

**SCHOOL OF PUBLIC HEALTH
COLLEGE OF HEALTH SCIENCES
UNIVERSITY OF GHANA**

**RISK FACTORS OF HYPERTENSION AMONG SECURITY OFFICERS OF THE
UNIVERSITY OF GHANA, LEGON CAMPUS**

BY

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**THIS DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF GHANA,
LEGON IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE
AWARD OF MASTER OF SCIENCE IN OCCUPATIONAL MEDICINE DEGREE**

JULY, 2016

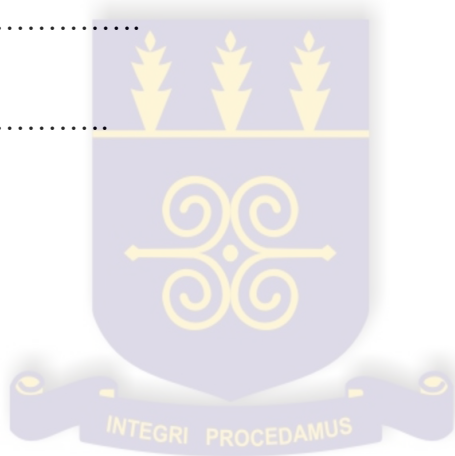
DECLARATION

I, Justina Buernokie Shaidah, declare that except for other people's investigations which have been duly acknowledged, this work is the result of my own original research, and that this dissertation, either in whole or in part has not been presented elsewhere for another degree.

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SIGNATURE.....

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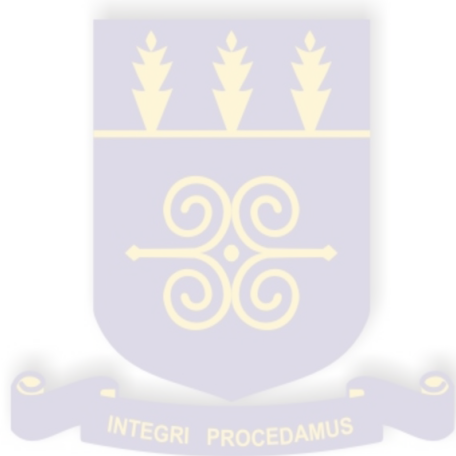
DEDICATION

This dissertation is dedicated to the glory of the Almighty God, the Ancient of days, the God of Prophet T. B. Joshua in Jesus' Mighty name.

To the loving memory of my late father Mr. William Owuraku Shaidah.

To my sweet mom and brother for holding the fort, for their love, support and encouragement during trying moments.

To all my friends whose support has made this work possible.



ACKNOWLEDGEMENT

I want to first and foremost thank the Lord God Almighty, my mentor prophet T.B Joshua and the Emmanuel TV prayer partners for helping me this far with your prayer support.

I acknowledge the immense contributions, corrections and productive criticisms of my supervisor Dr. Judith Koryo Stephens. Thank you for your patience, encouragement and counsel during the trying moments of this research.

My gratitude to Dr. Afua Asabea Amoabeng Nti, Dr. Grace Ahadzie, Dr. Pius Asigri of the University Hospital, for their contributions.

I want to thank Mr. Salifu, head of Security Services of the University of Ghana, the supervisors of the various security sectors for their support in diverse ways and especially all the security officers who participated voluntarily and enthusiastically in this research. This project would not have been successful without your support. Thank you for your priceless contributions.

I want to thank Mr. Simon Awini Asaman for his contributions. I really appreciate your time and patience.

I am grateful to all my classmates for their suggestions regarding this research. You made it sound so simple and feasible in spite of the challenges.

Last but not least, to the board of the College of Health Sciences, School of Public Health for giving me the opportunity to pursue this programme.

ABSTRACT

Hypertension is the most important modifiable risk factor for cardiovascular diseases. It is a major public health problem with a high mortality rate in developing countries such as Ghana. Security officers have high prevalence of traditional risk factors as well as occupation-specific risk factors for cardiovascular diseases. Traditional risk factors of cardiovascular diseases include hypertension, hyperlipidemia, metabolic syndrome, cigarette smoking, and a sedentary lifestyle. Occupation-specific risk factors include sudden physical exertion, acute and chronic psychological stress, shift work, and noise.

The objective of this study was to determine the prevalence of hypertension and its risk factors among security officers of the University of Ghana, Legon campus.

A self-administered questionnaire was used to obtain data about the security officers. The arterial blood pressure, weight and height of the security officers were checked by means of an electronic sphygmomanometer, a mechanical weighing scale with a stadiometer respectively.

Data obtained was analyzed using Stata 13 SE and Excel 2010. A total of 191 security officers participated in this study.

Prevalence of hypertension and prehypertension were 45 % and 37 % respectively. The mean systolic blood pressure was 135.3 mmHg (SD-22.75) while the mean diastolic blood pressure was 87.5mmHg (SD-15.41). The mean age of the participants was 43 years (SD-10.80) with 73.8 % of them being 35 years or above. The mean Body Mass Index (BMI) was 24.6 kgm⁻² (SD-3.94). The mean stress score was 20.4 (SD-4.66). Statistically significant associations were found between blood pressure and age (p-value<0.05), stress score (p value<0.05), BMI (p value<0.001) and years of work (p-value<0.05). Age was significantly associated with hypertension after adjusting for other independent variables. A high

prevalence of hypertension was found which was associated with the older age group, overweight/obesity, longer duration of service and having Senior Secondary School education or higher.

Keywords: Cardiovascular diseases, hypertension, security officer

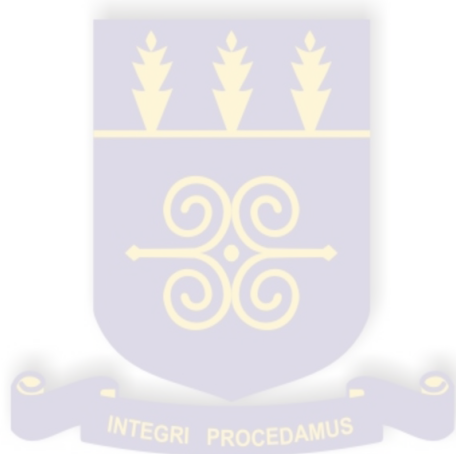


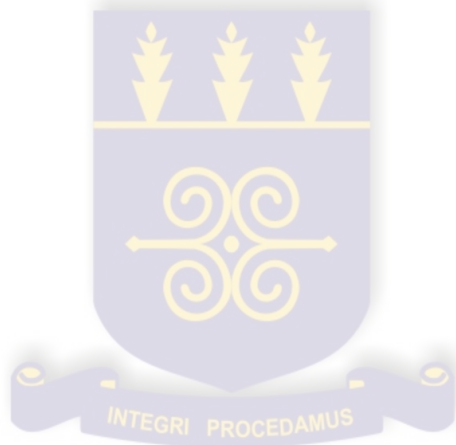
TABLE OF CONTENTS

DECLARATION	ii
DEDICATION	iii
ACKNOWLEDGEMENT	iv
ABSTRACT	v
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF APPENDICES	xi
LIST OF ABBREVIATIONS	xii
CHAPTER ONE	1
INTRODUCTION	1
1.1 Background	1
1.2 Problem Statement	2
1.3 Justification	2
1.4 Conceptual framework of risk factors for hypertension	3
1.5 Objectives	4
1.6 Research Questions	4
CHAPTER TWO	5
LITERATURE REVIEW	5
2.1 Scope of the review	5
2.2 Arterial blood pressure	5
2.3 The regulation of blood pressure	5
2.4 Classification of blood pressure	8
2.5 Hypertension	9
2.5.1 Pathophysiology of Hypertension	9
2.5.2 Risk factors for hypertension	11
2.5.3 Work related hypertension	14
2.5.4 Hypertension among security workers	14
2.5.5 Work of security officers	15
CHAPTER THREE	17
METHODOLOGY	17
3.1 Study Population	17
3.2 Study area	17
3.3 Inclusion and exclusion criteria	18
3.4 Study design	18
3.5 Ethical considerations	18

3.6 Variables	19
3.7 Sample size calculation	19
3.8 Sampling technique/ procedure	19
3.9 Materials and tools	20
3.10 Data collection	20
3.11 Height and weight measurements	20
3.12 Body mass index (BMI) determination	21
3.13 Blood pressure measurements	21
3.14 Perceived stress score (PSS) assessment	21
3.15 Data entry	22
3.16 Data analysis	22
3.17 Advice to participants	23
CHAPTER FOUR	24
RESULTS	24
4.1 Demographic characteristics	24
4.2 Awareness of the effect of security work on health	26
4.3 Potential causes of harm by Respondents' work	26
4.4 Smoking Habits	28
4.5 Alcohol drinking habit	29
4.6 Stress	29
4.7 Body Mass Index	30
4.8 Blood pressure distribution and hypertension	30
4.9 Associations of variables	31
CHAPTER FIVE	35
DISCUSSION	35
CHAPTER SIX	38
CONCLUSION, RECOMMENDATIONS AND LIMITATIONS	38
6.1 Conclusion	38
6.2 Recommendations	38
6.3 Limitations	38
REFERENCES	40
APPENDICES	45

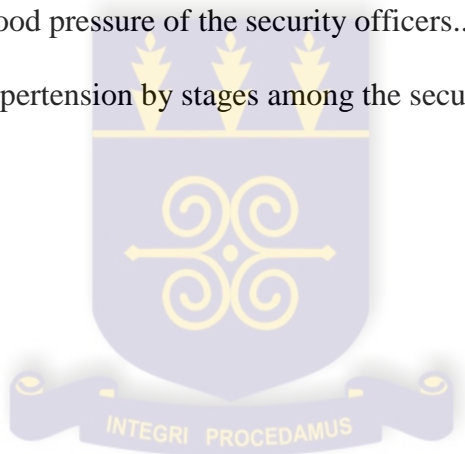
LIST OF TABLES

<u>Table 2.1 Classification of blood pressure</u>	8
<u>Table 4.1 Demographic characteristics of the security officers</u>	25
<u>Table 4.2 Potential harmful effects of work on health</u>	27
<u>Table 4.3 Perceived stress level of the security officers</u>	29
<u>Table 4.4 Statistical summary of variables</u>	30
<u>Table 4.5 Association of hypertension with risk factors by chi square analysis</u>	33
<u>Table 4.6 Association of hypertension with risk factors by multiple logistic regression</u>	34



LIST OF FIGURES

Figure 1.1 Conceptual framework of risk factors of hypertension.....	3
Figure 2.1 Pathophysiology of hypertension	10
Figure 3.1 Map of the University of Ghana.....	17
Figure 4.1 Awareness of the effect of security work on health.....	26
Figure 4.2 Smoking habits of security officers.....	28
Figure 4.3 Duration of smoking among security officers.....	28
Figure 4.4 Alcohol drinking habits of the security officers.....	29
Figure 4.5 Body mass index distributions of the security officers.....	30
Figure 4.6 Distribution of blood pressure of the security officers.....	31
Figure 4.7 Distribution of hypertension by stages among the security officers	31



LIST OF APPENDICES

Appendix 1 Participant information and Consent form.....	45
Appendix 2 Questionnaire.....	49
Appendix 3 Equipment.....	52

LIS T OF ABBREVIATIONS

ACE-Angiotensin converting enzyme

AME -Apparent mineralocorticoid excess

ANP-Atrial natriuretic peptide

AT₁- Angiotensin II type 1 receptor

AT₂- Angiotensin II type 2 receptor

BMI- Body mass index

BP- Blood pressure

CI-Confidence interval

CNS - Central nervous system

DBP-Diastolic blood pressure

df- Degree of freedom

GRA- Glucocorticoid-remediable aldosteronism

PSS-Perceived stress scale

SBP-Systolic blood pressure

SD- Standard deviation

WHO-World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background

Hypertension is the most important modifiable risk factor for cardiovascular diseases (CVD) (Ramey et al., 2011). Hypertension is responsible for at least 45% of deaths due to heart diseases and 51% of deaths due to stroke globally (Mendis, 2013).

Security officers have high prevalence of traditional risk factors as well as occupation-specific risk factors for CVD. Traditional risk factors for CVD include hypertension, hyperlipidemia, metabolic syndrome, cigarette smoking, and a sedentary lifestyle. Public security work is a high-stress occupation and occupation-specific risk factors include sudden physical exertion, acute and chronic psychological stress, shift work, and noise (Zimmerman, 2012).

A high level of work-related stress is a known risk factor for CVD hence these security personnel have an increased risk of cardiovascular morbidity and mortality (Ramey et al., 2011). Shift work is stressful (Van Gyes, 2006) with shift systems in general involving periods of 6–12 hours' of work at a time with the shift crews alternating on two, three, or four shifts in any 24 hour period. This results in disruption of circadian rhythm, disturbed socio-temporal patterns and social support, stress, smoking, poor diet, and lack of exercise. Shift work has been linked to metabolic syndrome and cardiovascular diseases (Ceide et al., 2015).

There is a fairly strong correlation between body mass index (BMI) and body fatness. People who are obese are at increased risk of many diseases and conditions such as hypertension, dyslipidemia, diabetes mellitus, coronary heart disease, and cerebrovascular attack (Freedman et al., 2013).

A study conducted among a group of security guards at a public university in Kuala Lumpur found them to be at increased risk of morbidity and mortality from CVD. About 60% of them were found to be overweight and obese, with a higher prevalence of hypertension than the general Malaysian population (Moy et al., 2006).

1.2 Problem Statement

According to the World Health Organization (WHO), hypertension is a major public health challenge globally (WHO, 2013). It is a common disease in adults, pre-disposing them to many cardiovascular complications. The prevalence of hypertension among the West African workforce is 34.4 % (Bosu, 2015). An estimated 25 percent of public servants in Ghana are hypertensive while most adults in Ghana are on medication for diabetes, hypertension or other chronic illnesses, a situation which affects the productivity of the workforce (Quaicoe-Duho, 2015). Although few studies report an increased prevalence of cardiovascular disease risk factors among law enforcement officers, there is evidence that mortality due to cardiovascular diseases is higher among law enforcement officers than other workers (Zimmerman, 2012). Hypertension and cardiovascular diseases among Ghanaian security personnel is therefore a challenge affecting their productivity and a major cause of mortality.

1.3 Justification

Although studies have shown an association between work-related stress and hypertension as well as other risk factors for cardiovascular disease (Kales et al., 2008), there is paucity of information on the prevalence of hypertension and its risk factors among Ghanaian security officers.

In order to take effective preventive measures, identification of the risk factors of hypertension is a prerequisite. When the magnitude of the problem is established from evidence based analysis among the security officers, it will serve as a reference for further

research among other security personnel such as the police, military and other security services in Ghana. Hence, this study is important to establish the fact and make appropriate recommendations to the right stakeholders

1.4 Conceptual framework of risk factors for hypertension

Figure 1.1 shows the conceptual framework of risk factors for hypertension. Hypertension develops over a period of time. Different factors such as ageing, obesity, high recurrent stress levels, smoking and high alcohol consumption among others contribute to the condition. Smoking causes changes in arteries by increasing rigidity and peripheral resistance thus increasing blood pressure (Viridis, 2010). Sedentary life style results in weight gain and obesity with resultant arteriosclerotic changes in arteries (Burke et al., 2008). Shift work is stressful (Van Gyes, 2006) and stress has been established to lead to the stimulation of the sympathetic nervous system with a resultant increase in blood pressure. Stress can cause vulnerable persons to indulge in alcohol or tobacco smoking (Sinha, 2008). Excess consumption of alcohol leads to hypertension (Husain et al., 2014). A family history of hypertension, ageing and gender are un-modifiable risk factors for hypertension (Liu et al., 2015).

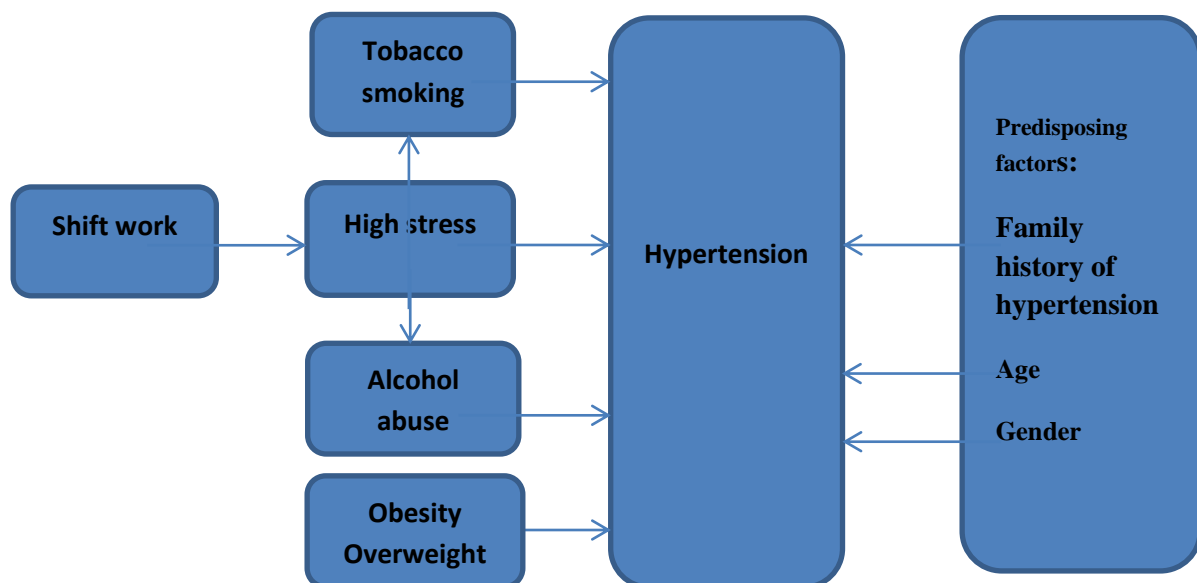


Figure 1.1 Conceptual framework of risk factors of hypertension

1.5 Objectives

1.5.1 General Objective

To determine the prevalence of risk factors of hypertension among the security officers of the University of Ghana, Legon campus.

1.5.2 Specific Objectives

1. To determine the prevalence of high blood pressure among the security officers.
2. To determine the body mass index of the security officers.
3. To determine the level of stress among the individual security officers.
4. To collect data on the demographic characteristics of the security officers.

1.6 Research Questions

1. What is the prevalence of hypertension among the security officers of the University of Ghana, Legon campus?
2. What factors are attributable to the presence of hypertension among these security officers?
3. What can be done to reduce morbidity and mortality due to hypertension among these security officers?
4. Is security work a predisposing factor for hypertension?

CHAPTER TWO

LITERATURE REVIEW

2.1 Scope of the review

The focus of the review will be on defining hypertension; the physiology of normal blood pressure; pathophysiology of hypertension; risk factors of hypertension; prehypertension; an insight into the work of security officers; work-related hypertension and hypertension among security officers and quasi professionals.

2.2 Arterial blood pressure

Arterial blood pressure is the force exerted by the blood on the wall of an artery as the heart contracts and relaxes. The systolic blood pressure is the degree of force exerted when the heart is contracting while diastolic blood pressure is the degree of force exerted when the heart is relaxed. Arterial blood pressure is a product of cardiac output and peripheral resistance (Foëx & Sear, 2004).

2.3 The regulation of blood pressure

The regulation of blood pressure involves several complex mechanisms which work together to maintain a particular blood pressure in an individual person (Foëx & Sear, 2004).

2.3.1 Neurogenic regulation

Blood pressure is regulated by the autonomic nervous system. The vasomotor centre located in the pons and midbrain; and arterial baroreceptors respond to vascular wall distension by an increase in the afferent impulse activity. This in effect decreases the efferent sympathetic activity and increases vagal tone. The overall effects of these are bradycardia and vasodilatation (Joyner et al., 2010). Increased sympathetic activity increases vascular tone through the effect of noradrenaline on vascular alpha adrenoreceptors. Adrenaline activates

both vascular beta-2 and alpha adrenoreceptors with resultant vasodilatation and vasoconstriction respectively (Kirkman & Sawdon, 2010).

2.3.2 Humoral regulation

Humoral regulation of blood pressure involves many interactive systems, hormones and factors such as the renin-angiotensin-aldosterone system, the renomedullary system, the kallikrein-kinin system, atrial natriuretic peptides, eicosanoids, endothelial mechanisms, adrenal steroids and others.

One important system that controls blood pressure is the renin-angiotensin-aldosterone system. Renin is a protein molecule produced mainly by the juxtaglomerular apparatus of the kidneys. The juxtaglomerular apparatus is sensitive to changes in renal perfusion pressure and the sodium concentration in the distal tubular fluid. Renin binds to angiotensinogen (produced by the liver) to form an inactive peptide; angiotensin I. Angiotensin I is then converted into an active peptide angiotensin II through the action of the enzyme angiotensin converting enzyme (ACE) (Widmaier et al., 2014). Angiotensin II acts on specific angiotensin II type 1 receptors (AT₁) and angiotensin II type 2 (AT₂) receptors causing smooth muscle contraction and the release of aldosterone, prostacyclin, and catecholamines which cause an increase in blood pressure (Yvan-Charvet & Quignard-Boulange, 2011). High angiotensin II concentrations suppress renin secretion via a negative feedback effect. Renomedullary interstitial cells found in the renal papilla secrete an inactive substance called medullipin I. Medullipin I is transformed into medullipin II in the liver. Medullipin has prolonged hypotensive effect through vasodilatation, inhibition of sympathetic drive and a diuretic action. The activity of the renomedullary system is controlled by renal medullary blood flow (Foëx & Sear, 2004).

Another important mechanism of control of blood pressure involves the adrenal corticosteroids; mineralocorticoids and glucocorticoids. Cortisol is the most important glucocorticoid. Aldosterone is the primary mineralocorticoid involved in electrolyte balance. Corticosteroids increase blood pressure. Mineralocorticoids cause sodium and water retention while glucocorticoids cause increased vascular reactivity. Both of them increase vascular tone by up regulating the receptors of pressor hormones such as angiotensin II. Sodium and water retention are associated with an increase in blood pressure while sodium depletion is associated with hypotension. It is postulated that through the sodium–calcium exchange mechanism, sodium causes an increase in intracellular calcium within vascular smooth muscles with a resultant increase in vascular tone (Foëx & Sear, 2004).

One important factor in the regulation of blood pressure is the atrial natriuretic peptide (ANP). ANP is released from atrial granules and it is a potent vasodilator. It produces natriuresis, diuresis and decreases blood pressure. It decreases plasma renin and aldosterone concentrations. There are three types of ANP and their concentrations are increased by raised filling pressures in the atria in persons with arterial hypertension and left ventricular hypertrophy as the wall of the left ventricle participates in the secretion of ANP (Widmaier et al., 2008).

Eicosanoids play an important role in blood pressure regulation. Examples of eicosanoids include prostaglandins, leukotrienes, thromboxanes, lipoxins. Some eicosanoids are vasodilators while others are vasoconstrictors. They are known to cause changes in blood pressure by their direct effects on vascular smooth muscle tone and interactions with other vasoregulatory systems such as the autonomic nervous system, renin–angiotensin–aldosterone system, and other humoral pathways.

The kallikrein-kinin system plays an important interactive role in the regulation of blood pressure. Tissue kallikreins activate kininogens to produce vasoactive kinins. The most important of these vasoactive kinins is a vasodilator called bradykinin which regulates renal blood flow, water and sodium excretion. The endothelium plays an important role in blood pressure regulation through the production of a number of vasodilator and vasoconstrictor substances which regulate vasomotor tone (Galley & Webster, 2004). The endothelium synthesises nitric oxide and endothelins. Nitric oxide is a known vasodilator while endothelins are known to be the most powerful vasoconstrictors (Flammer et al., 2012).

2.4 Classification of blood pressure

Optimal blood pressure is defined as a systolic blood pressure of 90-119 mmHg and a diastolic blood pressure 60-79 mmHg. Systolic blood pressure of 120-139 mmHg and or diastolic blood pressure 80-89 mmHg is defined as prehypertension. Systolic blood pressure of 140 mmHg or greater and or a diastolic blood pressure 90 mmHg or greater is defined as hypertension. Hypertension is further divided into three stages. Stage 1 hypertension is a systolic blood pressure of 140-159 mmHg and or a diastolic blood pressure 90-99 mmHg, stage 2 hypertension is a systolic blood pressure of 160-179 mmHg and or a diastolic blood pressure 100-109 mmHg and stage 3 hypertension is defined as a systolic blood pressure greater than or equal to 180 mmHg and or a diastolic blood pressure greater than or equal to 110 mmHg. Blood pressure can be classified as follows (Table 2.1 below):

Table 2.1 Classification of blood pressure

Category	Systolic (mmHg)	Diastolic (mmHg)
Optimal BP	90-119	60-79
Prehypertension	120-139	80-89
Stage 1 hypertension	140-159	90-99
Stage 2 hypertension	160-179	100-109
Stage 3 hypertension	≥180	≥110

(Source: Rashid et al., 2011).

2.5 Hypertension

Hypertension is defined as a persistent systolic blood pressure (SBP) of 140 mm Hg or more, and or a diastolic blood pressure (DBP) of 90 mm Hg or more, or taking medications to control high blood pressure (Roger et al., 2012).

2.5.1 Pathophysiology of Hypertension

The pathophysiology of hypertension is complex and involves different systems as illustrated in Figure 2.1 below. Blood pressure is the product of cardiac output and systemic vascular resistance. In arterial hypertension there may be an increase in cardiac output, an increase in systemic vascular resistance, or both. Increased systemic vascular resistance and increased stiffness of the vasculature with ageing play a dominant role in the pathophysiology of hypertension. Vascular tone may be raised as a result of increased α -adrenoceptor stimulation or increased release of peptides such as angiotensin or endothelins.

An increase in cytosolic calcium in vascular smooth muscles causes vasoconstriction. Several growth factors, including angiotensin and endothelins, cause an increase in vascular smooth muscle mass. Endothelial dysfunction causes a decline in nitric oxide production. In hypertensive persons, endothelial-derived relaxation is inhibited. The harmful vascular effects of endogenous endothelin-1 may be heightened by a decrease in nitric oxide production caused by endothelial dysfunction (Flammer et al., 2012).

An increase in systemic vascular resistance and vascular stiffness increases the load imposed on the left ventricle. This induces left ventricular hypertrophy and left ventricular diastolic dysfunction. The pulse pressure generated by the left ventricle is relatively low in young people. The waves reflected by the peripheral vasculature occur mainly after the end of systole; hence pressure is increased during the early part of diastole and improves coronary perfusion.

However, with ageing, stiffening of the aorta and elastic arteries increases the pulse pressure. Reflected waves move from early diastole to late systole. This results in an increase in left ventricular afterload, and left ventricular hypertrophy. The widening of the pulse pressure with ageing is a strong predictor of coronary heart disease.

The autonomic nervous system plays an important role in the control of blood pressure. In hypertensives, there is an increased release of norepinephrine and enhanced peripheral sensitivity to it. In addition, there is increased responsiveness to stressful stimuli. Another feature of arterial hypertension is a resetting of the baroreflexes and decreased baroreceptor sensitivity. The renin–angiotensin system is involved at least in some forms of hypertension such as renovascular hypertension and is suppressed in the presence of primary hyperaldosteronism (Foëx & Sear, 2004).

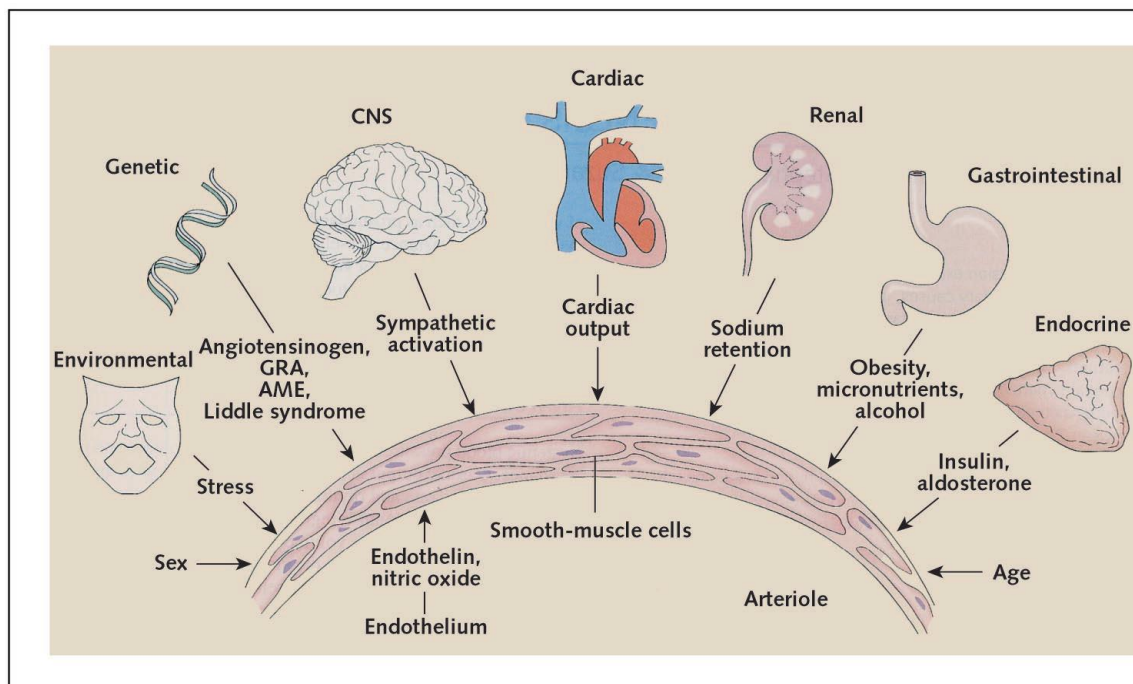


Figure 2.1 Pathophysiology of hypertension

AME - apparent mineralocorticoid excess; CNS - central nervous system; GRA - glucocorticoid-remediable aldosteronism.

(Source: Ausiello et al., 2003).

2.5.2 Risk factors for hypertension

Risk factors for hypertension include uncontrollable factors such as genetics, age, gender, race, and controllable factors; obesity, high sodium and calcium salts intake, stress, sedentary lifestyle, tobacco smoking, heavy alcohol consumption, hyperlipidemia. Hyperlipidemia, metabolic syndrome, cigarette smoking, and a sedentary lifestyle are traditional risk factors for hypertension.

2.5.2.1 Age

There is an increase in blood pressure with ageing. This is associated with structural changes in the arteries; mostly stiffness of large arteries. According to the Framingham Heart Study, systolic blood pressure increases steadily from 30 years onwards. Diastolic blood pressure varies with ageing; it increases up to about 50 years of age but steadily decreases from 60 years onwards (Leitschuh et al., 1991; Pinto, 2007).

2.5.2.2 Gender

In the second and third decades of life, women have slightly lower blood pressure compared to men of similar ages. Blood pressure in women after menopause is however comparable with that of men of similar ages or even higher. This is attributed to postmenopausal hormonal changes in women (Reckelhoff, 2001).

2.5.2.3 Race

Various studies report a higher prevalence of hypertension in people of African descent and other minority racial groups than in Caucasians living in the United States of America. The higher prevalence of hypertension in people of African origin in the United States of America than in Africa demonstrates that environmental and behavioural characteristics are likely to account for the higher prevalence of hypertension in Afro-Americans (Fuchs, 2011).

2.5.2.4 Genetics (Family history)

Family history is a major predictor of hypertension among other risk factors (Liu et al., 2015). In a recent study among adults in Sri Lanka, it was found that hypertension was significantly higher in those with a family history of hypertension (Ranasinghe et al., 2015).

2.5.2.5 Stress

Stress can cause hypertension through repeated blood pressure elevations as well as by stimulation of the nervous system to produce large amounts of vasoconstricting hormones that increase blood pressure. Overall, studies show that stress does not directly cause hypertension, but can have an effect on its development. Although stress may not directly cause hypertension, it can lead to repeated blood pressure elevations, which eventually may lead to hypertension (Virdis et al., 2010). Stress also leads to the production of excessive amount of cholesterol which can occlude blood vessels and lead to hypertension (Garbarino & Magnavita, 2015).

2.5.2.6 Overweight / Obesity

It is estimated that at least 75 % of the incidence of hypertension is related directly to obesity (Landsberg et al., 2013). Obesity is associated with numerous comorbidities including hypertension. Blood pressure is usually increased in overweight people. Overweight and hypertension interact with cardiac function. A key determinant of the weight-induced increases in blood pressure is a disproportional increase in cardiac output that cannot be fully accounted for by the hemodynamic contribution of new tissue. The hypertension among overweight people seems strongly related to altered sympathetic activity (Gray, 2009).

2.5.2.7 Smoking

Cigarette smoking acutely exerts a hypertensive effect, mainly via the stimulation of the sympathetic nervous system. Cigarette smoking is a powerful cardiovascular risk factor and

smoking cessation is the single most effective lifestyle measure for the prevention of a large number of cardiovascular diseases. Impairment of endothelial function, arterial stiffness, inflammation, lipid modification as well as an alteration of antithrombotic and prothrombotic factors are smoking-related major determinants of initiation, and acceleration of the atherothrombotic process, leading to cardiovascular events. Regarding the effect of chronic smoking on blood pressure, available data do not indicate a direct causal relationship between chronic smoking and hypertension. Hypertensive smokers however, are more likely to develop severe forms of hypertension such as malignant and renovascular hypertension, due to accelerated atherosclerosis (Viridis et al., 2010).

2.5.2.8 Alcohol consumption

One of the harmful effects of excessive alcohol intake is its association with hypertension. The positive relationship between the amount of alcohol consumed and blood pressure is one of the strongest associations of potentially modifiable risk factors for hypertension. Many studies show progressively higher blood pressure levels with increasing levels of alcohol intake and decreases in blood pressure over time when alcohol intake decreases. The hypertensive effect of alcohol usually decreases within several days of abstinence in alcoholics. Weekend drinkers have significantly higher blood pressures at the beginning of the week than towards the end of the week. Alcohol intake has also been associated with resistance to antihypertensive therapy. These could be due to poor compliance among heavy drinkers or interaction of alcohol with medications (O'Keefe et al., 2007).

2.5.2.9 Prehypertension

Prehypertension is defined as blood pressure between 120-139/80-89 mmHg. It is a major public health concern. Prehypertension is very prevalent. It is often associated with other cardiovascular risk factors and independently increases the risk of hypertension and subsequent cardiovascular events (Papadopoulos et al., 2008).

Early recognition of prehypertension provides important opportunities to prevent hypertension and cardiovascular diseases. Stage 1 prehypertension is blood pressure 120-129/80-84 mmHg and stage 2 as blood pressure 130-139/85-89 mmHg. Stage 2 prehypertensive individuals have a threefold greater risk for developing hypertension and twofold higher risk for cardiovascular events compared to normotensives (Egan & Julius, 2008).

2.5.3 Work related hypertension

Several occupations are known to be associated with high prevalence of hypertension. Occupations associated with high prevalence of hypertension include bankers, law enforcement officers, traders and healthcare workers (Bosu, 2015). A study conducted by Lakshman et al. (2014), found a high prevalence of hypertension and prehypertension among commercial bus drivers. The high prevalence of hypertension and prehypertension was associated with specific job related factors among these drivers. The factors responsible for work-related hypertension include increased job strain from several factors at work as well as certain workplace environmental exposures such as cadmium. According to Tellez-Plaza et al. (2008), cadmium levels in the blood are associated with modest blood pressure increases. Increased job strain results from shift work, work-related psychological stress, and long irregular working hours among several factors. Job strain is significantly associated with hypertension (Babu et al., 2014).

2.5.4 Hypertension among security workers

Public security work is a high-stress occupation and security personnel have an increased risk of cardiovascular morbidity and mortality. Security officers have high prevalence of traditional risk factors of hypertension as well as occupation-specific risk factors for hypertension and cardiovascular disease. Occupation-specific risk factors include sudden physical exertion, acute and chronic psychological stress, shift work, and noise (Zimmerman,

2012). Hypertension is an important health issue among high risk occupation groups like security personnel.

Several studies have shown an association between work-related stress and risk factors for cardiovascular disease (Czaja-Miturai et al., 2013). One major source of stress for security officers is shift work. Shift systems involve periods of 6–12 hours' work at a time with the shift crews alternating on two, three, or four shifts in any 24 hour period. Shift workers are at higher risks of hypertension than non-shift workers. This is attributed to circadian disruption caused by shift work (Ceide et al., 2015).

There is a fairly strong correlation between BMI and body fat. People who are obese are at increased risk for many diseases and health conditions, including hypertension, dyslipidemia, diabetes mellitus type 2, coronary heart disease, and stroke (Freedman et al., 2013).

2.5.5 Work of security officers

Law enforcement agents are trained to respond during crime or violence. Security guards on the contrary adopt a preventive approach to crime rather than a reactive one. Security guards are the first responders (Howie, 2014).

Security guards prevent risks and deter crime, look out for danger, and report any crime they may encounter. Security guards perform many duties, one of which is to make themselves clearly visible in order to deter criminals. Most criminals are deterred from committing treacherous acts when they see a security officer on guard.

Security guards look out for strange things that may pose a danger and thus must have accurate senses. A security guard must be able to sense crisis and also react fast to control the situation appropriately. A security guard must always be alert at post to avoid being caught unawares. After a dangerous situation has been averted, a security guard must report the

incident to his supervisor, police, fire service or the appropriate authorities to prevent future recurrence. If the situation becomes overwhelming for a security officer at post to handle, he is expected to call for help to avoid loss of lives or property. Security guards may have to be present at large gatherings such as parties, political or religious assemblies to maintain order, ensure safety of lives and property, and prevent stampedes.

A security guard may be required to maintain certain rules and policies of his employers as well as give certain security tips and precautions to his employers. He must ensure that all safety precautions are adhered to. Apart from the primary duty, security guards may be required to perform additional duties such as receiving telephone calls, acting as receptionists, running special errands for their employers. (www.ExpertSecurityTips.com, Badiwe et al., 2016). All of these work-related activities are stressful and may increase the risk of cardiovascular disease among security officers. A study of the factors that contribute to the risk of hypertension among such workers therefore is necessary to prevent them from developing cardiovascular diseases.

CHAPTER THREE

METHODOLOGY

3.1 Study Population

The study population comprises security officers of the University of Ghana, Legon campus. The security officers are situated at various posts on the university campus; residential areas, faculties, colleges, schools, the entrance and exit gates, halls of residence, administrative blocks, and libraries among others. There are three main shifts. The security officers comprise different ranks of both sexes. A few of them are retired police officers and military officers.

3.2 Study area

The University of Ghana Legon campus occupies a vast area of land as shown on the map (Figure 3.1).

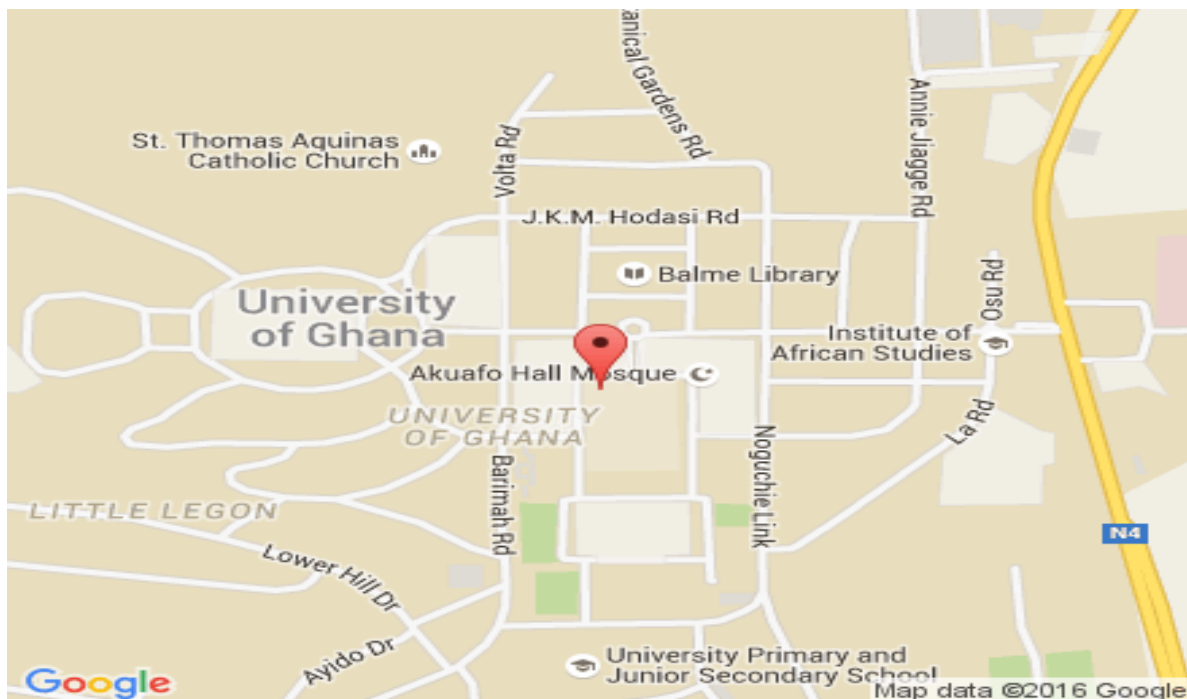


Figure 3.1 Map of the University of Ghana (Google Maps, 2016).

The Legon campus of the University of Ghana ($5^{\circ} 36' \text{ N}$, $0^{\circ} 10' \text{ W}$) is located in the Accra metropolis of the Greater Accra region of Ghana, about twelve kilometres northeast of the centre of Accra and at an altitude between 90 and 100 meters. The estimated population of the campus in 2011 was 3,963,264. The campus has hostels, halls of residence, lecture theatres, libraries, staff bungalows, a primary school and junior high school, a botanical garden, major roads (Garshong et al., 2013).

3.3 Inclusion and exclusion criteria

The criterion for inclusion in this study was any security officer irrespective of rank or gender who worked on the Legon campus of the University of Ghana. No pregnant security officers were included.

3.4 Study design

The study type is a cross-sectional quantitative study. Data was obtained by the use of questionnaire, measurement of blood pressure, weight and height of participants.

3.5 Ethical considerations

Ethical clearance was obtained from the Ghana Health Service Ethical Review Board. Permission was obtained from the head of Security Services of the University of Ghana. The participants were given a brief introduction about the study and their consent was sought for before enrolment. Each participant was told about the non-invasive nature of the procedures and that they might feel some discomfort with the blood pressure measurement as the cuff was being inflated. Each individual participant was required to complete a self-administered questionnaire, have his or her height, weight, and blood pressure checked. Each participant gave written or verbal informed consent before involvement in the study.

3.6 Variables

3.6.1 Dependent variable

- Presence of hypertension.

3.6.2 Independent variables

- Body mass index (BMI)
- Stress level
- Alcohol consumption
- Cigarette smoking

3.7 Sample size calculation

The prevalence of hypertension among West African workforce is 34.4 % (Bosu, 2015). The sample size of this population was calculated using the formula below:

$$n_0 = Z^2 pq/d^2$$

Where n_0 = estimated sample size, Z = confidence level (95% level of confidence - 1.96), p = the probability of having hypertension, (Prevalence = 34.4%) = 0.344, $q = 1 - p$, which is the probability of not having hypertension, in this case: $1 - p = 0.656$, $d = 0.05$ as the acceptable margin of error. The population of security officers = 325.

$$\begin{aligned} \text{Therefore, } n_0 &= \frac{(1.96)^2 (0.344)(0.656)}{(0.05)^2} \\ &= 347 \end{aligned}$$

$$\text{Correction for finite population } n_0 \div \left(1 + \frac{n_0 - 1}{\text{population}}\right) = 165$$

3.8 Sampling technique/ procedure

The sampling technique used was purposive sampling. The participants were selected from each of the eight sectors of the University of Ghana, Legon campus at their stations where the security officers log in before reporting to their various posts.

3.9 Materials and tools

Tools and equipment:

1. Digital sphygmomanometer; PhysioLogic (AMG Medical Inc., New York USA)
2. Mechanical weighing scale; ADE scale with adjustable stadiometer for measuring height (GmbH & Co, Hamburg-Germany).
3. Questionnaire- Cohen's Perceived Stress Scale (PSS) + other socio-demographic questions

3.10 Data collection

Data collection was carried out from 7th June, 2016 to 17th June, 2016.

Participants were selected from the various sectors of the University of Ghana, where the security officers were required to log in before reporting to their various posts.

3.11 Height and weight measurements

Weight was evaluated using a mechanical ADE scale, with a capacity of up to 150 kg and a 50 g interval variation. Height was measured using the stadiometer attached to the scale, with a 1 mm resolution and measuring capacity of up to 230 cm. The same scale was used for measuring the weight and height of each of the participants. The scale (ADE) was placed on a level floor. Each participant was weighed in light clothing after ensuring that all heavy objects were taken off. The scale was zeroed before each participant stepped onto it. An individual participant was required to stand upright on the scale with his or her spine facing the aneroid gauge of the ADE scale, arms by the sides, head up with eyes looking straight ahead before the reading was taken. The readings were recorded for each participant. Weight was recorded in kilograms and height in centimetres. Height in centimetres was converted into meters by dividing the figure in centimetres by 100.

3.12 Body mass index (BMI) determination

The BMI of each participant was calculated by dividing the weight in kilograms by the square of the body height in meters. The participants were categorised into four main groups based on their BMI: underweight; BMI less than 18.5 kgm^{-2} , normal weight; BMI $18.5-24.9 \text{ kgm}^{-2}$, overweight; BMI $25.0-29.9 \text{ kgm}^{-2}$ and obese; BMI 30.0 kgm^{-2} or above.

3.13 Blood pressure measurements

Blood pressure was verified using a pre-calibrated digital monitor (PhysioLogic). Each participant was made to rest seated for at least 5 minutes before the blood pressure measurement as taken. The pressure was taken twice on both arms for each participant seated with the feet on the ground or floor and arm resting on a flat surface. The average blood pressure for each arm was recorded. The blood pressure recordings of the left arm of the participants were used for the analysis of the data obtained.

The participants were grouped based on their blood pressure into five categories as illustrated in Table 2.1: optimal blood pressure; systolic blood pressure of less than 120 mmHg and a diastolic blood pressure less than 80 mmHg, prehypertension ; systolic blood pressure of 129-139 mmHg and or a diastolic blood pressure 80-89 mmHg, stage 1 hypertension; systolic blood pressure of 140-159 mmHg and or a diastolic blood pressure of 90-99 mmHg, stage 2 hypertension; systolic blood pressure of 160-179 mmHg and or a diastolic blood pressure of 100-109 mmHg and stage 3 hypertension; systolic blood pressure of 180 mmHg or greater, and or a diastolic blood pressure of 110 mmHg or greater.

3.14 Perceived stress score (PSS) assessment

The PSS of individual security officers was assessed based on the total score obtained from completing the ten questions in section 3 of the questionnaire adopted from the Cohen's perceived stress scale (Appendix 2). A total score of 20 or above was interpreted as high

perceived stress score, 10-19 as moderate perceived stress score and less than 10 as mild perceived stress score.

3.15 Data entry

Data obtained was entered into Excel 2010 worksheets in batches on a daily basis. Each participant was given a specific identification number. The data of each participant was entered in a row.

3.16 Data analysis

Data analysis was carried out using Microsoft Excel 2010 and Stata SE version 13 statistical software (StataCorp, 2013). Prevalence and risk factors of hypertension were presented as percentages. The association between hypertension and socio-demographic variables was assessed by comparing the prevalence of hypertension in individuals with and without these risk factors. The chi-square test and logistic regression analysis were used to analyse the differences, considering a p-value of less than 0.05 as statistically significant. The odds ratios (OR) of the statistically significant variables and their 95% confidence intervals were calculated. A multiple logistic regression analysis was carried out to obtain adjusted odds ratios for the variables.

For the purposes of chi square and logistic regression analyses, the variables were grouped into two categories each. They were grouped by age as follows; those below 35 years and those 35 years or above, by gender; male and female. They were grouped by level of education into two groups; those with lower than Senior Secondary School education and those with Senior Secondary School education or higher. They were grouped based on duration of work as security officers into two groups; those who had worked less than 5 years and those who had worked 5 years or more. The respondents were grouped by their total stress scores into two groups; those with stress score below 20 and those with stress score 20

or more. The respondents were grouped based on their BMI into two main groups; those with BMI less than 25 kgm^{-2} and those with BMI 25 kgm^{-2} or above. Based on their blood pressure measurements, they were categorised into two groups; those with systolic blood pressure less than 140 mmHg and or diastolic blood pressure less than 90 mmHg and those with systolic blood pressure 140 mmHg or above and or diastolic blood pressure 90 mmHg or above.

3.17 Advice to participants

Participants who were found to be prehypertensive were advised to consult their physicians, to have their blood pressure checked regularly at least every three months and adopt healthy lifestyles.

Those found to be hypertensives, were given written or verbal referrals to see a medical doctor with immediate effect. A few of them who were known hypertensives but were non-compliant on their medications were asked to take their medications daily and regularly go for their reviews with their doctors.

Participants who had normal BMI, blood pressure, low stress scores were commended and encouraged to maintain healthy lifestyles.

CHAPTER FOUR

RESULTS

4.1 Demographic characteristics

A summary of the demographic characteristics of the study participants is presented in Table 4.1.

A total of 191 security officers were sampled from the various sectors (eight sectors A-H) of the University of Ghana, Legon where the security officers reported daily to log in before dispersing to their various posts. All security officers who were present and agreed to participate in the study were included.

Most of the study participants 91.1% (174/191) were males and a few 8.9 % (17/191) were females.

The average age in years of the security officers was 43.0 ± 10.8 with a minimum age of 24 years and a maximum of 69 years. Majority of them, 73.8 % (141/191) were 35 years or older while the rest 26.2 % (50/191) were below the ages of 35 years.

A total of 92 % (176/191) of the participants indicated their marital status at the time of the study. Majority of them 73.9 % (130/176) were married. A few, 22.2 % (39/176) were single. The remaining were divorced, cohabiting or widowed and represent 1.1 %, 1.7 % and 1.1 % respectively.

Generally, the participants had one form of education or another. Most, 57 % (101/175) of them had Senior Secondary School education, some had tertiary education 24 % (42/176), few 16 % (28/176) had Junior Secondary School education, very few 2 % (4/176) had no formal education at all, and the least 0.6 % (1/176), had Primary School education.

The high proportion of the participants, 72 % (136/188) had worked as security officers for more than five years. Few 15 % (27/188) and 10 % (19/188) had worked between 4-5 years and 2-3 years respectively. Very few 3 % (3/188) had worked for less than one year as security officers.

Table 4.1 Demographic characteristics of the security officers

Variable	Category	Number	Frequency(n)	Per cent (%)
Age		191		
	Below 35		50	26.2
	35 and above		141	73.8
Gender		191		
	Male		174	91.1
	Female		17	8.9
Marital status		176		
	Married		130	73.9
	Single		39	22.2
	Divorced		2	1.1
	Cohabiting		3	1.7
	Widowed		2	1.1
Educational level		176		
	No formal education		4	2.3
	Primary		1	0.6
	JHS		28	15.9
	SHS		101	57.4
	Tertiary		42	23.9
Duration of service		188		
	Less than 1 year		6	3
	2-3 years		19	10
	4-5 years		27	15
	More than 5 years		136	72

4.2 Awareness of the effect of security work on health.

Figure 4.1 below, illustrates the participants' awareness of the effect of work on health. As shown, a majority of the security officers 97 % (185/191) expressed their knowledge about the potential harmful effects of security work on their health. Of these, 52 % (97/185) thought their work had potential harmful effect on health; a few 19 % (35/185) were of the view that their work had no potential harmful health effects and 29 % (53/185) did not know if their work was potentially harmful.

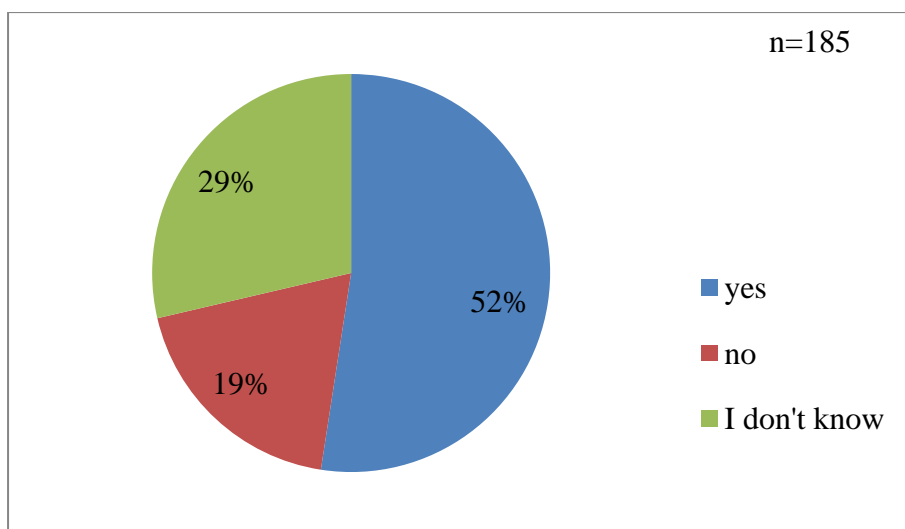


Figure 4.1 Awareness of effect of security work on health

4.3 Potential causes of harm by Respondents' work

A few of the security officers 38 % (37/97) who expressed the opinion that their work has potential harmful effects, gave reasons why they thought so as illustrated in Table 4.2.

Most 35 % (37/97) were of the view that the shift system of their work, long working hours and inadequate periods of rest because of their work schedule, were harmful to their wellbeing and 28 % (30/97) were of the view that they could be affected because of mosquito bites and malaria contracted from the mosquito bites. Other reasons given included potential attacks by armed robbers, reptile bites, stress, poor eating habits because of shift work,

exposure to harsh weather conditions, verbal assaults from the public, long periods of sitting and standing and risk of road traffic accidents.

Table 4.2 Potential harmful effects of work

Responses	Frequency	Per cent (%)
N=106		
1. Shift work, not enough rest, long working hours	37	34.91
2. Mosquito bites, malaria	30	28.3
3. Bodily pains	2	1.89
4. Armed robber attack, gun shots	8	7.55
5. Stress from work	3	2.83
6. Harsh weather conditions:		
• Cold weather	7	6.6
• Radiation from the sun	2	1.89
7. Reptile bites	4	3.77
8. Poor eating habits because of work	3	2.83
9. Danger of being knocked down by vehicles while directing traffic	1	0.94
10. Long duration of standing or sitting	6	5.66
11. Verbal attack from the public	1	0.94
12. Exposure to air pollutants from vehicles	2	1.89

4.4 Smoking Habits

An assessment of the smoking habits of the participants showed that majority of them 92 % (173/189) had never smoked before and about 8 % (16/189) of them had smoked. Majority, 75 % (12/ 16) of those who had smoked were former smokers while a few 25 % (4/16) still smoked. A total of 35.7 % (6/16) of those who had smoked before had smoked for more than ten years, 7.1 % (1/16) had smoked between 6 and ten years and 57.1 % (9/16) between one and five years (Figures 4.2 and 4.3).

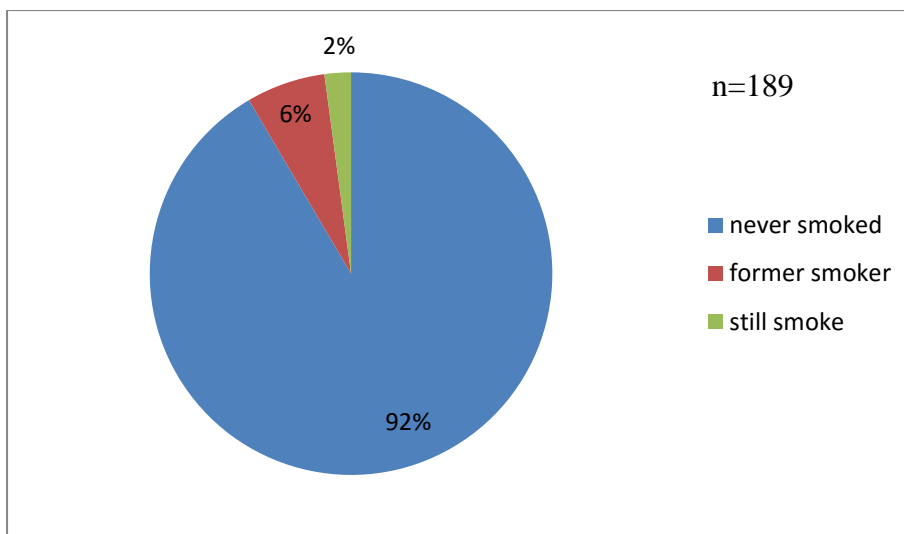


Figure 4.2 Smoking habits of security officers

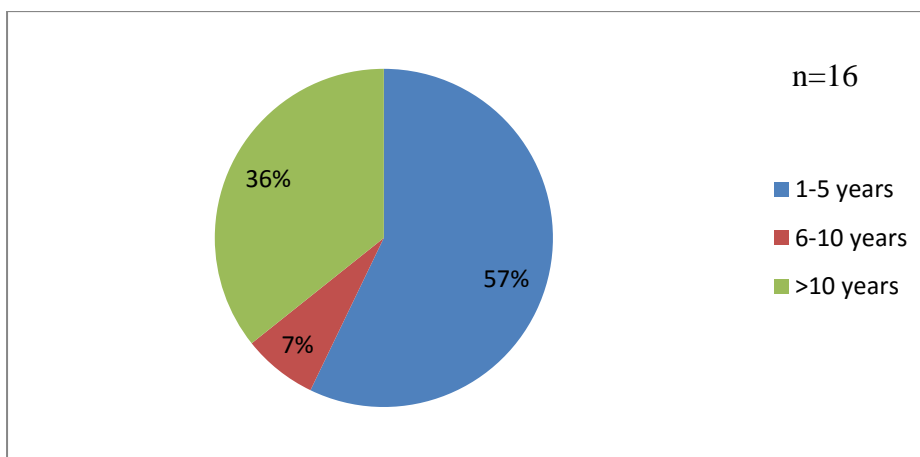


Figure 4.3 Duration of smoking among security officers

4.5 Alcohol drinking habit

An assessment of the drinking habits of the participants (Figure 4.4 below) showed that 41 % (77/188) had never taken alcohol while 55% (104/188) said they were currently drinking alcohol. A few of them 4 % (7/188) said they used to drink alcohol.

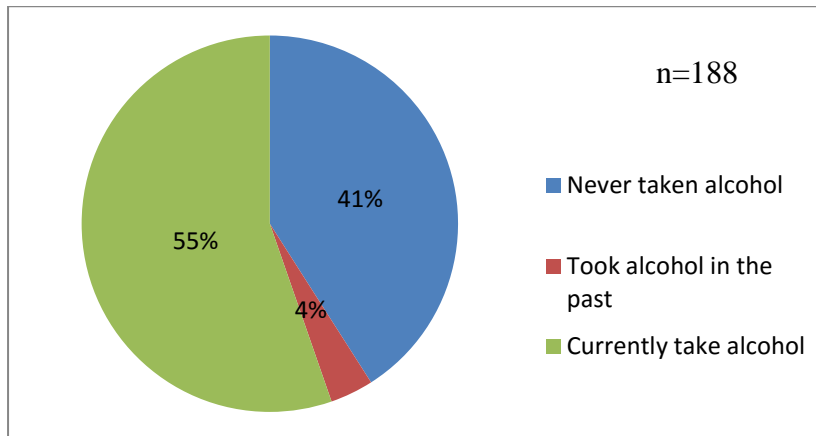


Figure 4.4 Alcohol drinking habits of the security officers

4.6 Stress

Table 4.3 and 4.4 below; summarize stress levels amongst the participants. As shown, the mean perceived stress score after summing up the individual scores by the Cohen's perceived stress scale was 20.4 ± 4.7 . An assessment of the perceived stress level of the participants showed that 58 % (94/162) had high perceived stress levels and approximately 38 % (61/162) had moderate perceived stress level. Very few, 4 % (7/162) had mild perceived stress levels.

Table 4.3 Perceived stress level of the security officers

Perceived Stress level	N=162	Frequency	Per cent %
Mild		7	4.32
Moderate		61	37.65
High		94	58.02

Table 4.4 Statistical summary of variables

Variable	No. of Observations	Mean	SD	Minimum. value	Maximum value
Age	188	43.00	10.80	24.0	69
Stress score	184	20.40	4.66	8.0	34
Systolic BP	188	135.30	22.57	97.0	218
Diastolic BP	188	87.51	15.41	8.0	138
BMI	184	24.63	3.94	15.7	38.3

4.7 Body Mass Index

In all, 96 % (184/191) of the participants had their weights and heights measured. The average BMI in Kgm^{-2} of these security officers was 24.63 ± 3.94 . The minimum BMI obtained was 15.7 Kgm^{-2} and the maximum BMI 38.3 Kgm^{-2} . Very few, 2% (4/184) of the security officers were underweight, 55 % (105/184) had normal BMI, 32 % (60/184) were overweight and 11 % (20/184) were obese.

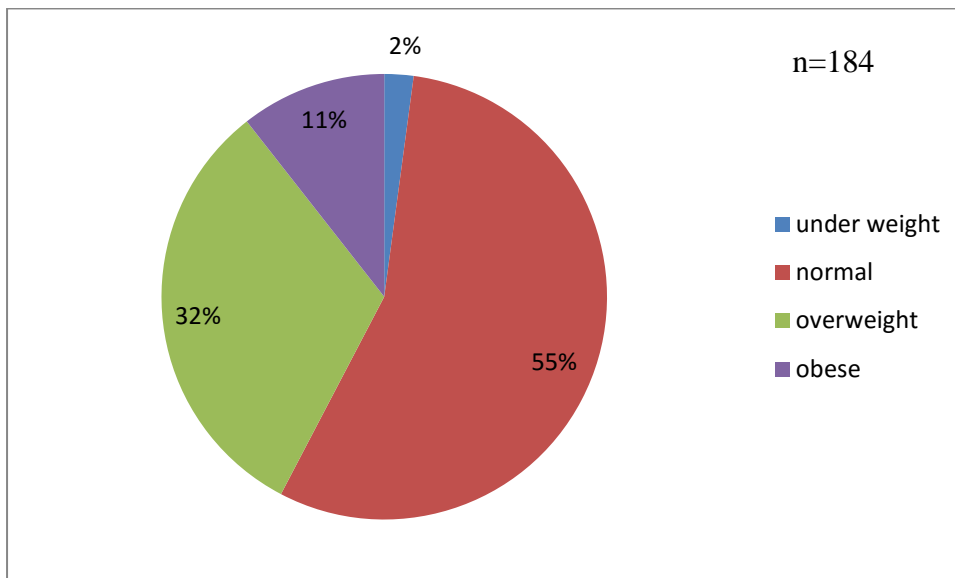


Figure 4.5 Body Mass Index distribution among the security officers

4.8 Blood pressure distribution and hypertension

Arterial blood pressure measurements were obtained from 98 % (188/191) of the participants. The mean systolic blood pressure was $135.3\text{mmHg} \pm 22.57$ while the mean diastolic blood

pressure was 87.51 mmHg \pm 15.41 (Table 4.4). Further assessment of their blood pressures revealed that 18 % (34/188) of them had optimal blood pressure; 37 % (69/188) had prehypertension and 45 % (85/188) had hypertension as illustrated in Figure 4.6. Among those who had hypertension, 53 % (44/85) had stage 1 hypertension; 28 % (24/85) had stage 2 hypertension and 19 % (16/85) had stage 3 hypertension as illustrated in Figure 4.7.

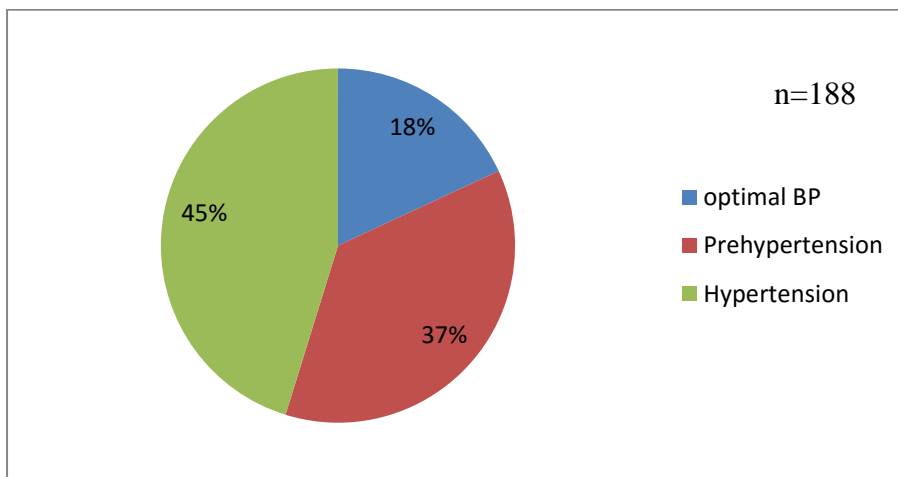


Figure 4.6 Distribution of blood pressure of the security officers

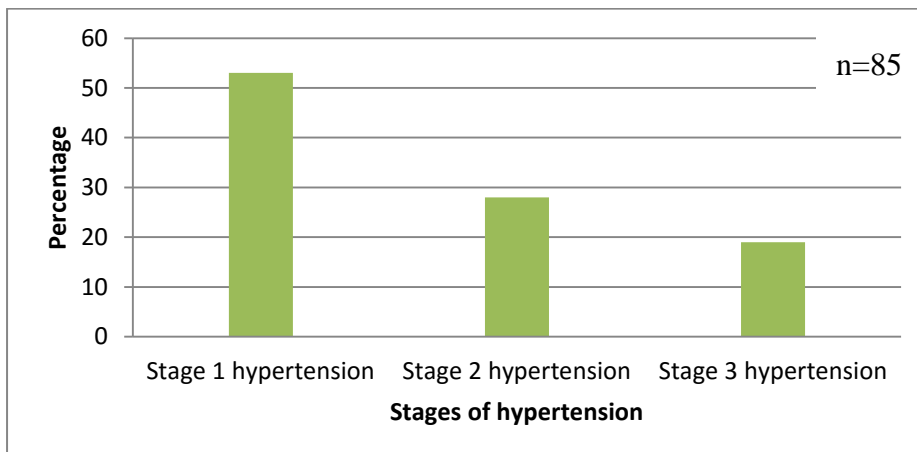


Figure 4.7 Distribution of hypertension by stages among the security officers

4.9 Associations of variables

According to the results (Table 4.5) there was significant association between the individual stress scores of the security officers and blood pressure; $\chi^2=40.52$ (df-22), $p < 0.05$. There

was however no significant association between stress score groups and blood pressure groups of the security officers.

A significant association was also found between the BMI of the security officers and blood pressure; $\chi^2=5.29$ (df-1), p-value <0.05. In addition, a significant association was found between gender and BMI of the officers; $\chi^2= 24.75$ (df-3), p-value <0.001.

The study also showed a significant association was found between number of years worked and blood pressure; $\chi^2=6.02$ (df-1), p-value <0.05. Furthermore, there was strong association between gender and hypertension; $\chi^2=18.46$, (df-1), p-value < 0.001. The association between age and hypertension was found to be strong, $\chi^2=10.89$ (df-1), p-value < 0.05.

Table 4.6 illustrates the association of hypertension with various study variables among the participants. There were no significant associations between smoking status and hypertension, alcohol consumption and hypertension, p-value > 0.005.

The odd of being hypertensive is 3.32 times greater with age 35 years or above. The odd of being hypertensive is 0.39 times greater in persons with secondary level education or higher. The odd of being hypertensive is 2.32 greater with 5 or more years of work. The odd of being hypertensive is 1.99 times greater in people who were overweight or obese than those not overweight or obese.

After adjusting for the other variables, no significant association was found between hypertension and gender, years of work, educational level, stress score and BMI as shown in Table 4.6 below. However, a statistically significant association was found between hypertension and age, p-value < 0.001.

Table 4.5 Association of hypertension with risk factors by chi-square analysis

Variable	Category	Non-hypertension	Hypertension	df	χ^2	p-value (<0.05)
BMI	Not Overweight	68	42	1	5.29	0.020
	Overweight	35	78			
Age	Below 35 years	36	12	1	10.89	0.001
	≥ 35 years	65	72			
Years of work	< 5	35	16	1	6.02	0.014
Educational level	5 and above	65	69	1	5.56	0.017
	Less than 2 ⁰ level	12	21			
Gender	Male	Not overweight	83	1	18.46	0.000
		Overweight	57			
Educational level	Female	Less than 2 ⁰ level	2	1	4.1	0.040
		2 ⁰ level or higher	13			
Educational level	Less than 2 ⁰ level	Never alcohol	8	1	4.33	0.040
		Take alcohol	25			
	2 ⁰ or higher	62	79			

2⁰-Secondary. p-value < 0.05 is statistically significant, χ^2 -Chi square

Table 4.6 Association of hypertension with risk factors by multiple logistic regression

Variable		Hypertension Unadjusted OR(95% CI)	P- value	Adjusted OR(95% CI)	P- value
Age	<35 yrs.				
	≥35 yrs.	3.32(1.594-6.926)	0.001	1.05(1.047-1.153)	0.000
Gender	female				
	males	1.57(0.557-4.450)	0.392	1.14(0.358-4.259)	0.844
Educational level	< 2 ⁰ educ.				
	≥2 ⁰ educ.	0.39(0.179-0.860)	0.02	1.29(0.462-3.642)	0.621
Years of work	<5yrs.				
	≥5yrs.	2.32(1.175-4.591)	0.015	1.05(0.391-2.796)	0.930
Stress score	< 20				
	≥20	0.62(0.3362-1.127)	0.116	0.80(0.392-1.639)	0.559
BMI	Not overweight				
	Overweight	1.99(1.104-3.585)	0.022	1.99(0.911-4.33)	0.084

p-value < 0.05 is statistically significant, OR-Odds ratio, yrs-years

CHAPTER FIVE

DISCUSSION

Hypertension is a major public health problem worldwide and the most common cardiovascular disease. Early detection and timely intervention is important for the control of hypertension and its complications.

This present study was carried out to find out the prevalence of hypertension, to study the association between hypertension and known risk factors of hypertension among security officers of the University of Ghana, Legon and to help make important timely interventions for the control of hypertension and its complications.

A total of 191 security officers participated in the study. About 73% (141/191) of the study participants were aged 35 years or above. Majority of them were males (91.1%). Approximately 74% (130/176) were married, 81.3% (143/176) had Senior Secondary School education or higher and 72 % (136/188) had worked for 5 years or more.

This study found a 45 % overall prevalence of hypertension and a 37 % prevalence of prehypertension. The prevalence of hypertension found is similar to the 42.4% weighted prevalence of hypertension in Ghana (Gebreselassie & Padyab 2015). A similar study conducted in India among 1817 police personnel found a 41.2 % and 42.9 % prevalence of hypertension and prehypertension respectively (Mallik, 2014).

In contrast, another study conducted in India among a smaller sample of 50 private security men of a teaching hospital found a lower prevalence of 16 % of hypertension (Prabhu et al., 2014). The differences in prevalence between the study conducted in India among 50 private security officers of a teaching hospital and this current study could be attributed to differences in sample size (Arya et al., 2012).

Results from the Framingham Heart Study indicate that the probability of persons with prehypertension developing hypertension is two to three times higher than in those with optimal (normal) blood pressure (Leitschuh et al., 1991). This study found that a high proportion (37 %) of the security officers were prehypertensive hence, the trend of prevalence of hypertension is likely to increase among these security officers in a few years if no intervention is made among the prehypertensive group.

There are various risk factors responsible for the elevation of blood pressure. Some are modifiable risk factors while others are not modifiable risk factors. Age is a non-modifiable risk factor. According to (Leitschuh et al., 1991; Pinto, 2007) there is a strong positive correlation between increasing age and increase in blood pressure. The results of this study also showed an increasing trend of blood pressure with increasing age (OR-2.86, 95 % CI, 1.348-6.077; p value <0.001). Apart from the two studies mentioned above, the results of this present study is also consistent with studies conducted by (Barquera et al., 2010) in Mexico and (Mungreiphy et al., 2011) in India. These studies found significant association between age and blood pressure.

Many studies have demonstrated the correlation between excess body weight and blood pressure. Obesity has been shown to be an independent risk factor for hypertension (Park, 2009). Overweight and obesity are modifiable risk factors for hypertension. A study conducted in India demonstrated a strong positive correlation between BMI and blood pressure (Dua et al., 2014). Another study in Malaysia among security guards of a university campus and their spouses demonstrated a high prevalence of overweight and obesity among them (Moy, 2012). This study found that being overweight or obese was significantly associated with hypertension. There was a trend of increasing blood pressure among those who were overweight or obese (OR-1.99, 95 % CI-1.104-3.585, p-value <0.05). However,

after controlling for other independent variables, there was no significant association as shown in Table 4.6.

Public security work is high-stress work (Zimmerman, 2012). Although stress does not directly cause hypertension, repeated exposure to stress causes repeated increases in blood pressure which can eventually lead to hypertension.

The mean perceived stress score in this study was 20.4 (SD-4.66). This is close to the value of 20.0 (SD-5.1) obtained in a similar study by (Ramey et al., 2011) among officers of an urban Midwestern police department. However, stress score was not significantly associated with hypertension ($p\text{-value} > 0.05$) in this study among the security officers of the University of Ghana.

Hypertension was found to be more among the security officers who had worked 5 years or more. Years of work was significantly associated with hypertension (OR-2.25, 95 % CI-1.175-4.591, $p\text{-value} < 0.05$). However, after adjusting for other independent variables the association was not statistically significant. This could be attributable to the cumulative effect of increasing age with increasing years of work since with increasing number of working years, an individual advances also in age.

Smoking and alcohol are notable risk factors for hypertension. Various studies (Raja et al., 2016 & Bowman et al., 2007) however indicate significant associations between smoking, alcohol intake and hypertension. However, no significant association was found between alcohol drinking habit, cigarette smoking habit and hypertension, in this present study. Even though the amount and frequency of alcohol intake and smoking significantly influence the development of hypertension, some security officers in this study did not respond to questions related to the amount and frequency of intake of such substances.

CHAPTER SIX

CONCLUSION, RECOMMENDATIONS AND LIMITATIONS

6.1 Conclusion

The study set out to establish the prevalence of hypertension and the risk factors of hypertension among security officers of the University of Ghana, Legon campus. This study revealed a high prevalence of hypertension and prehypertension among security officers of the University of Ghana, Legon campus. Hypertension among these officers was associated with age, BMI, perceived stress score and years of work as security officers. This study supports the fact that hypertension is a public health challenge (WHO, 2013) and more research needs to be done among security personnel in order to make the right policy interventions.

6.2 Recommendations

Considering the high prevalence of hypertension and other risks factors of hypertension, it is recommended that a prospective cohort study be carried out as a follow up to this study, to study the outcome of prehypertension and hypertension among the security officers of the University of Ghana.

It is recommended that health screenings be organised regularly among high risk populations such as these security officers.

6.3 Limitations

A few of the participants could not have their blood pressure measured because the cuff size available was not appropriate for the size of their arms. Other security officers could not have their weight or height checked. A few of the security officers were on leave.

Another limitation of this study is that, the pre-employment blood pressures of the participants were not taken into consideration in this present study.

Some security officers were not willing to fill out the questionnaires for various personal reasons but volunteered to have their blood pressure, weight and height checked.

REFERENCES

- Arya R, Antonisamy B, Garg SK, (2012). Sample Size Estimation in Prevalence Studies. *The Indian Journal of Pediatrics* 79(11). Available from: doi: 10.1007/s12098-012-0763-3. [Accessed: 20th June, 2016].
- Ausiello DA, Benos D. J, Abboud F, Koopman W (2003). *Annals of Internal Medicine* Vol.139 No. 9.
- Babu GR, Jotheeswaran AT, Mahapatra T, Mahapatra S, Kumar AS, Detels R, Pearce N (2014). Is hypertension associated with job strain? A meta-analysis of observational studies. *Occup Environ Med.* 71(4):304. Available from: doi: 10.1136/oemed-2013-101396. Accessed: 20th January, 2016.
- Badiwe M, Osman A, Amadu MR (2016). The State of Physical Security on Campuses of Tertiary Educational Institutions: The Role of the Security Guard. *International Journal in Management and Social Science*. Volume.4, Issue 1. Available from: <http://www.ijmr.net.in> [Accessed: 18th July, 2016].
- Barquera,S, Campos-Nonato I, Hernández-Barrera L, Villalpando S, Rodríguez-Gilabert C Durazo-Arvizú R, Aguilar-Salinas CA (2010). Hypertension in Mexican adults: results from the National Health and Nutrition Survey 2006 *Salud Pública Méx* 2010; Vol. 52(sup 1):63-71.
- Bosu EK (2015). The prevalence, awareness, and control of hypertension among workers in West Africa: a systematic review. *Global Health Action* 8: 10.3402/gha.v8.26227. Available from: doi: 10.3402/gha.v8.26227 [Accessed 25th October, 2015].
- Bowman TS, Gaziano JM, Buring JE, Sesso HD (2007). A Prospective Study of Cigarette Smoking and Risk of Incident Hypertension in Women. *Journal of the American College of Cardiology*, Vol. 50(21):2085-2092. Available from: doi:10.1016/j.jacc.2007.08.017. [Accessed: 20th June, 2016].
- Burke GL, Bertoni AG, Shea S, Tracy R, Watson KE, Blumenthal RS, Chung H, Carnethon MR (2008). The impact of obesity on cardiovascular disease risk factors and subclinical vascular disease: the Multi-Ethnic Study of Atherosclerosis. *Arch Intern Med.* 168(9):928-35.
- Ceide ME, Pandey A, Ravenell J, Donat M, Ogedegbe G, Jean-Louis G (2015). Association of short sleep and shift work with hypertension among black and white Americans. *International Journal of Hypertension.* 697275.
- Cohen S, Williamson G (1988). Perceived stress in a probability sample of the United States. In Spacapan S & Oskamp S, editors *The social psychology of health: Claremont Symposium on Applied Social Psychology*. Newbury Park, CA, Sage.USA.
- Czaja-Miturai I, Merecz-Kot D, Szymczak W, Bortkiewicz A (2013). Cardiovascular risk factors and life and occupational stress among policemen. *Med Pr;* 64(3):335-48.

Dua S, Bhuker M, Sharma P, Dhall M, Kapoor S (2014). Body mass index relates to blood pressure among adults *North American Journal of Medical Sciences*. Volume 6, Issue 2 pp. 89-95

Egan BM, Julius S (2008). Prehypertension: risk stratification and management considerations. *Curr Hypertens Rep*. 10(5):359-66

Flammer AJ, Anderson T, Celermajer DS, Creager MA, Deanfield J, Ganz P, Hamburg NM, Luscher TF, Shechter M, Taddei S, Vita JA, Lerman A (2012). The Assessment of Endothelial Function From Research into Clinical Practice. Available from: <http://dx.doi.org/10.1161/CIRCULATIONAHA.112.093245> [Accessed: 20th June, 2016].

Foëx P, Sear JW (2004). Hypertension: pathophysiology and treatment. Available from: ceaccp.oxfordjournals.org [Accessed 8th June, 2016].

Freedman DS, Horlick M, Berenson GS (2013). A comparison of the Slaughter skinfold-thickness equations and BMI in predicting body fatness and cardiovascular risk factor levels in children. *Am. J. Clin. Nutr.*, 98(6), pp.1417-24.

Fuchs FD (2011). Why Do Black Americans Have Higher Prevalence of Hypertension? *Hypertension* 57: 379-380.

Galley HF, Webster NR (2004). Physiology of the endothelium. *British Journal of Anaesthesia* 93 (1). Available from: doi: 10.1093/bja/ae163 [Accessed: 20th June, 2016].

Garbarino S, Magnavita N (2015). Work Stress and Metabolic Syndrome in Police Officers. A Prospective Study. *PLoS ONE* 10(12):e0144318.doi:10.1371/journal.pone.0144318.

Garshong RA, Attuquayefio DK, Gbogbo F (2013). Effect of Habitat Change through Infrastructural Development on Small Mammal Diversity and Abundance on the Legon Campus of the University of Ghana. *West African Journal of Applied Ecology*. Vol. 21(2), 1-9.

Gebreselassie KZ, Padyab M (2015). Epidemiology of Hypertension Stages in Two Countries in Sub-Sahara Africa: Factors Associated with Hypertension Stages. *International Journal of Hypertension*. Volume 2015. Article ID 959256.

Google maps (2016). www.maps.google.com.gh.

Gray GA (2009). Medical Consequences of Obesity. *The Journal of Clinical Endocrinology and Metabolism*. Available from: doi: <http://dx.doi.org/10.1210/jc.2004-0535> [Accessed: 20th June, 2016].

Howie L (2014). Security Guards and Counter-terrorism: Tourism and Gaps in Terrorism Prevention *International Journal of Religious Tourism and Pilgrimage*. Volume 2, Issue 1, Article 7.

Husain K, Ansari RA, Ferder L (2014). Alcohol-induced hypertension: mechanism and prevention. *World J Cardiol*. 6 (5): 245-252. Available from: doi: 10.4330/wjc.v6.15.245. [Accessed : 20th June, 2016].

Jermendy G, Horvath T, Littvay L (2011). Effect of genetic and environmental influences on cardiometabolic risk factors: a twin study. *Cardiovasc Diabetol* 10: 96.

Joyner MJ, Charkoudian N, Wallin BG (2010). Sympathetic Nervous System and Blood Pressure in Humans. Available from: hyper.ahajournal.org [Accessed 03 July 2016].

Kales SN, Tsismennakis AJ, Zhang C, Soteriades ES (2008). Blood Pressure in Firefighters, Police Officers, and Other Emergency Responders. *American journal of hypertension*. 296.
Knutsson A (2003). Health disorders of shift workers. *Occup Med* 53:103–108.

Kirkman E, Sawdo M (2010). Neurological and humoral control of blood pressure. *Anaesthesia and Intensive Care Medicine*. Volume 2, Issue 5, pp. 159-164. Available from: doi: <http://dx.doi.org/10.1016/j.mpaic.2010.02.009>. [Accessed: 20th June, 2016].

Lakshman A, Manikath N, Rahim A, Anilakumari VP (2014). Prevalence and Risk Factors of Hypertension among Male Occupational Bus Drivers in North Kerala, South India: A Cross-Sectional Study. Available from: <http://dx.doi.org/10.1155/2014/318532>. [Accessed: 20th June, 2016].

Landsberg L, Aronne LJ, Beilin LJ, Burke V, Leon I, Igel LI, Lloyd-Jones D, Sowers J (2013). Obesity-Related Hypertension: Pathogenesis, Cardiovascular Risk, and Treatment. *The Journal of Clinical Hypertension*. Volume 15, Issue 1, pages 14–33.

Leitschuh M, Cupples LA, Kannel W, Gagnon D, Chobanian A (1991). High-normal blood pressure progression to hypertension in the Framingham Heart Study. *Hypertension*. 17(1):22-7.

Liu M1, He Y, Jiang B, Wang J, Wu L, Wang Y, Zhang D, Zeng J, Yao Y (2015). Association Between Family History and Hypertension Among Chinese Elderly. *Medicine (Baltimore)*. 94(48):e2226. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26632912>. [Accessed: 15th January, 2016].

Mallik D, Mukhopadhyay DK, Kumar P, Sinhababu A (2014). Hypertension, Prehypertension and Normotension among Police Personnel in a District of West Bengal, India *Journal of the Association of Physicians of India*. Vol. 62 pp. 12-16.

Mendis S (2013). Hypertension: a silent contributor to global cardiovascular epidemic. *Regional Health Forum*. Volume 17, Number 1.

Moy FM, Atiya AS (2012). Lifestyle practices and prevalence of obesity in a community within a university campus. *Journal of Health and Translational Medicine*. Volume 8, Issue 1.

Moy FM, Atiya AS, Wong M (2006). The results of a worksite health promotion programme in Kuala Lumpur, Malaysia. *Health Promot. Int.* 21 (4): 301-310.

Mungreiphy NK, Satwanti Kapoor I, Rashmi Sinha R (2011). Association between BMI, Blood Pressure, and Age: Study among Tangkhul Naga Tribal Males of Northeast India. *Journal of Anthropology*. Volume 2011 Available from: <http://dx.doi.org/10.1155/2011/748147> [Accessed: 20th July, 2016].

O'keefe JH, Bybee KA, Lavie CJ (2007). Alcohol and Cardiovascular Health. *Journal of the American College of Cardiology*; 50 (11).

Papadopoulos DP, Makris TK, Papademetriou V (2008). Is it time to treat prehypertension? *Hypertens Res.*31(9):1681-6.

Park K (2009). Park's textbook of Preventive and Social Medicine.20th edition. Jabalpur, M/s. Banarasidas Bhanot Publishers, pp. 323-26.

Pinto E (2007). Blood pressure and ageing. *Postgrad Med J.* 83(976): 109–114.

Prabhu NJ, Kishore J, Kumar A (2014). Prevalence of Substance Abuse, Hypertension and Obesity among Security Men working in a Teaching Hospital in Delhi: A Cross Sectional Survey. *ADR Journals* pp. 70-75.

Quaicoe-Duho R (2015). Pay attention to workers' health - Employers urged.
Available from: <http://www.graphic.com.gh/news/general-news/pay-attention-to-workers-health-employers-urged.html>. [Accessed: 23rd October, 2015].

Raja RD, Achuyut RP, Bihungum B, Saira J, Surya D (2016). Prevalence and Associated Factors of Hypertension: A Community-Based Cross-Sectional Study in Municipalities of Kathmandu, Nepal. *International Journal of Hypertension* Volume 2016(2016), Article ID 1656938. Available from: <http://dx.doi.org/10.1155/2016/1656938>. [Accessed: 20th June, 2016].

Ramey SL, Perkhounkova Y, Downing NR, Culp KR (2011). Relationship of Cardiovascular Disease to Stress and Vital Exhaustion in an Urban, Midwestern Police Department. *NCBI.* 59(5): 221-227.

Ranasinghe P, Cooray DN, Jayawardena R, Katulanda P (2015). The influence of family history of hypertension on disease prevalence and associated metabolic risk factors among Sri Lankan adults. *BMC Public Health* 201515:576.

Rashid AA, Khalid Y, Chia, Y (2011). Management of Hypertension. *Cardiovasc Diabetol.* 6(1), 40–43.

Reckelhoff JF (2001). Gender Differences in the Regulation of Blood Pressure. *Hypertension.* 37: 1199-1208.

Roger VL, Go AS, Lloyd-Jones DM, Benjamin EJ, Berry JD, Borden WB, Bravata DM, Dai S, Ford ES, Fox CS, Fullerton HJ, Gillespie C, Hailpern SM, Heit JA, Howard VJ, Kissela BM, Kittner SJ, Lackland DT, Lichtman JH, Lisabeth LD, Makuc DM, Marcus GM, Marelli A, Matchar DB, Moy CS, Mozaffarian D, Mussolino ME, Nichol G, Paynter NP, Soliman EZ, Sorlie PD, Sotoodehnia N, Turan TN, Virani SS, Wong ND, Woo D, Turner MB (2012). Heart disease and stroke statistics -2012 update: a report from the American Heart Association. *Circulation.* 2012; 125 (1):e2-e220.

Sinha R (2008). Chronic Stress, Drug Use, and Vulnerability to Addiction. *Ann NY Acad Sci.* 1141: 105–130. Available from: doi: 10.1196/annals.1441.030. [Accessed: 25th June, 2016].

StataCorp. (2013).

Stata Statistical Software: Release 13. College Station, TX: StataCorp LP

Tellez-Plaza M, Navas-Acien A, Crainiceanu CM, Guallar E (2008). Cadmium Exposure and Hypertension in the 1999–2004 National Health and Nutrition Examination Survey (NHANES). *Environ Health Perspect* 116(1): 51–56. Available from: doi: 10.1289/ehp.10764. [Accessed: 20th June, 2016].

Van Gyes (2006). Night work and shift work cause high stress levels.

Available from: <http://www.eurofound.europa.eu/observatories/eurwork/articles/night-work-and-shift-work-cause-high-stress-levels> [Accessed: 2nd July, 2016].

Virdis A, Giannarelli C, Neves MF, Taddei S, Ghiadoni L (2010). Cigarette smoking and hypertension. *Curr Pharm Des.* 2010; 16(23):2518-25.

Widmaier EP, Raff H, Strang KT, (2014). *Vander's Human Physiology*, 13th Edition. McGraw-Hill. Pp. 500-516.

Widmaier EP, Raff H, Strang KT, (2008). *Vander's Human Physiology*, 11th Edition. McGraw-Hill. pp.291, 509-10.

World Health Organization (2013). A global brief on hypertension. Silent killer a global public health crisis. Available from: http://www.who.int/nmh/publications/wha_resolution53_14/en/ [Accessed: 25th November, 2015].

Yvan-Charvet L, Quignard-Boulangé A (2011). Role of adipose tissue renin-angiotensin system in metabolic and inflammatory diseases associated with obesity. *Kidney International* 79 (2): 162-8. Available from: doi: 10.1038/ki.2010.391.PMID 20944545. [Accessed: 25th November, 2015].

Zimmerman FH (2012). Cardiovascular disease and risk factors in law enforcement personnel: a comprehensive review. *Cardiol Rev.*; 20 (4):159-6.

APPENDICES

Appendix 1

Participant information

Title: Risk factors of hypertension among security officers of the University of Ghana, Legon campus.

Principal investigator: Justina Buernokie Shaidah

Qualifications: BSc. Medical Laboratory Technology

M.D. Doctor of Medicine

Contact: Mobile number: 054 63 62 741/ 020 97 61 152

E-mail: justinab2k@yahoo.com

General information about the research

This research is to collect data on the risk factors of hypertension among security officers of the University of Ghana, Legon campus.

The study is purely academic and forms part of the researcher's work towards the award of a Master's Degree in Occupational Medicine.

Possible risk of discomfort

There are no major risks associated with participating in this study. This study does not involve invasive procedures.

Description of level of research burden

Study participants will be asked to complete a questionnaire. Participants may feel some discomfort during the measurement of their blood pressure.

Possible benefits

This research may directly benefit participants by making them aware of issues relating to their health generally, cardiovascular health in particular and probably help a few of them to seek qualified medical management where necessary.

Confidentiality

Participants' names will not be disclosed in any form. The study materials (questionnaire, informed consent forms) will not be labelled with participants' names but rather a unique identification number.

Data security

All study recordings and field notes will be kept under lock by the principal investigator. The field notes will be expanded and typed into computer files with secured passwords.

Person responsible and phone number

The person responsible for the data storage will be the principal investigator.

Voluntary participation and the right to withdraw

Participation in the study is entirely voluntary and declining to enter this study, answer a question or terminate the interview will have no negative consequences on the participant.

Contacts for additional information

Please call the person responsible for this study, Justina Buernokie Shaidah on 054 63 62 741 if you have questions about the study. If you have any questions about your rights as a research participant or feel you have not been treated fairly, contact the administrator of the Ethics Review Committee of the Ghana Health Service for further clarification or redress.

Your right as a participant

This research has been reviewed and approved by the Ghana Health Service Ethics

Review Committee and your human rights will not be violated in any way through this study.

Consent Form

The benefits, risks and the procedures for the research titled, “Risk factors of hypertension among security officers of the University of Ghana, campus” have been read and explained to me.

My questions about the research have been answered to my satisfaction.

I agree to participate as a volunteer.

.....

Date

.....

Signature or initials of volunteer

Appendix 2

Questionnaire

Section 1

Please, kindly tell us about yourself.

General Information

1. What is your current age?
2. Gender Male Female
3. Marital status Single Married Divorced Co-habiting
4. What is your highest level of education? No formal education Primary JHS SHS Tertiary

The next set of questions is about your work

5. How long have you worked in this job? 6 months- 1 year 2-3 years 4-5years
 more than 5years.
6. Do you think the work you do can harm your health in any way? Yes No
 Don't know
7. If **yes** please specify how
8. Do you have any personal protective equipment? Yes No
9. Do you wear any personal protective equipment when you are working?
 Never Sometimes Always I don't know what it is.

The next set of questions is about your habits/ lifestyle.

10. Do you smoke cigarettes? Yes No In the past
11. If yes, how many sticks do you smoke per day? less than 5 sticks 5-10 sticks
 more than 10 sticks.
12. How long have you been smoking? 1-5 years 6-10 years more than 10 years
13. Do you take alcohol? Never Sometimes all the
time
14. How long have you been taking alcohol? 1-5 years 6-10 years more than10
years
15. Which type of alcohol do you usually take? Please tick (√) as appropriate.

Spirits	
Bitters	
Beers	
Other	

16. How much alcohol do you take in a day? less than 5 tots 5-10 tots
 more than 10 tots.

Section 2. Let us assess your stress level by answering the following questions: Please tick

1. In the past month, how often have you been upset because of something that happened unexpectedly?
 Never Almost Never Sometimes Fairly Often Very Often
2. In the past month, how often have you felt unable to control the important things in your life?
 Never Almost Never Sometimes Fairly Often Very Often
3. In the past month, how often have you felt nervous or stressed?
 Never Almost Never Sometimes Fairly Often Very Often
4. In the past month, how often have you felt that things were going your way?
 Never Almost Never Sometimes Fairly Often Very Often
5. In the past month, how often have you felt confident about your ability to handle personal problems?
 Never Almost Never Sometimes Fairly Often Very Often
6. In the past month, how often have you found that you could not cope with all the things you had to do?
 Never Almost Never Sometimes Fairly Often Very Often
7. In the past month, how often have you been able to control irritations in your life?
 Never Almost Never Sometimes Fairly Often Very Often
8. In the past month, how often have you felt that you were on top of things?
 Never Almost Never Sometimes Fairly Often Very Often
9. In the past month, how often have you been angry because of things that happened that were outside of your control?
 Never Almost Never Sometimes Fairly Often Very Often

10. In the past month, how often have you felt that difficulties were piling up so high that you could not overcome them?

Never Almost Never Sometimes Fairly Often Very Often

Score _____

Source: (Cohen & Williamson, 1988).

Thank you for your participation in this study.

Appendix 3

Equipment



ADE mechanical weighing scale, column type, dial indicating, with height measuring rod (GmbH & Co, Hamburg-Germany).

Source: <http://www.medicalexpo.com/prod/ade/product-67495-419660.html>.



PhysioLogic electronic BP monitor (AMG Medical Inc., New York USA).

Source: [http://www.amgphysiologic.com/product/essentia-blood-pressure-monitor/#iLightbox\[\]/0](http://www.amgphysiologic.com/product/essentia-blood-pressure-monitor/#iLightbox[]/0)