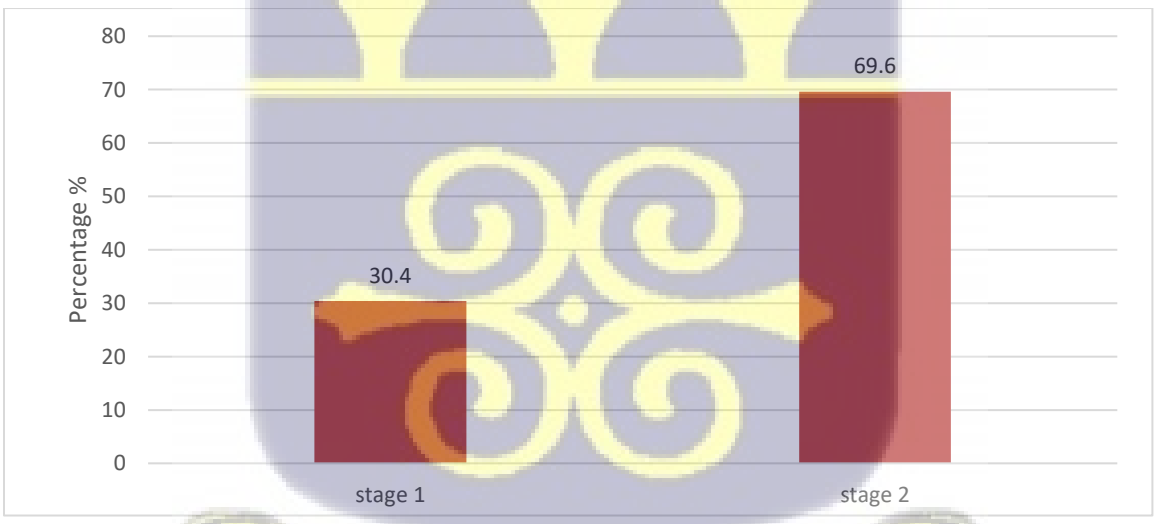

Figure 4: Prevalence of hypertension by stage

4.2.2 Prevalence of hypertension by cadre

No case of hypertension was reported among physicians at St. Dominic Hospital (0%), while

14.3% of physicians at Eastern Regional Hospital were hypertensive. The overall hypertension rate among physicians across both hospitals was 7.1%. The overall hypertension rate among midwives was 7%. Hypertension prevalence was higher among midwives at St. Dominic Hospital (16.7%) compared to Eastern Regional Hospital (4.4%). The overall hypertension rate among nurses was 11.5%. Nurses at St. Dominic Hospital had a higher hypertension rate (14.3%) compared to those at Eastern Regional Hospital (10.5%). The overall hypertension rate among laboratory personnel was 6.9%. Hypertension was reported among 22.2% of laboratory personnel at St. Dominic Hospital, while no cases were reported at Eastern Regional Hospital. No case of hypertension was reported among physician assistants or phlebotomists at either hospital. St. Dominic Hospital: The overall hypertension rate was 12.2%, indicating a higher burden of hypertension compared to Eastern Regional Hospital, where the overall rate was 6.1%.

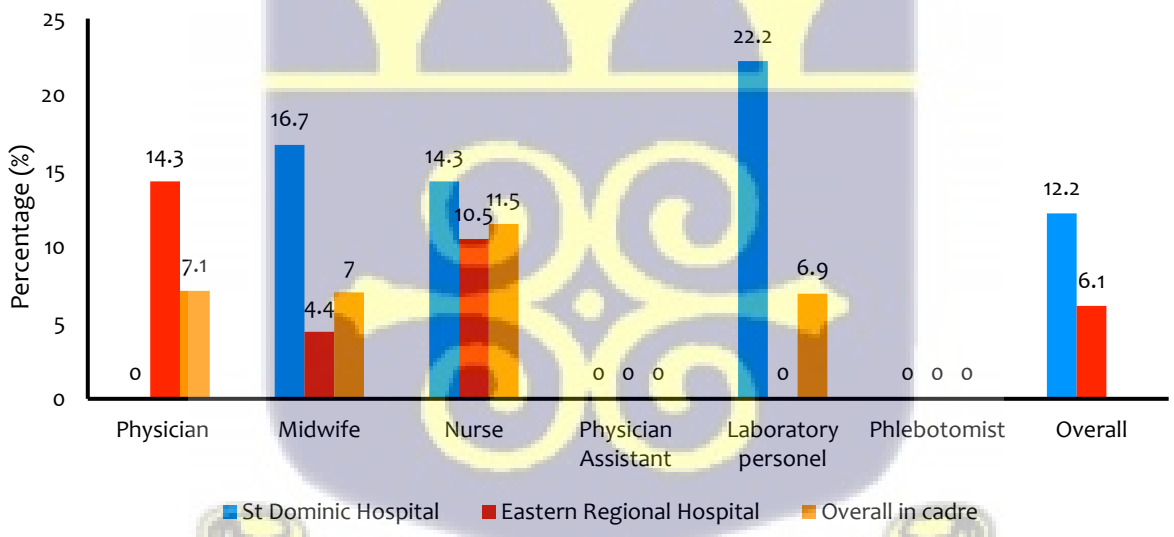

Figure 5: Prevalence of hypertension by cadre and health facility

4.3 Association between background, dietary, and physical characteristics and hypertension

A Chi-square test of association was used to assess the relationship between background, dietary, and physical characteristics, and hypertension. Among individuals with hypertension (HTP), 30.8% were male and 69.2% were female and majority (69.2%) were aged 29–39 years, while 15.4% were under 29 years. Most hypertensive individuals were married (76.9%) and Christian (84.6%). Of those who are hypertensive, most had moderate salt intake (76.9%). While 61.5% had their blood sugar checked in the past 12 months. There was a significant association between BMI and hypertension (p=0.022). Approximately 76.9% of hypertensive individuals were overweight, 15.4% were obese, and only 7.7% had a normal BMI (Table 3).

Table 3: Association between background, dietary, physical characteristics and hypertension

Characteristics	Normal	HTP	p-value
	151 [92.1%]	13 [7.9%]	
Sex			
Male	27 (17.9)	4 (30.8)	
Female	124 (82.1)	9 (69.2)	0.255
Age in years			
<29	45 (29.8)	2 (15.4)	
29 – 39	85 (56.3)	9 (69.2)	
40 – 49	21 (13.9)	2 (!5.4)	0.539
Marital status			
Single	71 (47.3)	3 (23.1)	
Married	79 (52.7)	10 (76.9)	0.092
Religious affiliation			
Christian	131 (86.8)	11 (84.6)	
Muslim	20 (13.2)	2 (15.4)	0.828
Cadre			
Physician	13 (8.6)	1 (7.7)	
Midwife	53 (35.1)	4 (30.8)	
Nurse	46 (30.5)	6 (46.2)	
Physician Assistant	10 (6.6)	0 (0)	
Laboratory personnel	27 (17.9)	2 (15.4)	
Phlebotomist	2 (1.3)	0 (0)	0.838
Hospital			
Eastern Regional Hospital	108 (71.5)	7 (53.8)	
St Dominic Hospital	43 (28.5)	6 (46.2)	0.182
Intake of fruit in a typical week			
One	57 (37.7)	3 (23.1)	
Two	27 (17.9)	4 (30.8)	
Three	15 (9.9)	0 (0)	
Four	52 (34.4)	3 (23.1)	0.388
Intake of vegetable in a typical week			
One	23 (15.2)	1 (7.7)	
Two	27 (17.9)	3 (23.1)	
Three	16 (10.6)	1 (7.7)	
Four	85 (56.3)	8 (61.5)	0.850
Salt intake			
Low	48 (31.8)	3 (23.1)	
Moderate	103 (68.2)	10 (76.9)	0.515
Blood sugar measured in the past 12 months			
No	28 (20.0)	5 (38.5)	
Yes	112 (80.0)	8 (61.5)	0.122
Family having HBP or Diabetes			
No	86 (56.9)	10 (76.9)	
Yes	65 (43.1)	3 (23.1)	0.161
Aware of your hypertensive status?			
No	19 (12.6)	1 (7.7)	
Yes	132 (87.4)	12 (92.3)	0.605
BMI			
Normal	48 (31.8)	1 (7.7)	
Underweight	1 (0.7)	0 (0)	
Overweight	51 (33.8)	10 (76.9)	
Obese	51 (33.8)	2 (15.4)	0.022

4.4 Factors associated with hypertension among health workers

A multivariable logistic regression was used to determine the factors associated with hypertension. The results of the analysis showed that nurses were 1.78 times more likely to develop hypertension compared to physicians [AOR=1.78 (95% CI: 1.05 – 12.10); p=0.006]. In addition, health workers who are obese were 2.04 times more likely to develop hypertension compared to those with normal BMI [AOR=2.04 (95% CI: 1.51 – 2.77); p=0.025]. However, health workers with moderate salt intake were 32% less likely to have hypertension compared to those with high salt intake [AOR=0.68 (95% CI: 0.19 – 0.99); p=0.011] (Table 4).

Table 4: Factors associated with hypertension among health workers

Characteristics	Adjusted logistic regression		
	AOR	[95% CI]	p-value
Sex			
Male			
Female	0.23	[0.02 – 2.62]	0.240
Age in years			
<29			
29 – 39	3.81	[0.34 – 4.23]	0.275
40 – 49	2.95	[0.08 – 10.17]	0.554
Marital status			
Single			
Married	5.99	[0.77 – 6.77]	0.086
Religious affiliation			
Christian			
Muslim	1.03	[0.12 – 8.83]	0.978
Cadre			
Physician			
Midwife	0.59	[0.04 – 8.99]	0.710
Nurse	1.78	[1.05 – 12.10]	0.006*
Physician Assistant	2.14	[1.34 – 5.71]	0.341
Laboratory personnel	0.33	[0.07 – 13.99]	0.559
Phlebotomist	11.12	[10.04 – 15.65]	0.761
Hospital			
Eastern Regional Hospital			
St Dominic Hospital	7.74	[0.81 – 7.91]	0.074
Intake of fruit in a typical week			
One			
Two	3.99	[0.34 – 4.68]	0.270
Three	1.34	[1.14 – 5.61]	0.431
Four	0.72	[0.09 – 6.44]	0.773
Intake of vegetable in a typical week			
One			
Two	11.31	[0.17 – 17.36]	0.255
Three	8.62	[0.09 – 17.55]	0.345
Four	7.39	[0.17 – 13.14]	0.295
Salt intake			
Low			
Moderate	0.68	[0.19 – 0.99]	0.011*
Blood sugar measured in the past 12 months			
No			
Yes	0.28	[0.034 – 2.28]	0.235
Family having HBP or Diabetes			
No			
Yes	0.93	[0.13 – 6.57]	0.947
BMI			
Normal			
Underweight	0.87	[0.63 – 1.56]	0.237
Overweight	2.04	[1.51 – 2.77]	0.025*
Obese	3.82	[0.23 – 6.37]	0.350

CHAPTER FIVE

5.0 DISCUSSION

5.1 Prevalence of hypertension

Since 1990, the global population suffering from hypertension has increased twofold, with most of this growth happening in low- and middle-income countries. Conversely, in high-income nations, the prevalence has declined, while health systems have reached treatment rates of as much as 80% and control rates of up to 60% (Zhou et al., 2021). Health workers in these regions are not immune to this trend and are often affected by the same risk factors. Health workers face unique occupational stressors, such as long working hours, shift work, and emotional strain, which contribute to higher rates of hypertension (Khalfan et al., 2023). However, nearly half (45.7%) of the healthcare workers were classed as pre-hypertensive, which puts them at high risk of developing full-blown hypertension if preventive steps are not taken.

The prevalence of hypertension among health workers in this study was 7.9%. This is much lower than the pooled prevalence reported in a systematic review, where the prevalence of hypertension on among healthcare workers ranged from 13% to 40% (Mwale et al., 2024). Further, the overall prevalence in this study is lower than the national prevalence from the Ghana Demographic and Health Survey of 13% (Sanuade et al., 2018). In addition, this prevalence was much lower than other studies conducted in Nepal (35.3%) (Ghimire et al., 2020), India (9.2%), Nigeria (20.1%) (Owolabi et al., 2015), and a previous study conducted in Ghana (16.7%). However, prevalence in this study was similar to what was reported in a referral hospital in Accra: The prevalence of hypertension among the selected healthcare workers at the 37 Military hospital, Accra, was 7% (Abubakari, 2018).

The reason for the lower prevalence in this study could be attributed to the fact that, most of the health workers in this study were below 40 years. Many studies have shown an increased hypertension among people aged over 50 years. Hypertension, or high blood pressure, becomes more common with age. According to data from the US Centres for Disease Control and Prevention (CDC), the prevalence of hypertension among persons aged 18 and above was 45.4% in 2017-2018. This incidence increased with age, reaching 22.4% among those aged 18-39, 54.5% among those aged 40-59, and 74.5% among those aged 60 and older (Ostchega & Nguyen, 2020).

Similarly, the World Health Organization (WHO) defines age over 65 as a non-modifiable risk factor for hypertension. Also, lower prevalence in this could be that most of the health workers barely engaged in risk factors associated in the occurrence of hypertension - all health workers from both hospitals stated that they had never smoked, with none reporting a history of smoking. Additionally, nearly all participants indicated that they had never consumed alcohol. Lastly, health workers generally possess a higher level of medical knowledge, enabling them to recognize early signs of hypertension and understand the importance of preventive measures. This understanding can lead to proactive health monitoring and control. Working in healthcare facilities also gives health professionals prompt access to medical tests and interventions, allowing for the rapid detection and treatment of increased blood pressure. As evident in this study, 78% had their blood sugar measured in the past 12 months and 87.8% aware of your hypertensive status.

5.1.2 Prevalence of hypertension by cadre

The prevalence was higher among nurses (11.5%) compared to physicians (7.1%), midwives (7.1%) and laboratory personnel (6.9%). The prevalence among nurses in this study was lower than the prevalence reported in South Africa (14.4%) (Kayaroganam et al., 2022). Again, in the

Manakali study, the prevalence of hypertension among nurses was found to be 52% (Monakali et al., 2018). Notably, nurses generally have greater hypertension rates than other healthcare professions. For example, one study found a hypertension prevalence of 28.96% among nursing personnel (Zhao et al., 2019). Factors contributing to this heightened risk include hard job hours, hefty patient loads, and mental stress (Khalfan et al., 2023). Nurses may have a higher prevalence of hypertension than other healthcare professionals due to their heavy workload, shift work, and job-related stress, all of which contribute to chronic stress and interrupted sleep patterns—both key risk factors for high blood pressure. These stressors can cause chronic stress and burnout, both of which are important risk factors for hypertension.

5.1.3 Prevalence of hypertension by hospital

Notably, the prevalence of hypertension among health workers in St. Dominic Hospital (12.2%) was double the prevalence in Eastern Regional Hospital (6.1%). The considerable difference in hypertension prevalence between St. Dominic Hospital and Eastern Regional Hospital indicates that job environment, task intensity, and stress levels may differ significantly between the two facilities. The higher hypertension rate at St. Dominic Hospital could be linked to variables such as an increased patient-to-staff ratio, longer working hours, resource constraints, and higher job-related stress levels, all of which lead to high blood pressure. Eastern Regional Hospital, on the other hand, may have higher staffing levels, better working conditions, or greater access to stress management therapies, potentially lowering hypertension rates among its employees.

5.2 Factors associated with hypertension

In this study, nurses were more likely to develop hypertension compared to physicians, highlighting the impact of job-related stress and workload. This is contrary to what was reported

in a systematic review where it was found that, compared with doctors' measurements, nurse-measured blood pressures were lower (Clark et al., 2014). A study of blood pressure trends among healthcare professionals discovered that nurses had a greater prevalence of hypertension, which was related to intense workloads, shift work, and associated lifestyle issues (Bartosiewicz et al., 2024). Another study on healthcare workers in the Gaza Strip found that nurses had a greater prevalence of hypertension than non-medical professionals, possibly due to the particular job-related stressors and duties that nurses face (Younis et al., 2024).

Also, health workers in this study who are obese were 2.04 times more likely to have hypertension compared to those with normal BMI. Several studies have looked at the link between obesity and hypertension among healthcare workers. For example, research of 3,480 hospital personnel discovered that the prevalence of hypertension was 14.8%, with a significant link between rising blood pressure and greater body mass index (BMI). This shows that obese healthcare workers are more prone to acquire hypertension than those with a normal BMI (Kurtul et al., 2020). Furthermore, research shows that different healthcare profession categories are connected with varying levels of obesity risk, with nurses appearing to be more likely to be obese. The increased risk of obesity among nurses may contribute to a higher prevalence of hypertension in this population (Kunyahamu et al., 2021).

Lastly, health workers with moderate salt intake were 32% less likely to have hypertension compared to those with high salt intake. While there are few studies focusing solely on healthcare workers, considerable research has found a clear correlation between high salt intake and higher hypertension risk in the general population. For example, a meta-analysis published has shown that even moderate reductions in salt consumption lead to significant drops in blood pressure

among both hypertensive and normotensive patients (Huang et al., 2020).

5.3 Strengths and limitations

The study's strength is that it focuses on healthcare workers, which provides useful insights into occupational pressures and health consequences in the medical community. Also, this study contributes to existing knowledge on the burden of hypertension among health workers in Ghana. One limitation is that the accuracy of relationships with hypertension may be impacted by bias in self-reported data on lifestyle factors like food and exercise.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusions

The study reveals a low prevalence of hypertension among healthcare workers, with a significant proportion classified as pre-hypertensive. The prevalence was higher among nurses compared to physicians, midwives and laboratory personnel. Nurses were 1.78 times more likely to have hypertension compared to physicians. Also, health workers who are obese were 2.04 times more likely to have hypertension compared to those with normal BMI. However, health workers with moderate salt intake were 32% less likely to have hypertension compared to those with high salt intake.

6.2 Recommendations

Based on the findings from the study, the study recommends:

- Hospitals should establish workplace wellness programs to promote better lives among healthcare personnel. To reduce the risk of obesity-related hypertension among its employees, hospitals and healthcare institutions can explore interventions such as structured physical activity programs, increased access to nutritional food options, and stress management measures. Addressing these occupational and lifestyle factors may result in improved health outcomes and worker productivity in the healthcare sector.
- Additional studies should be conducted to explore the underlying causes of hypertension among health workers and develop targeted interventions based on institutional differences.

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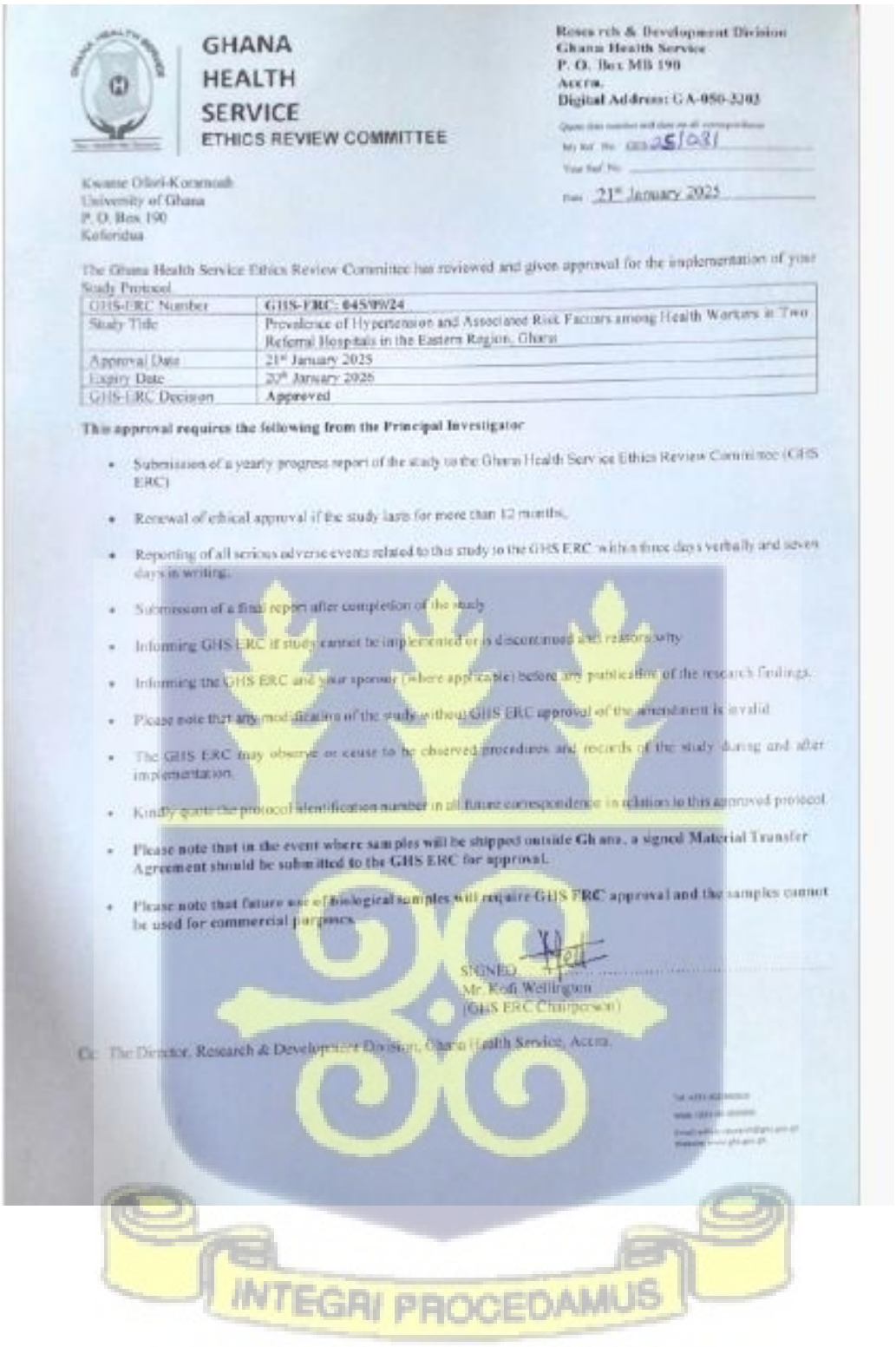
Appendix I

Ethical Clearance



GHANA HEALTH SERVICE
ETHICS REVIEW COMMITTEE

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra.
Digital Address: GA-050-3203

My Ref. No: GHS-25/031
Your Ref. No:
Date: 21st January 2025

Kwame Ofori-Koranteah
University of Ghana
P. O. Box 190
Koforidua

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	GHS-ERC: 045/09/24
Study Title	Prevalence of Hypertension and Associated Risk Factors among Health Workers in Two Referral Hospitals in the Eastern Region, Ghana
Approval Date	21st January 2025
Expiry Date	20th January 2026
GHS-ERC Decision	Approved

This approval requires the following from the Principal Investigator

- Submission of a yearly progress report of the study to the Ghana Health Service Ethics Review Committee (GHS ERC)
- Renewal of ethical approval if the study lasts for more than 12 months.
- Reporting of all serious adverse events related to this study to the GHS ERC within three days verbally and seven days in writing.
- Submission of a final report after completion of the study.
- Informing GHS ERC if study cannot be implemented or is discontinued and reasons why.
- Informing the GHS ERC and your sponsor (where applicable) before any publication of the research findings.
- Please note that any modifications of the study without GHS ERC approval of the amendment is invalid.
- The GHS ERC may observe or cause to be observed procedures and records of the study during and after implementation.
- Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol.
- **Please note that in the event where samples will be shipped outside Ghana, a signed Material Transfer Agreement should be submitted to the GHS ERC for approval.**
- **Please note that future use of biological samples will require GHS ERC approval and the samples cannot be used for commercial purposes.**

SIGNED
Mr. Kofi Wellington
(GHS ERC Chairperson)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra.

Appendix II

Participant Information Sheet

UNIVERSITY OF GHANA, LEGON

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF BIOLOGICAL ENVIRONMENTAL AND OCCUPATIONAL HEALTH

- **Title of study:** To determine the prevalence of hypertension and associated risk factors among health workers in two referral hospitals in the Eastern Region, Ghana.

- **Introduction:** My name is Kwame Ofori-Koramoah, I am a student pursuing a Master of Public Health program at the School of Public Health, University of Ghana, Legon. I am the principal investigator, and I am conducting a study to determine the prevalence of hypertension and associated risk factors among health workers in two referral hospitals in the Eastern Region, of Ghana.

- **Background and Purpose of Research.** The burden of hypertension and associated risk factors among health workers in referral hospitals considering the high-stress

environment of hospitals, combined with long working hours, irregular shifts, and the demanding nature of the job is known. Quantifying these risk factors to estimate the avoidable burden of hypertension and identifying cost-effective prevention strategies for and management remains crucial.

- **Nature of Research:** The research is a cross-sectional study, and quantitative methods will be used for data collection.

Participants Involvement

- **Duration/ what is involved:** If you agree to participate, you will be asked to attend a face-to-face interview. The interview will take approximately 20 minutes of your time.

- **Potential Risks and Discomforts:** There are no known risks associated with participating in this study.

The interview would be conducted in a conducive environment and covid 19 protocols will be adhered to.

- **Cost:** There are no costs for participating in this study except for your time.

- **Compensation**: There will be no compensation for participating in the study.

Confidentiality and anonymity: All information collected will be kept secure, and confidential and will be accessible only to the principal investigator and her supervisor. The interview will be digitally recorded and kept for a period of two years after which all information will be deleted. No information regarding participants' names or any other information that traces the data collected to the participants will be taken.

- **Voluntary participation and the right to refuse or withdraw:** Before participating in the study, please understand that your participation is voluntary. You do not need to participate in the research if you do not want to. You will also not lose any benefits that you would have otherwise been entitled to. If you agree to take part in the study, you can still withdraw from the study at any time, and this will not affect you in any way.

- **Outcome and feedback**: The research findings will be presented to the School of Public Health, College of Health Sciences.

- **Funding information**: This study is being funded by the Principal Investigator.

- **Sharing of Participants Information / Data**: Participant information or data will be kept by the principal investigator.

- **Provision of Information and Consent for participants**: A copy of the information sheet and consent form will be given to you to sign or thumbprint before the interview begins if you agree to participate.

- **Who to Contact for Further Clarification or Questions**: For any clarifications or concerns about this research, please contact Dr Kwame Ofori-Koramoah at 0243509340 and Dr Sylvia Takyi at the Department of Biological, Environmental, Occupational Health & Safety, School of Public Health on telephone number 0246092671.

- For further clarification on ethical issues, kindly contact the Ghana Health Service Ethics Review Committee Administrator, Nana Abena Apatu by telephone number 0503539896 and e-mail at ethics.research@ghs.gov.gh.

Appendix III:

Consent Form

STUDY TITLE: PREVALENCE OF HYPERTENSION AND ASSOCIATED RISK FACTORS AMONG HEALTH WORKERS IN TWO REFERRAL HOSPITALS IN THE EASTERN REGION, GHANA.

PARTICIPANTS' STATEMENT

I confirm that I have read and understood the information sheet above and the questions asked have been explained in a language I understand (English). I fully understand the contents and any potential implications as well as my right to withdraw from the research at any point even after I have signed this form. I voluntarily agree to be part of this research.

Name of Participant……

Participants' Signature ……...

Date: ……

Please Tick Box

INVESTIGATOR STATEMENT AND

I am aware the interview will be audio recorded and transcribed at a later time.

SIGNATURE

YES NO
☐

I certify that the participant has been given ample time to read and learn about the study. All questions and clarifications raised by the participants have been addressed.

Researcher's name…….

Signature …….

Date…….

☐

Appendix IV Questionnaire

HYPERTENSION AND RISK FACTORS

STEP 1: SELF REPORTED.

DEMOGRAPHIC CHARACTERISTICS

1. Sex of Respondent
    1. Male
    2. Female
2. Age of Respondents (in years)

3. What is your marital status?
    1. Single
    2. Married
    3. Divorced
    4. Widow
    5. Separation

4. Highest level of education.
    1. Never
    2. JSS
    3. SSS
    4. Tertiary

5. What is your main occupation? ……

6. Religious affiliation
    1. Christian
    2. Muslim
    3. Traditional
    4. Other (specify)

BEHAVIOURAL MEASUREMENTS

7. Which of the following best describes your smoking status?
    1. Never smoke
    2. Current smoker
    3. Ex-smoker

For option 1, please move to question 10.

8. Do you smoke any of the tobacco products such as pipes or cigarettes daily?
    1. Yes
    2. No

9. Average number of cigarettes/pipes smoked per day ……

10. Which of the following best describes your alcohol-drinking status?
    1. Never drink
    2. Current drinker
    3. Ex –drinker

11. How many times a day do you drink?
    1. Once
    2. Twice
    3. Thrice
    4. More than thrice

12. In the past 12 months, how frequently have you had at least one drink?
    1. Daily
    2. 5-6 days per week
    3. 1-4 days per week
    4. 1-3 days per month
    5. Other

DIETARY BEHAVIOUR

13. In a typical week, how per day do you eat fruits?
    1. One Day
    2. two days
    3. three days
    4. four days

14. In a typical week, on how many days do you eat Vegetables?
    1. One day
    2. Two days
    3. Three days
    4. Four days

15. What type of oils or fat is most often used for meal preparation in your household?
    1. Vegetable oil
    2. Lard
    3. Butter
    4. Margarine
    5. Peanut butter
    6. Other Specify ……

16. Which of the following best describes your salt intake ability.
    1. Low
    2. Moderate
    3. High

PHYSICAL ACTIVITY

17. Does your work involve vigorous-intensity activity that causes large increase in breathing or heart rate for at least 10 minutes continuously?
    1. Yes
    2. No

18. In a typical week, how many days do you do moderate-intensity activities as part of your work?
    1. One day
    2. Two days
    3. Three days
    4. Four days
    5. All days

19. How long is your typical working day? (Hours/minutes) ……..

HISTORY OF RAISED BLOOD PRESSURE

20. When was your blood pressure last measured by a health professional?
    a) Within the past 12 months
    b) 1-5 years ago
    c) Never had my BP checked before
    d) Other (Specify) ……

21. Have you had your blood sugar measured in the past 12 months?
    a) Yes
    b) No

22. Is any member of your family having HBP or Diabetes?
    1. Yes
    2. No
    3. Don't know

23. Are you aware of your hypertensive status?
    1. Yes
    2. No

24. What is your hypertension status

    (a) hypertensive
    (b) non-hypertensive

25. If yes to Q23, how long have you been hypertensive?

STEP 2: PHYSICAL MEASUREMENTS

Prompt for Data Collectors

Before proceeding with anthropometric measurements, ensure that all instruments (e.g., weighing scales, and height meters) are properly calibrated. Document the calibration status and confirm accuracy before recording any measurements.

Height and Weight
(BMI)

26. Height measurement: ……Centimeters (cm)
27.Weight measurement: …….. Kilogram(kg)

28. Heart Rate
(Pulse)

Reading 1 …… Beats per minute
Reading 2 ……....Beats per minute
Reading 3 …….. Beats per minute

29. Blood
Pressure
Reading 1 …… Systolic (mmHg) ……Diastolic (mmHg)
Reading 2 ……Systolic (mmHg) …… Diastolic (mmHg)
Reading 3 ……. Systolic (mmHg) ……. Diastolic (mmHg)