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EXPLORING THE ASSOCIATION BETWEEN SOCIO-ECONOMIC FACTORS AND HYPERTENSION AMONG AUTOMOBILE SPARE PARTS DEALERS IN THE ABOSSEY OKAI ENCLAVE AT THE ABLEKUMA CENTRAL DISTRICT GREATER ACCRA REGION GHANA

BY

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DECLARATION AND CERTIFICATION

I declare that this research is my own work and that to the best of my knowledge, it contains no materials previously published or written by another person nor any material which to a substantial extent has been accepted for the award of another degree or diploma in any institution of study except where due acknowledgement is made in the thesis.

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DEDICATION

This work is dedicated to friends and family who have supported me to make this possible.

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ABSTRACT

Background: Hypertension referred to as high blood pressure is a condition in which the blood vessels persistently receive high pressure. It was once regarded as a problem only in high income countries but currently, a global problem. There is increased prevalence of hypertension in low income countries with Ghana having an overall prevalence of 13.0%. It is a major risk factor for many cardiovascular diseases in developing countries. Being a major cause of cardiovascular disease, the socioeconomic factors that predispose people to hypertension include education, income levels, diet and stress.

The general objective of the study was to explore the association between socio-economic factors and hypertension among automobile spare parts dealers at Abossey Okai enclave in the Ablekuma Central District.

Methods: The study employed a cross sectional design at Abossey Okai between January and March,2020. Quantitative data was collected using a pre-tested questionnaire. A total sample size of 200 respondents was obtained and used for descriptive and inferential analyses with significant level set at $p<0.05$.

Results: Prevalence level of hypertension among the respondents was 17% with 95% CI (0.12-22). Factors that were significantly associated with hypertension at the bivariate stage were education ($p<0.001$), working experience (<0.001), monthly income ($p<0.001$) and Parent hypertension ($p<0.001$). Respondents who were above the age of 40 years had almost 11 times higher odds of hypertension compared to those below 40 years ($p=0.017$; 95% CI:1.53-75.63). Also, respondents with mothers who had hypertension were also 3 times more likely to have hypertension ($p=0.047$; 95%CI: 0.91-9.94).

Conclusion: Compared to younger respondents (below 40 years), adults aged above 40 years were the risk group and had higher odds to the condition. A positive family history of maternal hypertension was a significant hypertension risk factor. The spare parts dealers should adopt a habit of regularly checking their blood pressure. The aged ones should by awareness of their susceptibility practice preventive measures to avoid having the condition.

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ACRONYMS /ABBREVIATIONS

BP	-Blood Pressure
SBP	- Systolic Blood Pressure
DBP	- Diastolic Blood Pressure
BPT	-Blood Pressure Treatment
BMI	-Body Mass Index
SES	-Socioeconomic Status
NCD	-Non-Communicable Disease
LMIC	-Low - and Middle-Income Countries
CVD	-Cardiovascular Disease.
WHO	-World Health Organization

DEFINITION OF TERMS

Systolic Blood Pressure: The amount of blood pressure that the blood exerts on the vessels while the heart is beating.

Diastolic Blood Pressure: the blood pressure in the arteries when the heart rests in between beats.

Body Mass Index: the weight of a person divided by height squared. (Kg / m2)

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Hypertension refers to "the condition in which the blood vessels have persistently raised pressure". (World Health Organization, 2013). According to JNC VII, hypertension was defined as systolic BP level of greater than or equal to 140 mm Hg and diastolic BP of greater than or equal to 90 mmHg. The JNC VII defined normal BP as systolic BP of less than or equal to 120 mm Hg and a diastolic BP of less than 80 mmHg. The area between systolic BP of 120 – 139 mmHg and diastolic BP of 80 – 89 mm Hg is defined as prehypertension (Chobanian et. al,2003).

"Blood is transported from the heart to all parts of the body through vessels. Each heart beat pumps blood into all the vessels. Blood pressure is created by the force of blood pushing against the walls of blood vessels as it is pumped by the heart. The force of resistance against which the heart pumps generates a tension within the vessels. This is known as the blood pressure" (WHO, 2013).

"Hypertension is an important public health problem in both economically developing and developed countries" (Addo et. al., 2012). "Hypertension among cardiovascular diseases is one of the major components of non-communicable disease and is emerging as a major health problem throughout the world" (Pyakurel et al., 2019).

High blood pressure is a leading cause of mortality and disability worldwide. In South Africa, "the prevalence of hypertension is estimated to be 21% in people aged fifteen years

and above" (Folb et. al., 2016). It is a major cause of cardiovascular disease morbidity and mortality in Ghana (Sanuade et. al., 2018).

High blood pressure is a serious public health concern, with the World Health Organization (WHO, 2013) reporting a hypertension global mortality rate of 13 %. It is estimated to contribute to 25% of all European myocardial infarctions (Cuschieri et al., 2017). "Socioeconomic status is a known risk factor for cardiovascular disease" (Lam et. al., 2011).

"However, unlike the traditional Framingham risk factors, SES does not directly impact the cardiovascular system but exerts its cardiovascular effect through a complex interaction of bio- behaviour factors, such as exercise and diet" (Schultz et. al, 2018).

In Ghana, the prevalence of adult hypertension has been found to be consistently high in both urban and rural areas ranging from 19 to 48 percent (Nyarko et. al., 2016). "Hypertension is a preventable condition and has been found to be associated with an unhealthy lifestyle, including tobacco smoking, a lack of physical activity, and alcohol consumption" (Cuschieri et al 2017).

Hypertension belongs to a group of disease conditions known as the non - communicable diseases (NCDs) These are a leading cause of morbidity and mortality in low- and middle-income countries (LMIC) (Gupta et.al., 2018).

About eighty percent of morbidity in these countries is accounted for by NCDs with a high percentage of mortality occurring after 60 years of age (WHO 2018). "Each year fifteen million people die from NCDs between the ages of 30 and 69; over 85 % of these premature deaths occur in low- and middle-income countries" (WHO, 2018).

High blood pressure is a leading cause of mortality and disability worldwide (Perkovic et. al., 2007). "Ghana has shifted from predominantly communicable diseases to a combination of communicable and chronic non- communicable over the last few decades. Hypertension, stroke, diabetes and cancers have become top causes of death. Urbanization, changing lifestyles (including poor diets and sedentary lifestyles), ageing populations, globalization and weak health systems have all contributed to chronic disease risk; including morbidity and mortality" (Aikins et. al., 2012). Over the years, it has been recognized that the growing chronic disease burden; beginning in the 1990, has led to series of low-level interventions that is expected to improve the health of the populace.

Thus, NCDs contribute significantly to the nation's disease burden. They constitute both a public health and a developmental challenge which should be of urgent concern for the Ministry of Health in Ghana.

1.2 Problem Statement

High blood pressure is a leading cause of mortality and morbidity worldwide (Perkovic et.al., 2007). According to Pyakurel et al. (2019), "hypertension is one of the major components of non-communicable diseases and is emerging as a major health problem throughout the world".

"Hypertension was once regarded as a problem only in high income countries but is currently a global problem, increasing the risk for cardiovascular diseases (CVD) in most nations regardless of socioeconomic status" (WHO, 2019).

"The increasing prevalence of hypertension in low income countries represents a major public health problem with associated economic and social impacts" (Mills et.al., 2016).

"In Ghana, it is a huge public health challenge due to increasing longevity and the prevalence of contributing factors such as obesity, physical inactivity and an unhealthy diet" (Addo et al*.,* 2012). It has also been found out that the prevalence of hypertension is closely affected by occupation, education and income levels (Psaltopoulou et. al*.,* 2017). Thus, there has been recent need to establish the link between socioeconomic status (SES) and hypertension (Grotto et. al*.,* 2008).

"Urbanization, changing lifestyles including poor diets and sedentary lifestyles and stressful working environment predispose people to developing hypertension" (Aikins et.al., 2012). The environment in which automobile spare parts dealers at the Abossey Okai enclave in Accra, Ghana work is a highly stressful one coupled with noise pollution and has the possibility of triggering stressor mechanisms in those who work there.

The purpose of this study is to explore the relationship between socioeconomic factors and hypertension among the automobile spare parts dealers in the Abossey Okai enclave in Accra. Findings from this study will provide empirical evidence to further support related research into this area of public health concern as well support in guiding policy formulations by government aimed at curbing hypertension and its related disorders.

1.3 Rationale of Study

Various studies have been undertaken in Ghana about the prevalence of hypertension in men, women and adolescents. However, there is no study done on the prevalence of hypertension in a stressful working environment such as Abossey Okai. This study will provide literature on the prevalence of hypertension in this area.

Results from this study will present a clear picture of socio-economic impact on hypertension among the spare parts dealers. Through this study, epidemiological data would be provided on the prevalence of hypertension that can support diagnosis, management and lifestyle adjustment. The study population would also benefit from pre-survey counselling on risk factors and prevention of hypertension.

1.4 Conceptual framework

For achieving the objectives of this study, the conceptual framework for analysing policy response for prevention and control of NCD in Jamaica was adopted (World Bank 2008). There are reasons why this model is adapted from Jamaica:

1. "The demographic transition is almost the same as Ghana, as there is a declining 0-14 age group and an increasing working age group (15-64) and the above 60 age groups is growing, which is fast growing segment of the population". This type of population will be a group of people with greater lifetime exposure to the risk factors that cause hypertension. These include limited physical activity, tobacco use, alcohol abuse, and fatty foods.

2. "Both countries face a double burden of disease: communicable diseases were the greatest contributor to the burden of disease in both countries for past three decades but were surpassed by chronic diseases in current and coming decades. These epidemiological transitions occur through urbanization and lifestyle changes as living standards improve, education levels rise, access to health services increases, and morbidity and mortality patterns change with people living longer lives".

3. “Communities in poorer segments of the population are more likely to be at risk of NCDs. Such peoples with low incomes are uninsured or underinsured, and cannot afford preventive screenings for hypertension. In both countries the prevalence of hypertension is between 20 - 30%.”

Analyzing, “the policy response towards hypertension in Ghana has evolved from understanding the associated risk factors from individual behaviour at the micro level to policy response at the macro level. This is because of different reasons. First, the determinants of hypertension lie in behaviour and social conditions. Second, hypertension is not a one-off or episodic event, it builds up over long periods of time leading to disease progression that is accelerated with aging or cumulative exposure to risk factors. Third, people who acquire multiple risk factors and disease need lifelong disease management. Fourth, the complexity of preventing and managing hypertension requires intervention at multiple levels from different actors ranging from behaviour change to tertiary care” (WB, 2008).

Therefore, this adopted conceptual framework will be used to assist in identifying important risk factors likely to be involved in developing hypertension in Ghana. This is to understand the relationship among different factors and examine the limitations of existing health system policy responses to suggest possible solutions from best intervention practicing sub Saharan Africa countries. This is illustrated in figure 1.1 below. “In this adopted conceptual framework, both health profile and health policy can be seen to directly affect the use of health services for hypertension prevention and control, which in turn influences health outcomes for individuals. The organization of primary health care

setting determines the responsiveness of country policy to hypertension, yet this relationship can be modified by the social, environment, personal health practices".

The World Bank conceptual framework for Jamaica is built based on a different previous analysis of non-communicable diseases and pathways through which individual, social and environmental factors influence health outcomes. The conceptual framework for this study builds upon a vast amount of literature that has been developed in recent years on the determinants of health (Evans et al., 2001, Lurie & McLaughlin, 2003, Solar & Irwin, 2007). "The role of individual and social determinants and the interactions between them have been identified. The impact of different determinants has been further distinguished by the role of structural and intermediary determinants; primary and secondary determinants" (Solar & Irwin, 2007). "Primary determinants include socioeconomic and demographic factors while secondary determinants encompass biological and lifestyle factors" (Kosteniuk & Dickinson, 2003). The Economic Framework for the Prevention of Lifestyle-related Chronic Diseases, emphasize "the importance of interactions between individual factors and specific socioeconomic environmental influences; the framework focuses on preventing lifestyle-related NCDs" (Sassi & Hurst, 2008).

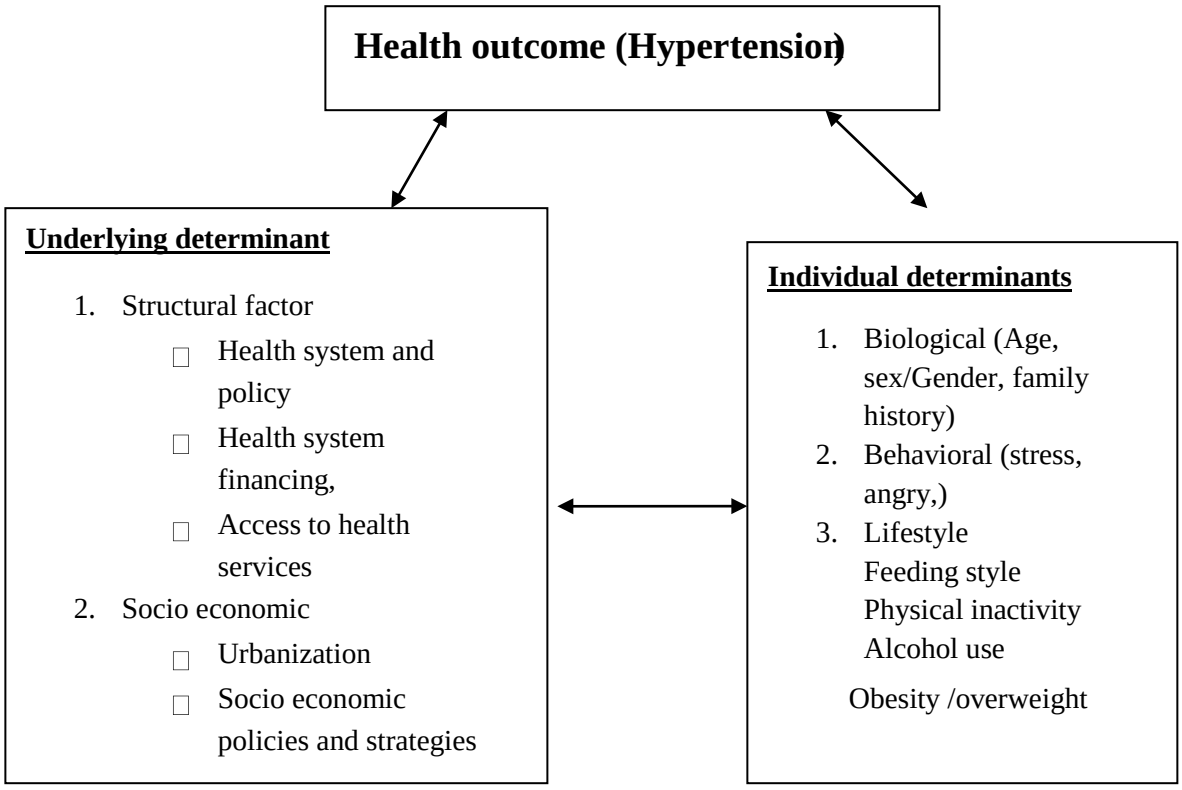

Figure 1.1: Conceptual framework for analyzing determinants of hypertension and health system response of NCD determinants and policy response.

This study adopted a framework that groups the factors into "underlying" and "individual" determinants. "Underlying determinants affect the health of the population at the macro level and structural determinants at the meso level and individual determinants affect individual health at the micro level. This distinction highlights the role that individuals can play in the prevention and control of hypertension while identifying the socioeconomic environment that influences individual behaviour and which can be changed by policy interventions" (World Bank 2008).

The aim of this framework is to provide a better understanding of the pathways that lead to hypertension.

1.5 Research Questions

1. What are the socio-economic patterns among the spare parts dealers at Abossey Okai?
2. What is the prevalence of hypertension among spare parts dealers at Abossey Okai.?
3. What are the risk factors of hypertension status among the spare parts dealer at Abossey Okai?
4. What is the association between socio economic patterns and the prevalence of Hypertension among the spare parts dealers?

1.6 General Objective

The goal of this research is to contribute to the global fight against NCDs by exploring the relationship between socioeconomic factors and hypertension among automobile spare parts dealers in the Abossey Okai enclave of Accra, Ghana.

1.7 Specific Objectives

a. To examine the socio-economic patterns among the spare parts dealers at Abossey Okai.

b. To determine the prevalence of hypertension among spare parts dealers at Abossey Okai.

c. To identify the risk factors of hypertension status among the spare parts dealer at Abossey Okai

d. To ascertain the association between socio economic patterns and the prevalence of Hypertension among the spare parts dealers.

1.8 Profile of the Study Area

The Accra Metropolitan District is counted as one of the 254 Districts in Ghana. It is found in the Greater Accra Region which comprises of 26 districts and has a population of 1,665,086 as of 2010. It covers an area of about 60km2 and engulfs the Ablekuma South, Ashiedu Keteke and Okaikoi South sub-metropolitan district council.

The study area, Abossey Okai is found in the Ablekuma Central sub-metropolitan district which is bordered by Okaikoi North Municipal in the North, Osu Klottey sub-metropolitan district to the South, Ablekuma South sub-metropolitan district to the West, and Ayawaso Central sub-metropolitan district to the East. The estimated population of the sub-metropolitan district at as at the last population and housing census in 2010 was 121,718 with 13,378 houses and 34,800 households. With the Greater Accra growth rate at 3.1%, it is estimated that the 2018 population stands at about 148, 897.

Bubiashie, Kaneshie (including Abossey Okai), North Kaneshie, Awudome and Avenor are some of the communities in the sub-metropolitan area.

1.9 Scope of Study

This study was limited to only male traders in the Abossey Okai Enclave of the Okai Koi district of the Greater Accra Region. It focused on traders who had worked there within the past six months. The checking of blood pressures was done to help establish a relationship between hypertension and socio-economic determinants.

1.10 Organization of Report

The report is organized into six chapters. The chapter one covers the general introduction and is grouped under the following sections: the background, the statement of the problem, the justification of the study, the objective of the study, the research questions, the scope of the study and the organization of the report.

Chapter two involved the review of literature of the subject under study.

Chapter three describes the various methods of collecting the data. These include the administration of questionnaire, physical observations, research design, data management, analysis, data preparation and reporting.

Chapter four presents the results of the study. Chapter five entails the discussions of the results obtained from the study.

Chapter six provides conclusions and recommendations from the study.

CHAPTER TWO

2 .0 LITERATURE REVIEW

2.1 Definition and Classification of Hypertension

Hypertension or high blood pressure as defined by the WHO refers to "a condition in which the blood vessels have persistently raised pressure. Physiologically, blood is transported from the heart to all parts of the body through vessels, known as arteries and veins. Arteries carry blood away from the heart to the peripheral tissues and veins carry blood from the peripheries to the heart."

"Thus, with each heartbeat, blood is pumped into these vessels. Blood pressure is created by the force of blood pushing against the walls of the blood vessels as it is pumped by the heart. The higher the pressure, the harder the heart has to pump. The force of resistance against which the heart pumps generates a tension within the blood vessels. This is called the blood pressure." (WHO 2013).

"In the United States, the most widely used classification of blood pressure for adults aged 18 years or older is from the 2003 Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7), as follows;

Normal: Systolic lower than 120 mm HG, diastolic lower than 80 mm HG

Prehypertension: Systolic 120 – 139 mm HG, diastolic 80 -89 mm HG.

In Stage 1 hypertension, systolic blood pressure is between 140 – 159 and a diastolic of 90 - 99 mm Hg.

In Stage 2 hypertension, the systolic blood pressure is 160 mm Hg or greater, diastolic 100 mmHg or greater.

In Severe hypertension, clinical systolic blood pressure is 180 mm Hg or higher or clinical diastolic blood pressure is 110 mm Hg or higher." (Alexander and Madhur, 2019)

2.1.1 Primary Hypertension

"Primary Hypertension also known as Essential hypertension is the most common type of hypertension affecting between 90% to 95 % of subjects diagnosed of hypertension. Primary hypertension has no clearly defined etiology. This is the main distinguishing factor between primary and secondary hypertension; since in secondary hypertension, the BP elevation is due to an identifiable cause" (Eckman & Kirk, 2013).

"Although Primary hypertension is of unidentifiable cause, risk factors have been implicated. Many studies have indicated several risk factors such as age, BMI, smoking and alcohol consumption" (Agrawal, Bhakwar & Basanna, 2008).

2.1.2 Secondary Hypertension

This accounts for about 5 % to 10% of hypertension cases. For this type of hypertension, specific causes can be identified. The cause of secondary hypertension includes renal pathology, thyroid disease such hyperthyroidism. (Eckman & Kirk, 2013).

2.2 The Pathophysiology of Hypertension

The mechanisms for the pathophysiology of hypertension are as follows;

2.2.1 Genetic Factor

Genetic factors are documented to be a major indicator in hypertension.

"Rare genetic forms of hypertension are caused by mutations in particular genes, many of which control the balance of fluids and salts in the body and affect blood pressure. The causes of essential hypertension, however are not well understood" (Patel. et al., 2017). "About 50% of patients with hypertension have a family history of hypertension or premature mortality of cardiovascular cause in a first degree relative. There are however rare forms of hypertension due to single genetic mutations, so called mendelian forms. These involve mutations in the epithelial sodium channel (ENaC) in the distal renal tubule (Liddle syndrome), mineralocorticoid receptor, chimeric CYP11B2 (familial hyperaldosteronism type 1). The inheritance of the mutation almost always results in the development of hypertension. Hypertension is however a broad phenotype, which results from many mechanistic pathways and usually require multiple attempts to manifest. Epidemiological studies known as genome wide association studies (GWAS) with over 30,000 subjects have identified 30 or more variants with relatively modest contribution to the risk of hypertension" (Butler et al., 2010).

"The genetics of hypertension comes in two types. The rare familial monogenic syndromes that should be labelled as secondary hypertension when they are recognized and the genomics of primary hypertension. The elucidation of genetic mechanisms for monogenic familial hypertension has been has been invaluable for understanding general blood pressure pathways and the entities are important to recognize clinically because specific treatments can be provided in some cases" (Ehret et al., 2018).

A research study with cross sectional design was conducted in 10 villages with about 9845 inhabitants between 2002 and 2008 measuring blood pressures; the essence was to assess the heritability of hypertension. It revealed that approximately 38.8% of this population had hypertension, the burden of disease varying by age, sex and among the villages considering the age and sex structure of their inhabitants. Hypertension was found to be independently associated with the following factors: age, obesity related factors, heart rate, total cholesterol, alcohol consumption, low education and smoking status. Significantly however, it was found out that heritability was 27 % for diastolic and 36 % for systolic blood pressure. Comparatively, it was significantly higher in men (57%) than in women (46%)" (Biino et.al 2013).

2.2.2 Balance between Cardiac Output and Peripheral Resistance.

"Blood pressure is usually dependent on the balance between cardiac output (C. O) and peripheral resistance (P. R). Cardiac output is the volume of blood flowing through the systemic and pulmonary circulation per minute. Cardiac output of the heart can be affected by alteration in heart rate and the stroke volume (the volume of blood ejected during each ventricular contraction). An increase in cardiac output without a decrease in peripheral resistance will cause both arterial volume and pressure to increase Total peripheral resistance is determined by changes in the diameter of the vessels (arterioles). Thus, constriction of the arterioles leads to an increase in mean arterial pressure by preventing the free flow of blood into the capillaries. Dilatation of the arterioles has an opposite effect" (Huether and McCance, 2012).

"Usually patients with essential hypertension have an increased peripheral vascular resistance and a normal cardiac output. The cardiac output may be increased in the early

stages of essential hypertension, so that the peripheral resistance gradually increases in order to maintain normal tissue perfusion and the cardiac output returns to normal. In the end stages of hypertension, left ventricular hypertrophy becomes so severe that cardiac output decreases; so that blood pressure is maintained solely by increased peripheral resistance. At the first stage, the cardiac output may be so impaired that blood pressure then decreases rendering the patient hypotensive" (Beevers et al.,2007).

2.2.3 Renin, Angiotensin and Aldosterone System

"Renin is secreted from the juxtaglomerular apparatus of the kidney in response to glomerular under perfusion, reduced intake of salt or stimulation from the sympathetic nervous system. Renin results in the conversion of renin substrate (Angiotensin) to Angiotensin I, which is a physiologically inactive substance. A key enzyme, angiotensin converting enzyme (ACE), results in the conversion of angiotensin I to angiotensin II" (Beevers et al., 2007).

"Angiotensin II is a potent vasoconstrictor that leads to an increase in BP. Angiotensin II may also cause some of the damage to hypertensive target organs such as left ventricular hypertrophy and atherosclerotic vascular disease. Hypertension that results directly from excess renin and aldosterone is seen in patients with renin secreting tumours and in some cases of renal artery stenosis. Angiotensin II also stimulates release of aldosterone from the zona glomerulosa of the adrenal gland. Aldosterone causes fluid and sodium retention and these results in further increase in blood pressure" (Beevers et.al., 2007).

"Several abnormalities in renal handling of Sodium has been implicated in the development of hypertension. It is believed that insulin enhances Sodium reabsorption in

the diluting segment of the distal nephron due to increased activity of sodium transporters such as the epithelial sodium channel, with a resulting decrease in sodium excretion. This potential leads to the beginning of hypertension development" (Manrique et.al., 2010).

"Furthermore, it is known that abnormally increased arterial stiffness, cardiac stiffness and associated functional changes are precursors and predictors for the development of hypertension, coronary heart disease, heart failure and renal disease. Now great interest has been placed on the relationship between activation of the Renin – angiotensin – aldosterone system (RAAS), important in controlling sodium – potassium balance, fluid volume and hemodynamic stability, and the pathogenesis of abnormal arterial and cardiac stiffness and associated cardiovascular disease" (Jia et. al., 2018).

"The renin -angiotensin system however is not thought to be responsible directly for the increase in BP in patients with essential Hypertension. This is because many of the patient with hypertension have low levels of circulating endocrine renin and angiotensin II; thus, in these patients, the drugs that block the renin- angiotensin- aldosterone system tend to be less effective" (Beevers et al., 2007).

2.2.4 Autonomic Nervous System (ANS)

Despite ambiguous results from many researches, "majority of evidence currently favours a pivotal role for the autonomic nervous system in the etiology of essential hypertension" (Brook et. al., 2000).

"Recent interest has been renewed in the role of the sympathetic nervous system in hypertension because it has been found out that sympathetic abnormalities can influence the development and progression of target organ damage" (Grassi et al., 2015). "The

autonomic nervous system has an important role in maintaining a normal BP including physiological responses to changes in posture, as well as physical and emotional activity" (Beevers et al., 2007).

Furthermore, abnormalities in the autonomic nervous system (ANS) resulting in increased sympathetic output and decreased parasympathetic tone are related to the development of hypertension. "This neurogenic component to hypertension is now well established. Along with raised vasomotor tone and increased cardiac output, the chronic activation of the sympathetic nervous system has a lot of pathophysiological ramifications leading to the development of hypertension" (Fisher and Paton, 2012).

"Stimulation of the sympathetic nervous system can cause arteriolar constriction and arteriolar dilatation. After stress and exercise, such changes mediate short term changes in blood pressure" (Beevers et al., 2007).

2. 5 Prevalence of Hypertension

Hypertension is the most common cardiovascular disorder which affects many people. It is a leading contributor of the global disease burden and a major cause of premature death. "Globally, an estimated 26% of the world's population (972 million), has hypertension and the prevalence is expected to increase to 29 % by 2025, driven largely by increase in economically developing nations" (Alexander and Yang, 2019).

In a study of the ABC of hypertension by Beevers et al., (2001), "it is estimated that 1 billion individuals worldwide, including at least 70 million Americans, have high blood pressure (BP) warranting some form of treatment. Approximately 9.4 million deaths each year can be attributed to uncontrolled hypertension".

"It is a major cause of cardiovascular morbidity and mortality in Ghana" (Sanuade et al., 2018). In the study by Alexander et. al., (2019), questioning the global prevalence of hypertension, it was estimated that, "26 % of the world's population has hypertension. Meanwhile, this estimated prevalence is expected to increase to 29 % by 2025. Approximately 40% of the world's population aged 25 and over (one billion) had hypertension in 2008".

Review of literature by Esmaeili et. al., (2017), shows that hypertension is prevalent in Iran. As a result, its control and treatment has become a priority. In South Africa, the prevalence of hypertension was estimated to be 21 % in individuals aged fifteen years and above in a study conducted by Folb et. al., (2016), on the socioeconomic and modifiable predictors of hypertension control in primary care attenders at Western Cape.

In Ghana, a study of individuals aged 15 – 49 years estimated hypertension to be 13.0 %. It was found out that, the Greater Accra Region (19.4 %) had the highest prevalence followed by the Ashanti Region (16.6 %). The lowest was recorded in the Upper West Region (7.6 %) (Sanuade *et.al.* 2018). In another study, "The epidemic of hypertension in Ghana: a systemic review", the crude prevalence of hypertension was estimated to be between 25 % and 48%, using the newer cut of point of 140/90 mm Hg (Bosu *et. al.* 2010).

The Women's Health Study of Accra (WHSA) conducted by Duda et. al., (2007), recorded a crude prevalence of 54.6 % among 1,303 women. In the work of Addo et.al, (2012), it was suggested that, the burden of hypertension was higher in the urban than the rural areas. The prevalence estimated was 19.3 % in the rural to 54.6 % in the urban areas.

2.3 The Complications of Hypertension

"Hypertension affects major organs such as the heart, brain, kidneys and the eyes. The higher the blood pressure, the higher the likelihood of harmful consequences to these organs. This is known as the cardiovascular risk and can also be high in people with mild hypertension combined with other risk factors, for example tobacco use, physical inactivity, unhealthy diet, Obesity, diabetes, high cholesterol, low socioeconomic status and family history of hypertension" (WHO, 2013).

2.3.1 Cardiovascular Complications

"Cardiovascular complications include left ventricular hypertrophy, angina pectoris, heart failure, coronary heart disease, myocardial infarction and sudden death. Myocardial hypertrophy is often characterized by changes in myocyte protein, apoptosis of myocytes and deposition of collagen in the heart muscles, which cause it to become thickened, scarred and less able to relax during diastole, leading to diastolic heart failure. In addition, the increased size of the heart muscles increase demand for oxygen over time. The contractility of the heart becomes impaired and the individual is at increased risk of systolic heart failure. Vascular complications include the formation, dissection and rupture of aneurysm (outpouching in vessel wall) and arteriosclerosis leading to vessel occlusion" (Huether and McCane, 2012).

2.3.2 Cerebral Complications of Hypertension

Occlusion of blood vessels due to the effects of arteriosclerosis results in decreased blood flow or sometimes the rupture of blood vessels in the brain resulting in stroke. "Ischemic

stroke is caused by arteriosclerosis and hypertension is a major risk factor for haemorrhagic stroke which results in high mortality and morbidity" (Rigaud et.al.,.2000).

2.3.3 Renal Complications of Hypertension

Parenchymal damage, nephrosclerosis, renal arteriosclerosis and renal insufficiency or failure are complications of uncontrolled high blood pressure (Huether and McCane, 2012).

2.3.4 Retinal Complication of Hypertension

"The changes that occur in the retina of subjects with hypertension include arteriolar narrowing, arteriovenous crossing changes, alteration of light reflexes on arterioles, cotton wool spot, microaneurysms, retinal haemorrhages, retinal oedema and blurred disc margin" (Gundeson and Karnath, 2003).

2.4 Management of Hypertension

JNC VII (2003) has made recommendations on the management of Hypertension. It has proposed that more attention should be given to managing blood pressure at the newly defined "prehypertensive stage". The JNC VII has simplified the classification of blood pressure levels and outlines how to apply this new classification scheme for hypertension control (Schwenk & chobanian, 2003). The management of hypertension includes pharmacological and non- pharmacological methods.

2.4.1 Pharmacological Management

"Not all subjects diagnosed of Hypertension will require medication but those at medium to high risk will need one or more essential medicine to lower their cardiovascular risk" (WHO 2013).

"More than two thirds of the population will require one or more antihypertensive medications usually selected from different classes of drugs" (JNC VII, 2003). These include the following;

2.4.2 Thiazides

These are a class of antihypertensives that exert their effect by reducing the BP by increasing the excretion of sodium and water and subsequently reduces blood volume. It also has vasodilating properties.

2.4.3. Beta – Blockers

These class of antihypertensives reduce the Cardiac Output through a negative chronotropic and ionotropic effects.

2.4.4 Calcium Channel Blockers

Calcium Channel Blockers act by preventing the transfer of calcium ions across smooth muscle cell membrane which causes the dilatation of the arterioles. These include Nifedipine, Amlodipine and Felodipine.

2.4.5 The ACE's

These are drugs that inhibit the action of the Angiotensin converting enzyme, which converts angiotensin I to angiotensin II.

2.6 Hypertension and Socioeconomic Factors

Socioeconomic status has been found to contribute to health disparities in different populations. It is proposed that subjective socioeconomic status (an individual's perception of his or her socioeconomic status) provides an estimation for physical health (Matthew et al., 2002).

Several socioeconomic indicators have been studied in various researches linking hypertension to socioeconomic standards. Indicators such as level of education, occupation, income levels, quality of diet (in relation to income level), stress, alcohol consumption and smoking are some of the well documented links (Lang et al., 2015).

This position has been further confirmed in the study of Matthew et.al., (2002), "Socioeconomic Trajectories and Incident Hypertension in Biracial Cohort of young adults"; it said that, "It is well established the middle aged and elderly who have a far lower SES, have an elevated risk of Cardiovascular Disease".

Furthermore, there has been a recent evidence linking socioeconomic status (SES) to Cardiovascular Disease and Cardiovascular risk factors in the study of Menstral and Stringhini (2017). In this study, published in the 2017 edition of the Current Cardiology Reports, it was observed that cardiovascular health is linked to their socioeconomic status. Thus, it was concluded that lower SES adults had higher mean blood pressure and a higher rate of hypertension in developed countries.

2.6.1 Hypertension and the level of Education

In a study of socioeconomic and modifiable predictors of blood pressure control for hypertension in primary care attenders in the Western Cape area of South Africa, it was found out that among the hypertensive cohort, low income patients and members with low levels of formal education attending public sector primary care clinics was associated with the likelihood of blood pressure control (patient factors). These patient factors were also associated with uncontrolled blood pressure at baseline levels, this included lower levels of education (Folb et al., 2016).

"Previous research suggests that educational status is inversely associated with blood pressure and the risk of hypertension; even after adjusting for income and other measures of socioeconomic status. However, education is characterized using only years of schooling or degree attainment" (Keily et.al., 2012).

"In Latin American countries, the low level of awareness, treatment and control is related to low educational level and residence in rural communities" (Jaramillo et al., 2017).

Kubota et. al., (2017), established that "More than half of adults who did not complete high school had adverse Cardiovascular events during their life time. Time. Presumably therefore, educational attainment is associated with risk for Cardiovascular Disease, as a marker or mediator of other traditional risk factors".

In an European study, that evaluated educational levels in a large sample of 812 hypertensive out - patients. It was discovered that the awareness of hypertension and its organ damage was education related.

In a similar study, in which the subjects were categorized in “High school “and “Little education” , it was surprisingly seen that most hypertensive patients attained high levels of education and were occupied at sedentary jobs. High diastolic blood pressures were associated with low educational levels” (Tedesco *et al.,* 2001).

2.6.2 Hypertension and Low-income Levels

Low socioeconomic status represented by such indices including household income has been associated with worse blood pressure control. Income levels have been shown to be inversely related to blood pressure.

Health disparities have been known to exist between different socioeconomic groups. In the Whitehall studies carried out among British civil servants, lower SES was associated with increased cardiovascular disease (CVD) risk (Anstey et. al., 2019).

Related studies have shown that most indicators of SES including income level, educational attainment, employment status, and environmental factors are associated with an increased risk of Cardiovascular Disease (Anstey *et al.,* 2019).

A study in North Carolina in the United States proved that, disadvantaged adolescents (those with low or no income) were at a higher risk for undiagnosed and untreated obesity and hypertension (Ewald *et al.,* 2017).

“It is established that the prevalence of hypertension and associated chronic diseases are more severe in medically underserved and low-income community populations. Thus, certain populations are at a higher risk for hypertension including African -Americans and those living in poor socioeconomic and environmental conditions. Furthermore, it has been found out that the incidence of death and disability from cardiovascular disease is

disproportionately higher in minority, low income and homeless populations" (Huckabay et al., 2016).

2.6.3 Effect of Stress on hypertension

Long working hours have been linked to hypertension. It has been found that pressure at work can negatively impact on employee's health. Stressful working conditions are associated with increased absenteeism and reduced productivity. Chronic stress may also cause health issues such as back problems, heart problems, stomach ulcers and hypertension.

In the Jackson Heart Study, it was reported that participants who reported either moderate or high exposure to stress on annual assessments were more likely to develop hypertension by the next study visit (Todd et al., 2019).

"Chronic psychological stress has been associated with hypertension; and a few studies has examined its relationship in blacks. It was discovered that hypertension developed in 30.6 % of participants with low perceived stress and 38.2 % in participants seen as high perceived stress" (Spruill et al., 2019).

2.6.4 Effect of Diet on Hypertension

"The incidence and severity of hypertension are affected by nutritional status and intake of certain nutrients. Excessive calorie intake and obesity are major causes of hypertension. Obesity is associated with increased activity of the renin- angiotensin – aldosterone system and the sympathetic nervous system. Mineralocorticoids activity, insulin resistance, salt –

sensitive hypertension and excessive salt intake all result reduced kidney function" (Savica et al., 2010).

"Diet has a major role in the development of hypertension. Reducing the amount of fat consumed may lower blood pressure and promote weight loss. High blood pressure increases the risk of arteriosclerosis which is exacerbated by increased consumption of fat" (Peters and Flack et al., 2000).

"Unhealthy diet and physical inactivity contribute to about 30% of preventable morbidity and mortality from non-communicable diseases including morbidity and mortality due to hypertension. Excessive intake of saturated fatty acids and trans fatty acids, along with higher consumption of salt and sugar are risk factors for cardiovascular diseases including hypertension" (WHO, 2013).

In a study in Iran aimed at evaluating the relationship between different lifestyle patterns and hypertension, it was found out that the cluster of participants differentiated by the intake of sugar sweetened beverages, salt and fatty foods and other ones differentiated by lack of physical activity, were more exposed to the risk of hypertension (Samaneh et. al., 2019).

2.6.5 Effect of Alcohol consumption on Hypertension

"Epidemiological, preclinical and clinical studies have established the association between high alcohol consumption and hypertension. However, the mechanism by which this happens is still unknown. Imbalance of the central nervous system, impairment of baroreceptors, enhanced sympathetic activity, stimulation of the renin – angiotensin - aldosterone; increased cortisol levels and increased vascularity due to increase

intracellular calcium levels, stimulation of the endothelium to release vasoconstrictors and loss of relaxation due to inflammation and oxidative injury of the endothelium" (Husain *et al.,* 2014).

"This leads to inhibition of endothelium dependent nitric oxide production. Loss of relaxation due to inflammation and oxidative injury of the endothelium by angiotensin II leading to inhibition of endothelium- dependent nitric oxide production which is the major contributors of 'alcohol induced hypertension'. The reduction of the amount of alcohol intake is necessary for the prevention of alcohol induced hypertension" (Husain *et al.,* 2014).

Studies have suggested an independent association between alcohol in-take and hypertension. A study by MacMahon et. al., (1987), established that "there is increased prevalence of hypertension in heavy drinkers or alcohol – dependent populations". It reported reviews on epidemiological evidence for the existence of an association between blood pressure and the level of alcohol consumption.

"Lifestyle related factors such as obesity, drinking habits, sodium and potassium intake and physical inactivity are well established in the development of blood pressure" (Beilin et al., 2009).

2.6.6 Housing and Hypertension

Cardiovascular diseases are amongst the major causes of death in developing nations (Perkovic et al., 2007). "Arterial hypertension and metabolic syndrome are important causes of cardiovascular diseases" (Braziene et al., 2019). "Metabolic syndrome is associated with abdominal obesity, elevated arterial bold pressure, dyslipidemia and high

levels of fasting blood glucose (FBG). The causes of these disorders are complex and related to genetic factors, lifestyle, diet structure, environmental factors such as traffic, air pollution, traffic noise, residential housing and the neighborhood quality" (Braziene et al., 2019).

Thus, many studies have tried to investigate the correlation between living spaces and the development of hypertension. Conclusively, it was established in the study, "Association between the living environment and the risk of arterial hypertension and other components of metabolic syndrome", that, "the greenness, the size and type of available open spaces were inversely related to cardiometabolic risk" (Braziene et al., 2019).

"Housing stability, a precursor to homelessness, may be an independent risk factor for poor health. Housing instability is described in sociological literature but lacks a standard definition. Various definition for housing instability has been postulated. It is defined as living doubled up with family or friends; or moving frequently due to inability to pay rent, living in an overcrowded condition or spending more than 50% of household income on rent. This problem has been found to be a growing public health problem and may be an independent risk factor for hypertension" (Vijayaraghavan et al., 2013).

Several research studies have assessed the role of neighborhoods and hypertension related outcomes and it has been established that low income housing residents from a disadvantaged group can develop hypertension because of living conditions (Al- Bayan et al.,2016).

CHAPTER THREE

3. 0 METHODOLOGY

3.1 Research Methods and Design

A cross sectional study was employed for this study to investigate the association between socio-economic factors and hypertension. The study was conducted between January and March, 2020. The study used a quantitative approach to data collection and analysis in examining the possible association between dependent and independent variables.

3.2 Data Collection Techniques and Tools

A standard questionnaire was developed using the WHO-NCD STEPWISE approach to surveillance. The questionnaire covered such areas as demographic information, socioeconomic status by ranking, education, lifestyle, income, marital status, number of children, sources of stress, alcohol intake and the use of tobacco. For the measurement of blood pressure, electronic blood pressure machine was used. Three research assistants were recruited and trained to facilitate data collection.

3.2.1 Blood Pressure Measurement

Blood pressure was taken by trained personnel using a digital crown star blood pressure monitor (sphygmomanometer). Measurements were taken from the right upper arm after subjects had been sitting for >5 min. Participants were asked to sit on a chair for five minutes. Different cuff sizes were used for different body sizes and placed to cover the right arm at the heart level. Systolic and diastolic blood pressure were taken three times,

with at least 5 minutes interval, using a digital sphygmomanometer. The average of the three readings was used for the analysis.

3.3 Study Population

The Abossey Okai Spare Parts enclave is a major vehicle parts market in Ghana. This vehicle parts market, which is referred to as the hub of the spare parts business in the country, houses over 15,000 shops with each shop employing an average of two persons. This brings the total population in the area, which is almost the size of two standard football fields, to about 30,000 people, according to the Abossey Okai Spare Parts Dealers Association (Fako et. al., 2019).

The study population included all male traders within the study area during the period of January to March 2020.

3.4 Inclusion and Exclusion Criteria

3.4.1 Inclusion Criteria

All male spare parts dealers working at Abossey Okai for at least six months.

3.4.2 Exclusion Criteria

Spare parts dealers who had worked less than 6 months in the Abossey Okai Enclave were excluded from the study. Females were also excluded from the study because female traders were generally in the minority.

3. 5 Rationale for Study Site

The study was conducted at the Abossey Okai Enclave in the Ablekuma Central district of the Greater Accra Region. The Abossey Okai area has a population of about twelve thousand and five hundred traders scattered over a large area. These twelve thousand and five hundred traders are made up of about ten thousand shop owners, one thousand and five hundred table top sellers and one thousand traders who are commuters.

This site was selected because it is found within a bustling metropolis in Accra where there are high economic activities with problems of heavy traffic and noise pollution. The study was therefore to establish a relationship of such a stressful work environment and the development of hypertension.

3.6 Study Variables

The main variables for study included;

1. Hypertension: This is a categorical variable determined through the blood pressure measurements taken from the study participants. The right upper arm blood pressure was measured and repeated after at least five minutes before diagnosing hypertension or otherwise. By the JNC 7 definition, systolic blood pressures greater than or equal to 140mm Hg was categorized under hypertension.

This variable characterizes whether one is hypertensive (existence of hypertension) or non- hypertensive (no existence of hypertension)

Hypertension is a dependent variable in this study.

2. Age groups: This is a continuous variable, determined by age in years of the study participants grouped into various age groups.

3. Socio-economic status: The indicators of socio-economic status which are categorical variables are the independent variables under study.

3.6.1. Socio-Economic Indicators

For the purpose of this study, four socioeconomic factors were considered in the sample population; educational level, income, housing type and diet.

Educational level has been reported as the most significant of all socioeconomic factors influencing the development of Hypertension and for that matter, Cardiovascular Disease (Kubota et. al 2017). Educational variables were recorded as one of four categories from Tertiary (3), Secondary (2), Primary and JSS (1) and No formal Education (0).

Income group was graded according to the total amount earned into the individual's household monthly. Individual earning less than 200 Ghana. Cedis was placed in the lowest group. Those earning between 200 Ghana. Cedis and 500 Ghana, Cedis were placed in the middle group; whilst those earning more than 1000 Ghana. Cedis were categorized as highest.

Marital status was recorded as single, married/ co-habiting, divorced/ Separated and Widowed.

Housing was categorized as those living in two-bedroom apartments and above as (High); those living in Chamber and Hall Apartments (Middle); those living in Single room (Moderate) and those perching or living with others as (Low).

3.6. 2. Cardiovascular Risk Factors

Four major cardiovascular risk factors were used in this study. They included alcohol use, tobacco use, hypertension and dietary intake of Sodium.

3.6.3 Other Considerations

Hypertension was taken as systolic blood pressure > 140 mm Hg and / or Diastolic blood pressure > 90 mmHg and / or Self-reported Diagnosis of hypertension or use of antihypertensive drugs regardless of BP during the physical examination.

Alcohol consumption was categorized into three groups; those who drink everyday (3), those who drink weekly (2), the occasional drinker (1) and non-drinker (0).

Tobacco consumption was categorized simply as current tobacco user, former user and never used.

3.7 Sampling

3.7.1. Sampling Technique

A descriptive cross-sectional study was chosen for this study. The nature of the research required this type of study design and especially because of the limited time available for the study.

3.7.1 Sampling Technique

In order to ensure that the sample represents the automobile spare parts dealers in the study area, different techniques were employed. Three sub-divisions were created in the Abossey Okai enclave where the automobile spare parts dealers operated. This consisted

of those traders who owned shops, those who sold on table tops and those who were daily commuters.

In each of the chosen divisions, a number of the dealers were selected based on their availability and willingness to participate. Sampling of ratios or quotas were used to represent the wider population in the chosen area. An estimated number of dealers in each of the divisions were obtained from their association and the relative proportions was determined. This guaranteed fair representation in the total sample for the study. The respondents were randomly selected using a list of shop numbers from each of the three division to get two hundred respondents.

3.8. Sample size calculation

Assuming the prevalence of hypertension in males in Greater Accra to be 12.1 % (Sanuade et.al.,2018); confidence interval of 95% (CI 95%) and 5% margin of error (e), sample size (n) was calculated as;

Sample size (n) = Z^2 p q / e^2 (Cochran, 1977)

Where n = sample size

Z = confidence interval at 95% (standard value of 1.96)

P = estimated prevalence of hypertension

e = margin of error (5 %)

n = $(1.96)^2$ (.121) (.879) / $(.05)^2$

= 163.4354

This sample size was increased to 200; to make up for non-response with an adjustment non-response rate of 22.4%.

3.9 Proportional Allocation

The estimated total population of the Abossey Okai Enclave is 12,500 traders. Out of this population, approximately 10, 000 were shop owners, 1500 were table top traders and 1000 were commuters.

However, the calculated sample size was 179 (rounded up to 200) and this sample size was divided proportionately among the various classes of traders.

If n/n is the sample size of the selected trader group

Then n/n = Nu / N X n

Where N = Total Population of Traders

n/a = sample size of traders with shops

n/b = sample size of traders who sell on table tops.

n/c = sample size of traders who commute daily.

Nu = Population of selected Trader groups.

n = calculated sample size (of study population)

n/a = 10,000

n/b = 1500

n/c = 1000

if n/n = Nu / N X n

n/a = 10000/ 12500 x 200

n/a = 160 traders with shops

n/b = 1500 / 12500 x 200

n/b = 24 traders selling on table-tops

n/c = 1000/ 12500 x 200

n/c = 16 traders who commute

Therefore, by proportional allocation:

Number of traders with shops (n/a) = 160

Number of traders using table -top (n/b) = 24

Number of traders who are commuters (n/c) = 16

3.7 Pre-testing

Questionnaire was pre-tested among 15 spare parts dealers at Kokompe another spare parts dealership hub in the Ablekuma North Municipal in the Greater Accra Region of Ghana to ascertain its user friendliness. All errors and ambiguities were identified and the necessary corrections were then be affected before the questionnaires are administered at the Abossey Okai enclave.

3.8 Data Handling

To ensure data quality, a number of things were done which included the training of data collectors on the use of the questionnaire and the administration of questionnaire. The questionnaire was pretested on similar population group before the final questionnaire was finalized. Data was entered using a pre-design entry form in Excel with error check tool to ensure that only accurate data was entered. Any wrong entry was automatically rejected with a prompt message indicating the type of error.

3.9 Data Analysis

Using the software program STATA (version 15) and Ms. Excel, data collected from the field was entered, cleaned and analyzed. The questionnaire pre-coding promoted and eased the method of information processing using the STATA. Furthermore, the information was produced in frequency tables and graphs that helped in the assessment. Using STATA, the research employed both descriptive and inferential statistical instruments. The descriptive method analyzed the frequency, percentage and summary statistics.

Bivariate analysis statistics assessed the association between socio-demographic characteristics of respondents and hypertension. Tests of significance on the associated factors using Fischer's exact test (because some observed variables have values less than 5), with statistical significance set at p-values <0.05. The bivariate analysis was first performed to determine the significant factors in order to reduce the predictors that were used in the multivariate model.

Multiple logistic regression analysis was performed using the factors that were found to be statistically significant at the bivariate stage. This was done to assess the association between hypertension (dependent variable) and the independent variables (socio-economic factors). Thus, the independent variables with p-values < 0.05 in bivariate analysis were fitted in the final multiple logistic regression model to assess the magnitude of the Adjusted Odds Ratio (AOR) with 95% confidence interval (CI). This was also done to correct the problem of the omitted variable problem and confounding effects of covariates. The odds ratio gives the likelihood or a prediction of the event or the outcome happening among the population.

Logistic Regression Model

The empirical specification of logistic regression followed the specification of Harrell (2001):

The model was formulated as follows. For the practice, Let Yi be the binary outcome hypertension, (Yes '1'/No '0') for individual i. Yi~Bernoulli (πi)

Logit (P(Y=1 | x)) = β0 + $\beta_1$age + β_2 + β3marital status+ β_4Monthlyincome + $\beta_5$education + $\beta_6$year of experience +β_7Ownhouse +β8havechildren+β_9Fatherhypertension + β_{10}Momhypertension + ei

3.10 Validity and Reliability of the study

The study used various strategies to make the findings trustworthy. Validated tools and approaches were applied in the data collection.

This included pretested questionnaires, training of data collectors, repeat measurements, conducting interviews in a language the participant could understand (so English as well as a common local language like Twi was used). The classification of SES indicators and Cardiovascular Risk factors adhered to conventional norms.

3.11 Generalizability of Study

The sample population of vehicle spare part dealers at Abossey Okai may not fully represent all communities in Accra and other parts of Ghana. Findings for this study will therefore serve as a basis for further investigations whilst answering the present research questions.

3.12 Limitations

Though great effort was used to minimize bias, there might have still been incidences of recall and measurement bias in the study arising from eliciting information regarding the duration of Cardiovascular risk factors.

Due to variations in geographical factors, Socioeconomic status of different communities differ; thus, the results from this study may not be generalized to other settings.

Hypertension may be classified using either the Systolic or Diastolic blood pressure. For the purpose of this study, Systolic blood pressure was used.

3.13 Ethical Consideration

Ethical approval for the study was obtained from the Ensign College of Public Health Ethics Review Board. Administrative approval was sought from the Chairman of the Abossey Okai spare parts dealers Association.

The design of the study was such that it posed minimum risk to the study participants. To ensure confidentiality, study participants were not required to write their names on either the consent forms or on the questionnaire.

Written informed consents were obtained from individual respondents before interviewing them. It was made known to all respondents that participation was voluntary and anyone could opt out at any time.

CHAPTER FOUR

RESULTS

4.0 Introduction

In this chapter, the presentation of study results is done following the research objectives and the order of the analysis. The results are presented on the demographic characteristics of respondents, their socio-economic and household factors. Also, results on the prevalence of hypertension as well as the associated risk factors are also presented. The analysis was based on data from 200 valid respondents/questionnaire. The chapter begins with the first section on the socio-demographic factors. This is followed by other subsections with each focusing on a specific research question.

4.1 Presentation of Socio-demographic factors on respondents.

This section is divided into the presentation of demographic characteristics and the socio-economic factors of respondents.

4.1.1 Demographic profile of respondents

The summary statistics shows that on the average, respondents were aged around 38 years ($\pm$10.98). The minimum age was 19 years and the maximum age was 62 years old (Table 4.2). The various age groups were 19-29 years (28.5%), 30-39 years (26.0%) and 40-49 years (28.5%). Almost all the respondents had some level of formal education except 2.5%. The majority had primary (42.5%) and secondary education (48.0%) with only 7.0% who had attained tertiary education. Over 90% were Christians, Akans were also the majority (79.5%) (Table 4.1). Most of the respondents were married (57.5%) whilst 38%

were also single with 3% and 1.5% in cohabitation and divorced/widowed respectively. The mean number of years of working as a spare parts dealer was 12 years ranging from one to thirty-five (35) years (Table 4.2).

Table 4.1: Demographic Profile of respondents

Variables	Frequency	Percentage
Age		
19-29	57	28.5
30-39	52	26.0
40-49	57	28.5
50 and above	34	17.0
Highest level of education		
No formal education	5	2.5
Primary	85	42.5
Secondary	96	48.0
Tertiary	14	7.0
Number of Partners		
0	38	19.0
1	135	67.5
2- 3	25	12.5
> 3	2	1.0
Religion		
Christian	189	94.5
Islam	8	4.0
Others	3	1.5
Marital Status		
Married		57.5
Single		38.0
Cohabitated		3.0
Divorced/Widowed		1.5
Ethnic group		
Akan	159	79.5
Hausa/Dagomba	12	6.0
Ewe	9	4.5
Ga	16	8.0
Other	4	2.0
Year of working experience		
1-5	53	26.5
6-10	57	28.5
11 and above	90	45.0

Number of Children In school		
All	104	52.0
Has no child	72	36.0
None	6	3.0
Some	18	9.0

Table 4.2: Summary statistics of age and years of working

Variables	**Minimum**	**Maximum**	**Mean**	**Sd.**	**p50 (median)**
Age	19	62	37.74	10.98	37
Year of working	1	35	12.26	8.29	10

4.1.2 Socio-economic/household characteristics of respondents

The socio-economic and household factors of respondents that were studied included monthly income, house, rent status and household size. These are presented in Table 4.3.

Table 4.3: Household and Socio-economic factors of respondents

Variables	Percentage	Frequency
Monthly Income		
Less than 500	37	18.5
500-1000	96	48.0
More than 1000	67	33.50
Household size		
1-3 people	175	87.5
4-5 people	25	12.5
Earnings regular		
No	62	31.0
Yes	138	69.0
Own a house		
No	163	81.5
Yes	37	18.5
Renting		
No	69	34.5
Yes	131	65.5

Data source: Field data collection, 2020

From Table 4.3, it is observed that most of the respondents earned between Ghc500 to Ghc 1,000 per month followed by those who earned more than Ghc 1,000 a month. Little above 18% earned less than Ghc 500 as their monthly income from their work. In terms of household size, most of the respondents have up to three members in their household. Only 18.5% owned a house whilst 65.5% are in rented buildings.

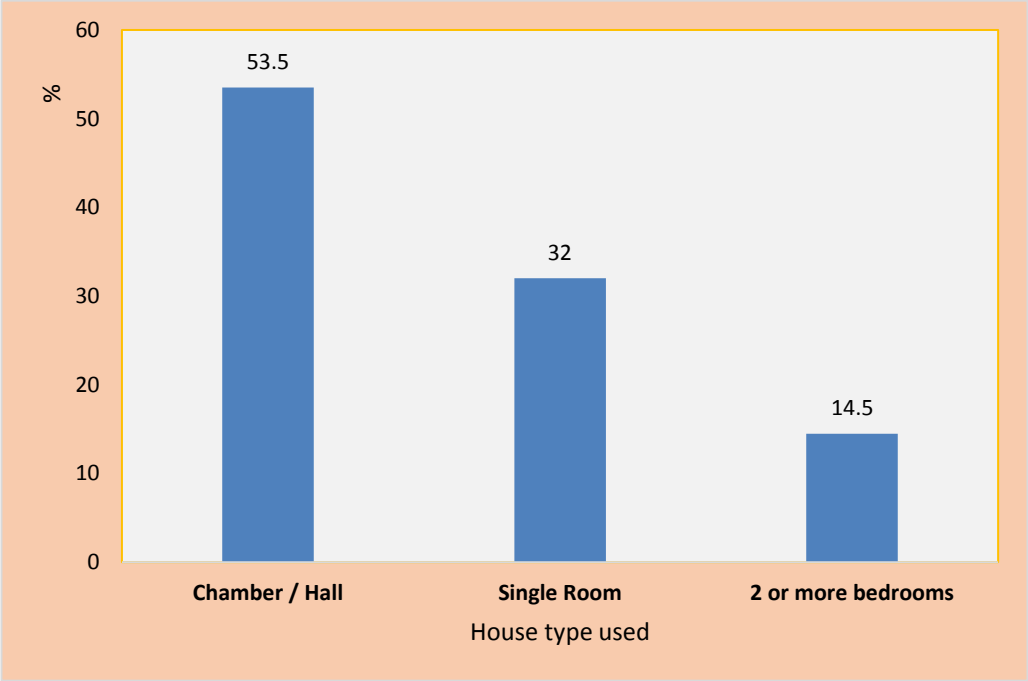

Figure 4.1:Type of house used

More than half (53.5%) of the respondents lived in a chamber and hall house followed by 32.2% in single rooms. For about 15% of the respondents, they stayed in a house which has two or more bedrooms (Figure 4.2).

4. 2 Prevalence of hypertension and its risk factors among the respondents

This section presents the results of the prevalence of hypertension as well as the risk factors to hypertension status among the respondents. The prevalence of hypertension is represented by those who have been diagnosed by qualified health professionals as being positive for hypertension. The results are contained in Table 4. 4..

However, 31 % of study participants were newly diagnosed as hypertensive using the cut off of Systolic Blood Pressure of 140 mm Hg or more. This percentage, however includes the percentage that had already been diagnosed hypertensive by a qualified health professional.

Table 4.4: Prevalence of hypertension among the respondents

Proportion		**Std. Err.**	**[95% Confidence Interval]**
hypertension			
No	0.835	0.026	.776-.881
Yes	0.165	0.026	.119-.224

The prevalence of hypertension was found to be 17% (0.165) with a confidence interval of 12%-22% (0.119-0.224), (Table 4.4).

4.2.1 Measurement of hypertension recorded from the field

This sub-section provides the various measurements of blood pressure taken from the field. The systolic blood pressure was also analyzed to provide the proportion of the respondents who were recorded as having hypertension. Comparison was also drawn to compare the prevalence from those already diagnosed (Table 4.4) and those found from the field.

Table 4.5: Proportion of respondents with systolic BP 140 mmHg and above

(Systolic _Bp)	Proportion	Std. Err.	95% Conf. Interval
Normal	69%	.03278	62%-75%
Hypertension	31.0%	.03278	25%- 38%

From Table 4.5, 31% of the samples taken from the field came out as having a systolic BP 140 mmHg and above, indicating a likely case of hypertension. Comparing this proportion to that provided in Table 4.4 (17%), the different is 14%.

Table 4.6: Various stages of hypertension

Category	Systolic (mmHg)	Frequency (%)	Diastolic (mmHg)	Frequency (%)
Normal	<120	48 (24.0)	<80	126 (63.0)
Prehypertension	120-139	90 (45.0)	80-89	33 (16.5)
Stage 1 hypertension	140-159	44 (22.0)	90-99	19 (9.5)
Stage 2 hypertension	>160	18 (9.0)	>99	22 (11.0)

Approximately 22.0% had stage 1 hypertension using their systolic measurements whiles only 9% had stage 1 hypertension. Using the diastolic the majority had normal measurement (<80 mmHg) (63%). Table 4.6.

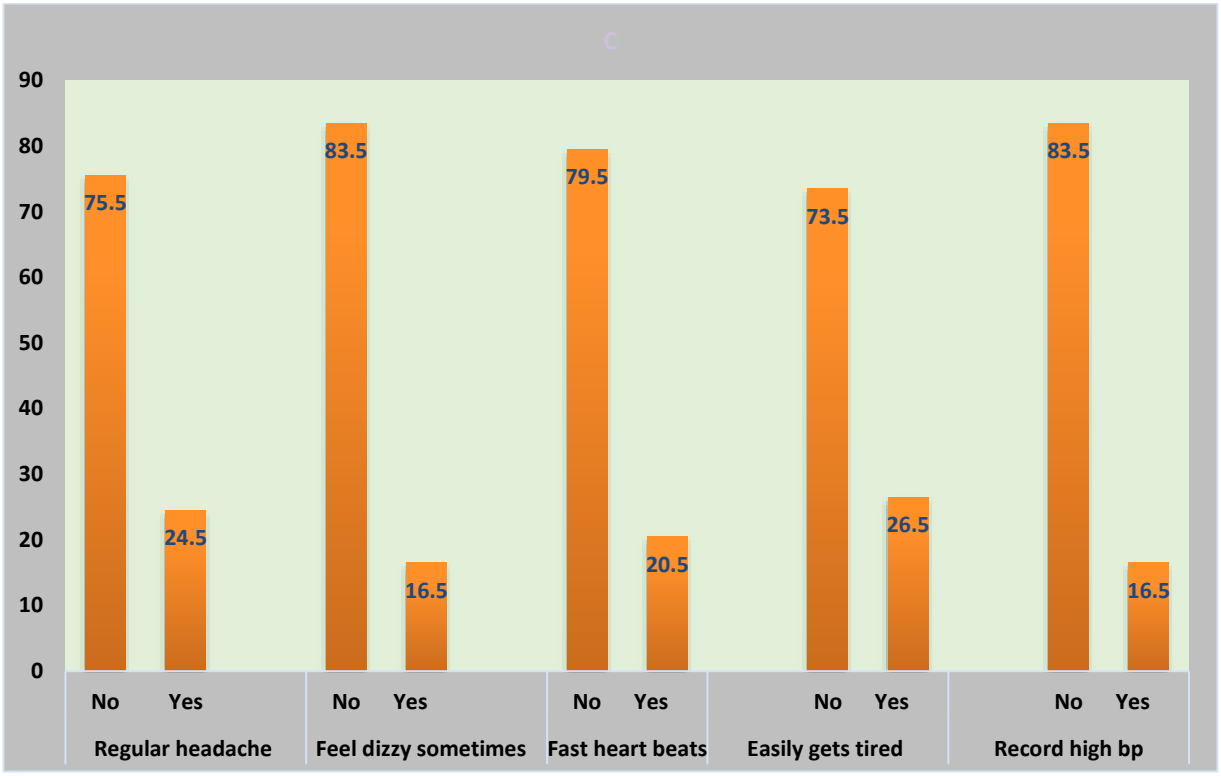

Figure 4.2: Diagnosis and symptoms of hypertension

As shown in Figure 4.3, symptoms that were reported by respondents were regular headache (24.5%), dizzy feeling (16.5%) and fast heart beats (20.5%). About 26.5% and 16.5% get easily tired and recorded high blood pressure respectively.

4.2.2 Risk factors of hypertension among respondents

The likely risk factors of hypertension were examined. These included dietary habit, family history of hypertension and the personal lifestyles of respondents. This is presented in Table 4.5

Table 4.7: Dietary, lifestyle and family risk factors to diabetes

Variable	Frequency	Percentage
Meals		
Cooked	196	98.0
Bought	4	2.0
Times of meals a day		
One	4	2.0
Two	101	50.5
Three	95	47.5
Takes salt		
No	163	81.5
Yes	37	18.5
Hypertensive father		
No	173	86.5
Yes	27	13.5
Hypertensive mother		
No	171	85.5
Yes	29	14.5
Smokes		
No	185	92.5
Yes	15	7.5
Alcohol Intake		
No	96	48.0
Yes	104	52.0

Data Source: Field data, 2020

The result on family history shows that only 13.5% and 14.5% of the respondents had their father and mother respectively being hypertensive. In terms of their lifestyles, only 7.5% smoked whilst more than half (52.0%) took alcohol. Almost all eat cooked food from their house except 2.0%.

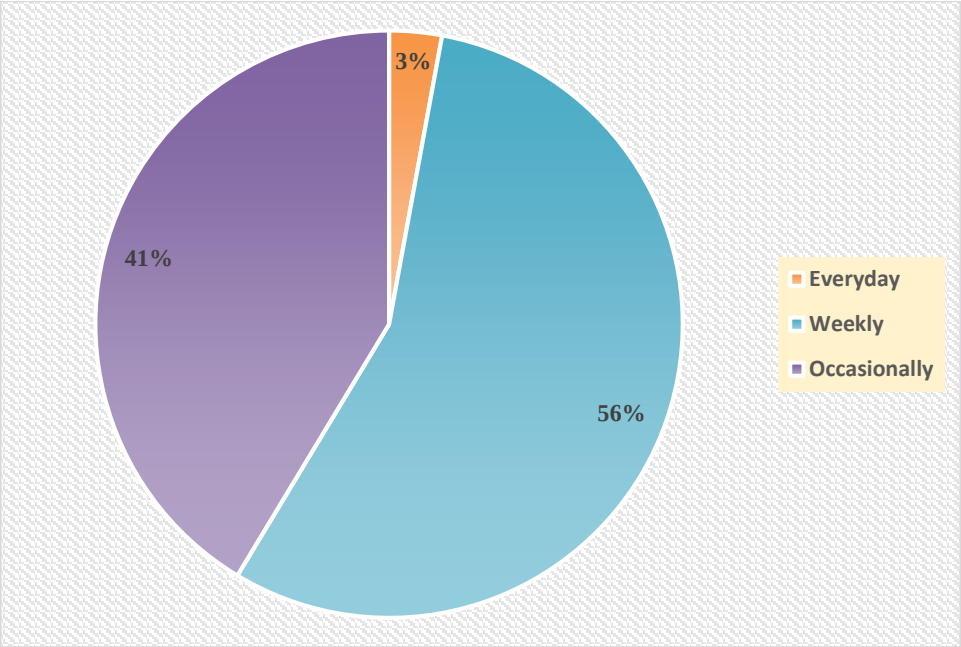

Figure 4.3: Frequency of alcohol intake

For respondents who indicated that they take alcohol, Figure 4.4 shows that 56% took it weekly followed by those who drank every day (41%). Just 3% drank occasionally, that is, during a social event or occasion.

4.3 Factors associated with hypertensive status among respondents

This section provides the analysis of factors that are associated with positive hypertensive status among respondents. The factors under examination were socio-demographic factors, family history and lifestyle risk factors.

Table 4.8: Bivariate Analysis of demographic factors and hypertension status

Variables	Hypertension		P-value
	Yes	No	
Age			
Below 40 years	3 (2.8)	106 (97.3)	0.001*
40 years and above	30 (33.0)	61 (67.0)	
Highest level of education			
Primary	20 (23.5)	65 (76.5)	0.021*
Secondary	9 (9.4)	87 (90.6)	
Tertiary	2 (14.3)	12 (85.7)	
No formal education	2 (40.0)	3 (60.0)	
Marital Status			
Not married	81 (95.3)	4 (4.7)	0.001*
Married	86 (74.8)	29 (25.2)	
Number of Partners			
No Partner	6 (15.8)	32 (84.2)	0.253
1	26 (19.3)	109 (80.7)	
2- 3	1 (4.0)	24 (96.0)	
> 3	0 (0.0)	2 (100.0)	
Religion			
Christian	32 (16.9)	157 (83.1)	1.00
Islam	1 (12.5)	7 (87.5)	
Others	0 (0.00)	3 (100.0)	
Ethnic group			
Akan	29 (18.2)	130 (81.8)	0.814
Hausa/Dagomba	2 (16.7)	10 (83.3)	
Ewe	1 (11.1)	8 (88.9)	
Ga	1 (6.3)	15 (93.8)	
Other	0 (0.00)	4 (100.0)	
Year of working experience			
Less than 10 years	104 (94.6)	6 (5.5)	0.001*
10 years and above	63 (70.0)	27 (30.0)	
Children			
No child	69 (95.8)	3 (4.2)	0.001*
Has child	98 (76.6)	30 (23.5)	

NB: Test of association: Fischer's Exact; *: the measured association is significant at p-value<0.05. Row percentages were computed.

Table 4.8 presents the result from a bivariate analysis of demographic factors associated with hypertension among respondents. P-value of <0.05 was considered as statistically significant (5% margin of error). From the table it could be observed that, most of the factors understudy were significant. For instance, age group, marital status, years of work experience and children were all statistically significant at p-value<0.001. Educational level was also significant with a p-value of 0.021. However, demographic factors such as religion, ethnic group and the number on partners were not statistically significant with observed p-values greater than 0.05.

Table 4.7 also presents the results on household socio-economic factor and the association with hypertension.

Table 4.9: Bivariate analysis output of household socio-economic factors and hypertension

Variables	**Hypertension**		P-value
	Yes	**No**	
Monthly Income			
Less than 500	35 (94.6)	2 (5.4)	0.001*
500-1000	89 (92.7)	7 (7.3)	
More than 1000	43 (64.2)	24 (35.8)	
Household size			
1-3	153 (87.4)	22 (12.6)	0.001*
4 and above	14 (56.0)	11 (44.0)	
Earnings regular			
No	50 (80.7)	12 (19.4)	0.537
Yes	117 (84.8)	21 (15.2)	
Own a house			
No	144 (88.3)	19 (11.7)	0.001*
Yes	23 (62.2)	14 (37.8)	
Renting			
No	52 (75.40	17 (24.6)	0.029*
Yes	115 (87.8)	16 (12.2)	

Kind of house			
Chamber / Hall	86 (80.4)	21 (19.6)	0.001*
Single Room	63 (98.4)	1 (1.6)	
2 or more bedrooms	18 (62.1)	11 (37.9)	

NB: Test of association: Fischer's Exact; *: the measured association is significant at p-value<0.05. Row percentages were computed.

In Table 4.9 result of a bivariate analysis of the association between socio-demographic factors and hypertension among respondents are presented. Similar, to the results presented in Table 4.6, P-value of <0.05 was considered as statistically significant. From the results, except for regular earnings, all the other variables were statistically significant. These variables were monthly income (0.001), household size (0.001), Owning a house (0.001) and renting (0.001).

Table 4.10: Household socio-economic factors and hypertension

Variables	**Hypertension**		**P-value**
	Yes	**No**	
Meals a day			
1	4 (100.0)	0 (0.0)	0.424
2	87 (86.1)	14 (13.9)	
3	76 (80.0)	19 (20.0)	
Takes salt			
No	134 (82.2)	29 (17.8)	0.461
Yes	33 (189.2)	4 (10.8)	
Hypertensive father			
No	150 (86.7)	23 (13.3)	0.001*
Yes	17 (63.0)	10 (37.0)	
Hypertensive mother			
No	148 (86.6)	23 (13.5)	0.012*
Yes	19 (65.5)	10 (34.5)	
Smokes			
No	152 (82.2)	33 (17.8)	0.139
Yes	15 (100.0)	0 (0.00)	

Takes alcohol			
No	82 (85.4)	14 (14.6)	0.569
Yes	85 (81.7)	19 (18.3)	
Frequently of alcohol intake			
Everyday	2 (66.8)	1 (33.3)	0.356
Weekly	37 (86.1)	6 (14.0)	
Occasionally	46 (79.3)	12 (20.7)	

NB: Test of association: Fischer's Exact; *: the measured association is significant at p-value<0.05. Row percentages were computed.

As shown in Table 4.10 result on bivariate analysis of the association between family and lifestyle risk factors and hypertension among respondents. Any variable of P-value of <0.05 was considered as statistically significant level.

From this analysis, only two variables were found to be statistically significant at the said p-value. These were father having hypertension and hypertensive mother with p-value of 0.001 and 0.012 respectively. Factors such as smoking, alcohol intake, meals and taking salt were not statistically significant.

4.3 Multivariate analysis of factors associated with hypertension

This section followed up on the analysis presented in section 4.3.1 and goes further in performing multivariate logistic regression on factors that were found to be statistically significant. This was done to resolve issues such as omitted variable problem and confounding effects associated with bivariate analysis. The Table 4.11 presents both the crude and adjusted odds ratio.

Table 4.11: Multivariate logistic regression model for associated factors to hypertension

Variables	P>z	COR (95% CI)	Robust Std. Err.	P>z	AOR [95% Conf. Interval]
Age					
				0.017*	10.76 (1.53-75.63)
Below 40 years	Ref	1			
Above 40yrs	0.001*	17.38 (4.52-4.52-66.8)	10.707		
Marital status					
Not married	Ref	1			
Married	0.0001*	6.83 (2.20-21.23)	0.593	0.729	0.76 (0.17-3.49)
Educational level					
Primary	Ref	1		Ref	1
Secondary	0.001*	0.33 (0.14-0.80)	0.352	0.406	0.63 (0.21-1.89)
Tertiary	0.440	0.54 (0.1102.66)	4.685	0.173	4.35 (0.53-35.95)
No formal education	0.410	2.17 (0.33-14.14)	2.042	0.459	2.07 (0.30-14.29
Working Experience					
10 and less	**Ref**	1		Ref	1
More than 10	0.001*	7.43 (2.74-20.11)	0.988	0.705	1.33 (0.31-5.71)
Monthly Income	**Ref**	1		Ref	1
Ghc 500-1000	0.6990	1.38 (0.27-7.00)	.568	0.599	.62 (0.10-3.75)
More than Ghc1000	0.0006*	9.77 (1.95-48.920	1.069	0.891	1.14 (0.18-7.18)
Household size					
1-3	Ref	1		Ref	1
4-5	0.0001*	5.46 (2.12-14.09)	0.961	0.589	1.44 (0.39-5.34)
Have children					
No	Ref	1			
Yes	0.00040	7.04 (1.98-25.05)	1.211	0.710	1.38 (0.25-7.70)
Own house					
No	Ref	1			
Yes	0.00010	4.61 (1.97-10.83)	1.475	0.184	2.32 (0.67-8.06
Renting					
No	Ref	1			
Yes	0.0001*	0.0248*	0.674	0.961	1.03 (0.29-3.71
Father has hypertensive					
No	Ref	1			
Yes	0.0020*	3.84 (1.53-9.63)	1.867	0.131	2.77 (0.74-10.38
Mother has hypertensive					
No	Ref	1			
Yes	0.0049*	3.39 (1.37-8.36)	1.841	0.047*	3.07 (0.91-9.94
_cons			.013	0.001*	.018 (0.003-0.08

Note: Number of obs. 200; Wald chi2(14): 65.85; Prob > chi2: 0.001*; Pseudo R^2: 0.317

CI: Confidence Interval; COR: crude Odds Ratio; AOR: Adjusted Odds Ratio; Ref: Reference group; Significant level: P<0.05.

The results presented in Table 4.9 shows the multivariate logistics model which was fitted to ascertain the adjusted odds ratio after adjusting for confounding variables and the effects of the presents of other covariates. The crude odds ratios are also presented for comparison purposes. The full model after adding all the initial significant factors indicates that only two variables showed up to be statistically significant (p-value<0.05, 95%CI). These variables were age group and the respondent's mother having hypertension. In terms of age, with reference to those who were 40 year and below, those above 40 years had higher risk of having hypertension. That is, they were 10.8 times more likely compared to those 40 years and below (AOR: 10.76; p-value=0.017; 95%CI: 1.53-75.63).

Furthermore, compared to those whose mother did not have hypertension, respondents with mothers who had hypertension had 3 times higher odds of having hypertension. This was also found to be statistically significant at p-value<0.05 (AOR: 3.07; 95% CI: 0.91-9.94). Other variables such as marital status, education, years of working experience, income, among others which were initially significant were not found to be significant in the adjusted model.

CHAPTER FIVE

DISCUSSIONS

5.0 Introduction

This chapter presents the discussion of the finding made from this study. The discussions relate the findings with other studies and adds further explanations to some of the findings. The author also presents his understanding and reflections on the subject of the study and makes links to connect the various parts of the study. The chapter begins with a discussion on the -demographic/socio-economic characteristics of the respondents and follows it with the prevalence of hypertension and risk factors and the factors associated with hypertensive status among the Spare parts dealers.

5.1 Demographic characteristics of spare parts dealers at Abossey Okai

Spare Parts Dealers (SPDs) fall into the informal sector workers in Ghana which constitute about 80% of the active employment population in Ghana (Ghana Statistical Service [GSS], 2012). In this study, the focus was on the SPDs only in the urban areas of Greater Accra Region precisely the Abossey Okai enclave which is notable for such activities.

This study found various variations in the socio-demographic characteristics of this group particularly their age, education, marital status, religion and ethnicity. The average age of 38 years means that these respondents were mainly adults in their middle to older age which is also a crucial stage for hypertension susceptibility. According to Bosu, (2014), majority of the people prone to hypertension fall between the older ages. Comparing this average age to the average age (35 years) of other groups of informal sector workers such

as market women and drivers within the Greater Accra (Nyarko & Ananga, 2017), no huge difference was found. The age group among the respondents in this study also showed that with ten years interval from 19 to 49 years, they also show similar proportion between 26% to 28%. This implies there was not much variation in terms of age group difference except for respondents above the age of 50 years which forms only 17%.

The educational status of the respondents showed an impressive result as more than 80% had at least basic education and had literacy skills of reading and writing. This finding was consistent with the adult illiteracy rate among the general population of Ghana 80% (World Bank, 2018). Also, the educational level found in this study was higher than other studies among informal sector workers in the Kumasi Metropolis where almost half had no formal education (Owiredu et al., 2019). Same low education level was also reported in Nigeria among spare parts dealers (Addo & Koram, 2006) but high in Kenya among automobile accessory dealers (Joseph et al., 2017).

The ethnicity and religious profile of the respondents in this study were consistent with the proportion in the general population. Respondents who were Christians were more than 90% of the total sample where Akan were almost 80%. In Ghana, statistics show that among these two groups (that is, religion and ethnicity), Akan forms more than 70% and in terms of religion Christians are also more than 70% followed by Muslims (GSS, 2010). The implication is that in terms of ethnicity and religion no heterogeneity was found.

5.1.1 Socio-economic characteristics of the Spare parts dealers

This study also examined the socio-economic profile of the respondents because such elements are important factors when studying hypertension and associated risk factors. It

helps to understand how people's economic status household characteristics could be an explanatory factor to hypertension status among the population. In this study variables such as income, household size, owning a house among others were considered as socioeconomic indicators that could affect hypertensive status.

In studies like this, it is commonly difficult to get an accurate reflection of the annual or monthly income of respondents. This is because due to the nature of their work, most workers in the informal sector are unable to determine how much they earn each month or what their real income is and how to arrive at it (Atinyi et al., 2017). Unlike workers in the formal sector where they receive regular and consistent monthly income which is already pre-determined by their employer, workers in the informal sector (mainly those who are self-employed or own their own businesses) may not have a regular or stable income. Additionally, it is also difficult for people to disclose their income especially in surveys (Dosoo et al., 2019; Nyarko & Ananga, 2017). In this study income levels were determined by asking respondents to indicate on the average how much they earn each month. These were then categorized into ranges for easy comparison and analysis. It was found that majority of these workers earn between Ghc 500 to 1000Ghc and some significant number also earn more than Ghc 1,000 each month. Comparatively, this was higher than other income levels found among some informal sectors employees in Ghana where most of them received less than Ghc 500 (Atinyi et al., 2017). The difference in income levels could be attributed to the fact that respondents in this study mostly own their own business or were the owners of the spare parts shops whereas in the previous studies, the respondents were employees. Again, an anecdote by some respondents also implied that the spare parts business is a lucrative venture.

In terms of their household characteristics, this study found that majority of the respondents have household members of up to three where more than 80% also owned their houses. The household size was comparatively small to regularly house size in Ghana which is on the average around five members (GSS, 2011). Again, in other studies in Ghana, Ethiopia and Sudan, a rather high number of household size were recorded (Atinyi et al., 2017; Bushara et al.,, 2016; Kebede et al., 2020). It was also found that most of the respondents were renting their houses which confirms the general situation of housing and staying in Accra. In a study on urban livelihood and Food security in the country's capital it was reported that more than 47% lived in family compound and rented houses (Maxwell et. al., 2000).

5.2 Prevalence and risk factors of hypertension among respondents

The prevalence of hypertension among the spare parts dealers in this study was found to stand at 17% (95%CI:12%-.22%) as at the time of the study. These were respondents who had been medically diagnosed by a qualified doctor as having the condition. Undiagnosed prevalence maybe higher than this proportion but this study was only interested in those diagnosed. In Ghana, various studies and hypertension screening exercises have found different prevalence rates among different segments of the population. In a recent study among the Ghanaian population drawing evidence from the demographic and health survey, an overall prevalence of 13.0% (Adekunle, Boatemaa, & Kushitor, 2018) was found which is just 4% less of what was reported in this study. Ghana's prevalence is similar to the prevalence of 12.0% among automobile garage workers in West Africa (Bosu, 2015) meanwhile, the general prevalence in the African Region is 27% as compared with the prevalence in the Americas (18%) (WHO, 2018).

In a community-based screening study done among informal workers in the middle-belt of Ghana, a rather high prevalence was reported (28.1%; 95% CI: 26.3%–29.8%) by Dosoo et al. (2019). The higher prevalence recorded by Dosoo et al. (2019) could be attributed to the robust nature of the screening exercises which also took place at the community level where a lot of people were captured. Unlike this study which focused on only spare parts dealers the Dosoo et al., (2019) study involved all informal sector workers. A similar higher prevalence of 27.9% (95% CI 26.0, 29.8) was found in a cross-sectional Community Based Study in Northwest Ethiopia (Abebe, Berhane, Worku, & Getachew, 2015).

In examining the lifestyle and history risk factors of hypertension among the spare parts dealers in Abossey Okai area, the study found that only 13.5% and 14.5% had their fathers and mothers having hypertension respectively. This comparing to a previous study in the Hohoe, and Cape Coast in Ghana found that 21% and 22% respectively of the respondents had history of hypertension in their families (Setorglo et al., 2019 and Atta et al., 2017). Other risk factors found in this current study were alcohol intake (48.0%) and smoking (7.5%). Excessive salt intake was found with 18.5% of the respondents. According to other studies on hypertension and risk factors, these factors were among the possible important variables to look for when examining at risk populations (Belachew et al., 2018; Bushara et al., 2016; Setorglo et al., 2019).

5.3 Factors associated with hypertensive status among the Spare parts dealers

This study performed various forms of analysis in studying the associated factors to hypertension status among the spare parts dealers. In the first stage of analysis where bivariate analysis was performed most of the socio-demographic and economic factors

such as age, education, income and household size were found to be significant. However, in order to find the true association by adjusting for the omitted variable problem and confounding variables, a multivariate logistic regression was performed. In this model, major demographic variables, household characteristics and lifestyle risk factors were considered. This study found only two factors were statistically significantly associated with hypertension. These were the age group and mother having hypertension.

In terms of age contributing to hypertension, this study found that, compared to those below the age of 40 years, respondents who were above 40 years had 10.8 times higher odds to hypertension. This confirms other studies that age is a risk factor to hypertension (Ghosh & Kumar, 2019; Owiredu et al., 2019). Thus, as people grow their risk of getting hypertension also increases. In India and Kenya, studies to examine adult hypertension came to a conclusion that among other factors age was one of the significant factors with odds of 9 and 7 respectively (Joseph et al., 2017; Owiredu et al., 2019). Again, in Ghana, a study within Greater Accra also found age as a risk factor to hypertension among workers (Addo & Koram, 2006). However, in Bangladesh and Brazil, a study among industrial workers found no association with age and hypertension (Khanam et al., 2019; Vinholes et al., 2017).

Furthermore, family history of hypertension particularly mother having hypertension was also found as a significant risk factor to hypertension. That is, respondents who had their mothers having hypertension were 3 times more likely to also have hypertension (95% CI: (0.91-9.94). Awuah et al.,(2019), reported that majority of the people in a hypertension study among African Migrants in Europe indicated having a father or mother having hypertension. Similarly, in Ghana, two studies also found that respondents who had either

of their parents having hypertension were more likely to also have hypertension adjusting for other variables (Incoom et al., 2017; Setorglo et al., 2019). This finding was not different from other studies in Sudan and Ethiopia where the risk among this group were 5 to 7 times more likely (Asresahegn, Tadesse, & Beyene, 2017; Bushara et al., 2016). The essential part of knowing these factors is the ability to link them to other risk factors and see how they relate with each other in contributing to people's susceptibility to hypertension. It is worth adding that all these studies were not looking for causal relationships but associations.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The study revealed a prevalence level of 17% which is slightly higher than the prevalence among the general population (13%). Although, this was high, it is still within the range where with improved efforts the figure could be managed to meet the WHO's target of reducing the global prevalence by 25% by 2025.

Most of the risk factors were significant at the crude stage of analysis but after an adjustment logistic regression proved that only age and maternal history of hypertension were significant risk factors. Compared to people who were younger (below 40 years), adults aged above 40 years were the risk group and had higher odds to the condition. This is a good finding for policy and intervention design and planning purpose. Creating awareness among this group is important in controlling the condition.

Family history of hypertension, particularly, mother having hypertension was also revealed as a significant factor to hypertension risk. Similar to the findings from other previous studies and from literature, this study also confirms that people who have parents who are hypertensive also stand greater risk of having hypertension in later life.

6.2 Recommendations

This study ends with a number of recommendations for policy and intervention planning. These recommendations are informed by the findings made from this study, although, it

is targeted at the study area, it can also be considered for other areas or districts within the Greater Accra Region. Recommendations are directed to the appropriate authorities. Further recommendations are also given for future study or research on hypertension and associated factors in the study area.

To the Municipal Health Authority

- The health authority should target people in the informal sector and increase screening exercises among them in order to have an accurate reflection of the true prevalence among such groups. Such screening services should be done at their point of work to encourage more participations. In this study, it was found that people who know their hypertension status got to know it when they visited the health facility. This implies those who had not make a conscious effort to check will remain undiagnosed.
- The health authority should also pay more attention to those in the adult population and those who have family history of hypertension since these groups were found to be more at risk.
- Awareness and education efforts should be intensified among the population on lifestyle risk factors so as to reduce the prevalence and avoid any increase in the number of affected persons in the future.

To the spare parts dealers

- The spare parts dealers should be aware of their hypertension status by adopting a habit of regularly checking their blood pressure so as to take the necessary precautions to avoid complications.

- The aged ones should by awareness of their susceptibility practice preventive measures to avoid having the condition.

Recommendation for further studies

- Further study should also incorporate anthropometric measurements including BMI and investigating their effect on hypertension
- For comparative purposes, future studies should include other areas in the informal sectors such as market women, street hawkers, drivers etc. to examine the variation across these groups.
- Community-wide screening activities is also recommended to cover the greater population to give a good reflection of the prevalence.
- Future studies should employ mix-methods to examine the health seeking behaviour, and medication adherence among people having hypertension.

REFERENCES

Abebe, S. M., Berhane, Y., Worku, A., & Getachew, A. (2015). Prevalence and Associated Factors of Hypertension: A Crossectional Community Based Study in Northwest Ethiopia. *PLoS ONE*, **241**, 1–11. https://doi.org/10.1371/journal.pone.0125210

Addo J. Agyeman C., Smeeth L., Aikins A., Edusei A. and Oge O. (2012) A review of population- based studies on Hypertension in Ghana. Review of hypertension in Ghana.

Addo, J., & Koram, K. A. (2006). The Changing Patterns of Hypertension in Ghana: A study of four rural communities in the GA District the C Hanging Patterns of Hypertension Ghana: A study of Hypertension may thus not be rare in rural Ghana as previously noted. *Ethnicity & Disease*, **16**(May 2014).

Adekunle, O., Boatemaa, S., & Kushitor, M. K. (2018). Hypertension prevalence, awareness, treatment and control in Ghanaian population: Evidence from the Ghana demographic and health survey. *PLoS ONE*, **13**(11), 1–18.

Aikins AG., Addo J., Ofei F., & Agyeman C (2012). Ghana's burden of chronic non-communicable diseases: Future directions in research, practice and policy. Ghana Med J.2012 Jun; 46(2 suppl): 1-3.

Al – Bayan M., Islam N., Edwards S., & Duncan D. (2016). Neighborhood perceptions and hypertension among low-income black women: a qualitative study. BMC Public Health.2016:16; 1075.doi:10.1186/s12889-016-3741-2.

Alexander M. & Yang E., (2019). What is the global prevalence of hypertension (high blood pressure)? Medscape. Answers/241381-7614/what- is- the -global-prevalence-of-hypertension-high-blood-pressure.

Anstey E., Christian J., & Shimbo D. (2019). Income inequality and hypertension control. Journal of the American Heart Association.2019;8. https: doi.org/10.1161/JAHA.119.013636.

Asresahegn, H., Tadesse, F., & Beyene, E. (2017). Prevalence and associated factors of hypertension among adults in Ethiopia: a community-based cross - sectional study. *BMC Research Notes*, 1–8. https://doi.org/10.1186/s13104-017-2966-1

Atinyi, R., Takramah, W., Axame, W. K., Owusu, R., Parbey, P. A., Takase, M., Kweku, M. (2017). Prevalence and awareness of Hypertension among urban and rural Adults in the Keta Municipality, Ghana. *JMR*, **3**(3), 155–163.

Awuah, R. B., Aikins, A., Dodoo, F. N., Meeks, K. A. C., Beune, E. J. A. J., Klipstein-grobusch, K, Agyemang, C. (2019). Psychosocial factors and hypertension prevalence among Ghanaians in Ghana and Ghanaian migrants in Europe: The RODAM study. https://doi.org/10.1177/2055102919885752

Beevers G. Lip G., & O'Brien E. (2001) ABC of hypertension: The pathophysiology of hypertension. BMJ 2001 Apr.14;322(7292): 912-916

Beevers G., Lip G., & O'Brien E (2001) Blood pressure measurement. British Medical Journal 322(7292), 981-981, 2001.

Belachew, A., Tewabe, T., Miskir, Y., Melese, E., Wubet, E., & Alemu, S. (2018). Prevalence and associated factors of hypertension among adult patients in Felege - Hiwot Comprehensive Referral Hospitals, northwest, Ethiopia: a cross - sectional study. *BMC Research Notes*, 1–6. https://doi.org/10.1186/s13104-018-3986-1

Biino G., Concas M., Adamo M., & Angius A, (2013). Environmental and genetic contribution to hypertension prevalence: data from epidemiological survey on Sardinian genetic isolates. Plos one, 2013- ncbi.nlm.nih.gov.

Bosu, W. K. (2010). Epidemic of hypertension in Ghana: a systematic review *BMC Public Health* 2010 Jul 14;**10**: 418.doi.org/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. *Global Health Action*, *1*(**8**), 2–22.

Braziene A., Tamsiunas A., Luksiene D., Radisauskas R., Andrusaityte S., Dedele A., Vencloviene J., (2019). Association between the living environment and the risk of arterial hypertension and other components of metabolic syndrome. *Journal of Public Health*, (Oxf).2020 May 26;42(**2**): e142-e149.doi:10.1093/pubmed/fdz046

Brook R., Julius S. et.al. Autonomic imbalance, hypertension, and cardiovascular risk. American Journal of Hypertension, volume 13, issue S4, June 2000, pages 112S-122S, https://doi.org/10.1016/S0895-7061(00)00228-4

Butler M., et.al (2010). Genetics of hypertension: Current status. JMed Liban (2010);58(3):175-178.

Bushara, S. O., Noor, S. K., Ibraheem, A. A. H., Elmadhoun, W. M., & Ahmed, M. H. (2016). Prevalence of and risk factors for hypertension among urban communities of North Sudan: Detecting a silent killer. *Family Med Prim Care*. Jul-Sep 2016;5(**3**):605-610. doi.org/10.4103/2249-4863.197317

Cuschieri S, Vassallo J., Calleja N, Pace N and Mamo J (2017) The Effects of Socioeconomic Determinants on Hypertension in a Cardiometabolic at –Risk European country. *International Journal of Hypertension*. Volume **2017**,10.1155/2017/ 7107385.

Dosoo, D K., Nyame S., Enuameh, Y., Ayetey, H., Danwonno, H., Twumasi, M., Asante, K P. (2019). Prevalence of Hypertension in the Middle Belt of Ghana: A Community-Based Screening Study. *International Journal of Hypertension*, **2019**.10.1155/2019/1089578

Evans T, Whitehead M, Diderichsen F, Bhuiya F, and Wirth M, 2001, 'Challenging inequalities in health: from ethics to action'. Oxford University Press.

Esmaeili R., Matlabi M., Khajavi A., Aliasghari E., & Sajjadi M (2017). Factors Affecting adherence to Antihypertensive Medication: Results from a Rural Population Study in East of Iran. *Global Journal of Health Science*; Vol.**9**, No. 5;2

Fako P., (2019). The impact of import duties on the Automobile spare parts industry in Ghana. University Ghana digital collections. http:// ugspace.ug.edu.gh/handle/ 123456789/32788

Fisher J., & Paton J. (2012) The sympathetic nervous system and blood pressure in humans: implication for hypertension. J Hum Hypertens.2012 Aug;26(8): 463-75.doi:10.1038/jhh.2011.66.

Folb N., Bachmann M., Bateman E., Steyn K., Levit N., Timmerman V., Lombard C., Gaziano T., and Fairall L. (2016) Socioeconomic and Modifiable Predictors of blood pressure control for hypertension in Primary care attenders in the Western Cape, South Africa. *SAMJ*. December 2016, Vol. **106**. No.12.

Ghosh, S., & Kumar, M. (2019). Prevalence and associated risk factors of hypertension among persons aged 15 – 49 in India: a cross-sectional study *BMJ open* 9 (12) ,2019 doi.org/10.1136-029714

Goswami A., Sultana S. and Uroof, S. (2017). Socio-demographic study of hypertension and its risk factors. *The Pharma innovation journal* **2017**; 6(12): 368-372.

Grassi G. et. al (2015). Sympathetic overdrive in hypertension: Clinical and therapeutic relevance. e-journal of the ESC Council for Cardiology practice. Vol.13, No.36(2015)

Grotto I., Huerta M, & Sharabi Y. (2008). Hypertension and socioeconomic status. Current opinion in cardiology 23(4): 335-9.doi:10.1097/HCO.obo13e3283021c70.

Gupta R., Gaur K. & Ram CV. (2019) Emerging trends in hypertension epidemiology in India. J Hum Hypertens **33,** 575 – 587 (2019) https://doi.org/10.10.38/s41371-018-0117-3

Jaramillo PL (2017). Educational level influence in the prevalence, awareness, treatment and control of hypertension in Colombia. Journal of Hypertension: June 2015- Volume 33- issue- p e392-e393.

Jia G., Aroor A., Hill M. & Sowers J. (2018) Role of Renin-Angiotensin – Aldosterone System Activation in promoting cardiovascular fibrosis and stiffness. Hypertension AHA.118.11065/Hypertension 2018; 72:537-548

Kebede, B., Ayele, G., Haftu, D., & Gebremichael, G. (2020). The Prevalence and Associated Factors of Hypertension among Adults in Southern Ethiopia. *International Journal of Chronic Diseases*, **2020**.doi.org/10.1155/2020/8020129

Khanam, R., Ahmed, S., Rahman, S., Muhammed, G., Kibria, A., Raza, J Pariyo, G. (2019). Prevalence and factors associated with hypertension among adults in rural Sylhet district of Bangladesh: a cross- sectional study. *BMJ Open*, ***9***(e026722), 1–9. https://doi.org/10.1136/bmjopen-2018-026722

Kiely D., (2012). The association of education attainment and SBP among older community -living adults: The Maintenance of Balance, Independent Living, Intellect and Zest in the Elderly (MOBILIZE) Boston Study. J Hypertens.2012;30(8): 1518-1525.doi: 10.1097/HJH.0B013E328550FC0

Kosteniuk, J, and Dickinson HD, 2003, 'Tracing the social gradient in the health of Canadians: primary and secondary determinants', *Social Science and Medicine, vol.**57**. no.2 pp. 263-276.*

Kubota Y., et al. Association of educational attainment with life time risk of cardiovascular disease: The Atherosclerosis Risk in communities' study. *JAMA Intern Med*. **2017** June 12; [e -pub]

Lam CS. (2011). The socioeconomics of hypertension: how $ 50 000 may buy a drop-in blood pressure. Hypertension (Dallas, Tex.: 1979), 58(2): 140-141. 10.1161/ hypertensionaha.111.175984.

Leng B., Jin Y., Li G., Chen L., & Jin N., (2015). Socioeconomic status and hypertension: A metanalysis. J Hypertens.2015,33(2)221-229. doi: 10.1097/HJH.0000000000000428

Lurie, N, and J McLaughlin, 2003, 'In pursuit of the social determinants of health: the evolution of health service research.' *Health Services Research, vol **38**, no.6, pp.1641-1643.*

Matthews K, Kiefe C., Lewis C, Liu K., Sidney S. and Yunis C. Socioeconomic Trajectories and Incident Hypertension in a Biracial Cohort of Young Adults. *Hypertension* **2002**; 39:772-77

Nyarko (2016) Prevalence and socio demographic determinants of hypertension history among women in reproductive age in Ghana. *International journal of hypertension*,**2016**. Hindawi.com.

Nyarko, S. H., & Ananga, M. K. (2017). Prevalence and Predictors of Hypertension History among Ghanaian Men. *Ghana Journal of Geography*, ***9***(3), 50–63.

Onyango, MJ, Kombe, I., Nyamongo, DS., & Mwangi, M. (2017). Hypertension among employees working at a call centre Nairobi Kenya, *Pan Afr Med J*.2017;**27**:178.

Owiredu, EW., Dontoh, E., Essuman, SE, & Bazanfara, B (2019). Demographic and Lifestyle Predictors of Prehypertension: A Cross-Sectional Study among Apparently Healthy Adults in Kumasi, Ghana, *BioMed Research International* Volume **2019**. doi.org/10.1155/2019/1764079

Perovic V., Huxley R., Wu Y., Prabhakaran D., MacMahon S. (2007). The burden of blood pressure Related Diseases: A neglected priority for Global Health. *Hypertension*.**2007**; 50:991-997

Psaltopoulou T, Hatzis G, Papageorgiou N, Androulakis E, Briasoulis A and Tousoulis D. (2017). Socioeconomic status and risk factors for cardiovascular disease: impact of dietary mediators. *Hellenic Society of Cardiology* (**2017**) 58, 32-42.

Pyakurel P, Yadav D, Thapa J, et al. (2019). Prevalence and associated risk factor of hypertension among individuals of age 18-59 years in Southeastern Nepal: A cross sectional study. *Nepalese Heart Journal* **2019**; Vol 16(1),19-26

Rose Ewald D., Bond S., Haldeman L. (2017), Hypertension in Low – Income Adolescents. *Global Pediatric Health*.**2017**; 4: 2333794x17741819.

Samaneh A., Khalili D. and Zeraati H. (2019). Relationship between lifestyle pattern and blood pressure – Iranian national Survey. *Sci Rep*. **2019**; 9; 1594.

Sanuade O, Boatema S, and Kushitor M (2018) Hypertension prevalence, awareness, treatment and control in Ghanaian population: Evidence from the Ghana demographic and health survey. *PLoS ONE* **13**(11): e0205985.

Sarki A., Nduka C., and Uthman O. (2015) Prevalence of Hypertension in Low – and Middle – Income Countries. A systematic Review and Meta-analysis. *Medicine* (*Baltimore*). **2015** Dec; 94(50): e 1959.

Savica V., Bellingher G. and Kopple J. (2010). The effect of nutrition blood Pressure

Setorglo, J., Gorleku, P. N., Appeatu, D., Kwadwo, K., Pereko, A., Egbi, G., & Steiner-Asiedu, M. (2019). Hypertension prevalence and predictors among taxi drivers at Abura in Cape Coast metropolis of Ghana. *J Public Health Policy Plann*, **3**(3).

Solomon, I., Adjuik, M., Takramah, W., Axame, WK., Owusu, R., Atta, P and Tarkang, E. (2017). The Frequency of Hypertension and Pre-hypertension Among Adults in the Hohoe Municipality of Ghana. *Journal of Preventive Medicine & Healthcare*, **1**(3), 1–9.

Spruill T., Butler M., Thomas S., Association between high perceived stress over time and incident hypertension in African – Americans: findings from Jackson Heart Survey. *JAM Heart association*. **2019**.Epub.

Tedesco M. (2001). Educational level and hypertension: Low socioeconomic differences condition healthcare. *Journal of Human Hypertension*. (**2001**)15, 727-731

Todd N. (2019) Chronic stress in Africa- Americans linked to Hypertension *tct MD*/ the heartbeat.

Vinholes, DB., Bassanesi, SL., Castro, H. De, Junior, C., Machado, C. A., Melo, I. M. F and Fuchs, SC. (2017). Association of workplace and population characteristics with prevalence of hypertension among Brazilian industry workers: a multilevel analysis. *BMJ Open*, **7**(e015755), 1–8. https://doi.org/10.1136/bmjopen-2016-015755

World Bank (WB), 2008, 'Human accessed development unit. Non-communicable

disease in Jamaica moving from prescription to prevention'.

Wu X. and Zhonghua W. (2019). Role of Socioeconomic Status in Hypertension among Chinese Middle -Aged and Elderly Individuals. *International Journal of Hypertension*. Vol. **2019**/ Article ID 6956023/ 6 pages

APPENDICES

Appendix 1: Questionnaire

Please tick ( ) the appropriate answer.

	A. SOCIO-ECONOMIC DATA		
1.	Age		
2.	Religion	Christian: Islam: Traditional: Others:	
3.	Ethnic group		
4.	How long have you been working here?		
5.	Highest level of education	Tertiary: Secondary: Primary: No formal education:	
6.	Occupation of participant	Spare part dealer: [ ] Additional job : [ ]	
7.	Marital Status	Single: [ ] Married: [ ] Cohabitation: [ ] Divorced/widowed [ ]	
8.	Number of Partners	1 [ ] 2- 3 [ ] > 3 [ ]	
9.	Number of Children	0 – 3 [ ] 4 - 5 [ ] > 5[ ]	
10.	Number of Children in school.	All [ ] Some [ ] None [ ]	
11.	Why are they not in school?	Financial [ ]	

		Not Interested [ ]	
	INCOME		
12.	How much do you earn monthly	Less than 200 [ ] 200-500 [ ] More than 500 [ ] More than 1000 [ ]	
13.	Is your income regular?	Yes [ ] No [ ]	
	HOUSING		
14.	Do you own your own house?	Yes [ ] No [ ]	
15.	Are you renting?	Yes [ ] No [ ]	
16.	What kind of house do you live in?	More than 2 bedroom[ ] Chamber / Hall [ ] Single Room [ ]	
	MEDICAL HISTORY		
17.	Are you hypertensive?	Yes [ ] No [ ]	
18.	Have been diagnosed by a qualified medical practitioner?	Yes [ ] No [ ]	
19.	Are you currently on treatment?	Yes [ ] No [ ]	
20.	Do you have a sibling who is hypertensive?	Yes [ ] No [ ]	
21.	Is your father hypertensive?	Yes [ ] No [ ]	
22.	Is your mother hypertensive?	Yes [ ] No [ ]	
	DIETRY HISTORY		
23.	About your meals ?	Cooked [ ] Bought [ ]	
24.	How many meals in the day are bought?	1 [ ] 2 [ ] 3 [ ]	
25.	Do you add salt to your meals?	Yes [ ] No [ ]	
	LIFESTYLE		
26.	Do you smoke	Yes [ ] No [ ]	
27.	Do you take in alcohol	Yes [ ] No [ ]	

28.	How often to do drink alcohol?	Everyday [ ] Weekly [ ] Occasionally[ ]	
	DIAGNOSIS OF HYPERTENSION		
29.	Do you have regular headaches?	Yes [ ] No [ ]	
30.	Do you feel dizzy sometimes?	Yes [ ] No [ ]	
31.	Does your heart beat fast sometimes	Yes [ ] No [ ]	
32.	Do you become easily tired especially when you climb?	Yes [ ] No [ ]	
33.	Do you record high BP sometimes?	Yes [ ] No [ ]	

APPENDIX 2

INFORMED CONSENT

TITILE OF RESEARCH: Exploring the relationship between socioeconomic factors and Hypertension in automobile spare parts dealers in the Abossey Okai Enclave in the Ablekuma Central district of the Greater Accra Region of Ghana.

PRINCIPAL INVESTIGATOR: Nathaniel Affum

AFFILIATION: Student, Ensign College of Public Health

CONTACT INFORMATION: P.O. Box DK 131 Accra; Telephone: 0244822020

1. INTRODUCTION AND PURPOSE OF STUDY

Hypertension is a silent killer and it is prevalent in our community. The best intervention is for people to have their blood pressure checked, controlled and go through appropriate lifestyle changes.

The aim of this research apart from gathering data on the prevalence of hypertension in the specified population; will also grant participants the opportunity to have their Blood pressure checked and have interventions made.

2. CONFIDENTIALITY

All information taken from the study will be coded to protect each subject's name. No names or other identifying information will used when discussing or reporting data. The investigator will safely keep all files and data collected in a secured locked cabinet in the Principal investigator office. Once the data has been fully analysed, it will be destroyed.

3. RISK

We are asking you to share with us some very personal information about yourself and your experiences as far as hypertension is concerned. You may feel uncomfortable talking about some of the topics. You do not have to answer if you don't wish to do so, and that is also fine. You so not have to give us any reason for not responding to any question or for refusing to take part in the interview.

4. BENEFITS

There will be no direct benefit to you, but your participation is likely to help us find out about how hypertension is affected by the socioeconomic status of people. You will not be provided any incentive to take part in the research.

5. DURATION

I would like to ask you some questions about your attitudes, beliefs and experiences related to hypertension and its relationship to socioeconomic factors. The interview usually takes about 20 -30 minutes to complete.

Participation in this study is voluntary and you can choose not to answer any question or all of the questions.

At this time, do you want to ask me anything about the interview?

I voluntarily agree to participate in this research programme.

[Yes]……..

[**No**] ……..

[**YES**] ---------- BEGIN

[**NO**] ----------END

I understand that I will be given a copy of this signed consent form.

NAME OF PARTICIPANT

:……..

SIGNATURE

……

NAME OF WITNESS

:……

SIGNATURE

:……

PERSON OBTAINING CONSENT:……...

SIGNATURE

……

DATE:

……

NOTE: A copy of the signed and dated consent form must be kept by the Principal Investigator and a copy must be given to the participant.