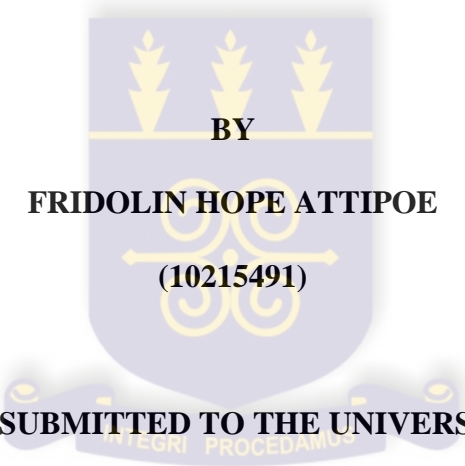


**SCHOOL OF PUBLIC HEALTH
COLLEGE OF HEALTH SCIENCES
UNIVERSITY OF GHANA**

**MEDICATION NON-ADHERENCE AMONG HYPERTENSIVE GHANAIAN UN
PEACEKEEPERS**

The crest of the University of Ghana is a shield-shaped emblem. It features three golden stalks of grain at the top, a central golden sun or star symbol, and a banner at the bottom with the Latin motto 'VERITAS LIBERABIT VOS'. The crest is rendered in a light purple and gold color scheme.

**BY
FRIDOLIN HOPE ATTIPOE
(10215491)**

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

JULY 2014

DECLARATION

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

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Dr. Fridolin Hope Attipoe

Student:

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Date

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Prof. Isabella A. Quakyi

Primary ACADEMIC SUPERVISOR:

.....

Date



DEDICATION

This study is dedicated to all hypertensive Ghanaian-UN peacekeepers and to the memory of those departed hypertensive souls who out of ignorance of the consequences of medication non-adherence died on UN peacekeeping mission, and also to those still living with the complications of hypertensive medication non-adherence.

This study is also dedicated to my wife Naa Dedei Aryetey, my lovely children Ian, Lucy, Iana and Paul for having to excuse me most of the time when they needed me to be around to be teaching them and helping out with their homework.



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ABSTRACT

Medical fitness of troops participating in UN peacekeeping mission is of paramount importance to commanders on the field for efficient and productive execution of set tasks. Disability resulting from complications of chronic illnesses, markedly reduces the number of active troops, which includes highly trained specialists, hence commanders fail to achieve targeted objectives.

The objective of this study was to estimate the prevalence of hypertension among Ghanaian – UN peacekeepers and assess the level of anti-hypertensive medication non-adherence among the known hypertensive personnel serving on UN peacekeeping mission.

This study was conducted using a descriptive cross-sectional method. Using a power survey calculator, 1207 filled pre-deployment medical examination forms for troops embarking on UN peacekeeping mission were sampled for the determination of prevalence of hypertension among personnel of the Ghana Armed Forces. One hundred and thirty two personnel took part in the medication non-adherence study. Quantitative and nominal data were collected using filled pre-deployment screening medical forms for troops embarking on UN peacekeeping missions as well as close-ended structured questionnaire and an adapted modified Morisky's scale for measuring adherence level to medication regimen.

The prevalence of hypertension was estimated to be 30% among troops embarking on UN peacekeeping mission. The mean systolic pressure was 173.23 mmHg with a standard deviation of 17.81 and the mean diastolic pressure of 104.18 mmHg and with a

standard deviation of 11.83. The proportion of hypertensive personnel were 50% and 69% in the age groups 40 – 54 and 55 – 59 years respectively. Increasing Age and BMI were significantly associated with prevalence of hypertension. The level of non-adherence exhibited by peacekeepers was extremely high (98.4%).

In this study, the level of knowledge about hypertension and its management was very significantly associated with anti-hypertensive medication non-adherence (P-value < 0.001). Rank was also very significantly associated with adherence, with Senior Non Commissioned Officers were 4.48 times more likely to adhere compared to their junior counterparts and this rose to 5.23 after adjusting for other variables.

In conclusion, half of the service personnel recruited into the Ghana Armed Forces were likely to become hypertensive after 40 years of age. Robust and targeted interventional education programs need to be developed for the various age groups especially the younger age groups which this study found to be four times less likely to adhere to prescribed anti-hypertensive drugs, in order to achieve primary and secondary prevention of hypertension. Assessment of the Instituted Claims System for purchased drugs clearly showed there is need for modification with optional suggestions.

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LIST OF ACRONYMS

ACE:	Angiotensin Converting Enzymes
BP:	Blood Pressure
CAD:	Coronary Artery Disease
CCF:	Chronic Cardiac Failure
CHD:	Chronic Heart Disease
CHF:	Chronic Heart Failure
CRF:	Chronic Renal failure
CVA:	Cerebro – Vascular Accident
CVD:	Cardio Vascular Disease
DALYS:	Disability Adjusted Life Years
DBP:	Diastolic Blood Pressure
GFR:	Glomerular Filtration Rate
HF:	Heart Failure
ICU:	Intensive Care Unit
IRB:	Institution Review board
JNC:	Joint National Committee
JNCO:	Junior Non – Commissioned Officers

LVH:	Left Ventricular Hypertrophy
MI:	Myocardial Infarction
OA:	Operational Area
SBP:	Systolic Blood Pressure
SMOs:	Senior Medical Officers
SNCO:	Senior Non – Commissioned Officers
SOP:	Standard Operating Procedures
TCCs:	Troops Contributing Countries
UN:	United Nations

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

According to the United Nations' Medical Standard Operating Procedures (SOPs), it is mandatory for all troops embarking on United Nations (UN) peacekeeping operations to undergo a pre-deployment medical examination in their respective countries. This is to ensure fitness of troops on the field, in order to productively and efficiently carry out their prescribed duties.

Hypertension-related complications such as cerebro-vascular accidents (CVA) and chronic cardiac failure (CCF) as well as chronic renal failure (CRF) and sometimes deaths have been identified to be the main cause of repatriation on health grounds among Ghanaian troops serving in different UN mission areas. (UN Missions. End of Tour of duties Medical Reports; UNIFIL/GH68 2008, UNIFIL/GH69 2009).

It is the duty of Troops Contributing Countries (TCCs) to conduct the required pre-deployment medical screening according to the UN standards. If the screening is not properly conducted, it could be a reason for potential peacekeepers with chronic diseases to get into the operational area. Some of these chronic conditions are kept secret from the accompanying Senior Medical Officer until they deteriorate into life-threatening conditions and medical emergencies before they are reported.

Mitigation in these situations requires prompt medical evacuations that usually involve evacuations by air to Intensive Care Units (ICU) of secondary and tertiary care hospitals, sometimes situated hours of flight from the Operational Areas (AOs) and often at a huge financial cost.

The outcome of these complications is temporary or permanent disabilities and deaths in certain cases. Report of deaths due to complications of hypertension causes panic among the personnel serving on peace keeping missions and lapses into prolonged period of grief.

A decrease in the number of active peacekeepers due to disabilities or deaths, results into inefficient deployment of troops and this leads to fatigue and errors on the field.

The process of repatriation of disabled troops or their corpses, with medical escorts, to their various countries, runs into thousands of US Dollars depending on the distance from the mission areas.

The untold human suffering and economic hardships faced by these disabled troops and or their families upon returning home cannot be over emphasized, especially if they are the sole bread winners of their families.

1.2 Statement of the Problem

Medical fitness of troops participating in UN peacekeeping mission is of paramount importance to commanders on the field for efficient and productive execution of set tasks. Sometimes due to disabilities resulting from complications of chronic illnesses, the number of active troops on the field is markedly reduced. Highly trained specialists in their various fields may also be affected therefore commanders may fail to achieve targeted objectives.

The military health authority ensures that every known hypertensive personnel embarking on peacekeeping mission carries a consignment of required drugs to cover him or her for at least seven months even though the duration of each tour is six months, thus making room for unforeseen delay in rotation of troops in the mission area.

Despite the measures taken to ensure medication adherence, including weekly monitoring of blood pressure check for known hypertensive among all ranks in the operational area, life-threatening hypertension-related complications resulting in disabilities or sometimes death continue to occur in the field. (UN Missions End of Tour of duties Medical Reports; UNIFIL/GH68 2008, UNIFIL/GH69 2009).

Medication non-adherence has been identified as a major contributing factor to the observed phenomenon, but no study has been conducted to assess its level and predicting factors.

The current interventional general health education for troops, seems not to be adequately effective, therefore the results of this study may help tailor intervention educational programs for troops with hypertension in particular and may inform policy at large.

1.3 Justification for the Study

Anti-hypertensive medication non-adherence has been of great concern to the military health authorities over the past years. This is because there is limited information in this area. As a result the appropriate High Military Command expressed the need for baseline data to serve as reference.

In addition, experiences with the United Nations (UN) Peacekeeping Mission over the years, in different countries such as Sierra Leone, Democratic Republic of Congo, la Cote d'Ivoire and Southern Lebanon partly contributes to the interest in this research project. Many cases of hypertension-related complications which resulted in disabilities and sudden deaths among the Ghanaian Battalion on UN Peacekeeping Mission have been observed in line of duty.

Field observations reported in end of tour of duties and medical reports have identified medication non-adherence as a major contributory factor for the development of such hypertension-related complications in UN peace keeping mission but there is no documentation of studies conducted to assess the magnitude and predictors of medication non-adherence among Ghanaian – UN peacekeepers.

The purpose of this study therefore is to determine the prevalence of hypertension, assess the magnitude of anti-hypertensive medication non-adherence among Ghanaian troops serving on UN peacekeeping missions, identify the contributory factors and suggest evidence-based solutions.

1.4 Study Objectives

1.4.1 General objective:

To estimate the burden of hypertension and the level of medication non-adherence among Ghanaian - UN peacekeepers.

1.4.2: Specific objectives:

- To estimate the prevalence of hypertension among troops embarking on UN peacekeeping missions
- To assess the level of anti-hypertensive medication non-adherence
- To determine barriers and factors that contribute to medication non-adherence
- To assess the opinion of hypertensive troops about the refund system in place for purchased drugs

1.5 Conceptual Framework

The conceptual frame work (figure 1) illustrates the various contributory factors to medication Non Adherence. In general, economic, personal, institutional and medication factors all contribute to non-adherence. Ultimately, the effects of non-adherence can lead to grave economic and health outcomes.

1.5.1 Contributory Factors to Medication Non-Adherence

The contributory factors to medication Non-Adherence and the Outcome Effects are as follows;

Economic Factors

Economic factors such as cost of drugs, availability, accessibility and affordability greatly contribute to medication non-adherence. (Stergachis, 1998).

Patient And Disease Factors

Factors such as age, memory deficit, pill-fatigue, peer pressure and increased sensitivity to adverse effects of drugs contribute to non-adherence with the resulting outcome effects (Stergachis, 1998). In addition, disease factors such as multiple chronic diseases, and kind of illness for example chronic diseases with diverse manifestation of symptoms or those without symptoms are also determinants of adherence. (Stergachis, 1998).

Medication Factors

Drug factors involving complex regimen, inconvenient timings coupled with multiple dosing, degree of associated adverse effects and drug quality can influence patients' non-adherence behavior leading to the health and economic outcomes such as treatment failure and cost of avoidable hospital admissions (Stergachis, 1998). Also, an analysis of multiple patient populations by Khan, Shah and Hameed (2014) reveals that the prevalence of medication non-adherence is affected by the choice of drugs, use of concomitant medications, tolerability of drug and duration of drug treatment.

Institutional factors

Factors such as patient-non education and counseling, patients' non-involvement in drug regimen decision-making with treating physicians coupled with ineffective interaction with a knowledgeable pharmacist contribute to medication non-adherence (Stergachis, 1998).

1.5.2 Outcome Effects of Non-Adherence

Appropriate treatment adherence leads to faster clinical improvement and drastic decrease in cost of treatment thus reducing overall health expenditure. Health and Economic outcomes are associated with medication adherence.

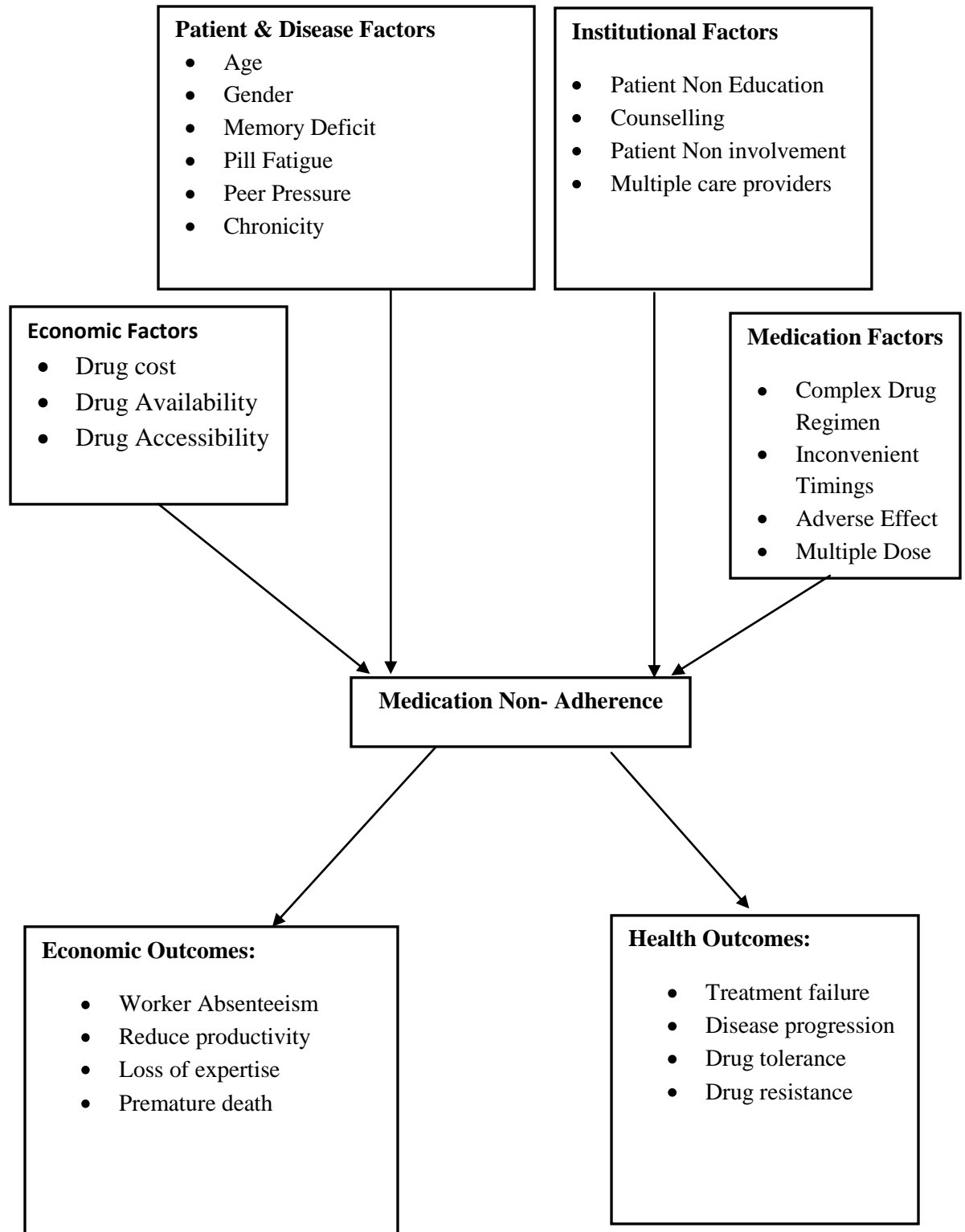
Health outcomes:

According to Stergachis (1998), health outcomes due to medication non-adherence include the following conditions and occurrences: treatment failure, disease progression, increased rates of avoidable hospital re-admissions, drug-related morbidity, drug tolerance, drug resistance and increased risks of organs and / or system failures. These conditions eventually lead to premature deaths.

Economic outcomes:

Also, the economic outcomes of medication non-adherence are numerous and include the following: cost of work-absenteeism, cost of reduced productivity, cost of avoidable hospital re-admissions and cost of treatment of new and more complicated disease conditions. The consequence is loss of expertise due to disability and premature death among people in active service (Stergachis, 1998).

Figure 1: Factors contributing to Non-Adherence and Related Outcomes



CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

Hypertension is an increasingly important medical and public health issue worldwide. High blood pressure is estimated to have caused 7.6 million premature deaths which amounted to 13.5% of the global burden of hypertension and contributed to 92 million disability adjusted life years worldwide in 2001 (Addo et al, 2007)

Hypertension is a global public health issue. It contributes to the burden of heart disease, stroke and kidney failure and premature death and disability. According to the World Health Organization (WHO), in 2008 sub-Saharan Africa had the highest prevalence of hypertension, with 46% of adults aged 25 and older affected in the region (WHO, 2013)

It has been suggested that the prevalence of cardiovascular disease and hypertension is increasing rapidly in sub-Saharan Africa (SSA) (Seedat, 2004). The current prevalence in many developing countries, particularly in urban societies, is said to be already as high as those seen in developed countries (Khor, 2001; Vorster, 2002).

In Sub-Saharan Africa where most health systems are overwhelmed with communicable diseases such as malaria and HIV/AIDS, coupled with very limited resources most patients with hypertension are likely to be untreated resulting in high morbidity and mortality from potentially preventable consequences like stroke, myocardial infarction, cardiac failure and chronic renal failure (Addo et al, 2007)

The prevalence of hypertension is very high worldwide. The increase in prevalence rates in Ghana are well documented (Pobee, 1994, Bosu, 2010). In 2002, the prevalence rate

was estimated at about 35% of Ghanaians in the 40 – 45 years age group, and 40% in those above 55 years of age. The prevalence was approximately 6% in those below 40 years. In this age group, the prevalence was higher in males than females (Buabeng et al, 2004). The prevalence of hypertension in a Ghana Army Unit was estimated as 22.3% (Darkwa, 2011). In Cameroon the prevalence of hypertension in a recent study was 29.7%, (Kingue et al, 2015). Cameroon, a low-income country in Central Africa, has not been spared by the global epidemic of hypertension. Between 1994 and 2003, the 10-year change showed that the prevalence of hypertension increased by two- to five-fold in rural and urban Cameroonian men and women (Feuzeu, Kengne, Balkau, et al 2010). The age-adjusted prevalence rate of hypertension moved from 24.4% to 37.2% in men and from 20.1% to 37.5% in women. The hypertension prevalence rate of up to 47.5% was reported in a self-selected urban population in Cameroon (Dzudie et al, 2012) Twagirumukiza and colleagues in 2011 have projected that by 2025, 125.5 million people in sub-Saharan Africa will be affected.

Hypertension has been identified as the most common cause of heart failure, stroke, chronic renal disease and spontaneous sudden deaths in Ghana (Plange-Rhule et al, 1999.) A major reason for the increasing hypertension-related complications is that many patients in relatively poor countries find it difficult to afford standard hypertension medication (Buabeng et al, 2004).

Many physicians face the problem of non-adherence among their hypertensive patient population. During the first year of treatment 16 – 50% of patients stop taking their high blood pressure medication (Stergachis, 1998). Overall, it is estimated that only about

30% - 50% of patients with hypertension adhere precisely to their hypertension medication regimens (Kretchy et al 2014).

2.2 Hypertension and its Definition

Hypertension is defined as an elevated systolic blood pressure (SBP), diastolic blood pressure (DBP) or both (Chobanian et al, 2003). A clinical diagnosis of hypertension is based on the mean of two or more properly measured seated blood pressure measurements taken on two or more occasions.

The Seventh Report of the Joint National Committee (JNC 7) on Detection, Evaluation and Treatment of High BP classifies it based on systolic and diastolic values (Chobanian et al, 2003).

2.2.1 Classification of Hypertension

The Seventh Report of the Joint National Committee (JNC 7) classification include normal BP, pre-hypertension, stage 1 hypertension and stage 2 hypertension. The use of qualitative terms (e.g. Mild, moderate, high-normal, severe) is no longer recommended (Chobanian et al, 2003).

Blood pressure is classified as normal when systolic blood pressure is less than 120 mmHg, when diastolic blood pressure is less than 80 mmHg and when both systolic and diastolic blood pressure are less than 120 and 80 mmHg respectively.

Pre-hypertension is any systolic blood pressure that falls within 120 – 139 mmHg and or any diastolic blood pressure that falls within 80 – 89 mmHg.

Stage 1 hypertension is any systolic blood pressure that falls within 140 – 159 mmHg and or any diastolic blood pressure that falls within 90 – 99 mmHg.

Stage 2 hypertension is any systolic blood pressure is 160 mmHg and more, and or any diastolic blood pressure that is equal to 100 mmHg and more.

2.3 Etiology:

The majority of hypertension patients have essential hypertension (also known as primary hypertension) with no identifiable cause for their disorder. Patients with secondary hypertension have a specific identified cause for elevated BP.

2.4 Hypertension Related-Target Organ Damage:

The ultimate goal of treating hypertension is to reduce associated morbidity and mortality. These hypertension related complications manifest as target-organ damage which include cardiovascular disease and are the primary causes of death in hypertensive patients. Organ systems adversely affected by hypertension include the heart, brain, kidneys, peripheral circulation and eyes.

Heart Hypertension can affect the heart either indirectly, by promoting atherosclerotic changes or directly, via pressure-related effects. Hypertension can promote cardiovascular disease (CVD) and increase the risk for ischemic events such as angina and myocardial infarction (MI).

Hypertension also promotes the development of left ventricular hypertrophy (LVH), which is a myocardial (cellular) change, not an arterial change. It is commonly believed

that LVH is a compensatory mechanism of the heart response to the increased resistance caused by elevated blood pressure. LVH is a strong and independent risk factor for coronary arterial disease (CAD), heart failure (HF) and arrhythmias (Eselin & Carter, 1994). A major cardiac outcome of hypertension is heart failure.

Brain: Hypertension is one of the most frequent causes of cerebrovascular disease (Mac Mahon et al, 1990). Cerebrovascular signs can manifest as transient ischemic attacks, ischemic strokes, multiple cerebral infarcts and hemorrhages. Residual functional deficits caused by stroke are among the most devastating forms of target organ damage. A sudden, prolonged increase in systemic BP can also cause hypertensive encephalopathy, which is a hypertensive emergency.

Kidney: Glomerular Filtration Rate (GFR) is used to estimate kidney function. It declines with aging but this rate of decline is greatly accelerated by hypertension. Hypertension is associated with nephrosclerosis, which is caused by increased intraglomerular pressure. It is unknown whether a primary kidney lesion with ischemia causes systemic hypertension or whether systemic hypertension directly causes glomerular capillary damage by increasing intraglomerular pressure. Regardless, chronic kidney disease, whether mild or severe, can progress to kidney failure and the need for haemodialysis.

Peripheral Arterial Disease: This is another form of atherosclerotic vascular disease that is considered target organ damage. Complications of peripheral arterial disease can include infection and necrosis which in some cases require revascularization procedures or extremity amputation

Eye: Hypertension causes retinopathies that may progress to blindness. In severe cases, papilloedema occurs (Jambedu, 2006)

2.5 Management of Hypertension

Primary hypertension has no cure but treatment can modify its course (Merck Manual 1999). It is recommended that every hypertensive patient who also has other risk factors for coronary heart disease be given prompt and optimum anti-hypertensive treatment to minimize their overall risk for heart disease.

2.5.1 Non -Pharmacological Management

This involves life style modifications such as weight reduction, dietary changes, cessation of smoking and reduction or avoidance of alcohol.

2.5.2 Pharmacological Management of Hypertension

The main goal of treatment of hypertension is to bring hypertension under control quickly and permanently. This involves the use of anti-hypertensive drugs when lifestyle modifications do not normalize blood pressure. These drugs include:

Diuretics, β – Blockers, Calcium channel blockers, Angiotensin Converting Enzymes (ACE) inhibitors, Angiotensin 11 receptor blockers, Adrenergic inhibitors and Alpha one (α 1) receptor blockers as well as Vasodilators (Jambedu, 2006).

2.6 Main Potential Quality-of-Life Effects of Anti-hypertensive Drugs

Different categories of anti-hypertensive drugs have various Quality-of-Life symptoms associated with them. Below is a list of them with their undesirable adverse effects against them.

2.6.1 Drug Category

Diuretics: - When individuals present with fluid imbalance (depletion) due to diuretics, adverse events such as: Impotence, decreased libido, dizziness, lethargy, constipation, nausea, dry eye. Hypokalaemia as a result of diuretics was found to account for 11.8% to 12.1% of adverse drug effect among the elderly, (Passarelli et al, 2006)

Beta-adrenoreceptor antagonists: - Beta-blockers, also known as beta antagonists, beta-adrenergic blocking agents, or beta-adrenergic antagonists, are drugs that are prescribed to treat several different types of conditions, including hypertension. They are associated with following adverse drug reactions: Cold extremities, dizziness, fatigue, insomnia, dreams, reduced verbal memory depression. In a recent study it was found that Beta-blockers cause adverse drug reaction in 22.1% of patients (Barron et al. 2013).

Central alpha-2- adrenoreceptor agonists (Methyldopa, clonidine):- These set of drugs are implicated in the following side effects: Impotence, tiredness, diarrhea, dry mouth, vivid dreams, sleep disturbance, postural hypotension, sedation, reduced verbal *memory*, depression (Jambebu, 2006).

Alpha-1 Adrenoreceptor antagonists: - These category of drugs are associated with the following undesirable adverse effects such as postural hypotension and headache (Jambedu, 2006)

Calcium channel antagonists: Calcium channel blockers are widely used in the treatment of hypertension, angina pectoris, cardiac arrhythmias, and other disorders, and the longer-acting preparations have been prescribed with increasing frequency. The

overall incidence of side effects of this category of anti-hypertensive drugs range between 20% - 52% of patients (Drug Information Reference, 2003)

Dihydropyridines: - Ankle edema, flushing, headache and dizziness are the adverse drug effects associated with these set of drugs (Jambedu, 2006).

Non-dihydropyridines: - Constipation, headache, nausea and dizziness are the side effects associated with this category of drugs (Jambedu, 2006).

ACE inhibitors: - Angiotensin-converting enzyme (ACE) inhibitors and angiotensin II receptor blockers (ARBs) are widely used in the treatment of hypertension, chronic kidney disease, and heart failure. In addition to efficacy, these agents have the additional advantage of being particularly well tolerated since they produce few idiosyncratic side effects and do not have the adverse effects on lipid and glucose metabolism seen with higher doses of diuretics or beta blockers. Angioedema occurred in 86 (0.68%) of the subjects. Stepwise logistic regression identified black race (odds ratio [OR], 2.88; 95% confidence interval [CI], 1.72-4.82), history of drug rash (OR, 3.78; 95% CI, 1.80-7.92), age greater than 65 years (OR, 1.60; 95% CI, 1.02-2.53), and seasonal allergies (OR, 1.79; 95% CI, 1.06-3.00) as independent risk factors for angioedema (Kostis et al. 2005)

Angiotensin II receptor antagonists: - Dizziness, rash and loss of taste are adverse drug effects associated with this group of drugs (Jambedu, 2006)

2.7 Adherence

Medication non-adherence is a global public health problem (Kretchy et al, 2015). Adherence is a term that is often inappropriately used interchangeably with compliance.

However, the term adherence is preferred over compliance because it implies an interactive, collaborative relationship between the patient and the care-giver (Nichols-English & Poirier, 2000). Compliance is defined as the extent to which a person's medication-taking behaviour coincides with the healthcare providers' medical advice (Haynes, 1979). The word compliance originated from a practitioner – centered paradigm and implies an authoritarian model that places the patient in a passive role (Felkey, 1995). Adherence includes dosing regularity and timing of intake, and for some specific patient populations (example for HIV/AIDS patients), selected drug-food interactions.

2.7.1 Forms of Good Adherence

Persistency describes another type of patient behaviour linked with keeping to prescribed medication regimens and entails taking one's medication, as prescribed regularly and not stopping pharmacotherapy prematurely.

Concordance is concerned with an initiative to involve the patient in the treatment process and so improve compliance. It may imply that the patient is involved in treatment planning and implementation (Meichenbaum & Turk, 1987). It also makes reference to a consultation process between a health care professional and a patient.

2.7.2 Classification of Adherence

Non-adherence can take many different forms. It may include the following: failing to fill or refill a prescription, taking an incorrect dose, take a medication at the wrong time, forgetting to take doses, or stopping therapy too soon. It may also involve taking foods or other medications that will alter bioavailability or alter metabolism rates. Patients can be classified as:

- a. Fully Adherent - Those who take adequate amounts of medications in accordance with prescribed regimens.
- b. Partially Adherent - Those who take many doses but not regularly enough to control their disease.
- c. Non-adherent - Those who take few or no doses.
- d. Over-adherent - Involves taking doses too frequently or taking too high of a dose. Patients taking pain medications for example.

2.7.3 Measurement of Medication Adherence

Diverse direct and indirect methods can be used to assess or evaluate medication adherence, ranging from patient self-report to the use of sophisticated electronic medication monitors. The primary measures of adherence may be divided into: subjective, (when patients or others report); direct (when measuring drug levels in body fluids) and indirect (example pill counts, prescription refills, electronic monitors or medication use). Each approach to assessing medication adherence has advantages and disadvantages shown as follows:

The interview method is simple and practical but may lead to overestimation and the pill count method is also simple and practical but patients may not be really taking the drugs or may be discarding them. The plasma drug levels methods is appropriate for certain drugs such as anti-convulsants and blood thinning drugs, but comes at a high cost and the potential for greater adherence just before visit. The pharmacy refill records approach is accessible but databases may not always be complete. The electronic monitoring

approach may provide accurate and detailed information but comes at a high cost and cannot determine if the drug were actually ingested.

2.7.3.1 Subjective Measurements

Asking patients about their adherence has been reported to detect more than 50% of those with low adherence, with specificity of 87% (Stephenson et al, 1993). One question to ask patients that has been validated in scientific studies is; “Have you missed any pills in the past week?” (Jambedu, 2006) Any indication of having missed pills based on this question signals a problem with adherence. However, self-report may be misleading or erroneous because of patient’s difficulty recalling the details of doses taken or missed; attempting to please the pharmacist; or a combination of these factors. Physicians generally overestimate their patients’ adherence rates (Roth & Caron, 1978, Jambedu 2006). Patients self-report is the most practical and widely used. In general, patients can be very accurate in reporting whether they are adhering to their treatment regimens if they are asked simply and directly (Duong et al, 2001).

2.7.3.2 Direct Measurements

The measurement of drug levels in body fluids (blood, saliva, urine) involves assessing the presence of a drug or its metabolite using an assay. These are considered to be more reliable measures of adherence than pill counts or subjective measures are based on recall and are useful for many medications (antiepileptic, anticoagulation drugs). However, these measurements are affected by dose and timing for example if the patients take the dose just prior to a physician visit, results can be misleadingly high. Furthermore, drug

levels are often not routinely available for most medications and tests are costly. Individual differences in absorption rates and metabolism of drugs can lead to a wide variation of drug levels among people who are equally adherent or compliant. Drug assays can show that the patient ingested some amount of the drug at some time, but it cannot determine if the patient took the appropriate amount of drug at the proper time as prescribed (Gottlieb, 2000).

2.7.3.3 Indirect Measurements:

Prescription Refill: Prescription refill records are only a valid source of information about medication adherence when patients use a pharmacy or a pharmacy benefits management programme where monitoring occurs. Pharmacy refill records can be used to measure adherence as well as persistency. A method of measuring adherence based on pharmacy records is determining the number of administered doses for defined period of time reported as a proportion of prescribed doses taken at the prescribed time interval as measured by the period of time. The number of days between refills can also be compared with the number of days over which the prescription was prescribed.

Using prescription refill records, medication persistence can be measured by determining the time between initiation and discontinuation of therapy. Refill-based assessments of medication adherence correlate well with other measures of patient adherence (Steiner & Prochazka1997).

Pill Counting: - Counting the actual number of unused pills or volume of medication remaining after a given time and subtracting this from the original quantity dispensed also provides an estimate of the quantity of medication presumably used by the patient.

This number can be compared with the intended intake, based on the prescribed directions for use and quantity of drug dispensed. These types of medication counts are a simple and practical approach that can be performed by the pharmacist. A limitation of this approach is that the actual patient ingestion is not measured and the schedule of intake is unknown. Also, this approach is subject to patients discarding some of their medications before visit or taking them in a manner other than that prescribed (Jambedu, 2006)

Electronic Monitor: -Electronic monitoring devices have been used to record both frequency and patterns of use that a medication was assumed to have been taken. These devices use microprocessors to record and store events such as the opening and closing of a container, the act of turning off an alarm, patterns of inhaler use, and the tilting of an eyedropper bottle. The Medication Event Monitoring Systems (MEMS) system for example consists of a medicine bottle fitted with a cap that contains an electronic circuit, registering the date and time of openings and closing of the bottle. Although there is no certainty about the actual intake of the medication by the patients, this type of approach has been shown to have a superior sensitivity compared with other methods (Cramer et al, 1989). An advantage of these devices is that the actual times of events are recorded and can be retrieved and interpreted by the pharmacist and other healthcare professionals. The limitations of these devices are that they do not record the actual ingestion of the drugs and are generally too expensive and cumbersome for routine use.

2.7.4 Prevalence of non-adherence to medications

Medication non-adherence is a large and complex problem that represents a significant impact on our healthcare system. Non adherences to long term medication regimens are worse than non-adherence to short term regimens. Most studies tend to converge on a non-adherence rate of 50% for long term pharmacologic therapy and 20-25% for medications prescribed for short periods of time (Claxton et al, 2001).

Non-adherence varies by the disease being treated (Stergachis et al, 1998). Asymptomatic and chronic conditions, such as hyperlipidemia are associated with higher rates of non-adherence. Benner et al, (2002) found that only 56% of patients aged 65 or older who were prescribed statins were still taking them 6 months after initiation of therapy and only 35% were taking them 5 years later. In another study, Jackevicius et al (2002); found that only 40% of patients aged 66 or older who had a heart attack or chest pain were still taking their medicines two years later, compared with 36% of those with chronic heart disease and 25% of those who were prescribed the drugs to prevent heart disease.

2.7.5 Hypertensive Medication Adherence

Adherence is important in the treatment of hypertension. An early study by Haynes et al (1976) showed that adequate control of hypertension was associated with taking at least 80% of a prescribed regimen. The patients' inability to perceive a benefit from the use of anti-hypertensive therapy removes a powerful stimulus for adherence. Non adherence rates for patients with hypertension are reported to be 50% after 1 year and 85% after 5 years (Garfield et al, 2000).

Stergachis study of 4086 elderly outpatient Medicaid recipients newly started on anti-hypertensive agents from 1982 through 1988 reported an overall adherence rate of only 49%. Only 23% of the patients studied had an adherence level of 80% or higher. Over half of patients with hypertension dropped out of treatment within a year, and only two-thirds of those who remained under care took enough of their medication to control the problem. Patients who do not take enough of their medications to reduce their blood pressure effectively are vulnerable to the long term consequences of hypertension, including an increased risk of acute myocardial infarction. Poor adherence to drug therapy is considered one of the leading preventable causes of treatment failure and hospital admission for chronic heart failure.

Medication adherence is poor even for conditions where the consequences of non-adherence can lead to adverse outcomes such as in people with epilepsy, asthma, mental illness and people who undergo transplants.

The most common predictors such as poor knowledge, negative perceptions about medication, adverse drug reactions and high cost of drugs were found to be strongly associated with medication non-adherence (Ashna et al, 2011) In Ghana, unaffordable cost drug prices was a major cause of anti-hypertensive medication non-adherence (Buabeng et al, 2004)

A study concluded 64.6% adherence to anti-hypertensive medication among patients on follow-up at University of Gondar hospital in North West Ethiopia (Ambaw et al, 2012).

Another study conducted in Northern Nigeria found 53% adherence to anti-hypertensive treatment plan (Tamuno & Fadare, 2011).

In Ghana, a study conducted found adherence to anti-hypertensive medication regimen to be 19.3%, while partial or medium adherence was 49.3% and non-adherence was 31.4% (Jambedu, 2006). According to Buabeng and colleagues [13], the level of non-adherence to anti-hypertensive medication in Ghana is about 93%, (Buabeng et al, 2004).

2.7.6 The Effects of Non-adherence on Health Outcomes

Failure to adhere to medication regimens correctly, can lead to treatment failure, disease progression; drug related morbidity, drug tolerance and drug resistance. There is an increasing body of evidence that persons who do not adhere to medications as prescribed for cardiovascular disease suffer adverse health outcomes. The Beta-Blocker Heart Attack Trial reported a 1- year mortality rate of 5.4% in non-adherent patients (i.e. took $\leq 75\%$ of prescribed medication) compared with 2.2% among those who took 75% or more of their prescribed medication (Horowitz et al, 1990). In this study, poor adherers had an increased risk of death whether they were on the *B*-blocker or placebo.

Maronde et al (1989), reported that adherence with hypertensive drug therapy was 18% lower for those who were readmitted to the hospital when compared with those who were not readmitted.

In a study of risk factors for first –time events of coronary heart disease (CHD) in persons with hypertension, patients who did not fill their prescriptions regularly enough to be at least 80% compliant as well as those who recently stopped the use of a *B*-blocker, had an increased risk of CHD (Psaty et al, 1990). Other studies have reported a linkage between under dosing of anti- hypertensive drugs and adverse outcomes. Stergachis et al, 1992,

studied persons with peripheral arterial disease and found that continuous users of pentoxifylline (those who received 80% or more of the recommended dose for a minimum of 120 days) had a 65% reduction in risk of invasive vascular procedures when compared with those who used less than 80% of the recommended dose.

Others have linked non-adherence to an increased risk of admission to an acute care hospital. Col, Fanale & Kronholm, (1990), studied 315 of consecutively admitted elderly persons to an acute care hospital; 28% were drug-related with 11% of these due to non-adherence. Studies have also linked non-adherence to an increase risk of hospital admissions for chronic heart failure (CHF), relapses in schizophrenia and depression.

2.7.7 The Effects of Non-adherence on Economic Outcomes

An overall estimates of the cost of non – adherence with prescription drugs in the United States has been reported by the National Pharmaceutical Council in 1992, to be as much as \$100 billion annually. This estimate includes \$50 billion in economic loses from absenteeism and reduced worker productivity, \$25 billion in avoidable hospital admissions, \$5 billion in avoidable nursing home admissions and over \$ 20 billion from the premature death of working people and extra treatment cost for ambulatory patients. However, such estimates of lost of productivity and medical spending should be interpreted with caution because they are not supported by detailed analysis. Non-adherence to medication results in cost largely due to the occurrence and consequent treatment of new or more morbid conditions and possibly due to increased side effect of medication. Poor adherence can lead to inaccurate assessments of treatment effectiveness

that leads to inappropriate- and often more costly – adjustment in drug therapy (Jambedu, 2006).

The extent and direct cost of hospitalization due to non-adherence was estimated by Sullivan et al in 1990 to be 5.5% of hospital admissions representing approximately \$8.5 billion in unnecessary hospital expenditures in 1990. This figure amounted to 1.7% of all healthcare expenditures in the United States during that year. The same study estimated that annual indirect costs exceed \$1.5 billion in lost patient earnings and \$50 billion in lost productivity (Jambedu, 2006).

2.7.8 Factors Affecting Medication Non-adherence

Many factors affect patient adherence with medication regimens. Pharmacists need to be knowledgeable about the risk factors for non-adherence in order to help identify these issues and assist their patients. While hundreds of factors that can lead to non-adherence have been evaluated by researchers, no single factor has been found to reliably predict patient non-adherence. Studies have however eliminated factors such as level of intelligence, memory, personality traits, age, and level of education as contributing substantially to non-adherence (Stergachis, 1998).

Below is a summary of those factors that have been associated with non-adherence of medications.

Patient and Disease factors: - Conflicting results have been reported for demographic variables such as age groups, gender, race/ethnicity or educational background. These factors have not been very useful in identifying non-compliant patients. Older age likely influences adherence rates because the elderly are more likely to have other

characteristics associated with non-adherence (multiple chronic disease, poly-pharmacy, memory deficits and increased sensitivity to the effects of medications). Certain factors can affect adherence among children and adolescents, including parents not adequately monitoring the intake of their children's medication, busy schedules, peer pressure, and lack of school involvement. The kind of illness, for example chronic diseases with diverse manifestation of symptoms or those without symptoms are also determinants of adherence problems. When a preventive medication is prescribed or when the medication prescribed for treatment increases the patients' symptoms, non-adherence is more likely (Jambedu, 2006).

CHAPTER THREE

3.0 METHODS

3.1 Study Design

This was a two-stage cross-sectional study in which two separate quantitative data sets simultaneously were collected. To answer the prevalence question, one data set was collected at the Public Health Division of the 37 Military Hospital using 1207 sampled pre-deployment medical screening forms for the determination of hypertension prevalence among troops serving on UN peacekeeping missions.

By convenience sampling method, another data set was collected from 132 hypertensive troops serving in Ghanaian UN peace-keeping bases in southern Lebanon, Liberia and Cote d'Ivoire, and also including those who at that time were undergoing pre-deployment medical screening examination in the assessment of non-adherence component at the Public Health Division of the 37 Military Hospital in Accra. All the participants were on anti-hypertensive medication regimen.

This data set was collected using structured questionnaire to address the study objective of the Non-Adherence to anti-hypertensive medication among Troops.

3.2 Study Population

Study participants were active service personnel of the Ghana Armed Forces who were diagnosed hypertensive, on medication and serving on UN peace-keeping missions.

The participants recruited were urban dwellers in military barracks in all the regional capital cities of Ghana. They were physically active, had at least Basic Compulsory Education Certificate (Basic Education Certificate Exams) and ranged between the ages of 20 – 60years.

3.3 Variables

To achieve the set objectives, continuous and nominal data were collected on the following demographic characteristics in order to establish their association with hypertension and level of anti-hypertensive medication non-adherence.

3.3.1 Independent Variables:

- AGE – all age groups between 20 – 60 years were considered.
- SEX – personnel of both sexes who were hypertensive and on medication were included.
- RANK – all ranks both men and officers were targeted.
- MARITAL STATUS – personnel with different marital status were inclusive.
- FAMILY SIZE – personnel with small or large family were considered.
- RELIGION – personnel with the various religious backgrounds were inclusive.

3.3.2 Dependent Variables:

- Average blood pressure of troops measured three consecutive times per visit, on three different days
- Adherence

3.4 Sampling

Data were collected from sampled pre-deployment medical screening forms, and from hypertensive troops on anti-hypertensive drugs by convenience methods at the locations cited above.

3.4.1 Sample Size Determination for prevalence of hypertension

Sample size was determined using the following statistical formula, the minimum required in order to achieve internal validity:

The total number of pre deployment medical screening forms available were 4992 and at 95% confidence interval and power of 2%, a sample size of 1248 forms were achieved using a power survey calculator.

3.4.2 Sampling Methods

A cross-section of randomly selected pre-deployment medical examination forms for troops embarking on UN peacekeeping operations between January - December 2013 was retrospectively reviewed to estimate the prevalence of hypertension among troops. In all 4992 forms were available, and out of this number 1248 forms were sampled. Forty one (41) forms had no blood pressure indicated on them therefore were discarded. The remaining 1207 forms were used for this study. The much larger sample size was preferably used in order to capture personnel from all Arms of the Ghana Armed Forces, and also to achieve much greater validity and accuracy of results.

Though 374 participants were diagnosed hypertensive, 85 of them had their systolic and diastolic blood pressure controlled on medication and within the normal range. They

therefore could not be classified under the categories of hypertension. Hence reducing the number of hypertensive troops used for the classification of hypertension to 289 participants.

Also in computation of BMI only 1147 out of the 1207 sampled forms had both weight and heights indicated on them, and hence were included in the analysis. These reasons (missing values) accounted for the variations in numbers observed in reporting of the results (Refer to table 1).

For the anti-hypertensive medication non-adherence study, data from 132 returned questionnaires out of the 500 copies sent out to the various study locations were used. Here also no responses from participants for particular questions, accounted for the variations in the number of respondents used in the analysis and only valid percentages were reported in the results below.

3.5 Data Collection Tools

Data for hypertension burden estimation were collected using filled pre-deployment medical examination forms designed for troops embarking on UN peacekeeping missions while structured questionnaires were used for the non-adherence study data collection.

3.6 Quality Control

Data were compiled by double entry to check for consistency. The data were cleaned and stored for analysis.

3.7 Data Analysis

Data were analyzed quantitatively using **SPSS 16** program to obtain frequency and cross-tabulation tables, as well as graphs. Statistical analysis was done using regression methods under the same program to establish the significance of association between predictor variable and outcome variables. Data on adherence level, knowledge and motivation were analyzed using a modified Morisky's score scale (Morisky, Green & Levine, 1986).

Adherence level was measured using a modified Morisky's total score scale of 8 (eight) points. Interpretation of the score scale was as follows:

Scores between 8 and 2 meant low adherence. Score of 1 or 2 meant medium adherence.

Zero (0) score implied high adherence. Question 8 on adherence was scored as: A = 0 while B - E = 1 (an adapted questionnaire for measuring self-reported medication adherence) (Morisky, Green & Levine, 1986).

Similarly, interpretation of total score for motivation and knowledge was as follows:

Scores for Motivation were interpreted as: a zero score (0) or 1 meant High Motivation while a score of 2 or 3 meant Low Motivation.

Also scores on Knowledge were interpreted as follows: a score of zero (0) or 1 meant High Knowledge while a score of 2 or 3 means Low Knowledge.

3.8 Ethical Considerations

The purpose and benefits of the study were clearly spelt out to participants as well as risks and discomfort.

Confidentiality and anonymity were assured as participants' names and service numbers were not required and filled questionnaires were handled only by those recruited to collect data on the field.

Participants' consent was sought and participation was purely voluntary without any coercion, fear of victimization or punishment. Consenting was done by giving out consent forms stating no compensation in any form and all conditions, to willing participants with clarifications when the need arose. After reading the terms and conditions for participation, when satisfied with the terms of participation and conditions the willing participants appended their signatures to confirm their decision.

To ensure privacy, the anonymously-filled questionnaires were stored under medical confidence sealed envelopes under the care of the administering field Senior Medical Officers who personally returned with them as the time of their rotation coincided with study period. Upon receipt of the questionnaires, data was transferred electronically, cleaned and stored under a coded password known only to the researcher. The questionnaires were then stored in metal cabinets under lock in the research unit of the Public Health Division of the 37 Military Hospital for future reference.

Permission was sought from the appropriate military authorities, the Commandant and the head of Public Health Division of the 37 Military Hospital as well as from the Ghana

Health Service Institutional Review Board (IRB). There is no known conflict of interest and funding was solely from researcher's personal sources.

3.9 Pretest

The questionnaires were pretested at the Medical Out-Patients Division of the 37 Military Hospital among known hypertensive patients attending specialists' clinic in order to identify and correct problems that arose while administering the questionnaires.

CHAPTER FOUR

4.0 RESULTS

4.1 Characteristics of Participants

Participants were mainly non-commissioned service personnel of all ranks drawn from the three Arms of Service of the Ghana Armed forces, namely the Army, Navy and the Air Force. They were physically active and fit personnel ranging between the ages of 20 – 60 years, with at least basic formal education. They were mainly urban-dwellers living in the Military Barracks located in almost all the regional capitals of Ghana.

The mean age was 35.8, median age of 34.0, a modal age of 27 years and standard deviation of 9.0

The BMI of study was computed by dividing the weight of participants in kilograms by the square of their heights in metres all indicated on the sampled pre-deployment medical screening forms. The alcohol status of participants in the hypertension prevalence study also declared on the pre-deployment medical screening forms See the frequency table 1:

Table 1: Frequency Table of Characteristics of participants

Characteristics	Frequency	Percent
Arm of Service		
AIRFORCE	173	18.8
ARMY	967	78.3
NAVY	67	5.3
Total	1207	100.0
Age Groups		
20-24years	75	6.2
25-29 years	327	27.2
30-34 years	213	17.7
35-39years	154	12.8
40-44years	188	15.6
45-49years	145	12.1
50-54years	74	6.2
55-59years	26	2.2
Total	1202	100.0
BMI		
Underweight	14	1.2
Normal BMI	707	61.6
Overweight	360	31.4
Obese	66	5.8
Total	1147	100.0
Alcohol status		
Negative	667	55.3
Positive	539	44.7
Total	1206	100.0
Blood pressure status		
No value of BP available	41	3.3
Hypertension	374	30.0
Normotension	833	66.7
Total	1248	100.0

Among the three Arms of Service of the Ghana Armed Forces, the Army units form the bulk of troops, while the Navy and the Air Force form the minority.

The study population is largely made of the younger junior ranks because they perform most of the regular military duties required on the field.

The Body Mass Index (BMI) of the 1147 participants computed were as follows: 14 (1.2%) were underweight, 707 (61.6%) with normal BMI, 360 (31.4%) were overweight while 66 (5.8%) were obese.

Six hundred and sixty seven representing (55.3%) of 1206 participants, did not drink alcohol and the remaining 539 (44.7%) drank alcohol.

Three hundred and seventy four (30%) of the 1207 participants were diagnosed hypertensive while 833 (66.7%) were normotensive.

4.2 Prevalence of Hypertension

The prevalence of hypertension in the study population was 30% with a mean systolic blood pressure of 173.2 and standard deviation of ± 17.8 . The mean diastolic blood pressure was 104.18 and a standard deviation of ± 11.83 . Refer to table 2 below:

Table 2: Statistics of hypertension Prevalence among Ghanaian-UN Peacekeepers

Statistics		Systolic Blood Pressure(SBP)	Diastolic Blood Pressure(DBP)
N		374	374
Mean		173.23	104.3
Median		170.00	100.0
Mode		170	100.0
Std. Deviation		17.81	11.8
Minimum		130	80
Maximum		240	170

Table 3 shows that the proportion of hypertensive troops within the age groups was found to be increasing with age and consistently stood above 50% from 40 years and above.

Table 3: Proportion of Hypertensive troops within the Age Groups

AGE GROUP	Total	DIAGNOSIS	
		HYPERTENSIVE	NORMOTENSIVE
		N(%)	N(%)
20 – 24 YRS	75	3(4.0%)	72(96.0%)
25 – 29 YRS	327	50(15.3%)	277(84.7%)
30 – 34 YRS	213	45(21.1%)	168(78.9%)
35 – 39 YRS	154	48(31.2%)	106(68.8%)
40 – 44 YRS	188	94(50.0%)	94(50.0%)
45 – 49 YRS	145	74(51.0%)	71(49.0%)
50 – 54 YRS	74	41(55.4%)	33(44.6%)
55 – 59 YRS	26	18(69.2%)	8(30.8%)

4.3 Classification of Hypertension

The participants were categorized as normotensive (those with normal blood pressures) or hypertensive (systolic blood pressure greater than 140 mm Hg and or diastolic blood pressure greater than 90 mmHg).

Hypertension is now classified as systolic and/or diastolic hypertension. Both systolic and diastolic hypertensions are further categorized into stage 1 and stage 2 as indicated at the literature review section (page 11).

Figures 2 and 3 show the different of the different stages of the two categories of hypertension, that is systolic and diastolic hypertension..

Figure 2: Proportions of systolic Blood Pressure

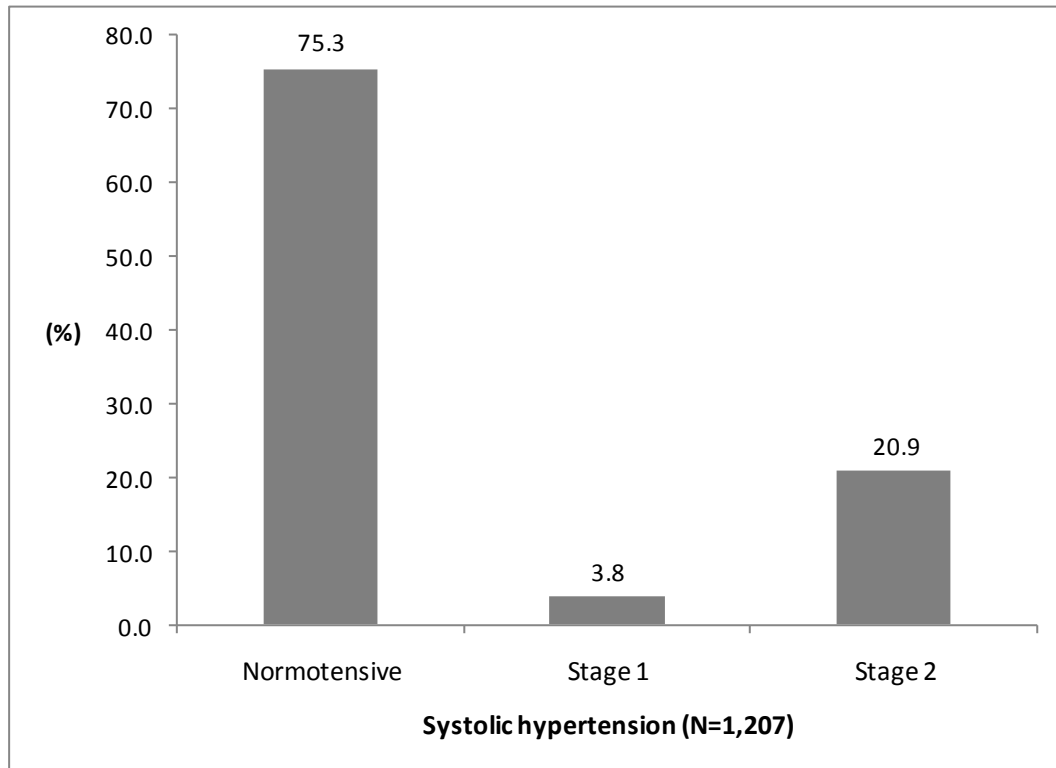
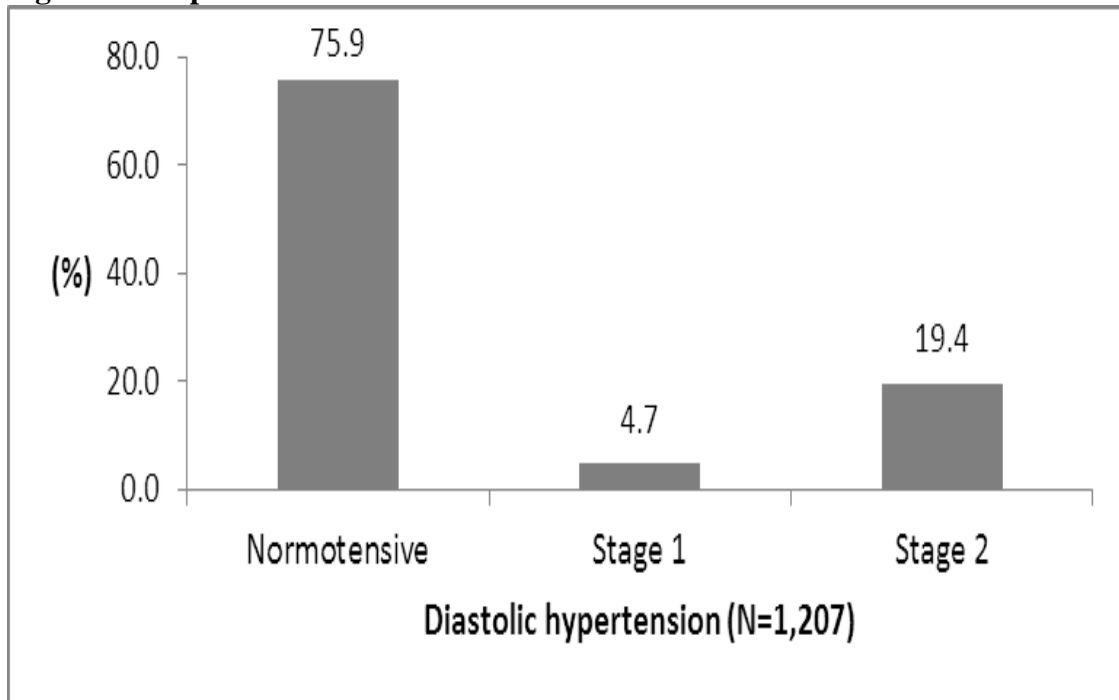


Figure 3: Proportions of Diastolic Blood Pressure



The proportion of stage 1 and 2 systolic hypertension among participants was 3.8% and 20.9% respectively, shown in figure 2 above.

The proportion of stage 1 and 2 diastolic hypertension was 4.7% and 19.4% respectively, Figure 3.

Of the 289 participants who were classified, 43 representing (14.9 %), had stage 1 systolic hypertension while 246 (85.1%) had stage 2 systolic hypertension.

Fifty seven participants had stage 1 diastolic hypertension, in addition 12 (21.1%) of them also had stage 1 systolic hypertension while 45 (78.9%) also had stage 2 systolic hypertension.

Among the 232 hypertensive troops who had stage 2 diastolic hypertension, 31 (13.4%) of them also had stage 1 systolic hypertension while 201 (86.6%) also had stage 2 systolic hypertension in addition.

Table 4: Association between Age, BMI and Systolic Hypertension

Characteristic	Systolic hypertension [N (%)]				Chi-square, P-value
	Normotensive N=909	Stage 1 N=46	Stage 2 N=252	Total N=1,207	
Age (years)					118.50, P<0.001 ^a
20 – 24	72 (96.0)	0	3 (4.0)	75 (100.0)	
25 – 29	288 (88.1)	9 (2.8)	30 (9.2)	327 (100.0)	
30 – 34	172 (80.8)	6 (2.8)	35 (16.4)	213 (100.0)	
35 – 39	117 (76.0)	4 (2.6)	33 (21.4)	154 (100.0)	
40 – 44	118 (62.8)	9 (4.8)	61 (32.5)	188 (100.0)	
45 – 49	83 (57.2)	11 (7.6)	51 (35.2)	145 (100.0)	
50 – 54	42 (56.8)	5 (6.8)	27 (36.5)	74 (100.0)	
55 – 59	12 (46.2)	2 (7.7)	12 (46.2)	26 (100.0)	
BMI (kgm ²)					30.67, P<0.001 ^a
Underweight	14 (100.0)	0	0	14 (100.0)	
Normal	561 (79.4)	24 (3.4)	122 (17.3)	707 (100.0)	
Overweight	277 (70.1)	18 (4.6)	100 (25.3)	395 (100.0)	
Obese	37 (56.1)	3 (4.6)	26 (39.4)	66 (100.0)	

a. Fisher's exact p-value showed instead where expected cell frequency is less than 5.
Missing values not shown

Table 5: Association between Age, BMI and Diastolic Hypertension

Characteristic	Diastolic hypertension [N (%)]				Chi-square, P-value
	Normotensive N=916	Stage 1 N=57	Stage 2 N=234	Total N=1,207	
Age (years)					126.40, P<0.001 ^a
20 – 24	72 (96.0)	1 (1.3)	2 (2.7)	75 (100.0)	
25 – 29	291 (89.0)	12 (3.7)	24 (7.3)	327 (100.0)	
30 – 34	173 (81.2)	9 (4.2)	31 (14.6)	213 (100.0)	
35 – 39	117 (76.0)	8 (5.2)	29 (18.8)	154 (100.0)	
40 – 44	119 (63.3)	11 (5.9)	58 (30.9)	188 (100.0)	
45 – 49	84 (57.9)	11 (7.6)	50 (34.5)	145 (100.0)	
50 – 54	42 (56.8)	2 (2.7)	30 (40.5)	74 (100.0)	
55 – 59	13 (50.0)	3 (11.5)	10 (38.5)	26 (100.0)	
BMI (kgm ²)					31.29, P<0.001 ^a
Underweight	14 (100.0)	0	0	14 (100.0)	
Normal	565 (79.9)	25 (3.5)	117 (16.6)	707 (100.0)	
Overweight	280 (70.9)	23 (5.8)	92 (23.3)	395 (100.0)	
Obese	37 (56.1)	7 (10.6)	22 (33.3)	66 (100.0)	

b. Fisher's exact p-value showed instead where expected cell frequency is less than 5.
Missing values not shown

Table 4 shows a significant association between increasing proportion of systolic hypertension (especially stage 2 systolic hypertension) with increasing age and BMI (P-value < 0.001)

Table 5 also shows a significant association between increasing proportion of diastolic hypertension (especially stage 2 diastolic hypertension) with increasing age and BMI (P-value < 0.001).

4.4 Anti-Hypertensive Medication Non – Adherence

The participants in the non-adherence assessment study were known hypertensive patients, who were referred to the Medical Division of the 37 Military Hospital, monitored, confirmed and put on anti-hypertensive therapy. The participants have similar demographic characteristics as those in the hypertension prevalence study. Table 6 shows the demographic characteristics of the participants.

Table 6: Association between Demographic Characteristics of Participants and Non-Adherence

Characteristic	N (%)			Chi-square, P-value
	Non-adherent N=80	Adherent N=45	Total N=125	
Age (years)				2.58, P=0.503 ^a
20 – 29	4 (80.0)	1 (20.0)	5 (100.0)	
30 – 39	18 (75.0)	6 (25.0)	24 (100.0)	
40 – 49	37 (58.7)	26 (41.3)	63 (100.0)	
50 – 59	17 (63.0)	10 (37.0)	27 (100.0)	
Sex				0.42, 0.710 ^a
Male	70 (63.6)	40 (36.4)	110 (100.0)	
Female	6 (75.0)	2 (25.0)	8 (100.0)	
Rank				4.27, P<0.05
Junior NCO	14 (87.5)	2 (12.5)	16 (100.0)	
Senior NCO	64 (61.0)	41 (39.1)	105 (100.0)	
Marital status				0.00, P=1.000 ^a
Not married	5 (62.5)	3 (37.5)	8 (100.0)	
Married	72 (63.2)	42 (36.8)	114 (100.0)	
Family size				1.02, P=0.313
Small	46 (62.2)	28 (37.8)	74 (100.0)	
Large	30 (71.4)	12 (28.6)	42 (100.0)	
Religion				0.13, P=0.722
Christian	61 (64.2)	34 (35.8)	95 (100.0)	
Muslim	19 (67.9)	9 (32.1)	28 (100.0)	

a. Fisher's exact p-value showed instead where expected cell frequency is less than 5. Missing values not shown

Among the characteristics of participants considered, only the Rank of respondents was strongly associated with adherence (p -value<0.05) as shown in table 6. The Senior Non-commissioned Officers (NCOs) were more adherent to medication than their junior counterparts.

4.5 Duration of Diagnosis

Nearly thirty percent of study respondents (29.8%) were diagnosed in less than a year, 55.7% ranged between 1 – 5 years while the rest 14.5% were diagnosed for more than 5 years. Therefore more than half of respondents had their diagnosis from 1 – 5 years

which has significant association with low adherence to anti-hypertensive medication (P-value < 0.001).

4.6 Number of Drugs Taken by Participants

Less than forty eight percent of participants (47.3%) were on only one drug, 42.4% were on two drugs while 9.3% were on 3 to 6 different drugs. This is presented in Table 7 below.

Table 7: Count and percentage of participants with corresponding number of anti-hypertensive drugs

	PERCENTAGE	No. of Anti-hypertensive drugs taken by personnel
COUNT		
62	47.3%	1
56	42.4%	2
12	9.3%	3 – 6
130	100%	

4.7 Drug Adverse Effects Experienced by Participants

Close to forty eight percent of respondents (47.7%) do not experience any side effects. Nearly 64% of those on anti-hypertensive drugs, experienced sexual dysfunction and the remaining adverse effects such as headache, generalized weakness and dizziness accounted for the remaining 36%.

4.8 Level of Knowledge among Participants

Among all the 132 respondents, 66.7% and 33.3% showed high and low medical knowledge respectively.

4.9 Level of motivation among participants

One hundred and nine (82.6%) of all the 132 participants, showed high motivation, while only 23 (17.4%) had low motivation.

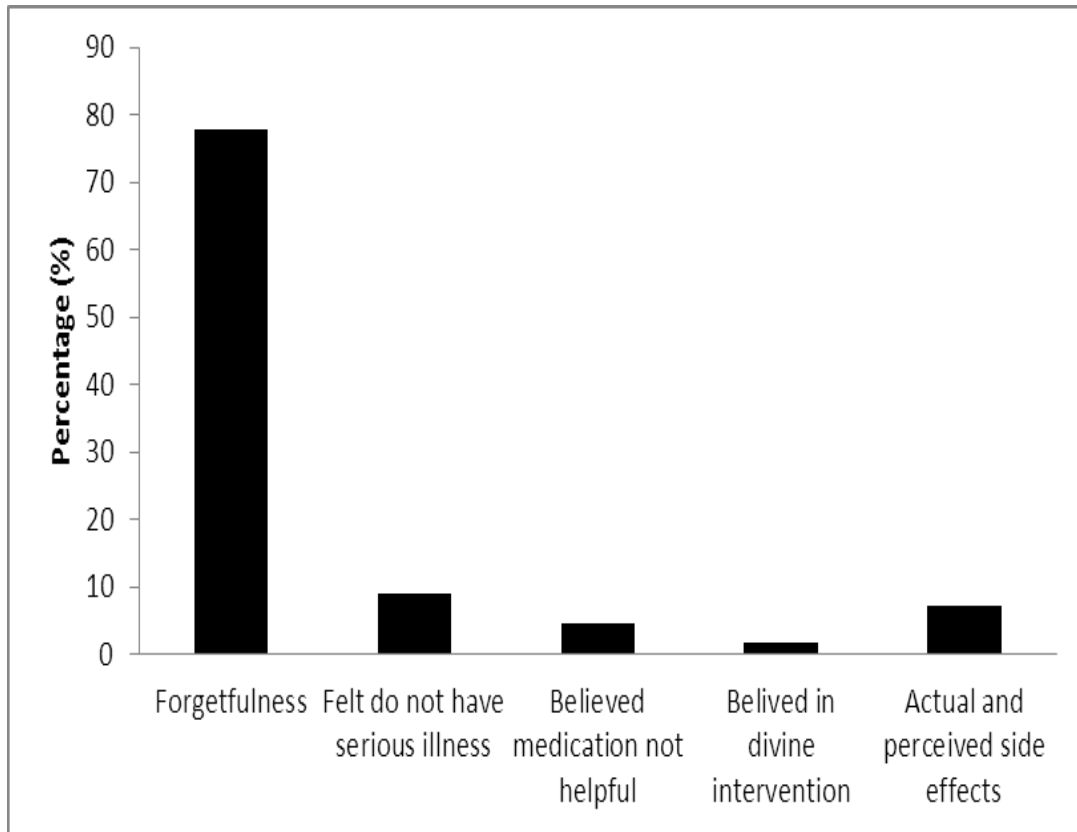
4.10 Level of Anti-Hypertensive Medication Non-Adherence

Eighty troops representing (64%) of the 125 participants who responded, showed low adherence, 43 representing 34.4%, exhibited medium adherence, while only 2, making up 1.6% showed high adherence level.

Non-adherence can take many different forms. Patients can fail to acquire the needed anti-hypertensive medication, take an incorrect dose, take a medication at the wrong time, forget to take doses, or stop therapy too soon. Non-adherence can also involve taking foods or other medications that will alter bioavailability or alter metabolism rates.

4.11 Reasons given for Anti-Hypertensive Medication Non - Adherence

Respondents gave various reasons for non-adherence to their anti-hypertensive medication. This study revealed that out of the 112 respondents who stated the reasons for not adhering to their medications, majority (77.7%) attributed their non-adherence to forgetfulness, 8.9% felt they have no serious illness while 7.1% of the respondents attributed non-adherence to actual and perceived side effects of the medication. This is depicted in figure 4 below:

Figure 4: Reasons for Non-Adherence

4.12 Other Forms of Medication Non- Adherence Exhibited

This study also identified other forms of medication non-adherence among troops in the following proportions: 54.6% of the participants associated non-adherence to inconvenience, 30.6% stopped the medication when they felt their hypertension was under control while 26.8% of respondents forgot to carry medication along when leaving home or traveling. In addition, 34.7% of the respondents for other reason either than forgetfulness missed taking their medications over the previous two weeks.

4.13 Other Factors that May Contribute to Medication Non-Adherence

The tables 8, 9, and 10 below show the association between some factors and medication adherence.

Table 8: Association of Behaviours , Factors and Reasons with Non-Adherence

Factor	N (%)			Chi-square, P-value
	Non-adherent N=80	Adherent N=45	Total N=125	
Careless at times about taking medication				7.30, P<0.01 ^{ai}
No	63 (58.9)	44 (41.1)	107 (100.0)	
Yes	15 (93.8)	1 (6.3)	16 (100.0)	
Sometimes forget to buy my drugs on time				0.46, P=0.497
No	62 (62.0)	38 (38.0)	100 (100.0)	
Yes	16 (69.6)	7 (30.4)	23 (100.0)	
Sometimes stop taking medication after feeling worse				16.02, P<0.001 ^a
No				
Yes	51 (54.3)	43 (45.7)	94 (100.0)	
	26 (96.3)	1 (3.7)	27 (100.0)	
Knowing long term benefit of medication regimen as told by doctor/pharmacist				0.98, P=0.322
No	7 (53.9)	6 (46.2)	13 (100.0)	
Yes	71 (67.6)	34 (32.4)	105 (100.0)	
Sometimes I stop taking medication when feeling better				22.43, P<0.001 ^a
No				
Yes	45 (51.1)	43 (48.9)	88 (100.0)	
	33 (97.1)	1 (2.9)	34 (100.0)	
Motivation				3.68, P=0.085 ^a
Low	18 (81.8)	4 (18.2)	22 (100.0)	
High	62 (60.2)	41 (39.8)	103 (100.0)	
Knowledge				24.54, P<0.001 ^a
Low	38 (95.0)	2 (5.0)	40 (100.0)	
High	42 (49.4)	43 (50.6)	85 (100.0)	
Reason for non-adherence				0.04, P=1.000
Forgetfulness	56 (67.5)	27 (32.5)	83 (100.0)	
Other reason	16 (69.6)	7 (30.4)	23 (100.0)	

Missing values not shown.

From the table above, knowledge, carelessness about taking medication and medication discontinuation after feeling worse or better were strongly associated with adherence as indicated by the p-values.

^aFisher's exact p-value showed instead where expected cell frequency is less than 5

Knowledge

Though respondents (89%) claimed they knew about the long term benefits of taking anti-hypertensive medications, it did not reflect in their adherent behaviour shown in the table above (P-value >0.05).

Motivation

There was no significant association (P-value > 0.05) between the high motivation shown by respondents and the low adherence as observed in Table 8.

Table 9: Significance of Other Factors that may Contribute to Non-Adherence

Factor	N (%)			Chi-square, P-value
	Non-adherent N=80	Adherent N=45	Total N=125	
Duration of hypertension				1.16, P=0.562
< 1 year	20 (57.1)	15 (42.9)	35 (100.0)	
1+ years	46 (67.7)	22 (32.4)	68 (100.0)	
5+ years	11 (61.1)	7 (38.9)	18 (100.0)	
On medication for other ailments				0.18, P=0.728
No	69 (62.7)	41 (37.3)	110 (100.0)	
Yes	5 (55.6)	4 (44.4)	9 (100.0)	
Types of drugs taken				1.89, P=0.410
1	40 (67.8)	19 (32.2)	59 (100.0)	
2	32 (62.8)	19 (37.3)	51 (100.0)	
3+	4 (44.4)	5 (55.6)	9 (100.0)	
Often discuss medication regimen with physician				0.15, P=0.697
No	28 (65.1)	15 (34.9)	43 (100.0)	
Yes	48 (61.5)	30 (38.5)	78 (100.0)	
Often change physicians				3.05, P=0.106
No	64 (60.4)	42 (39.6)	106 (100.0)	
Yes	14 (82.4)	3 (17.7)	17 (100.0)	
Always buy drugs from the same pharmacy				4.06, P<0.05
No	55 (70.5)	23 (29.5)	78 (100.0)	
Yes	23 (52.3)	21 (47.7)	44 (100.0)	
Often discuss best medication with pharmacist before buying				0.48, P=0.489
No	26 (59.1)	18 (40.9)	44 (100.0)	
Yes	51 (65.4)	27 (34.6)	78 (100.0)	

a. Fisher's exact p-value showed instead where expected cell frequency is less than 5.

Missing values not shown

The only variable marginally associated with adherence was buying drugs from the same pharmacy (p-value<0.05).

Table 10: Association of Significant Factors with Adherence

Factor	Crude		Adjusted	
	OR (95% CI)	P-value	OR (95% CI)	P-value
Rank				
Junior NCO	Ref. 4.48 (0.97, 20.76)	P<0.05	Ref. 5.23 (0.98, 27.82)	P<0.01
Senior NCO				
Careless at times about taking medication				
No	Ref. 0.10 (0.01, 0.75)	P<0.01	Ref. 0.27 (0.02, 3.05)	P=0.258
Yes				
Sometimes stop taking medication after feeling worse				
No	Ref. 0.05 (0.01, 0.35)	P<0.001	Ref. 0.11 (0.01, 0.96)	P<0.01
Yes				
Sometimes stop taking medication when feeling better				
No	Ref. 0.03 (0.00, 0.24)	P<0.001	Ref. 0.06 (0.01, 0.54)	P<0.001
Yes				
Knowledge				
Low	Ref.19.45 (4.41, 85.81)	P<0.001	Dropped from adjusted model due to large margin of error	
High				
Always buy drugs from the same pharmacy				
No	Ref. 2.18 (1.01, 4.70)	P<0.05	Ref. 2.49 (0.97, 6.38)	P<0.05
Yes				

From the table above, Senior NCOs were 4.48 times more likely to be adherent compared to Junior NCOs and this rose to 5.23 after adjusting for the other variables shown above. Respondents who admitted to carelessness regarding taking their medication were also less likely (about 90%) to be adherent compared to those who were more careful. However, this was not significant after adjusting for the other variables.

Though binary logistic regression found most contributing factors not significantly associated with adherence, using high adherence as reference in a multi-nominal logistic

regression analysis found very significant association between low adherence and the following factors: being a Moslem, motivation, duration of diagnosis, drug adverse effects, and institutional barriers (such as non-involvement of patients in the discussion on anti-hypertensive medication regimen, provision of care by multiple physicians as well as counselling from pharmacist). The P-value in each case was less than 0.001.

4.14 Assessment of Instituted Claims System for Purchased Drugs

In assessing the opinion of troops about the Instituted Claims System run by the Ghana Armed Forces, the following facts were revealed: (see table 11)

The 132 participants who responded were represented in the following proportions: only 16.8% did not know of its existence, 62.9% never claimed any money for purchased drugs, 68.4% of respondents asserted the Claims System was cumbersome while 78.4% of the respondents found it helpful.

More than seventy five (75.5%) of the participants felt the Claims System should be reformed. It was also found that, 55.3% of the participants who responded, admitted that the cost of their medications caused economic hardships to them and their families. Despite this 96.6% of the respondents claimed they did not wait for claims to be paid before purchasing their medications.

The respondents made suggestions for change in the claims system in the following proportions: 34.9% would prefer that the required anti-hypertensive drugs should always be made available in order to avoid buying and claiming, 23.5% felt the procedure claims could be made simpler while 15.9% thought the duration for payment of claims should be shortened to a couple of weeks.

Table 11 shows the count and percentage of how participants assess the refund system.

Table 11: Assessment of Current Refund System

Assessment	N	%
Aware the GAF has an institutionalized claims system for purchased drugs		
No	22	16.7
Yes	109	82.6
Ever claimed money for purchased drugs		
No	83	62.9
Yes	47	35.6
<i>For those who said yes,</i>		
Procedure for claims cumbersome		
No	5	10.6
Yes	39	83.0
Does it take too long for claims to be paid		
No	4	8.5
Yes	41	87.2
Claims system is helpful		
No	29	22.0
Yes	70	53.0
Current claims system should be changed		
No	23	17.4
Yes	71	53.8
Economic hardships due to cost of drugs		
No		
Yes	53	40.2
	73	55.3
Preference for other financial commitments to buying drugs		
No	95	72.0
Yes	29	22.0
Often wait for claims to be paid before buying drugs		
No	115	87.1
Yes	3	2.3

CHAPTER FIVE

5.0 DISCUSSION

The prevalence of hypertension among Ghanaian troops embarking on UN peace keeping missions was estimated at 30.0% which is very close to the 29.7% found in a recent study conducted in Cameroon (Kingue et al, 2015). The prevalence of hypertension in an unpublished study by Darkwa (2011) among troops of a Ghana Army Unit was estimated at 22.3%. The difference in the prevalence may be explained by the much larger sample size in this study, including personnel from the numerous units of the Ghana Army and units of the other Arms of the Ghana Armed Forces (the Navy and the Air Force). The proportion of hypertensive troops in age groups 40 – 54 years was found to be consistently higher than 50% while those above 55 years as high as 69.2%.

This high prevalence of hypertension among the older age groups can be attributed to the stressful nature of their job and lifestyle such as unhealthy diet, alcohol and tobacco use. (Darkwa, 2011).

A study conducted in Ghana estimated the prevalence among age groups 40 – 45 at 35.0% and those above 55 years at 45.0% (Buabeng et al 2004). The same study also estimated the prevalence of hypertension among the under-40 years age groups at 6.0% whereas this study found that only respondents in the 20 – 24 age group had a prevalence rate below the 6.0%. All the other age groups up to 40 years consistently had prevalence rates far greater than the 6.0%

The result of the study by Buabeng et al, 2004 is inconsistent with findings of this current study in terms of the higher prevalence among the various age groups. This may be due

to the fact that the study populations were different. While this study focused on the Personnel of the Ghana Armed Forces, the 2004 study was done among the general population. This means the stress levels among the different study populations may differ as well.

However, it is interesting to note that the trend in this and other studies is consistent, in that hypertension prevalence increases with age (Buabeng et al, 2004; Addo, et al 2007; Darkwa, 2011). This can be attributed to the physiological changes associated with aging.

BMI was also significantly associated with hypertension and this is consistent with the findings in a study by Darkwa in 2011. Troops are physically active and here unhealthy diet as found by Darkwa and overeating may be contributing to excessive weight gain, which in turn may result in their BMI being out of the normal range.

Therefore, to achieve primary prevention of hypertension vigorous health and lifestyle education is to be targeted at the younger age groups, half of whom are likely to become hypertensive by the age of 40 years. This study found the Senior NCOs to be 4.48 times more likely to be adherent compared to their Junior NCOs and this rose to 5.23 after adjusting for other variables.

By the JNC 7 classification the majority of the participants were found in the stage 2 hypertension category, with 85.1% having stage 2 systolic hypertension, 78.9% had stage 2 diastolic hypertension, while 86.6% had both stage 2 systolic and stage 2 diastolic hypertension. This high proportion of stage 2 hypertension may be due to the hostile and stressful field environment in which Ghanaian troops operate. Therefore patient

education and adherence counselling should be targeted vigorously at this group to achieve secondary prevention.

Some studies tend to converge on a non-adherence rate of 50% for long term pharmacologic therapy and 20-25% for medications prescribed for short periods of time (Claxton et al, 2001; Brown & Bussell, 2011).

Non-adherence varies by the manifestation of disease being treated. Asymptomatic and chronic conditions, such as hyperlipidemia are associated with higher rates of non-adherence (Stergachis et al, 1998).

Non adherence rates for patients with hypertension are reported to be 50% after 1 year and 85% after 5 years (Garfield et al 2000).

This study found only 1.6% of respondents showed high level of adherence. If high adherence and medium adherence should amount to adherence, then the adherence rate found by this study was 36%, while non-adherence level was as high as 64%. This is consistent with the findings by Garfield and colleagues whereby there was also a high non-adherence to anti-hypertensive medication regimen among respondents.

However, studies conducted in Ethiopia, Nigeria and Ghana found high adherence rates of 64.6%, 53% and 68.6% respectively for anti-hypertensive medication regimen (Ambaw et al, 2012; Tamuno & Fadare, 2011; Jambedu, 2006). This huge difference may be explained by the demographic characteristics of participants.

The finding of this study was inconsistent with the above listed studies and may be due to the fact that hypertension as a chronic disease, progresses if uncontrolled with very subtle

or virtually no symptoms. This fact coupled with the risk-taking behaviour of some Ghanaian troops who feel they are physically fit may explain why nearly two thirds (64%) of them exhibited low adherence. Therefore a lot of patient education and adherence counselling is required.

Among all reasons, forgetfulness was attributed to non-adherence by more than 3/4(75.5%) of respondents which is much higher than the 45.4% found in another study (Jambedu, 2006). This can be attributed to the difference in the study population of the two studies. Also the high forgetfulness among troops can be attributed to the demanding nature of their jobs. Troops could be advised to tie the timing of their regimen to coincide with some daily activities and also place their drugs in places where they are visible and not easily forgotten such as bathroom cabinets, on top of bed-side lockers and on dining tables. They may also involve friends and family members to remind them regularly to take their medications. Other devices such as alarm clock reminders may be useful.

Another study found that the use of long-acting drugs to reduce dose frequency enhances adherence so prescribers should be mindful of this fact when discussing medication regimen with their clients (Munger, et al 2007)

This study found a significant association between low adherence to anti-hypertensive medication regimen and being a Moslem. This observation could be explained by the conclusion made in a study conducted in Ghana, which suggested that while spirituality/religiosity was dominant among hypertensive patients, these spiritual attachments of patients with a supreme being potentially increased their trust in the expectation of divine

healing instead of adhering adequately with their anti-hypertensive medications (Kretchy, Owusu-Daaku & Danquah, 2013). Also religious practices such as dry fasting especially during the Ramadan period may contribute to non-adherence among Moslems (Aadil N, Houti E. I & Moussamih S, 2004) Therefore more patient education and adherence counselling among this subgroup is needed.

The study found high level of medical knowledge and very high level of motivation among respondents, ironically only 1.6% of them exhibited high level of adherence despite the fact that 89% of them claimed to have knowledge of the long term benefits of anti-hypertensive drugs. This phenomenon could be attributed to the existence of suboptimal knowledge reported in some studies (Ambaw, et al, 2012; Brown & Bussell, 2011). Therefore optimization of patient education, knowledge and adherence counselling is required.

An earlier study conducted in Ghana found adherence was better when duration of the diagnosis of hypertension was less than six years (Jambedu, 2006). In contrast, this study found out that low adherence to anti-hypertensive medication regimen was significantly associated with the 1 – 5 year group. This group formed more than half of respondents who were mostly junior NCOs. This is not surprising because the JNCO are more than four times less likely to adhere to anti-hypertensive medication regimen. Also the SNCO might have seen their mates succumbed to, or survived themselves the complications of uncontrolled hypertension in peace time, hence more compliant. Therefore to achieve secondary prevention, the younger age-group should be vigorously targeted for patient education and adherence counseling.

Less than half of participants (47.7%) experienced no drug adverse effects. Sixty four percent of those who experienced adverse effects cited sexual dysfunction as a prominent drug adverse effect, which this study found significantly associated with low adherence. This finding is consistent with findings in another study, (Grover et al, 2006). This may explain the high level of non-adherence observed among hypertensive personnel on the field during the period close to the end of their tour of duties when they are getting ready to return home to meet their wives and girlfriends. From field experience, it is usually during this period that the most dramatic hypertension-related cerebro-vascular accidents and deaths occur. Pill count during this period to check on non-adherence proved ineffective because they were discarding the drugs before visiting the medical officer. Therefore, anti-hypertensive drugs with undesirable sexual dysfunction effects should be discouraged, especially the diuretics and beta-blockers.

The interpersonal skills and accessibility of the healthcare provider are also predictors of non-adherence. Using multiple physicians or multiple pharmacies has been associated with a significantly higher risk of hospitalization due to non-adherence. The latter can negatively affect adherence as patients lose the opportunity for continuity of pharmacist counselling and coordinated refill reminders.

Lack of coordination of care is a major physician-related factor. There is much that could be done at the time a physician prescribes a medication to optimize and tailor regimens for individual patients. For physicians there is vital need to reconcile the prescribed regimen and what a patient is actually taking and to understand there is a difference between the two. Non-involvement of patients in the treatment decision-making process

leads to non-adherence to anti-hypertensive medication. Also provision of care by multiple physicians leads to non-adherence to anti-hypertensive medication.

This study found a significant association between low adherence to anti-hypertensive medication and lack of involvement of respondents in treatment decision-making process. This study also found, there was a significant association between low adherence to anti-hypertensive medication and provision of care by multiple physicians. These findings are consistent with finding in another study (Brown & Bussell, 2011) which showed that lack of patient participation in medication decision-making affects adherence. Therefore more involvement of patients in the medication regimen decision-making process should be considered by treating physicians and discourage the use of multiple physicians.

Pharmacists can use several methods or strategies to help patients improve their adherence to medication regimens. Acquisition of anti-hypertensive drug coupled with adherence to regimen counseling are some of the strategies used by knowledgeable pharmacists to promote adherence among their patients. This study found out that, buying of anti-hypertensive drugs from different source was significantly associated with low adherence to anti-hypertensive medication regimen. It also found that, lack of adherence counseling by pharmacists was significantly associated with low adherence to anti-hypertensive medication regimen. These findings are consistent with findings in other studies (Haynes et al 2002; McDonald et al 2002).

Also, lack of discussion on quality of anti-hypertensive drugs with the pharmacists was significantly associated with low adherence to anti-hypertensive medication regimen. (P-value <0.001). From field experience cheaper and inferior quality drugs proved

ineffective in controlling hypertension among troops. Therefore this goes to support the suggestion by troops that, the institution should provide them with the necessary high quality anti-hypertensive drugs. In addition knowledgeable pharmacists could be encouraged to handle group adherence counselling sessions for troops.

An earlier study showed that adequate control of hypertension was associated with taking at least 80% of the prescribed drugs (Haynes et al, 1976). The Patients' inability to perceive a benefit from the use of anti-hypertensive therapy removes a powerful stimulus for adherence. This study found a high proportion of stage 2 hypertension among the hypertensive troops .Though 89% of participants claimed to know about the long term benefits of taking anti-hypertensive drugs non-adherence among them was as high as 64%.

Patients who do not take enough of their medications to control their blood pressure effectively are vulnerable to long term consequences of uncontrolled hypertension, which include an increased risk of acute myocardial infarction (Jambedu, 2006). Poor adherence to anti-hypertensive medication has an increased risk of death (Horowitz et al, 1990). The high proportion of stage 2 hypertension coupled with the high level of anti-hypertensive medication non-adherence found in this study poses a high risk of target organ damages, myocardial infarction and cerebro-vascular accident to troops. In 1989, Maronde et al reported that non-adherence was 18% more for those readmitted to hospital, compared to those not readmitted. Hence the Ghana Armed forces and the United Nations will continue grappling with the health and economic effects of anti-hypertensive medication regimen non-adherence if it is not reduced.

For example the United Nations Organization deploys a lot of resources including logistic, human and financial in mitigating the long term complications of uncontrolled hypertension secondary to anti-hypertensive medication non-adherence among peace-keepers on the field. The Ghana Armed Forces also spends a large portion of the Military medical budget in off-setting bills for haemodialysis, for its officers who had chronic renal failure as a result of anti-hypertensive medication non-adherence.

Although 83.2% of respondents knew of the existence of the claims system, more than half (62.9%) of them never made claims for purchased drugs due to the bureaucracy involved in the claims process. This is supported by the fact that more than 66% of respondents found the claims system cumbersome and more than 75% of them felt the claims process should be reviewed. The majority suggested that the institution should provide the needed drugs in order to avoid buying and claiming of money for purchased drugs.

Field experience showed that the majority of hypertensive personnel carry with them drugs of questionable quality and efficacy which is often proven because of their ineffectiveness in management of their hypertension on the field. Some have to use their per diem to purchase very expensive but needed drugs on the field. They have to do out-of-pocket purchase of drugs, enough to cover them for at least seven months, even though the tour of duty is six months because there may be unforeseen delays in their rotations. As a result some personnel usually prefer buying cheaper drugs with questionable origin, quality and efficacy, probably due to the economic hardships cited by 55.3% of respondents. Some studies concluded that increasing cost- sharing, negatively impacts on adherence (Chernew, Shah, Wegh, et al 2008; Yoon & Ettner, 2009)

The demographic characteristics and their subgroups that may contribute to medication non-adherence were not significantly associated with adherence level in this study. This is in agreement with findings in other studies that indicated that factors such as level of intelligence, memory, personality traits, age, and level of education do not contribute substantially to non-adherence. Similarly, conflicting results have been reported for demographic variables such as age groups, gender, race/ethnicity or educational background. These factors have not been very useful in identifying non-compliant patients (Jambedu, 2006; Stergachis, 1998).

Time frame available for presentation of dissertation did not permit enough data collection for the adherence study, so as to meet the required minimum sample size of 385 participants in order to achieve internal validity. Therefore the findings of this study cannot be generalized but can serve as a baseline for future reference.

CHAPTER SIX

6.0 CONCLUSION

The prevalence of hypertension among Ghanaian UN peacekeepers in this study was 30.00% with a mean systolic blood pressure of 173.23 and standard deviation of ± 17.81 . They also had a mean diastolic blood pressure of 104.18 and standard deviation of ± 11.83 .

The proportion of hypertensive troops in the above 40 years age groups consistently stood above 50% with potential health and economic implications.

The majority of the hypertensive troops (86.6%) had both stage 2 systolic and stage 2 diastolic hypertension. Clearly a lack of adherence to medication will lead to long-term hypertension-related complications, coupled with their health and economic effects.

Increasing age and BMI were significantly associated with increasing blood pressure.

Non-adherence level was extremely high, because 98.4% of participants showed either medium or low adherence.

Knowledge and rank of participants were strongly associated with adherence and the seniors were four times more likely to adhere to their anti-hypertensive drugs compared to their juniors.

Forgetfulness was the main reason given by participants for non-adherence.

Sexual dysfunction stood prominently among the adverse effects of anti-hypertensive drugs, experienced by participants.

Hypertensive troops with duration of diagnosis between 1 – 5 years were significantly associated with low adherence and mainly consisted of the younger age groups of the study population who are four times more likely not to adhere to their anti-hypertensive medication regimen.

Institutional factors such as lack of involvement of hypertensive troops in the decision-making concerning their anti-hypertensive medication regimen, use of multiple care providers, lack of adherence counseling and purchasing drugs from multiple sources were found to be significantly linked with low adherence.

The opinion of hypertensive troops clearly showed that, the Instituted Claims System for purchased drugs needs modification and the majority preferred being provided with the needed drugs by the Institution.

6.1 Recommendations

The aim of this study was to suggest appropriate interventions to enhance anti-hypertensive medication adherence among troops serving on UN peacekeeping missions. The following recommendations if taken into consideration will enhance adherence among troops on the field and at home:

Since knowledge showed a very significant association with adherence level, robust interventional education programs targeting all age groups need to be developed by the military health authority coupled with Higher Command playing a proactive role. The interventional education programs on adherence should focus mainly on the health and economic benefits to be gained by troops on anti-hypertensive medications.

Though the participants are physically active, the targeted education programs should be directed towards life-style such as consumption of unhealthy diet, alcohol abuse and tobacco use as well as stress management due to the stressful nature of their jobs. This will enhance primary prevention of hypertension among the younger age groups who are more than four times less likely to adhere to their anti-hypertensive medication regimen compared to their seniors.

Nearly two-thirds (64%) of troops on anti-hypertensive drugs, who ever experienced any side effects, cited sexual dysfunction as drug-related adverse effect. So prescribers should be mindful of this fact and avoid as much as possible drugs that have this undesirable effect.

The suggestion by the majority, for the institution to supply them with the appropriate required drugs should be given due consideration by the Armed Forces Higher command.

Provision of long-acting drugs to reduce dose frequency may enhance adherence. Tying the timing of medication regimen to daily activities and putting the drugs in places where they can easily be visible, coupled with the involvement of family members as monitors may help reduce medication non-adherence attributed to forgetfulness.

Encouraging the participation of patients in the decision-making process concerning their anti-hypertensive medication regimen and discouraging the provision of care by multiple physicians may improve adherence.

The provision of anti-hypertensive drugs from the same source coupled with adherence counselling by a multi-disciplinary team, may also improve adherence among troops.

Reducing anti-hypertensive medication regimen non-adherence among troops will save both the Ghana Armed Forces and the United Nations Organization a huge cost. Hence considerable commitments and efforts in this regard are very necessary.

This study may serve as a baseline study for other studies. The adherence study needs a greater sample size to achieve internal validity.

A longitudinal study is therefore recommended among recruited service personnel in order to ascertain the incidence rate of hypertension in the Ghana Armed Forces.

REFERENCES

- Aadil N, Houti E. I, Moussamih S. Drug intake during Ramadan. *BMJ*. Oct 2, 2004; 329(7469): 778–782
- Addo J, Smeeth L, Leon D.A. Hypertension in Sub-Saharan Africa A Systematic Review 2007;50:1012-1018.)
- Ambaw A.D, Alemie G.A, Yohannes S.M & Mengesha ZB Adherence to Anti-hypertensive treatment and associated factors among patients on follow-up at University of Gondar Hospital, North West Ethiopia. *BMC Public Health* 2012, **12**:282 doi:10.1186/1471-2458-12-282
- Ashna D.K, Shran K.W, Lee J.L, Stedmans M. and Chodhry N. A systematic review of Adherence to cardiovascular medications in Resource limited setting. *J Gen Intern Med* DOI: 10.1007/s11606-011-1825-3© Society of General Internal Medicine 2011
- Barron AJ, Zaman N, Cole GD, et al. Systematic review of genuine versus spurious side-effects of beta-blockers in heart failure using placebo control: recommendations for patient information. *Int J Cardiol*. 2013 Jun 21. pii: S0167-5273(13)00996-0. doi: 10.1016/j.ijcard.2013.05.068.
- Benner J.S, Glynn R.J, Mogun H. Long-term persistence in use of statin therapy in elderly patients. *JAMA*. **288**: 455 – 461, 2002.
- Bosu WK. Epidemic of hypertension in Ghana: a systematic review. *BMC Public Health*. 2010; 10:418.
- Brown M.T. & Bussell J.K. Medication Adherence Who Cares.Mayo Clin Proc. 2011 April; 86(4): 304–314. doi: 10.4065/mcp.2010.0575PMCID: PMC3068890
- Buabeng K.O., Matowe L., & Plange-Rhule J. Unaffordable drug prices: A major cause of non-compliance with hypertension medication in Ghana, 2004.*J Pharm Phamaceut Sc*. **7(3)**: 350 – 352.
- Chernew ME, Shah MR, Wegh A, et al. Impact of decreasing copayments on medication adherence within a disease management environment. *Health Aff (Millwood)*. 2008;27(1):103–112.
- Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL, Jr.,. The seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: The JNC 7 Report .*JAMA* 2003;289:2560-72. **PR**
- Claxton AJ, Cramer J, Pierce C. A systematic review of the association between dose regimens and medications compliance .*Clin Therapeutics*. 2001; **23**: 1296 – 1310.

- Col N, Fanale JE, Kronholm P. The role of medication noncompliance and adverse drug reactions in hospitalization of the elderly. *Arch Intern Med.* 1990; **150**: 841-845
- Cramer JA, Mattson RH, Prevey ML, Scheyer RD, Ouellette VL. How often is medication taken as prescribed? A novel assessment technique. *JAMA.* 1989; **261**: 3273 – 3277.
- Darkwa T. E. (2011) The Prevalence of Hypertension in Ghana Army. A Case Study of the 5th Battalion of Infantry Burma Camp Accra. School of Public Health Reference Library, University of Ghana Legon
- Duong M, Piroth L, Grappin M. Evaluation of the Patients on antiretroviral regimens. *HIV Clin Trials.* 2001; **2**: 128 – 135.
- Dzudie A, Kengne AP, Muna WF, et al. Prevalence, awareness, treatment and control of hypertension in a self-selected sub-Saharan African urban population: a cross-sectional study. *BMJ Open.* 2012; **2**: e001217.
- Eselin J. L, Carter BL. Hypertension and Left Ventricular Hypertrophy: is drug therapy beneficial? *Pharmacotherapy* 1994. (Impact Factor: 2.31). 01/1994; **14**(1):60-88. DOI: 10.1002/j.1875-9114.1994.tb02790.x
- Felkey BG. Adherence screening and monitoring. *Am Pharm.* **NS35**:42 – 51.
- Feuzeu L, Kengne AP, Balkau B, et al. Ten-year change in blood pressure levels and prevalence of hypertension in urban and rural Cameroon. *J Epidemiol Community Health.* 2010; **64**:360–365.
- Garfield FB, Caro JJ. Achieving patient buy-in and long term compliance with anti-hypertensive treatment. *Dis Manage Health Outcomes.* 2000; **7**: 13 – 20.
- Gottlieb H. Medication non-adherence: finding solutions to a costly medical problem. *Drug Benefit Trends.* 2000; **12**:57 – 62.
- Grover SA, Lowensteyn I, Kaouache M, Marchand S, Coupal L, DeCarolis E, Zoccoli J, Defoy I. The prevalence of erectile dysfunction in the primary care setting: importance of risk factors for diabetes and vascular disease. *Arch Intern Med.* 2006; **166**(2):213–219. [[PubMed](#)]
- Haynes RB Taylor DW, Sacket DL Determinants of compliance: the diseases and the mechanics of treatment. In: eds. Compliance in Healthcare. *Baltimore.Md: The John Hopkins University Press; 1979*: 49 – 62
- Haynes RB, McDonald H, Garg AX, Montague P. Interventions for helping patients to follow prescriptions for medications. *Cochrane Database Syst Rev.* 2002; **(2)** *CD 000011*.
- Horwitz R.I Viscoli R.M. Donaldson C.M, Murray C.J., Ransohoff D.F Berkman, L., Treatment adherence and risk of death after a myocardial infarction. *The Lancet*, Volume 336, Issue 8714, Pages 542 - 545, 1 September 1990.

- Jackevicius CA, Mamdani M, Tu JV. Adherence with statin therapy in elderly patients with and without acute coronary syndromes. *JAMA*. 2002; **288**: 462 – 467.
- Jambedu H.A. Adherence to Anti-Hypertensive Medication Regimens among Patients attending the G.P.H.A. hospital in Takoradi - Ghana. October 2006. A Thesis submitted to the Department of Clinical and Social Pharmacy, Kwame Nkrumah University of Science and Technology in partial fulfillment of the requirements for the degree of MASTERS OF SCIENCE Faculty of Pharmacy and Pharmaceutical Sciences College of Health Sciences
- Khan M, Shah S. & Hameed T. (2014) Barriers to and Determinants of Medication Adherence among Hypertensive Patients attended National Health Service Hospital Sunderland. *Journal of Pharmacy & Bioallied Sciences* 6(2) 104 – 108. Doi: 104103/0975 – 7406 .129175.
- Khor GL. Cardiovascular epidemiology in the Asia-Pacific region. *Asia Pac J Clin Nutr*. 2001;10:76–80.
- Kingue et al, Prevalence and Risk Factors of Hypertension in Urban Areas of Cameroon: A Nationwide Population-Based Cross-Sectional Study 2015; *J Clin Hypertens (Greenwich)*. 2015:819–824. DOI: [10.1111/jch.12604](https://doi.org/10.1111/jch.12604). © 2015 Wiley Periodicals, Inc.
- Kretchy Irene Mawuena Akwo; Biopsychosocial Determinants of Medication Non-Adherence among Hypertensive Patients. A Thesis submitted in Fulfilment of the requirements for the Degree of Doctor of Philosophy 2014.
- Kretchy I. Owusu-Daaku F. Danquah S. Spiritual and religious beliefs: do they matter In the medication adherence behaviour of hypertensive patients? *Biopsychosoc Med*. 2013; 7: 15. doi: 10.1186/1751-0759-7-15 PMID: PMC3854617
- Irene Akwo Kretchy, Frances Thelma Owusu-Daaku, Samuel Danquah. Locus of control and anti-hypertensive medication adherence in Ghana. *Pan Afr Med J*. 2014;17(Supp 1):13
- Kostis JB, Kim HJ, Rusnak J, Casale T, Kaplan A, Corren J, Levy E. Incidence and characteristics of angioedema associated with enalapril. *Arch Intern Med*. 2005;165(14):1637.
- MacMahon S, Peto R, Cutler J, Collins R, Sorlie P, Neaton J, Abbott R, Godwin J, Dyer A, Stamler J. Blood Pressure, Stroke and Coronary heart diseases. Part I: Prolonged Differences in blood pressure: Prospective observational studies corrected for the regression dilution bias. *Lancet* 1990; **335** (8692):765-74.
- Maronde RF Chan LS, Larson FG, Strandberg LR, Laventurier MF, Sullivan SR. . Underutilization of antihypertensive drugs and associated hospitalization. *Med Care*. 1989; **27**: 1159 – 1166.

- McDonald HP, Garg AX, Haynes RB. Interventions to enhance patient adherence to medication prescriptions: scientific review. *JAMA*.2002; **288**: 2868 – 2879.
- Meichenbaum D, Turk DC (1987). Facilitating Treatment Adherence. A Practitioner's Guidebook. NY: Plenum Press; 1987; **20**.
- Merck Manual. **17th** Edition. (1999). 1629-35.
- Morisky DE, Green LW, Levine DM. Concurrent and predictive validity of a self-reported Measure of medication adherence. *Med Care*.1986; **24**: 67 – 74.
- Munger MA, Tassell BWV, La Fleur J. Medication Non-Adherence: An unrecognized Cardiovascular Risk Factor. *Med Gen Med*. 2007; 9(3): 58. Published online 2007 September 19. PMID: PMC2100116
- Nichols – English G, Poirier S. Optimizing adherence to pharmaceutical care plans. *J Am Pharm. Assn*. 2000; **40**: 475 – 485
- Non-compliance with medication Regimens. An Economic Tragedy .Emerging Issues in Pharmaceutical Cost Containing. Washington, DC: National Pharmaceutical Council; 1992: 1 – 16.
- Passarelli M.CG, Jacob-Filho W and Figueras A.Adverse Drug Reaction in an Elderly Hospitalised Population. Inappropriate Prescription a Leading Cause.2005*
- Plange-Rhule J., Phillips R., Acheampong J.W. (1999).Hypertension in renal failure in Ghana1.*J Hum Hypert*.**3**:37 – 40
- Pobee O.M.J. National high blood pressure education programme working group report on hypertension and diseases in Ghana. (1994) 23: 145.
- Psaty BM, Koepsell TD, Wagner EH. The relative risk of incident coronary heart disease associated with recently stopping the use of beta-blockers. *JAMA*.1990; **263**:1653-1
- Roth HP, Caron HS.Accuracy of doctor's estimates and patients' statements on adherence to a drug regimen. *Clin Phaarmacol Ther*. 1978; 361 – 370.
- Schweizer RT, Rovelli M, Palmeri D. Noncompliance in organ transplant recipients. *Transplantation*.1990; **49**: 374 – 377.
- Seedat YK. Recommendations for hypertension in sub-Saharan Africa. *Cardiovasc J S Afr*. 2004;15:157–158.)
- Steiner JF, Prochazka AV. The assessment of refill compliance using pharmacy records: methods, validity, and applications *J Clin Epidemiol*. 1997; **50**: 105 – 116.
- Stephenson BJ, Rowe BH, Haynes RB, et al. Is this patient taking the treatment as prescribed? *JAMA*.1993; **269**: 2779 – 2981.

- Stergachis A IMPACT: Improving Patients Compliance with Medication Regimens. *US Pharmacist*. 1998; (Suppl): 1 – 16.
- Tamuno Igbiks, Fadare Joseph. Drug treatment for hypertension in tertiary Health Care Facility in Northern Nigeria. *Int J Pharm Biomed Res* 2011, 2(2), 104-109
- Twagirumukiza M, De Bacquer D, Kips JG, de Backer G, Stichele RV & Van Bortel LM. Current and projected prevalence of arterial hypertension in sub-Saharan Africa by sex, age and habitat: an estimate from population studies. *J Hypertens*. 2011; 29(7): 1243-1252.
- Vorster H.H. The emergence of cardiovascular disease during urbanization of Africans. *Public Health Nutr*. 2002;5:239 –243.)
- Weiden PJ, Zygmunt A. Medication noncompliance in Schizophrenia: part 1, assessment. *J Prac Psych Behav Health*. 1997, 106 – 110.
- World Health Organization (WHO). (2013) *A Global Brief on Hypertension: Silent Killer, Global Public Health Crisis* <http://www.thehealthwell.info/node/466541>
- Yoon J, Ettner SL. Cost sharing and adherence to antihypertensives for low and high adherers. *Am J Manag Care*. 2009;15(11):833–840

APPENDIX I

RESEARCH QUESTIONNAIRE

QUESTIONNAIRE FOR KNOWN HYPERTENSIVES ON MEDICATION(S)

- 1. NUMBER:**
- 2. AGE:**
- 3. SEX: MALE/ FEMALE**
- 4. RANK: JUNIOR NCO/ SENIOR NCO / OFFICER**
- 5. MARITAL STATUS: SINGLE/ MARRIED / DIVORCED**
- 6. FAMILY SIZE: SMALL/ LARGE**
- 7. RELIGION: CHRISTIAN/ MOSLEM/ OTHERS**

A) MOTIVATION

Q1. Do you ever forget to take your medicine? YES(1) / NO(0)

Q2. Are you careless at times about taking your medicine? YES(1) / NO(0)

**Q3. Sometimes do you forget to buy your prescribed medicine on time? YES(1) /
NO(0)**

B) KNOWLEGE

Q4. Sometimes if you feel worse when you take your medicine, do you stop taking it?

YES(1) / NO(0)

Q5. Do you know the long-term benefit of taking your medicine as you were told by your doctor or pharmacist? YES(1) / NO(0)

Q6. When you feel better do you sometimes stop taking your medicine? YES(1) / NO(0)

TOTAL

SCORE:

A).....B).....

REASONS FOR NON-ADHERENCE

Q7. If you ever missed taking your medication(s) what was/were the reason(s)?

- a. Forgetfulness**
- b. I do not think I have a serious disease**
- c. I do not believe my medication is helpful**
- d. I believe in divine intervention**
- e. Actual and perceived side effects of drugs**

f. I do not trust efficacy of drugs

C) DURATION AND COMPLEXITY OF MEDICATION

Q8. How long have you been diagnosed to be hypertensive?

a. Less than one year b. More than one year c. More than 5 years

Q9. Are you on medications for other illness(es) apart from hypertension?

YES(1) / NO(0)

Q10. How many types of drugs are you taking in all?

a. One b. Two c. More than two

D) ADVERSE DRUG-CONTRIBUTORY FACTORS TO NON-ADHERENCE

Q11. Which related side effects of your medications have you ever experienced?

a) Sexual dysfunction

b) Generalized weakness

c) Headache

d) Dizziness

e) Allergic reaction

f) None

**Q12. Do you often discuss your medication regimen with your physician? YES(1)
/ NO(0)**

Q13. Do you often change your physicians? YES(1) / NO(0)

Q14. Do you always buy your drugs from the same pharmacy? YES(1) / NO(0)

**Q15. Do you often discuss the best brand of your drugs with the pharmacist before
buying? YES / NO**

E) ASSESSMENT OF CURRENT REFUND SYSTEM

**Q16. Do you know Ghana Armed Forces has an institutionalized claims system for
purchased drugs? YES(1) / NO(0)**

Q17. Have you ever claimed money for purchased drugs? YES(1) / NO(0)

Q18. If yes, is the procedure for claims cumbersome? YES(1) / NO(0)

Q19. Does it take too long for claims to be paid? YES(1) / NO(0)

Q20. Do you think the claims system is helpful? YES(1) / NO(0)

Q21. Do you think the current claims system should be changed? YES(1) / NO(0)

Q22. If yes, then how?

a. I feel drugs should always be made available to avoid buying and claiming

b. I think the procedure for claims could be made simpler

- c. I think the duration for payment of claims should be shorten to a couple of weeks

Q23. Does the cost of your medications cause you and your family economic hardships?

YES(1) / NO(0)

Q24. Do you sometimes use the money available to you for other financial commitments instead of buying your drugs? YES(1) / NO(0)

Do you often wait for claims to be paid before buying your drugs? YES(1) / NO(0)

You indicated that you are taking medication for your “high blood pressure”. Individuals have identified several issues regarding their medication-taking behavior and we are interested in your experiences. There is no right or wrong answer.

Please answer each question based on your personal experience with your high blood pressure medication.

Interviewers may self- identify regarding difficulties they may experience concerning medication-taking behavior. (Please circle the correct number) No=0

Yes=1

1. Do you sometimes forget to take your [health concern] pills? YES (1) /NO (0)

2. People sometimes miss taking their medications for reasons other than forgetting.

Thinking over the past two weeks, were there any days when you did not take your high blood pressure medicine? YES (1) / NO (0)

3. Have you ever cut back or stopped taking your medication without telling your doctor, because you felt worse when you took it? YES (1) / NO (0)

4. When you travel or leave home, do you sometimes forget to bring along your anti-hypertensive medication? YES (1) / NO (0)

5. Did you take your anti-hypertensive medicine yesterday? YES (1) / NO (0)

6. When you feel like your hypertension is under control, do you sometimes stop taking your medicine? YES (1) / NO (0)

7. Taking medication every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your blood pressure treatment plan? YES (1) / NO (0)

8. How often do you have difficulty remembering to take all your medications?

(Please circle the correct number) Never/Rarely.....0

Once in a while.....1

Sometimes.....2

Usually.....3

All the time.....4

TOTAL SCORE:

APPENDIX II
CONSENT FORM

Title of research: Medication Non-adherence among Ghanaian UN Peace Keepers.

INTRODUCTION

NAME OF RESEARCHER: Dr. F.H. Attipoe

ADDRESS : Public Health Division

Accra-Ghana

CONTACT NUMBER : 00233244835918 / 0232960423

PURPOSE OF STUDY

1. To estimate hypertension burden and assess level of medication non-adherence among UN-Ghanaian Peace-Keepers on the field.
2. To use outcome of study to make recommendation to the Armed Forces health authorities in the particular and to higher command in general.

BENEFITS OF STUDY

This is an on-going study since 2009 and outcome recommendations may benefit participants personally or collectively, directly, through implementation.

RISK AND DISCOMFORTS

The study poses no direct risk to participants, though some may find some of the questions uncomfortable to answer and may choose not to answer them or answer them as honestly as possible.

CONFIDENTIALITY

The study is purely scientific research not designed to put any participant at risk of discrimination or punishment. Confidentiality is assured as anonymity is strictly required where by participants are not required to write down their names or service numbers.

EXCLUSION CRITERIA

1. Anyone who has participated once before
2. Anyone who find the study unimportant
3. Anyone who feels being coerced to participate

PARTICIPANT'S SIGNATURE:

DATE:

APPENDIX III: ETHICAL CLEARANCE

GHANA HEALTH SERVICE ETHICAL REVIEW COMMITTEE

*In case of reply the
number and date of this
letter should be quoted*

*My Ref: GHS-ERC/3
Your Ref: No*



Research & Development Division
Ghana Health Service
P. O. Box 583 Accra
Accra
Tel: +233 302-681199
Fax: +233-302-675771
Email: Researchanddev@ghsnet.org

10th June, 2014

Dr. Erislein Hope Antipoo,
School of Public Health
University of Ghana
Legon

ETHICAL APPROVAL - ID NO: GHS-ERC/14/04/14

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

"Medication Non-Adherence among Ghanaian UN-Peacekeepers"

This approval requires that you inform the Ethical Review Committee (ERC) when the study begins and provide Mid-term reports of the study to the Ethical Review Committee (ERC) for continuous review. The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Please note that any modification without ERC approval is rendered invalid.

You are also required to report all serious adverse events related to this study to the ERC within seven days verbally and fourteen days in writing.

You are requested to submit a final report on the study to assure the ERC that the project was implemented as per approved protocol. You are also to inform the ERC and your sponsor before any publication of the research findings.

Please always quote the protocol identification number in all future correspondence in relation to this approved protocol.

SIGNED
DR. CYNTHIA BANNERMAN
(GHS-ERC VICE CHAIRPERSON)

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