SCHOOL OF PUBLIC HEALTH

COLLEGE OF HEALTH SCIENCES

UNIVERSITY OF GHANA

BURNOUT, METABOLIC SYNDROME AND RISK OF CARDIOVASCULAR DISEASES AMONG HEALTH WORKERS IN ACCRA, GHANA

BY

KENNEDY DODAM KONLAN

(10280735)

THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF DOCTOR OF PHILOSOPHY (PhD) PUBLIC HEALTH DEGREE

SEPTEMBER, 2021

DECLARATION

I, Kennedy Dodam Konlan hereby declare that except the references cited in this work which have been duly acknowledged, this thesis is a product of my own doctoral research work conducted under the supervision of Dr. Emmanuel Asampong, Prof. Phyllis Dako-Gyeke and Dr. Franklin N. Glozah. I further declare that no part or whole of this thesis has ever been submitted for the award of any degree in this University or any University elsewhere.

.... 7/06/2022

Kennedy Dodam Konlan Date

(Student)

This thesis was submitted with our approval as members of the supervisory committee:

.... 7th June, 2022

Dr. Emmanuel Asampong Date

(Primary Supervisor)

.... 7TH JUNE, 2022

Prof. Phyllis Dako-Gyeke Date

(Secondary Supervisor-)

.... 07/06/2022

Dr. Franklin N. Glozah Date

(Secondary Supervisor)

DEDICATION

I dedicate this thesis to Professor Ben Gyan and my dear wife, Mrs. Theresa Akua Appiah Konlan. Your guidance, support and spirit of excellence are a model to me and several others.

ACKNOWLEDGEMENTS

My profound gratitude goes to the study participants and research assistants who left their busy schedules and participated in this research for the advancement of science. I am also grateful to the management of the three hospitals whose employees were involved in this study for their immense support.

To my supervisors, Dr. Emmanuel Asampong, Prof. Phyllis Dako-Gyeke and Dr. Franklin N. Glozah, thank you for your guidance, encouragement and support throughout my doctoral studies. I have learnt so much from you. It has been a privilege to work under you and I will forever remember your mentorship. It was a very humbling experience. Your thoroughness in reviewing this work was unparalleled.

I also wish to thank the faculty and staff of the Department of Social and Behavioural Sciences as well as the School of Public Health, University of Ghana who contributed in diverse ways to make this work successful. To Adams and Pharin, my colleagues, thank you for your encouragement and support.

I would like to thank Dr. Kwame Yeboah of the Department of Physiology for mentoring me in biomedical research and helping me to find laboratory space at an early stage of my academic voyage.

I wish to express my profound gratitude to Building a New Generation of Academics in Africa (BANGA) Project at the University of Ghana (UG). This study was supported by the UG-BANGA Project Grant for Thesis Completion.

The greatest thanks go to Jehovah God.

DEFINITION OF TERMS

Burnout syndrome - Burnout syndrome is a psycho-social disorder which develops in an individual exposed to chronic job stress, and it is characterized by three elements; emotional exhaustion, depersonalization and reduced personal accomplishment.

Cardiovascular Diseases (CVDs) - Cardiovascular diseases are abnormalities of the heart and blood vessels. They include; coronary heart disease (heart attack), cerebrovascular accident (stroke), peripheral artery disease, pulmonary embolism, deep vein thrombosis, congenital heart disease, and rheumatic heart disease.

Metabolic Syndrome (MetS) - Metabolic syndrome is defined as the constellation of the risk factors for CVDs in an individual. It is diagnosed in individuals with any three of the following: high fasting plasma glucose, borderline hypertension or current antihypertensive drug use, dyslipidemia and central obesity.

Health workers - Health workers are hospital-based workers, comprising staff involved in direct patient care known as clinicians such as doctors, nurses/midwives, pharmacists, laboratory staff, etc and those not involved in direct patient care known as non-clinicians such as administrators, security personnel, secretaries, drivers, accountants, cooks, technicians, engineers, etc.

ABSTRACT

Background: In sub-Saharan Africa (SSA), an epidemiological transition has caused cardiovascular diseases (CVDs) to overtake communicable diseases and this presents a double-barreled challenge to the under-resourced health system. Health workers are critical in reversing this twofold burden of diseases. The corona virus disease 2019 (COVID-19) pandemic has increased the workload of health workers predisposing them to additional job-related burnout. Burnout among health workers increases their risk of CVDs. However, there is a paucity of data about the link between burnout syndrome and CVDs among health workers in Ghana.

Aim: This study aimed to examine burnout, metabolic syndrome and risk of cardiovascular diseases among health workers in Accra, Ghana.

Methodology: A cross-sectional study was conducted among 1,264 health workers recruited from three public hospitals in Accra. The participants were sampled using a proportionate stratified sampling technique and completed a questionnaire that collected socio-demographic, job-profile, lifestyle, resilience and burnout information. In addition, each participant's anthropometric and hemodynamic indices were measured. Furthermore, five milliliters of blood was obtained for analysis of fasting plasma glucose, lipids and cortisol. Descriptive, bivariate and multivariable logistic and ordinal regression analyses were employed to examine the associations between independent and dependent variables. Data analyses were conducted with the aid of Stata 15.0.

Results: The prevalence of burnout was 20.57%. Burnout was significantly associated with the job profile factors except job support and control ($p < 0.05$). Also, the prevalence of MetS was 41.85%. Burnout was significantly associated with hypercortisolemia and MetS as well as ten-year risk of CVDs ($p<0.001$). Specifically, for a one unit increase in overall burnout, the odds of experiencing metabolic syndrome was increased by 19.78 times (AOR=19.78, 95% CI: 12.69-30.83) as compared to those without burnout. Similarly, for a one unit increase in burnout, the odds of experiencing a high ten-year risk of CVDs increased by 2.07 times (AOR=2.07; 95% CI: 1.73-2.40).

Conclusion: There is high prevalence of burnout among health workers in Accra particularly during the COVID-19 pandemic. Workers at the primary level of healthcare and those on night shifts are most likely to experience burnout. Burnout is significantly associated with MetS and an increased ten-year risk of CVDs. It is recommended that the Ghana Health Service should undertake health systemic changes to decrease challenges of night shifts and at primary care facilities. Furthermore, the Ministry of Health needs a Staff Medicare Policy to help reduce disease-related turnovers.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

ADL	Activities of Daily Living
AHA	American Heart Association
ALM	Allostatic Load Model
APA	American Psychological Association
BANGA	Building a New Generation of Academics in Africa
BIA	Bioelectrical Impedance Analysis
BMI	Body Mass Index
BOS	Burnout Syndrome
BP	Blood Pressure
BRS	Brief Resilience Scale
CAD	Coronary Arterial Disease
CCNY	Carnegie Corporation of New York
CHD	Coronary Heart Disease
CM	Centimeter
CNS	Central Nervous System
CV	Cardiovascular
CVA	Cerebrovascular Accident
CVDs	Cardiovascular Diseases

DBP	Diastolic Blood Pressure
DM II	Diabetes Mellitus type II
e,g	Example
e.t.c	et cetera
FHS	Framingham Heart Study
FRS	Framingham Risk Score
GAR	Greater Accra Region
GARH	Greater Accra Regional Hospital
GAS	General Adaptation Syndrome
GHS	Ghana Health Service
GSS	Ghana Statistical Service
HR	Human Resources
HWs	Health Workers
KBTH	Korle-Bu Teaching Hospital
LMICs	Low-and Middle-Income Countries
MAP	Mean Arterial Pressure
MBI-HSS	Maslach Burnout Inventory-Human Services Survey
MBP	Mean Blood Pressure
mmHg	Millimeter of Mercury

MetS	Metabolic Syndrome
mmol/l	Millimole per Liter
MOH	Ministry of Health
NCDs	Non-Communicable Diseases
NHNES	National Health and Nutrition Examination Survey
NIH	National Institute of Health
PP	Pulse Pressure
SBP	Systolic blood pressure
SD	Standard Deviation
SDGs	Sustainable Development Goals
UG	University of Ghana
VS	Versus
WC	Waist Circumference
WHO	World Health Organization
WGMH	Weija-Gbawe Municipal Hospital
WHR	Waist Hip Ratio

CHAPTER ONE

INTRODUCTION

This chapter presents a general introduction of the study with emphases on the background facts necessitating the conduct of this study. It captures the statement of the problem that the study sought to address and the justification that established the basis for the study. Also, the research questions that the study sought to answer are presented. Subsequently, the general and specific objectives are stated. Furthermore, the theoretical underpinnings and the conceptual framework for the study are presented in the final section of this chapter.

1.1 Background

Cardiovascular diseases (CVDs) are abnormalities of the heart and blood vessels (Roth et al., 2017; Wang et al., 2015; World Health Organization (WHO), 2020). These diseases are part of a broad category of diseases known as non-communicable diseases (NCDs) (Kaptoge et al., 2019; United Nations (UN), 2015; WHO, 2014b); which are generally classified as chronic, non-infectious and non-transmissible conditions (Agaba et al., 2017; Konlan et al., 2020c; WHO, 2017). The common CVDs include; heart attack, stroke, pulmonary embolism, congenital diseases among others (Boateng et al., 2017; Roth et al., 2017; WHO, 2018). Cardiovascular diseases are classified into two broad categories; cardiovascular diseases due to atherosclerosis and others (WHO, 2018). Cardiovascular diseases due to atherosclerosis include; stroke, angina, heart attack, coronary heart disease, aneurysm and peripheral artery disease. The other categories of CVDs are; diseases of the valves, inflammations of the layers of the heart, congenital cardiac diseases, and cardiac failures (WHO, 2018).

Globally, cardiovascular diseases are now a serious public health concern due to their rising rates and complications (Tibazarwa & Damasceno, 2014; Wang et al., 2015; WHO, 2020). It is reported (Konlan et al., 2020a; Ofori-Asenso & Garcia, 2016; WHO, 2020) that CVDs are now responsible for over two thirds (2/3) of all global adult deaths each year, with low- and middle-income countries (LMICs) accounting for over eighty percent (82%) of such deaths. Studies (Ahmed, Jadhav, & Sobagaiah, 2018; Konlan et al., 2020b; MOH, 2012; Ofori-Asenso & Garcia, 2016; WHO, 2020) point to the fact that CVDs make the largest contribution to the NCDs burden in LMICs. Diabetes mellitus, obesity and high blood pressure (BP) have been cited as responsible for the worldwide rise in CVDs (Bosu, 2010; MOH, 2012; Sumaila, Shittu, Idris, Aliyu, & Ef, 2016; WHO, 2014b). Hyperglycemia, obesity and elevated BPs are known causes of CVDs (Agaba et al., 2017; Bosu, 2015; Nyiambam, et al., 2020; WHO, 2017). Unfortunately, it is estimated that the global rates of diabetes mellitus will expand by 54% by 2030 (American Heart Association (AHA), 2018; Mistire & Ahmed, 2013; WHO, 2015a). Also, almost sixty percent (58%) of the global population are said to be obese (Abshire, 2014; Ofori-Asenso, Agyemang, Laar, Boateng, 2016; WHO, 2014a) and similar findings have been reported for high BPs (Bosu, 2010; Gyang, Danjuma, Gyang, Sule, & Musa, 2018; Konlan et al., 2020b; Yeboah et al., 2018).

In Africa, cardiovascular diseases have overtaken communicable diseases as the leading cause of adult deaths (Agyei-Mensah & Aikins, 2010; Gyang et al., 2018; Nyiambam, et al., 2020; WHO, 2013a; 2015b). The risk factors for CVDs are rising rapidly and it is said that one in three adults in Africa are hypertensive (Sumaila et al., 2016), with over 46% of persons above thirty-five (35) years in SSA diagnosed with high BP (Bosu, 2015; Gyang et al., 2018; Konlan et al., 2020c; WHO, 2017). Similar findings have been reported for obesity (Duodu, 2015; Kasu, Ayim, & Tampouri, 2015; WHO, 2011). Also, the prevalence of diabetes mellitus in SSA is projected to rise by 75.8% by 2030 (Yeboah et al., 2018). This proportion is more than double the projected worldwide rise of 37% (Arranz et al., 2012; Alwan, 2011; WHO, 2013c). Drivers of this rise in hypertension, obesity and diabetes mellitus in SSA include; the relative aging of the population, physical inactivity and changes in lifestyle associated with rising urbanization (Anand & Yusuf, 2011; Arranz et al., 2012; Roth et al., 2017; WHO, 2014a).

In Ghana, Agyemang and colleagues report that CVDs constitute 9.1% of hospital admissions involving persons above thirty (30) years and that 13.2% of deaths involving adults are due to CVDs (Agyemang et al., 2012). Majority of the persons with CVDs are either hypertensive, obese and/or diabetic (Agyemang, et al., 2012; Bosu, 2015; Duodu, 2015; MOH, 2012). Other studies in Ghana (Appiah et al., 2017; Boateng et al., 20117; Kasu et al., 2015; Kodaman et al., 2016; Konlan et al., 2020c) report that CVDs occur commonly in persons with elevated plasma glucose, BPs and BMIs. The rate of hypertension in Ghana is estimated at almost twenty percent (19.3%) (for the residents in rural communities) to above fifty percent (54.6%) (for the urban residents) (Appiah et al., 2017). Similar rates are reported for obesity and diabetes mellitus (Kasu et al., 2015; MOH, 2012; Ofori-Asenso et al., 2016). The literature (Appiah et al., 2017; Grundy et al., 2005; MOH, 2012; Moy & Bulgiba, 2010; Osei-Yeboah et al., 2018; Yeboah et al., 2018) suggests that the risk factors of CVDs often cluster as metabolic syndrome before eventually causing CVDs.

The onset of most cardiovascular diseases is characterized by sub-clinical physiological dysregulation known as metabolic syndrome (MetS) (McEwen, 2015; Nyiambam et al., 2020; Ofor-Asenso et al., 2017). Metabolic syndrome refers to a situation in which the risk factors of CVDs congregate in an individual (Moy & Bulgiba, 2010; Ofori-Asenso, Agyeman, & Laar, 2017; Yeboah et al., 2018). The National Cholesterol Education Program-Adult Treatment Panel III (NCEP-ATP III) revision describes metabolic syndrome as a constellation of any three of these clinical characteristics; dyslipidemia, high BP, high blood sugar, and central obesity in an individual (Grundy et al., 2005; Moy & Bulgiba, 2010; Ofori-Asenso et al., 2016). The number of people with metabolic syndrome is rising globally (Yeboah et al., 2018). Metabolic syndrome is estimated to affect between 19% and 31% of the world's population (Chico-Barba et al., 2019). The literature on the prevalence of metabolic syndrome among Ghanaians by three different criteria is stated as 12.2% (based on the common NCEP ATP III) (Ofori-Asenso et al, 2017), 16.2% (WHO) (Nyiambam et al., 2020), and 7.8% (IDF) (Owusu et al., 2013). Also, Yeboah et al. (2018) reports that the prevalence of MetS among medical students in Ghana is 12.4%; but it is higher in females than males and that MetS is an established risk factor of CVDs.

Health workers are at the fore-front of providing health information for promoting healthy lifestyles as well as preventing CVDs (MOH, 2012). They are engaged in actions with the primary intent of preventing diseases (Asamani et al., 2019). Health workers create awareness within the community by imparting health education which is considered the most powerful tool to bring behavior change (Gyang et al., 2018). Also, health workers are considered to be knowledgeable role models in relation to health (Osei-Yeboah et al., 2018). It is believed that as counsellors, they would themselves live exemplary lives and use the information they provide to the public to maintain their own health (Sumaila et al., 2016). However, health workers are often concerned about taking care of others to the neglect of their own health with the result that most of them end up with lifestyle diseases like MetS (Osei-Yeboah et al., 2018). Metabolic syndrome among health workers poses a significant risk to them as they could develop CVDs in later years (He, Chen, Zhan, Wu, & Opler, 2014), and this could derail efforts at achieving the sustainable development goal target of having an adequate skilled health workforce (UN, 2015). This is particularly serious in SSA where 3% of the global health workforce is responsible for 25% of the world's disease burden (Asamani et al., 2019; Gyang et al., 2018; MOH, 2012; Yeboah et al., 2018).

Health workers consist of those involved in direct patient care known as clinical staff (doctors, nurses/midwives, pharmacists, laboratory staff, etc) and those not involved in direct patient care called non-clinical staff (administrators, security staff, secretaries, drivers, accountants, cooks, technicians, engineers, etc) (Asamani et al., 2019). Health workers often deliver health care in teams to promote the health of patients and the welfare of the general populace (Odonkor & Frimpong, 2020). This places high job demands on each team member and exposes them to job-related burnout (Afulani et al., 2021a). This is further compounded in SSA where health workers are engaged in one of the most challenging work environment due to the limited material and human resources for work (Dubale et al., 2019). The corona virus disease 2019 (COVID-19) pandemic has further aggravated the workload on the few health workers in SSA predisposing them to additional job-related stress and its associated burnout (MOH, 2020). Studies in SSA (Abdo, El-Sallamy, El-Sherbiny, & Kabbash, 2016; Afulani et al., 2021a; Atindanbila et al., 2012; Atinga et al., 2014; Dubale et al., 2019; Odonkor & Frimpong, 2020) suggest that health workers from primary care institutions record the highest levels of job-related stress.

Burnout syndrome is a psycho-social disorder resulting from exposure to chronic interpersonal stress at the workplace and characterised by three elements; emotional exhaustion, negative attitude towards service recipients and a feeling of low self-accomplishment (Afulani et al., 2021a; Atlam, 2018; Odonkor & Frimpong, 2020). Aside burnout affecting the productivity of health workers (Odonkor & Frimpong, 2020), it has emerged as a psycho-social risk factor for CVDs among working populations elsewhere (He et al., 2014). Burnout syndrome contributes to reducing the number of skilled health manpower through CVD-associated mortalities (Chico-Barba et al., 2019; He, et al., 2014; Kitaoka-Higashiguchi et al., 2009). In addition, the modifiable risk factors for CVDs are said to be present in individuals experiencing burnout (Kivimäki et al., 2012). Therefore, burnout is suggested to be linked to CVDs (Afulani et al., 2021b; Kitaoka-Higashiguchi et al., 2009; Kivimaki et al., 2015) but no such relationship has been determined among health workers in urban Ghana.

1.2 Problem statement

Non-communicable diseases account for over seventy percent (71%) (41 million) of the fifty seven (57) million adult deaths worldwide (Agaba et al., 2017; Appiah et al., 2017; Ofori-Asenso & Garcia, 2016; Roth et al., 2017; WHO, 2020). Eighty-two percent (82%) of the said deaths occur in LMIC (Boateng et al., 2017; MOH, 2012; WHO, 2017). Cardiovascular diseases are a major culprit in these NCD-related deaths (Appiah et al., 2017; Ofori-Asenso et al., 2016; WHO, 2017). In 2016, cardiovascular diseases resulted in almost eighteen (17.9) million deaths worldwide (Konlan et al., 2020c; Nyiambam, et al., 2020; WHO, 2020). Over three quarters (3/4) of these CVD-associated deaths took place in LMIC (Agaba et al., 2017; WHO, 2020; Yeboah et al., 2018). Globally, cardiovascular diseases are projected to result in almost twenty-four (23.6) million deaths by 2030 (Appiah et al., 2017; Roth et al., 2017; Wang et al., 2015; WHO, 2020). The largest increase will be seen in developing countries, with about 27% in the African region (Appiah et al., 2017; MOH, 2012; Nyiambam, et al., 2020). In West Africa, almost sixty percent (55.9%) of the working population are diagnosed with the risk factors of CVDs; obesity, hypertension and diabetes mellitus and this is projected to rise further with the increase in urbanization and its associated lifestyle changes (Agaba et al., 2017; Bosu, 2015; Gyang et al., 2018; Sumaila et al., 2016).

In Ghana, cardiovascular diseases are the main cause of adult mortality (Appiah et al., 2017; Konlan et al., 2020a; MOH, 2012; Nyiambam, et al., 2020). They account for thirty-four percent (34%) of total adult deaths and thirty-one percent (31%) of total disability-adjusted-life years (DALYs) (Appiah et al., 2017; Kasu et al., 2015; Konlan et al., 2020b; Nyiambam, et al., 2020). It is reported (Appiah et al., 2017; Boateng et al., 2017; Bosu, 2015; Nyiambam, et al., 2020) that twenty-five percent (25%) of public servants in Ghana are battling with CVDs. Also, Osei-Yeboah et al. (2018) report that 16.07% of Ghanaian health workers are affected with CVDs. In addition, the risk factors for CVDs, particularly diabetes mellitus, hypertension, and obesity, are said to be implicated in over forty percent (46%) of mortalities involving health workers in Ghana (Duodu, 2015; Kasu et al., 2015; Nyiambam, et al., 2020; Nuhu et al., 2020; Ofori-Asenso, et al., 2016; Osei-Yeboah et al., 2018). Unfortunately, the burden of these risk factors is projected to rise further due to the increase in job-related stress in addition to the surge in the modifiable risk factors for CVDs among health workers (Bosu, 2015; Nuhu et al., 2020; Nyiambam, et al., 2020).

In the Greater Accra region, evidence (Agyei-Mensah & Aikins, 2010; Amoah, 2009; Appiah et al., 2017; Bosu, 2015; Yeboah et al., 2018) points to an increased prevalence of the risk factors for CVDs. According to the Ghana Demographic and Health survey, Accra has the highest prevalence of hypertension, diabetes mellitus and obesity in Ghana (Duodu, 2015; Ofori-Asenso & Garcia, 2016; Yeboah et al., 2018). In the 2009 civil servant study in Accra, nineteen (19) percent of participants reported with severe high BPs while forty eight (48) percent reportedly had organ damage secondary to high BPs (Kodaman et al., 2016). Despite the fact that the risk factors for CVDs have over the last two-decades attracted significant research interest in Ghana (Bosu, 2010; Kodaman et al., 2016; Konlan et al., 2020a; Ofori-Asenso et al., 2017; Yeboah et al., 2018), there has been limited attention to its burden among health workers, particularly those in Accra.

The impact of CVDs transcends morbidity and mortality to impose a huge financial burden on nations and households (Ofori-Asenso & Garcia, 2016; Osei-Yeboah et al., 2018; Yeboah et al., 2018; WHO, 2017). Cardiovascular diseases are among the most severe threats to global economic development (Appiah et al., 2017; BeLue et al., 2009; Boateng et al., 2017; WHO, 2015b). At the household level, CVDs pose a heavy financial burden, especially on poor households, and deter many affected people from seeking care for other diseases (Kodaman et al., 2016). According to the Harvard School of Public Health and World

Economic Forum, NCDs pose a substantial economic burden that will evolve into a loss of forty-seven (47) trillion dollars over the period of 2010 to 2030, and CVDs will be the major contributor to this economic burden (Bloom et al., 2011; Bosu, 2015; WHO, 2018). In addition, diseases of the heart and blood vessels contribute to disability, diminish quality of life and makes health care expensive (Bosu, 2015; UN, 2015; WHO, 2020). Particularly, cardiovascular diseases among health workers lower the possibility of meeting the SDG-three target by reducing the skilled workforce (Bosu, 2015). This is occurring at a time when there are inadequate health workers in SSA to tackle the double-barreled challenge of communicable and non-communicable diseases (MOH, 2020).

Globally, job-related burnout is now a major public health issue due to its rising prevalence (Habadi et al., 2018). The prevalence of burnout among healthcare staff is said to range between 21.5% (Chico-Barba et al., 2019) to a high rate of 75.8% (Afulani et al., 2021b). The literature indicates that health workers from SSA record the highest burnout rates (Dubale et al., 2019) possibly due to the under-resourced healthcare systems (Odonkor & Frimpong, 2020). In Ghana, burnout prevalence is high among sections of clinical professionals (Atinga et al., 2014; Dapaah, 2014; Fiadzo et al., 1997). Afulani and colleagues (2021a) report that almost half (46%) of health workers particularly nurses have burnout. Likewise, Asiedu et al. (2018) and Nuhu et al. (2020) found that burnout affected over a quarter of clinicians in Ghana particularly nurses and midwives who form the majority of the health workforce (Asamani et al., 2019). Similarly, rates have been reported among physicians in Ghana (Ayisi-Boateng et al., 2020; HOH, 2020; Opoku & Apenteng, 2014).

Burnout is said to be responsible for the poor attitude of health workers towards recipients of care (Dubale et al., 2019; Holmes et al., 2017; Kim et al., 2018). Poor attitudes from health workers has the potential of reducing the confidence of the general populace in the healthcare system (Mbanga et al., 2018) particularly in SSA where access to health care is highly constrained (Afulani et al., 2021a). In Ghana, there have been public outcry over the attitudes of health workers (Asamani et al., 2019; Atinga et al., 2014; Dapaah, 2014) and this was evident in the recent public discourse about the "no bed syndrome" in Ghanaian health facilities (Konlan et al., 2020c). Furthermore, evidence exists (Atindanbila et al., 2012; Atinga et al., 2014; Dapaah, 2014) regarding poor handling and abuse of patients by health workers in Ghana for which the reasons advanced include burnout (Afulani et al., 2021a; Atinga et al., 2014; Odonkor & Frimpong, 2020). The situation has further been worsened with the onslaught of the COVID-19 pandemic, with more people having become regular attendees of health facilities (Afulani et al., 2021a). Health workers in Accra have therefore been compelled to attend to a lot of patients especially with the surge in positive COVID-19 cases (MOH, 2020), and this predisposes them to a high workload and its associated job-related burnout (Afulani et al., 2021a; MOH, 2020; Odonkor & Frimpong, 2020).

Burnout as a psycho-social disorder affects the mental health of victims (Asiedu et al., 2018). Mental instability among health workers means reduced standard (Afulani et al., 2021a) and quality of care (MOH, 2020). In addition, burnout could predispose health workers to metabolic syndrome and future CVDs (Chico-Barba et al., 2019; He et al., 2014; Kitaoka-Higashiguchi et al., 2009). These could trigger disease-related staff turnover (Nuhu et al., 2020) and could hinder Ghana's potential of achieving the sustainable development goal three C (3C) target of ensuring the availability and retention of skilled workforce for the health sector by 2030 (Asamani et al., 2019; MOH, 2020; Odonkor & Frimpong, 2020).

1.3 Justification for the study

Studies on burnout among health workers in SSA (Afulani et al., 2021a; Asiedu et al., 2018; Ayisi-Boateng et al., 2020; Dapaah, 2014; Divinakumar et al., 2014; Dubale et al., 2019;

Odonkor & Frimpogng, 2020; Opoku & Apenteng, 2014) have largely focused on the impact of burnout syndrome on employee attitudes and work output. However, some few studies (Afulani et al., 2021b; He et al., 2014; Kitaoka-Higashiguchi et al., 2009; Steptoe & Kivimäki, 2012) have suggested that burnout is related to the pathological activation of the cardiovascular system. In addition, job-related burnout has been linked to hypertension, diabetes mellitus and obesity in sections of hospital staff (Chico-Barba et al., 2019; Kyle et al., 2017; He et al., 2014; Kitaoka-Higashiguchi et al., 2009) but this link remains largely undetermined among health workers in urban Ghana, a geographical area with alarming rates of hypertension, diabetes mellitus and obesity (Ofori-Asenso, et al., 2016). Determining the link between burnout syndrome and the risk of CVDs among health workers is fundamental to understanding the physiological dysregulation in employees experiencing chronic stress at the workplace (Afulani et al., 2021b; Bosu, 2015; He et al., 2014).

Also, many health workers in Ghana are not aware of their CVD-risk status and would likely develop CVDs in the near future (Bosu, 2015; Kasu et al., 2015; Nuhu et al., 2020; Osei-Yeboah et al., 2018). This is occurring against the backdrop of the need for adequate health workers to meet the SDG three targets (Asamani et al., 2019; Duodu, 2015; MOH, 2020). In addition, there is little information on the effect of the combination of the risk factors on total CVD-risk among health workers (Osei-Yeboah et al., 2018). Assessing health workers' risk of CVDs has been identified as one of the ways to determine their future occurrence and to guide preventive actions as well as human resources for health decisions (Kasu et al., 2015; MOH, 2012; Osei-Yeboah et al., 2018). Thus, determining the risk of CVDs among health workers provides a plausible means of making decisions about instituting interventions aimed at reducing CVDs among health workers so as to meet the SDG targets, particularly those related to health (Appiah et al., 2017; United Nations Communications Group SDGs, 2017; WHO, 2018). Therefore, assessing the ten-year risk of CVDs among health workers is a useful step for the identification of health workers at high risk of developing CVDs by 2030 (D'Agostino et al., 2013; Goff et al., 2014; MOH, 2012).

1.4 Research questions

Questions that this study sought to address included:

1. What is the prevalence of burnout among health workers in Accra?
2. What job-related factors influence burnout among health workers in Accra?
3. What is the prevalence of metabolic syndrome among health workers in Accra?
4. What is the relationship between burnout and metabolic syndrome among health workers in Accra?
5. What is the relationship between burnout and the ten-year risk of cardiovascular diseases among health workers in Accra?

1.5 Objectives of the study

1.5.1 General Objective

This study aimed to examine burnout, metabolic syndrome and risk of cardiovascular diseases among health workers in Accra, Ghana.

1.5.2 Specific objectives

The specific objectives were:

1. To determine the prevalence of burnout among health workers in Accra.
2. To identify the job-related factors associated with burnout among health workers in Accra.
3. To determine the prevalence of metabolic syndrome among health workers in Accra.
4. To examine the relationship between burnout and metabolic syndrome among health workers in Accra.

5. To assess the relationship between burnout and the ten-year risk of CVDs among health workers in Accra.

1.6 Theoretical underpinning and conceptual framework

Theories are very useful in designing any scientific study as they provide guides on the possible relationship between the variables of interest. Most quantitative studies are guided by theories which give insights about the phenomena of interest (Cohen, Evans, Stokols & Krantz, 2013). Many theories give insights on the relationship between burnout syndrome and CVDs (Beckie, 2012; Israel, Baker, Goldenhar, Heaney, & Schurman, 1996; McEwen & Gianaros, 2011; Read & Grundy, 2012). Some of these are; the general adaptation syndrome (GAS) theory, the theory of homeostasis, and the theory of allostasis (Beckie, 2012; McEwen & Gianaros, 2011; Read & Grundy, 2012).

The general adaptation syndrome theory is of the view that even though the physiological responses following chronic stress aid survival, they may trigger pathological processes for most CVDs (Polikandrioti et al., 2019). However, the GAS theory is criticised as being too broad with a lot of abstractions, making it impracticable for use (Read & Grundy, 2012). Another theory which seeks to provide some insights into how chronic stress results in CVDs is the theory of homeostasis (McEwen & Gianaros, 2011). Homeostasis focuses on the maintenance of internal constancy despite changes in the external environment (Read & Grundy, 2012). Unfortunately, the homeostatic concept of stable states as well as feedback loops is unable to provide adequate explanation of the complex physiological dysregulation during chronic stress states (McEwen & Gianaros, 2011). Allostasis is an extension of the theory of homeostasis and provides a more plausible explanation regarding the link between burnout (chronic stress) and CVDs (McEwen & Gianaros, 2011; Read & Grundy, 2012; Sterling, 2004; Sterling & Eyer, 1988). While homeostasis is focused on maintaining a balance in the body, by static single-point tuning, allostasis proposes dynamic regulation of internal constancy of physiological systems via multiple pathways where the human body makes adjustment to the physiological systems to match chronic demands (McEwen & Stellar, 1993). The theory also posits that this overtime exerts a load on the body of victims; an allostatic load (Cohen et al., 2013). This load is the long term effect of adjusting to chronic stress (Beckie, 2012; Cohen et al., 2013; Read & Grundy, 2012). This study was based on the theory of allostasis and the conceptual framework adapted McEwen's allostatic load model (Beckie, 2012; McEwen, 2015; McEwen & Stellar, 1993).

Allostasis describes the adjustment of human physiological systems to physical, psychosocial and environmental stressors (McEwen & Gianaros, 2011; Polikandrioti et al., 2019; Read & Grundy, 2012). The theory of allostasis was postulated by the neurobiologist, Peter Sterling, and an epidemiologist, Joseph Eyer (1988). Their most simple three-word definition of allostasis is, stability through change (McEwen & Gianaros, 2011; Read & Grundy, 2012; Sterling & Eyer, 1988). According to Sterling and Eyer (1988), allostasis describes the mechanism by which physiological stability is achieved through changing processes of bodily systems following exposure to chronic stressors. The allostatic process provides that one of the mechanisms of healthy adaptation to chronic environmental demands is through variability of physiological systems (Clark, Bond & Hecker, 2007), which is in contrast with homeostasis which supports stability of the bodily systems (McEwen & Gianaros, 2011). However, long term variability results in a load being placed on physiological systems; an allostatic load, (Clark et al., 2007; McEwen, 2015; McEwen & Gianaros, 2011) and this overtime leads to pathologies such as CVDs (Cohen et al., 2013).

According to the allostatic theory, actual or perceived threats (stressors) to the body trigger the sympathetic–adrenal–medullary (SAM) axis release of the catecholamine called adrenalin/epinephrine and the hypothalamic pituitary–adrenal (HPA) axis production of glucocorticoids (cortisol) that energize the body for the immediate response as well as long-term adaptation (Beckie, 2012; Cohen et al.,2013; McEwen & Gianaros, 2011). Coordination of the allostatic response is based on the central nervous system's analysis of the threats/stressors (hippocampal, amygdaloid, and prefrontal cortical regulation) (McEwen & Gianaros, 2011) and execution of physiological responses via neuro-hormonal release; epinephrine (adrenaline) and cortisol (McEwen & Gianaros, 2011). These hormones exert physiological as well as pathological effects on the body (Bellingrath, Weigl, & Kudielka, 2009). The released hormones affect effectors such as the heart, blood vessels and adipose tissues, leading to an elevation of heart rates and BPs, fat deposition and blood vessel narrowing, among others (McEwen & Gianaros, 2011). In the immediate term, they promote adaptation, maintain homeostasis, and aid survival (Cohen et al., 2013). Yet, when called upon frequently, they exact a cost (i.e., an allostatic load) that can accelerate CVD processes (Danese & McEwen, 2012). It has to be pointed out that the body's perception of threat and mobilization of the neuro-hormonal systems are fundamentally shaped by individual differences in biological, psychological, and social characteristics that ultimately determine the ability to cope with stress (McEwen & Gianaros, 2011).

The allostatic load model (ALM) was developed to illustrate the physiological consequence of chronic stress on bodily systems of victims (Fleg & Strait 2012; McEwen & Gianaros, 2011; Read & Grundy, 2012; Sterling & Eyer, 1988) (Figure 1). The model views the individual as a bio-psycho-social being and the individual's perception of stress as influenced by major life events, trauma, abuse as well as environmental factors at home and work (McEwen, 2015). The individual's perception of these events as stressful or not depends on the level of resilience/coping of the individual, which largely depends on individual differences (McEwen & Gianaros, 2011). These individual differences are shaped by biological and social factors (Cohen et al., 2013). Furthermore, perceived stress, aside initiating the flight-fight mechanism, could also trigger unhealthy lifestyle patterns such as poor diet, smoking, alcohol use and physical inactivity (McEwen & Gianaros, 2011). These unhealthy behavioural responses, together with the flight-fight mechanism, activate physiological processes from the nervous, endocrine and cardiovascular systems with a goal of adaptation (allostasis). However, persistence of the stressors results in an allostatic load (physiological wear and tear) and resultant chronic disease outcomes (Cohen et al., 2013). The allostatic load model is shown in figure 1.

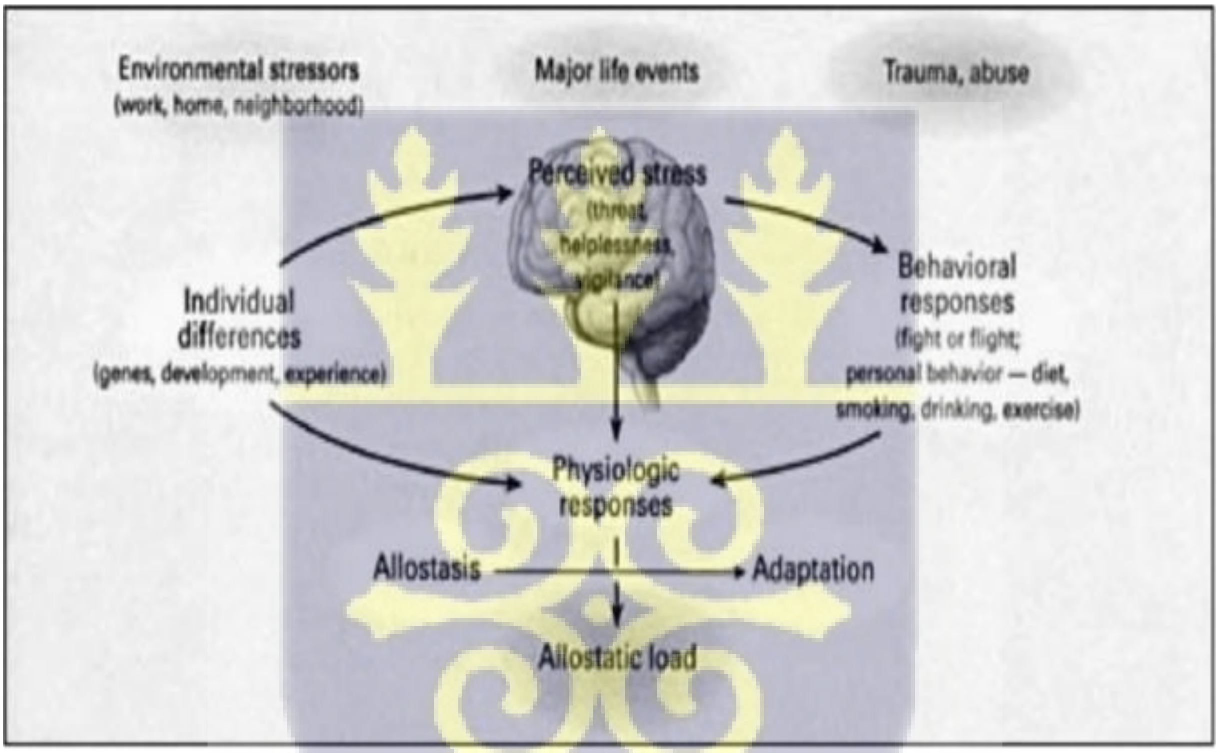

Figure 1. McEwen's Allostatic Load Model (McEwen & Stellar, 1993)

Allostatic load is assessed in physiological systems as imbalances in cardiovascular, metabolic, neuro-endocrine and immune system activity as well as plasticity changes in the brain structures (Beckie, 2012; Israel et al., 1996; Read & Grundy, 2012). McEwen and Gianaros (2011) identified a number of physiological indicators for determining allostatic load. These included systolic and diastolic BPs, high-density lipoproteins (HDL) and total cholesterol (TC), fasting plasma glucose, glycosylated hemoglobin (HbA1c), levels of plasma glucose, serum dihydroepiandrosterone (DHEA-S), plasma cortisol or 17-Hydroxycorticosteroids or 24-hour urinary cortisol excretion, overnight urinary noradrenaline, adrenalin excretions, BMI and waist circumference. High allostatic load scores in an individual is indicative of MetS and increases the risk of CVDs (Fleg & Strait, 2012) while lower allostatic scores indicate reduced risk (Read & Grundy, 2012).

1.6.1 Conceptual framework

The conceptual framework was based on the allostatic load model. As stated earlier, the model views each individual as a bio-psycho-social being affected by biological, social and psychological factors (McEwen, 2015: McEwen & Gianaros, 2011; Read & Grundy, 2012). An individual's tendency to develop burnout is shaped by the individual's biological (constitutional), psychological (coping/resilience), and socio-environmental (historical) factors (Read & Grundy, 2012). The biological factors include; age, sex and familial history of chronic diseases (which represents the genetic ambit of the individual). The socio-environmental factors include the social experiences of the individual such as; years of experience on the job, socio-economic status, marital status as well as job-profile factors such as the category of staff, type of shift, service area, perceived workload, job satisfaction, labour seniority, intentions to quit job and additional jobs. The main psychological factor is the level of resilience, and this determines whether or not the health worker can cope with stressors from the biological and socio-environmental factors. This in turn determines whether or not the individual will experience burnout. Individuals with a low level of resilience easily become overwhelmed with chronic stress at the workplace and thus experience burnout syndrome (Read & Grundy, 2012). Burnout syndrome activates the SAM and HPA hormonal systems resulting in increased heart rate, rise in BPs, fat deposition, and insulin resistance, among others (metabolic syndrome) (Read & Grundy, 2012). Burnout could also cause the adoption of unhealthy lifestyle choices such as physical inactivity, excessive use of alcohol, smoking and poor diet (McEwen & Gianaros, 2011). These together predispose the individual to MetS and future CVDs (McEwen, 2015: McEwen & Gianaros, 2011; Read & Grundy, 2012).

The conceptual framework depicting the relationship between the variables is shown in Figure 2

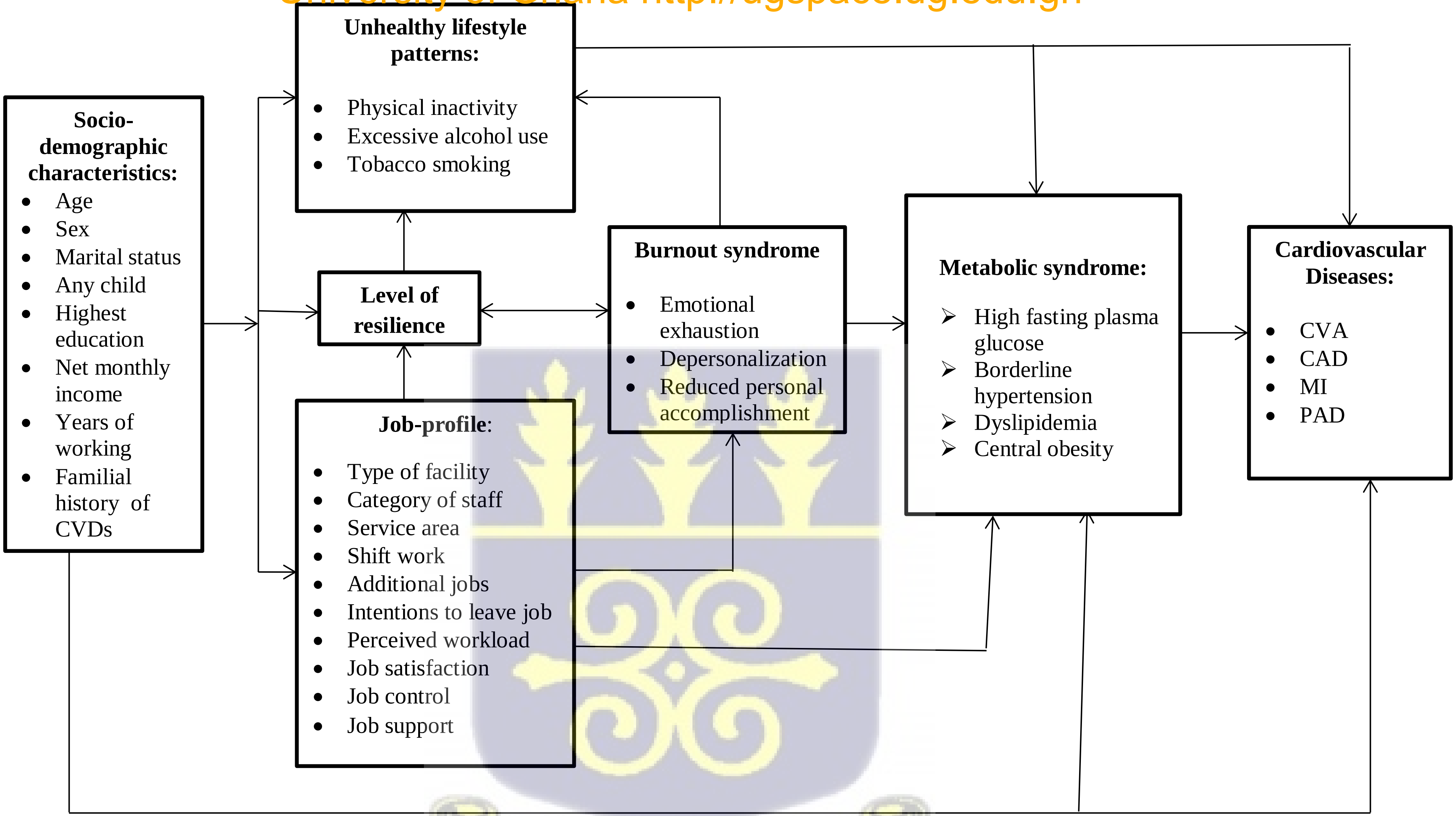

Figure 2. Conceptual framework adapted from McEwen's Allostatic Load Model

As depicted in the conceptual framework (figure 2), the individual health worker is affected by biological (socio-demographic), socio-environmental (job-profile factors) and psychological (resilience) factors. The socio-demographic and job-profile factors interact to determine the level of resilience (psychological state) of the health worker (Figure 2). The level of resilience in-turn determines whether the health worker will experience burnout. Also, the level of resilience influences the adoption of unhealthy lifestyle choices such as; physical inactivity, excessive alcohol use and smoking. In addition, health workers who develop burnout syndrome adopt same unhealthy lifestyle patterns. These unhealthy lifestyle choices indirectly could result in allostatic load manifesting as metabolic syndrome and future CVDs. Furthermore, burnout directly leads to metabolic syndrome in the immediate term and future CVDs through neuro-hormonal pathways (allostatic overload) in the long term. Also, the socio-demographic factors independently influence the experience of metabolic syndrome and CVDs (Figure 2).

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of the literature in the area of study and relevant information on what is known about the area under investigation. The literature reviewed highlighted current research findings on the subject matter and identified gaps in the literature. Literature reviews provide scientific and theoretical knowledge about a research problem enabling synthesis of what is known and unknown (Grove, Burns, Gray, & Burns, 2015 and Polit & Beck, 2014). A search of peer-reviewed, published works was conducted from various databases such as: Web of Science, PubMed, PsycINFO (EBSCO), Cumulative Index to Nursing and Allied Health Literature, Google Scholar and Cochrane database of systematic reviews. Keywords and phrases used for the searches either individually or in combination to find related studies included; burnout, metabolic syndrome, cardiovascular diseases, risk of cardiovascular diseases and health workers. Peer reviewed articles published in English were used. Boolean operators such as "AND", "OR", and "NOT" were used in combination to explore a wider scope of literature on the study variables.

2.2 Cardiovascular health

Cardiovascular health refers to a state in which there is absence of cardiovascular diseases together with the presence of highest levels of the following; absence of cigarette smoking, healthy diet, no excessive alcohol use, sufficient physical activity, normal body weight, normal plasma lipids, normal BPs, and normal plasma glucose in an individual (AHA, 2018; Fleg & Strait, 2012; WHO, 2017).

2.2.1 Definition of cardiovascular diseases

Cardiovascular diseases are chronic disease conditions arising from a malfunctioning of the heart and blood vessels (AHA, 2018; Wang et al., 2015; WHO, 2020). The CVDs include; coronary artery diseases, stroke, hypertension, peripheral artery disease, heart attack, cardiac failures among others (WHO, 2018).

2.2.2 Types of cardiovascular diseases

Several forms of CVDs exist. The common types are: myocardial infarction, heart failures, cerebrovascular accident (stroke), peripheral artery disease, rheumatic heart disease and congenital heart disease (WHO, 2020). Myocardial infarction refers to death of cardiac muscle due to reduced blood and oxygen supply to the myocardium; cerebrovascular accident is a disease of blood vessels supplying the brain; peripheral arterial disease constitutes a disease of blood vessels supplying the arms and legs; rheumatic heart disease causes damage to the heart muscle and heart valves from rheumatic fever, caused by streptococcal bacteria; congenital heart diseases are malformations of the heart structures which exist at birth; while deep vein thrombosis refers to blood clots in the leg veins which can dislodge and move to the heart and lungs causing pulmonary embolism (Bosu, 2010). Out of the various types of CVDs, cardiomyopathy and stroke are the most prevalent in Africa (Addo et al., 2012; AHA, 2018; Wang et al., 2015; WHO, 2017).

2.2.3 Epidemiology of cardiovascular diseases

2.2.3.1 Global prevalence of cardiovascular diseases

Globally, cardiovascular diseases are the leading cause of adult deaths (AHA, 2018; Sumaila et al., 2016; WHO, 2017). The number of deaths as a result of CVDs rose by a quarter (25%) between 1990 and 2010, and in 2015 one in three deaths among adults were due to CVDs (WHO, 2018). Worldwide, the number of people dying from CVDs rose by 15% leading to almost eighteen million deaths in 2016 (WHO, 2017). Cardiovascular diseases such as myocardial infarctions and cerebrovascular accidents together accounted for almost 85.1% of the CVD-deaths in 2016 (WHO, 2017). Global deaths due to CVDs are expected to rise to almost twenty-four (23.6) million by 2030 (WHO 2020). In the European Union (EU), cardiovascular diseases account for 37% of all deaths (WHO, 2020), and in the United Kingdom (UK), they represent the second cause of deaths, with 46% of such deaths being a result of coronary artery disease (CAD) and 26% a result of stroke (WHO, 2015b). In the United States of America (USA), over ninety-two million adults are diagnosed with at least one CVD or another (AHA, 2018; Bosu, 2015; WHO, 2020). It is projected that by 2030, 43.9% of the USA population would have at least one type of CVD (AHA; 2018; Wang et al., 2015; WHO, 2018).

Cardiovascular diseases were perceived to be diseases of the developed nations until recent years when epidemiological data (Appiah et al., 2017; Bosu, 2010; Global Burden of Disease (GBD) Risk Factors Collaborators, 2017; Ofori-Asenso & Garcia, 2016; Sumaila et al., 2016; WHO, 2017) point to epidemic levels, especially in developing nations. Major cardiovascular event are now lowest in developed countries and highest in developing countries; accounting for over eighty percent (80%) of adult deaths (Bosu, 2015; Sumaila et al., 2016; WHO, 2014b). Majority (over 80%) of these deaths occur in LMIC in SSA mainly because preventive measures are inadequate (Addo et al., 2012; Nyiambam et al., 2020; Osei-Yeboah et al., 2018; Sumaila et al., 2016).

2.2.3.2 Prevalence of cardiovascular diseases in sub-Saharan Africa

In sub-Saharan Africa, cardiovascular disease-associated deaths increased between 1990 and 2015 and it was the only region in the world where deaths as a result of CVDs increased significantly beyond expectation (Ofori-Asenso et al., 2016; Sumaila et al., 2016; WHO, 2017). Cardiovascular diseases were also ranked as the leading cause of death among people aged over forty (40) years (Bosu, 2015; Sumaila et al., 2016; WHO, 2020; Yeboah et al., 2018). Cerebrovascular accident is the dominant form of CVDs in SSA (Nyiambam et al., 2020; Osei-Yeboah et al., 2018; Sumaila et al., 2016). In 2012, nearly half a million deaths due to stroke were recorded in SSA, representing 4.4% of all deaths in the region (Bosu, 2015; Nyiambam et al., 2020; WHO, 2013).

Cardiovascular diseases affect more young people, women and those with HIV/AIDS in SSA (Kodaman et al., 2016). For example, myocardial damage following delivery has been cited as the main cause of congestive cardiac failure (Nyiambam et al., 2020). In Nigeria, myocardial damage among females is reported to be a common phenomenon after childbirth (Agaba et al., 2017). Also, rheumatic valvular disease is still a major cause of mortality and pericardial disease is one of the earlier manifestation of HIV infection (Sumaila et al., 2016). In addition, aortic aneurysms are also associated with HIV/AIDS in SSA (Appiah et al., 2017).

Although CVDs are a serious public health issue in high income and LMIC, the impact is felt much in the latter due to numerous factors such as the poor health care systems (WHO, 2017) as well as the poor income levels among other factors (Bosu, 2015; Sumaila et al., 2016; WHO, 2013b). Whereas in high income countries, CVD-related deaths are more in older people, in the LMIC, it is predominant in young people (Sumaila et al., 2016). Hence, disabilities due to CVDs would be felt more in LMIC as young people who are supposed to form the active workforce would be battling CVDs or their associated disabilities (Roth et al., 2017). In particular, the negative impact of CVDs would be dire in SSA because the health care systems in most countries are still battling with communicable diseases and thus the emergence of CVDs contribute to further overburdening the under-resourced health care systems (Agaba et al., 2017; Nyiambam et al., 2020; Sumaila et al., 2016; WHO, 2017).

2.2.3.3 Prevalence of cardiovascular diseases in Ghana

Cardiovascular diseases are now the main cause of adult mortalities in Ghana (Appiah et al., 2017; MOH, 2012; Yeboah et al., 2018). In 2014, stroke and coronary heart disease (CHD) were ranked as the second and fourth causes of deaths (Nyiambam et al., 2020) and CVDs were responsible for 34% of institutional admissions (Ofori-Asenso & Garcia, 2016). A review of autopsy cases spanning 2006 to 2010 at the national referral hospital in Ghana revealed that of 19,289 deaths, 22.5% resulted from CVDs (Anand & Yusuf, 2011; Bosu, 2015; Nyiambam et al., 2020; Owusu et al., 2014). In 2012, cardiovascular diseases were the cause of 40.6% deaths due to NCDs in Ghana (Owusu et al., 2013). In 2008, 14.5% of adult deaths reported in Ghana were said to be caused by CVDs, as compared to 13.4% from malaria (MOH, 2012). It was also the most occurring cause of mortality in 2014 (Ofori-Asenso, & Garcia, 2016). Hypertension, a major cause of CVDs, is said to affect over fifty percent of adults in urban Ghana (Nyiambam, et al., 2020).

In Ghana, twenty-five percent (25%) of public servants are battling with CVDs (Bosu, 2015; Kasu et al., 2015; Nyiambam et al., 2020; Ofori-asenso & Garcia, 2016), with over sixteen percent (16.07%) of health workers being victims (Osei-Yeboah et al., 2018). According to the WHO (2013b), coronary heart disease related deaths in Ghana constitute 6.48% of total deaths. It is said that the likelihood of a person between the ages of thirty (30) to sixty (60) years dying from CVDs, diabetes, cancer or chronic respiratory disease is 20% (MOH, 2012). Overtime, the health care system is going to be disadvantaged as individuals engaged in productive jobs particularly in the health care system would be made disabled by CVDs (Kasu et al., 2015; Nuhu et al., 2020; Nyiambam et al., 2020; Osei-Yeboah et al., 2018). This may cause people with diseases in need of health care to be denied access to quality health care as active health workers themselves would become victims to these diseases (Osei-Yeboah et al., 2018).

In the Greater Accra Region, cardiovascular diseases as well as their risk factors are on the rise (Yeboah et al., 2018). Obesity is said to affect over sixty percent of adults in Accra (Ofori-Asenso et al., 2016) and similar findings were found among health workers (Kasu et al., 2015). Also, hypertension is said to affect almost sixty percent of individuals above forty years in the Greater Accra region (Ofori-Asenso & Garcia, 2016) and health professionals are increasing suffering from this disease (Yeboah et al., 2018). Similar rates have been reported for borderline diabetes mellitus (Mistire & Ahmed, 2013). These risk factors increasingly cluster as MetS (Ofori-Asenso et al., 2017).

2.2.4 Risk factors for cardiovascular diseases

Risk factors are defined as assessable biological and lifestyle characteristics of an individual which manifest before a well described outcome or disease and can predict a disease (MOH, 2012; Sumaila et al., 2016; WHO, 2017). Risk factors that contribute to cardiovascular diseases include age, sex, family history of CVDs, high blood pressure, smoking, dyslipidemia, diabetes mellitus, obesity, alcoholism, physical inactivity and metabolic syndrome (AHA, 2018; Konlan et al., 2020a; Nyiambam et al., 2020; Osei-Yeboah et al., 2018; WHO, 2020). These risk factors are often classified into non-modifiable and modifiable risk factors (Agaba et al., 2017; Sumaila et al., 2016; WHO, 2017).

2.2.4.1 Non-modifiable risk factors for cardiovascular diseases

2.2.4.1.1 Age

The normal aging process is associated with progressive alterations in cardiovascular structure and function in healthy individuals, even in the absence of major contributing factors to cardiac dysfunction like hypertension and atherosclerosis (Bosu, 2010; MOH, 2012; WHO, 2017). Age is the strongest determinant of stroke, which is less common before thirty (30) years (AHA, 2018). However, from the age of forty (40) years, the incidence of stroke doubles with each successive decade (WHO, 2017). Thickening and dilatation of large arteries, large artery stiffness, endothelial dysfunction, and increase in collagen content with the fraying of elastin fibers, cardiomyocyte apoptosis and blunted β-adrenergic response are amongst the several changes that occur with age even amongst healthy normotensive individuals (Chico-Barba et al., 2019; Fleg & Strait, 2012; Genest et al., 2009; MOH, 2012; Nyiambam et al., 2020).

Epidemiologic data (Bosu, 2015; D'Agostino et al., 2013; Goff et al., 2014; Nyiambam et al., 2020; WHO, 2017) suggest that the risk of cardiovascular events increases four to five (4-5) fold at older age particularly in the presence of other modifiable risk factors such as cigarette smoking, excessive alcohol intake, hypertension, hyperglycaemia, obesity and dyslipidaemia. Studies (Chico-Barba et al., 2019; Goff et al., 2014; Nyiambam et al., 2020; Roth et al., 2017) point to the fact that the probability of surviving after eighty years reduces with more risk factors, from almost forty percent for males that have no risk factors to two percent with multiple risk factors, and from sixty percent for females without risk factors to fourteen with additional risk factors. By 2030, twenty percent of the population will be greater than sixty-five (> 65) years (WHO, 2020). In this particular age group, CVDs will lead to over 70% of all mortalities (Owusu et al., 2014).

Insights from the Framingham heart study reveal three hemodynamic phases in the changing pattern of age and BPs (D'Agostino et al., 2013). Under the age of fifty (50) years, the progressive rise in systolic BP (SBP) suggests the predominance of increased vascular resistance; the constancy of diastolic BP (DBP), together with the symptomless leveling of mean arterial pressure and increased gradient of pulse pressure, suggests higher vascular resistance along with increased large artery stiffness and lastly, the fall in DBP during later ages signals a preponderance (superiority) of large artery stiffness as the cause of further rise in SBP and, hence, a dramatic widening of pulse pressure in the elderly (Goff et al., 2014).

These changes cause increases in systolic and pulse pressure, which in turn lead to left ventricular wall thickening and reduced early diastolic filling rate (Fleg & Strait, 2012), exposing the elderly to hypertension, stroke, coronary heart disease, heart failure and other cardiovascular complications (AHA, 2018; Appiah et al., 2017; Goff et al., 2014).

2.2.4.1.2 Sex

Although males and females share most classic CVD-risk factors, there is often an incorrect perception that women are 'protected' against CVDs, and thus an underestimation of their risk of heart diseases (AHA. 2018; Bosu, 2015; Roohafza et al., 2014). This incorrect perception may be attributed to the observation that many women with traditional risk factors do not experience coronary events (Bosu, 2010; D'Agostino et al., 2013; Goff et al., 2014). The perceived "protection" stems from the fact that exposure to estrogen during the fertile periods of life delays the manifestation of atherosclerotic disease in women (AHA, 2018; Goff et al., 2014; Roohafza et al., 2014; Yeboah et al., 2018). The "protection" however changes during menopause which is associated with a worsening CVD-risk profile (Agaba et al., 2017; AHA, 2018; Bosu, 2015; Goff et al., 2014; Melamed & Kushnir, 2015). Estrogen is known to have a regulatory effect on several metabolic factors such as inflammatory markers, lipids, and the coagulant system (Bosu, 2015; Kivimäki et al., 2015; Melamed & Kushnir, 2015; Nyiambam et al., 2020). Data from the Women's Ischaemia Syndrome Evaluation (WISE) study show that premenopausal women who are deficient in estrogen have over a seven fold increased risk of CVDs (Nyiambam et al., 2020).

In 2014, the WHO stated that cardiovascular mortality among females was 55% compared to 43% in males (WHO, 2015b). Myocardial infarction, stroke and other CVDs represented 23%, 18% and 15% respectively among females compared to 21%, 11% and 11% respectively among males (Streptoe & Kivimaki, 2012), clearly pointing to less prevalence of

CVDs in men. The possible reason for the increased prevalence of CVDs in females is that following menopause, there is a rise in central obesity with its resultant increase in visceral fat occurring more in women compared with ageing men and this increase in obesity parallels an increase in the prevalence of type II diabetes mellitus and a greater risk of CVDs (Goff et al., 2014; MOH, 2012; Yeboah et al., 2018). Also, systolic BPs increases more steeply in older females making women appear to have more incidence of hypertension with each successive year (MOH, 2012). Furthermore, total cholesterol and LDL-cholesterol levels also rise by 20% and 14% respectively in women compared to men (Ofori-Asenso et al., 2017). All of these changes, therefore, increase the risk and make post-menopausal women more vulnerable to CVDs (Kivimäki et al., 2015; Melamed & Kushnir, 2015; MOH, 2012).

2.2.4.1.3 Familial history of cardiovascular diseases (genetic predisposition)

Family history of CVDs defines the sub-set of families that account for most of the cases of CVDs in the population (MOH, 2012). For instance, the risk of stroke among persons with positive family history ranges from two to nine (2 to 9) percent (Owusu et al., 2013). A history of heart attack in both parents increases the tendency for CVDs before fifty (50) years of age in children by almost sixty (58) percent (Amoah, 2009; Anand & Yusuf, 2011; Owusu et al., 2014). Yeboah et al. (2018) reports that parental history of CVDs is associated with metabolic syndrome in young adults, and this serves as the one of the possible channels for the continuous occurrence of CVDs in some families.

Genetic predisposition is a cardinal cause of CVDs, particularly among young people; males less than the age of thirty-five (35) years and females below forty-five (45) years (AHA, 2018; Kivimäki et al., 2015; Yeboah et al., 2018). Individuals with genetic predisposition to CAD usually have a higher tendency to die from CAD or stroke before age fifty (Addo et al., 2012). Particularly, in identical twins, the tendency to die from CAD increases 3.8 to 15 times if they have parental or sibling history of CAD (D'Agostino et al., 2013). In addition, there is an increased risk of myocardial infarction (MI) if one relation had MI (OR=1.67) (Owusu et al., 2014), or a single parent had MI before age fifty (50) years (OR=2.36) (AHA, 2018), or both parents had MI (OR=2.90) (Ahmed et al., 2018) and if both parents had MI prior to age fifty (50) (OR=6.56) (Anand & Yusuf, 2011).

2.2.4.2 Modifiable risk factors for cardiovascular diseases

2.2.4.2.1 Excessive alcohol use

While the negative consequences of alcohol on disease states such as; injuries, liver cirrhosis and cancers have been firmly established (WHO, 2013), cohort studies (D'Agostino et al., 2008; Hartley et al., 2011; Owusu et al., 2013; Roohafza et al., 2014) suggest that light-to-moderate alcohol consumers (less than 3 drinks a day, or 1 to 2 glasses of wine a day) have an increased survival rate compared to abstainers. Some evidence (Smith et al., 2009) suggests a protective effect of moderate drinking on CVDs such as ischemic stroke, peripheral arteriopathy and congestive heart failure. Similarly, Harley et al. (2011) have described the link between alcohol and CVDs as an L-shape, suggesting no increase in CVD-risk associated with higher alcohol consumption. Rather, moderate alcohol intake is said to be associated with lower stroke incidence and mortality, though this association differs by stroke sub-type; with a slightly lower risk of ischaemic stroke but a higher risk of hemorrhagic stroke (Harley et al., 2011). However, other studies (AHA, 2018; D'Agostino et al., 2013; Holmes et al., 2014; Owusu et al., 2013) have described the relationship as J-shaped or U-shaped suggesting an increased CVD-risk among those with higher intake of alcohol. Excessive intake of alcohol is said to be associated with an over six-fold increased risk of CVDs for all populations (AHA, 2018; Owusu et al., 2013; WHO, 2017).

The cardio-protective effects of moderate alcohol drinking have mainly been attributed to an increase in antioxidant capacity, changes in lipid profiles (raises HDL-C levels), improved insulin sensitivity and the anti-inflammatory effects produced by alcohol (AHA, 2018; D'Agostino et al., 2013; Jahangiry et al., 2017). However, despite these effects of moderate alcohol consumption, there are discrepancies regarding the specific effects of different types of beverages (wine, beer and spirits) on the cardiovascular system and whether the possible protective effects of alcoholic beverages are due to their alcoholic content (ethanol) or to their non-alcoholic components (mainly polyphenols) (Arranz et al., 2012). Furthermore, it is suggested that the perceived benefits of moderate alcohol consumption could rather be explained by the elevated cardiovascular risk from underlying poor health in non-drinkers, or by the confounding role of lifestyle and social factors associated with light to moderate drinking (Arranz et al., 2012; Genest et al., 2009; WHO, 2017).

Even though in the INTERSTROKE study, it was reported that excessive alcohol use increased the risk of stroke by 2.09 and 2.44 respectively (Arranz et al., 2012), the Prospective Urban Rural Epidemiology (PURE) study found no significant relationship between high alcohol use and CVAs (Kodaman et al., 2016). Interestingly, the Health Professionals Follow up Study found that small alcohol use was associated with reduced tendency to experience MI (Owusu et al., 2013). Also, reducing alcohol intake has been shown to minimize the risk of all forms of mortality in residents of China and Japan (He et al., 2014). This advantage of alcohol is supported by the Second Manifestation of Arterial (SMART) study which also found that small alcohol intake was linked to decreased risk of vascular diseases (D'Agostino et al., 2013). The literature supports the fact that moderate alcohol use could be protective but that over time it has serious negative consequences on health.

2.2.4.2.2 Physical inactivity

Reduced physical activity, also known as sedentary lifestyle, is associated with several risk factors for CVDs (Owusu et al., 2013). Persons with reduced or no structured physical activity easily develop CVDs (Ahmed et al., 2018). However, persons with high exercise regime have delayed onset of most CVDs (WHO, 2017). AHA (2018) states that physical activity has an effect on total cholesterol as well as LDL-C concentrations. Exercises are also suggested to increase the level of HDL-C concentrations and contribute to reducing the risk of CVDs (Anand & Yusuf, 2011; He et al., 2014; Owusu et al., 2014). Improving exercise life contributes to reducing dyslipidemia as well as enhancing blood flow to all tissues particularly the heart muscle itself and this serves as a useful protection against CVDS (AHA, 2018; Anand & Yusuf, 2011; Owusu et al., 2014).

2.2.4.2.3 Cigarette smoking

Smoking of cigarette is said to double the risk of CVDs in healthy persons (AHA, 2018; Anand & Yusuf, 2011; Bosu, 2015; Witter et al., 2013). The co-existence of one other risk factor alongside with smoking causes almost a four-time increased risk of CVDs while the co-existence of two other risk factors together with exposure to smoke leads to an eight-time increased risk of CVDs (Anand & Yusuf, 2011). Smoking is estimated to cause nearly ten (10) percent of CVDs and its next after high BP (Ambrose & Barua, 2004; Konlan et al., 2020c; Osei-Yeboah et al., 2018; WHO, 2018). It is also one of the commonest channels to reduce the incidence of CVDs (WHO, 2013c).

Smoking cigarette increases the tendency to develop clinical atherosclerotic syndromes including; stable angina, acute myocardial infarction, and cerebrovascular accident (Ambrose & Barua, 2004; He et al., 2014; Roohafza et al., 2014). Cigarette smoking has been found to impair endothelial vasodilation (vasomotor dysfunction), increase the level of multiple inflammatory markers and modify lipid profile; to increased levels of total cholesterol, triglycerides and LDL-C as well as reduces HDL-C (Steptoe & Kivimäki, 2012). Smoking also increases the oxidative modification of LDL-C, which together with the aforementioned lipid changes are critical mechanisms in the starting and completion of atherosclerosis and thus may explain the increased risk of CVDs among smokers (Ambrose & Barua, 2004; Chico-Barba et al., 2019; Gyang et al., 2018; WHO, 2020).

The effects of smoking go beyond the active smoker to affect even those who do not smoke (Ambrose & Barua, 2004;). In 2014, exposure to second-hand smoke was estimated to have caused 603,000 deaths, 379,000 of which were due to ischaemic heart disease, accounting for about 1% worldwide mortality (Ambrose & Barua, 2004; He et al., 2014; Roohafza et al., 2014; WHO, 2015b). Second-hand smoke contains increased concentration of toxic gases just as main stream cigarette smoke in active or first-hand smoking and its believed to cause CVDs in much the same way as in active smokers (He et al., 2014; Roohafza et al., 2014; WHO, 2017). Women are reported to be more exposed to second hand smoke and suffer the largest effects than men (Ambrose & Barua, 2004).

2.2.4.2.4 Dyslipidaemia

Dyslipidemia is defined as elevated total cholesterol (TC), low density lipoprotein cholesterol (LDL-C), triglycerides and high density lipoprotein cholesterol (HDL-C), alone or in combination (Chico-Barba et al., 2019; He et al., 2014; Moy & Bulgiba, 2010). Dyslipidemia is recognized as a prominent risk factor for CVDs and is characteristically seen in individuals with obesity, insulin resistance and diabetes mellitus (Grundy et al., 2005; Owusu et al., 2014; Yeboah et al., 2018). Although each component of dyslipidemia has been shown to increase the tendency for CVDs, the literature (Chico-Barba et al., 2019; He et al., 2014; Owusu et al., 2013) supporting causality is strongest for elevated levels of LDL-C. This is probably because LDL-C has a greater susceptibility for oxidation and is more likely to instigate the inflammatory process in vascular endothelium to cause atherosclerotic diseases (Moy & Bulgiba, 2010). High density lipoprotein cholesterol also has a strong epidemiologic relationship with CVDs but unlike LDL-C, increased HDL-C levels are rather protective against CVDs (Osei-Yeboah et al., 2018). Studies show that each 1-mg/dL decrement in HDL-C is associated with a 2% to 3% increased risk of CHD, whereas each l-mg/dL increase is associated with a 6% lower risk of death from a coronary event (He et al., 2014; Moy & Bulgiba, 2010; Roohafza et al., 2014).

Elevated triglycerides in dyslipidemic individuals contribute directly to atherosclerotic plague formation and progression via indirect mechanisms, particularly those involving lipolysis and binding at the artery wall (Hartley et al., 2011). The role of triglycerides in atherogenesis is, however, often complicated by the inverse relationship that exists between the plasma concentrations of triglycerides and HDL-C (He et al., 2014). Because cholesterol esters are transferred from HDL-C to very low density lipoprotein (vLDL) - a triglyceride rich molecule, higher levels of vLDL promote this transfer and so lead to reduced HDL-C and a reduction in the protection it offers to the cardiovascular system (Chico-Barba et al., 2019).

2.2.4.2.5 Obesity

Obesity is a medical condition in which an individual has excess fat accumulated in his/her body to the extent that it may have an adverse effect on health (Duodu, 2015; Kasu et al., 2015; Yeboah et al., 2018). It is as a result of intake of major nutrients in high quantities than the body's physical activity demands leading to positive energy balance (Duodu, 2015). Obesity is a serious health issue globally as its level has tripled since the 1990s (Kasu et al., 2015). Excess weight gain manifesting as obesity affects over a billion adults world-wide and this is projected to increase exponentially (WHO, 2015a). It is estimated that, its prevalence will be tripled by 2030 (Ahmed et al., 2018). High body mass index (BMI) of above thirty kilograms per square meter is indicative of general obesity (AHA, 2018; Kasu et al., 2015; WHO, 2011) while abdominal or central obesity is determined by the waist circumference (>102 cm in men and 88 cm in women) (Chico-Barba et al., 2019; Osei-Yeboah et al., 2018; Yeboah et al., 2018).

Both general and abdominal obesity results from excess energy input as compared to the energy expenditure in an individual (Chico-Barba et al., 2019; Kasu et al., 2015; WHO, 2011). Obesity is associated with premature mortality in all age groups (Osei-Yeboah et al., 2018). Studies (Duodu , 2015; Bosu, 2010; Kyle et al., 2017; Osei-Yeboah et al., 2018) suggest that individuals who are non-smokers but obese at age thirty (30) years died six to seven (6-7) years earlier than the non-obese. An obesity pandemic is ravaging most regions of the world with almost sixty percent (55.5%) of adults in SSA (48% of men and 63% of women) being obese (Yeboah et al., 2018). It is said that obesity is the main cause of CVDs (Kasu et al., 2015; Kyle et al., 2017; Osei-Yeboah et al., 2018) in particular and NCDs in general (Ahmed et al., 2018; Alwan, 2011; Anand & Yusuf, 2011; Kyle et al., 2017).

Central obesity is the type of obesity linked to metabolic syndrome, a cardinal risk factor for most CVDs (Chico-Barba et al., 2019; Moy & Bulgiba, 2010; Yeboah et al., 2018). Metabolic syndrome has abdominal obesity as the prominent clinical manifestation (Moy & Bulgiba, 2010). Chronic diseases such as; diabetes mellitus, stroke, MI and cancer are strongly linked to excess fat accumulation in the abdominal region (He et al., 2014). A substantial body of evidence (Addo et al., 2012; Grundy et al., 2005; Kasu et al., 2015; Moy & Bulgiba, 2010; Yeboah et al., 2018) reports that obesity is linked to an increased risk of stroke and other CVDs even in the absence of other risk factors.

There are several factors contributing to obesity and these include; genetics, sedentariness, income levels and socio-cultural factors (Moy & Bulgiba, 2010). Evidence (Nuhu et al., 2020; Moy & Bulgiba, 2010; Yeboah et al., 2018) suggest that obese parents have a greater risk of passing faulty genes to their offspring. Also, individuals who engage in less physical activity have increased risk of obesity (Duodu, 2015). Kasu and colleagues aver that workers whose jobs require less physical activity have increased tendency to develop obesity and its associated conditions of metabolic syndrome and CVDs (Kasu et al., 2015). This is supported by other recent studies (Kodaman et al., 2016; Kyle et al., 2017; Osei-Yeboah et al., 2018; Yeboah et al., 2018). In addition, some of the socio-demographic factors associated with obesity include gender, socio-economic status (SES) and educational level (AHA, 2018; Anand & Yusuf, 2011; Kasu et al., 2015; Moy & Bulgiba, 2010). In emerging economies, obesity is more common among women and those from higher income brackets, but the pandemic affects lower income persons when high fat diet becomes cheap (Duodu, 2015; Kasu et al., 2015; Ofori-Asenso et al., 2017). In addition, higher educational status is linked to lower levels of obesity in HIC, but the reverse is the case in emerging economies like those in SSA where obesity is culturally associated with affluence and a manifestation of "supposed good-living" (Duodu, 2015).

2.2.4.2.6 Diabetes mellitus

Diabetes mellitus (DM) is diagnosed as elevated fasting plasma glucose of or greater than seven millimole per litre (≥ 7.0 mmol/L) after at least eight to twelve hours of overnight fast (Adler et al., 2002; Arranz et al., 2012; Moy & Bulgiba, 2010; Yeboah et al., 2018). The World Health Organization reports that diabetes mellitus is one of the main causes of adult morbidities and deaths (WHO, 2017). Likewise, data from the International Diabetes Federation (IDF) estimates that over four hundred million adults aged 20-79 years have diabetes mellitus and this number is projected to reach over six hundred million by 2040 (Anand & Yusuf, 2011; Bloom et al., 2011; Yeboah et al., 2018). The prevalence of diabetes mellitus is estimated at 13.3% in Africa, 7.3% in Europe, and 10.7% in the Middle East and North Africa (AHA, 2018). In the United States of America, 9.4% of the adult population and

25.2% of those above 65 years have diabetes mellitus (AHA, 2018). The WHO states that 58% of diabetes mellitus occurs in individuals with BMI >25kg/m^2 (He et al., 2014; Moy & Bulgiba, 2010; WHO, 2017).

Cardiovascular diseases are the most common cause of deaths in diabetic patients (AHA, 2018; Osei-Yeboah et al., 2018; Nuhu et al., 2020). Several studies (AHA, 2018; He et al., 2014; Moy & Bulgiba, 2010; Nuhu et al., 2020; Yeboah et al., 2018) report that increased oxidative stress, coagulability; endothelial damage and autonomic neuropathy as the link between DM and CVDs. Particularly, individuals with DM with poor control, suffer from microvascular complications arising from the above mechanisms (He et al., 2014) and that the relative risk of CVDs in adults with DM ranges from 1 to 3 in males and from 2 to 5 in females compared to those without DM (Belue et al., 2009). Other studies (AHA, 2018; Appiah et al., 2017; Boateng et al., 2017) report that individuals with DM have twice to four times the increased tendency to die from CVDs.

2.2.4.2.7 Hypertension

A persistent (at least after three measures) systolic BP of or above one hundred and forty millimeters of mercury (140 mmHg) and or a diastolic blood pressure (DBP) of or above ninety millimeters of mercury (90 mmHg) is diagnostic of hypertension (Gyang et al., 2018; Konlan et al., 2020a; Kyle et al., 2017; Moy & Bulgiba, 2010; Sumaila et al., 2016). Usually, a diagnosis of hypertension is made after three measures with the individual at rest (Konlan et al., 2020b; Kyle et al., 2017; Melamed & Kushnir, 2015; Sumaila et al., 2016; WHO, 2017). Hypertension, also known as high BP, is the leading cause of CVDs (Konlan et al., 2020c; Kyle et al., 2017; Melamed & Kushnir, 2015; Sumaila et al., 2016).

Hypertension is classified into primary and secondary hypertension (Konlan et al., 2020a; Kyle et al., 2017; Melamed & Kushnir, 2015; Sumaila et al., 2016). Secondary hypertension results from underlining diseases or due to intake of some drugs (Kyle et al., 2017; Melamed

& Kushnir, 2015; Sumaila et al., 2016; Yeboah et al., 2018). Unlike secondary hypertension, primary hypertension is idiopathic (Bosu, 2015; Kyle et al., 2017; Melamed & Kushnir, 2015; Sumaila et al., 2016). Idiopathic hypertension is the cause of 95% of all hypertension cases (AHA, 2018; Kyle et al., 2017; Melamed & Kushnir, 2015; Sumaila et al., 2016). Most individuals with hypertension usually remain undiagnosed leading to complications such as stroke and heart failures (Boateng et al., 2017; Melamed & Kushnir, 2015; WHO, 2017).

Approximately, over a billion adults have BP of above 140/90 mmHg. This corresponds to more than 50% of adult morbidities (Konlan et al., 2020b; Kivimäki et al., 2015; Melamed & Kushnir, 2015; WHO, 2020). This is expected to rise by 70% by 2030 due to the aging of the population (Gyang et al., 2018). Globally, hypertension is the major cause of mortality in adults (AHA, 2018; He et al., 2014; Kyle et al., 2017; Melamed & Kushnir, 2015). In LMIC, one out of three adults (1 in 3) have hypertension, with higher rates in the elderly and obese persons (Appiah et al., 2017; Boateng et al., 2017; Konlan et al., 2020c; Kyle et al., 2017; Melamed & Kushnir, 2015; WHO, 2017).

Several studies (Gyang et al., 2018; He et al., 2014; Konlan et al., 2020a; Yeboah et al., 2018; WHO, 2020) point to a positive link between either high SBP or DBP and CVDs. Cerebrovascular accidents and MI are known complications of hypertension (AHA, 2018; Konlan et al., 2020a; Kyle et al., 2017; Melamed & Kushnir, 2015; WHO, 2017). An elevation of 20 mmHg in SBP or a 10 mmHg increase in DBP is associated with a twofold increased risk of death from stroke (AHA, 2018; He et al., 2014; Kyle et al., 2017; Melamed & Kushnir, 2015). Adults with borderline hypertension (130-139/85-89mm Hg) have a threefold greater risk of progression to hypertension and a twofold increased risk of CVDs (AHA, 2018; Kyle et al., 2017; Melamed & Kushnir, 2015; WHO, 2020). In the Framingham heart study, hypertension was linked to a two (2) to four (4) fold increased risk of CVDs (D'Agostino et al., 2013). Hypertension is linked to the risk of stroke even in the absence of familial predisposition (D'Agostino et al., 2013; Goff et al., 2014; Konlan et al., 2020b). Managing elevated BPs alone decreases the risk of CVA by 30% and MI by 20%-25% even in the presence of other risk factors (AHA, 2018; Ahmed et al., 2018; Amoah, 2009).

2.2.4.8 Metabolic syndrome

Metabolic syndrome is defined as the constellation of the risk factors for CVDs in an individual (Chico-Barba et al., 2019). The features of metabolic syndrome include varying abnormalities of insulin, glucose and lipids as well as borderline hypertension and obesity (Grundy et al., 2005; He et al., 2014; Moy & Bulgiba, 2010; Ofori-Asenso et al., 2017).

2.2.4.8.1 Determination of metabolic syndrome

The most commonly used criterion for diagnosing metabolic syndrome is the revised NCEP-ATP III criterion (Chico-Barba et al., 2019; Moy & Bulgiba, 2010; Yeboah et al., 2018). The NCEP-ATP III (revised criterion) uses three of the six indicators for determining the presence or otherwise of metabolic syndrome. Also, the IDF gives an alternative diagnostic criterion for MetS (Chico-Barba et al., 2019; He et al., 2014; Osei-Yeboah et al., 2018).

The two diagnostic criteria are illustrated in Table 1:

Table 1: Criteria for the determination of metabolic syndrome

	NCEP-ATP III (revised)	IDF
Hypertension	Current antihypertensive therapy OR SBP ≥ 130 OR DBP ≥ 85	Current antihypertensive therapy OR BP ≥ 130/85
Dyslipidemia- - Elevated Triglycerides	Plasma triglycerides ≥ 1.7mmol/L or	Plasma triglycerides ≥ 150 mg/dL or specific treatment for high triglycerides
Dyslipidemia - Depressed HDL	HDL < 1.03mmol/L in men or < 1.29 mmol/L in women	HDL < 40 mg/dL in men or < 50 mg/dL in women or specific treatment for low HDL
Central obesity	Waist circumference ≥ 102cm in men or ≥ 88cm in women	Waist circumference > 37 inches in men or > 31.5 inches in women
Glucose	Fasting blood glucose ≥ 5.6 mmol/L	Fasting glucose ≥ 100 mg/dL OR previously diagnosed type 2 diabetes
Requirements for diagnosis	Any 3 of the above criteria.	Waist circumference criteria PLUS any 2 of other criteria

2.2.4.8.2 Prevalence of metabolic syndrome

Metabolic syndrome is said to affect between 11.8% to 36.2% of the global adult population (He et al., 2014; Moy & Bulgiba, 2010; Ofori-Asenso et al., 2017). In Europe and Asia, the rate is between 14% to 32% respectively (He et al., 2014; Kyle et al., 2017; Moy & Bulgiba, 2010) with about 34% of adults in the USA meeting the diagnostic criteria (AHA, 2018). Among the residents of the USA, the prevalence does not differ significantly between sexes (AHA, 2018). However, some studies (Chico-Barba et al., 2019; Kyle et al., 2017; Osei-Yeboah et al., 2018; Yeboah et al., 2018) suggest that the prevalence of metabolic syndrome is higher in females. Metabolic syndrome is said to affect between 11% to 37% of adults in Africa depending on the diagnostic tool use (Agaba et al., 2017; Anand & Yusuf, 2011; Gyang et al., 2018). Consistent with the data from other continents such as Europe, Asia and America, the occurrence of metabolic syndrome varies in most nations in SSA by gender and diagnostic methodology (AHA, 2018; Kyle et al., 2017; Moy & Bulgiba, 2010; Ofori-Asenso et al., 2017).

Approximately, one-fourth (1/4) of health workers in Asia and Europe meet the diagnostic criteria for MetS (Chico-Barba et al., 2019; He et al., 2014; Kyle et al., 2017; Ofori-Asenso et al., 2017). Also, metabolic syndrome was found to be higher among health workers in China (He et al., 2014), Malaysia (Moy & Bulgiba, 2010) and Mexico (Chico-Barba et al., 2019). However, Yeboah et al. (2018) found the prevalence of MetS to be low, just above 12% among medical students in Ghana as compared to the higher prevalence stated by Ofori-asenso et al. (2017) among the general population. Similarly, Osei-yeboah (2018) found that over twenty percent of health workers in Ghana have metabolic syndrome.

It has been argued (Chico-Barba et al., 2019; He et al., 2014; Moy & Bulgiba, 2010; Osei-Yeboah et al., 2018) that the over focus on work and the welfare of others make health workers to neglect their own health, leading to obesity and eventually metabolic syndrome. However, Kasu et al. (2015) aver that the socio-economic prestige attached to obesity as well as the rise in the consumption of "fast foods" with urbanization is implicated in the rise in obesity and metabolic syndrome among health workers in Ghana. Other researchers (Chico-Barba et al., 2019; He et al., 2014; Melamed et al., 2006; Nuhu et al., 2020) have further suggested that job-related stress and its associated burnout-induced hormonal dysregulation are implicated in the rise in metabolic syndrome in particular and CVDs in general among health workers.

2.2.4.8.3 Components of metabolic syndrome

2.2.4.8.3.1 Borderline high blood pressure

A determination of borderline hypertension is made in individuals when the blood pressure is found to be greater than or equal to a systolic BP of one hundred and thirty and a diastolic BP of eighty-five millimeters of mercury (Bosu, 2015; Chico-Barba et al., 2019; He et al., 2014; Yeboah et al., 2018). Borderline high BP is a common occurrence in persons diagnosed with metabolic syndrome and has been found to occur in over eighty percent of persons with other components of the syndrome (He et al., 2014). The mechanism commonly cited for the existence of borderline hypertension in individuals with metabolic syndrome is through hyperinsulinemia induced BP rise through the activity of the sympathetic nervous system (SNS) and as well as the renin-angiotensin-aldosterone system (RAAS) leading to water retention, rise in cardiac output and endothelial dysfunction (Bosu, 2010; Konlan et al., 2020a; Moth & Bulgiba, 2010). Also, metabolic syndrome is primarily associated with insulin resistance and this overtime results in compensatory excess insulin release. The compensatory hyperinsulinemia may raise BP by increasing sympathetic nervous system activation and stimulation of vascular smooth muscle cell growth (Bosu, 2015; Moth & Bulgiba, 2010; Yeboah et al., 2018).

2.2.4.8.3.2 Hyperglycaemia

Elevated fasting plasma glucose known as hyperglycemia is yet another component of metabolic syndrome. Hyperglycemia is defined as blood glucose levels equal to or above 5.6 mmol/l after a minimum of eight hours of overnight fasting (Moy & Bulgiba, 2010). The plausible factor accounting for this elevation of blood glucose is through insulin resistance (Ofori-Asenso et al., 2017). The defects in insulin action in obese persons directly affects glucose metabolism, defined as an insufficient ability of insulin to suppress glucose production by the liver, and to mediate glucose uptake and metabolism in skeletal muscle and adipose tissue (He et al., 2014). Insulin sensitivity is determined not only by the number and affinity of insulin receptors but also by the functional state of the intracellular signaling pathways that transduce insulin binding to the various effectors (e.g. glucose transport, phosphorylation and oxidation, glycogen synthesis, lipolysis and ion exchange). Therefore, a massive reduction in the number of insulin receptors (or the presence of high titers of circulating anti-insulin or anti-insulin-receptor auto-antibodies) is associated with insulin resistance (Moy & Bulgiba, 2010). Signaling through phosphatidylinositol 3-kinase is crucial for insulin-mediated glucose transport and activity of this enzyme is reduced in insulin resistant states and this accounts for the hyperglycemia (Yeboah et al., 2018).

2.2.4.8.3.3 Obesity

Metabolic syndrome is linked to obese states, particularly, high waist circumference, an indicator of central obesity (Yeboah et al., 2018). The rationale for this is because excess adiposity particularly visceral fat causes a reduction in insulin-driven glucose absorption into the cells (Osei-Yeboah et al., 2018). This eventually leads to excess glucose in plasma and reduction of the breakdown of body fat (Moth & Bulgiba, 2010). Central adiposity is the type of fat abnormality directly linked to the occurrence of metabolic syndrome (Moth & Bulgiba, 2010). Metabolic syndrome as a disease state has insulin resistance as the core mechanism (Kasu et al., 2015) and central obesity as the cardinal clinical feature (MOH, 2012; Moth & Bulgiba, 2010; Ofori-Asenso & Garcia, 2016).

2.2.4.8.3.4 Dyslipidaemia

Dyslipidemia is one of the commonest features of metabolic syndrome. It is defined as a reduced HDL-cholesterol levels or raised triglycerides or elevated small, dense LDL (Alwan, 2011; Chico-Barba et al., 2019; Osei-Yeboah et al., 2018). This subnormal lipid level is termed atherogenic lipid triad and this is often associated with insulin resistance as well as CVDs (Osei-Yeboah et al., 2018). Free fatty acid (FFA) concentrations released from adipose tissue are suggested to be the critical link between insulin resistance and dyslipidemia (Yeboah et al., 2018). In persons with insulin resistance, the suppression of FFA release from adipocytes is impaired, providing increase in the hepatic production of apoB containing vLDL particles, especially triglyceride-rich vLDL1 particles, leading to hypertriglyceridemia (Ofori-Asenso et al., 2017). The defect in lipoprotein lipase activity in insulin resistance also contributes to the decrease in plasma HDL-cholesterol, and the LDL-cholesterol pool may become enriched with small dense, highly atherogenic LDL particles (Moth & Bulgiba, 2010). Importantly, the increased function of cholesterol ester transfer protein (CETP) and hepatic lipase are associated with the component parts of dyslipidemia (Jahangiry, Farhangi, & Rezaei, 2017).

2.2.5 Prediction of cardiovascular diseases

2.2.5.1 Studies predicting the risk of cardiovascular diseases

2.2.5.1.1 Framingham heart study

The Framingham Heart Study (FHS) is one of the earlier studies which predicted the risk of CVDs in healthy cohorts (AHA, 2018; Kodaman et al., 2016; Konlan et al., 2020b). The study had its name from Framingham, a town in the East of Massachusetts that was selected for the study (D'Agostino et al., 2008). The study had an objective of identifying the common risk factors of CVDs (Kodaman et al., 2016). The study recruited 5,200 residents of Framingham between the ages of 30-62 years. An additional 5,120 individuals consisting of offspring of the original study participants and their spouses were added to the study cohorts in 1972. In 2001, the grandchildren of the original cohort were added to explore the genetic link to CVDs (D'Agostino et al., 2008). Additionally, the study recruited the OMNI1 and OMNI2 cohort in 1994 and 2003, to reflect the racial diversity of the people in the town of Framingham. Every two years, individuals enrolled in the study were subjected to physical examination and interviews on their lifestyle (D'Agostino et al., 2013; He et al., 2014; Kyle et al., 2017; Lin & Li, 2009). From the FHS, scores and algorithms were established for the prediction of the risk of cardiovascular diseases among apparently healthy persons (D'Agostino et al., 2013; Goff et al., 2014; Owusu et al., 2013).

2.2.5.1.2 Prospective Urban Rural Epidemiological (PURE) study

The Prospective Urban Rural Epidemiological (PURE) study was a study that recruited over one hundred and fifty thousand adults aged 35-70 years who were resident in six hundred (600) communities selected from seventeen (17) countries: three (3) High Income Countries (HIC), seven (7) Middle Income Countries (MIC) and seven (7) Low Income Countries (LIC) around the world. The study collected information on socio-economic level, medical history, lifestyle patterns, anthropometrics measures, and familial history of CVDs (Lin & Li, 2009).

The main results revealed:

- That CVDs are highest in LIC.
- The burden of total CVDs is similar in HIC, MIC and LIC
- The burden of CVDs was lower in urban communities, but the rate of non-major cardiovascular events was higher in urban areas.
- There was better control of hypertension in HIC compared with LIC.
- Secondary preventive drugs (antiplatelets drugs, B-blockers, ACEIs, ARBs and statin) even at low-cost were less likely to be used in LIC than in HIC

2.2.5.2 Cardiovascular diseases risk scoring

Cardiovascular diseases risk scoring charts/tools give estimates as to whether or not an individual will develop cardiovascular diseases within a given time frame (D'Agostino et al., 2013). The scores also give an idea of individuals who can be targeted to benefit from primary prevention strategies (Anand & Yusuf; 2011; D'Agostino et al., 2008; Goff et al., 2014; Owusu et al., 2013).

2.2.5.2.1 Framingham Risk Score

The Framingham Risk Score (FRS) is one of the commonest tools used to predict the risk of CVDs in healthy persons (D'Agostino et al., 2013; Goff et al., 2014; Lin & Li, 2009). It calculates the risk of CVDs over a ten-year period in asymptomatic individuals (Goff et al., 2014). The FRS includes the following risk factors; age, sex, total cholesterol, HDL-cholesterol, smoking, and blood pressure to predict the ten-year risk of developing CVDs (D'Agostino et al., 2008). The score has been validated in many populations, such as Caucasian Americans and African- Americans (AHA, 2018; D'Agostino et al., 2013; Goff et al., 2014; Owusu et al., 2013).

The FRS algorithm is used to predict the ten-year risk of CVDs in individuals (D'Agostino et al., 2008). This algorithm has been used to predict the risk of CVDs in healthy individuals in some cross-sectional studies with accuracy (D'Agostino et al., 2013). The algorithm predicts the ten-year risk for CVDs using seven coronary risk factors (CRF): age, gender, TC, HDL-C, systolic BP, diabetes and smoking habits (Owusu et al., 2013). Sex-specific points are assigned to each CRF for each individual (D'Agostino et al., 2013). The points for each individual are then summed up to obtain a score which is matched against the corresponding CVD-risk to obtain that individual's total CVD risk (Owusu et al., 2013). The total risk scores are then stratified as low risk <10%, intermediate risk (10 – 20) % and high risk ≥20% (AHA, 2018; D'Agostino et al., 2013; Lin & Li, 2009).

2.2.5.2.2 Systemic Coronary Risk Evaluation (SCORE)

Another tool for predicting the risk of CVDs is the Systemic Coronary Risk Evaluation (SCORE) tool (He et al., 2014; Lin & Li, 2009; Owusu et al., 2013). The SCORE predicts the risk of heart attack, stroke or aortic aneurysm. The key factors used to estimate the CVD risk using the score system include; age, gender, total cholesterol to HDL-cholesterol ratio, SBP, and smoking (Owusu et al., 2013). Two charts are proposed to determine the risk of CVDs by considering the overall characteristics of the population (high or low risk) (D'Agostino et al., 2008).

2.2.5.2.3 WHO cardiovascular risk prediction charts

Another scale used to identify the risk of CVDs is the WHO CVD-risk chart (D’Agostino et al., 2013). The chart uses age, sex, BP, cigarette smoking, total cholesterol and the presence or absence of hyperglycaemia (D’Agostino et al., 2008). There are two main charts: the one with a laboratory test where the lipid profile is measured and the other without a laboratory test (WHO, 2017).

2.2.5.2.4 Atherosclerotic Cardiovascular Disease risk calculator (ASCVD Risk)

The Atherosclerotic Cardiovascular Disease risk calculator is used to predict the occurrence of myocardial infarction, coronary heart disease, or stroke (D'Agostino et al., 2008) in an individual. The key factors used are; age, gender, race, total cholesterol, HDL-cholesterol, systolic BP, on current treatment for high BP, diabetes mellitus and smoking (D'Agostino et al., 2008).

2.2.5.2.5 Choice of cardiovascular disease risk scoring scale

Several CVD-risk estimation systems are in existence including but not limited to: the FRS (Framingham Risk Score) (D’Agostino et al., 2013), the SCORE (Systematic Coronary Risk Evaluation) system (D'Agostino et al., 2008), and the WHO-risk scoring charts (AHA, 2018). The total CVD-risk scores are determined based on multivariate risk analyses of cohorts that ascribe values to several risk factors which are computed together (D'Agostino et al., 2013; Goff et al., 2014; Owusu et al., 2013). While they all aim at estimating CVD-risk, different approaches were used to generate these tools. Some of the CVD-risk prediction tools have been validated while others have not. For instance, the FRS and SCORE have been externally validated in other populations (than those from which they were generated) with good discrimination (D'Agostino et al., 2013) but the WHO CVD-risk tool has not been assessed.

The Framingham risk scoring system is one of the known and most commonly used risk scores internationally and has been recommended by a number of national and international guidelines for CVD-prevention (D'Agostino et al., 2013; Genest et al., 2009; Goff et al., 2014). It calculates the ten-year risk of CVD-events and has sex, age, HDL- cholesterol, total cholesterol, systolic blood pressure, diabetic status, and smoking status as the variables incorporated into it (Appendix Ei– Eiii). Various sub-categories of each variable have sex specific points assigned to them. These points are then given to individuals based on their individual values for the various variables. The points for each person on the various variables are then summed up to obtain a final score which is matched against the corresponding CVD-risk to obtain that individual’s total CVD-risk (D'Agostino et al., 2008). The eventual CVD risk is stratified as low risk (<10%), intermediate risk (10 – 20%) and high risk (≥ 20%) (D'Agostino et al., 2013).

The Framingham risk score tool has been shown to have good discrimination in a number of external validation studies; the PRIME study (Genest et al., 2009), the Dutch Study (Owusu et al., 2013) and the Physicians Health Study (Seeman et al., 2014). In addition, the FRS has being applied with accuracy among African American populations (D'Agostino et al., 2013). Unfortunately, information on the use or transportability of this risk score in a purely African population with increased risk of CVDs such as health workers is scarce.

2.2.6 Prevention of cardiovascular diseases

In medieval times, people suffered from few CVDs (AHA, 2018; Goff et al., 2014; Owusu et al., 2014). The possible explanation was because natural food consumption as well as physical activity was high in the olden days (Owusu et al., 2013). However, deaths from

CVDs started to rise after the industrial revolution (Owusu et al., 2013). Also, as life expectancy increases, the more health problems become essential. As age rises, it is accompanied with alarming health problems such as chronic diseases, particularly CVDs (D'Agostino et al., 2008; Genest et al., 2009; WHO, 2017).

Some of the suggested means of preventing CVDs even in the aged include; reducing the intake of fatty and salty foods, regular exercises and avoiding cigarette smoking as well as excessive alcohol use (AHA, 2018; D'Agostino et al., 2008; Nuhu et al., 2020; WHO, 2013). Individuals can reduce their risk of disease conditions like MI, CAD, stroke, deep vein thrombosis (DVT), and peripheral artery disease (PAD) by early screening to detect risk factors early enough, choosing diets rich in fruits and vegetables and maintaining a healthy body weight (AHA, 2018; MOH, 2012; Owusu et al., 2014). The literature (Appiah et al., 2017; Konlan et al., 2020a; Owusu et al., 2013; WHO, 2013) suggests that comprehensive and integrated actions targeting individuals and communities are essential if CVDs are to be prevented. This approach require the use of different approaches (integrated and population-based interventions) that seek to reduce the risks throughout the population with strategies that target individuals at high risk or those already diagnosed with diseased-states (Chico-Barba et al., 2019; D'Agostino et al., 2008; Goff et al., 2014; WHO, 2017). In addition, the WHO (2020) suggests that simple prediction charts/tools are very useful in identifying the CVD-risk of healthy persons with increased risk of experiencing CVDs (AHA, 2018; D'Agostino et al., 2013; Goff et al., 2014).

More so, there are surgical procedures which can be used to treat some of the CVDs. These surgical procedures include; coronary artery bypass, balloon angioplasty, valve repair and replacement, heart transplantation, and artificial heart operations (AHA, 2018; Chico-Barba et al., 2019; D'Agostino et al., 2013; Goff et al., 2014). Finally, several implants are available to manage some other specific CVDs (WHO, 2020). Such devices include; pacemakers, prosthetic valves, and patches for repairing congenital abnormalities of the heart (Owusu et al., 2014). However, most of these devices are unavailable in developing countries (Owusu et al., 2013). There is therefore the need for governments in LMIC to formulate policies for the prevention and the control of CVDs through national programs (D'Agostino et al., 2013; MOH, 2012; WHO, 2017).

2.3 Occupational health

Atlam (2018) defines occupational health as the maintenance of physical, mental, social, economic and spiritual wellbeing of employees in all work settings by promoting health and making the workplace safe. The Government of Ghana has an occupational health and safety policy for the health sector to improve the occupational health of employees (MOH, 2012). Most hospitals in Ghana do not adhere to the set down guidelines in the policy (Atinga et al., 2014; Dapaah, 2014; Odonkor & Frimpong, 2020). This has resulted in diseases due to exposure to job hazards (Afulani et al., 2021a; Asamani et al., 2019; Odonkor & Frimpong, 2020). It is reported (Afulani et al., 2021a; Asamani et al., 2019; Kasu et al., 2015; Osei-Yeboah et al., 2018) that hospital workers in Ghana experience a lot of job-related challenges and these predispose them to stress-related disorders like job-related burnout (Afulani et al., 2021a; Atinga et al., 2014; Dapaah, 2014; Korsah, 2011).

2.3.1 Occupational stress models

Some models exist to explain the occurrence of job-related stress among health service workers (Atlam, 2018; Brief & Weis, 2017; Ibikunle, Amah, & Useh, 2016). The Effort-Reward Imbalance (ERI) model is one of such models. The effort-reward-imbalance model provides that job-stress result when mismatches exist between efforts spent on the job and rewards accompanying the efforts (Atlam, 2018; Clark et al., 2007; Dapaah, 2014). Efforts according to the ERI model include; physical and psychological demands whereas reward includes wages, salary, self-esteem, promotion prospects and security (Abdo et al., 2016;

Brief & Weiss, 2017; Ibikunle et al., 2016). An imbalance between efforts and rewards lead to job-related stress (Brief & Weis, 2017; Mbanga et al., 2018; Paiva et al., 2016).

Another model used to explain the occurrence of job-related stress is the job demand-control-support (DCS) model (Karasek & Theorell, 1992). The model suggest that job-related stress occurs due to mismatches in job demand, control and support (Atlam, 2018; Dubale et al., 2019; Ibikunle et al., 2016). Job demands are the efforts needed on the job. Job control on the other hand deals with decision making on the job while job support includes the support system attached to specific jobs. The model proposes that increased demands at work coupled with reduced control and support results in high job-stress and eventual burnout (Atlam, 2018; Dubale et al., 2019; Habadi et al., 2018). This model has been used to guide several studies (Gilles et al., 2014; Ibikunle et al., 2016; Paiva et al., 2016; Pascoal et al., 2021).

2.3.2 Burnout syndrome

Burnout is a psycho-social disorder that occurs when employees are exposed to high job demands with low support and control (Abdo et al., 2016; Bellingrath, Weigl, & Kudielka, 2009; Pascoal et al., 2021). It is regarded as an employee's reaction to chronic stress in a career (Abdo et al., 2016; Dubale et al., 2019; Israel et al., 1996). Burnout is a syndrome made up three elements; emotional exhaustion, depersonalization and reduced personal competence (Afulani et al., 2021a; Langade et al., 2016; Mbanga et al., 2018). Burnout syndrome occurs in persons confronted with an exceptional amount of occupational stress, particularly in the human services field such as health care work (Afulani et al., 2021a; Akkuş, Karacan, Göker & Aksu, 2010; Alhajjar, 2013; Odonkor & Frimpong, 2020).

The concept of burnout received scientific attention in the 1970s and was originally referred to as a reaction to interpersonal conflicts and demands on the job (Mbanga et al., 2018; Ndawula, 2011; Odonkor & Frimpong; Thorsen et al., 2011). It was described by the psychologist, Freudenberger (1974) as a situation where the person failed, wore-out or became exhausted by demands on the job (Afulani et al., 2021a; Dubale et al., 2019; Israel et al., 1996). Maslach and Jackson (2015) described burnout syndrome as involving three elements: emotional exhaustion, depersonalization, and reduced personal accomplishment (Brief & Weiss, 2017; Ibikunle, Amah & Useh, 2016; Thorsen et al., 2011). The terms burnout syndrome, burnout, job-related burnout, employee burnout, professional burnout refer to the same concept (Abdo et al., 2016; Afulani et al., 2021a; Brief & Weiss, 2017; Dubale et al., 2019; Israel et al., 1996).

According to Brief and Weiss (2017), burnout is defined as a state of mind that affects people who work with other people and give much more than what they get in return from their colleagues, friends, supervisors and clients. This results in a lack of enthusiasm, a sense of helplessness and frustration (Abdo et al., 2016; Dubale et al., 2019; Mbanga et al., 2018; Paiva et al., 2016). This definition can further be expanded so that burnout is regarded as a persistent negative occupational mood among "normal" people, characterized by fatigue associated with distress, a sense of reduced effectiveness and motivation as well as the development of dysfunctional attitudes and behaviors in a work context (Dubale et al., 2019; Mbanga et al., 2018; Paiva et al., 2016). Burnout, therefore, can be regarded as the end result of persistent, insufficient or unsuccessful efforts to handle stressors at the workplace (Afulani et al., 2021a; Mbanga et al., 2018; Pascoal et al., 2021).

2.3.3 Historical perspective of burnout

The historical development of burnout is linked to George Beard who, in 1869, classified the disease as "neurasthenia" (Abdo et al., 2016; Dubale et al., 2019; Freudenberger, 1974; Thorsen et al., 2011). Neurasthenia is related to social changes such as industrialization, capitalism and an increase in time duration for work (Dubale et al., 2019; Mbanga et al., 2018; Paiva et al., 2016). Herbert Freudenberger (1974), one of the first researchers to study burnout, made the following statement, [burnout is] a demon, born out of the society and that it occurs in our on-going struggle to give our lives meaning (Bria et al., 2012). A stressful occupational situation, such as monotonous work, is described as the main cause of burnout (Dubale et al., 2019; Mbanga et al., 2018; Pascoal et al., 2021).

Burnout only emerged as a syndrome associated with severe fatigue in the 1980s (Thorsen et al., 2011). The concept of burnout syndrome originated from the psychological field (Pascoal et al., 2021). It was initially argued that primarily health care professionals were affected by burnout syndrome as their particular occupational group had demanding interpersonal relationships on their jobs (Dubale et al., 2019; Mbanga et al., 2018; Paiva et al., 2016). The result was the depletion of emotional and empathetic resources – emotional exhaustion – which left the person feeling drained and weak. Thus, emotional exhaustion became the cardinal characteristic of burnout syndrome (Polikandrioti et al., 2019) which triggered the development of the other two characteristics. Essentially, emotional exhaustion together with depersonalization or cynicism and professional incompetence form the core features of burnout syndrome (Asiedu et al., 2018; Atlam, 2018; Thorsen et al., 2011).

2.3.4 Elements of burnout syndrome

Burnout is a syndrome that has three elements namely; emotional exhaustion, depersonalization and a sense of reduced personal accomplishment (Dubale et al., 2019; Mbanga et al., 2018; Pindar & Coker, 2012; Polikandrioti et al., 2019). Emotional Exhaustion (EE) is said to be the most widely reported manifestation of burnout syndrome and reflects the stress dimension of burnout (Polikandrioti et al., 2019). It refers to the situation where an individual worker feels overstretched and depleted emotionally and physically (Mbanga et al., 2018). The Depersonalization (DP) manifestation in burnout reveals the interpersonal aspect of burnout (Abdo et al., 2016). It makes the individual experiencing burnout syndrome to display negative and callous tendencies, and also to show detachment from his/her job (Dubale et al., 2019; Mbanga et al., 2018; Paiva et al., 2016). Depersonalization makes the burnout worker put a "distance" between self and service recipients/patients (Polikandrioti et al., 2019). Also, it makes the worker regard his/her service recipients as impersonal objects, and constantly ignore them when they make demands (Polikandrioti et al., 2019). This means that a health worker who is experiencing depersonalization shows a disrespectful attitude towards patients and constantly ignores their legitimate demand for quality care. The third manifestation of burnout syndrome makes the individual worker experience a feeling of reduced personal achievement (Polikandrioti et al., 2019). In other words, this manifestation negatively affects job performance, and leads to low productivity. Persons experiencing burnout syndrome may absent themselves from work and also contemplate leaving the job due to the feeling of reduced personal accomplishment (Anduaga-beramendi, Beas, Maticorena-quevedo, & Mayta-tristán, 2019).

2.3.5 Models of burnout

2.3.5.1 The Maslach Burnout Model

The Maslach burnout model views burnout as a syndrome made up three components: emotional exhaustion, depersonalization, and a low personal accomplishment (Abdo et al., 2016; Ibikunle et al., 2016; Mbanga et al., 2018). Emotional exhaustion is the commonest manifestation of burnout and deals with the depletion one's psychological resources (Brief & Weis, 2017; Dubale et al., 2019; Ibikunle et al., 2016). Depersonalization (cynicism) on the other hand deals with the social component of burnout and involves a state where employees are detached from service recipients (Ibikunle et al., 2016). The third dimension was re-labeled as reduced professional accomplishment or efficacy, depicted to include the self-assessments of low self-efficacy, lack of accomplishment, lack of productivity and incompetence (Polikandrioti et al., 2019). Low personal accomplishment is the last aspect of burnout and deals with the situation where the employee loses interest in the job as well as manifesting a feeling of reduced competence (Abdo et al., 2016; Dubale et al., 2019; Ibikunle et al., 2016; Mbanga et al., 2018; Ndawula, 2012).

2.3.5.2. Leiter's Model

Leiter's model is based on the Maslach Burnout Inventory (MBI) components and helps for better understanding of professional burnout components (Langade et al., 2016). Leiter developed his model through the use of structural equation modeling, which allows one to test the distinct contribution of various organizational measures while maintaining the MBI's three factor structure, and also to explore the impact of one component of burnout on the other two components (Polikandrioti et al., 2019). The model suggests that to reduce the experience of burnout, it is essential to find ways of adjusting workload, relocating tasks, designing ways to decrease interpersonal conflict among other factors (Pascoal et al., 2021).

2.3.5.3 Shirom-Melamed Burnout Model (S-MBM)

The Shirom-Melamed Burnout Model (S-MBM) is based on the Conservation of Resources (COR) theory (Dubale et al., 2019; Mbanga et al., 2018; Paiva et al., 2016). Here, professional burnout is seen as an emotional state. The core principles of the COR theory are that people have a basic motivation to keep and protect things they value (Polikandrioti et al., 2019). It is seen in the S-MBM that job-related stress and burnout does not occur as an event, but rather represents an unfolding process, so individuals who lack adequate resilience experience cycles of resource loss (Polikandrioti et al., 2019) and this eventually results in burnout (Dubale et al., 2019; Mbanga et al., 2018; Paiva et al., 2016).

2.3.5.4 Pines' Burnout Model

The Pines' Burnout Model (PBM) is a uni-dimensional measure of burnout (Odonkor &

Frimpong, 2020). Some authors (Anduaga-beramendi et al., 2019; Dubale et al., 2019; Odonkor & Frimpong, 2020) describe the PBM as a measure of job strain that encompasses physical fatigue, emotional exhaustion, depression, anxiety, and low self-esteem (Polikandrioti et al., 2019). The model sees burnout as an affective and behavioral-state caused by long-term involvement in emotionally-charged occupational settings (Odonkor & Frimpong, 2020). The model expands the concept of burnout to marital relationships as well as the aftermath of civil conflicts (Anduaga-beramendi et al., 2019)

2.3.6 Diagnosis of burnout

Several standardized tools or scales exist to capture an employee's experience of job-related burnout. Some of the commonly used scales are; the Maslach Burnout Inventory (MBI), the Copenhagen Burnout Inventory (CBI), the Pines' Burnout Measure (PBM) and the Shirom-Melamed Burnout Questionnaire (SMBQ).

2.3.6.1 The Maslach Burnout Inventory (MBI)

The Maslach Burnout Inventory Human Services Survey (MBI-HSS) is the commonly used tool for diagnosing burnout among health workers (Maslach et al., 2015). This tool is a 22-item questionnaire measuring the three facets of burnout. The first part of the scale measures "Emotional Exhaustion" and this consists of nine (9) items to assess feelings of being emotionally over-extended. The second sub-scale "Depersonalization" consists of five (5) negative items to assess "unfeeling" and unhealthy response towards service recipients. The third sub-scale "Personal Accomplishment" consists of eight (8) items to assess feelings of professional competence in one's work with people. The reliability of the tool as estimated by Cronbach's alpha is 0.90 for the EE sub-scale, 0.79 for the DP sub-scale and 0.71 for the PA sub-scale (Abdo et al., 2016; Maslach et al., 2015; Pascoal et al., 2021).

The MBI-HSS is scored on a seven (7)-point scale from never (0) to everyday (6) and yields three sub-scale scores. Low burnout: EE score 0±18, DP score 0±5, PA score 40+; Moderate burnout: EE score 19±26, DP score 6±9, PA score 34±39; High burnout: EE score 27+, DP score 10+, PA score 0±33. The emotional exhaustion dimension has been consistently viewed as the core component of the MBI (Pascoal et al., 2021).

Even though the original authors of the MBI (Maslach et al., 20015) recommend that in using the tool, the scores should not be aggregated into a single score and that burnout should be looked at from the three construct level, other authors (Abdo et al., 2016; Afulani et al., 2021a; Ibikunle et al., 2016; Kitaoka-Higashiguchi et al., 2009; Polikandrioti et al., 2019; Thorsen et al., 2011) have suggested an aggregation of the three elements to produce a single measure of burnout for individuals so as to be able to differentiate those with burnout from those not experiencing burnout for treatment purposes. They suggest that individuals with high emotional exhaustion, high depersonalization and low personal accomplishment are classified as experiencing burnout (Abdo et al., 2016; Afulani et al., 2021a; Ibikunle et al., 2016; Kitaoka-Higashiguchi et al., 2009; Polikandrioti et al., 2019; Thorsen et al., 2011).

2.3.6.2 The Copenhagen Burnout Inventory (CBI)

The Copenhagen Burnout Inventory (CBI) was designed to overcome the limitations of MBI (Corsino-de-Paiva, Gomes-Canário, Corsino-de-Paiva, Rodrigues-Monteiro, & Gonçalves-da-Silveira, 2016). It is a nineteen-item scale measuring the three sub-dimensions of professional burnout (Holmes et al., 2017). The first subscale measures personal burnout and has six (6) items. The second part of the tool measures job-related burnout and has seven (7) items. The third part measures client-related burnout and has six (6) components (Gilles et al., 2014).

2.3.6.3 Pines' Burnout Measure (PBM)

The Pines' Burnout Measure (PBM) determines the rate of burnout using a single score by adding-up the 21-items of the PBM (Odonkor & Frimpong, 2020). The PBM assesses three types of exhaustion: physical exhaustion (items 1, 4, 7, 10, 13, 16, 20); emotional exhaustion (items 2, 5, 8, 12, 14, 17, 21); and mental exhaustion (items 3, 6, 9, 11, 15, 18, 19). In using the tool, individuals are asked to rate the frequency of their experiences about work or life, how they feel today or in general. Responses are made on a 7-level likert scale ranging from 1 (never) to (seven) 7 (always). The internal consistency of the scale ranges from 0.91 to 0.93 (Dubale et al., 2019; Fishburn, 2015; Ndawula, 2012; Odonkor & Frimpong, 2020).

2.3.6.4 The Shirom-Melamed Burnout Questionnaire (SMBQ)

The Shirom-Melamed Burnout Questionnaire (SMBQ) is another instrument that assesses the reduction of energetic resources manifesting as burnout (Langade et al., 2016). It has three sub-scales; physical fatigue, emotional exhaustion, and cognitive weariness (Gilles et al., 2014). The SMBQ contains 22 items, each rated on a 7-point scale (1 being almost never and 7 almost always) (Corsino-de-Paiva, et al., 2016).

2.3.7 Prevalence of burnout among health workers

2.3.7.1 Global prevalence of burnout

Globally, health workers report burnout rate in excess of fifty (50) percent (Atlam, 2018; Corsino-de-Paiva, et al., 2016; Ibikunle et al., 2016; Langade et al., 2016; Mbanga et al., 2018). Multiple studies (Brief & Weis, 2017; Corsino-de-Paiva, et al., 2016; Dubale et al., 2019; Gilles et al., 2014; Pascoal et al., 2021; Thorsen et al., 2011) suggest that 55% to 65% of health care staff worldwide, have professional burnout, and up to 86% have at least one sub-scale of burnout. Burnout is found more in primary care, critical care and emergency unit staff (Abdo et al., 2016, Rouleau et al., 2012 Polikandrioti et al., 2019). Similarly, almost fifty percent (47%) of non-clinical staff globally report symptoms of severe burnout (Anduaga-beramendi et al., 2018). Among pediatric critical care physicians the prevalence of burnout is 71%, and this is more than the rate in general practitioners (Neckel et al., 2017). In addition, Pindar and Coker (2012) indicated that worldwide, 77.5% of health workers have high emotional exhaustion, and that 56.0% report high depersonalization while 33.0% manifest low personal accomplishment as measured by MBI-HSS tool.

Studies (Atlam, 2018; Dubale et al., 2019; Ndawula, 2012; Rocha, 2013) which compared burnout rates among medical professionals and the general population found significantly higher burnout rates among medical professionals. Although burnout affects health care professionals regardless of medical specialty, studies report that the highest burnout rates are shared by those working in surgical (Corsino-de-Paiva et al., 2016), primary health care setting (Abdo et al., 2016), oncology (Habadi et al., 2018), front line of care access such as family and emergency medicine (Dubale et al, 2019), and obstetrics and gynaecology (Mbanga et al., 2018).

Also, high burnout level was found among Italian health workers and this was correlated with stress and lack of organizational support for work (Pascoal et al., 2021). Similarly, Ndawula (2012) reports that the rate of burnout was 49.8% among immigrant hospital staff in America. In addition, 73% of health workers working in trauma settings are said to be having burnout (Eneluzia et al., nd) with 38.4% of the clinicians in general wards having professional burnout (Langade et al., 2016). Likewise, Bria et al. (2012) indicate that 82% of clinicians in the USA have moderate to high burnout. It is reported that the prevalence of professional burnout among Mexican health workers in Family Medicine units was 16.79% (Chico-Barba et al., 2019), 18.5% in general surgical nurses (Bria et al., 2012), and 40% in ICU nurses (Chico-Barba et al., 2019). In addition, He et al. (2014) showed that Chinese health workers reported with higher levels of professional burnout (50%). Also, Habadi et al. (2018) states that 48% of health workers in primary care settings in Jeddah and Saudi Arabia have burnout. Similarly, in a population of junior physicians in India, 77.8% had experienced burnout in the past year while 52.4% were experiencing burnout at their current job. Among these doctors, scores on the Physician Stress Inventory were significantly higher among those with burnout (Langade et al., 2016).

2.3.7.2 Prevalence of burnout in sub-Saharan Africa

Health workers in SSA report with the highest level of burnout compared to their counterparts from other parts of the world (Abdo et al., 2016; Dubale et al., 2019; Selim et al., 2018), partly due to the low resources for the health sector (Mbanga et al., 2018). For example, among physicians at a rural district hospital in South Africa, 81% of participants reported with burnout on emotional exhaustion, with 31% reporting high burnout on the other two components of the MBI (Dubale et al., 2019). Also, 65.2% of physicians in southern Ethiopia (N = 491) reported high emotional exhaustion, 91% reported with low personal accomplishment and 85.1% with high depersonalization (Dubale et al., 2019). In addition, physicians undergoing residency training at a hospital in Nigeria reported a high prevalence of burnout, with 45.6% of residents reporting burnout on emotional exhaustion, 57.8% depersonalization, and 61.8% with reduced personal accomplishment (Ibikunle et al., 2016).

In addition, it has been found that clinicians working in a high dependency settings, particularly ICUs and emergency settings experience more burnout (Kim et al., 2018). It is reported that burnout rate is almost fifty percent among emergency and critical care health workers (Abdo & Kabbash, 2016) in contrast with the 14.5% in general practitioners (Pindar & Coker, 2012). Among South African anesthetists in private practice, 20.9% reported high emotional exhaustion, with 26.7% reporting high depersonalization and 37.2% reporting low personal accomplishment (Dubale et al., 2019).

Likewise, among nursing and medical students in Cameroon, burnout was examined using the Oldenburg Burnout Inventory and was shown to be in excess of 40% among both sets of respondents (Njim et al., 2018). Furthermore, Thorsen et al. (2011) found that high levels of burnout exist in clinicians working in obstetrics and gynecology units in Malawi and that this high burnout levels affected 72% of the respondents. This finding is similar to the 62% rate of burnout among health workers in Zambia (Dubale et al., 2019). Similarly, Ndawula (2012) found that 59% of the staff working in Kenyan hospitals had burnout. Also, emotional exhaustion was found to affect 38% of Kenyan psychiatric nurses (Dubale et al., 2019) and 39.1% in Nigerian general hospital staff (Pindar & Coker, 2012).

2.3.7.3. Prevalence of burnout syndrome in Ghana

Earlier studies in Ghana have suggested that the rates of job-related stress and burnout are high among health workers; particularly among clinicians (Atinga et al., 2014; Dapaah, 2014; Fiadzo et al., 1997). Recently, Asiedu et al. (2018) and Nuhu et al. (2020) found that burnout affected over a quarter of clinicians in Ghana particularly nurses and midwives who form the majority of the health workforce in Ghana (Asamani et al., 2019). Similarly, among physicians who participated in a web-based survey, burnout measures were high on the emotional exhaustion (mean ± standard deviation (SD): 19.1 ± 2.6), personal accomplishment (15.8 ± 1.6), and depersonalization (15.2 ± 2.1) sub-scales of the abbreviated MBI-HSS tool (Opoku & Apenteng, 2014).

However, Ayisi-Boateng et al. (2020) in their study of burnout among physicians using the MBI-HSS tool found that 5.5% of the respondents experienced depersonalization, 7.8% had a lack of personal achievement and 10.8% experienced emotional exhaustion. In addition, Odonkor and Frimpong, (2020) in their study of health workers in Accra report that the total score for all burnout variables among health worker groups ranged from good (71.50%), alarming (12.60%), acute crisis (6.02%), and burnout (9.90%). Among the health worker groups, nurses had the highest percentage score values for all the burnout variables. However, Odonkor and Frimpong's (2020) study was conceptualized around the Pines burnout model and the sample size was non-representative.

A recent study (Afulani et al., 2021a) found that almost half (46%) of health workers in Ghana have burnout. They further found that appreciation from management and family support was associated with lower stress and burnout, while fear of COVID-19 infection was associated with higher stress and burnout. Afulani and colleagues concluded that low perceived preparedness to respond to the COVID-19 pandemic increased stress and burnout among health workers in Ghana. Afulani and colleagues recommended that interventions, incentives, and health systemic changes are needed to increase health care workers' morale so as to reduce the occurrence of burnout. It has to be pointed out that Afulani and colleagues' work focused on inadequate preparedness towards COVID-19 as a determinant of burnout and was not aimed at estimating the prevalence of burnout syndrome among health workers in Ghana. More so, the sample size was skewed towards clinicians and non-representative of the health work force in urban Ghana.

It has to be noted that some of the studies in Ghana (Ayisi-Boateng et al., 2020 and Opoku & Apenteng, 2014) were conducted among only physicians and the sample sizes were not representative of the population of medical doctors in Ghana. Similarly, the other Ghanaian studies (Afulani et al., 2021; Asiedu et al., 2018; Atindabila et al., 2012; Nuhu et al., 2020; Odonkor & Frimpong, 2020) were limited to clinicians; predominantly nurses. The ability to make generalizations for all health workers in Ghana from these studies are limited by the relatively small sample sizes and they being conducted only among a section of health workers. In addition, there is limited information on the prevalence of burnout among health workers engaged in the different levels of the health care system in Ghana. Therefore, there is the need for comprehensive studies on the prevalence of burnout among clinicians and non-clinicians as well as among health workers engaged in the various levels of the health care system using representative sampling techniques to give a better overview of the burnout situation in urban Ghana.

2.3.8 Risk factors for burnout

Some authors (Afulani et al., 2021a; Asiedu et al., 2018; Ayisi-Boateng et al., 2020; Dapaah, 2014; Konlan et al., 2020c; Nuhu et al., 2020; Odonkor & Frimpong, 2020) have cited a combination of personal and job-related challenges as being responsible for the occurrence of burnout among health workers in Ghana. These challenges can be classified as socio-demographic and job-related predictors of burnout (Opoku & Apenteng, 2014).

2.3.8.1 Socio-demographic predictors of burnout

Even though some studies (Ayisi-Boateng et al., 2020; Kim et al., 2018; Opoku & Apenteng, 2014) have concluded that gender does not influence burnout development. However, several other studies (Abdo et al., 2016; Dubale et al., 2019; Ibikunle et al., 2016; Langade et al., 2016; Thorsen et al., 2011) suggest that female health workers have more vulnerability to emotional exhaustion than males and as a result are more prone to overall burnout than their male counterparts. The literature among health care providers (Afulani et al., 2021a; Dubale et al., 2019; Fiadzo et al., 1997; Mbanga et al., 2018) has shown burnout is more common among women. Furthermore, some studies (Ayisi-Boateng et al., 2020; Ibikunle et al., 2016; Thorsen et al., 2011) suggest that women tend to report higher emotional exhaustion scores, while men tend to report higher depersonalization (Dubale et al., 2019) and low personal accomplishment scores (Langade et al., 2016).

Mbanga et al. (2018) reports that older health workers aged forty to fifty (40-50) years have a greater subjection to psychological and physical oppressions caused by fatigue resulting from overworking and carrying out tedious duties, and this resulted in burnout. The majority of studies (Afulani et al., 2021a; Ayisi-Boateng et al., 2020; Dubale et al., 2019) investigating the relationship between burnout and age of health care professionals included age as a control variable. However, results of other studies (Abdo et al., 2016; Ibikunle et al., 2016; Thorsen et al., 2011) are inconclusive, as most of them found no burnout differences comparing young and senior health care professionals.

Marital status and burnout seem unrelated according to Ayisi-Boateng and colleagues (Ayisi-Boateng et al., 2020), Similarly, Kim et al. (2018) states that the two offer no congruent results. However, Asiedu et al. (2018) found that having a partner is a protective factor. Also, Dubale et al. (2019) found that health workers prevented burnout mainly through support from family members and hobbies. Thus, married health workers demonstrate a lower rate of burnout due to adequate spousal support (Pascoal et al., 2021). This observation stands to reason because families are sources of all kinds of support; moral, emotional, financial, and physical (Asiedu et al., 2018).

In addition, a low level of resilience has been identified as yet another personal factor accounting for the experience of burnout among health workers (Afulani et al., 2021a; Ayisi-Boateng et al., 2020; Cocchiara et al., 2019; Kim et al., 2018). Health care staff with low resilience tend to have poor coping abilities when exposed to stressors at the workplace and easily experience burnout compared to those with normal or high resilience (Cocchiara et al., 2019). Resilience building through structured mentorship programs as well as emotional intelligence strengthening among health workers provides plausible mechanisms of reducing burnout (Afulani et al., 2021a; Dubale et al., 2019; Rocha, 2013; Tsai et al., 2013).

Furthermore, Odonkor and Frimpong (2020) found a significant link between burnout and these socio-demographic characteristics: age, sex, educational qualification, years of work experience, marital status and having children. However, this is in contrast to the assertions of Ayisi-Boateng et al. (2020) in their study where the link between burnout and age, sex, years of practice and clinical specialty was not statistically significant.

2.3.8.2. Job-related predictors of burnout

Some of the job-related predictors of burnout include; workload (Atlam, 2018; Dubale et al., 2019; Ibikunle et al., 2016), poor job control (Abdo et al., 2016; Kim et al., 2018; Odonkor & Frimpong, 2020), absence of rewards (Opoku & Apenteng, 2014; Dubale et al., 2019; Hartley et al., 2011), poor community or interpersonal relationship at the workplace (Afulani et al., 2021a; Ayisi-Boateng et al., 2020; Dubale et al., 2019), lack of fairness at the workplace (Dubale et al., 2019) and poor job satisfaction (Abdo et al., 2016; He et al., 2014; Opoku & Apenteng, 2014).

2.3.8.2.1 Workload

Workload has been established as a source of stress and burnout in different studies (Afulani et al., 2021a; Asiedu et al., 2018; Atlam, 2018). Steenkamp (2014) states that workload is the cause of the exhaustion component of burnout. Workload causes mismatch that contribute to job-related burnout. A mismatch occurs due work load in excess of resources at the job setting (Kim et al., 2018). Also, work mismatch could arise due to insufficient skills for certain types of jobs (Asiedu et al., 2018). Similarly, workload could arise from long shifts, compulsory overtime, no shift rotation among others (Atinga et al., 2014). Dubale et al. (2019) states that workload experienced by health workers influenced their rate of burnout by increasing job demands or efforts in excess of the rewards available. Similarly, Abdo and colleagues (2016) linked high workload and job demands to emotional exhaustion and this was also reported by Odonkor and Frimpong (2020) who states that hospital staff with increased workload easily experienced burnout.

Neckel and colleagues have suggested that the most common source of stress and burnout among health workers is work overload (Neckel et al., 2017). Inadequate staff induced workload is reportedly correlated with a high score on the emotional exhaustion and depersonalization sub-scales of MBI-HSS (Kim et al., 2018). A heavy workload experienced by a nurse affects the nurse, other nurses, the quality of nurse-physician collaboration (Eneluzia et al., n.d.), nurse-patient communication (Corsino-de-Paiva et al., 2016) and training or supervision of new employees (Brief & Weiss, 2017). Hiring more health workers is seen as one of the best ways to reduce the workload (Ibikunle et al., 2016), unfortunately, this appears to be the most difficult strategy given the fact that economic resources are scarce particularly in SSA (Asamani et al., 2019).

Similarly, high workload has been identified to be associated with burnout among clinicians (Dubale et al., 2019). For instance, among nurses in South Africa, workload was a significant predictor of emotional exhaustion as measured by the MBI- HSS (Dubale et al., 2019). Also, among hospital workers in Nigeria and Ghana, inadequate number of clinicians and frequent night duties were predictors of burnout on the emotional exhaustion sub-scale of the MBI-HSS, as they were found to be associated with increased workload (Asiedu et al., 2018; Ibikunle et al., 2016; Odonkor & Frimpong, 2020).

2.3.8.2.2 Job control

Employees with adequate control over their jobs have reduced tendency to develop burnout (Asiedu et al., 2018; Dubale et al., 2019; Gilles et al., 2014; Kim et al., 2018). A feeling of autonomy is important to hospital staff as job burnout is lower when health workers have control over how they perform their jobs (Bria et al., 2012). Job control deals with power play in the organization, sense of responsibility, ability to take decisions among others (Paiva et al., 2016). Afulani and colleagues suggest that a mismatch in control is generally related to low personal accomplishment aspects of burnout (Afulani et al., 2021a). Similarly, Langade and colleagues in India observed that the risk of burnout is increased among health workers who perceive a lack of control for their jobs (Langade et al., 2016).

2.3.8.2.3 Rewards

Rewards are what employees receive for work done and include; wages, job security, job identity, wages/salaries, opportunities for continuous professional development, promotions among others (Shakori, Vokhlacheva & Farzanehkari, 2018). Mismatch occurs when there are inadequate rewards to match with the job efforts (Selim et al., 2018). Lack of reward is closely associated with feelings of inefficacy (Ibikunle et al., 2016). Being adequately rewarded is key for health workers (Rouleau et al., 2012), and its lack gives rise to burnout (Afulani et al., 2021a; Dapaah, 2014; Mbanga et al., 2018). For instance, Thorsen et al. (2011) reported that over sixty percent of health workers said that their contributions were not publicly acknowledged and this predisposed them to job-related burnout. Also, Ibikunle and colleagues found that burnout was significantly associated with lack of recognition and dissatisfaction (Ibikunle et al., 2016).

2.3.8.2.4 Interpersonal relationships among health workers

Among health care providers, burnout is associated with interpersonal and professional conflicts (Dubale et al., 2019). Conflicts such as doctor to doctor conflict (Neckel et al., 2017), doctor to nurse conflict (Njim et al., 2018), work to family conflict (Asiedu et al., 2018), and interpersonal conflict in general (Pascoal et al., 2021) have been found to be linked with burnout. Among doctors in India, those who did not report doctor-doctor conflict were less likely to have burnout on the depersonalization sub-scale of the MBI-HSS (Langade et al., 2016). Similarly, among Nigerian nurses, doctor-nurse conflict was a predictor of burnout on the emotional exhaustion sub-scale and on the depersonalization sub-scale (Ibikunle et al., 2016). Among nurses from public hospitals in Ghana (N = 134), work-to-family and family-to-work conflict accounted for 20% of the variance in burnout (Asiedu et al., 2018). It is established that poor community life among professionals in the health care system leads to burnout (Afulani et al., 2021a; Ayisi-Boateng et al., 2020; Dubale et al., 2019; Pascoal et al., 2021; Rocha. 2013).

2.3.8.2.5 Fairness

Fairness entails equal treatment and handling of every employee in assignment of rewards, tasks, scheduling, recognition, promotions and decision making (Holmes et al., 2017). The concept of fairness connotes respect and confirms people's self-worth (Paiva et al., 2016). Asiedu et al. (2018) states that a lack of fairness worsens burnout in two ways. First, the experience of unfair treatment causes emotional upsets and exhaustion and secondly, unfairness leads to lack of interest for the job. Similarly, Dubale et al. (2019) observed that health workers who worked in discriminatory environment and where there was a lot of unfairness tended to have burnout. Unfairness is said to hinder interpersonal communication and also promotes conflicts at the workplace (Neckel et al., 2017).

2.3.8.2.6 Values

The values and ethical principles in an organization determine whether or not an employee will experience burnout or not (Asiedu et al., 2018). Mismatch results when there is a conflict between health worker's career aspirations and the values of the health institution (Ibikunle et al., 2016). In some cases, employees feel compelled by the job to do things that are unethical and not in consonance with their own personal values. Such situations breed mistrust and intra-personal conflicts and is associated with burnout (Asiedu et al., 2018). Dubale et al., (2019) found the essential values for nurses' job satisfaction as autonomy, independence, and their relationships with physicians. Nurses who experienced these core values at their workplace are less likely to experience burnout.

2.3.9 Management of burnout

The negative consequences of burnout on both the employee and the organization calls for measures to reduce its existence (Afulani et al., 2021a; Ayisi-Boateng et al., 2020; Dapaah, 2014; Dubale et al., 2019). Burnout prevention strategies, either addressing the general working population (primary prevention) or the occupational groups which are more vulnerable (secondary prevention) are recommended. Similarly, measures focused on reducing the risk factors of burnout are needed to tackle the increasing rates of burnout in SSA (Alexander, Rollins, Walker, Wong, & Pennings, 2015).

Programs aimed at managing burnout are rare in SSA (Dubale et al., 2019). Only three studies (Fiadzo et al., 1997; Ledikwe et al., 2018; Madede et al., 2017) in combined populations of health workers examined burnout management interventions in SSA. The Support, Train and Empower Managers (STEM) study is one such study (Madede et al., 2017). In the STEM study, Madede and colleagues designed and implemented a staff support intervention aimed at reducing burnout among health workers in Mozambique (Madede et al., 2017). At baseline, 67.1% of the health workers reported low, 15.9% moderate, and 17.1% high burnout on the MBI-HSS. After the intervention, 71.1% reported low, 17.8% moderate, and 11.1% high burnout. However, the authors found no statistically significant differences in emotional exhaustion from baseline to post-intervention (Madede et al., 2017). Similarly, Ledikwe and colleagues examined health workers at a public health facility in Botswana (N = 1348) who participated in the Workplace Wellness Program (WWP) (Ledikwe et al., 2018). In the WWP study, job satisfaction was found to be significantly higher for health workers who participated in seven (7) or more activities in the WWP compared to those who did not participate in any activities (p = 0.004). Also, health workers who participated in seven (7) or more WWP activities had significantly higher scores on the job description index sub-scales related to satisfaction with work, supervision, promotion opportunities and pay ($p < 0.05$). Additionally, stress levels ($p = 0.006$), measured on the Stress in General scale, and exhaustion ($p < 0.001$), measured on the MBI-HSS, were significantly lower among those with high participation in WWP activities (Ledikwe et al., 2018).

In addition, yoga has been identified as a useful tool for managing burnout among health workers (Alexander et al. 2015 and Cocchiara et al., 2019). In a randomized-controlled trial that examined the efficacy of yoga to improve self-care and burnout among health workers, Alexander and colleagues (2015) indicate that yoga reduces the level of all components of burnout syndrome (Alexander et al. 2015). Although the control group demonstrated no change throughout the course of the study, the yoga group showed a significant improvement in scores from pre- to post-intervention for self-care, mindfulness, emotional exhaustion, and depersonalization outcomes. Similarly, Cocchiara et al. (2019), in a systematic review to summarize the current knowledge regarding the use of yoga to manage and prevent stress and burnout in health care workers, found yoga to be very effective in the management of stress among health workers (Cocchiara et al., 2019). In addition, Kim et al. (2018) found that an eleven-week yoga and meditation program could be used to reduce or prevent burnout among service employees.

Furthermore, exercise has been recommended as an effective tool to reduce physiological and psychological stress-abnormalities among health workers in Ghana (Nuhu et al., 2020). This is supported by an earlier study involving Tsai and colleagues (2013), who explored the impact of a twelve (12)-week exercise program in banking and insurance workers' burnout and metabolic syndrome (Tsai et al., 2013). It was found that workers in the high-intensity exercise program had decreased burnout and systolic BPs. In addition, high SBPs were found to be independently associated with burnout (Tsai et al., 2013).

Spooner-Lane and Patton (2007) indicate that burnout can be prevented by reducing or keeping moderate professional duties and responsibility, making clearer job descriptions, promoting leisure activities, and enhancing self-care capabilities. Similarly, Fiadzo et al. (1997) have suggested that health workers keep to reduced responsibility with clear job descriptions in order to help reduce the tendency to develop burnout.

Also, Neckel et al. (2017) examined the effect of Psycho-social Intervention Training (PIT) on the experience of burnout among randomly selected hospital employees. The duration of the programme was six (6) months. The MBI was used to assess the level of burnout. The hospital staff in the experimental group had reduced burnout levels as compared to their counterparts. Similarly, Israel et al. (1996) state that psychological counseling sessions (PCS) aimed at improving resilience can be used to reduce burnout among health workers.

Different programmes have been used in different studies (Alexander et al. 2015; Cocchiara et al., 2019; Tsai et al., 2013) to reduce burnout among health workers. Not all programmes reduced all dimensions of burnout as some changed the level of only one or two dimensions (Alexander et al., 2015). The literature (Alexander et al. 2015; Cocchiara et al., 2019; Dubale et al., 2019; Tsai et al., 2013) suggests that interventions that aim at building resilience are key to reducing the occurrence of high burnout among service workers just like yoga. Resilience is a psychological characteristic that enables an employee to adjust to stress in a healthy way (Cocchiara et al., 2019). It has been recognized as a mechanism to mitigate symptoms of burnout syndrome (Afulani et al., 2021a; Dubale et al., 209; Tsai et al., 2013). While there are innate or inherent qualities of resilience, there are qualities of resilience that can be developed through learning (Cocchiara et al., 2019). Examples of such resilience techniques include: being optimistic, developing cognitive flexibility, establishing and maintaining a supportive social network, mindfulness training and exercising (Alexander et al., 2015; Ayisi-Boateng et al., 2020; Tsai et al., 2013). It is recommended that preventive measures should focus on developing these resilience techniques among service workers so as to reduce the occurrence of burnout (Alexander et al., 2015; Ayisi-Boateng et al., 2020; Dubale et al., 2019; Tsai et al., 2013).

2.3.10 Complications of burnout

Studies (Abdo et al., 2016; Dubale et al., 2019; Alexander et al., 2015; Odonkor & Frimpong, 2020) have consistently linked health care professionals' burnout with medication errors and sub-optimal care. Health workers with burnout tend to give sub-optimal care to their clients (Pindar & Coker, 2012). For example, among health providers in Malawi, burnout was associated with self-reported sub-optimal patient care (Mbanga et al., 2018). Also, the experience of burnout may result in voluntary turnover of health workers (Asamani et al., 2019). Excessive turnover increases the cost of health delivery, reduces staff morale, and decreases the overall quality of care (Afulani et al., 2021a; Asamani et al., 2019; Cañadas-De la Fuente et al., 2018; MOH, 2020).

Shakori et al. (2018) found that burnout predicted later onset of musculoskeletal pain among apparently healthy hospital staff. Musculoskeletal pain is a highly prevalent medical condition among health care staff which often results in chronic disability (Smeltzer et al., 2016) and job-related hazards and burnout are cited as implicated.

Furthermore, burnout is suggested as a predictor of CVDs among health professionals (He et al., 2014). Studies (Afulani et al., 2021b; Kitaoka-Higashiguchi et al., 2009; Kyle et al., 2017; Melamed & Kushnir, 2015; Sumaila et al., 2016) have sought to link burnout to the future incidence of CVDs among health workers. Even though the underlining pathway is poorly understood, abnormal activation of the neuro-hormonal system as well as associated burnout-induced unhealthy lifestyle patterns are said to be implicated (Chico-Barba et al., 2019; Kitaoka-Higashiguchi et al., 2009; Kyle et al., 2017; McEwen, 2015; Melamed & Kushnir, 2015; Melamed et al., 2006; Osei-Yeboah et al., 2018; Sumaila et al., 2016).

2.3.11 Burnout and physiological dysregulation: Allostatic load

Chronic stress manifesting as burnout has a significant physiological impact on the body of victims (Beckie, 2012; Bellingrath et al., 2009; Clark et al., 2007; Danese & McEwen, 2012; McEwen, 2015). The stress response in itself does not lead to adverse health outcomes; it actually protects the organism from harmful stimuli (Read & Grundy, 2012). However, each time the stress response is activated, physiological adjustments, must be made and over time these adjustments lead to accumulated wear and tear of physiological systems; an allostatic load (Abshire, 2014; Beckie, 2012; Read & Grundy, 2012; Smeltzer et al., 2016). The concept of allostatic load describes the accumulated wear and tear on individuals' physiological systems on exposure to chronic stress; sub-clinical physiological dysregulation (Belligrath et al., 2009: McEwen & Gianaros, 2011; Read & Grundy, 2012). How well an individual's physiological system adapts to environmental challenges determine the extent of physiological dysfunction (Seeman et al., 2014). If exposure to the stress is for a longer period, it causes sub-clinical dysfunction of physiological systems of victims leading to chronic diseases (Beckie, 2012; McEwen, 2015; Read & Grundy, 2012).

The pathway in which chronic stress induces diseases emerges from malfunction of several systems (Seeman et al., 2014). For instance; cardiovascular diseases may result from stress related amygdale hyperactivity, elevation in inflammation and abnormal metabolic functioning. Also, chronic stress related elevation in inflammation and cortisol secretion may decrease cell sensitivity to insulin, promoting the development of metabolic disorders, such as DM, MetS and eventual CVDs (Read & Grundy, 2012). Also, the elevation of inflammation and the hypercortisolemia may also promote CVDs as well as neuro-degeneration, which may lead to cognitive decline and dementia. Inflammation and metabolic abnormalities may contribute to the shortening of a region of repetitive DNA at the end of chromosomes (telomere attrition) causing cellular aging (Smeltzer et al., 2016).

The allostatic load process often follows three stages (Abshire, 2014; Read & Grundy, 2012; Seeman et al., 2014; Smith et al., 2009). In the first stage, there is often an immediate stress response leading to a rise in primary mediators such as the stress hormones (e.g. epinephrine, norepinephrine and cortisol) as well as anti-inflammatory cytokines (e.g. Interleukin-6) in the body. In the second stage, a more long-term stress adaptive-response results in secondary outcomes which include changes in metabolic (e.g. insulin, glucose, total cholesterol, triglycerides, and visceral fat deposition), cardiovascular (e.g. systolic and diastolic BPs) and immune systems (e.g. C-reactive protein, fibrinogen, etc). Overtime, this allostatic-load process results in tertiary outcomes comprising cognitive decline, cellular aging, and poor health outcomes such as CVDs (Read & Grundy, 2012). However, it is not clear how long it takes to develop secondary and tertiary outcomes after primary stress reactions (Adam & Kumari, 2009; Beckie, 2012; Read & Grundy, 2012; Smith et al., 2009).

Characteristic of the allostatic-load process is that the physiological mediators are interconnected, reciprocal and have non-linear effects (McEwen & Gianaros, 2011). Allostatic load is associated with alterations in the functions of many organ systems and this highlights the need to always measure its level in individuals under constant stress for early risk stratification (Read & Grundy, 2012). Since it is a multi-system concept, measurement is based on deriving a composite score based on indicators from a number of different systems (McEwen & Gianaros, 2011). The allostatic load score represents the interplay of different systems (e.g. inflammatory, neuro-endocrine, cardiovascular and metabolic) and the markers may consist of short term outcomes (primary mediators) or more long-term outcomes (secondary and tertiary outcomes). It is important to take these into account in creating a composite measure (Read & Grundy, 2012). Different systems can be weighted so that the outcome score is representative of the multi-system dysregulation. It is suggested that measures of metabolic and cardiovascular systems (clinical measures) are stronger predictors of later health outcomes than inflammatory and neuro-endocrine measures (non-clinical measures) (Beckie, 2012). Primary mediators representing the neuro-endocrine system, on the other hand, are more strongly associated with stress than secondary outcomes in inflammatory, cardiovascular and metabolic systems (Smeltzer et al., 2016).

In one of the first attempts to operationalize the measurement of allostatic load, ten (10) biomarkers were used (Beckie, 2012). Four of them were primary mediators: cortisol, epinephrine, norepinephrine and dihydroepiandrosterone sulphate (DHEAS) and the other six of them represented secondary outcomes: systolic and diastolic BPs, waist-hip ratio, HDL-C, TC ratio and fasting plasma glucose or glycosylated haemoglobin. The measures were chosen so that they covered both primary mediators and secondary outcomes of allostatic load (Bellingrath et al., 2009). The overall allostatic load score which indicates the extent of physiological dysregulation is dependent on the number of biomarkers that the individual has higher than normal physiological measures (Beckie, 2012). Other studies (Adam & Kumari, 2009; McEwen, 2015; Seeman et al., 2014) have used more biomarkers to create the composite score, for the allostatic load, but the number of biomarkers varies from one study to another, with some authors (Beckie, 2012; McEwen, 2015; McEwen & Gianaros, 2011; Melamed et al., 2006; Seeman et al., 2014) recommending the inclusion of anthropometric indices in addition to the neuro-hormonal and cardio-metabolic biomarkers to create a better outlook of the physiological dysregulation following chronic stress.

2.3.12 Burnout and physical health outcomes

Burnout is associated with multi-system physiological dysregulation in victims (Afulani et al., 2021b; Polikandrioti et al., 2019; Read & Grundy, 2012). It induces high allostatic load (Clark et al., 2007; McEwen, 2015; Smeltzer et al., 2016) resulting in physical health conditions like metabolic syndrome and later CVDs (Beckie, 2012; Bellingrath et al., 2009; Cohen et al., 2013).

2.3.12.1 Hormonal response to stress

The human body has a complex set of physiologically adaptive processes that occur in response to stress (McEwen, 2015). This response is in the form of immediate and long term adaptive processes. The immediate response is mediated by the sympatho-medullary-adrenal axis (Read & Grundy, 2012) while long term adaptation is through the hypothalamic-pituitary-adrenal axis (McEwen, 2015). Even though both response systems are key to adaptation, the HPA axis is mainly involved in chronic stress (McEwen, 2015; Read & Grundy, 2012; Seaman et al., 2014). The hypothalamus is the main regulator of the body's endocrine response to stress, and operates through the hypothalamic-pituitary-adrenal (HPA) axis. The hypothalamus collects information from its environment through the continuous monitoring of several physiological processes to maintain homeostasis (Seaman et al., 2014). Any deviation from physiological set points initiates a cascade of responses in an attempt to return to homeostasis, resulting in the release of glucocorticoids (McEwen, 2015). Glucocorticoids and androgenic steroids induce physiological changes in the body, such as increased glucose and fat metabolism (Read & Grundy, 2012). The most common glucocorticoid in humans is cortisol, which is known to induce a variety of different physiological and behavioural adaptations that prepare the body to respond to challenging, or threatening situations (McEwen, 2015). While behavioural adaptations may result in changing lifestyles such as substance abuse due to the depressive symptoms (Seaman et al., 2014), physiological adaptations may include increased blood pressure, heart rate, and blood glucose and fat concentrations among others (McEwen, 2015). The physiological adaptations are mainly as a result of high cortisol release in chronic stress and its associated consequences on other hormones like insulin (McEwen, 2015; McEwen & Gianaros, 2011; Melamed et al., 2006; Roth et al., 2017; Smith et al., 2009).

2.3.12.1.1 Cortisol

Cortisol is an important glucocorticoid produced from cholesterol by the zona fasciculata (fasciculate zone) in the adrenal cortex (Mistire & Ahmed, 2013). Glucocorticoid steroid hormones (GCSH) are affected by stress exposure (McEwen, 2015). The corticotrophin-releasing hormone (CRH) from the hypothalamus which stimulates the release of adrenocorticotrophin hormone (ACTH) and is inhibited by the negative feedback of cortisol (Seaman et al., 2014).

About 75% of cortisol is protein-bound in circulation, it is bound to transcortin which is known as the cortisol binding globulin (CBG) (Read & Grundy, 2011). Cortisol increases hepatic gluconeogenesis during fasting and the release of Acetyl CoA from the muscle serves a substrate for the TCA cycle which is required for gluconeogenesis, it increases the release of free fatty acid and glycerol by lipolysis (McEwen, 2015). Cortisol inhibits glucose uptake in the adipose tissues and muscles by decreasing insulin sensitivity (McEwen, 2015; Melamed et al., 2006; Mistire & Ahmed, 2013).

The level of cortisol upon awakening in the first hour follows a diurnal variation with increased levels of cortisol and a decreased level of cortisol throughout the rest of the day (Seaman et al., 2014). Stress induced cortisol increases blood pressure, blood sugar levels, may cause infertility in women, and suppresses the immune system (He et al., 2014). These normal endogenous functions are the basis for the physiological consequences of chronic stress; prolonged cortisol secretion causes muscle wastage, hyperglycaemia, and suppression of immune/ inflammatory responses (McEwen, 2015). The same consequences arise from long term use of glucocorticoid drugs (Seaman et al., 2014).

Physiological levels of stress can be quantified using blood, saliva, and urine levels of cortisol (McEwen, 2015). In measuring cortisol levels, it must be noted that resting cortisol levels follow a diurnal rhythm (McEwen, 2015). Cortisol secretion peaks approximately thirty (30) minutes after waking and decrease over the course of twenty four (24) hours until the following waking period when they spike once again (Seaman et al., 2014). When in a condition of stress, the HPA axis produces and releases additional cortisol into the circulation to overcome the stressor. This concentration of cortisol is higher than resting levels and peaks roughly 15- 30 minutes after encountering the stressor (McEwen, 2015). Although blood, salivary, and urine measurements of cortisol provide accurate and point-specific concentrations for cortisol, they do not provide accurate measures of long-term stress due to the high variability induced from individual and environmental characteristics (McEwen, 2015; Read & Grundy, 2012; Seaman et al., 2014).

2.3.12.1.2 Insulin

Insulin is a peptide hormone produced by beta cells of the pancreatic islets (Mistire & Ahmed, 2013). It is synthesized as pre-proinsulin (McEwen, 2015). Within a minute after synthesis it is discharged into cisternae space of rough endoplasmic reticulum where it is cleaved into proinsulin A and B by proteolytic enzymes (Mistire & Ahmed, 2013). Insulin has significant effects on carbohydrate metabolism, proteins and fats (McEwen & Gianaros, 2011). Insulin contributes to the metabolism by stimulating the absorption of circulating glucose into the liver, fats and skeletal muscle cells (Seaman et al., 2014).

Glucose is transported into the cells via the glucose transporter two (GLUT-2) (Mistire & Ahmed., 2013). The transported glucose is then oxidized by glucokinase. Glucokinase therefore acts as a glucose sensor (McEwen, 2015). Oxidized glucose is transformed into triglycerides. In the liver, glucose production and release into the blood is strongly repressed by elevated level of plasma insulin (Seaman et al., 2014). Circulating insulin also affects the synthesis of proteins in a wide variety of tissues. In high concentrations, it functions as an anabolic hormone promoting the conversion of small molecules in the blood into large molecules inside the cells (McEwen, 2015). Low insulin levels in the blood have the opposite effect by promoting widespread catabolism (Read & Grundy, 2012).

Elevation of fasting plasma glucose is an indirect measure of insulin resistance in the body (McEwen, 2015; Mistire & Ahmed., 2013; Seaman et al., 2014). Diabetics generally have an impaired function of pancreatic B-cell in its secretion (McEwen, 2015) or insensitivity of insulin receptors in the body (Mistire & Ahmed, 2013). Fasting plasma glucose levels provides a proxy estimation about the level of sensitivity of insulin or its receptors and an provide an indication of insulin resistance (McEwen, 2015; Mistire & Ahmed, 2013; Ofori-Asenso et al., 2017).

2.3.12.2 Burnout and cardiovascular diseases: Mechanistic perspective

The direct pathway linking burnout to cardiovascular diseases is predominantly through the activation of the chronic stress pathway; the hypothalamo-pituitary-adrenal (HPA)-axis (Chico-Barba et al., 2019; Roohafza et al., 2014; Read & Grundy, 2012), with its negative effect on glucose metabolism, adipogenesis, the heart and blood vessels. The activation of the HPA-axis creates a surge in plasma cortisol with an associated increase in insulin resistance (Cohen et al., 2013; Melamed et al., 2006; Melamed & Kushnir, 2015; Read & Grundy, 2012). This results in insulin inactivity and adipogenesis leading to general and central obesity as well as poor glucose metabolism (Read & Grundy, 2012). In addition, there is increased visceral fat as well as a rise in BPs (Yeboah et al., 2018). These abnormalities often cluster in victims of burnout and give rise to metabolic syndrome (Beckie, 2012; Chico-Barba et al., 2019; He et al., 2014; Osei-Yeboah et al., 2018). Metabolic syndrome leads to increased risk of atherosclerosis (Kitaoka-Higashiguchi et al., 2009; Kyle et al., 2017; Melamed & Kushnir, 2015; Sumaila et al., 2016a). Overtime, these processes all together cause CVDs (Chico-Barba et al., 2019; Cohen et al., 2013; Kyle et al., 2017; Read & Grundy, 2012; Tsai et al., 2013).

In addition to the direct pathway, some authors (Belligrath et al., 2009; Kasu et al., 2015; Chico-Barba et al., 2019; He et al., 2014; Osei-Yeboah et al., 2018; Pascoal et al., 2021) suggest cigarette smoking, excessive consumption of alcohol and increased intake of "fast food" rich in fats and sugars as indirect effects inherent in the chronic stress confrontation and relief. These unhealthy lifestyle choices made by individuals experiencing burnout in a bid to cope with their stress and associated depressive symptoms predispose them to CVDs (Ahmed et al., 2018; He et al., 2014; Osei-Yeboah et al., 2018; Pascoal et al., 2021) as these unhealthy lifestyle patterns stated supra are independent risk factors of CVDs (Beckie, 2012; Bellingrath et al., 2009; Chico-Barba et al., 2019; Yeboah et al., 2018).

2.3.12.3 Relationship between burnout and metabolic syndrome

Some studies (Beckie, 2012; Chico-Barba et al., 2019; Duodu, 2015; He et al., 2014; Kasu et al., 2015; Osei-Yeboah et al., 2018) point to a positive association between burnout and increased BMIs as well as metabolic syndrome particularly among health workers (predominantly clinicians). Similarly, Jahromi et al. (2017) reports on the Whitehall 2 study that chronic work stress manifesting as burnout among nurses predicts metabolic syndrome. With respect to lipid disorders, the burnout group showed a larger increase of total cholesterol and a significantly higher risk for hypercholesterolemia independent of other risk factors (age, baseline total cholesterol and health behaviours). Similarly, Melamed et al. (2006) states that burnout is significantly associated with elevation of cholesterol, triglycerides and glucose levels suggestive of metabolic syndrome.

Also, Melamed and Kushnir (2015) in a study of disease-free male employees of a high-tech company found that burnout correlated with elevated risk for metabolic syndrome.

Specifically, they report a positive association between burnout and fasting glucose levels and that the combination of high burnout and tension was significantly associated with increased total cholesterol, LDL-C, triglycerides, and uric acid, and marginally with electrocardiogram abnormality. Similarly, Streptoe and Kivimaki (2012) in their study of healthy employees states that burnout in men is predictive of cholesterol changes and metabolic syndrome, evidenced 2–3 years later. Furthermore, burnout has been found to be associated with reduced HDL-C levels, a cardinal determinant of metabolic syndrome (Chico-Barba et al., 2019; Lin & Li, 2009; Roohafza et al., 2014). These associations were obtained independent of BMI.

The lowering of HDL-C as well as elevation of BPs, glucose and LDL-C in individuals with burnout is indicative of SAM and HPA activation (Melamed & Kushnir, 2015). Some direct evidence for this possibility comes from the study by Streptoe and Kivimaki (2012) in which burnout correlated positively with epinephrine reaction to real-life stressors as well as stress-induced cholesterol change and plasma cortisol levels. It was concluded by Streptoe and collegaue that the relationship between burnout and metabolic syndrome may originate in norepinephrine-induced lipolysis and HPA axis cortisol activation (Chico-Barba et al., 2019; He et al., 2014; Osei-Yeboah et al., 2018; Roohafza et al., 2014). Burnout arises following prolonged exposure to chronic job strain (Pascoal et al., 2021) and results in the body being on the alert (Chico-Barba et al., 2019; Kitaoka-Higashiguchi et al., 2009; Kyle et al., 2017). As a result, the SAM and the HPA axis remain hyperactive and fat accumulation in the body becomes dominant, which leads to lipid abnormalities, hyperglycaemia, obesity and increase in BPs as found by Chico-Barba and colleagues in Mexico and Osei-yeboah and colleagues in Ghana (Chico-Barba et al., 2019 and Osei-Yeboah et al., 2018).

In addition to this direct effect, burnout may have indirect effects on the body (He et al., 2014). After leaving work, many workers who are experiencing burnout release their stress by eating "fast foods" and/or drinking alcoholic beverages or smoking cigarette (Chico-Barba et al., 2019). In addition, the associated depressive symptoms in individuals experiencing burnout leads to apathy towards life and reduced physical activity. These overtime results in increased components of metabolic syndrome and eventual metabolic syndrome (Ahmed et al., 2018; He et al., 2014; Kyle et al., 2017; Roohafza et al., 2014).

2.3.12.4 Relationship between burnout and cardiovascular diseases

The evidence concerning the association between burnout and CVDs comes from largely longitudinal (prospective) studies (Kitaoka-Higashiguchi et al., 2009; Lin & Li, 2009; McEwen & Gianaros, 2011; Tsai et al., 2013). This evidence suggest that even after adjusting for potential confounding variables, the relative risk of CVDs associated with burnout syndrome, was equal to, and sometimes even exceeded the risk conferred by classical risk factors, such as age, BMIs, smoking, BPs, and lipid levels (He et al., 2014; Kitaoka-Higashiguchi et al., 2009; Lin & Li, 2009; Melamed & Kushnir, 2015). Using burnout as a predictor variable, in a 4.2-year follow-up of apparently healthy men, burnout was predictive of future MI, even after controlling for BPs, smoking, cholesterol levels, age, and use of antihypertensive drugs (Lin & Li, 2009). Similarly, Kitaoka-Higashiguchi and colleagues report that burnout is predictive of arteriosclerosis in workers (Kitaoka-Higashiguchi et al., 2009).

Burnout plays a major role in various pathophysiological processes associated with the cardiovascular system (He et al., 2014; Jahromi et al., 2017; Kitaoka-Higashiguchi et al., 2009; McEwen, 2015; McEwen & Sellar, 1993). Even though stress potentially has ameliorating or detrimental capacities (Jahromi et al., 2017). However, with regards to the cardiovascular system, chronic stress (burnout) most often is related to deleterious results (He et al., 2014; Kitaoka-Higashiguchi et al., 2009; Kyle et al., 2017). The specific outcome depends on multiple variables (amount of stress, duration of its influence, family history/predisposition i.e the genetic components) (Kitaoka-Higashiguchi et al., 2009; Jahromi et al., 2017; Osei-Yeboah et al., 2018). The two stress systems – SAM and HPA even though exist to maintain a delicate state of balance but when over-stretched could induce pathological states of the heart and blood vessels (Beckie, 2012). Kivimaki et al. (2012) states that exposure to strain induces sympathetic arousal and decreased endothelial integrity of various vascular segments, leading to endothelial dysfunction – a precursor of atherosclerosis. They aver further that cortisol levels are elevated following exposure to long-term stress and this has dilapidating effects on the heart and vasculature of victims (Kivimaki et al., 2012).

Some studies (Afulani et al., 2021b; Belligrath et al., 2009; Beckie, 2012; Cohen et al., 2013; He et al., 2014) point to a significant association between stress experienced at the workplace by health care workers and the risk of CVDs, The authors argue that health workers who are exposed to high levels of stress on their job manifesting as burnout had persistently activated neuro-hormonal systems and this contributed to increasing their BPs, BMIs, fasting plasma glucose among others. They state that the initial adrenaline surge and later rise in cortisol were complacent in this burnout syndrome induced increased risk of CVDs (Beckie, 2012; He et al., 2014; Kivimaki et al., 2012; Melamed et al., 2006; Osei-Yeboah et al., 2018).

In addition, burnout has been shown to be involved in vascular hypertension (He et al., 2014; Melamed et al., 2006; Osei-Yeboah et al., 2018; Tsai et al., 2013). It may even, in part, contribute to the clinical onset of arterial stiffness (Beckie, 2012). Here, animal models have illustrated the critical role of sympathetic arousal, associated with stress, in the development of hypertension (Kivimaki et al., 2012). In particular, acute stress is capable of immediately increasing the arterial BPs while chronic stress induced hypercortisolemia contributes to the sustenance of the rise in BPs (Melamed et al., 2015; Kitaoka-Higashiguchi et al., 2009; Kyle et al., 2017; Osei-Yeboah et al., 2018). This is probably due to vasoconstriction, triggered by enhanced sympathetic nervous activity in the acute phase of stress (Kivimaki et al., 2012; Melamed & Kushnir, 2015; Sumaila et al., 2016a) and later arteriosclerotic process generated by hypercortisolemia with the persistence of the stress. Kivimaki et al. (2015) aver that people under stressful work conditions (such as high job demand with low job control as seen in health workers with burnout) who had developed hypertension earlier, have been shown to be more vulnerable to angina pectoris, myocardial infarction, and cerebrovascular insults compared to controls. Thus, stress does not only affect the onset, development, and progression of hypertension, but also a number of associated cardiovascular complications are enhanced with the persistence of stress (Kitaoka-Higashiguchi et al., 2009; Kyle et al., 2017; Melamed & Kushnir, 2015; Sumaila et al., 2016).

In addition, burnout is associated with endothelial dysfunction and atherosclerosis (Kitaoka-Higashiguchi et al., 2009). This endothelial dysfunction has been shown to be an abnormal vascular response to stress, leading to a paradoxical constriction, especially at points of pre-existing stenosis (Melamed & Kushnir, 2015). In fact, this paradoxical pattern of response (constriction instead of the normal, reasonable vasodilation) represents the substantial and hazardous nature of burnout (Melamed et al., 2006). Also, burnout has been demonstrated to increase oxidative stress (Streptoe & Kivimaki, 2012) and induce endothelial injury (Kitaoka-Higashiguchi et al., 2009) via the sympatho-adreno-medullary axis activation (beta 1-adrenoceptor activation) and this contributes to atherosclerosis, particularly around branching points of the descending aorta (Streptoe & Kivimaki, 2012). Thus, burnout syndrome, also described as “asymmetries in the psycho-social job environment” (Streptoe & Kivimaki, 2012) may lead to a (hyper) arousal of the sympathetic nervous system, endothelial dysfunction and eventual development of CVDs (Beckie, 2012; Kitaoka-Higashiguchi et al., 2009; Melamed & Kushnir, 2015).

Furthermore, burnout affects oestrogen activity (as it induces a decrease in oestrogen production) which may be of importance in the development of pre-menopausal atherosclerosis (Kivimaki et al., 20112; Loucks, Juster & Pruessner, 2008; Melamed et al., 2006; Melamed & Kushnir, 2015). The low oestrogen concentration along with the associated hypercortisolemia may be related to the accelerated onset of otherwise rare pre-menopausal atherosclerosis, since oestrogen seems to be a strong protective factor against atherosclerosis in pre-menopausal female monkeys (Melamed et al., 2006; Loucks et al., 2008; Streptoe & Kivimaki, 2012).

In summary, there is some evidence (Beckie, 2012; Hartley et al., 2011; Melamed & Kushnir, 2015; Kitaoka- Higashiguchi et al., 2009; Kivimaki et al., 2012; Streptoe & Kivimaki, 2012) linking burnout and CVDs. The underlining pathways includes the SAM and HPA axis dysregulation, sleep disturbances, inflammation, blood coagulation and fibrinolysis as well as poor lifestyles (Kitaoka- Higashiguchi et al., 2009; Lin & Li, 2009; Melamed & Kushnir, 2015; Osei-Yeboah et al., 2018) but this is largely undetermined among Ghanaian health workers.

2.4 Conclusion

Even though there is some data (Abdo et al., 2016; Afulani et al., 2021a; Ayisi-Boateng et al., 2020; Asiedu et al., 2018; Dubale et al., 2019; Fiadzo et al., 1997; Mbanga et al., 2018; Odonkor & Frimpong, 2020; Opoku & Apenteng, 2014) about the burden of burnout among health workers from SSA generally and Ghana in particular, most of the studies focused on specific category of clinicians (nurses or midwives or physicians) in specific hospitals with little focus on the rate of burnout among a combined and representative sample of health workers. There is the need for studies that will give a clearer overview of the prevalence of burnout among clinicians and non-clinicians as well as among health workers from the various hospitals in the different levels of the health care system in Ghana.

In addition, some studies (Chico-Barba et al., 2019; He et al., 2014; Kitaoka-Higashiguchi et al., 2009; Melamed et al., 2006) have suggested a link between burnout and the risk of CVDs in other jurisdictions, but this has not been investigated in Ghana. Most studies among health workers in Ghana (Afulani et al., 2021a; Asiedu et al., 2018; Ayisi-Boateng et al., 2020; Duodu, 2015; Fiadzo et al., 1997; Kasu et al., 2015; Nuhu et al., 2020; Odonkor & Frimpong, 2020; Opoku & Apenteng, 2014; Osei-Yeboah et al., 2018) have looked at these disease conditions (burnout and CVDs) in isolation and the results are inconclusive. The possible link between burnout syndrome and the risk of CVDs among health workers in urban Ghana remains largely undetermined. There is the need for comprehensive studies to fill this gap in the literature and provide evidence to improve the health and welfare of hospital workers.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the methods used for this study, beginning with the philosophical foundation of the study. Also, it looks at the study design, giving a justification for the appropriateness of the design. It further gives a description of the study setting, placing it in context and justifying the selection of the study areas. In addition, this chapter delineates the study population and how the sample size was determined. Furthermore, the techniques that were used to sample participants in this study are covered in this chapter as well as how the data collected was analyzed. The final part of this chapter describes the ethical issues that were considered in this study as well as how the study findings were disseminated.

3.2 Philosophical foundation of the study

This study embraced the positivist philosophical approach to research. Under the influence of the positivist philosophy, the ontological view of the researcher regarding burnout syndrome and risk of cardiovascular diseases was that these variables were objectively measurable.

Positivists believe that there is a single reality, which can be measured and prefer to work with observable phenomena that lead to the production of credible data (Polit & Beck, 2014). An important assumption underpinning the positivist approach to research is that the research is undertaken, as far as possible, in a value-free way and that the researcher is independent of the data and maintains an objective stance (Polit & Beck, 2014). Positivists lean towards using a highly structured methodology in order to facilitate replication. The emphasis is placed on quantifiable observations that can be analysed using statistical tools to arrive at objective conclusions (Creswell, 2009).

There are two common philosophical concepts to consider when designing a study, ontology and epistemology (Polit & Beck, 2014). Both philosophical concepts help to determine the design and the methodology to be used. Ontology is defined as the researcher's view of reality and how that reality is measured (Creswell, 2009). This philosophical concept gives rise to two main research designs; quantitative and qualitative study designs, with a modern design that merges the two main approaches (Mixed) (Creswell, 2009). Quantitative design is based on the positivist view and asserts that reality is a static, measurable phenomenon and can be determined using series of laid down objective procedures (Creswell, 2009). Epistemology, on the other hand, looks at the relationship between the investigator and what is being studied (Creswell, 2009).

In choosing the positivist approach, the investigator embarked on the quantitative study of burnout syndrome and the risk of CVDs by maintaining a distance between him and the researched.

3.3 Study design

This study employed a cross-sectional survey design in which quantitative data were collected from health workers engaged in three public hospitals in Accra.

A research design is a blueprint for conducting a study (Babbie & Mouton, 2001; Grove, Burns & Gray, 2015; Polit & Beck, 2014). Several research designs exist, and these include; experimental, grounded theory, case study, action research, ethnographic study, archival research and survey design (Grove et al., 2015). Survey design involves the collection of data from a sample of individuals in a population with the aim of generalization (Babbie & Mouton, 2001). According to Alreck and Settle (1985), the survey design is suitable for studying a large number of cases. Cross-sectional survey involves the collection of data during a single period without follow up (Polit & Beck, 2014). The measurement focuses on the outcome and the exposure variables at the same time (Creswell, 2009).

3.4 Study setting

The study was conducted in three public hospitals in Accra in the Greater Accra Region of Ghana. Accra is the capital and largest city of Ghana, with a total population of over four million (4,010,054) (Ghana Statistical Service (GSS), 2013; Odonkor & Frimpong, 2020; Yeboah et al., 2018). As the commercial and political capital of Ghana, Accra receives visitors from all the regions of Ghana particularly; the Central, Volta, Western, Eastern and Ashanti Regions on a daily basis as well as from neighbouring countries such as Burkina Faso, Mali, Niger, la Cote D'Ivoire, Togo and Nigeria (GSS, 2013). The high commercial activities and the associated high cost of living place huge demands on the residents of Accra (GSS, 2013). In addition, health workers in both public and private hospitals in Accra spend several hours to and from work due to heavy vehicular traffic on the roads of the city (Odonkor & Frimpong, 2020). These factors predispose them to stress (Asiedu et al., 2018) and possible burnout syndrome.

In this study, three public hospitals were purposively chosen to represent the three levels of the public health care system in Accra; primary, secondary and tertiary. The primary level hospital was chosen because it had been ranked as the best performing hospital among its peers using a peer ranking system established by the Ghana Health Service (GHS) (GHS, 2017). The secondary level hospital was chosen because it receives referral cases from the district and sub-district health facilities and it also serves as the regional hospital for the Greater Accra Region (GHS, 2017). The tertiary level hospital was the national referral hospital and the teaching hospital in the Greater Accra Region (Korle Bu Teaching Hospital (KBTH), 2017).

A pictorial map of Accra is shown (Figure 3).

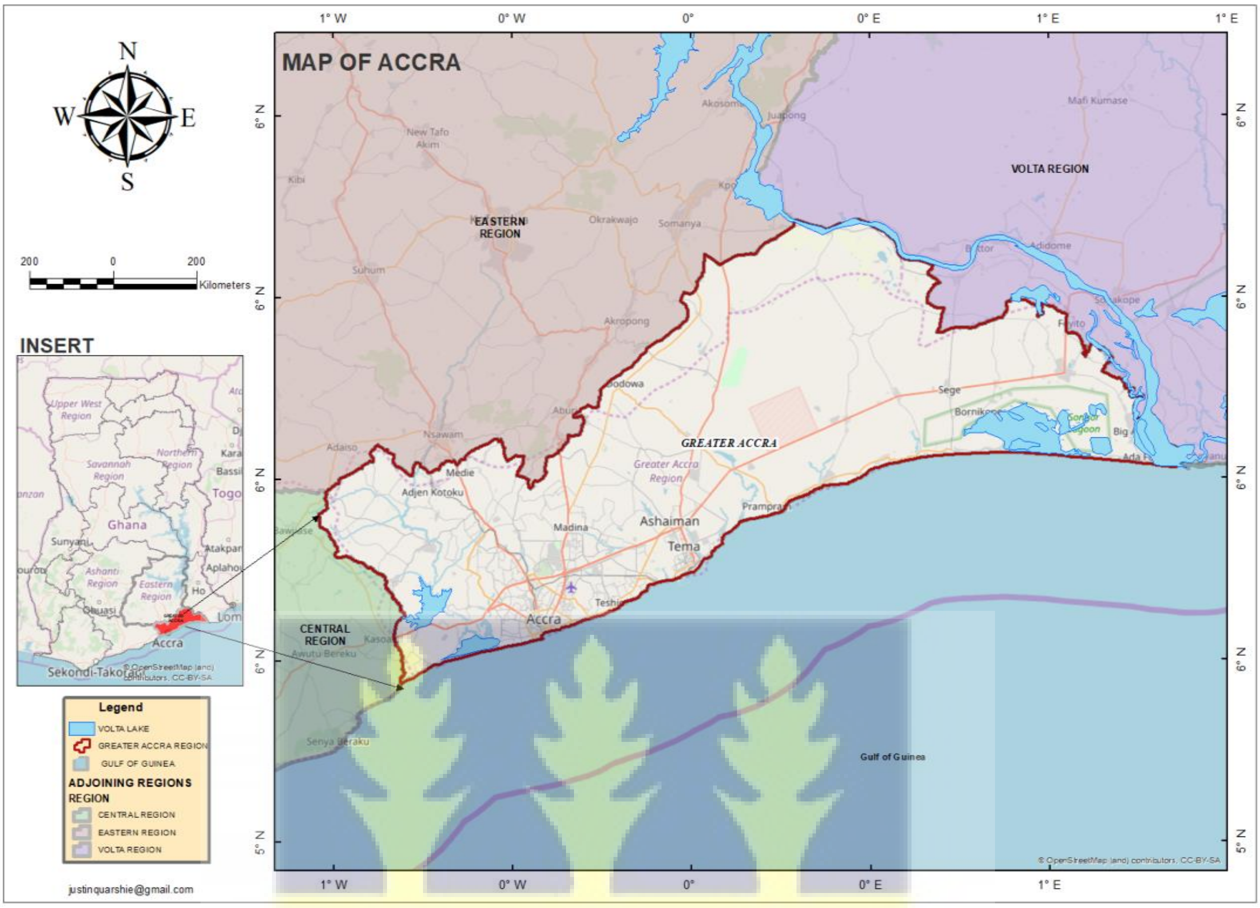

Figure 3: Map of Accra

3.4.1 Organization of health facilities in Accra

Accra has over twenty (20) public health facilities including one tertiary hospital and more than eight hundred (800) private health facilities (GHS, 2017). The public health facilities are mainly those under the Ghana Health Service, the teaching hospital and those established by quasi-government institutions such as the police service, the military and public universities (GHS, 2017). These health facilities are organized in a three-tier system, primary, secondary and tertiary levels (GHS, 2017). The primary level of health care consists of the sub-district and district health facilities, the secondary level consists of the regional and specialist health facilities and the tertiary level looks at the teaching hospital (GHS, 2017). Accra has one teaching hospital, one regional hospital and several district hospitals that offer both curative and preventive services (GHS, 2017). The private sector is made up of faith-based, private-for-profit and private-not-for-profit health institutions, and the traditional health system (GHS, 2017).

Public hospitals in Accra have higher number of patients as compared to the private facilities (GHS, 2017; GSS, 2013; Osei-Yeboah et al., 2018). This study therefore involved only health workers in the public health facilities who were at increased risk of burnout due to their high patient numbers (Ayisi-Boateng et al., 2020; Konlan et al., 2020c; Opoku & Apenteng, 2014). The situation is exacerbated by the emergence of COVID-19 pandemic, whereby Accra reportedly has the highest number of COVID-19 cases (MOH, 2020) and thus predisposing health workers in public hospitals in the city to increased workload and job-related burnout (Afulani et al., 2021a; MOH, 2020; Odonkor & Frimpong, 2020).

As stated earlier, three public hospitals in Accra were purposively chosen to represent the three levels of the public health care system; primary, secondary and tertiary. The selected hospitals were the Weija-Gbawe Municipal Hospital (WGMH), the Greater Accra Regional Hospital (GARH) and the Korle Bu Teaching Hospital representing the primary, secondary and tertiary levels respectively.

3.4.1.1 Facility one (primary level): Weija-Gbawe Municipal Hospital

The Weija-Gbawe Municipal Hospital (WGMH) which was previously known as the Ga South Municipal Hospital or “Alkawe Hospital” was selected to represent the primary level of health care. This hospital was chosen because it had been ranked as the best performing hospital among its peers using a peer ranking system established by the Ghana Health Service (GHS, 2017). The hospital has five hundred and seventy-six (576) health workers consisting of three hundred and eighty (380) clinicians and one hundred and ninety-six (196) non-clinicians. The Weija-Gbawe Municipal Hospital is located in the Weija-Gbawe Municipality in the Greater Accra Region. The Weija-Gbawe Municipal Assembly was carved out of the Ga South Municipal Assembly (GSS, 2012).

3.4.1.2 Facility two (secondary level): Greater Accra Regional Hospital

The Greater Accra Regional Hospital (GARH) also known as the Ridge hospital was selected to represent the secondary level of the health care system in Accra. The Ridge hospital receives referral cases from the district and sub-district health facilities and is the main secondary level health facility in Accra (GHS, 2017). It is located along the Castle Road around the central part of Accra (GHS, 2014). The hospital has four hundred and twenty (420) beds following refurbishment (GHS, 2017). The Ridge hospital currently has nine hundred and thirty-six (936) clinicians and four hundred and sixty-four (464) non-clinicians.

3.4.1.3 Facility three (tertiary level): Korle Bu Teaching Hospital

The Korle Bu Teaching Hospital (KBTH) was selected to represent the tertiary level of health care in Accra. The hospital is the national referral hospital of Ghana and the teaching hospital of the Greater Accra Region (KBTH, 2017). The hospital was established as a general hospital in the colonial days to address the health needs of indigenes of the then Gold Coast (KBTH, 2017). This quaternary facility has over two thousand (2000) beds with several specialties and centers of excellence (KBTH, 2017). The hospital is known to receive huge number of referral cases from across the country and to have an average daily patient attendance of almost two thousand with daily admission rate at almost three hundred patients (KBTH, 2017). The hospital is the largest referral facility in the West African sub-region and the third largest hospital in Africa with a staff strength of four thousand, nine hundred and sixty-nine (4,969) consisting of three thousand one hundred and seventy-eight (3,178) clinicians and one thousand seven hundred and ninety-one (1,791) non-clinicians (KBTH, 2017).

3.5 Study population

The target population for this study was the entire population of health workers in Accra in the Greater Accra Region of Ghana. On the other hand, the accessible population consisted of health workers with not less than one year's working experience and at post at the three chosen hospitals (the WGMH, the GARH and the KBTH representing the primary, secondary and tertiary level of health care respectively).

In research, study population refers to an identified group of individuals of interest to the researcher; the group to which the research results would be generalized (Creswell, 2009). It is composed of two groups, namely: target population and accessible population. The target population is the entire group of people or objects to which the researcher wishes to generalize the study findings, whiles the accessible population is the portion of the target population to which the researcher has reasonable access, usually a subset of the target population.

3.5.1 Accessible population at facility one: Weija-Gbawe Municipal Hospital

Information from the human resources (HR) unit of the WGMH revealed that there were three hundred and eighty (380) clinicians and one hundred and ninety-six (196) non-clinicians. However, only two hundred and eighty (280) clinicians and one hundred and forty (140) non-clinicians had not less than a year's working experience and were at post at the time of recruitment.

3.5.2 Accessible population at facility two: Greater Accra Regional Hospital

Data from the HR unit of the GARH revealed that the hospital had nine hundred and thirty-six (936) clinicians and four hundred and sixty four (464) non-clinicians. However, only eight hundred and thirty-six (836) clinicians and two hundred and seventy-seven (277) non-clinicians had not less than a year's working experience and were at post at the time of recruitment.

3.5.3 Accessible population at facility three: Korle Bu Teaching Hospital (KBTH)

Data from the HR directorate of the KBTH revealed that there were four thousand, nine hundred and sixty-nine (4,969) workers consisting of 3,178 clinicians and 1,791 non-clinicians. However, only two thousand five hundred and seventy-four (2,574) clinicians and one thousand and five hundred and forty (1,540) non-clinicians had not less than one year's working experience and were at post.

3.6 Inclusion and Exclusion Criteria

3.6.1 Inclusion criteria:

Participants were recruited if the following criteria were met:

* Clinicians or non-clinicians working at any of the three chosen hospitals.
* Not less than one (1) year's working experience
* At post at the time of recruitment

3.6.2. Exclusion criteria:

Participants were excluded from the study based on the following:

* Health workers on admission for CVDs.
* Pregnant health workers and female employees within six (6)-weeks post-partum.
* Staff on leave at the time of data collection.
* Health workers with less than one (1) year's working experience
* Staff on steroid medications

3.7 Sampling

Proportionate stratified random sampling technique was used to select the participants from the accessible population at the three chosen health facilities. In selecting the participants, sampling proportionate to size was used to determine the number of health workers recruited in both clinical and non-clinical categories of staff and from the three selected hospitals.

A proportionate stratified random sampling is a probability sampling technique in which the researcher divides the population into different homogeneous sub-groups and then randomly selects the final subjects proportionally from the different sub-groups based on their estimated proportionate distribution in the entire population (Polit & Beck, 2014). Every individual in the population is assigned to one stratum or homogenous group and then simple random sampling is applied to select the individuals to be recruited within each stratum to ensure each homogenous sub-group is represented. This sampling method improves the precision of the sample by reducing the sampling error and also prevents over representation of one homogenous unit in the final chosen sample (Creswell, 2009).

3.7.1 Sample size determination

The sample size for the study was determined using the sample size determination table designed by Krejcie and Morgan (1970).

The sample size table designed by Krejcie & Morgan (1970) is based on the formula:

$$s = \frac{X^2 NP(1-P)}{d^2(N-1) + X^2P(1-P)}$$

Where

s = required sample size.

X^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841, that is 1.96x1.96) at a 95% confidence level.

N = the population size.

P = the population proportion (assumed to be .50 since this would provide the maximum sample size).

d = the degree of accuracy expressed as a proportion (.05).

3.7.1.1 Sample size determination for clinicians

The total population of eligible clinical staff was three thousand six hundred and ninety (3,690) based on the staff distribution for the three selected hospitals; 280, 836 and 2,574 for primary, secondary and tertiary level hospitals respectively. Using the Krejcie & Morgan (1970) tables for sample size determination, these populations of eligible clinical staff corresponded to sample sizes of 162, 292 and 335 participants for the primary, secondary and tertiary level hospitals respectively. After adding 10% for non-response to the sample sizes as recommended by other studies (Afulani et al., 2020a; Blakeley & Ribeiro, 2008; Odonkor & Frimpong, 2020), these corresponded to the adjusted sample sizes of 179, 322 and 369 participants for the primary, secondary and tertiary level hospitals respectively. Thus, an overall sample of 870 clinical workers was recruited for the study (Figure 4).

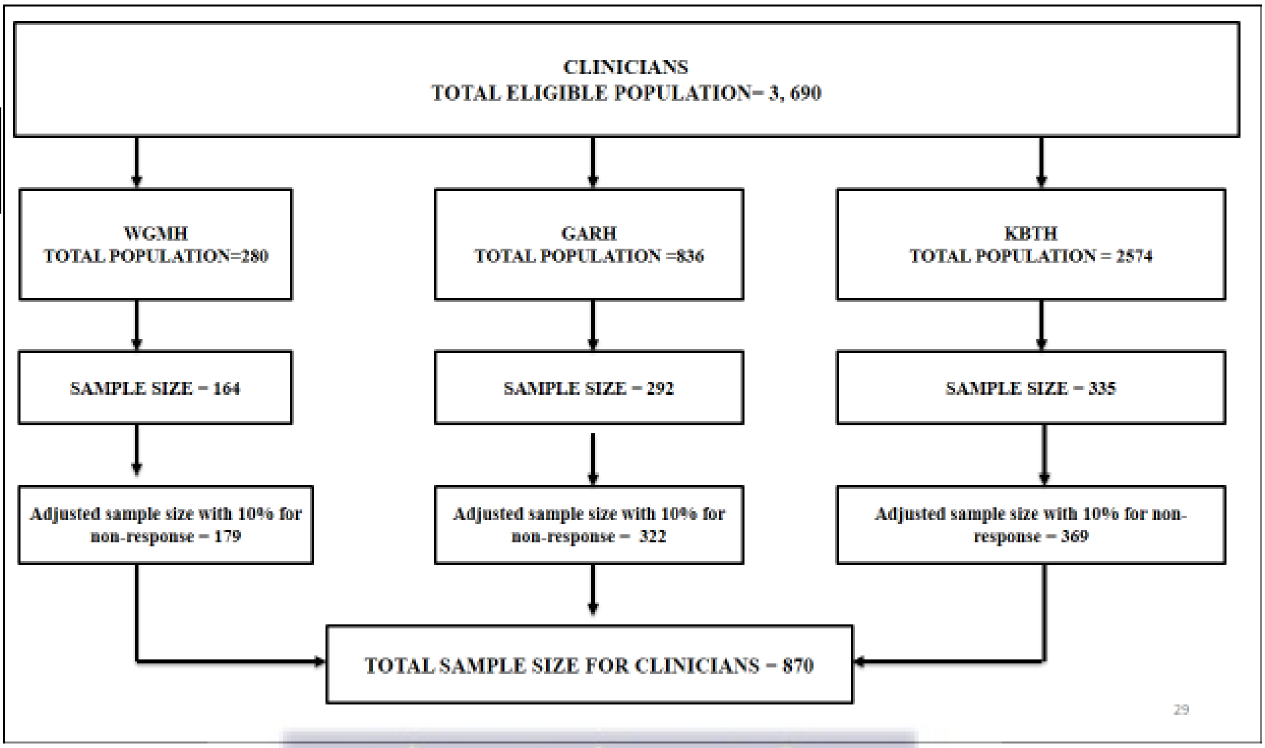

Figure 4. Sample size for clinicians

3.7.1.2 Sample size determination for non-clinicians

The total eligible population for the non-clinicians was one thousand nine hundred and fifty-seven (1,957) based on the staff distribution for the three selected hospitals which was 140, 277 and 1,540 for primary, secondary and tertiary level hospitals respectively. Using the Krejcie & Morgan (1970) table for sample size determination, these populations corresponded to sample sizes of 103, 162 and 310 participants for the primary, secondary and tertiary level hospitals respectively. After adding 10% for non-response to the sample sizes as recommended (Odonkor & Frimpong, 2020), these corresponded to the adjusted sample size of 114, 178 and 341 participants for the primary, secondary and tertiary level hospitals respectively. Thus, a total sample size of 633 non-clinical employees was recruited for the study (Figure 5).

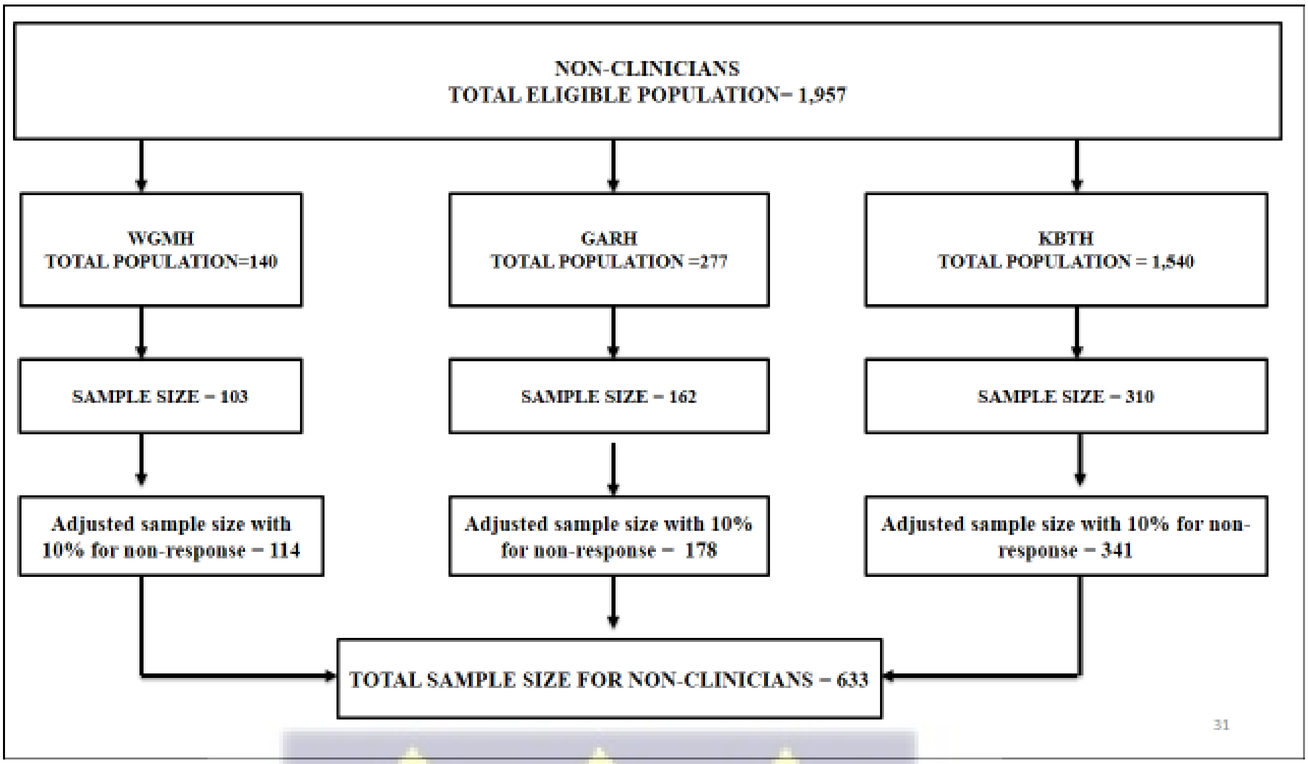

Figure 5. Sample size for non-clinicians

3.7.2 Sampling procedure

In this study, a proportionate stratified random sampling technique was used to recruit the participants. In selecting the participants, sampling proportionate to size was used to determine the number of health workers recruited in both clinical and non-clinical categories and from the three selected facilities studied. This was determined using the distribution of the various clinical groups in the Greater Accra Region as stated by the GHS (2017); nurses/midwives (69%), doctors (16.1%), pharmacists/pharmacy technicians/ dispensing assistants (4.4%), biomedical scientists/laboratory assistants (3.9%) and the rest of the clinical grades, that is, audiologists, radiographers, dental clinical assistants, and physiotherapists (6.6%). On the other hand, for the non-clinicians, the proportion sampled from each rank was determined based on the distribution of senior and junior staff in the Greater Accra Region as stated by the GHS (2017) as comprising senior staff of 38% and junior staff of 62%.

3.7.2.1 Sampling procedure at facility one: Weija-Gbawe Municipal Hospital

Specifically, at the WGMH, the sample size recruited consisted of one hundred and seventy-nine (179) clinicians and one hundred and fourteen (114) non-clinicians. Using the distribution of various professional sub-groups within the clinician group in the Greater Accra Region as stated by the GHS (2017); the sample size at the WGMH was proportionally divided into one hundred and twenty three (123) nurses, twenty nine (29) doctors or prescribers, eight (8) pharmacists, seven (7) laboratory scientists and twelve (12) other clinical staff. With the non-clinical staff, their distribution according to rank in the Greater Accra Region as stated by the GHS (GHS, 2017) corresponded to seventy one (71) junior staff and forty three (43) senior staff.

3.7.2.2 Sampling procedure at facility two: Greater Accra Regional Hospital

Also, for the GARH, the sample size consisted of three hundred and twenty two (322) clinicians and one hundred and seventy eight (178) non-clinicians. Using the distribution of the various professional groups among the clinicians in the Greater Accra Region as stated by the GHS (2017); the sample size at the GARH was proportionally divided into two hundred and twenty two (222) nurses/midwives, fifty two (52) doctors or prescribers, fourteen (14) pharmacists, thirteen (13) laboratory scientists and twenty one (21) other clinical staff. The distribution of the various non-clinical staff according to rank in the Greater Accra Region as stated by the GHS (GHS, 2017) corresponded to one hundred and ten (110) junior staff and sixty seven (68) senior staff.

3.7.2.3 Sampling procedure for facility three: Korle Bu Teaching Hospital

Finally, for the KBTH, the sample size consisted of three hundred and sixty-nine (369) clinicians and three hundred and forty-one (341) non-clinicians. Using the distribution of various clinical professional groups in the Greater Accra Region as stated by the GHS (2017); the sample size at the KBTH was proportionally divided into two hundred and fifty-five (255) nurses/midwives, sixty (60) doctors, sixteen (16) pharmacists, fourteen (14) laboratory scientists and twenty-four (24) other clinical workers. With the non-clinical staff at the KBTH, using the distribution of the various non-clinical staff according to rank for the Greater Accra Region as stated by the GHS (2017), this corresponded to a sample size of two hundred and eleven (211) junior employees and one hundred and thirty (130) workers of the senior staff category.

3.8 Recruitment of study participants

The individual participants were selected by the simple random selection technique of balloting without replacement from the eligible clinicians and non-clinicians. Procedurally, a list of all eligible clinicians and non-clinicians was obtained from the HR units of the three hospitals. The lists of eligible staff were put into strata (each professional group for clinicians and each rank for non-clinicians). All the eligible participants in each stratum (each professional group of clinicians and each rank of non-clinicians) were given unique codes. These unique codes were written on small pieces of papers which were placed into covered containers for each professional group of clinicians and each rank of non-clinicians. The covered containers were then shaken thoroughly, after which the small pieces of papers were picked out at random from each container. The number of pieces of paper picked from each container representing each stratum (each professional group of clinicians and each rank of non-clinicians) was determined based on staff distribution as per the GHS (2017) nurses/midwives (69%), doctors (16.1%), pharmacists/pharmacy technicians/ dispensing assistants (4.4%), biomedical scientists/laboratory assistants (3.9%) and the rest of the clinical grades, that is, audiologists, radiographers, dental clinical assistants, and physiotherapists (6.6%). On the other hand, for the non-clinicians, the proportion sampled from each rank was determined based on the distribution of senior and junior staff in the Greater Accra Region as stated by the GHS (2017) as comprising senior staff of 38% and junior staff of 62%.. The workers recruited were those whose identities corresponded with the codes on the randomly picked pieces of papers from each container for each professional group and each rank of non-clinical staff.

All the measures aimed at preventing COVID infection such as; maintaining social distancing, wearing of face masks and shields, and use of alcohol-based hand sanitizers as recommended by the Ghana Health Service (MOH, 2020) were strictly adhered-to during the data collection.

3.9 Study variables

3.9.1 Dependent Variables

The dependent variables in this study were:

- Ten-year cardiovascular disease risk
- Metabolic syndrome
- Burnout syndrome (This was the dependent variable for only specific objective two)

3.9.2 Independent Variables

The main independent variables were:

- Burnout syndrome
- Job-related factors; type of facility, category of staff, service area, shift work, additional jobs, intentions to leave job, perceived workload, job satisfaction, job control and job support (These were independent variables for specific objective two)

Table 3 shows the various variables, operational definitions and their measurement scales.

Table 3. Study variables

Variable	Operational Definition	Level of measurement
Ten-year CVD risk	• 10-year risk of CVDs was determined using Framingham Risk Scoring algorithm • The total risk score was then stratified either as: -Low risk <10% -Intermediate risk(10– 20)% -High risk ≥20%	Ordinal
Metabolic syndrome	Any 3 or more of the following in a staff (NCEP/ATP III revised criterion) was indicative of MetS: * High fasting plasma glucose (FPG) ≥ 5.6 mmol/L. * High blood pressure (BP) ≥130/85mmHg.or current antihypertensive drug use. * Decreased high density lipoprotein (DHDL) cholesterol (men ≤1.03 mmol/L, women ≤ 1.29mmol/L). * Raised Triglycerides (RTGL) ≥ 1.7mmol/L. * Abdominal/ central obesity (high waist circumference): ≥ 102cm in men, ≥88cm in women	Nominal
Burnout	• Burnout was defined as High EE + High DP + Low PA	• Nominal
Elements of Burnout syndrome • Emotional Exhaustion (EE)	• Low EE≤16, Moderate EE=17-26 & High EE ≥ 27	• Ordinal
• Depersonalization (DP)	• Low DP≤6, Moderate DP=7-12 & High DP ≥ 13	• Ordinal
• Personal Accomplishment (PA)	• Low PA ≤31, Moderate PA=32-38 & High PA≥39	• Ordinal

3.10 Quality Control /Assurance

3.10.1 Training of research assistants

Six research assistants (RAs) were recruited to assist in the data collection. Four of the RAs possessed the following qualifications: Bachelor of Science (BSc) in nursing, were registered general nurses with the Nursing & Midwifery Council of Ghana and had worked for at least three years post qualification as nurses. The other two RAs were licensed laboratory scientists with the minimum of a postgraduate qualification in biomedical sciences, with over three years' working experience. Training of the RAs was done in English, to ensure that the data collection techniques were well understood. The RAs were trained on the consent process for research participants, confidentiality issues in research, sampling, establishing rapport, administration of questionnaires, anthropometric and hemodynamic measurements, blood sample handling and ethical issues in research, among others. The training was organized over a five-day period at the School of Public Health with the last day reserved for a practical session involving a pilot study at the Dansoman Polyclinic, Accra, to make sure the RAs understood and were proficient with the data collection procedures. The training was done by the investigator who holds a Bachelor of Science in nursing, is a registered general nurse with over eight (8) years working experience, has an MPhil in physiology and is currently pursuing a PhD in public health.

3.10.2 Pilot study and review of instrument

A pilot study was conducted at the Dansoman Polyclinic in Accra to evaluate the effectiveness of the training given to the RAs. It also afforded the researcher the opportunity to identify and correct any anomalies in the questionnaire before it was administered to the actual participants. The pilot study was conducted among thirty five (35) clinicians and twenty five (25) non-clinical workers.

The pre-test of the questionnaire during the pilot study revealed that some of the words in the original MBI-HSS were too technical to be understood or interpreted. Hence, with the support of the supervisors and suggestions from the participants, the MBI-HSS was modified with replacement of some of the words with simpler ones to make it easier to understand. The study however maintained the 22-question structure of the original MBI-HSS as well as the 6-item structure of the Brief Resilience Scale (BRS).

3.11 Data collection

3.11.1 Data Collection Procedure

The data collection took place between March and November, 2020. Once selected and consent obtained, the participants were given the study questionnaire a day before their scheduled date for other measurements by an RA at the rest rooms or conference rooms of their various units in their various departments or hospitals. The role of each participant was to complete and return the study questionnaire in a sealed brown envelope (which was provided by the investigator) within twelve (12) to twenty-four (24) hours for other measurements to be done. Also, after the participants were handed the unfilled questionnaires, they were educated on the fasting guidelines of at least eight hours before blood samples would be taken for laboratory tests.

Upon the return of the filled questionnaire within twelve (12) to twenty-four (24) hours and confirmation that the minimum fasting requirement had been observed, participants had their anthropometric, body composition and hemodynamic measures taken at their various departments/units in their various hospitals. Further, a five (5) milliliter (mls) sample of each participant's fasting blood was taken by trained research assistants who had knowledge in venipuncture techniques (laboratory scientists) and analyzed for fasting plasma glucose, cortisol, and lipid profile. All the measurements were done between 6:00 and 9:00 GMT.

In line with the guidelines of the GHS regarding the COVID-19 pandemic (MOH, 2020), all the RAs and participants were given free re-usable face masks at no cost to them to wear during the period of the data collection and thereafter. Also, "Veronica buckets" with water and soap were provided for hand washing with soap under running water in units where there was no access to flowing water. Furthermore, alcohol-based hand sanitizers were provided free of charge for the RAs and participants to use in order to protect them from the deadly COVID-19. Additionally, social distancing (6 feet between people) was maintained as far as possible throughout data collection.

All measurements were taken after following the standard protocols and instructions for the use of the devices as per the manufacturers' instructions in order to maintain the quality of all measures. All digital measuring instruments were calibrated based on the standard calibrations as suggested by the manufacturers. Also, all laboratory tests were conducted following standard protocols in order to ensure quality results were obtained.

During the data collection, the participants who were identified with health problems such as high BP or high fasting plasma glucose or morbid obesity or burnout and who did not know about their condition prior to the study were referred to see a physician or dietician or clinical psychologist for confirmatory tests and further management using a referral form (Appendix D).

3.11.2 Data Collection Tools

The data collection tools included a structured questionnaire to collect socio-demographic information, job-related information, lifestyle characteristics, level of resilience and burnout information. Other tools included; a tape measure for measuring waist and hip circumferences, a digital sphygmomanometer for hemodynamic measurement, a weighing scale for measuring weight, a stadiometer for standing height measurement and a body fat analyzer for measuring body composition. All digital measuring instruments were calibrated based on the standard calibrations as suggested by the manufacturers.

3.11.2.1 Structured questionnaire administration

Each participant completed and returned the study questionnaire in a sealed brown envelope (which was provided by the researcher) within twelve (12) to twenty-four (24) hours to clear the way for other measurements. The last section of the questionnaire (Section H) was completed by the research assistants after anthropometric, haemodynamic and laboratory measurements. Prior to completing section H of each questionnaire, inspection of the other sections was done to ensure all questions had been completed by the participants. Each questionnaire was given a unique code in order to ensure confidentiality of the responses.

The structured questionnaire (Appendix C) consisted of eight sections:

- Section A: Collected socio-demographic information of participants such as age, sex, marital status, having a child, net monthly income, highest educational qualification, and years of working.
- Section B: Collected information on familial history of CVDs and lifestyle patterns.
- Section C: Focused on collection of information on job profile of participants such as service area, type of facility, additional jobs, common shifts, self-reported perceived workload, labor seniority, job support, job satisfaction and job controls as well as intentions to leave job.
- Section D: Collected information on the resilience of participants to determine the level of resilience using the Brief Resilience Scale (BRS) (Smith et al., 2008). The BRS is a six-item (statement) scale. The participants were asked to indicate how well each statement described their behaviour and actions on a 5-point likert-type scale, ranging from "1" = does not describe me at all to "5" = describes me very well. Item 2

(I have a hard time making it through stressful events), Item 4 (It is hard for me to snap back when something bad happens) and Item 6 (I tend to take a long time to get over set-backs in my life) were reverse-coded and this was taken into consideration during the data collection, entry and analysis. The BRS was scored by adding the responses varying from 1-5 for all six items giving a range from 6-30. The total scores were then divided by the total number of questions answered to give the score corresponding to the level of resilience as recommended in the literature (Smith et al., 2008). Participant scores on the BRS were categorized into 1.0 to 2.99, 3.0 to 4.30 and 4.31 to 5.0 and these scores corresponded to low resilience, normal resilience and high resilience respectively (Smith et al., 2008).The original six-item structure of the BRS was maintained due to its good overall internal consistency (Cronbach's α = 0.78) (Smith et al., 2008).

- Section E: Focused on burnout assessment using the Maslach Burnout Inventory – Human Services Survey (MBI-HSS). The tool is used to measure burnout (Maslach et al., 2015). The scale has been widely used and has an overall reliability coefficient of 0.87 (Cronbach's Alpha) (Maslach et al., 2015). The MBI-HSS is a validated 22-item tool. Each inventory item is rated on a seven-point likert scale that measures how frequently the participants experience a particular feeling (from 0 for never to 6 for every day). The MBI-HSS measures the three elements of burnout: Emotional Exhaustion (EE), using nine (9) items to measure physical and emotional depletion; Depersonalization (DP), using five (5) items to measure negative or cynical feelings towards service recipients; and Personal Accomplishment (PA), using eight (8) items to measure how one perceives one's own competence. In this study, the researcher modified some of the questions of the original MBI-HSS to make it clearer for use in Ghana (Cronbach's alpha scores: 0.94 for EE, 0.83 for DP, and 0.86 for PA). The modification of the original MBI-HSS was informed by the results of the pre-testing of the tool during the pilot study. The modifications were made with the assistance of the health workers who took part in the pilot study and the supervisors of the researcher. The participants from the pilot study and supervisors reviewed the tool and identified questions that appeared too difficult to understand. Specific words/statements that were unclear were replaced with clearer language. For example, for item 1, the term “drained” was replaced with “exhausted”; item 11 was modified from “I worry that this job is hardening me emotionally” to "I worry that this job is making me emotionally tough"; and item 20 was modified from “I feel like I am at the end of my rope” to “I feel like I can't manage at all anymore”. However, the 22-question structure of the MBI-HSS was maintained despite the modifications. The adapted MBI-HSS was used to collect the final information on burnout syndrome from the participants. Participants with high scores on emotional exhaustion and depersonalization as well as low scores on personal accomplishment sub-scales were diagnosed as burnout (Abdo & Kabbash, 2016; Dubale et al., 2019; Thorsen et al., 2011).

- Section F: Focused on the collection of information on hypertension status of the participants.
- Section G: Focused on the collection of information on diabetes mellitus status of the participants.
- Section H: This was the last part of the questionnaire and was used to record information on the anthropometric, body composition, hemodynamic and biochemical indices of the participants. This section was completed by the researcher or the research assistants after inspecting the other sections of the questionnaires for completeness.

3.11.2.2 Anthropometric measurement

Anthropometric measurements were taken in the rest room or conference rooms of each selected hospital. Weight was measured with participants barefooted and wearing light clothing using an Omron digital scale (HN-288), and it was recorded to the nearest 0.1kg. Height was measured using the Seca Stadiometer (Seca, Germany) with participants in an erect position and barefooted, with shoulders in normal alignment. Body mass index (BMI in kg/m^2) was calculated for each participant as the individual's body weight (in kilograms) divided by the square of height (in meters).

BMI was categorized as underweight (BMI < 18.50 kg/m^2), normal weight (BMI: 18.50 – 24.99 kg/m^2), overweight (BMI: 25.00 – 29.99 kg/m^2) and obese (BMI ≥ 30 kg/m^2).

In the measurement of waist and hip circumferences, each participant was made to stand with his arms at the sides, feet positioned close together, and weight evenly distributed across the feet. Measurements for waist circumference (WC) were made at the end of a normal expiration, with a non-elastic tape measure, at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest. Hip circumference was measured at the level of the greater trochanters. Waist-hip ratio was determined as the ratio of waist circumference and the circumference of the hip.

3.11.2.3 Body composition measurement

The body composition of each participant was measured using the Omron Body Composition Monitor (BF- 506, Omron Health care, Inc., Vernon Hills, IL, USA). This device sent a non-detectable low electrical current of 50 kHz and 500mA through the body to determine the amount of fat tissue. Muscles, blood vessels and bones are body tissues with large water content, thus they conduct the electrical current with less resistance. Body fat has a lower electrical conductivity. The proportion of fat in the body was calculated by the machine using five variables: electric resistance, height, weight, age and sex.

The measurements were performed at erect position, with electrodes in contact with soles and heels of both feet. Biological impedance was measured with 4 terminals. The participants' age, gender and height were entered into the equipment and they were asked to stand upright (straight torso) on the platform in the same condition as the weight measurement. The participants were instructed to grab the grip of the electrodes of the monitor by placing the palm around the electrodes while placing the thumbs up, resting on the top of the unit, and stretching the arms forward to approximately 90^o to the axis of the body. The body fat percentage (%), visceral fat level and BMI in kg m^{-2} were computed for each participant by the machine.

3.11.2.4 Hemodynamic measurements

Systolic and diastolic BPs were measured using an automated digital BP monitor (Omron 991 XL, Health care, Inc., Vernon Hills, IL). Before the BP measurement, the participants were asked to empty their urinary bladder if they had not passed urine within the last four (4) hours to prevent indirect pressure of a full urinary bladder on the aorta at the aortic bifurcation around the iliac region. The blood pressure cuff was placed on the left arm of the participant lying in a supine position on an examination bed; with the lower edge of the cuff about 2-3 cm above the elbow crease and the bladder centered over the brachial artery. The arm was rested on a table and raised so that the cuff was at the level with the heart. The participants were allowed to rest for at least 5-10 minutes prior to the BP measurements. The blood pressure was measured three times; each measurement was spaced so that it occurred at least a 60 second interval after the preceding. The first measurement was discarded and the last two measurements were averaged to give the BP for each participant.

Hypertension was diagnosed as BPs of above 140/90mmHg after three different BP measurements (Konlan et al., 2020a; MOH, 2012; WHO, 2020) and undiagnosed hypertension was determined as participants with high BP of above 140/90mmHg after three measures who were not aware of this fact prior to taking part in the study.

Each participant's heart rate was taken and mean blood pressure computed.

3.11.2.5 Laboratory analysis

3.11.2.5.1 Blood sample collection

After 8-12 hours of overnight fast, a venous blood sample of five milliliters (5 mls) was collected from the antecubital area of each participant. The five milliliters (5 mls) of blood was divided into one milliliter (1 ml) for fluoride (ash top) tubes for a fasting plasma glucose (FPG) measurement, two milliliters (2 mls) into EDTA (violet top) tubes and two milliliters (2 mls) into gel-separator tubes (yellow top). Within fifteen (15) minutes of sample collection, the collection tubes were centrifuged at 4000g: five (5) minutes for fluoride oxalate collection tubes and fifteen to forty (15-40) minutes for plain and ethylene diamine tetra-acetic acid (EDTA) (Na^{+}-EDTA) collection tubes. Plasma and serum samples were collected into Eppendorf tubes. Blood lipids and glucose were analysed immediately before storage. Plasma glucose was measured enzymatically within fifteen (15) minutes after sample collection. Plasma and serum samples were then aliquoted into sterile Eppendorf tubes and stored at -20°C until further analysis for cortisol.

3.11.2.5.2 Chemical principle – glucose oxidase test for fasting plasma glucose

The fasting plasma glucose (FPG) was measured with a Selectra Junior chemical auto analyzer from the United Kingdom (Bayer Diagnostics, UK), using ELITech glucose PAP SL reagent from ELITech clinical systems, France, following the manufacturer's instructions. The analysis involved enzymatic oxidation of glucose to form an equimolar amount of gluconic acid and hydrogen peroxide.

$$\text{Glucose} + O_2 + H_2O \rightarrow \text{GOD} \rightarrow \text{gluconic acid} + H_2O_2$$

The hydrogen peroxide formed reacts, under the catalysis of peroxidase, with phenol and 4-aminophenazone to form a red-violet quinoneimine dye as indicator.

$$2H_2O_2 + \text{4-aminophenazone} + \text{phenol} \rightarrow POD \rightarrow \quad \text{quinoneimine} + 4\ H_2O$$

The concentration was determined by the equipment after reading the absorbance of the indicator at a wave length of 500 nm.

Diabetes was diagnosed as fasting plasma glucose (FPG) ≥ 7.0 mmol/L (126 mg/ dl).

The fasting plasma glucose levels that was measured was used as a proxy measure of insulin and insulin resistance in the body as insulin levels was not directly measured (McEwen, 2015; Read & Grundy, 2012; Seaman et al., 2014).

Fasting was defined 'as no caloric intake for at least 8 -12 hours'.

Uundiagnosed DM type II was determined as participants with fasting plasma glucose (FPG) ≥ 7.0 mmol/L (126 mg/ dl) who were not aware of this fact prior to taking part in the study.

3.11.2.5.3 Plasma lipid profile assay

Lipid profile of plasma was analyzed using Selectra Junior chemical auto analyzer from the United Kingdom (Bayer Diagnostics, UK), using ELITech cholesterol SL, ELITech cholesterol HDL SL 2G and ELITech triglycerides Mono SL New reagents from ELITech clinical systems, France, following the manufacturer's instructions.

The total amount of cholesterol (TChol) in the plasma was assayed after enzymatic hydrolysis and oxidation. Briefly, cholesterol ester in the plasma was hydrolyzed by cholesterol esterase to form cholesterol and fatty acids.

$$\text{Cholesterol ester} + H_2O \rightarrow \text{cholesterol ester} \rightarrow \quad \text{cholesterol} + \text{fatty acids}$$

The cholesterol was oxidized afterward, by cholesterol oxidase to form cholestene-3-one and hydrogen peroxide.

$$\text{Cholesterol} + O_2 \rightarrow \text{cholesterol oxidase} \rightarrow \text{cholestene-3-one} + H_2O_2$$

Plasma triglycerides (TG) were assayed after enzymatic hydrolysis with lipases. Triglycerides are hydrolyzed by lipases to form glycerol and fatty acids.

$$\text{Triglycerides} + H_2O \rightarrow \text{lipases} \rightarrow \quad \text{glycerol} + \text{fatty acids}$$

Phosphate is transferred from adenosine triphosphate (ATP) to glycerol, under catalysis of glycerolkinase (GK), to form glycerol-3-phosphate, which is oxidised by glycerol-3-phosphate oxidase (GPO) to form dihydroacetonephosphate and hydrogen peroxide.

$$\text{Glycerol} + \text{ATP} \rightarrow \text{GK} \rightarrow \quad \text{glycerol-3-phosphate} + \text{ADP}$$

$$\text{Glycerol-3-phosphate} + O_2 \rightarrow \text{GPO} \rightarrow \quad \text{dihydroacetonephosphate} + H_2O_2$$

The hydrogen peroxide formed reacts, under the catalysis of peroxidase, with phenol and 4-aminophenazone to form a red-violet quinoneimine dye as indicator.

$$2H_2O_2 + \text{4-aminophenazone} + \text{phenol} \rightarrow \text{POD} \rightarrow \quad \text{quinoneimine} + 4\ H_2O$$

The concentration was determined by the equipment after reading the absorbance of the indicator at a wavelength of 500 nm.

HDL cholesterol was assayed by the precipitation method. 500 µL of diluted precipitant solution, containing phosphotungstic acid in the presence of magnesium, which was added to 200 µL of the plasma sample. The sample was allowed to sit for ten (10) minutes at room temperature and centrifuged afterwards at 4000g for ten (10) minutes to precipitate low density lipoproteins and chylomicrons. The HDL cholesterol was assayed from the supernatant solution at an absorbance of 500nm.

The levels of LDL cholesterol were calculated from Frieldwald's equation, LDL = TChol – (HDL+TG/2.2).

MetS was diagnosed using the NCEP ATP III revised criteria (Grundy et al., 2005; Moy & Bulgiba, 2010; Ofori-Asenso et al., 2017) of three (3) or more of the following:

- High fasting plasma glucose (FPG) ≥ 5.6 mmol/L.
- High blood pressure (BP) ≥130/85mmHg or current use of anti-hypertensive drugs

* Decreased high density lipoprotein (low HDL) cholesterol (men ≤1.03mmol/L, women ≤1.29mmol/L).
* Raised Triglycerides (RTGL) ≥ 1.7mmol/L.
* Abdominal/ central obesity (high waist circumference): ≥ 102cm in men, ≥88cm in women

3.11.2.6 Plasma cortisol enzyme-linked immunoassay

Plasma cortisol was assayed using an enzyme linked immunoassay (ELISA) method using cortisol Elisa Kit (Cayman Chemical).

3.11.2.6.1 Materials

- A plate reader
- Adjustable pipettes
- Ultra-pure water or double distilled water
- Cortisol Elisa Kit (Cayman Chemical)

Manufacturer's recommendations were followed in the preparation of materials.

3.11.2.6.2 Principle

This assay is based on the competitive binding between cortisol and cortisol-acetyl cholinesterase (AChE) conjugate for a fixed number of cortisol-specific mouse monoclonal antibody binding sites. The concentration of the cortisol varies while the cortisol tracer is held constant; the amount of cortisol tracer that is able to bind to the cortisol monoclonal antibody will be inversely proportional to the concentration of the cortisol in the well. The free or tracer antibody-cortisol complex binds to the goat polyclonal anti-mouse IgG that has been attached to the well. The plate is washed to remove any unbound reagents; the Ellman's reagent contains the substrate to AChE (which is acetylthiocholine) which is added to the well. The products of the enzymatic reaction (thiocholine and 2-nitrobenzoic acid) produce a distinct yellow colour which is absorbed strongly at 412nm. The intensity of the colour is determined spectrophotometrically and is proportional to the amount of cortisol tracer bound to the well which in inversely proportional to the amount of free cortisol present in the well during incubation.

3.11.2.6.3 Pre-Assay Preparation

All the Ultra-pure water used to prepare the ELISA reagents and buffer was deionized and free of trace organic contaminants. The pre-assays are below.

Cortisol AChE tracer and Tracer dye

1 vial of the Cortisol AChE was reconstituted with 6ml ELISA buffer and 60 µl of the tracer dye was added to the 6ml tracer and mixed thoroughly.

Cortisol ELISA Monoclonal Antibody

1 vial of the Cortisol ELISA monoclonal antibody was reconstituted with 6ml ELISA buffer, 60 µl of the antiserum dye was added to 6ml tracer and mixed thoroughly.

Buffer Preparation

1. ELISA Buffer Preparation

The ELISA buffer concentrate was diluted with 90ml of Ultra-pure water.

2. Wash Buffer Preparation

5ml of the wash buffer concentrate was diluted to a total volume of 2 litres with Ultra- pure water and 1ml of polysorbate 20 was added.

3.11.2.6.4 Preparation of Cortisol Elisa Standard

Serial dilution of the stock standard solution was made as follows:

100 µl of the cortisol ELISA standard was transferred into a clean test tube and then diluted with 900 µl of Ultra-pure water. Eight clean test tubes were numbered from one to eight (1-8), 900 µl of the ELISA buffer was transferred into the test tube #1 and 600 µl of the ELISA buffer was transferred to tubes #2-8. 100 µl of the stock standard was transferred to test tube #1 and mixed thoroughly. Serial dilution of the standard was done by removing 400 µl from tube #1, transferring it to tube #2 and mixed thoroughly. 400 µl was transferred from tube #2 to tube #3 and was mixed thoroughly. This process was repeated for tube #4 to tube #8. The diluted standards were not stored for more than 24 hours.

3.11.2.6.4 Performing the Assay

Addition of reagents to the wells

100 µl of the ELISA buffer was added to the non-specific binding well (NSB) and 50 µl of the ELISA buffer was added to the Maximum Binding (B_O) well.

50 µl from tube #8 of the cortisol ELISA standard was added to both of the lowest standard wells (S8), and another

50 µl from tube #7 of the cortisol ELISA standard was added to next two standard wells (S7). This process was repeated for tube #6 to tube #1.

50 µl of the plasma was added to the sample per well and 50 µl of the Cortisol AChE was added to each well except Total activity (TA) and blank wells.

50 µl of Cortisol ELISA monoclonal antibody was added to each well except Total activity

(TA), Non-Specific Binding well (NSB) and blank well.

Incubation of Plate

Each plate was covered with a plastic film and incubated overnight at 4^{o}C.

3.11.2.6 5 Development of Plate

20 ml of Ellman's reagent was reconstituted with 20 ml of Ultra-pure water; .the wells were emptied and rinsed five times with wash buffer. 200 µl of Ellman's reagent was added to each well and 5 µl of the tracer was added to the Total Activity wells (TA).

The plate was covered with a plastic film and allowed to develop in the dark. Optimum development is obtained in the dark as exposure to light will affect the results (Adam & Kumari, 2009).

Reading the Plate

The bottom of the plate was wiped with clean tissue to remove dirt and fingerprints.

The plate cover was carefully removed to prevent any loss of the Ellman's reagent which will affect the absorbance readings. The plate was read at a wavelength of 420 nm; the absorbance was checked periodically until the B_O well reached a minimum of 0.3 absorbance units after the blank subtraction.

3.11.2.6.6. Calculation of Sample Concentration

The average absorbance of Maximum Binding (B_O) and Non-Specific Binding (NSB) was calculated. The correct maximum binding (Corrected B_O) was calculated by subtracting the average absorbance of Non-Specific Binding (NSB) from the Maximum Binding (B_O). The

B/B_O (Sample Bound/Maximum Bound) was calculated by subtracting the average NSB absorbance from the S1 absorbance (standard well) and then dividing it by the corrected B_O. The standard wells S2-S8 and all sample wells were calculated by subtracting the average NSB from the respective wells and dividing the results by the corrected B_O. The values for B/B_O (Sample Bound/Maximum Bound) were multiplied by 100 to obtain $\%B/B_O$.

3.11.2.6.7 Plotting of the Standard Curve and Sample Concentration

The $\%B/B_O$ (Sample Bound/Maximum Bound) for standard S1-S8 was plotted against the Cortisol concentration using a linear (y) and log(x) axes; a 4-parameter logistic was performed. The concentration of each sample was obtained by using the equation obtained from the standard curve plot.

Quality control was ensured by covering the microplate reader when not in use to avoid exposure to dust and fungal growth on the lenses. The wells were free from grease, fungus, moisture or abrasions on the surface. The plate was covered with a plastic film and allowed to develop in the dark, optimum development is obtained in the dark; exposure to light would affect the results.

3.11.2.7 Determination of Allostatic load

The allostatic load in the participants was determined using eleven (11) biomarkers from the neuro-endocrine, cardiovascular, metabolic and anthropometric measures as recommended (Seeman et al., 2014). The biological markers were: cortisol (neuro-endocrine), mean systolic BP, mean diastolic BP and heart rate (cardiovascular system); BMI and waist-to-hip ratio (anthropometric); and HDL, LDL, total cholesterol, triglycerides and fasting plasma glucose (metabolic). Each biological marker was dichotomized into high versus low-risk values (1–0) according to clinical thresholds as found in the literature (Beckie, 2012; Seeman et al., 2014;

GHS, 2014). The total numerical scores of the allostatic load scores for each participant were computed by summing up the dichotomized values, and these ranged between 0 and 11. The final allostatic scores were dichotomized into high versus low allostatic load risk by using the median (5.5) as a cut-off value. Scores at or above the median were seen as high while those below the median were classified as low (Beckie, 2012).

3.11.2.8 Prediction of ten-year risk of CVDs

The Framingham risk scoring tool was used to predict the ten-year risk of cardiovascular diseases among the participants (D'Agostino et al., 2013; GHS, 2014; Goff et al., 2014; Owusu et al., 2014). The ten-year risk of CVDs was calculated based on seven (7) coronary risk factors (CRFs); age, gender, TC, HDL-C, systolic BP, diabetes and smoking habits. Each of these CRFs were assigned a pre-established value as recommended (D'Agostino et al., 2013 and De-Oliveira, Ferreira, & Santos, 2016) and the values for each risk factor was later added to the others. The result was a final value/score that was correlated with a table of percentage risks for developing CVDs in the next ten years (Appendix Ei-Eiii).

The structured questionnaire helped to obtain information about age, sex, presence or absence of DM and/or hypertension. Afterwards, the biochemical variables (TC, HDL-C and fasting plasma glucose) were measured using standardized and routine methods, through the collection of venous blood after the participants had fasted for 8-12 hours. Furthermore, systemic BP measurements were obtained by evaluating the systolic and diastolic BPs after a 5-10 minute rest.

After the questionnaire administration, laboratory analysis and haemodynamic measurements, the participants were placed in the various categories for each variable as stipulated by the FRS algorithm (Appendix Ei & Eii) and assigned corresponding sex specific risk score for that category. The various risk scores for each participant were then summed up to obtain the total risk score. This total risk score was matched against the corresponding CVD risk

(Appendix Eiii) to obtain the total ten-year risk of CVDs. These predicted risk scores were further categorised as low if the total risk was less than 10%, intermediate if the total risk was between 10 – 20% and high if the total risk was greater than 20% (De-Oliveira et al., 2016).

3.12 Data handling

Unique codes were assigned to all the participants' questionnaires and these corresponded to the codes on the eppendorf tubes containing the blood products that were collected from each participant. The data obtained was kept confidential during and after the study and only accessible to the investigator or with prior permission from the participants. Participants remained anonymous in results dissemination. The filled questionnaires were kept in a locked cabinet at the Department of the investigator and only the investigator has access to the cabinet. Blood samples and products of blood were stored in a locked refrigerator at the Central Laboratory of the KBTH. Permission would be sought from the participants before any usage for further analysis/studies. Data files (Excel Sheets) were and are still strictly protected by password to prevent any unauthorized access and or copying.

3.13 Data Analysis

Data analysis was done with the aid of Stata version 15.0. The variables which were continuous measures such as; age, anthropometric, biochemical and hemodynamic indices were tested for normality and presented as mean ± standard deviation as they were normally distributed. A one-way ANOVA was conducted to determine if cortisol was different for groups with different ten-year risk of CVDs. Frequencies and percentages were used to present the socio-demographic and job-related characteristics of the participants at the univariable level. Overall internal consistency of the 22-item adapted MBI-HSS was determined using Cronbach's alpha estimation.

This was followed by a bivariable analysis using a chi-square test for categorical measures and a student's t-test for continuous measures. Bivariable analysis or models are used to determine the association between an independent and a dependent variable (Creswell, 2009). Thus, the Pearson's chi-square test of independence was performed to test for individual independent association ($p<0.05$) between the independent and dependent variables with observations more than six. This is because Pearson's Chi-square has been reported to demonstrate more stability and gives a better estimator for such type of variables (Babbie & Mouton, 2001). However, for variables with observations less than six, which were also nominal and dichotomized a Fisher's exact test, were used to determine the associations.

After the binary analysis, multivariable logistic and ordinal regressions were used to determine the strength of association between the independent and dependent variables. In running the regressions, the first observation in each of the independent variable was used as the reference category. The multivariable logistic and ordinal regressions were done at two levels. The first was to establish the crude level of association between the independent variables and the dependent variables for categorical variables. In this strategy, all independent variables were added to the first model to establish the crude relationship with the dependent variable at various levels of measurement. Afterwards, variables that were significant in the first model and at the bivariable analysis level were put in a multivariable logistic and ordinal regression models to adjust for the effects of those variables.

Specifically, the prevalence of burnout as well as metabolic syndrome was determined as the proportion of participants meeting the diagnostic criteria for both burnout and metabolic syndrome among clinicians and non-clinicians as well as for the three chosen hospitals. Also, the participants were categorised into various CVD-risk groups based on their scores on the FRS into low, intermediate and high CVD-risk. In addition, associations between burnout (dependent variables) and the job-profile of the participants (independent variables) were determined. Similarly, the association between burnout and metabolic syndrome as well as the ten-year risk of CVDs were investigated at the bivariate level. Finally, a multivariable logistic regression was done to determine the relationship between burnout (exposure variable) and metabolic syndrome (outcome variable). On the other hand, a multivariable ordinal logistic regression was done to assess the relationship between burnout (exposure variable) and the ten-year risk of CVDs (outcome). Data analayses were conducted at a significant level of (alpha=0.05) and 95% confidence.

3.14 Ethical considerations

3.14.1 Permission to proceed

All the study methods were carried out in accordance with the declaration of Helsinki. Ethical approval for the study was obtained from the Ghana Health Service's Ethics Review Committee (Protocol Number: GHS-ERC 018/03/20: Refer Appendix F). Also, the study was approved by the Institutional Review Board of the Korle Bu Teaching Hospital (Protocol Number: KBTH-IRB /000133/2018). Permission was also sought from the management of the three hospitals before data collection. The specific ethical issues that the researcher addressed included:

3.14.2 Potential risk/benefit

The participants spent approximately forty (40) minutes answering the questionnaires and having anthropometric, body composition and hemodynamic measurements taken. Also, all participants were assured of minimal pain during blood sample collection as the investigator made use of trained and experienced venipuncture specialist to collect the blood samples. There were some indirect benefits to the health workers as they had the opportunity to know their hypertension, diabetes mellitus, obesity and metabolic syndrome status as well as burnout level. Participants who had high BPs, high fasting plasma glucose, morbid obesity and burnout were referred to a physician/dietician/psychologist for further investigation and treatment.

3.14.3 Privacy and confidentiality

The questionnaires did not contain names of the participants, but were labeled using unique codes for identification and to prevent others from seeing the specific views expressed by participants in the questionnaire, thus ensuring confidentiality. Also, participants were given adequate privacy during the body composition, blood pressure, anthropometric measurement and blood sample taking.

3.14.4 Data storage and usage

Study materials were given unique study identification numbers (unique codes). The materials for the study were stored under the supervision of the investigator, Mr. Kennedy Dodam Konlan. The study materials were stored in locked file cabinets and also in a locked refrigerator at the Central Laboratory of the KBTH (Blood products) for research purposes. Data was entered into Microsoft Excel and Stata SE version 15.0 (64-bit) software with the identification numbers, and electronic files are only accessible to the investigator.

3.14.5 Description of the consenting process

After the proposal for the study was accepted by the Department of Social and Behavioral Science, it was sent to the GHS Ethics Review Committee and the Institutional Review Board of the KBTH for clearance. Authorization was also obtained from the management of the three chosen hospitals prior to the commencement of the study. Every participant was given information on the motive, threats and benefits of the study prior to recruitment and signing the written informed consent form. Furthermore, participants were told that it was not mandatory to take part in study and that they could opt out at any stage.

3.14.6 Voluntary consent/withdrawal

Potential study participants were told that participating in the research or study was entirely voluntary, and that declining to enter the study, declining to answer the questions, or terminating participation had no negative consequences.

3.14.7 Compensation

The eligible participants who consented to participate in the survey were not given any monetary compensation. However, the results of the study were disseminated to the management and staff of the three chosen hospitals.

3.14.8 Declaration of conflict of interest

There was no conflict of interest in this study.

3.14.9 Project funding

The study was sponsored by the UG-BANGA Thesis Completion Grant.

3.14.10 Protection against COVID-19

a. Protecting study participants against COVID-19

- Hand washing: All participants were required to wash their hands under running water. Hence, a Veronica's bucket containing water, soap and paper towels was provided by the researcher in facilities/units with no tap/running water to ensure proper hand washing by all the participants.
- Wearing of face masks: All participants were provided with home-made re-usable face masks at no cost to them. The participants were taught and/or reminded about how to wear the face mask as well as how to decontaminate, wash and iron the re-usable mask for re-use. Participants were advised to wear their masks to and from the study sites and when they leave the study sites to their homes. Re-usable facemasks were provided free of charge to the participants.

- Physical distancing: Physical/social distancing was maintained during the data collection to prevent anyone from contracting COVID-19 during the study. The recommended distance of at least six (6) feet between participants was maintained.
- Participants who had been exposed to any COVID-19 suspected case were advised to comply with self-isolation or quarantine directives as put forth by the national or local facility.
- Participants were asked questions to elicit information about any COVID-19 tests done so as to help protect them, other participants and the research team members.

b. Protecting members of study team

- The measures enumerated above (3.14.10a) for the protection of study participants were adhered to by the research team members to protect them from COVID-19.
- All members of the study team were well protected through practising good personal hygiene through regular hand washing under running water and soap, the use of alcohol-based hand sanitizers, wearing of facemasks, wearing of disposable gloves and practicing of social/physical distancing of at least six (6) feet between them and the participants.
- The cost of putting in place measures to prevent COVID-19 was funded by the investigator.

3.15 Dissemination

The findings of this study were submitted to the University of Ghana School of Graduate Studies. Also, the findings of the study were presented at seminars at the study sites to stimulate policy and management level discussion about how to ensure wellbeing of staff so as to retain experienced workers and improve the quality of care. The findings will further be published in scientific journals and presented at scientific seminars and workshops.

CHAPTER FOUR

RESULTS

4.1. Introduction

This chapter presents the results according to the objectives of the study. The socio-demographic and job profile of the participants are presented first, followed by the anthropometric, hemodynamic, biochemical and lifestyle characteristics. The results provide information on the prevalence of burnout among clinical and non-clinical staff as well as in the three selected hospitals. Furthermore, the result of the job-related factors influencing burnout is provided. In addition, information on allostatic load, prevalence of metabolic syndrome as well as the relationship between burnout and metabolic syndrome are presented. The chapter concludes by looking at the other risk factors for CVDs and the relationship between burnout and metabolic syndrome as well as the ten-year risk of CVDs.

4.2 Description of the participants

4.2.1 Socio-demographic characteristics of participants

The total number of participants who took part in the study was one thousand two hundred and sixty four health workers (1,264) and this represented a response rate of 84.10%. Seven hundred and three (703) (55.62%) of the participants were clinicians while five hundred and sixty-one (561) (44.38%) were non-clinicians. As shown in Table 4.1, the participants' mean age was 40.81 ± 8.33 years. More than half of them (53.09%) were females. Also, more than half (61.31%) were married with only 36.08% of the participants claiming not to have children. In addition, majority (65.59%) claimed to have obtained tertiary education. The study found that three hundred and twenty-six (326) (25.79%) had low level of resilience. Furthermore, 35.28% claimed they had familial history of CVDs (Table 4.1).

Table 4.1. Socio-demographic characteristics of participants

Socio-demographic characteristics	Clinicians, n (%) 703 (55.62)	Non-clinicians, n (%) 561 (44.38)	Total, n (%) 1,264, (100)
Age in years: mean (± SD)	41.05±8.30	40.51±8.38	40.81 ± 8.33
Sex of respondent			
Male	317 (45.09)	276 (49.20)	593 (46.91)
Female	386 (54.91)	285 (50.80)	671 (53.09)
Marital status			
Single	106 (15.01)	99 (17.65)	205 (16.22)
Married	428 (60.88)	347 (61.85)	775 (61.31)
Divorced/Separated	169 (24.04)	115 (20.50)	150 (22.47)
Having Children			
Yes	409 (57.75)	399 (71.12)	808 (63.92)
No	294 (41.82)	162 (28.88)	456 (36.08)
Highest educational level			
Low	0(0)	33 (5.88)	33 (2.61)
Middle	6 (0.85)	304 (54.19)	310 (24.53)
High	697 (99.15)	224 (39.93)	921 (72.87)
Range of net monthly income			
Low	251 (35.70)	483 (37.79)	734 (58.07)
Middle	392 (55.76)	78 (66.13)	470 (37.18)
High	60 (8.53)	0 (0)	60 (4.75)
Years of working			
1-5	267 (37.98)	227 (40.46)	494 (39.08)
6-10	133 (18.92)	88 (15.69)	221 (17.48)
11-15	23 (3.27)	50 (8.91)	73 (5.78)
16-20	50 (7.11)	54 (9.63)	104 (8.23)
> 20	230 (32.72)	142 (25.31)	372 (29.43)
Level of resilience			
Low	166 (23.61)	160 (28.52)	326 (25.79)
Normal	271 (38.55)	209 (37.25)	480 (37.97)
High	266 (37.84)	131 (23.35)	458 (36.23)
Familial History of CVDs			
Yes	247 (35.14)	199 (35.47)	446 (35.28)
No	456 (64.86)	362 (64.53)	818 (64.72)

Frequency (n) and percentage (%)

4.2.2 Job-profile of participants

The results shows that five hundred and seventy-five (575) (45.49%), four hundred and six (406) (32.12%) and two hundred and eighty-three (283) (22.39%) of the participants were from the tertiary, secondary and primary health care facilities respectively. Also, one hundred and seventy-eight (178) (14.08%) of the participants claimed to be rendering their services in highly dependent units (emergency and intensive care units). The participants had worked predominantly night shifts for the past six months. In addition, five hundred and forty-four (544) (43.04%) of them said they had additional jobs aside their current jobs and half of them harbored intentions of leaving their current jobs. In addition, 40.11% of the participants claimed they had adequate support for their jobs while 46.20% claimed to have control over their jobs. Further, the majority said they were not satisfied with their jobs with 20.57% perceived their current jobs as imposing a high workload on them (Table 4.2).

Table 4.2. Job-profile of participants

Job-profile of participants	Clinicians, n (%) 703 (55.62)	Non-clinicians, n (%) 561 (44.38)	Total, n (%) 1264 (100)
Type of facility			
Primary	149 (21.19)	134 (23.89)	283 (22.39)
Secondary	264 (37.55)	142 (25.31)	406 (32.12)
Tertiary	290 (41.25)	285 (50.80)	575 (45.49)
Service Area			
Highly dependent unit	125 (17.78)	51 (9.09)	178 (14.08)
Stable in-patients	287 (40.83)	177 (31.55)	464 (36.71)
Out-patient	264 (37.55)	0 (0)	264 (20.89)
No contact with patients	27 (3.84)	277 (49.38)	304 (24.05)
Management	0 (0)	56 (9.98)	56 (4.43)
Common shift for past 6 months			
Night	269 (38.26)	332 (59.18)	601 (47.55)
Afternoon	228 (32.43)	146 (26.02)	374 (29.59)
Morning	206 (29.30)	83 (14.80)	289 (22.86)
Additional Jobs			
Yes	339 (48.22)	205 (36.54)	544 (43.04)
No	364 (51.78)	356 (63.46)	720 (56.96)
Intentions to leave job			
Yes	341 (48.51)	291 (51.87)	632 (50.00)
No	362 (51.49)	270 (48.13)	632 (50.00)
Job support			
Yes	249 (35.42)	258 (45.99)	507 (40.11)
No	454 (64.58)	303 (54.01)	757 (59.89)
Job control			
Yes	309 (43.95)	275 (49.02)	584 (46.20)
No	394 (56.05)	286 (50.98)	680 (53.80)
Job satisfaction			
Yes	330 (46.94)	215 (38.32)	545 (43.12)
No	373 (53.06)	346 (61.68)	719 (56.88)
Perceived high workload			
Yes	110 (15.65)	150 (26.74)	260 (20.57)
No	593 (84.35)	411 (73.26)	1004 (79.43)

Frequency (n) and percentage (%)

4.2.3 Lifestyle patterns of participants

There was no difference in former and current alcohol use between clinical and non-clinical participants. Compared to the clinical participants, the non-clinical participants had significantly higher current and former smoking histories. However, more of the clinical staff engaged in planned exercises. Similarly, self-reported daily fruit and vegetable intake as well as fatty diets were higher among clinical staff (Table 4.3).

Table 4.3. Lifestyle patterns of participants

Lifestyle Patterns	Clinical N (%) 703 (56.60)	Non-Clinical N (%) 561 (43.40)	X^2, p-value
Alcohol use			
Current	242 (34.42)	175 (31.19)	1.47, 0.225
Ever taken alcohol	266 (37.84)	222 (39.57)	0.40, 0.529
Tobacco Smoking status			
Current	70 (9.96)	77 (13.73)	4.31, 0.038
Previous history	82 (11.66)	105 (18.72)	12.31, <0.001
Planned exercises			18.65, <0.001
Yes	132 (18.77)	54 (9.63)	
No	571 (81.22)	507 (90.37)	
Quantity of daily salt intake			
< 1 teaspoon	531 (75.53)	358 (63.81)	20.54, <0.001
>1 teaspoon	172 (24.47)	203 (36.19)	12.31, <0.001
Frequency of vegetables and fruits intake			16.48, <0.001
Never	29 (21.19)	165 (29.41)	
Daily	244 (37.55)	100 (17.83)	
Weekly	303 (41.25)	210 (37.43)	
Occasionally	62 (8.82)	56 (9.98)	
Sometimes	65 (9.24)	30 (5.35)	
Frequency of fatty diet intake			140.88, <0.001
Daily	400 (56.90)	272 (50.46)	
Weekly	170 (24.18)	122 (21.75)	
Occasionally	100 (14.22)	93 (17.25)	
Sometimes	33 (4.69)	74 (13.73)	

Data are presented as frequency (percentages) and p-values were determined using $\chi 2$.

4.2.4 Anthropometric profile of participants

Compared to the clinical participants, those in the non-clinical category were taller and had higher hip circumference. On the other hand, the clinical participants had higher weight, BMIs, and waist-hip ratio than their non-clinical counterparts (Table 4.4).

Table 4.4 Anthropometric profile of participants

Anthropometric Profile	All participants N (%) 1264 (100%) (π ±SD)	Clinical (N= 703) (π ±SD)	Non-Clinical (N=561) π ±SD)	P
Height, cm	161.77±6.91	160.68±7.11	163.13±6.40	< 0.001
Weight, kg	69.06±10.24	69.23±9.89	68.86±10.66	< 0.001
BMI	26.46±3.93	26.90±3.98	25.90±3.79	< 0.001
Body Fat, %	26.93±0.02	27.24±0.08	26.54±0.03	0.125
Visceral Fat, %	8.50±0.16	8.10±6.00	9.02±5.65	0.005
Hip circumference, cm	100.5±15.35	99.40±15.24	101.55±15.34	0.003
Waist circumference, cm	93.46±11.54	94.15±11.67	93.46±11.38	0.292
Waist-Hip Ratio (WHR)	0.97±0.19	1.0±0.19	0.95±0.19	<0.001

Data are presented as mean (± standard deviation), p values were determined using t tests

4.2.5 Hemodynamic characteristics of participants

There was no difference in systolic, diastolic and mean BPs of the participants. However, non-clinicians had higher heart rates as compared to the clinicians (Table 4.5).

Table 4.5 Hemodynamic indices of participants

Hemodynamic indices	All participants N (%) 1264 (100%) (π ±SD)	Clinical (N= 703) (π ±SD)	Non-Clinical (N=561) π ±SD)	P
Systolic BP, mmHg	127.32±15.33	128.01±15.33	126.46±15.08	0.07
Diastolic BP, mmHg	78.66±11.07	78.65±11.25	78.68±10.84	0.951
Heart rate, beats/minute	73.78±12.66	72.65±12.79	75.18±12.37	<0.001
Mean BP, mmHg	95.03±12.047	95.24±12.21	94.75±11.90	0.467

Data are presented as mean (± standard deviation), p values were determined using t tests

4.2.6 Biochemical indices of participants

There was no significant difference between the mean levels of biochemical indices between clinical and non-clinical participants except for total cholesterol and low-density lipoprotein level where clinicians had a higher mean level compared to their non-clinical counterparts. However, non-clinicians had higher mean plasma cortisol levels (Table 4.6).

Table 4.6 Biochemical indices of participants

Biochemical indices	**All participants N (%) 1264 (100%)** (π ±SD)	**Clinical (N= 703)** (π ±SD)	**Non-Clinical (N=561)** π ±SD)	**P**
Fasting Plasma Glucose, mmol/L	5.44±1.16	5.49±1.12	5.43±1.21	0.342
Cortisol, nmol/L	441.9±198.3	433.5±195.6	451.7±201.3	0.042
Total Cholesterol, mmol/L	5.24±1.3	5.34±1.29	5.05±1.20	0.020
Triglycerides, mmol/l	1.68±020	1.68±0.21	1.67±0.19	0.229
HDL, mmol/l	0.92±0.24	0.91±0.24	0.92±0.25	0.491
vLDL, mmol/l	0.33±0.22	0.33±0.19	0.34±0.22	0.109
LDL, mmol/l	3.25±0.95	3.31±0.87	3.18±1.03	0.025

Data are presented as mean (± standard deviation), p values were determined using t tests

4.2.7 Mean, standard deviation and internal consistency of adapted MBI-HSS

The results showed that the overall reliability of the scores on the adapted MBI-HSS (items 1–22) was sufficient (Cronbach's α = 0.88), with the lowest internal consistency value for the scale of depersonalization (DP) (Cronbach's α = 0.83). The mean scale scores and Cronbach's alpha values are presented in Table 4.7.

Table 4.7. Mean standard deviation and internal consistency of adapted MBI-HSS

MBI- subscale	Number of Items	Mean	Standard deviation	95% CI	Cronbach's alpha
EE	9	24.02	15.60	23.16-24.88	0.94
DP	5	6.79	8.70	6.25-9.32	0.83
PA	8	33.58	11.81	32.93-34.23	0.86
Total	22				0.88

4.3 Prevalence of burnout among the study participants

4.3.1 Distribution of elements of burnout among clinicians and non-clinicians

The results showed that there was no significant difference in the rate of emotional exhaustion and personal accomplishment between clinicians and non-clinicians. However, non-clinicians displayed higher depersonalization (Table 4.8).

Table 4.8 Distribution of elements of burnout between clinicians and non-clinicians

Elements of burnout	Clinical N (%) 703 (56.60)	Non-Clinical N (%) 561 (44.38)	X^2, p-value
Emotional Exhaustion			3.523, 0.172
Low	280 (39.83)	195 (34.76)	
Moderate	199 (28.31)	168 (29.95)	
High	224 (31.86)	198 (35.29)	
Depersonalization			11.10, 0.004
Low	515 (73.26)	375 (66.84)	
Moderate	38 (5.41)	22 (3.92)	
High	150 (21.38)	164 (29.23)	
Personal Accomplishment			3.027, 0.220
Low	283 (40.26)	199 (35.47)	
Moderate	115 (16.36)	99 (17.65)	
High	305 (43.39)	263 (46.88)	

Data are presented as frequency (percentages) and p-values were determined using $\chi 2$.

4.3.2 Distribution of elements of burnout in the three hospitals.

The results show that participants from the primary facility had the highest level of high emotional exhaustion and depersonalization. However, the level of low personal accomplishment was highest in the secondary facility (Table 4.9).

Table 4.9 Distribution of elements of burnout in the three hospitals

Elements of burnout	Primary N (%) 283 (22.39)	Secondary N (%) 406 (32.12)	Tertiary N (%) 575 (45.49)	X^2, p-value
Emotional Exhaustion				41.49, < 0.001
Low	115 (40.64)	148 (36.45)	212 (36.87)	
Moderate	42 (14.84)	127 (31.28)	198 (34.4)	
High	126 (44.52)	131 (32.27)	165 (28.70)	
Depersonalization				26.74, < 0.001
Low	169 (59.72)	288 (70.93)	433 (75.30)	
Moderate	12 (4.24)	21 (5.17)	27 (4.69)	
High	102 (36.04)	97 (23.89)	115 (20)	
Personal Accomplishment				20.87, < 0.001
Low	99 (34.98)	165 (40.64)	218 (37.91)	
Moderate	72 (25.44)	63 (15.52)	79 (13.74)	
High	112 (39.58)	178 (43.84)	278 (48.35)	

Data are presented as frequency (percentages) and p-values were determined using $\chi 2$.

Specific objective one: To determine the prevalence of burnout among health workers in Accra.

4.3.3 Prevalence of burnout among participants

The overall prevalence of burnout among the study participants was 20.57%. The prevalence of burnout was significantly highest among workers of the primary facility (36.04%). Also, compared to the clinical participants, their non-clinical counterparts had a significantly higher prevalence of burnout (26.74% versus 15.64%) (Table 4.10).

Table 4.10 Prevalence of burnout among participants

Profile of participants	Burnout	
	Frequency (n)	Percentage (%)
Category of staff		
Clinicians	110	15.65
Non-clinicians	150	26.74
Total	260	20.57
Facility of working		
Primary	102	36.04
Secondary	69	17.12
Tertiary	89	15.48

Frequency (n) and percentage (%)

Specific objective two: To identify the job-related factors associated with burnout among health workers in Accra.

4.3.7 Bivariate association between job-related factors and burnout

The results showed that aside job support and job control, all the other job-related factors (type of facility, category of staff, service area, common shift for the past six months, additional jobs, harboring of intentions to leave job, job dissatisfaction and perceived high workload) were significantly associated with burnout. More than half (57.69%) of those burnout were non-clinicians. The results showed that 31.92% of those who were experiencing burnout rendered their services in highly dependent units. Also, night shifts were associated with significantly higher level of burnout. Further, burnout was found to be significantly associated with additional jobs. In addition, participants who expressed intentions of leaving their jobs were more burnout. Similarly, burnout was found to be significantly associated with perceived high workload and job dissatisfaction (Table 4.11).

Table 4.11. Bivariate association between job-related factors and burnout

Job-related factors	Burnout N (%)	X^2, p-value
Type of facility		53.77, < 0.001
Primary	102 (39.23)	
Secondary	69 (26.54)	
Tertiary	89 (34.23)	
Category of staff		23.49, < 0.001
Clinicians	110 (42.31)	
Non-clinicians	150 (57.69)	
Service Area		176.7, <0.001
Highly dependent unit	83 (31.92)	
Stable in-patients	82 (31.54)	
Out-patient	13 (5.00)	
No contact with patients	70 (26.92)	
Management	12 (4.62)	
Common shift for past 6 months		13.46, 0.001
Night	101 (38.85)	
Afternoon	86 (33.08)	
Morning	79 (30.38)	
Additional Job		97.06, <0.001
Yes	182 (70.00)	
No	78 (30.00)	
Intention to leave job		217.6, <0.001
Yes	236 (90.77)	
No	24 (9.23)	
Job support		2.134, < 0.144
Yes	94 (36.15)	
No	166 (63.85)	
Job control		0.920, 0.337
Yes	127 (48.85)	
No	133 (51.15)	
Job satisfaction		4.381, 0.036
Yes	127 (48.85)	
No	133 (51.15)	
Perceived high workload		217.6, <0.001
Yes	236 (90.77)	
No	24 (9.23)	

Data are presented as frequency (percentages) and p-values were determined using $\chi 2$.

3.8 Multivariable logistic regression between job-related factors and burnout

In order to determine the influence of job-related factors on the experience of burnout among the participants, binary logistic regression analysis was carried out using two models (Table 4.12). Model I was a bivariate logistic regression analysis of burnout and all the job-related factors that had an association with burnout in Table 4.11. Model II was a multivariable logistic regression analysis of burnout and all the job-related characteristics, adjusting for level of resilience and job satisfaction. It was revealed that employees of the primary health facility were 3.91 times more likely (AOR=3.91, 95% CI=2.39-6.41) to experience burnout on the job compared to the tertiary health facility. Also, non-clinicians were 2.57 times more likely (AOR=2.57, 95% CI =1.73-3.83) to experience burnout compared to clinicians. Similarly, participants with additional jobs were 1.14 times more likely (AOR=1.14, 95% CI=0.75-1.74) to experience burnout compared to those without additional jobs. In addition, participants harbouring intentions of leaving their current jobs were 4.61 times more likely (AOR=4.61, 95% CI=2.73-7.78) to experience burnout on the job compared with those with no intentions to leave job. Furthermore, participants with perceived high workload were 2.38 times more likely (AOR=2.38, 95% CI=1.40-4.05) to experience burnt-out on the job compared to those who did not perceive their jobs as stressful (Table 4.11).

Table 4.12. Multivariable logistic regression between job-related factors and burnout

Job-related factors	Burnout					
	Crude Odd ratio	**95% CI**	**P-value**	**Adjusted Odd ratio**	**95% CI**	**P-value**
Type of facility						
Primary	3.08	2.20-4.29	<0.001	3.91	2.39-6.41	< 0.001
Secondary	1.12	0.79-1.58	0.525	1.11	0.70-1.75	0.665
Tertiary			**Reference**			
Category of staff						
Clinicians			**Reference**			
Non-clinicians	1.97	1.49-2.59	<0.001	2.57	1.73-3.83	< 0.001
Service Area						
Highly dependent unit			**Reference**			
Stable in-patients	0.19	0.13-0.28	< 0.001	0.21	0.12-0.38	<0.001
Out-patient	0.01	0.000.03	< 0.001	0.01	0.00-0.05	<0.001
No contact with patients	0.27	0.18-0.40	< 0.001	0.37	0.20-0.68	0.001
Management	0.24	0.12-0.49	< 0.001	0.16	0.06-0.41	<0.001
Common shift for past 6 months						
Morning			**Reference**			
Afternoon	1.35	0.97-1.87	0.074	0.94	0.60-1.49	0.805
Night	1.86	1.33-2.61	< 0.001	1.10	0.68-1.78	0.689
Additional Job						
No			**Reference**			
Yes	4.14	3.08-5.56	< 0.001	1.14	0.75-1.74	0.042
Intentions to leave job						
No			**Reference**			
Yes	15.10	9.74-23.41	< 0.001	4.61	2.73-7.78	< 0.001
Perceived high workload						
No			**Reference**			
Yes	15.10..	9.73-23.40	< 0.001	4.60	2.73-7.77	< 0.001

Logistic regression models adjusted for level of resilience and job satisfaction

4.4 Burnout and sub-clinical physiological dysregulation

4.4.1 Allostatic load among participants

The results revealed that 26.27% of the participants had high allostatic load indicative of sub-clinical physiological dysregulation. Also, 38.40% of those in the primary facility were found to have high allostatic load (Table 4.13).

Table 4.13 Allostatic load among participants

Profile of participants	Allostatic load	
	Low	**High**
	N (%)	**N (%)**
Category of staff		
Clinicians	519 (73.83)	184 (26.17)
Non-clinicians	413 (73.62)	148 (26.38)
All participants	932 (73.73)	332 (26.27)
Type of facility		
Primary	182 (64.31)	101 (38.40)
Secondary	308 (75.86)	98 (24.14)
Tertiary	442 (76.87)	133(23.13)

Frequency (n) and percentage (%)

4.4.2 Association between burnout and allostatic load

The results indicated that high emotional exhaustion, high depersonalization and low personal accomplishment were significantly associated with high allostatic load. Also, the participants with overall burnout had significantly higher allostatic load (Table 4.14).

Table 4.14 Association between burnout and high allostatic load

	High AL N (%)	**X^2, p-value**
Emotional Exhaustion		409.4, <0.001
Low	46 (13.86)	
Moderate	26 (7.83)	
High	260 (78.31)	
Depersonalization		293.6, < 0.001
Low	112 (33.73)	
Moderate	30 (9.04)	
High	190 (57.23)	
Personal Accomplishment		159.4, < 0.001
Low	207 (62.35)	
Moderate	72 (21.69)	
High	53 (15.96)	
Burnout		340.6, <0.001
Yes	185 (55.72)	
No	147 (44.28)	

Data are presented as frequency (percentages) and p-values were determined using $\chi 2$.

4.4.3 Plasma cortisol and Burnout

There were significantly higher mean levels of cortisol among the participants with burnout as compared to those without burnout (Table 4.15).

Table 4.15 Plasma cortisol and burnout

	Burnout	No Burnout	P
Cortisol, nmol/l	702.75±142.13	373.96±148.45	< 0.001

Data presented as mean and standard deviation (π ±SD)

4.4.3 Correlation between plasma cortisol and elements of burnout

There was a strong positive correlation between plasma cortisol and emotional exhaustion as well as depersonalization. However, a weak negative correlation was found between plasma cortisol and personal accomplishment (Table 4.16).

Table 4.16 Correlation between elements of burnout and cortisol

	EE		DP		PA	
	r	p	r	p	r	p
Cortisol	0.62	< 0.001	0.62	<0.001	-0.39	<0.001
EE			0.80	< 0.001	-0.37	<0.001
DP					-0.56	<0.001

4.5 Risk of cardiovascular diseases among the participants

4.5.1 Prevalence of the components of metabolic syndrome

There were no significant differences in the components of metabolic syndrome between clinicians and non-clinicians. Overall, 39.59% of the participants had borderline hypertension and similar findings (37.42%) were found for high fasting plasma glucose. Also, 51.56% of the participants had low HDL-C level, with 41.77% having elevated triglycerides. Furthermore, 36.55% of the participants had high waist circumferences, with 58.07% having dyslipidemia (Table 4.17).

Table 4.17. Prevalence of components of metabolic syndrome

Components of MetS	**All participants N (%) 1264 (100)**	**Clinicians N (%) 703 (55.62)**	**Non-clinicians N (%) 561 (44.38)**	**X^2, p-value**
Borderline hypertension	500 (39.59)	288 (40.97)	212 (37.79)	1.365, 0.243
High fasting plasma glucose	473 (37.42)	267 (37.98)	206 (36.72)	0.212, 0.646
Low HDL	652 (51.56)	378 (53.77)	274 (48.84)	3.034, 0.082
Elevated Triglycerides	528 (41.77)	309 (43.95)	219 (39.04)	3.101, 0.078
High waist circumference	462 (36.55)	263 (37.41)	199 (35.47)	0.506, 0.477
Dyslipidemia	734 (58.07)	425 (57.90)	309 (55.08)	3.702, 0.054

Data are presented as frequency (percentages) and p-values were determined using $\chi 2$.

Specific objective three: To determine the prevalence of metabolic syndrome among health workers in Accra.

4.5.2 Prevalence of metabolic syndrome among the participants

The overall prevalence of metabolic syndrome in the study participants was 41.85%. Also, compared to the clinical participants, the non-clinical participants had a higher prevalence of MetS (42.42% versus 41.39%). In addition, the prevalence of metabolic syndrome was significantly highest among workers of the primary facility (49.47%) (Table 4.18).

Table 4.18. Prevalence of metabolic syndrome among the participants

Profile of participants	Metabolic syndrome	
	Frequency	Percentage
Category of staff		
Clinicians	291	41.39
Non-clinicians	238	42.42
Total	529	41.85
Type of facility		
Primary	140	49.47
Secondary	161	39.66
Tertiary	228	39.65

Frequency (n) and percentage (%)

Specific objective four: To examine the relationship between burnout and metabolic syndrome among health workers in Accra.

4.5.3 Bivariate association between burnout and metabolic syndrome

The results showed that overall burnout was significantly associated with metabolic syndrome. Also, the study found significant associations between each of the three elements of burnout and metabolic syndrome (Table 4.19).

Table 4.19 Bivariate association between burnout and metabolic syndrome

Independent variables	Metabolic syndrome N (%)	X^2, p-value
Burnout		277.9, < 0.001
Yes	227 (87.31)	
No	33 (12.69)	
Emotional Exhaustion		348.2, <0.001
Low	127 (24.01)	
Moderate	72 (13.61)	
High	330 (62.38)	
Depersonalization		209.0, <0.001
Low	235 (44.42)	
Moderate	36 (6.8)	
High	259 (48.96)	
Personal Accomplishment		192.0, <0.001
Low	281 (53.12)	
Moderate	131 (24.76)	
High	117 (22.24)	

4.5.4 Multivariable logistic regression of the relationship between burnout and MetS

In order to determine the influence of burnout on the experience of metabolic syndrome among the participants, binary logistic regression analysis was carried out using two models (Table 4.20). Model I was a bivariate logistic regression analysis of MetS and components of burnout in Table 4.19. Model II was a multivariable logistic analysis of MetS and burnout, adjusting for age, sex, familial history of CVDs, current alcohol use, previous smoking, physical inactivity, BP, FPG, BMI and visceral fat. The results showed that for a one unit increase in overall burnout, the odds of experiencing metabolic syndrome was increased by 19.78 times (AOR=19.78, 95% CI: 12.69-30.83) as compared to those without burnout. In addition, for a unit increase in high emotional exhaustion, the odds of experiencing metabolic syndrome increased was increased by 31.44 times (AOR=31.44, 95% CI: 19.81-49.90) as compared with those with low emotional exhaustion. Similarly, for a one unit increase in high depersonalization, the odds of experiencing metabolic syndrome was increased by 7.69 times (AOR=7.69, 95% CI: 5.47-10.81) as compared to those with low depersonalization. Also, for a one unit increase in low personal accomplishment, the odds of experiencing metabolic syndrome was increased by 0.15 times (AOR=0.15, 95% CI: 0.10-0.21) as compared with those with high personal accomplishment (Table 4.20).

Table 4.20. Multivariable logistic regression of the relationship between burnout and metabolic syndrome

Independent Variables	Metabolic syndrome					
	Crude Odds ratio	**95% CI**	**P-value**	**Adjusted Odds ratio**	**95% CI**	**P-value**
Burnout						
No				Reference		
Yes	15.99	10.03-23.60	<0.001	19.78	12.69-30.83	<0.001
Emotional Exhaustion						
Low				Reference		
Moderate	0.67	0.48-0.93	0.016	0.97	0.66-1.44	0.894
High	9.83	7.22-13.37	<0.001	31.44	19.81-49.90	<0.001
Depersonalization						
Low				Reference		
Moderate	3.67	2.15-6.28	<0.001	8.82	4.83-16.11	<0.001
High	7.29	5.44-9.77	<0.001	7.69	5.47-10.81	<0.001
Personal Accomplishment						
High			Reference			
Moderate	1.13	0.81-1.57	0.47	2.63	1.72-4.04	<0.001
Low	0.19	0.14-0.24	<0.001	0.15	0.10-0.21	<0.001

Logistic regression models adjusted for age, sex, familial history of CVDs, current alcohol use, previous smoking, physical inactivity, BP, FPG, BMI and visceral fat

4.5.5 Cortisol and metabolic syndrome

There were significantly higher mean cortisol levels among the participants with metabolic syndrome (Table 4.21).

Table 4.21 Cortisol and MetS

	MetS	No MetS	P
Cortisol, nmol/l	525.09±222.71	381.49±152.77	< 0.001

Data presented as mean and standard deviation (π ±SD)

4.6 Ten-year risk of cardiovascular diseases among participants

4.6.1 Prevalence of other individual risk factors for CVDs among the participants

There was no significant difference in the other individual risk factors for CVD among the participants except for general obesity for which the clinicians appeared to have higher prevalence. The overall prevalence of systolic hypertension among the participants was 26.98%. Likewise, the overall prevalence of diabetes mellitus among the participants was 12.66%. Also, the overall prevalence of dyslipidemia was 58.07% (Table 4.22).

Table 4.22 Prevalence of CVD risk factors among the participants

CVD risk factor	Clinical N (%) 703 (55.62)	Non-Clinical N (%) 561 (44.45)	X^2, p-value	All participants N (%) 1264 (100)
Hypertension	182 (25.89)	159 (28.34)	0..953, 0.329	341 (26.98)
Diabetes mellitus type II	84 (11.95)	76 (13.55)	0.721, 0.396	160 (12.66)
General Obesity	140 (19.92)	77 (13.73)	14.75, 0.001	217 (17.17)
Abdominal Obesity	263 (37.41)	199 (35.47)	0.506, 0.477	462 (36.55)
Dyslipidemia	425 (60.46)	309 (55.08)	3.702, 0.054	734 (58.07)

Data are presented as frequency (percentages) and p-values were determined using $\chi 2$.

4.6.2 Ten-year risk of CVDs among participants

The results showed that 13.61% of the participants were at high risk of CVDs in the next decade, with non-clinicians having an increased high CVD-risk (13.73%). Furthermore, the results showed that high ten-year risk for CVDs was more prevalent among workers of the primary facility (16.25%) (Table 4.23).

Table 4.23 Ten-year risk of CVDs among participants

Profile of participants	Ten-year risk of CVDs		
	Low N (%)	Intermediate N (%)	High
Category of staff			
Clinicians	484 (68.85)	124 (17.64)	95 (13.51)
Non-clinicians	359 (63.99)	125 (22.28)	77 (13.73)
All participants	843 (66.69)	249 (19.70)	172 (13.61)
Type of facility			
Primary	155 (54.77)	82 (28.98)	46 (16.25)
Secondary	282 (69.46)	66 (16.26)	58 (14.29)
Tertiary	406 (70.61)	101 (17.57)	68 (11.83)

Frequency (n) and percentage (%)

Specific objective five: To assess the relationship between burnout and ten-year risk of CVDs among health workers in Accra.

4.6.3 Bivariate association between burnout and ten-year risk of CVDs

The results showed that overall burnout was significantly associated with high ten-year risk of CVDs. Also, the study found significant associations between each of the three elements of burnout and high ten-year risk of CVDs (Table 4.24).

Table 4.24 Bivariate association between burnout and ten-year risk of CVDs

Independent variables	Ten-year risk of CVDs			
	Low n (%)	Intermediate n (%)	High n (%)	X^2, p-value
Burnout				33.30, <0.001
Yes	94 (11.15)	78 (31.33)	88 (51.16)	
No	749 (88.85)	171 (68.67)	84 (48.84)	
Emotional exhaustion				295.7, <0.001
Low	328 (38.91)	112 (44.98)	35 (20.35)	
Moderate	341 (40.45)	26 (10.44)	0 (0)	
High	174 (20.64)	111 (44.58)	137 (79.65)	
Depersonalization				131.1, < 0.001
Low	670 (79.48)	150 (60.24)	70 (40.70)	
Moderate	40 (4.74)	5 (2.01)	15 (8.72)	
High	133 (15.78)	94 (37.75)	87 (50.58)	
Personal Accomplishment				198.4, < 0.001
Low	266 (31.55)	107 (42.97)	109 (63.37)	
Moderate	97 (11.51)	104 (41.77)	13 (7.56)	
High	480 (56.94)	38 (15.26)	50 (29.07)	

Data are presented as frequency (percentages) and p-values were determined using $\chi 2$

4.6.4 Multivariable ordinal logistic regression of the relationship between burnout and ten-year risk of CVDs

In order to determine the influence of burnout on the experience of high ten-year risk of CVDs among the participants, ordinal regression analysis was carried out using two models (Table 4.25). Model I was a bivariate ordinal regression analysis of ten-year CVD risk and burnout as well as elements of burnout that had an association with ten-year CVD risk in Table 4.24. Model II was a multivariable ordinal logistic regression analysis of ten-year risk of CVDs and burnout, adjusting for age, sex, familial history of CVDs, current alcohol use, previous smoking, physical inactivity, BP, FPG, BMI and visceral fat. The results showed that participants with overall burnout were 2.07 times more likely (AOR=2.07, 95% CI=1.73-2.40) to experience CVDs in the next ten years as compared those without burnout (Table 4. 25).

Table 4.25 Multivariable ordinal logistic regression of the relationship between burnout and ten-year risk of CVDs

Independent Variables	Ten-year risk of CVDs					
	Crude Odd ratio	**95% CI**	**P-value**	**Adjusted Odd ratio**	**95% CI**	**P-value**
Burnout						
No				**Reference**		
Yes	1.67	1.40-1.94	< 0.001	2.07	1.73-2.40	< 0.001
Emotional Exhaustion						
Low				**Reference**		
Moderate	2.05	1.72-2.37	< 0.001	7.41	5.25-9.58	< 0.001
High	3.19	2.83-3.56	< 0.001	9.06	6.87-11.26	< 0.001
Depersonalization						
Low				**Reference**		
Moderate	1.85	1.60-2.10	< 0.001	7.81	5.65-9.97	< 0.001
High	3.02	2.72-3.31	< 0.001	9.47	7.29-11.65	< 0.001
Personal Accomplishment						
Low	-0.66	-0.94-0.38	< 0.001	7.13	5.21-9.04	< 0.001
Moderate	0.49	0.20-0.78	< 0.001	5.48	3.58-7.38	< 0.001
High				**Reference**		

Ordered logistic regression models adjusting for age, sex, familial history of CVDs, current alcohol use, previous smoking, physical inactivity, BP, FPG, BMI and visceral fat.

4.4.3 Plasma cortisol and ten-year risk of CVDs

There was a statistically significant difference in the mean cortisol levels between groups with high ten-year risk of CVDs as compared to those with intermediate and low risk as determined by one-way ANOVA (*p*<0.001). A Tukey post-hoc test revealed that cortisol was significantly higher in the high ten-year risk of CVDs group (*p* <0.001) (Table 4.26).

Table 4.26 Plasma cortisol and ten-year risk of CVDs

Ten-year risk of CVDS	**Cortisol (π ±SD)**	**P**
		< 0.001
High	587.39 ±218.51	
Intermediate	467.49±215.35	
Low	404.19±172.28	

Data presented as mean and standard deviation (π ±SD)

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This study used a cross-sectional design to examine burnout, metabolic syndrome and risk of cardiovascular diseases among health workers in Accra, Ghana. The study was based on an adapted McEwen's allostatic load model, a bio-psycho-social model which looks at the effect of chronic stress on physiological systems. This section therefore discusses the findings of the study addressing each of the five objectives. The chapter begins with a discussion of the socio-demographic and job profile of the participants followed by a discussion of the objectives with reference to other published works. The concluding part of this chapter is focused on the limitations of the study.

5.2 Socio-demographic and job profile of participants

The study found that more than half of the participants were females. This is in line with reports from other studies (Asamani et al., 2019; Ibikunle et al., 2016; Odonkor & Frimpong, 2020; Osei-Yeboah et al., 2018) that females constitute the majority of the health workforce in SSA. However, Pindar and Coker (2012) found males to be the dominant health workers in northern Nigeria. The high number of females among the participants in this study was because nurses and midwives who form the majority of the health workforce are predominantly females (Asiedu et al., 2018; Mbanga et al., 2018; Nuhu et al., 2020).

The study further found that more than a quarter of the participants reported with low level of resilience. Low level of resilience is said to predispose health workers to psycho-social disorders such as burnout (Afulani et al., 2021a; Odonkor & Frimpong, 2020; Smith et al., 2008), as it reduces their abilities to cope with stress (He et al., 2014; Nuhu et al., 2020; Roohafza et al., 2014;). Asiedu et al. (2018) suggested that increasing the level of resilience of nurses is one of the effective ways of reducing burnout, and this recommendation is supported by earlier studies (Ndawula et al., 2012; Thorsen et al., 2011; Tsai et al., 2013).

In addition, the results revealed that majority of the health workers were clinicians and this is in consonance with other studies in Ghana (Asamani et al., 2019; Asiedu et al., 2018; Dapaah, 2014; Odonkor & Frimpong, 2020) that have established that clinicians are the dominant category of hospital staff. Also, almost half of the participants reportedly did additional jobs often called "locum" aside their main hospital jobs, with half of them harboring intentions of leaving their current hospital jobs. This finding of high intentions of wanting to leave the job is in line with those found by other authors (Abdo et al., 2016; Asamani et al., 2019; Ibikunle et al., 2016) who observed that majority of health workers in Egypt, Ghana and Nigeria harbor intentions of leaving their current jobs for more rewarding jobs in other jurisdictions. Similarly, other studies (Asiedu et al., 2018; Mbanga et al., 2018; Nuhu et al., 2020) have stated that most health workers in SSA contemplate migrating to other countries where they perceive health care work to be less stressful but more rewarding in terms of income.

Also, the high intentions of wanting to leave current jobs for other jobs in other jurisdictions as found in this study could be a result of the high workload and its associated burnout (Asiedu et al., 2018; Ayisi-Boateng et al., 2020; Nuhu et al., 2020). Usually, burnout is associated with apathy towards work (Afulani et., 2020a; Ibikunle et al., 2016; Roohafza et al., 2014) and this could trigger intentions of wanting to give up the job (Asamani et al., 2019; Dubale et al., 2019; Mbanga et al., 2018; Odonkor & Frimpong, 2020).

5.3 Prevalence of burnout among the participants

This study found a high prevalence of overall burnout among the health workers in Accra. This study involved a representative sample of health workers (clinicians and non-clinicians as well as among hospital staff from the different levels of the health care system) in Accra, and thus provides a better overview of the burnout situation as compared to the earlier studies in Ghana (Afulani et al., 2021a; Asiedu et al., 2018; Ayisi-Boateng et al., 2020; Odonkor & Frimpong, 2020; Opoku & Apenteng, 2014) which focused on just some sections of health workers (predominantly clinicians). The finding of high prevalence of burnout in this study is in consonance with the findings of Asiedu et al. (2018) who reported high burnout levels among nurses in Ghana. Similarly, Afulani et al. (2021a) reports that burnout is high among Ghanaian health workers and that inadequate preparedness towards the COVID-19 pandemic further compounded the situation. The fear of contracting the deadly virus makes health workers feel stressed-out and developed burnout eventually. Also, the findings in this study are in line with those of Afulani et al. (2021b) that reported that almost 30% of health workers in Kenya have burnout. In addition, the findings are in line with those found by He et al. (2014) in which burnout was reported to be high among health workers in China. However, the prevalence of burnout in this study is higher than the little over ten percent rate of burnout found by Habadi et al. (2017) among Saudi Arabian health professionals. Likewise, the finding in this study is higher than the less than the ten (10) percent prevalence found by Ayisi-Boateng et al. (2020), Yunus et al. (2009) and Odonkor and Frimpong (2020) among some sections of health workers. Similarly, the findings are in contrast with those of Opoku and colleague among physicians in which burnout levels was found to be low (Opoku & Apenteng, 2014). Furthermore, the findings are in contrast with what Langade et al. (2016) observed among health workers in India where they reported low prevalence of burnout.

In addition, the results showed that over a third (1/3) of the participants were said to be emotionally exhausted. This finding is consistent with other studies (Dubale et al., 2019; Ibikunle, et al., 2016; Ndawula, 2012). Similarly, Paiva et al. (2016) found high level of emotional exhaustion among nurses in their study. This finding is however in contrast to other studies (Neckel et al., 2017; Njim et al., 2018; Opoku & Aperteng, 2014; Pascoal et al., 2021) where it was found that emotional exhaustion was generally low. Similarly, Ayisi-Boateng et al., (2020) found emotional exhaustion to be lower among physicians in Ghana. The high emotional exhaustion makes health workers exhausted at work, leading to poor quality of care (Asiedu et al., 2018; Atindanbila et al., 2012; Dubale et al., 2019).

The study found that over a quarter (1/4) of the health workers had depersonalization and similar findings were recorded in other studies (Afulani et al., 2021a; Dubale et al., 2019; He et al., 2014). The high depersonalization among the health workers could be responsible for the poor attitudes towards service recipients in Ghana (Asiedu et al., 2018; Fiadzo et al., 1997; Konlan et al., 2020c). However, other studies in Finland, Ghana and Brazil (Ahola et al., 2006; Opoku & Apenteng, 2014; Pascoal et al., 2021) found depersonalization to be low.

Also, almost forty percent of the participants had reduced personal accomplishment. This is in contrast with the lower rates reported by Brief and Weis (2017). However, similar higher rates were found in other studies (Dubale et al., 2019; Ibikunle et al., 2016; Paiva et al., 2016). This finding of reduced personal accomplishment could be responsible for the increased intentions of participants to want to leave their current jobs as they no-longer find their jobs exciting enough (Asiedu et al., 2018). Similar reasons have been cited as responsible for the rising turnover of hospital staff (Afulani et al., 2021a; Asamani et al. 2019; Pascoal et al., 2021).

The finding of high overall burnout among the participants could be because of the inadequate resources for health care as reported by earlier studies in Ghana (Asiedu et al., 2018; Ayisi-Boateng et al., 2020; Odonkor & Frimpong, 2020; Opoku & Apenteng, 2014). Also, the rising cost of health care more especially with the emergence of COVID-19 (MOH, 2020) as well as the fear of contracting the deadly virus in the line of duty by health workers could be implicated in the high burnout rates (Afulani et al., 2021a). Other studies (Abdo et al., 2016; Atlam, 2018; Dubale et al., 2019; Mbanga et al., 2018) have suggested that inadequate resources to handle complications of HIV/AIDS, cancers and rising maternal health issues are contributory to the rising rates of burnout in SSA.

Also, the high rate of burnout found in this study can be attributed to the numerous job-related (Abdo et al., 2016; Asamani et al., 2019; Mbanga et al., 2018) and personal (Afulani et al., 2021b; Asiedu et al., 2018; Dubale et al., 2019 Ibikunle et al., 2016) challenges experienced by health workers in SSA. The under-resourced health care system (Afulani et al., 2021a; Dapaah, 2014; Dubale et al., 2019) coupled with inadequate hospital staff (Afulani et al., 2021b; Asamani et al., 2019; Ibikunle et al., 2016) as well as the inability to maintain an adequate balance between work and personal life (Asiedu et al., 2018) puts high demands on health workers and these could trigger the experience of burnout (Ibikunle et al., 2016; Mbanga et al., 2018; Odonkor & Frimpong, 2020).

Furthermore, the absence of a structured mentorship system for staff in most Ghanaian hospitals (Atinga et al., 2014; Nuhu et al., 2020; Opoku & Apenteng, 2014) to help new employees cope with work and develop high resilience against stressors at the workplace could be implicated in the high prevalence of burnout. It has been suggested that high job-related stress and burnout is partly responsible for the rising exodus of health workers to other jurisdictions (Asamani et al., 2019; Dubale et al., 2019; Ibikunle et al., 2016; Mbanga et al., 2018) and this has implications on the human resource for health situation in SSA.

5.4 Association between job-related factors and burnout

The results revealed that non-clinicians had higher burnout as compared to clinicians, and this could partly be due to the high level of resilience that was found among clinicians as compared to the non-clinicians. Resilience is one mechanism which individuals use to adapt and live with stressful situations (Afulani et al., 2021a; Asiedu et al., 2018; Pindar & Coker, 2012). Employees with high level of resilience tend to have increased capacity to deal with stressors and therefore adapt better to stressful situations at the workplace resulting in a lower risk of burnout (Dubale et al., 2019; Isreal et al., 1996; Smith et al., 2008). Also, the increased demands on the non-clinicians as they interact with different cadres of staff; both clinicians and non-clinicians increased the tendency for them to have interpersonal conflicts and its associated burnout (Afulani et al., 2021b; Dapaah, 2014; Ibikunle et al., 2016).

The study found that participants from the primary level of health care had more burnout compared to their counterparts at the secondary and tertiary levels. However, this findings is in contrast with those reported by Abdo et al. (2016); Dapaah (2014) and Ibikunle et al. (2016) where it was stated that working in specialist and tertiary facilities involved a lot of interactions between various specialist health workers and such interpersonal relationships triggered burnout as compared to working at the primary level of health care. Abdo and colleagues, (2016) aver that jobs at the primary level of care were less demanding as compared to the secondary and tertiary levels which served as referral points for the numerous primary level care facilities, and this led to increased workload and its associated burnout on health practitioners at those facilities. This finding of high burnout at the primary level of care could be because health workers at that level had less supportive colleagues compared to those at the higher level (Afulani et al., 2021a; Odonkor & Frimpong, 2020; Polikandrioti et al., 2019). Also, the low resource allocation to the primary level of health care (Asamani et al., 2019; Asiedu et al., 2018; Langade et al., 2016) predisposes workers to higher burnout due to the mismatch between job demands and resources (Afulani et al., 2021a; Dubale et al., 2019; Fiadzo et al., 1997; Mbanga et al., 2018).

Also, employees on night duties were found to have significantly higher odds of experiencing burnout and this could be due to the low material (Asiedu et al., 2018; Atinga et al., 2014;

Ayisi-Boateng et al., 2020) and human resources (Abdo et al., 2016; Afulani et al., 2021a; Dubale et al., 2019; Nuhu et al., 2020) during night shifts. Night shifts often have inadequate staff (Asamani et al., 2019; Dapaah, 2014; Fiadzo et al., 1997; Mbanga et al., 2018) and this places increased demands on the available staff with its associated burnout (Abdo et al., 2016; Afulani et al., 2021a; Dapaah, 2014; Polikandrioti et al., 2019). Furthermore, the sleep deprivation and associated hormonal imbalance among health workers doing night shifts makes them emotionally labile and thus at increased risk of burnout (Asiedu et al., 2018; McEwen & Gianaros, 2011; Isreal et al., 1886; Polikandoioti, 2009). The relaxation effect of high melatonin level (Fishburn, 2015; Melamed & Kushnir, 2015; Read & Grundy, 2012) associated with a good night sleep is minimally available for health workers on night duties and hence predisposes them to burnout (Asiedu et al., 2018: He et al., 2014; McEwen, 2015; McEwen & Sellar, 1993; Roohafza et al., 2014).

In addition, working in high dependency units (HDUs) such as the intensive care units (ICUs) and/or emergency units was associated with higher odds of experiencing burnout. Working in an HDU is associated with challenging job demands and this predisposes workers in these units to higher odds of experiencing burnout (Afulani et al., 2021a; Dubale et al., 2019; Fiadzo et al., 1997; Paiva et al., 2016). Similarly, other studies (Abdo et al., 2016; Kim et al., 2018; Mbanga et al., 2018; Peterson, 2008) have stated that working in emergency settings was associated with higher odds of experiencing burnout. Also, Atlam (2018) found that burnout was more common among staff of intensive care units. This finding require that staff engaged in HDUs be given extra support to prevent them from getting burnout since this could result in sub-optimal care and physical health conditions in victims (Afulani et al., 2021b; Asiedu et al., 2018; He et al., 2014).

Employees who did additional jobs aside their current jobs were more likely to get burnout because of the additional strain (Odonkor & Frimpong, 2020) on them. This finding is similar to what was found by Ayisi-Boateng et al. (2020) and Ibikunle et al. (2016). Hospital workers engaged in additional jobs aside their primary jobs often known as “locum work”, tend to have less time to rest and are constantly under stress (Asiedu et al., 2018; Dapaah, 2014; Odonkor & Frimpong; Nuhu et al., 2020). This constant job strain predisposes such health workers to professional burnout (Afulani et al., 2021a; Ayisi-Boateng et al., 2020; Opoku & Apenteng, 2014).

This study further found that employees who perceived their current jobs as imposing high workload had more burnout. This finding is in line with those reported in other studies (Abdo et al., 2016; Dubale et al., 2019; He et al., 2014; Kim et al., 2018) who stated that high workload influences an employee’s level of burnout.

The study further found that burnout was higher among those with no job satisfaction. Job dissatisfaction is a known determinant of burnout (Dapaah, 2014; Mbanga et al., 2018; Opoku & Apenteng, 2014). Employees who feel dissatisfied with their jobs are more likely to be emotionally unstable and at risk of experiencing burnout (Abdo et al., 2016; Atinga et al., 2014; Asiedu et al., 2018). Similarly, Opoku and Apenteng (2014) found that job satisfaction among physicians was associated with lower risk of experiencing burnout. Satisfied health workers have increased motivation to work and this intrinsic desire to perform up to set standards has been found to be a protective factor against burnout (Asiedu et al., 2018; Dubale et al., 2019; Opoku & Apenteng, 2014; Silvia-Holmes et al., 2017).

5.5 Risk of cardiovascular diseases

5.5.1 Prevalence of metabolic syndrome among participants

This study found a high prevalence of metabolic syndrome among the participants. This finding is in line with the findings of Osei-Yeboah et al. (2018) where a high prevalence (28.7%) of metabolic syndrome was found among a cross-section of health workers at Sefwi–

Wiawso, Ghana. Also, the finding of high metabolic syndrome is in line with those found among health workers in Mexico (Chico-Barba et al., 2019) and China (He et al., 2014). Further, the study found that non-clinicians had higher prevalence of metabolic syndrome. This finding is in contrast with the findings of Kasu et al. (2015) where obesity, a key risk factor for metabolic syndrome was found to be higher among clinicians. However, the finding are in line with Harley et al. (2011) who found that 43% of employees were overweight and 13% being obese with most of them meeting the criteria for metabolic syndrome diagnosis.

Similarly, in other studies (Afulani et al., 2021b; Bosu, 2015; Gyang et al., 2018), metabolic syndrome among primary health care employees ranged from 25% to 44.7% and this is in consonance with what was found in this study where metabolic syndrome was found to be common among health workers engaged in the primary level facility. However, this finding is in contrast with those found by Addo et al. (2012) and Nyiambam et al. (2020). The possible reason for the high prevalence of metabolic syndrome particularly among employees of the primary level of care could possibly be as a result of the high burnout (chronic stress) found among those employees. This is rightly so because burnout has been established as a risk factor for metabolic syndrome among health workers (Chico-Barba et al., 2019; He et al., 2014; Jahromi et al., 2017; Moy & Bulgiba, 2010; Osei-Yeboah et al., 2018). The suggested mechanism is that burnout is said to activate the sympatho-adreno-medullary axis in the short term and the hypothalamo-hypophyso-adrenal axis in the long run leading to high epinephrine and cortisol levels (Osei-Yeboah et al., 2018). These increase the risk of metabolic syndrome (Chico-Barba et al., 2019; Gyang et al., 2018; He et al., 2014; Kyle et al., 2017). It is not surprising that this study further found that participants with metabolic syndrome had higher mean levels of cortisol as has been reported elsewhere (Chico-Barba et al., 2019; He et al., 2014; Kivimaki et al., 2015) and this hypercortisolemia could be responsible for the high rate of metabolic syndrome (Duodu, 2015; Chico-Barba et al., 2019; He et al., 2014; Osei-Yeboah et al., 2018).

Another possible reason accounting for the high prevalence of metabolic syndrome among the participants in this study is the female preponderance for obesity, a key risk factor, for metabolic syndrome (Duodu, 2015; Kyle et al., 2017; Yeboah et al., 2018) and health care employees are tilted towards the female sex (Asamani et al., 2019; Mbanga et al., 2018; Odonkor & Frimpong, 2020). The high obesity among health workers predisposes them to metabolic syndrome and other NCDs as obesity is a key determinant of metabolic syndrome (GHS, 2014; He et al., 2014; Moy & Bulgiba, 2020; Ofori-Asenso et al., 2016).

Other possible reasons for the high metabolic syndrome is the sedentary lifestyle among working populace (Chico-Barba et al., 2019; Duodu, 2015; He et al., 2014), cultural appreciation of fatness as a sign of good living and affluence (Kasu et al., 2015; Osei-Yeboah et al., 2018: Yeboah et al, 2018) as well as rising urbanization with its associated "fast foods" consumption (Duodu, 2015). Also, health workers are often concerned about the health and welfare of others (Asiedu et al., 2018; Duodu, 2015; Nuhu et al., 2020; Osei-Yeboah et al., 2018) making them to neglect their own health (Afulani et al., 2021a; Duodu, 2015; He et al., 2014; Roohafza et al., 2014). They care less about their eating patterns and do not get time to engage in structured physical activities due to their busy work schedules and these contribute to them experiencing MetS (Kasu et al., 2015; Kyle et al., 2017; Nuhu et al., 2020).

5.5.2 Other individual risk factors for cardiovascular diseases among the participants

The study found that over a third of the participants had familial history of CVDs as compared to the 28% found by Yeboah et al. (2018) among young adults in urban Ghana. Furthermore, the results give an indication that the use of alcohol, tobacco smoking and physical inactivity which are risky lifestyle patterns are highly prevalent among the study participants who are supposed to be mentors to the public particularly in relation to health and live exemplary lives. Similar findings of risky lifestyle choices were found in other studies (Duodu, 2015; He et al., 2014; Osei-Yeboah et al., 2018). This finding of risky lifestyle patterns is a source of concern due to how these negative lifestyle patterns could affect work efficiency (Ibikunle et al., 2016; Opoku & Apenteng, 2014; Pascoal et al., 2021) as well as employees' physical health (Chico-Barba et al., 2019; He et al., 2014; Nuhu et al., 2020; Roohafza et al., 2014)..

Also, the study found that clinicians had higher weight, BMIs, and waist-hip ratio than their non-clinical counterparts. This finding is consistent with earlier works (Kyle et al., 2017; Osei-Yeboah et al., 2018; Yeboah et al., 2018) where it was stated that clinicians tend to have increased general and abdominal obesity. The high rate of obesity in the clinicians is partly because majority of them are females (Asamani et al., 2019) and are at increased tendency to have high fat deposition due to the role of estrogen on fat deposition particularly in premenopausal women (Chico-Barba et al., 2019; McEwen, 2015; Melamed et al., 2006; Nuhu et al., 2020; Osei-Yeboah et al., 2018). Also, the high prevalence of obesity and dyslipidaemia among the clinicians could possibly be due to the sedentary lifestyles of clinicians who are overwhelmed with increased workload that they hardly get time to engage in structured exercises (Osei-Yeboah et al., 2018).

Furthermore, the clinical participants had higher systolic BPs as compared to their non-clinical counterparts and this is partly due to the increased obesity associated with clinical staff (Duodu, 2015; Gyang et al., 2018; Kyle et al., 2017; Osei-Yeboah et al., 2018). In addition, the study found that the overall prevalence of hypertension was 25.7% among the participants. This is in consonance with the findings of Sumaila et al. (2016) that over twenty percent of health workers were hypertensive in Nigeria. It is also in line with the findings of Gyang et al. (2018) who reported hypertension to be high among health care employees.

This study points to a high prevalence of diabetes mellitus type II as compared to the rate reported in other studies (Duodu, 2015; GHS, 2014; Mistire et al., 2013; Owusu et al., 2013). However, similar findings were reported by Osei-Yeboah et al. (2018) who stated that insulin resistance and its resultant hyperglycemic state was high among health workers in Ghana. The high abdominal obesity as well as hypercortisolemia could trigger insulin resistance and increase the rate of diabetes mellitus (Agaba et al., 2017; Chico-Barba et al., 2019; GHS, 2014; Melamed et al., 2006; Yeboah et al., 2018; WHO, 2015a).

Also, there was high dyslipidemia among the participants and this is similar to the findings of Nuhu et al. (2020) where dyslipidemia was found to be high among hospital workers. The findings are further in line with those of He et al. (2014) among Chinese and Chico-Barba et al. (2019) among Mexican health workers. The underlining possible cause could be due to the high rate of cortisol and obesity (Osei-Yeboah et al., 2018) which induces abnormal lipid metabolism (He et al., 2014; McEwen, 2015; Kyle et al., 2017).

The study found that more than a third of the participants had either intermediate or high risk of developing CVDs in the next decade. This results suggest that over a third of health workers in Accra will develop CVDs by 2030; a time Ghana should be achieving the SDG three targets of improving the availability of skilled workforce and reducing the prevalence of NCDs in the general population and health workers in particular (UN, 2015). This finding is in line with the findings of Bosu (2015), Lin & Li (2009), Sumaila et al. (2016) and Kivimaki et al. (2012) who found that the risk for CVDs was high among working populations. Also, the study found the non-clinicians to have a high tendency to develop CVDs as compared with their clinical counterparts. This finding is in contrast with those found in earlier studies (Chico-Barba et al., 2019; Melamed et al., 2006; Osei-Yeboah et al., 2018; Sumaila et al., 2016). The probable explanation for the high risk of CVDs among the non-clinicians could possibly be due to their lower knowledge on healthy lifestyle practices

(Chico-Barba et al., 2019; He et al., 2014; Melamed & Kushnir, 2015). Also, since most of the non-clinicians are involved in administrative and management duties, they are more likely to have sedentary lifestyles at work as compared with their clinical counterparts and this probably could be responsible for their increased ten-year risk of CVDs (Afulani et al., 2021b; Ahmed, 2018; Kasu et al., 2015; Melamed et al., 2006)

In addition, the high ten-year risk of CVDs among the participants could be due to the high prevalence of metabolic syndrome (Jahangiry et al., 2017; Jahromi et al., 2018; Kivimaki et al., 2015; Osei-Yeboah et al., 2018) as metabolic syndrome in the long run predisposes victims to CVDs (Gyang et al., 2018; Kyle et al., 2017; Yeboah et al., 2018). Furthermore, the high ten-year risk of CVDs among the participants particularly the non-clinicians is probably related to the high job-related burnout (chronic stress) (Jahangiry et al., 2017; Kitaoka-Higashiguchi et al., 2009; Roohafza et al.,2014) and low physical activity (Kasu et al., 2015; Jahromi et al., 2017; Kivimäki et al., 2015). Exposure to chronic stress (burnout) has been established as a predictor of CVDs (Melamed & Kushnir, 2015) via the dysregulation of the hypothalamic-hypophyseal-adrenal axis (Ahmed, 2018; He et al., 2014; Kitaoka-Higashiguchi et al., 2009; Lin & Li, 2009; Melamed & Kushnir, 2015). Also, the associated unhealthy lifestyle choices among workers that are experiencing burnout such as physical inactivity, excessive alcohol use, smoking and increased intake of “fast” foods that have been reported in other studies (Kasu et al., 2015; Melamed et al., 2006; Osei-Yeboah et al., 2018) could be contributory to burnout-related increased risk of CVDs.

5.6 Relationship between burnout and metabolic syndrome

The results showed that participants with burnout had increased odds of experiencing metabolic syndrome. This is in line with other studies (Chico-Barba et al., 2019; Hartley et al., 2011; He et al., 2014) where it was found that burnout among health workers was associated with metabolic syndrome. The plausible explanation as stated earlier could be through burnout induced dysregulation of the hypothalamic-pituitary-adrenal axis (Kivimaki et al., 2012; Melamed & Kushnir, 2015; Melamed et al., 2006) which predisposes health workers to chronic stress hormonal imbalance and a resultant metabolic syndrome (Chico-Barba et al., 2019; He et al., 2014; Ofori-Asenso et al., 2017; Osei-Yeboah et al., 2018). As espoused by the allostatic load model (Kivimaki et al., 2015; McEwen & Gianaros, 2011; Melamed & Kushnir, 2015; Read & Grundy, 2012), the individual health worker is a bio-psycho-social being who adapts to chronic stress using the biological adaptive system of the hypothalamic-hypophyseal-adrenal axis (Kivimaki et al., 2012; Melamed et al., 2006; Selim et al., 2018). Exposure to chronic job-related stress results in the adaptive systems of the affected health worker becoming persistently activated and this results in an upsurge in stress hormones, particularly cortisol with its negative physiological consequence of insulin resistance and activation of the renin angiotensin aldosterone system leading to obesity, hyperglycemia, rise in BP and resultant metabolic syndrome (Ahmed, 2018; He et al., 2014; Melamed et al., 2006; Read & Grundy, 2012; Roohafza et al., 2014).

Also, the associated depressive symptoms among employees who are experiencing burnout may make them to resort to substance abuse such as tobacco smoking, and excessive alcohol use, and these negative lifestyle patterns are risk factors for metabolic syndrome (Kitaoka-Higashiguchi et al., 2009). Similar findings were reported by Chico-Barba et al. (2019) and He et al. (2014) in which the authors observed that health workers experiencing burnout tend to have depressive symptoms with its associated unhealthy lifestyle choices predisposing them to metabolic syndrome.

5.7 Relationship between burnout and the ten-year risk of CVDs

The results showed that health workers who had burnout displayed high risk of CVDs in the next decade. This is the first Ghanaian study which evaluated the association of burnout with the ten-year risk of CVDs. This finding is in line with the findings of other studies (Jahromi et al., 2017; Kitaoka-Higashiguchi et al., 2009; Kyle et al., 2017; Melamed & Kushnir, 2015; Sumaila et al., 2016) who observed an increased CVD-risk among health workers who were experiencing burnout. The authors (Jahromi et al., 2017; Kitaoka-Higashiguchi et al., 2009; Kyle et al., 2017; Melamed et al., 2006; Melamed & Kushnir, 2015; Sumaila et al., 2016a) cited chronic stress hormonal dysregulation to be principally responsible. Also, the above authors argue that the protective effect of estrogen is lost in female employees experiencing burnout syndrome and this contributes in enhancing atherosclerotic process even in pre-menopausal health workers.

Long term hormonal dysregulation following burnout causes pathological states of the heart and the blood vessels (Chico-Barba et al., 2019; Duodu, 2015; Jahromi et al., 2017; Kitaoka-Higashiguchi et al., 2009) leading to CVDs. The underlining direct mechanism is based on the biological plausibility espoused by the allostatic load model in which chronic stress leads to persistent hypercortisolemia, metabolic syndrome and eventual pathological state of the heart and the blood vessels (Afulani et al., 2021b; Beckie, 2012; Read & Grundy, 2012). Similarly, Kitaoka-Higashiguchi et al. (2009) found that burnout was associated with high levels of cortisol and this enhanced lipid abnormalities and eventual atherosclerosis in workers with burnout syndrome. Other studies (He et al., 2014; Melamed et al., 2006; Roohafza et al., 2014) have cited the biological pathway in which there is persistent activity of the SAM and HPA leading to increased epinephrine and cortisol levels as the direct link between burnout and CVDs.

In addition to the direct pathway, some authors (He et al., 2014; Lin & Li, 2009; Melamed et al., 2006; Peterson et al., 2008) argue that burnout triggers unhealthy lifestyle choices such as physical inactivity, excessive alcohol intake and smoking in affected persons, and these could trigger CVDs (Hartley et al., 2011; He et al., 2014; Kitaoka-Higashiguchi et al., 2009). Even though health workers are supposed to be knowledgeable about the risk factors of CVDs

(Osei-Yeboah et al., 2018) and generally live healthier lives, most studies (Gyang et al., 2018; Kasu et al., 2015; Kyle et al., 2017; Melamed et al., 2006; Melamed & Kushnir, 2015; Osei-Yeboah et al., 2018) have stated that most health workers are often so busy with their work schedules especially those in demanding work environment that they ignore their personal health and become victims to chronic diseases like CVDs (He et al., 2014; Melamed et al., 2006; Ofori-Asenso & Garcia, 2016).

In addition, health workers are generally adults and therefore have the normal predisposition to CVDs as they age, just like other adults in the general population (Duodu, 2015; Jahromi et al., 2017; Kitaoka-Higashiguchi et al., 2009; Ofori-Asenso & Garcia, 2016). Likewise, female health workers loose the protection offered by estrogen as they age and this contributes to their increased risk of experiencing CVDs post-menopause (Melamed et al., 2006).

5.8 Limitations of the study

Although the study examined burnout syndrome and risk of CVDs among health workers in Accra, it is important to situate the conclusions in the context of the limitations of the study. Firstly, the design that was used for the study was a cross-sectional design; hence, causality cannot be inferred from the findings (Creswell, 2009 and Polit & Beck, 2014). The study only depicts a relationship between the variables and does not in any way infer causation. However, the findings provide insights for possible longitudinal and experimental studies to establish possible causation.

The study was conducted in only three public hospitals out of the over eight hundred in the Greater Accra region, and hence there may be a limit to the extent to which the findings can be generalized to other health workers in hospitals that were not selected. However, to overcome the effects of this limitation, the chosen hospitals were purposively selected to represent the three levels of the public health care system in Accra. It is believed that the hospitals that were not selected share common features with the selected facilities and that the health workers are invariably similar in characteristics (Afulani et al., 2021a; Asamani et al., 2019; Odonkor & Frimpong, 2020).

The adapted MBI-HSS tool which was used for assessing burnout syndrome required the participants to recall information from their work over the past few weeks and this could have been affected by recall bias. To overcome this limitation, the participants were asked to frankly answer the questions on the questionnaire and to try and remember incidents before choosing their responses on the questionnaire. They were given between twelve to twenty four hours to vividly respond to the questions on the questionnaire.

Also, the high level of burnout among the participants could be because of the impact of COVID-19 on the psychological state of health workers as reported by Afulani et al. (2021a) that inadequate preparedness against COVID-19 was associated with burnout among health workers. This finding could be responsible for the high burnout among the participants in this study.

Furthermore, the data collection was done in the mornings between 6:00am to 9:00am due to the biochemical parameters like fasting plasma glucose, cortisol and lipid profile which are best measured from morning blood samples (McEwen, 2015). This meant that majority of those who took part in the study were either night or morning duty staff who were largely at post during the time of the data collection. However, to overcome this challenge, the researcher recruited most of the participants in the evenings a day before their involvement in the study.

Another limitation of the study was that it did not measure the level of insulin but rather used the level of fasting plasma glucose as a proxy to estimate insulin resistance (McEwen, 2015).

In addition, per the sample size calculation, the overall minimum sample size for clinicians and non-clinicians was 1366. However, the number of study participants who completed the study was 1264. This is less than the minimum sample size required for the study. Hence the study was under-powered and the scientific rigor compromised. However, the study sets a stage on what percentage of the minimum sample size should be added to the sample size to cater for non-response. It is recommended that future studies among health workers consider a non-response rate of twenty percent (20%) as compared to the 10% non-response rate that was added to the sample size in this study.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter provides a summary of the major findings of the study in line with the study objectives, and relevant conclusions for each objective. It further provides the novel findings in this study as contributions of the study to knowledge. It concludes by providing the implications of the study for public health decision-making, recommendations of the study, and suggestions for further research and for policy makers.

6.2 Summary of findings

The study examined burnout, metabolic syndrome and risk of cardiovascular diseases among health workers in Accra, the most urbanized town in the Greater Accra Region of Ghana. Specifically, the study sought to; determine the prevalence of burnout among health workers in Accra, identify the job-related factors associated with burnout among health workers in Accra, determine the prevalence of metabolic syndrome among health workers in Accra, examine the relationship between burnout and metabolic syndrome among health workers in Accra and assess the relationship between burnout and the ten-year risk of CVDs among health workers in Accra.

A cross-sectional survey was conducted among 1,264 health workers randomly selected in three purposively selected public hospitals in Accra representing the primary, secondary and tertiary levels of health care in the Accra. The participants filled out a structured questionnaire and certain measurements and laboratory test were done.

The main findings of the study included:

1. The study revealed that the prevalence of burnout among the participants using the adapted MBI-HSS was 20.57% with non-clinicians displaying higher burnout (26.74%) compared to clinicians (15.64%). Also, the prevalence of burnout was highest among employees of the primary level of health care (36.04%).
2. The results showed that aside job support and job control, the other job-related factors were significantly associated with burnout. Particularly, night shift and working at the primary level of care were associated with higher odds of experiencing burnout.
3. The prevalence of metabolic syndrome using the NCEP-ATP III revised criterion was 41.39% for the clinicians and 42.42% for the non-clinicians. The overall prevalence of metabolic syndrome among the study participants was 41.85%. Again, the prevalence of metabolic syndrome just as in burnout was highest among participants from the primary level facility.
4. In addition, the results showed a significant association between burnout and metabolic syndrome. For a one unit increase in burnout, the odds of experiencing metabolic syndrome increased by a factor of 19.78 (AOR=19.78, 95% CI: 12.69-30.83) when adjusted for age, sex, familial history of CVDs, current alcohol use, previous smoking, physical inactivity, BP, FPG, BMI and visceral fat.
5. Furthermore, the results showed that burnout was significantly associated with high ten-year risk of CVDs. Thus, for a one unit increase in burnout, the odds of experiencing high ten-year risk of CVDs increased by a factor of 2.07 (AOR= 2.07, 95% CI: 1.73-2.40) when adjusted for age, sex, familial history of CVDs, current alcohol use, previous smoking, physical inactivity, BP, FPG, BMI and visceral fat.

6.3 Conclusion

There is high prevalence of burnout among health workers in Accra. Night shift and working at the primary level of health care are associated with the highest rate of burnout. Also, burnout is associated with MetS and increased ten-year risk of CVDs. It is recommended that a national burnout risk assessment among health workers should be undertaken by the GHS to establish the countrywide prevalence. Also, the GHS should ensure shift rotation among staff as well as adequate resource allocation for night shifts and primary health care institutions. Furthermore, the MOH should put in place policies to boost the resilience of health workers through scheduled psychological counseling and structured mentorship program. In addition, annual mandatory medical screening for health workers should be instituted by the MOH/GHS to aid in early CVD risk identification and targeted management.

6.4 Contributions of the study to knowledge

This study is one of the first in Ghana that determined physiological and psychological measures of chronic stress in a combined and representative sample of health workers in Accra. Physiological and psychological levels of stress were measured using plasma cortisol enzyme-linked immunoassay and an adapted MBI-HSS respectively. Earlier studies in Ghana (Asiedu et al., 2018; Ayisi-Boateng et al., 2020; Nuhu et al., 2020; Opoku & Apenteng, 2014) have mostly focused on psychological measures of stress and the samples were restricted largely to nurses/midwives and physicians. The few others that have examined burnout among all health workers (Afulani et al., 2021a; Atinga et al., 2014 Odonkor & Frimpong, 2020) had small sample sizes and generated inconclusive results. This study contributes to the field of knowledge by determining both the psychological and physiological measures of chronic stress in a combined and representative sample of health workers in urban Ghana. In addition, the use of the adapted MBI-HSS with its high reliability and validity ensured accurate measurements of burnout syndrome. This is the first time such a tool has been used successfully in a comprehensive sample of health workers in Accra.

Another novel contribution of this study is the determination of the allostatic load among health workers in Accra in the Greater Accra region of Ghana. The study determined the physiological wear and tear on bodily systems of health workers using eleven (11) biomarkers from neuro-endocrine, cardiovascular, metabolic and anthropometric systems. This is the first time of determining the allostatic load among health workers in Ghana. It expands the stress-disease literature by determining a cascade of multi-system physiological dysregulation that contributes to disease trajectories among health workers in resource-constrained settings. Most studies in SSA (Abdo et al., 2016; Afulani et al., 2021; Asiedu et al., 2018; Dapaah, 2014; Dubale et al., 2019; Mbanga et al., 2018; Odonkor & Frimpong, 2020) have largely focused on the impact of burnout syndrome on employee attitudes and organizational performance; none has focused on the link between burnout and sub-clinical physiological dysregulation measured in terms of allostatic load.

Also, the study determined the association between job-related burnout and actual physical health problems (metabolic syndrome and other CVD-risk factors) among health workers in Accra. The study links two distinct disease conditions: burnout syndrome and cardiovascular diseases. Traditional studies among health workers in Ghana (Afulani et al., 2021a; Ayisi-Boateng et al., 2020; Asiedu et al., 2018; Dapaah, 2014; Duodu, 2015; Kasu et al., 2015; Korsah, 2011; Odonkor & Frimpong, 2020, Osei-Yeboah et al., 2018) have largely looked at these conditions in isolation, but comprehensive studies that examine the association between the two disease conditions are limited, and this study helps to bridge this gap.

In addition, the study contributes to knowledge through its finding of increased odds of experiencing burnout and cardiovascular diseases among hospital staff engaged on night shifts and at the primary level of health care. This is useful in understanding the long term psycho-social and physiological impact of being on night shifts as well as working at the primary level of health care where resources are generally limited (Afulani et al., 2021b; Asamani et al., 2019; Dapaah, 2014). This provides some insights into the impact of rendering services in resource-constrained shifts (Atinga et al., 2014; Dapaah, 2014; He et al., 2014; Ibikunle et al., 2016; Opoku & Apenteng, 2014) and facilities (Ayisi-Boateng et al., 2020; Odonkor & Frimpong, 2020; Osei-Yeboah et al., 2018) and serves as a useful guide in risk stratification of health workers in Accra.

Furthermore, the study contributes to knowledge by predicting the ten-year risk of developing CVDs among health workers in Accra. This is the first study which has predicted the ten-year risk of CVDs among clinicians and non-clinicians in Accra. Assessing the participants' risk of developing CVDs in the next decade is one of the ways of determining the future occurrence of CVDs among health workers and an essential guide for decisions concerning human resources for health. This is useful in reducing disease-related staff turnovers and a positive step towards meeting the SDG targets related to health by 2030 (Asamani et al., 2019).

6.5 Recommendations

6.5.1 Recommendations for practice

Considering that burnout syndrome has been found to be very prominent among health workers in Accra, it is recommended that the HR unit of the Ministry of Health should embark on a national burnout risk assessment to determine the country wide prevalence of the phenomenon of burnout. This will help early burnout risk identification and targeted management for those meeting the threshold for diagnosis so as to retain experienced health workers in order to meet the SDG-target of having adequate skilled health workforce by 2030.

Also, considering the high prevalence of metabolic syndrome among the health workers, it is recommended that the HR units of the various hospitals in particular and the Ghana Health Service in general should put in place mandatory annual medical examination for their employees to aid in early identification of burnout and metabolic syndrome as well as CVDs. Thereafter, targeted treatment of those diagnosed should be done to prevent loss of skilled workforce.

In addition, it is recommended that professional associations such as the Ghana Medical Association, Pharmaceutical Society of Ghana, Ghana Registered Nurses and Midwives Association, and the Health Workers Union should organize Continuous Professional Development (CPD) programs in the various hospitals on burnout syndrome to create awareness of this psycho-social disorder.

6.5.2 Recommendations for policy makers

Considering the high prevalence of burnout among the participants, it is recommended that the MOH, Ghana should develop and implement a staff mentorship policy which will help health workers develop resilience and emotional intelligence to help reduce burnout amongst them. High resilience has been found to be associated with low burnout (Afulani et al., 2021; Dapaah, 2014; Asiedu et al., 2018; Odonkor & Frimpong, 2020) and mentorship has been identified as one of the ways to increase the resilience of health workers (Gilles et al., 2013; Dubale et al., 2019; Tsai et al., 2013).

Furthermore, the MOH should develop a staff medical care policy that will require mandatory annual assessment of health workers for NCDs. Ten-year CVD-risk estimation should be incorporated into this mandatory assessment to enable health workers know their risk status so that they can adopt appropriate measures to improve their health.

6.5.3 Recommendations for future research

Considering that this study was cross-sectional and pointed to an association between burnout and increased risk of CVDs, longitudinal studies are needed to establish burnout as a causal factor for CVDs among health workers in Ghana.

Also, interventional studies which focus on the possible benefit of scheduled psychological counseling and resilience building through structured mentorship programmes are needed to find ways of reducing burnout among health workers in resource constrained settings.

REFERENCES

Abdo, S.A., El-Sallamy, R.M., El-Sherbiny, A.A., & Kabbash, I.A. (2016). Burnout among physicians and nursing staff working in the emergency hospital of Tanta University, Egypt. *East Mediterr Health J*, 21(12):906-15.doi: 10.26719/2015.21.12.906.

Abshire, D. A. (2014). Cardiovascular disease risk factors among emerging adults in college. *ProQuest Dissertations and Theses*, 113. Retrieved from http://ezproxy.lib.umb.edu/login?url=http://search.proquest.com/docview/1764221257?accountid=28932%5Cnhttp://linksource.ebsco.com/linking.aspx?sid=ProQuest+Dissertations+&+Theses+Global&fmt=dissertation&genre=dissertations+&+theses&issn=&volume=&issue=&d

Adam, E.K. & Kumari, M. (2009). Assessing salivary cortisol in large-scale, epidemiological research. *Psychoneuroendocrinology*, 34 (10): 1423-36. doi: 10.1016/j.psyneuen.2009.06.011.

Addo, J., Agyemang, C., Smeeth, L., de-Graft Aikins, A., Edusei, A.K., & Ogedegbe, O. (2012). A review of population-based studies on hypertension in Ghana. *Ghana Med J*, 46(2 Suppl):4-11.

Adler, A.I., Stevens, R.J., Neil, A., Stratton, I.M., Boulton, A.J., & Holman, R.R. (2002). UKPDS 59: hyperglycemia and other potentially modifiable risk factors for peripheral vascular disease in type 2 diabetes. *Diabetes Care*, 25(5):894-9. doi: 10.2337/diacare.25.5.894.

Afulani, P.A., Gyamerah, A.O., Nutor, J.J., Laar, A., Aborigo, R.A., Malechi, H., et al. (2021a). Inadequate preparedness for response to COVID-19 is associated with stress and burnout among health care workers in Ghana. *PLOS ONE*, 16(4): e0250294. https://doi.org/10.1371/journal. pone.0250294

Afulani, P.A., Ongeri, L., Kinyua, J. et al. (2021b). Psychological and physiological stress and burnout among maternity providers in a rural county in Kenya: individual and situational predictors. *BMC Public Health*, **21,** 453. https://doi.org/10.1186/s12889-021-10453-0

Agaba, E. I., Akanbi, M. O., Agaba, P. A., Ocheke, A. N., Gimba, Z. M., Daniyam, S., & Okeke, E. N. (2017). A survey of non-communicable diseases and their risk factors among university employees: a single institutional study. *Cardiovascular Journal of Africa*; 28:1-8.

Agyei-Mensah, S., & de-Graft Aikins, A. (2010). Epidemiological transition and the double burden of disease in Accra, Ghana. *Journal Urban Health; 87*(5):879-97. doi: 10.1007/s11524-010-9492-y.

Agyemang, C.G., Attah-Adjepong, E., Owusu-Dabo, A., De-Graft Aikins. J., Addo. A. K., Edusei, B. C., & Nkum, G. (2012). Stroke in Ashanti Region of Ghana. *Ghana Medical Journal*, 46 (2 Suppl): 12-17.

Ahmed, M. T., Jadhav, J., & Sobagaiah, R. T. (2018). Assessment of risk factors of non-communicable diseases among health care workers in Nelamangala: a cross sectional study. *International Journal Of Community Medicine And Public Health*, *5*(2), 745. https://doi.org/10.18203/2394-6040.ijcmph20180261

Ahola, K., Honkonen, T., Isometsä, E., Kalimo, R., Nykyri, E., Koskinen, S., Aromaa, A., & Lönnqvist, J. (2006). Burnout in the general population. Results from the Finnish Health 2000 Study. *Soc Psychiatry Psychiatr Epidemiol*, 41(1):11-7. doi: 10.1007/s00127-005-

0011-5.

Akkuş, Y., Karacan, Y., Göker, H., & Aksu, S. (2010). Determination of burnout levels of nurses working in stem cell transplantation units in Turkey. *Nurs Health Sci.*, 12(4):444-9. doi: 10.1111/j.1442-2018.2010.00557.x.

Alexander, G.K., Rollins, K., Walker, D., Wong, L. & Pennings, J. (2015). Yoga for Self-Care and Burnout Prevention Among Nurses. *Workplace Health Safety*, 63(10):462-70; quiz 471. doi: 10.1177/2165079915596102.

Alhajjar, B. I. (2013). A programme to reduce burnout among hospital nurses in Gaza-Palestine. *International Journal of Preventive Medicine Research*, Vol. 4, No. 4, pp. 98-105 http://www.aiscience.org/journal/ijpmr

Alreck, P. L. & Settle, R. B. (1985). Planning your survey. *American Demographics*: 12

Alwan, A. (2011) Global Status Report on Non-communicable Diseases 2010. World Health Organization, Geneva

Ambrose, J. A., & Barua, R.S. (2004). The pathophysiology of cigarette smoking and cardiovascular disease: An update. *Journal of the American College of Cardiology* 43 (10): 1731-1737.

American Heart Association (AHA). (2018). Cardiovascular Disease & Diabetes. [Online]. Available from: http://www.heart.org/HEARTORG/Conditions/More/Diabetes/WhyDiabetesMatters/Cardiovascular-Disease-Diabetes_UCM_313865_Article.jsp#.WzjpPy3pOgQ [Accessed: 1 July 2020].

Amoah, A. (2009). Spectrum of cardiovascular disorders in a national referral centre, Ghana.

East African medical journal, 3; 70-77.

Anand, S.S. & Yusuf, S. (2011). Stemming the global tsunami of cardiovascular disease. *Lancet*, 377(9765):529-32. doi: 10.1016/S0140-6736(10)62346-X.

Anduaga-Beramendi, A., Beas, R., Maticorena-Quevedo, J., & Mayta-Tristán, P. (2019). Association Between Burnout and Intention to Emigrate in Peruvian health-care Workers. *Safety and health at work*, *10*(1), 80–86. https://doi.org/10.1016/j.shaw.2018.08.004

Appiah, L. T., Sarfo, F. S., Agyemang, C., Tweneboah, H. O., Appiah, N. A. B. A., Bedu-Addo, G., & Opare-Sem, O. (2017). Current trends in admissions and outcomes of cardiac diseases in Ghana. *Clinical Cardiology*, *40*(10), 783–788. https://doi.org/10.1002/clc.22753

Arranz, S.G., Chiva-Blanch, P., Valderas-Martínez, A., Medina-Remón, R., Lamuela-Raventós, M., & Estruch, R. (2012). Wine, beer, alcohol and polyphenols on cardiovascular disease and cancer. *Nutrients* 4 (7): 759-781.

Artigao-Rodenas, L. M., Carbayo-Herencia, J. A., Divisón-Garrote, V. F., Gil-Guillén, J., Massó-Orozco, M., Simarro-Rueda, F., Molina-Escribano, C., Sanchis, L., & De-Coca E. L. (2013). Framingham risk score for prediction of cardiovascular diseases: a population-based study from southern Europe. *PLOS ONE*, 8 (9): e73529.

Assmann, G., Cullen, P., & Schulte, H. (2002). Simple Scoring Scheme for Calculating the Risk of Acute Coronary Events Based on the 10-Year Follow-Up of the Prospective Cardiovascular Münster (PROCAM) Study. *Circulation*, 105 (3): 310-315.

Asamani, J. A., Amertil, N. P., Ismaila, H., Francis, A. A., Chebere, M. M., & Nabyonga-orem, J. (2019). Nurses and midwives demographic shift in Ghana - the policy implications of a looming crisis. *Hum. Resour. Health*, 17:32. doi: 10.1186/s12960-019-0377-1

Asiedu, E.E.A., Annor, F., Amponsah-Tawiah, K., & Dartey-Baah, K. (2018). Juggling family and professional caring: role demands, work-family conflict and burnout among registered nurses in Ghana. *Nurs Open*, 5(4):611–20.

Atlam, S. A. (2018). Burnout Syndrome: Determinants and Predictors among Medical Students of Tanta University, Egypt. *The Egyptian Journal of Community Medicine, 36*(01), 61–73. https://doi.org/10.21608/ejcm.2018.6870

Atindanbila, S., Abasimi, E., & Anim, M.T. (2012). A Study of Work Related Depression, Anxiety and Stress of Nurses at Pantang Hospital in Ghana. *Res Humanit Soc Sci.* 2:1–8

Atinga, R. A., Domfeh, K. A., Kayi, E., Abuosi, A., & Dzansi, G. (2014). Effects of perceived workplace politics in hospitals on nurses' behavioral intentions in Ghana. *Journal of Nursing Management*, *22*(2), 159–69. doi:10.1111/jonm.12178

Ayisi-Boateng, N.K., Bankah, M.E., Ofori-Amankwah, G.K., Egblewogbe, D.A., Ati, E., Opoku, D.A., Appiah-Brempong, E., & Spangenberg, K. (2020). A cross-sectional self-assessment of burnout amongst a sample of doctors in Ghana. *African Journal of Primary Health Care & Family Medicine.* ISSN: (Online) 2071-2936, (Print) 2071-2928

Babbie, E. & Mouton, J. (2001). The Practice of Social Research. Cape Town: Oxford

Balagopal, P.B., de Ferranti, S.D., Cook, S., Daniels, S.R., Gidding, S.S., Hayman, L.L., McCrindle, B.W., Mietus-Snyder, M.L., & Steinberger, J. (2011). American Heart Association Committee on Atherosclerosis Hypertension and Obesity in Youth of the Council on Cardiovascular Disease in the Young; Council on Nutrition, Physical Activity and Metabolism; Council on Epidemiology and Prevention. Nontraditional risk factors and biomarkers for cardiovascular disease: mechanistic, research, and clinical considerations for youth: a scientific statement from the American Heart Association. *Circulation*, 123(23):2749-69. doi: 10.1161/CIR.0b013e31821c7c64.

Beckie, T.M. (2012). A systematic review of allostatic load, health, and health disparities. *Biological Research for Nursing*, 14; 311–34

BeLue, R., Okoror, T. A., Iwelunmor, J., Taylor, K. D., Degboe, A. N., Agyemang, C., & Ogedegbe, G. (2009). An overview of cardiovascular risk factor burden in sub-Saharan African countries: A socio-cultural perspective. *Globalization and Health*, *5*, 1–12. https://doi.org/10.1186/1744-8603-5-10

Bellingrath, S., Weigl, T., & Kudielka, B.M. (2009). Chronic work stress and exhaustion is associated with higher allostatic load in female school teachers. *Stress*; 12, 37–48.

Berger, J. S.,C. Jordan, O., Lloyd-Jones, D., & Blumenthal, R.S.(2010). Screening for Cardiovascular Risk in Asymptomatic Patients. *Journal of the American College of Cardiology* **55** (12): 1169-1177.

Bernard, H. R. (2006). Research Methods in Anthropology: Qualitative and Quantitative Approaches. Library (Vol. 4th). Rowman & Littlefield Publishers. Inc.

Berry, J.D., Dyer, A., Cai, X., Garside, D.B., Ning, H., Thomas, A., Greenland, P., Van Horn, L., Tracy, R.P., & Lloyd-Jones, D.M. (2012). Lifetime risks of cardiovascular disease. *Engl J Med.*; 366(4):321-9. doi: 10.1056/NEJMoa1012848.

Blakeley, J. A., & Ribeiro, V. E. (2008). Early retirement among registered nurses: contributing factors. *Journal of Nursing Management*, 16(1), 29-37

Bloom, D.E., Cafiero, E.T., Jané-Llopis, E., Abrahams-Gessel, S., Bloom, L.R., Fathima, S., Feigl, A.B., Gaziano, T., Mowafi, M., Pandya, A., Prettner, K., Rosenberg, L., Seligman, B., Stein, A.Z., & Weinstein, C. (2011). The Global Economic Burden of Non-communicable Diseases. Geneva: World Economic Forum

Boateng, D., Wekesah, F., Browne, J. L., Agyemang, C., Agyei-Baffour, P., De-Graft Aikins, A., … Klipstein-Grobusch, K. (2017). Knowledge and awareness of and perception towards cardiovascular disease risk in sub-Saharan Africa: A systematic review. *PLOS ONE*, *12*(12), 1–21. https://doi.org/10.1371/journal.pone.0189264

Bosu, W.K. (2010). Epidemic of hypertension in Ghana: a systematic review. *BMC Public Health*, 10:418. doi: 10.1186/1471-2458-10-418

Bosu, W. K. (2015). The prevalence, awareness, and control of hypertension among workers in West Africa: a systematic review. B*iomed Central Public Health*, 10,418. Retrieved from doi: 10.1186/1471-2458-10-418.

Bria, M., Baban, A., & Dumitrascu, D. (2012). Systematic Review of Burnout Risk Factors among European Health care Professionals. Cognition, Brain, Behavior. *An Interdisciplinary Journal*, XVI. 423 - 452.

Brief, A. P., & Weiss, H. M. (2017). Organizational Behavior : Affect in the Workplace. *Annual Review of Psychology*. https://doi.org/10.1146/annurev.psych.53.100901.135156

Cañadas-De la Fuente, G. A., Ortega, E., Ramirez-Baena, L., De la Fuente-Solana, E. I., Vargas, C., & Gómez-Urquiza, J. L. (2018). Gender, marital status, and children as risk factors for burnout in nurses: A meta-analytic study. *International Journal of Environmental Research and Public Health*, *15*(10). https://doi.org/10.3390/ijerph15102102

Chico-Barba, G., Jiménez-Limas, K., Sánchez-Jiménez, B., Sámano, R., Rodríguez-Ventura,

A. L., Castillo-Pérez, R., & Tolentino, M. (2019). Burnout and metabolic syndrome in female nurses: An observational study. *International Journal of Environmental Research and Public Health*, *16*(11). https://doi.org/10.3390/ijerph16111993

Clark, M. S., Bond, M. J., & Hecker, J. R. (2007). Environmental stress, psychological stress and allostatic load. *Psychol Health Med*, 12(1), 18-30.

Cocchiara, R., Peruzzo, M., Mannocci, A., Ottolenghi, L., Villari, P., Polimeni, A., … La Torre, G. (2019). The Use of Yoga to Manage Stress and Burnout in Health care Workers: A Systematic Review. *Journal of Clinical Medicine*, *8*(3), 284. https://doi.org/10.3390/jcm8030284

Cohen, S., Evans, G.W., Stokols, D. & Krantz, D.S. (2013). Behavior, Health, and Environmental Stress. Springer Science & Business Media, New York, NY.

Corsino-de-Paiva, L., Gomes-Canário, A. C., Corsino-de-Paiva, E. L., Rodrigues-Monteiro, B., & Gonçalves-da-Silveira, A. K. (2016). Risk factors identification for Burnout syndrome in nurses. *International Archives of Medicine*, 1–7. https://doi.org/10.3823/2199

Creswell, J. W. (2009). Research design: Qualitative, quantitative, and mixed methods approaches. Research Design Qualitative Quantitative and Mixed Methods Approaches, 3rd, 260.

D'Agostino, R.B.Sr., Pencina, M.J., Massaro, J.M., & Coady, S. (2013). Cardiovascular Disease Risk Assessment: Insights from Framingham. *Glob Heart*, 8(1):11-23, doi: 10.1016/j.gheart.2013.01.001.

D'Agostino, R.B.Sr., Vasan, R.S., Pencina, M.J., Wolf, P.A., Cobain, M., Massaro, J.M., & Kannel, W.B. (2008). General cardiovascular risk profile for use in primary care: the

Framingham Heart Study. *Circulation*, 12; 117 (6):743-53. doi: 10.1161/circulationAHA.107.699579.

Danese, A., & McEwen, B. S. (2012). Adverse childhood experiences, allostasis, allostatic load, and age-related disease. *Physiol Behav*, 106(1), 29-39.

Dapaah, A. K. (2014). Causes of stress among nurses in the Greater Accra Region. *International Journal of Research in Social Sciences*, *3*(8), 74–82.

de-Graft Aikins, A. (2007). Ghana's neglected chronic disease epidemic: A developmental challenge. *Ghana Med J*, 41; 154-159.

De-Oliveira, A. C. M., Ferreira, R. C., & Santos, A. A. (2016). Cardiovascular risk assessment according to the Framingham score and abdominal obesity in individuals seen by a clinical school of nutrition. *Revista Da Associacao Medica Brasileira*, *62*(2), 138–144. https://doi.org/10.1590/1806-9282.62.02.138

Dubale, B. W., Friedman, L. E., Chemali, Z., Denninger, J. W., Mehta, D. H., Alem, A., … Gelaye, B. (2019). Systematic review of burnout among health care providers in sub-Saharan Africa. *BMC Public Health*, *19*(1). https://doi.org/10.1186/s12889-019-7566-7

Duodu, C. (2015). Assessment of Overweight and Obesity Prevalence Among Practicing Nurses and Midwives in the Hohoe Municipality of the Volta Region, Ghana. *Science Journal of Public Health*, Vol. 3, p. 842. https://doi.org/10.11648/j.sjph.20150306.18

Eneluzia, I. I., Corsino, L., Paiva, L. C. De, Carla, I. A., Cana, G., & Katherine, A. (n.d.). Burnout syndrome in health-care professionals in a university hospital. https://doi.org/10.6061/clinics/2017(05)08

Fiadzo, E., Golembiewski, R., Luo, H., Bradbury, M., Rivera, T. (1997). Burnout in

Ghanaian hospitals: phase model findings in sub-Saharan Africa. *J Health Hum Serv Adm.*, 19(4):442–66.

Fishburn, P. C. (2015). Stress theories; an introduction. *The Theory of Social Choice*, 1–12. https://doi.org/10.1515/9781400868339-002

Fleg, J. L., & Strait, J. (2012). Age-associated changes in cardiovascular structure and function: a fertile milieu for future disease. *Heart failure reviews*, 17(4-5), 545-554.

Frank, J. (2020). Chapter 1: Introduction. *Dostoevsky*, 3–8. https://doi.org/10.1515/9780691209371-004

Freudenberger, J. (1974). Burnout Syndrome. *Journal of Social Issues*, 30(1), 159–165.

Genest, J., McPherson, R., Frohlich, J., Anderson, T., Campbell, N., Carpentier, A., Couture, P., Dufour, R., Fodor, G., Francis, G.A., Grover, S., Gupta, M., Hegele, R.A., Lau, D.C., Leiter, L., Lewis, G.F., Lonn, E., Mancini, G.B., Ng. D., Pearson, G.J., Sniderman, A., Stone, J.A., & Ur. E. (2009). Canadian Cardiovascular Society/Canadian guidelines for the diagnosis and treatment of dyslipidemia and prevention of cardiovascular disease in the adult - 2009 recommendations. *Can J Cardiol.*, 25(10):567-79. doi: 10.1016/s0828-282x(09)70715-9.

Ghana Health Service (GHS). (2014). Guidelines for the establishment of Non-Communicable Diseases (NCD) Screening Services in Ghana. Screening Services Guidelines| Ministry of Health/Ghana Health Service. www.ghanahealthservice.org. (Accessed 20th May 2019)

Ghana Health Service (GHS). (2017). 2016 Annual Report of GHS. Accra, Ghana. [Online]. Available from: http://www.moh.gov.gh [Accessed: 10th January, 2020].

Ghana Statistical Service (GSS). (2012). 2010 Population and Housing Census: Summary Report of Final Results [Retrieved from: http://statsghana.gov.gh/docfiles/2010phc/Census2010_Summary_report_of_final_results.pdf. Accessed on July 31, 2018]

Ghana Statistical Service (GSS). (2013). 2010 Population & Housing Census: National Analytical Report. Ghana Statistics Service.

Gilles, I., Burnand, B., & Peytremann-Bridevaux I. (2014). Factors associated with health care professionals' intent to stay in hospital: a comparison across five occupational categories. *Int J Qual Health Care*, 26(2):158-66. doi: 10.1093/intqhc/mzu006.

Global Burden of Disease (GBD) Risk Factors Collaborators. (2017). Global, regional and national comparative risk assessment of 84 behavioral, environmental and occupational, and metabolic risks or clusters of risks, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet*; 390**:** 1345–422.

Goff, D.C. Jr., Lloyd-Jones, D.M., Bennett, G., Coady, S., D'Agostino, R.B.Sr., Gibbons, R., Greenland, P., Lackland, D.T., Levy, D., O'Donnell, C.J., Robinson, J.G., Schwartz, J.S., Shero, S.T., Smith, S.C.Jr., Sorlie, P., Stone, N.J., & Wilson, P.W.F. (2014). 2013 ACC/AHA guideline on the assessment of cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J *Am Coll Cardiol*, 63(25 Pt B):2935-2959. doi: 10.1016/j.jacc.2013.11.005.

Grove, S. K., Burns, N., Gray, J., & Burns, N. (2015). Understanding nursing research: Building an evidence-based practice. 6th edition. St. Louis, Missouri: Elsevier.

Grundy, S.M., Cleeman, J.I., Daniels, S.R., Donato, K.A., Eckel, R.H., Franklin, B.A., Gordon, D.J., Krauss, R.M., Savage, P.J., Smith, S.C. Jr., Spertus, J.A., Costa

F.(2005).American Heart Association; National Heart, Lung, and Blood Institute. Diagnosis and management of the metabolic syndrome: an American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement. *Circulation,* 12(17):2735-52. doi: 10.1161/CIRCULATIONAHA.105.169404.

Gyang, M. D., Danjuma, S. A., Gyang, B. Z., Sule, H., & Musa, D. (2018). Correlates of undiagnosed hypertension among health care workers in a secondary health care facility in north central nigeria. *African Journal of Primary Medicine*, *18*(1), 22–28.

Habadi, A. I., Alfaer, S. S., Shilli, R. H., Habadi, M. I., Suliman, M., Al-aslany, S. J., & Habadi, M. I. (2018). The Prevalence of Burnout Syndrome among Nursing Staff Working at King Abdulaziz University Hospital , Jeddah , Saudi Arabia. *Diversity and Equality in Health and Care,* 15(3): 122-126

Hartley, T.A., Burchfiel, C.M., Fekedulegn, D., Andrew, M.E., Knox, S.S., Violanti, J.M. (2011). Associations between police officer stress and the metabolic syndrome. *Int J Emerg Ment Health*,13(4):243-56

He, S., Chen, Y., Zhan, J., Wu, J., & Opler, M. (2014). Job Burnout, Mood State, and Cardiovascular Variable Changes of Doctors and Nurses in a Children's Hospital in China. *ISRN Nursing*, 1–6. https://doi.org/10.1155/2014/386719

Holmes, E. S., Ribeiro, S., Alice, A., Almeida, F. De, Martins, R., Candeia, S., & Cássia, L. De. (2017). Prevalence of Burnout Syndrome and Factors Associated with University Teachers. *Archives of Medicine,* 10. 10.3823/2319.

Ibikunle, P., Amah, E., & Useh, U. (2016). Prevalence and pattern of burnout syndrome among health care professionals in a university teaching hospital. *Tropical Journal of Medical Research*, *19*(2), 144. https://doi.org/10.4103/1119-0388.185443

Israel, B. A., Baker, E. A., Goldenhar, L. M., Heaney, C. A., & Schurman, S. J. (1996). Occupational stress, safety, and health: conceptual framework and principles for effective prevention interventions. *Journal of Occupational Health Psychology*, *1*(3), 261–286. https://doi.org/10.1037/1076-8998.1.3.261

Jahangiry, L., Farhangi, M.A., & Rezaei, F. (2017). Framingham risk score for estimation of 10-years of cardiovascular diseases risk in patients with metabolic syndrome. *J Health Popul Nutr*., 36(1):36. doi: 10.1186/s41043-017-0114-0.

Jahromi, M., Hojat, M., Koshkaki, S., Nazari, F., & Ragibnejad, M. (2017). Risk factors of heart disease in nurses. *Iranian Journal of Nursing and Midwifery Research*, *22*(4), 332. https://doi.org/10.4103/1735-9066.212986

Kaptoge, S., Pennells, L., De Bacquer, D., Cooney, M. T., Kavousi, M., Stevens, G., … Di Angelantonio, E. (2019). World Health Organization cardiovascular disease risk charts: revised models to estimate risk in 21 global regions. *The Lancet Global Health*, *7*(10), e1332–e1345. https://doi.org/10.1016/S2214-109X(19)30318-3

Karasek, R.A. & Theorell, T (1992) Healthy Work: Stress, Productivity, and the Reconstruction of Working Life. Basic Books, New York, NY.

Kasu, E., Ayim, A., & Tampouri, J. (2015). Prevalence of obesity among health workers in Kadjebi District of Ghana. *Ghana Medical Journal*; Vol.5.

Kim, M. H., Mazenga, A. C., Simon, K., Yu, X., Ahmed, S., Nyasulu, P., … Abrams, E. J. (2018). Burnout and self-reported suboptimal patient care amongst health care workers providing HIV care in Malawi. *PLOS ONE*, *13*(2), 1–15. https://doi.org/10.1371/journal.pone.0192983

Kitaoka-Higashiguchi, K., Morikawa, Y., Miura, K., Sakurai, M., Ishizaki, M., Kido, T., …

Nakagawa, H. (2009). Burnout and risk factors for arteriosclerotic disease: Follow-up study. *Journal of Occupational Health*, *51*(2), 123–131. https://doi.org/10.1539/joh.L8104

Kivimäki, M., Nyberg, S. T., Batty, G. D., Fransson, E. I., Heikkilä, K., Alfredsson, L., … Theorell, T. (2012). Job strain as a risk factor for coronary heart disease: A collaborative meta-analysis of individual participant data. *The Lancet*, *380*(9852), 1491–1497. https://doi.org/10.1016/S0140-6736(12)60994-5

Kivimäki, M., Jokela, M., Nyberg, S. T., Singh-Manoux, A., Fransson, E. I., Alfredsson, L., … Virtanen, M. (2015). Long working hours and risk of coronary heart disease and stroke: A systematic review and meta-analysis of published and unpublished data for 603 838 individuals. *The Lancet, 386* (10005), 1739–1746. https://doi.org/10.1016/S0140-6736(15)60295-1

Kodaman, N., Aldrich, M. C., Sobota, R., Asselbergs, F. W., Poku, K. A., Brown, N. J., … Williams, S. M. (2016). Cardiovascular disease risk factors in Ghana during the rural-to-urban transition: A cross-sectional study. *PLoS ONE*, *11*(10), 1–20. https://doi.org/10.1371/journal.pone.0162753

Konlan, K. D., Afam-adjei, C. J., Afam-adjei, C., Oware, J., Appiah, T. A., Konlan, K. D., & Bella-fiamawle, J. (2020a). Practice and Sociodemographic Factors Influencing Self-Monitoring of Blood Pressure in Ghanaians with Hypertension. *International Journal of Chronic Diseases*, 7 pages https://doi.org/10.1155/2020/6016581

Konlan, K. D., Baku, E. A., Japiong, M., Konlan, K. D., Doat, A. R., Suuk, A. N., & Amoah, R. M. (2020b). Practices of Adults in a Periurban Community of the Ho Municipality on Prevention of Hypertension. *International Journal of Hypertension*, https://doi.org/10.1155/2020/2136213

Konlan, K. D., Armah-mensah, M., Aryee, R., & Appiah, T. A. (2020c). Expectation and Satisfaction with Nursing Care among Hypertensives Receiving Care at a Resource-Constrained Hospital in Ghana. *Nursing Research and Practice*, 1–11.

Korle Bu Teaching Hospital (KBTH). (2017). 2016 Annual Report. Korle Bu, Accra. Available from: https://www.kbth.gov.gh/assets/downloads/pdf/Korlebu- Annual-Report 2016.pdf [Accessed: 15th January 2021].

Krejcie, R.V. & Morgan, D.W. (1970) Determining sample size for research activities. *Educational and Psychological measurement*. 30, 607 – 610.

Kyle, R. G., Wills, J., Mahoney, C., Hoyle, L., Kelly, M., & Atherton, I. M. (2017). Obesity prevalence among health care professionals in England: A cross-sectional study using the Health Survey for England. *BMJ Open*, *7*(12), 1–7. https://doi.org/10.1136/bmjopen-2017-018498

Langade, D., Modi, P. D., Sidhwa, Y. F., Hishikar, N. A., & Amit, S. (2016). Burnout Syndrome Among Medical Practitioners Across India : A Questionnaire-Based Survey. *Cureus*, *8*(9). https://doi.org/10.7759/cureus.771

Ledikwe, J.H., Kleinman, N.J., Mpho, M., Mothibedi, H., Mawandia, S., Semo, B.W., et al. (2018). Associations between health care worker participation in workplace wellness activities and job satisfaction, occupational stress and burnout: a cross-sectional study in Botswana. BMJ Open, 8(3):e018492.

Lin, C.M., &, Li, C.Y. (2009). Prevalence of cardiovascular risk factors in Taiwanese health care workers. *Ind Health*, 47(4):411-8. doi: 10.2486/indhealth.47.411.

Loucks, E. B., Juster, R. P., & Pruessner, J. C. (2008). Neuroendocrine biomarkers, allostatic load, and the challenge of measurement: A commentary on Gersten. *Social Science & Medicine*, *66*(3), 525–530. https://doi.org/10.1016/j.socscimed.2007.09.006

Madede, T., Sidat, M., McAuliffe, E., Patricio, S.R., Uduma, O., Galligan, M, et al. (2017).The impact of a supportive supervision intervention on health workers in Niassa, Mozambique: a cluster-controlled trial. *Hum Resour Health*, 15(1):58

Maslach, C., Jackson, S.E., Leiter, M.P., Schaufeli, W.B., & Schwab, R.L. (2015). Maslach burnout inventory instruments and scoring guides forms: General, human services, & educators. *Health and Quality of life Outcomes*, 7, 31. http://www.mindgarden.com

Mbanga, C., Makebe, H., Tim, D., Fonkou, S., Toukam, L., & Njim, T. (2018). Determinants of burnout syndrome among nurses in Cameroon. *BMC Research Notes*, *11*(1). https://doi.org/10.1186/s13104-018-4004-3

McEwen, B.S. (2015). Biomarkers for assessing population and individual health and disease related to stress and adaptation. *Metabolism*, 64(3 Suppl 1):S2–10

McEwen, B. S., & Gianaros, P. J. (2011). Stress- and Allostasis-Induced Brain Plasticity. *Annual Review of Medicine,* Vol 62, 2011, 62, 431-445.

McEwen, B.S. & Stellar, E. (1993). Stress and the individual: Mechanisms leading to diseases. *Arch Intern Med.*, 153(18):2093–101

Melamed, S. & Kushnir, T. (2015). Burnout and Risk Factors for Cardiovascular Diseases. https://doi.org/10.1097/PSY.0b013e31826c3174

Melamed, S., Shirom, A., Toker, S., Berliner, S., & Shapira, I. (2006). Burnout and risk of cardiovascular disease: Evidence, possible causal paths, and promising research directions. *Psychological Bulletin*, *132*(3), 327–353. https://doi.org/10.1037/0033-2909.132.3.327

Ministry of Health (MOH). (2012). National Policy for the Prevention and Control of Chronic Non-Communicable Diseases in Ghana. Retrieved February 29, 2019, from https://www.moh.gov.gh./ncdpolicy

Ministry of Health (MOH). (2020). Ghana COVID-19 emergency preparedness and response project & additional financing. Retrieved August 28, 2021, from https://www.moh.gov.gh/wp-content/uploads/2016/02/FINAL-COVID-19-ESMF.pdf

Mistire W. G., Y. C. M., & Ahmed R.G., S. K. B. (2013). Prevalence of Undiagnosed Diabetes Mellitus and its Risk Factors in Selected Institutions at Bishoftu Town, East Shoa, Ethiopia. *Journal of Diabetes & Metabolism*, 1–7. https://doi.org/10.4172/2155-6156.s12-008

Moy, F.M., & Bulgiba, A. (2010). The modified NCEP ATP III criteria may be better than the IDF criteria in diagnosing Metabolic Syndrome among Malays in Kuala Lumpur. *BMC Public Health* **10**, 678. https://doi.org/10.1186/1471-2458-10-678

Ndawula, M. (2012). Examining the causes , coping strategies and prevention . A Literature Review. 1–51.

Neckel, S., Schaffner, A. K., & Wagner, G. (2017). Burnout, Fatigue, Exhaustion: An Interdisciplinary Perspective on a Modern Affliction. *Behaviour Sci.,23; 311*–316. https://doi.org/10.1007/978-3-319-52887-8

Njim, T., Mbanga, C., Mouemba, D., Makebe, H., Toukam, L., Kika, B., & Mulango, I. (2018). Determinants of burnout syndrome among nursing students in Cameroon : cross - sectional study. *BMC research notes*, 1–6.

Nuhu, N., Ainuson-quampah, J. K., & Brown, C. A. (2020). Association between caloric intake and work-related stress among nurses in two district hospitals in Ghana. *HSI Journal*, Volume 1(Issue 1):50-56. https://doi.org/10.46829/hsijournal.2020.6.1.1.50-56.

Nyiambam, W., Sylverken, A. A., Owusu, I. K., Buabeng, K. O., Boateng, F. A., & Owusu-Dabo, E. (2020). Cardiovascular disease risk assessment among patients attending two cardiac clinics in the Ashanti Region of Ghana. *Ghana medical journal*, *54*(3), 140–145. https://doi.org/10.4314/gmj.v54i3.3

Odonkor, S. T. & Frimpong, K. (2020). Burnout among Health care Professionals in Ghana : A Critical Assessment. *BioMed Research International*, Volume 2020, Article ID 1614968, 8 pages https://doi.org/10.1155/2020/161496*2020*.

Ofori-Asenso, R., Agyeman, A.A., Laar, A., Boateng, D. (2016). Overweight and obesity epidemic in Ghana-a systematic review and meta-analysis. *BMC Public Health*, 16(1):1239. doi: 10.1186/s12889-016-3901-4.

Ofori-Asenso, R., & Garcia, D. (2016). Cardiovascular diseases in Ghana within the context of globalization. *Cardiovascular Diagnosis and Therapy*, *6*(1), 67–77. https://doi.org/10.3978/j.issn.2223-3652.2015.09.02

Ofori-Asenso, R., Agyeman, A. A., & Laar, A. (2017). Metabolic Syndrome in Apparently "Healthy" Ghanaian Adults: A Systematic Review and Meta-Analysis. *International Journal of Chronic Diseases*, *2017*, 1–9. https://doi.org/10.1155/2017/2562374

Opoku, S. T., & Apenteng, B. A. (2014). Career satisfaction and burnout among Ghanaian physicians. *Int Health*., 6(1):54-61. doi: 10.1093/inthealth/iht038.

Osei-Yeboah, J., Kye-Amoah, K. K., Owiredu, W. K. B. A., Lokpo, S. Y., Esson, J., Bella Johnson, B., … Asumbasiya Aduko, R. (2018). Cardiometabolic risk factors among health care workers: A cross-sectional study at the Sefwi-Wiawso Municipal Hospital, Ghana. *BioMed Research International*, *2018*. https://doi.org/10.1155/2018/8904548

Owusu, I., Adu-Boakye, B.R., & Boadi, R. (2013). Cardiovascular Risk Profile of Patients Seen At A Cardiac Clinic In Kumasi, Ghana. *The Internet Journal of Health*, **14** (1).

Owusu, I. K, Adu-Boakye, Y., & Tetteh, L. A. (2014). Hypertensive Heart Failure in Kumasi, Ghana. *Open Science Journal of Clinical Medicine*, 2 (1): 39 - 43

Paiva, L. C. De, Carla, A., Canário, G., Monteiro, B. R., & Gonçalves, A. K. (2016). Burnout syndrome in health-care professionals in a university hospital. *Clinics*, 72. 305-309. 10.6061/clinics/2017(05)08.

Pascoal, F. F. da S., Evangelista, C. B., Pascoal, K. P. M. F., Batista, J. B. V., Rodrigues, M. de S. D., & Souza, G. P. (2021). Burnout syndrome: occupational health team's knowledge / Síndrome de burnout: conhecimento da equipe saúde do trabalhador. *JRFCO*, *13*, 302–308. https://doi.org/10.9789/2175-5361.rpcfo.v13.8567

Peterson, U., Demerouti, E., Bergström, G., Åsberg, M., & Nygren, Å. (2008). Work characteristics and sickness absence in burnout and non-burnout groups: A study of Swedish health care workers. *International Journal of Stress Management*, 15(2): 153-172.

Pindar, S. K., & Coker, A. O. (2012). Comparison of burnout syndrome among clinical and non-clinical staff of two tertiary health institutions in maiduguri , nigeria. *Transnational J Science and Technology*. 2(11), 57-73.*2*(11), 57–73.

Polikandrioti, M., Koutelekos, I., Panoutsopoulos, G., Gerogianni, G., Zartaloudi, A., Dousis, E., Babatsikou, F., & Toulia, G. (2019). Hospitalized patients with heart failure: the impact of anxiety, burnout, fatigue, and therapy adherence on quality of life. *Archives of* *medical sciences. Atherosclerotic diseases, 4,* e268–e279. https://doi.org/10.5114/amsad.2019.90257

Polit, D. F., & Beck, C. T. (2014). Nursing research: Principles and methods (8th ed.). Lippincot William & Wilkins

Read, S., & Grundy, E. (2012). Allostatic Load: A Challenge to Measure Multisystem Physiological Dysregulation. National Centre for Research Methods, United Kingdom.

Rocha, K. (2013). Prevalence and Factors Associated with Burnout Syndrome in Professionals in Basic Health Units. *Ciencia & Trabajo*. 47-76.

Roohafza, H., Sadeghi, M., Naghnaeian, M., Shokouh, P., Ahmadi, A., & Sarrafzadegan, N. (2014). Relationship between metabolic syndrome and its components with psychological distress. *International Journal of Endocrinology, 2014.* https://doi.org/10.1155/2014/203463

Roth, G. A., Johnson, C., Abajobir, A., Abd-allah, F., Abera, S. F., Ms, C., … Xu, G. (2017). Global , Regional , and National Burden of Cardiovascular Diseases for 10 Causes , 1990 to 2015. *J Am Coll Cardiol*, 70(1):1-25. doi: 10.1016/j.jacc.2017.04.052.

Rouleau, D., Fournier, P., Philibert, A., Mbengue, B., & Dumont, A. (2012). The effects of midwives ' job satisfaction on burnout , intention to quit and turnover : a longitudinal study in Senegal. *Human resources for health,* 1186/1478-4491-10-9.

Seeman, M., Stein-Merkin, S., Karlamangla, A., Koretz, B., & Seeman, T. (2014). Social status and biological dysregulation: the "status syndrome" and allostatic load. *Social Science & Medicine,* 118, 143–151.

Selim, N., Elshaer, M., Shawky, M., Moustafa, A., Wagdy, M., Ibrahim, M., & Ramadan, E.

(2018). Job Stress and Burnout Syndrome among Critical Care Health care Workers. *Alexandria Journal of Medicine*, *54*(3), 273–277. https://doi.org/10.1016/j.ajme.2017.06.004

Shakori, A., Vokhlacheva, A., & Farzanehkari, P. (2018). Prevention of burnout among nursing staff: A literature review. Retrieved from http://www.theseus.fi/bitstream/handle/10024/140886/Thesis January 2018.pdf?

Smeltzer S. C., Bare B. G., Hinkle J. L., & Cheever, K. H. (2016) Brunner & Suddarth's Textbook of Medical-Surgical Nursing. (12th ed.). Lippincott Williams & Wilkins.

Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The brief resilience scale: assessing the ability to bounce back. *International journal of behavioral medicine*, 15(3), 194-200.

Smith, A.K., Maloney, E.M., Falkenberg, V.R., Dimulescu, I., & Rajeevan, M.S. (2009). An angiotensin-1 converting enzyme polymorphism is associated with allostatic load mediated by C-reactive protein, interleukin-6 and cortisol. *Psychoneuroendocrinology* 34, 597.

Silva-Holmes, E., Ribeiro-dos-Santos, S., Figuerêdo-de-Almeida, A. A., Martins-Simões-Candeia, R., Mendonça-Rezende-Chaves, L. C., Cruz-de-Oliveira, A. E., … Do-Nascimento, J. A. (2017). Prevalence Of Burnout Syndrome And Factors Associated With University Teachers. *International Archives of Medicine*, *10*, 1–8. https://doi.org/10.3823/2319

Spooner-Lane, R., & Patton, W. (2007). Determinants of burnout among public hospital nurses. *Australian Journal of Advanced Nursing*, *25*(1), 8–16.

Steenkamp, J. G. (2014). Investigating the psychological and social predictors of burnout among nurses. *BMC Human Resources*, 148–155.

Steptoe, A., & Kivimäki, M. (2012). Stress and cardiovascular disease. *Nature Reviews Cardiology*, *9*, 360.

Sterling, P. (2004). Principles of allostasis: optimal design, predictive regulation, pathophysiology and rational therapeutics. In: Schulkin, J. (Ed.), Allostasis, Homeostasis, and the Costs of Adaptation. Cambridge University Press, Cambridge, p. 17.

Sterling, P. & Eyer, J. (1988). Allostasis: a new paradigm to explain arousal pathology. In: Fisher, S., Reason, J. (Eds.), Handbook of Life Stress, Cognition and Health. John Wiley & Sons, New York, p. 629.

Sumaila, F. G., Shittu, A., Idris, A. S., Aliyu, M., & Ef, A. (2016). Prevalence of Undiagnosed Hypertension and its risk factors among health care workers of some selected hospitals in Dutse , Jigawa State , North western. *Advances in Medical Sciences*, *1*(2), 19–23.

Thorsen, V. C., Tharp, A. L. T., & Meguid, T. (2011). High rates of burnout among maternal health staff at a referral hospital in Malawi : A cross-sectional study. *BMC Nursing*, *10*(1), 9. https://doi.org/10.1186/1472-6955-10-9.

Tibazarwa, K. B., & Damasceno, A. A. (2014). Hypertension in Developing Countries. *Canadian Journal of Cardiology*, *30*(5),527-533.

Tsai, H. H., Yeh, C. Y., Su, C. T., Chen, C. J., Peng, S. M., & Chen, R. Y. (2013). The effects of exercise program on burnout and metabolic syndrome components in banking and insurance workers. *Industrial Health*, *51*(3), 336–346. https://doi.org/10.2486/indhealth.2012-0188

United Nations (UN).(2015). Transforming our world: the 2030 agenda for sustainable development. https://www.un.org/ga/search/ view_doc.asp?symbol=A/RES/70/1&Lang=E (accessed July 26, 2019).

United Nations (UN) Communications Group on SDGs. (2017). The Sustainable Development Goals (SDGs) in Ghana. *United Nations Development Programme (UNDP) Home Page*, 1–40. Retrieved from https://www.undp.org/content/undp/en/home/search.html?q=housing+and+economic+development

Wang, Y., Liu, J., Wang, W., et al. (2015). Lifetime risk for cardiovascular disease in a Chinese population: the Chinese Multi–Provincial Cohort Study. *Eur J Prev Cardiol*; **22:** 380–88.

Williams, C. (2007). Research methods. Journal of Business & Economic Research, 5(3), 65–72.

World Health Organization (WHO). (2011). Global status report on non-communicable diseases. www.who.int/nmh/publications/ncd_report_full_en.pdf. (Accessed 20 August 2014)

World Health Organization (WHO). (2013a). A global brief on hypertension. Geneva, World Health Organization. Retrieved from http://www.who.int

World Health Organisation (WHO). (2013b). Cardiovascular diseases. Fact Sheet no 317. http://www.who.int/mediacentre/factsheets/fs317/en/. (Accessed 20 April 2014)

World Health Organisation (WHO). (2013c). Global action plan for the prevention and control of NCDs 2013–2020. Geneva: World Health Organization.

World Health Organisation (WHO). (2014a). Obesity and Overweight. Fact sheet No 311. Geneva. www.who.int/mediacentre/factsheets/fs311/en. (Accessed 24 September, 2019)

World Health Organization. (2014b). Non communicable Diseases Country Profiles 2014. Geneva, Switzerland. doi:ISBN 978 92 4 150750 9

World Health Organization (WHO). (2015a). Diabetes. World Health Organization.

World Health Organization (WHO). (2015b). World Health Statistics 2015. Geneva, Switzerland.

World Health Organization (WHO). (2017). Cardiovascular diseases (CVDs). Geneva. Available from: http://www.who.int/mediacentre/CVDsfactsheets/fs317/en/ [Accessed: 19th December, 2020].

World Health Organization (WHO). (2018). Heart technical package. https://www.who.int/publications-detail/hearts-technical-package (accessed on July 26, 2019).

World Health Organization (WHO). (2020). Global burden of cardiovascular diseases 1990 to 2017 : evidence from the Global Burden of Disease Study. *The Lancet Global Health*, *7*(10), 1–9. https://doi.org/10.1093/inthealth/ihaa069

Witter, T., Poudevigne, M., Lambrick, D. M., Faulkner, J., Lucero, A. A., Page, R., & Iii, L. G. P. (2013). Perspectives in Public Health Modifying cardiovascular diseases in Fiji A conceptual framework for managing modifiable risk factors for cardiovascular diseases in Fiji. https://doi.org/10.1177/1757913913500045

Yeboah, K., Dodam, K. K., Affrim, P. K., Adu-gyamfi, L., Bado, A. R., Mensah, R. N. A. O., … Gyan, B. (2018). Metabolic syndrome and parental history of cardiovascular disease in young adults in urban Ghana. *BMC Public Health*, 1–8.

https://doi.org/10.1186/s12889-017-4652-6

Yunus, J., Mahajar, A., Idris, P., & Yahya, A. (2009). The empirical study of burnout among nurses of public hospitals in the northern part of Malaysia. T*he Journal of International Management Studies*, 4 (3): 56-64.

APPENDICES

APPENDIX A - PARTICIPANT INFORMATION SHEET

STUDY TITLE: BURNOUT, METABOLIC SYNDROME AND RISK OF CARDIOVASCULAR DISEASES AMONG HEALTH WORKERS IN ACCRA, GHANA.

Who are the people in charge of this study?

PhD student: Mr. Kennedy Dodam Konlan, Department of Social and Behavioural Sciences, School of Public Health, College of Health Sciences, University of Ghana, Email: kennedy.konlan@gmail.com. Tel: 233 207271 342.

Supervisors:

Dr. Emmanuel Asampong, Department of Social and Behavioural Sciences, School of Public Health, College of Health Sciences, University of Ghana.

Dr. Phyllis Dako-Gyekye, Department of Social and Behavioural Sciences, School of Public Health, College of Health Sciences, University of Ghana.

Dr. Franklin N. Glozah, Department of Social and Behavioural Sciences, School of Public Health, College of Health Sciences, University of Ghana.

1: You have been invited to take part in the research study mentioned above. As a participant on this research project, your role is to complete the study questionnaire provided and have some measurement done on you. If you want to take part in the research, you will be asked to fast overnight for 8-12 hours. We will ask you to provide information about yourself, family, alcohol intake and smoking. You may feel uncomfortable providing such information but be rest-assured that the information would be treated confidentially and used only for the purpose in which its collected. Also, your blood pressure, height, weight and amount of fat in your body will be measured. These procedures are painless and might give slight tingling sensations for a few seconds when the BP measuring cuffs inflate. Also, some amount of blood equivalent to 3 teaspoonfuls will be drawn to measure substances in your bloodstream. You are assured that this amount will not affect your health. All the tests you will undergo in connection with this research will be free of charge. **You will NOT make any financial commitment to the study except your time of averagely thirty to forty-five minutes of your time.**

2: Background information about the project: Shortage of staff coupled with high patient attendance seems to be imposing a considerable level of job-related stress on health care staff, which could in turn lead to the development of what is called burnout. Burnout is known to have negative effects on the quality of care as well as on the health of staff by causing diseases like obesity, hypertension and diabetes mellitus type II.

3: About voluntary participation: You are being invited to take part in this research project. You have the right to decide to participate in this project or to decline to do so. Your decision to participate in this project should be voluntary. The researcher per this document will assist you to know what the project is about to enable you take an informed decision. The investigators will explain to you what the study is about, possible risks and benefits of participation and your role as a participant. You can ask questions about anything you do not understand for further explanation. You will be required to sign the study consent form if you voluntarily decide to partake in this project. A copy of the signed form will be given to you to keep.

4: Purpose of this project: This project aims at determining burnout syndrome among health workers and its link with cardiovascular diseases.

5: Duration of project involvement: It is envisaged that the data collection will last for about ten months in order to collect the required data. However, should you decide to voluntarily participate in this study, you will spend approximately only 30 – 45 minutes of your time to fill out the study questionnaire and have some measurements taken on you.

6: What will I be asked to do? – You will be given the study questionnaire which you will be required to complete and return to the research team. The questionnaire is in seven parts. Part A, B, C, D, E F & G will ask you questions. Part H, will be filled for you by the researcher or research assistants.

7: What are the possible risks? – You may experience a minor bruise and/or temporary discomfort at the site of taking the blood and this risk is not more than what you will normally be exposed to when having blood drawn at the hospital for routine laboratory tests. We will reduce this discomfort by asking experienced staff to take the blood samples. You will not be given any medical intervention or treatment and no manipulation will be done on your person or environment, apart from spending part of your time to complete the study questionnaire and have some measurements taken.

8: What are the possible benefits? All your test results would be explained to you. You may through this study discover that you have bad fat in the blood, obesity, hypertension or diabetes. You will be advised professionally and/or referred appropriately if you are found to have any of these conditions after testing. Results of this project are likely to provide evidence to influence policies on staffing level and training for staff in the hospitals. The investigators would give you a referral note should we find out that your BP is higher than normal even though yu were not aware of it. This will enable you see a doctor or dietician for proper management.

9: Participant's rights: - Your decision to participate in this research project is entirely voluntary. You have the right to withdraw from the study at any time if you change your mind and you will not suffer any prejudice. You may also decline to participate and you will not suffer any consequences whatsoever.

10: How much will it cost me to participate? You will not be asked to make any payment if you decide to participate. Participation is **FREE.**

11: Will I be paid for participation? No participant on this project shall be given any financial reward. You will, however, be given a pen to enable you fill the study questionnaire.

12: Can I leave before the project ends? Yes. You have the right to leave at any stage if you are no longer interested.

13: How will my information be protected? Your name will not be written in the study report and your identity will not be revealed publicly at any time. All information you will provide on the questionnaire will be treated confidentially and anonymously. As such, your identity cannot be traced.

14. Additional protection against COVID-19: In line with the guidelines/protocols of the Ghana Health Service against the COVID-19 pandemic, you will be given a free re-usable mask to wear during the period of the data collection. Also, a veronica bucket with water and soap will be provided for you to wash your hands if there is no running water where the data will be collected. Further, alcohol-based hand sanitizers will be provided free of charge for you to use in order to protect you from COVID- 19. Additionally, social distancing requirements will be maintained throughout the data collection.

15. Be frank with your responses in order to help advance science and improve the welfare of hospital workers.

For further information

This research has been reviewed and approved by the Ethics Committee of the Ghana Health Service (GHS-ERC). If you have any questions about your rights as a research participant you can contact Nana Abena Kwaa Ansah Apatu, the Administrative Secretary of the GHS-ERC Office between the hours of 8am-5pm on 0503539896.

APPENDIX B: INFORMED CONSENT FORM

STUDY TITLE: BURNOUT, METABOLIC SYNDROME AND RISK OF CARDIOVASCULAR DISEASES AMONG HEALTH WORKERS IN ACCRA, GHANA

PARTICIPANT'S STATEMENT

I acknowledge that I have read or have had the purpose and contents of the participant's information sheet read and all questions satisfactorily explained to me in a language I understand (English). I fully understand the contents and any potential implications as well as my right to change my mind (i.e. withdraw from the research) even after I have signed this form.

I voluntarily agree to be part of this research.

Name of Participant…………………………..

Participants' Signature ……………………...OR Thumb Print……………………………

Date:…………………………………..

STATEMENT OF WITNESS

I was present when the purpose and contents of the Participant Information Sheet were read and explained satisfactorily to the participant in a language he/she understood (English). I confirm that he/she was given the opportunity to ask questions/seek clarifications and to obtain satisfactory responses before voluntarily agreeing to be part of the research.

Name:…………………………

Signature…………………………... OR Thumb Print ……….............................

Date:……………………………

INVESTIGATOR's STATEMENT AND SIGNATURE

I certify that the participant has been given ample time to read and learn about the study. All questions asked and requests for clarification made by the participant have been addressed.

Researcher's name……………………………………….

Signature ………………………………………………….

Date……………………………………………………….

APPENDIX C: STUDY QUESTIONNAIRE

DATE: **PARTICIPANT'S ID NO: ………**

STUDY TITLE: BURNOUT, METABOLIC SYNDROME AND RISK OF CARDIOVASCULAR DISEASES AMONG HEALTH WORKERS IN ACCRA, GHANA

INSTRUCTIONS: TICK (√) BY THE NUMBER OF THE APPROPRIATE OPTION AND FILL IN BLANK SPACES WHERE REQUIRED. THERE ARE NO RIGHT OR WRONG ANSWERS.	
SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS	
1. How old are you? (Completed years) ………………………. Years	2. Sex of participant Male …………………………………………1 Female………..…………………..…………..2
3. Marital status of participant Single ………………………………….………..1 Married …………...……...……………...… …...2 Divorced ……………………………………...3 Cohabitating……………….………………….4 Separated …………………………………..…5 Widowed ……………………………………..6	4. What is the range of your net monthly income in GHC? <1000 ………………………………...………1 1000-2000 …...………………...…………..2 2001-3000 ……...…………..………………3 3001-4000 ………..………..………………4 4001-5000 …………...…...……...……….. 5 5001-6000 ……………..….…………….......6 > 6000 …………………......……………….7
5. What is the highest level of school you attended? Primary ……………………….....……………1 Middle/JSS ……………………...………..2 Secondary/SSS ..……………………………3 Vocational/Technical …………………………4 Tertiary …………………….……………….5 Postgraduate/specialization ………………..……6	6. Do you currently have children that you take care of at home? Yes…………………………………………..1 No ……………………….……………………2
7. What category of staff are you? Clinical staff…………………………………..1 Non-clinical staff ………………………………..2	8. Which hospital do you work at currently? Weija-Gbawe Municipal Hospital ……………1 Greater Accra Regional Hospital……………...2 Korle-Bu Teaching Hospital ……………….…3
9. Specific profession/occupation of staff? ………………………………………………	

SECTION B: FAMILIAL HISTORY OF CVDs AND LIFESTYLE RISK FACTORS FOR CVDs	
10. Do you currently smoke cigarette or anything else? Yes ……..………………..………………………1 No ……..……………………………………….2	11. Have you ever smoked cigarette or anything else? Yes ………………………………………………1 No ………………………………………………2
12. Do you currently take in alcohol? Yes …………………………………………………1 No ………………………………………………..2	13. Have you ever taken in alcohol? Yes ………………………………………………1 No ………………………………………………2
14. Do you have any family member (s) who suffered any of the CVDs ? If 'NO' move to Q. 16 Yes …………………………………………………1 No ………………………………………………..2	15. Which of these diseases did they suffer from or are they suffering from? You can select more than one option Hypertension……………………………………..1 Diabetes Mellitus ……………………………..2 Stroke ……………………..…..………………3 Cancer ………………………..………………4 Coroanary Artery Disease …………………….5 Dyslipideamia …………………..……………6 Others ………………………………..………7 Not Applicable …………………………..……8
16. If you chose "Yes" in Question 14, indicate which family member (s) have the CVDs? You can choose more than one option. Father ……………………………………….. 1 Mother ……………………………………… 2 Grandparent …………………………...…. 3 Siblings ……………………..…………….. 4	17. Do you currently have a structured exercise plan? Yes …………………………………………………1 No …………………………………………………2
18. What type of exercise do you currently undertake? None ……………………………………………..0 Brisk walking …...……………………………1 Soccer …………...……………………………2 Jogging …………..……………………………3 Going to the gem ………………………………4 Swimming ……………………..……………….5 Other(specify) ……………………………….6	19. How often do you exercise? Not applicable ……………………………….0 Never ……………………………………….. 1 Daily ………………………………………… 2 Weekly ……………………………………….. 3 Occasionally ……..…………………………. 4 Sometimes ……………………………………. 5
20. What quantity of salt do you take daily? < 1 teaspoon ………………………………….. 1 >1 teaspoon ……..…………………………… 2	21. How often do you eat fruits? Never ……..………………………………….. 1 Daily ………………………………………… 2 Weekly ……………………………………….. 3 Occasionally ………………………………… 4 Sometimes …………………………………… 5
22. How often do you eat vegetables?	23. How often do you take in fatty foods?

Never ……..………………………………….. 1 Daily ………………………………………… 2 Weekly ………………………………………… 3 Occasionally …………………………………… 4 Sometimes …………………………………….. 5	Never ……..………………………………….. 1 Daily ………………………………………… 2 Weekly ………………………………………… 3 Occasionally …………………………………… 4 Sometimes …………………………………….. 5
SECTION C: JOB-RELATED CHARACTERISTICS OF PARTICIPANTS	
24. Which unit of the hospital do you work? Intensive care unit/HDU……………………..……. 1 In patients ……………………………….…….. 2 Out patients ……………………………….........3 No contact with patients…………………………4 Management .. ……..…………………………...5	25. What is the most common shift you have run for the past six months? Morning duties ……………………………… 1 Afternoon duties………………………..……… 2 Night duties ………………………..…….........3
26. How many years have you worked at your current facility? ……………………………………..years	27. Do you currently do more than one job? Yes ……………..……………………………. 1 No ………………………………………….. 2
28. Do you harbor intentions of leaving your current work? Yes …………… ……………………………… 1 No …… ..……………………………….……. 2	29. If 'Yes' in Q. 28, what will you do should you leave you current job? Change profession.…………………….……..1 Move to another country ………..…………..2 Stay at home …………………..……………..3 Move to another hospital ……………………4
30. How will you rate your rank in this hospital? Junior staff …….. ……………………………… 1 Senior staff ……..……………………………. 2 Management ……………………………........3	31. Averagely, how many patients are under your care daily? ……………………………… Patients. Not applicable …………………NA
32. How many hours do you spend weekly working in this hospital? …………………………… hours	33. When do you feel used-up (stressed-out) as a staff? Immediately post recruitment…………………..1 During restructuring ……………..…………….2 Post annual leave ……………..……………...3 Post promotion ……………..………………..4
34. Do you feel you have support for your work? Yes ……………………………………………..1 No ………………………………………….. 2	35. Do you feel you have control over your job? Yes ………………………………………….1 No …………………………………………2
36. Which of these three (3) factors can cause burnout in health workers? You can select more than 1 option Workload ……….. ….1 Unfamiliar Administrative work ……………………2 Time Pressure ………………………………………3 Suffering Patient …………………………………4	37. Which of the measures do you use to control the burnout from your work? Support from family…………………………..1 Stress relievers…………………………………..2 Interest & Hobbies ……………………………...3

Interpersonal Conflict ……………………………5 No Motivation ……………………………………6	
38. Are you satisfied with your current job? Yes …………… ……………………………… 1 No …… ..……………………………………. 2	39. Do you perceive your current job to be associated with high workload? Yes …………… ……………………………… 1 No …… ..……………………………………. 2
SECTION D: LEVEL OF RESILIENCE AMONG PARTICIPANTS	
40. I tend to bounce back quickly after hard times Strongly Disagree…..................................... …….1 Disagree…………………….. ……………………2 Neutral……………………………….……………3 Agree……………………………….………………4 Strongly agree ……………..………………………5	41. I have a hard time making it through stressful events Strongly Disagree…..................................... …….1 Disagree…………………;.. ……………………2 Neutral……………..……………….……………3 Agree……………..……………….………………4 Strongly agree ……………..………………………5
42. It does not take me long to recover from a stressful event Strongly Disagree…..................................... …….1 Disagree…………………….. ……………………2 Neutral……………………………….……………3 Agree……………………………….………………4 Strongly agree ……………..………………………5	43. It is hard for me to snap back when something bad happens. Strongly Disagree…..................................... …….1 Disagree…………………;.. ……………………2 Neutral……………..……………….……………3 Agree……………..……………….………………4 Strongly agree ……………..………………………5
44. I usually get through difficult times with little trouble Strongly Disagree…..................................... …….1 Disagree…………………;.. ……………………2 Neutral……………..……………….……………3 Agree……………..……………….………………4 Strongly agree ……………..………………………5	45. I tend to take a long time to get over set-backs in my life. Strongly Disagree…..................................... …….1 Disagree…………………;.. ……………………2 Neutral……………..……………….……………3 Agree……………..……………….………………4 Strongly agree ……………..………………………5
SECTION E: ASSESSMENT OF BURNOUT AMONG PARTICIPANTS	
46. I feel emotionally **exhausted** from my work Never …………………………………………… 0 A few times a year or less …………………… 1 Once a month or less ………………………… 2 A few times a month ……………………… .. .3 Once a week ……………………………………. 4 A few times a week …………………………… 5 Everyday ……..………………………………. 6	47. I feel used up at the end of the workday Never …………………………………………… 0 A few times a year or less …………………… 1 Once a month or less ………………………… 2 A few times a month ……………………… .. .3 Once a week ……………………………………. 4 A few times a week …………………………… 5 Everyday ……..………………………………. 6
48. I feel fatigued when I get up in the morning and have to face another day on the job. Never …………………………………………… 0 A few times a year or less …………………… 1	49. I can easily understand how the recipients of my services feel about things. Never …………………………………………… 0 A few times a year or less …………………… 1

Once a month or less .... 2 A few times a month .... .3 Once a week .... 4 A few times a week .... 5 Everyday 6	Once a month or less .... 2 A few times a month .... .3 Once a week .... 4 A few times a week .... 5 Everyday 6
50. I feel I treat some recipients as if they were impersonal objects. Never .... 0 A few times a year or less .... 1 Once a month or less .... 2 A few times a month .... .3 Once a week .... 4 A few times a week .... 5 Everyday 6	51. Working with people all day is really a strain for me. Never .... 0 A few times a year or less .... 1 Once a month or less .... 2 A few times a month .... .3 Once a week .... 4 A few times a week .... 5 Everyday 6
52. I deal very effectively with the problems of my recipients. Never .... 0 A few times a year or less .... 1 Once a month or less .... 2 A few times a month .... .3 Once a week .... 4 A few times a week .... 5 Everyday 6	53. I feel burnt-out from my work. Never .... 0 A few times a year or less .... 1 Once a month or less .... 2 A few times a month .... .3 Once a week .... 4 A few times a week .... 5 Everyday 6
54. I feel I'm positively influencing other people's lives through my work Never .... 0 A few times a year or less .... 1 Once a month or less .... 2 A few times a month .... .3 Once a week .... 4 A few times a week .... 5 Everyday 6	55. I've become more callous toward people since I took this job. Never .... 0 A few times a year or less .... 1 Once a month or less .... 2 A few times a month .... .3 Once a week .... 4 A few times a week .... 5 Everyday 6
56. I worry that this job is making me emotionally tough. Never .... 0 A few times a year or less .... 1 Once a month or less .... 2 A few times a month .... .3 Once a week .... 4 A few times a week .... 5 Everyday 6	57. I feel very energetic. Never .... 0 A few times a year or less .... 1 Once a month or less .... 2 A few times a month .... .3 Once a week .... 4 A few times a week .... 5 Everyday 6
58. I feel frustrated by my job Never .... 0 A few times a year or less .... 1 Once a month or less .... 2 A few times a month 3	59. I feel I'm working too hard on my job. Never .... 0 A few times a year or less .... 1 Once a month or less .... 2 A few times a month 3

Once a week .... 4 A few times a week .... 5 Everyday 6	Once a week .... 4 A few times a week .... 5 Everyday 6
60. I don't really care what happens to some recipients Never .... 0 A few times a year or less .... 1 Once a month or less .... 2 A few times a month .... .3 Once a week .... 4 A few times a week .... 5 Everyday 6	61. Working with people directly puts too much stress on me. Never .... 0 A few times a year or less .... 1 Once a month or less .... 2 A few times a month .... .3 Once a week .... 4 A few times a week .... 5 Everyday 6
62. I can easily create a relaxed atmosphere with my recipients Never .... 0 A few times a year or less .... 1 Once a month or less .... 2 A few times a month .... .3 Once a week .... 4 A few times a week .... 5 Everyday 6	63. I feel exhilarated after working closely with my recipients. Never .... 0 A few times a year or less .... 1 Once a month or less .... 2 A few times a month .... .3 Once a week .... 4 A few times a week .... 5 Everyday 6
64. I have accomplished many worthwhile things in this job. Never .... 0 A few times a year or less .... 1 Once a month or less .... 2 A few times a month .... .3 Once a week .... 4 A few times a week .... 5 Everyday 6	65. I feel like I can't manage at all anymore. Never .... 0 A few times a year or less .... 1 Once a month or less .... 2 A few times a month .... .3 Once a week .... 4 A few times a week .... 5 Everyday 6
66. In my work, I deal with emotional problems very calmly. Never .... 0 A few times a year or less .... 1 Once a month or less .... 2 A few times a month .... .3 Once a week .... 4 A few times a week .... 5 Everyday 6	67. I feel recipients blame me for some of their problems. Never .... 0 A few times a year or less .... 1 Once a month or less .... 2 A few times a month .... .3 Once a week .... 4 A few times a week .... 5 Everyday 6
SECTION F: HYPERTENSION STATUS OF PARTICIPANTS	
68. Before your blood pressure measurement today, were you aware of your hypertension status? Yes 1	69. What was your last blood pressure reading? ……………………..mmHG

No ………………………………………………2	Cannot remember…………….
70. Have you been diagnosed with CVD before? Yes…………………………………………………1 No ………………………………………………2	71. If 'Yes' in Q. 60, are you taking medications for any CVD? Yes……………………………………………1 No ……………………………………………2 72. Not applicable ………………………………3
SECTION G: DIABETES MELLITUS TYPE II STATUS OF PARTICIPANTS	
73. Before your fasting sugar measurement today, were you aware of your diabetes mellitus type II status? Yes …………………..……………………1 No ……………………………………..……….2	74. What was your last fasting plasma sugar reading? ……………………..mmol/L Cannot remember …………….
75. Have you been diagnosed with diabetes mellitus type II before? Yes……………………………………………1 No ………………………………………….2	76. If 'Yes' in Q. 64, are you taking medications for high sugar in your blood? Yes……………………………………………1 No ……………………………………………2 Not applicable ……………………………...3
SECTION H: ANTHROPOMETRIC, HAEMODYNAMIC & BIOCHEMICAL MEASUREMENTS	
Height in (cm)	
Weight (kg)	
Visceral fat	
Body fat	
BMI	
BMR	
Waist/Abdominal girth (cm)	
Hip circumference (cm)	
WHR	
Blood pressure 1	SBP1______ DBP1 _ HR1
Blood pressure 2	SBP2______DBP2 _ HR 2

HDL (mmol/L)	
LDL (mmol/L)	
Triglycerides (mmol/L)	
Total cholesterol (mmol/L)	
FPG (mmol/L)	
Cortiso (namol/l)	

THANK YOU

APPENDIX D: REFERRAL FORM

Name: **Sex:**

Age:

Date:

Brief Medical history
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………

Measurements and Results:
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………

Provisional diagnosis
……………………………………………………………………………………………………
……………………………………………………………………………………………………

Name of Hospital/Unit referred to:
……………………………………………………………………………………………………
……………………………………………………………………………………………………..
Name of Researcher ……………………………………………………………………………….

Signature and Date……………………………………………………………………………..

APPENDIX Ei: FRAMINGHAM RISK SCORE (FRS)

Step 1: In the "points" column enter the appropriate value according to the patient's age, HDL-C, total cholesterol, systolic blood pressure, and if they smoke or have diabetes. Calculate the total points.

Risk Factor	Risk Points				Points
	Men		**Women**		
Age					
30-34	0		0		
35-39	2		2		
40-44	5		4		
45-49	7		5		
50-54	8		7		
55-59	10		8		
60-64	11		9		
65-69	12		10		
70-74	14		11		
75+	15		12		
HDL-C (mmol/L)					
>1.6	**-2**		**-2**		
1.3-1.6	**-1**		**-1**		
1.2-1.29	**0**		**0**		
0.9-1.19	**1**		**1**		
<0.9	**2**		**2**		
Total Cholesterol					
<4.1	0		0		
4.1-5.19	1		1		
5.2-6.19	2		3		
6.2-7.2	3		4		
>7.2	4		5		
Systolic Blood Pressure (mmHg)	**Not Treated**	**Treated**	**Not Treated**	**Treated**	
<120	-2	0	-3	-1	
120-129	0	2	0	2	
130-139	1	3	1	3	
140-149	2	4	2	5	
150-159	2	4	4	6	
160+	3	5	5	7	
Smoker	Yes	4	3		
	No	0	0		
Diabetes	Yes	Statin-indicated condition			
	No	0	0		
Total Points					

APPENDIX Eii: FRAMINGHAM RISK SCORE (FRS)

Step 2: Using the total points from Step 1, determine the 10-year CVD risk (%).

Total points	**10-year CVD risk**	
	Men	**Women**
-3 or less	<1	<1
-2	1.1	<1
-1	1.4	1.0
0	1.6	1.2
1	1.9	1.5
2	2.3	1.7
3	2.8	2.0
4	3.3	2.4
5	3.9	2.8
6	4.7	3.3
7	5.6	3.9
8	6.7	4.5
9	7.9	5.3
10	9.4	6.3
11	11.2	7.3
12	13.3	8.6
13	15.6	10.0
14	18.4	11.7
15	21.5	13.7
16	25.3	15.9
17	28.4	18.51
18	>30	21.5
19	>30	24.8
20	>30	27.5
21+	>30	>30

APPENDIX Eiii: FRAMINGHAM RISK SCORE (FRS)

Step 3: Using the total points from Step 2, determine the 10-year CVD risk classification .

Total % points	10-YEAR CVD RISK
More than 20%	High
10-19%	Intermediate
Less than 10%	Low

APPENDIX F: ETHICAL CLEARANCE LETTER

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

In case of reply the number and date of this Letter should be quoted.

My Ref. : ERC-
Your Ref. No.

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
GPS Address: GA-050-3303
Mob: +233-50-3539896
Tel: +233-302-681109
Fax + 233-302-685424
Email: ethics.research@ghsmail.org
8th April, 2020

Kennedy Dodam Konlan

GHS-ERC
Review Summary

Protocol ID NO: GHS-ERC 018/03/20
Country of Review: Ghana

Protocol Title: "Burnout, Metabolic Syndrome and Predisposition to Non-Communicable Diseases: A Study among Health Workers of the Greater Accra Region of Ghana"

Dear Kennedy Dodam Konlan,

Please find the review summary of the protocol titled: **"Burnout, Metabolic Syndrome and Predisposition to Non-Communicable Diseases: A Study among Health Workers of the Greater Accra Region of Ghana"** that was submitted to the ERC secretariat for review.

We wish to inform you that the above-mentioned protocol underwent full general meeting review and that approval has been granted for implementation of the study.

Please note that your approval letter is being processed and you will receive an email notification as soon as it is ready.

We wish you a successful project implementation.

Accept our congratulations.

Administrator, Ghana Health Service Ethics Review Committee
For: Chairman
Name: Nana Abena Apatu