

GHANA COLLEGE OF PHYSICIANS AND SURGEONS

FACULTY OF FAMILY MEDICINE

**ASSOCIATION BETWEEN FAMILY RESOURCES AND DRUG ADHERENCE
IN HYPERTENSIVE MANAGEMENT AT THE CHRONIC CARE CLINIC OF
KOMFO ANOKYE TEACHING HOSPITAL**

**SUBMITTED TO THE FACULTY OF FAMILY MEDICINE, IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR THE CONFERMENT OF A
FELLOW OF THE GHANA COLLEGE OF PHYSICIANS (FGCP)**

DR CONSTANCE AFRA OPOKU
FM/04/17/001/F

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DECLARATION

I hereby declare that this research report is my original work and has not been previously published or used for any degrees or diplomas in the past. To the best of my knowledge, this body of text contains no material previously published except as acknowledged in the text.

A handwritten signature in black ink, appearing to read 'A. Opoku', is shown within a light blue rectangular box.

Dr Constance A. Opoku

Signed 25/10/2021

CERTIFICATION PAGE

This is to certify that this research was conducted by Dr Constance Afra Opoku and has been reviewed by the underlisted supervisors for submission in partial fulfillment for the attainment of a fellowship in Family Medicine with the Ghana College of Physicians and Surgeons



Dr Kathryn Spangenberg, FGCP (FamMed)
Signed 25/10/2021



Dr Akye Essuman, FGCP (FamMed)
Signed 25/10/2021

.



Dr Emmanuel Ati, FGCP (FamMed)
Signed 25/10/2021

.

DEDICATION

This work is dedicated to Mrs. Dora Afua Bota Opoku.

You got it done!

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It has taken a team to bring this work to fruition and I first would like to acknowledge the Almighty God for bringing me further than I ever believed I could go.

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STRUCTURED ABSTRACT

Introduction

Hypertension is the commonest risk factor for cardiovascular diseases which is currently the leading cause of death globally. Of the almost 1.4 billion people with hypertension worldwide, 71.4% (one billion) are found in low and middle-income countries (LMIC) with the WHO Africa region having the highest current prevalence of hypertension.

One of the strongest pillars in the multifactorial approach to the management of hypertension is improving medication adherence to antihypertensives. It is imperative that innovative ways be sought to achieve this goal among health practitioners and especially Family Physicians who aim to provide comprehensive care for any pathology including hypertension.

Even though there is information on social determinants of health and their influence on medication adherence and hypertension, little is known about the effect of family resources on medication adherence in hypertension and consequently blood pressure control.

Aim

To determine the relationship between Family Resources and Medication Adherence in patients with essential hypertension

Materials and Methods

This was a cross-sectional study carried out at the Chronic Care Clinic of the Family Medicine Directorate at the Komfo Anokye Teaching Hospital. Systematic sampling was used to select 110 patients with essential hypertension attending the clinic. Patients were administered a questionnaire which incorporated the Morisky 8 adherence Scale, the SCREEM questionnaire for measuring family resources and general demographic data.

Medical records of the patients were also assessed to obtain current and previous blood pressure control records. The information obtained was entered into epi-info, cleaned and transferred into STATA statistical software (Version 15). Basic demographic

data and frequencies were extracted following which Chi square analysis and Fisher exact tests were conducted and multivariate regression performed on specific variables to assess relevant relationships. The results of the analysed data were then presented as frequencies in tables and charts.

Results

A total of 110 patients with essential hypertension were enrolled in this study majority of whom were female (94, 85.5%), Christian (102, 92.7%), married (54, 49.1%) had basic education (84, 76.4%) and had uncontrolled blood pressure (65, 59.1%).

Adequate family resources were reported by most respondents (85, 77.3%) with religious resources most reported as being available (89.1%) while the least available resource was economic (30.9%). The results also showed that married participants were more likely to have adequate family resources ($p = 0.04$) and Christians were more likely to report adequate social resources ($p = 0.04$).

Majority of participants self-reported medium or high adherence to their antihypertensive medication (68.2%), however participant demographics had no influence on medication adherence or blood pressure control.

Conclusion

The most available family resource was the religious resource with the least available resource being economic. Self-reported medication adherence was found to be adequate in majority of respondents, with 68.2% of respondents reporting either medium or adequate medication adherence.

No association was found between family resources and medication adherence among respondents. It is imperative that further research be conducted to establish how to harness religious resources in the improvement of medication adherence.

It is also recommended that other objective adherence measuring tools be used to assess for possible relationships between family resources and medication adherence in the control of essential hypertension.

Keywords: Family Resources, Essential Hypertension, Medication Adherence, SCREEM

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LIST OF ABBREVIATIONS

ACC	American College of Cardiology
ACE	Angiotensin Converting Enzyme
AIDS	Acquired Immune Deficiency Syndrome
ADA	American Diabetes Association
AHA	American Heart Association
APGAR	Adaptation, Partnership, Growth, Affection, Resolve
ARB	Angiotensin II Receptor Blockers
ASH	American Society of Hypertension
BBB	Blood Brain Barrier
BMI	Body Mass Index
BMQ	Brief Medication Questionnaire
BP	Blood Pressure
CCB	Calcium Channel Blocker
CCC	Chronic Care Clinic
CDC	Center for Disease Control
CVA	Cerebrovascular Accident
CVDs	Cardiovascular Diseases
DAI	Drug Attitude Inventory
DASH	Dietary Approaches to Stop Hypertension
DoD	Department of Defense
DOTS	Directly Observed Treatment Short-Course
EMR	Electronic Medical Record
ESC	European Society of Cardiology
ESH	European Society of Hypertension
FIRM	Family Inventory of Resources for Management
FRS	Family Resource Scale
GDHS	Ghana Demographic and Health Survey
GDP	Gross Domestic Product

GHS	Ghana Health Service
GSS	Ghana Statistical Service
HIV	Human Immunodeficiency Virus
HOT	Hypertension Optimal Trial
ID	Identification
IRB	Institutional Review Board
JNC	Joint National Committee
KATH	Komfo Anokye Teaching Hospital
KATH-IRB	KATH Institutional Review Board
KATH-R&D	KATH Research and Development Unit
LHIMS	Lightwave Health Information Management System
LMIC	Low and Middle-Income countries
MAQ	Medication Adherence Questionnaire
MARS	Medication Adherence Report Scale
MDGs	Millennium Development Goals
MI	Myocardial Infarction
MMAS	Morisky Medication Adherence Scale
MMAS-4	MMAS 4 - Item Questionnaire
MMAS-8	MMAS 8 - Item Questionnaire
NCDs	Non-Communicable Diseases
NHBPEP	National High Blood Pressure Educational Programme
NHIS	National Health Insurance Scheme
NHLBI	National Heart Lung and Blood Institute
NPHRL	National Public Health Reference Laboratory
NSAIDs	Nonsteroidal Anti- Inflammatory Drugs
OPD	Out-Patient Department
PURE	Prospective Urban Rural Epidemiology
R&D	Research and Development
SCREEM	Social, Cultural, Religious, Economic, Educational, Medical

SCREEM-RES	SCREEM Based Family Resource Survey
SDGs	Sustainable Development Goals
SEAMS	Self-Efficacy for Appropriate Medication Use Scale
SSNIT	Social Security and National Insurance Trust
TIA	Transient Ischaemic Attack
UKPDS	UK Prospective Diabetic Study
UN	United Nations
VA	Department of Veterans Affairs
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

Non-communicable diseases (NCDs) are the leading cause of mortality globally¹ and of all conditions that are categorized as NCDs, hypertension is ranked as a top cause of NCD related mortality.²

Following a global push to reduce morbidity and mortality resulting from hypertension,³ efforts have been mobilized in the medical fraternity to combat this public health scourge. In the developing world which faces the double burden of disease, the resultant impact of hypertension is excessive stress on already fragile health systems.^{4,5}

In an attempt to combat what is projected to be a worsening public health problem, the United Nations (UN) strategic plan which replaced the Millennium Development Goals (MDGs), i.e. the Sustainable Development Goals (SDGs) intends to reduce by a third, premature deaths from hypertension by 2030 using preventive and treatment methods.³

In an all-hands-on deck approach, member countries of the UN are using age old and innovative interventions to meet the SDGs target to assuage the burden of hypertension. These interventions include education, regular screening and the establishment of hypertension clinics among others.

Family Physicians are often at the forefront of tackling diseases of public health concern and are uniquely positioned to analyse and propose solutions to health problems as they often consider patients in the context of a family.⁶

Clinical tools unique to Family Physicians enabling them to analyse patients in the context of a family have previously been used to study problems like childhood cancer,⁷ patient-centred care⁸ and intimate partner violence⁹ among others. In the non-family medicine medical fraternity, social influencers of health have been used to assess hypertension and there is significant data from one of the critical determinants of hypertension control which is medication adherence.¹⁰

Available research on medication adherence in the management of hypertension has mostly focussed on the general effects of social factors in influencing adherence and this has been used as part of the multipronged strategy to positively influence adherence to medication in people with hypertension.¹¹

Conversely, there has been very little work done on using family medicine tools to assess the influence of the family on medication adherence in the control of hypertension as well as its complications.

This dearth of data offers an excellent opportunity for Family Physicians to insert themselves in a unique way as contributors to the global effort to impact work on hypertension management. A study on the association between family resources and drug adherence in essential hypertension management thus sits well with the global goal of reducing overall morbidity and mortality from hypertension. The unique perspective of the Family Physician especially in the developing world can only bode well for hypertension and medication adherence research and play a role in determining where emphasis should be placed in the allocation of often scarce health resources.

1.2 PROBLEM STATEMENT

One of the major challenges in the control of hypertension is poor medication adherence, which by extension increases the rates of morbidity and mortality. Not only does good medication adherence improve the lives of people with hypertension,¹² it directly results in the reduction of hypertension related complications which is expected to directly contribute to the third sustainable development goal (SDG) that aims to reduce by a third the number of premature deaths from non-communicable diseases among which hypertension ranks high.³

Even though poor medication adherence to hypertensive treatment is a global challenge,¹¹ the problem is worse in developing economies when compared to the developed world¹³ with evidence of increasing medication adherence in the developed world while the opposite is true for countries in sub-Saharan Africa.¹⁴ In context, medication non-adherence has been documented to be as high as 66.7% in Ghana and Nigeria¹⁵ which are both rapidly urbanizing countries in sub-Saharan Africa whereas

similar studies in the USA found medication non-adherence rates to be as low as 14.2%.¹⁶

Taking this into account, as well as the fact that most patients in developing economies have families within which they function, it is important that Family Physicians gather more information on the effect of resources available to hypertensive patients by virtue of being in a family. It is also necessary that determinations on how to harness family resources to improve the critically important rate of medication adherence among patients be made. This is the premise on which questions were formulated for this body of work.

1.3 RESEARCH QUESTIONS

1. What are the family resources available to patients with essential hypertension?
2. How well do patients with essential hypertension adhere to their medication?
3. Is there any relationship between the available family resources and medication adherence to antihypertensive medication?

1.4 HYPOTHESIS

Null Hypothesis: Family resources have no association with medication adherence of patients with essential hypertension.

Alternate Hypothesis: Patients with more family resources will be more adherent to their antihypertensive medication.

1.5 RATIONALE FOR THE STUDY

The figures for cardiovascular diseases (CVDs) remain unacceptably high worldwide with developing countries having more than their fair share of CVDs morbidity and mortality.¹⁷ Major risk factors for CVDs include untreated hypertension and poorly treated hypertension. Hypertension is close to endemic in most developing countries¹⁸ and remains among the top causes of hospital attendance and causes of morbidity and mortality in Komfo Anokye Teaching Hospital (KATH).¹⁹ The long-term nature of treatment for hypertension lends itself to medication default which invariably leads to complications. This adds to the burden of CVD morbidity and mortality. Drug adherence is thus considered vital in the management of hypertension.²⁰

A number of factors affect adherence to medication especially in the management of chronic conditions like hypertension.²¹ Family Medicine emphasizes the important role of the family in health outcomes of the individual and is able to measure the functionality of a family with the family Adaptation, Partnership, Growth, Affection, Resolve (APGAR) tool and assess family provided resources that translate into the individual attainment of health goals⁷ using the Social, Cultural, Religious, Economic, Educational and Medical Based Family Resource Survey (SCREEM-RES).

A study that assessed the effect of family resources in the management of childhood cancers established the importance of available family resources in health outcomes⁷. This study seeks to assess family resources in patients being managed for essential hypertension while assessing their rates of medication adherence juxtaposed with objective blood pressure measurements. It also seeks to ascertain the influence of the different categories of family resources on the promotion of drug adherence as a component of essential hypertension management.

1.6 AIMS AND OBJECTIVES.

The main objective of this study was to assess the association between family resources and medication adherence in patients with essential hypertension seen at the Chronic Care Clinic, Komfo Anokye Teaching Hospital, Kumasi.

Specific Objectives were:

1. To assess the family resources available to the study population.
2. To determine the rates of adherence to medication in patients with essential hypertension.
3. To determine the relationship between family resources and adherence to medication.

CHAPTER TWO

LITERATURE REVIEW

2.1 OVERVIEW OF HYPERTENSION

Hypertension is defined as office systolic blood pressure of $\geq 140\text{mmHg}$ and/or diastolic blood pressure $\geq 90\text{mmHg}$.²² Blood pressure of $140/90\text{mmHg}$ or higher is the most important risk factor for the development of cardiovascular events²³ and has thus been described as a public health menace by the World Health Organization (WHO).²³ Hypertension is seen in all ages and across genders and is usually categorized depending on the stage of life it occurs or the underlying cause.²⁴

Due to the fact that globally, cardiovascular pathology is a major cause of morbidity and mortality,²⁴ hypertension control remains as a top global health focus. The World Health Assembly in 2012 set a goal of reducing high blood pressure prevalence by 25% by the year 2025 as part of the greater **outcome** of reducing premature deaths from non-communicable diseases by 25% within the same period.²⁵

Currently, hypertension remains a major public health challenge with current global estimates of prevalence set between 972 million and 1.34 billion people.^{23,26,27} Equally alarming is the fact that prevalence figures have risen steadily from 594 million (all adults) from 1975 to 1.13 billion in 2015²⁸ with an expected rise to 1.56 billion in 2025.²⁹

Out of the non-communicable diseases which are currently responsible for 68% of deaths worldwide, hypertension is the most modifiable condition.³⁰ This is exemplified by the fact that a reduction of 10mmHg in systolic blood pressure will reduce the likelihood of development of a cerebrovascular accident (CVA) by as much as 20%, coronary heart disease by 17% and all-cause mortality by 13%.³¹

As the leading risk factor for cardiovascular morbidity and mortality and the leading preventable cause of death worldwide³², the effects of hypertension significantly reduce a person's quality of life.

Premature deaths from hypertension are often from cardiovascular effects, kidney failure, strokes and ischaemic heart disease which on their own cause significant

morbidity and mortality.³² To put that in perspective, strokes for instance is the second major cause of death and disability worldwide with 13 million new cases annually³³ and the decade between 2018 and 2028 is expected to see a 17% prevalence rise in the already alarming number of persons with hypertension.³⁴

Following the loss of the protective effect of sex hormones in menopause,³⁵ there is minimal gender disparity in the prevalence of hypertension with the number of males affected being estimated to be between 659-730 million while the number of women with hypertension are estimated to be between 660-727 million.³²

In countries with less resourced health care systems, a greater prevalence of hypertension in women.³² has been found when compared to men, however men were also more likely to remain undiagnosed and thus untreated. In these same countries, even when diagnosed, men were more likely to have uncontrolled blood pressure levels when compared with women.³⁶ This data is associated with a blood pressure control rate of both sexes being about 9% and the observed gender disparities are attributed to inadequately resourced health systems.³²

Conversely, high income countries with better resourced health systems have shown higher prevalence of hypertension in men.³⁷ Ghana's prevalence of hypertension mimics that of the African region³⁸ and locally, hypertension is a major cause of morbidity and mortality among the population.³⁹ Prevalence of hypertension in Ghana has been rising over the past few decades aided by a rapidly urbanizing society and its inevitable strain on general health.⁴⁰

2.2 TYPES OF HYPERTENSION

A common way of classifying hypertension is as either essential or secondary hypertension⁴¹ Essential hypertension forms majority (95%)⁴² of all cases of hypertension seen in adults and is said to occur when there is sustained elevated systolic blood pressure $\geq 140\text{mmHg}$ and/or diastolic blood pressure $\geq 90\text{mmHg}$ with no determined aetiology.⁴³

Essential hypertension typically occurs in the second half of life and is also known as primary or idiopathic hypertension.⁴³ Even though aetiology for essential hypertension has not been established there are multiple associated risk factors like obesity, high alcohol intake, high salt intake, ageing, sedentary lifestyles, stress, low potassium intake as well as low calcium intake.⁴⁴

Secondary hypertension occurs when the rise in blood pressure can be attributed to a particular or an identifiable cause.⁴¹ A significant cause of secondary hypertension especially in children is kidney disease.⁴⁵ In the broad sense, kidney involvement usually means impaired excretion of sodium and water leading to hypertension. Individual renal causes however have different pathways that lead to blood pressure control.

The common causes of nephropathy include conditions like diabetes, polycystic disease, renovascular disease, tubulointerstitial nephritis and glomerulonephritis.²⁴ It is to be noted that when present, hypertension worsens kidney disease leading to a vicious morbid cycle. Elevated renin levels have also been implicated in renal causes of hypertension.

A second cause of secondary hypertension is from underlying endocrine conditions. Examples of these are Acromegaly, Cushing's syndrome, Adrenal hyperplasia, Conn's syndrome and Pheochromocytoma. Common drugs that cause secondary hypertension include corticosteroids, nonsteroidal anti-inflammatory drugs (NSAIDs) and oestrogens which are normally used in birth control.⁴⁶

Another less common but major cardiovascular cause of hypertension in children is coarctation of the aorta.⁴⁵

As opposed to secondary hypertension, essential hypertension occurs when no particular cause of the hypertension is identified. Essential hypertension tends to be associated with a number of risk factors, forefront being increasing age.⁴⁷ Even though the mechanism of action is not fully known in essential hypertension, a number of possible theories have been proposed that include increased cardiac output, increased peripheral resistance from structural changes to the blood vessels as well as atherosclerosis, narrowing of the vascular lumen and endothelial dysfunction. Other risk factors for essential hypertension are obesity, family history, black race, physical inactivity as well as a high sodium diet and a low potassium diet.²³

Uncontrolled hypertension in pregnancy can often result in fatal consequences and may be as a result of pre-existing essential or secondary hypertension before pregnancy occurs, or elevated blood pressure after the initiation of pregnancy. The common pathological pathway often involves uterine and placenta circulation which unchecked can cause eclampsia.⁴⁸ Hypertension in pregnancy is a leading cause of prenatal and maternal mortality.⁴⁸ A number of risk factors are associated with hypertension in pregnancy include nulliparity, advanced maternal age, chronic kidney disease, high body mass index, assisted reproduction, multiple pregnancy, systemic lupus erythematosus or combinations of these risk factors.⁴⁸

2.3 REGIONAL DISPARITIES IN HYPERTENSION

The World bank classifies global regions based on income. High income countries are classified into one region while low and middle - income countries are classified into six geographical regions.⁴⁹ Using these categories, the age standardized prevalence of hypertension is higher in low and middle-income countries at 31.5% when compared to high income countries which is pegged at 28.5%.³²

The obvious global disparity in the prevalence of hypertension is largely as a result of inequity in hypertensive awareness, treatment options and control measures.³² At the beginning of 2010 it was estimated that there was a 27.3-29.7% prevalence of hypertension in high income countries which is remarkably lower than the 30.2-32.9% prevalence reported in low and middle income countries.³²

Of the over a billion people living with hypertension in 2010, almost three times the number prevalent in high income countries were found in low and middle income countries³² with the highest absolute burden being on people between the ages of 40 – 59,³² an age category which are some of the most productive in any population.

The global increase in non-communicable diseases in general and hypertension in particular has demonstrated a stark contrast in progression over the years when comparing low income and high income economies.³² This is exemplified by a

decreasing prevalence in hypertension of 2.6% in high income countries as against a 7.7% increase in hypertensive prevalence in low and middle-income countries between 2000 and 2010.³²

The decade starting in 2010 has not seen much of an improvement for low and middle - income countries as the highest prevalence of hypertension for men moved to central Asia while that for women was in sub-Saharan Africa.³² At the same time, the lowest prevalence of hypertension for men was in South Asia while that for women was identified in high-income economies.³²

Prevalence of hypertension has also increased in East Asia and Pacific, Latin America and the Caribbean, South Asia and sub-Saharan Africa for both men and women with the evident brunt of disease highly felt in low and middle-income countries.³²

The greatest absolute burden of hypertension defined as the deaths and loss of health due to a disease/condition is in the East Asia and Pacific regions with 4.39 million people directly affected whereas the middle east and Northern Africa now has the lowest absolute burden.³²

Similarly, the greatest increase in absolute burden of hypertension has been observed in the East Asia and Pacific region, South Asia and also in sub-Sharan Africa.³² These regions have had increases not just in hypertensive prevalence but in population leading to greater barriers to holistic health care provision. Healthcare provider shortages on the provider level and educational problems on the patient level are but a few of the barriers to prevention and control leading to the observed increases in the absolute burden of hypertension in middle and low income economies.³⁰

Based on the Prospective Urban Rural Epidemiology (PURE) study which reported higher levels of awareness, treatment and control of hypertension in high income countries when compared to low and middle income countries,³² projections for the future prevalence of hypertension are not positive for low and middle - income countries. Contributors to this expected negative trend include lack of access to care, costly medication, overburdened health care providers, lack of treatment guidelines, poor adherence, low patient health literacy and adverse side effects.³²

2.4 HYPERTENSION IN AFRICA

In Africa, a quarter of all men and a fifth of all women have hypertension and the WHO African region reports hypertensive prevalence to be 27%,²³ which is the highest in the world.²³ A trend of increasing hypertension prevalence in Africa is one that has been largely seen in the past few decades.^{50,51} Other studies have pegged pooled prevalence of hypertension in Africa as high as 30.8% with values for sub-Saharan Africa between 30-31.1%.¹⁸ These grim statistics translate into hypertension being the leading cause of cardiovascular disease deaths in Africa and systolic blood pressure being the leading risk factor for death on the continent for older adults.¹⁸

In 2016, ten percent of all deaths in Africa were caused by hypertension, which reflects a startling 82% increase since 1990.¹⁸ Half of all first-time acute strokes in Africa are caused by systolic hypertension and hypertension also takes credit as the leading driver of cardiovascular disease deaths in Africa.¹⁸ These figures are expected to worsen as cardiovascular diseases are projected to double in sub-Saharan Africa by 2030.^{52,53}

The high prevalence of hypertension in Africa has led to hypertensive complications being one of the commonest causes of medical admissions in African hospitals.¹⁸ In addition to cardiovascular complications, another challenge among elderly Africans is the fact that hypertension is a potentially modifiable risk factor for dementia, and when unchecked adds to age related morbidity.¹⁸

On the other side of the age spectrum, Africa's relatively young population augurs well for the various economies on the continent, but as the leading WHO region in adult hypertension prevalence,⁵⁴ the potential havoc of hypertensive complications on its young populace undercuts this advantage especially since a lot of patients with hypertension remain unaware of their diagnosis and even after diagnosis do not adhere to the necessary treatment.^{50,55}

The average age of hypertensive patients in Africa is lower than found in the west³⁰ resulting in the often disastrous impact of strokes and hypertensive heart disease in a young and otherwise economically productive population.³⁰ In sub-Saharan Africa, only about 27% of hypertensives are aware of their diagnosis with 18% receiving treatment while on average only about 7% of diagnosed patients with hypertension have good blood pressure control.⁵⁵

This situation, if unchecked, is expected to worsen. Current forecasts are expectant of an even higher prevalence of hypertension for the WHO African region²⁷ in the foreseeable future. Contributing to this expected rise, is the fact that sub-Saharan Africa like most developing economies share challenges such as inadequate screening programmes, unaffordable health care, poor availability of the right information on hypertension among patients and health care professionals, as well as poor medication adherence among patients.⁵⁶

2.5 HYPERTENSION IN GHANA

In Ghana, like most sub-Saharan countries, hypertensive prevalence has increased steadily over the past few decades. A recent meta-analysis indicates pooled hypertensive prevalence in the country at 27%,³⁸ putting national prevalence of hypertension on par with prevalence on the continent⁵⁷ and greater than prevalence in high - income economies like USA and Canada.⁵⁸ To add to this, an estimated 83% of people with hypertension in Ghana are undiagnosed⁵⁸ and 87% remain untreated.⁵⁸

Region specific studies targeting rural and urban regions in Ghana have found prevalence rates higher than the national average with rural areas having an average prevalence of 19% and urban prevalence pegged at 48%.²⁷

Nationally though, prevalence of hypertension has a slightly greater number in females (13.4%) than in males (12.1%).³⁹

The increase in prevalence of hypertension in Ghana has mirrored the trend towards urbanization considering the association of urbanization with increasing obesity, lack of exercise and poor diet which are considered risk factors contributing to worsening cardiovascular morbidity and mortality.³⁹

Like a lot of countries in Africa, Ghana has a fair share of institutional challenges. Geographically, numerical disparities exist between the health labor force in urban and rural areas.³⁹ Additionally, the ongoing battle of infections in Ghana also creates an uneven distribution of health resources with a health care budget

overwhelmingly favoring infectious disease control leaving very limited resources for non-communicable diseases like hypertension.⁵⁹ Combined with uncoordinated healthcare and inconsistent medication supply among others, the above stated challenges account for the consequent shortfall in cardiovascular disease management.³⁹

The most comprehensive study on hypertensive prevalence in Ghana till date has been the study by the government of Ghana in conjunction with the Ghana Statistical Service (GSS), the Ghana Health Service (GHS) and the National Public Health Reference Laboratory (NPHRL).³⁹ In this study, specialized data was collected on blood pressure in the 2014 Ghana Demographic and Health Survey (GDHS) which sought to assess hypertension in Ghanaians with the overall objective of creating strategies to stem the expected increasing prevalence as well as reduce the current disease burden in the country.³⁹ It is from this study that the prevalence of 13.1% was obtained.

Other results of this study showed a positive correlation of hypertension with advancing age, being formerly married, having a higher wealth status, living in Western, Central and Brong Ahafo regions, being covered by the National Health Insurance Scheme (NHIS) and visiting a health facility over the past 6 months before the survey.³⁹

2.5.1 HYPERTENSION IN THE ASHANTI REGION

The Ashanti region is one of 16 regions in Ghana and the third largest region based on land mass.⁶⁰ It is the most populated region in Ghana with 6 million inhabitants³⁹ and has 16 districts. The Kumasi metropolis is the most populated district in the Ashanti Region with over 2 million inhabitants. The urban-rural ratio in Ashanti region is about 1.5:1 giving a fair representation of hypertension in the country.

According to the Ghana health service, hypertension has consistently been in the top ten causes of out-patient department (OPD) attendance in the Ashanti region since 2012.⁶¹ Per the latest published figures from the service, hypertension currently ranks at number 5 on the list of out-patient conditions.⁶² The impact of hypertension has been determined to be more profound in the rural areas of the Ashanti region as compared to the urban areas.

By region, Ashanti has the highest male prevalence of hypertension in Ghana and the second highest female prevalence.⁶¹

Gender prevalence also contradicting national values as male prevalence of hypertension in the region is 18.1% while female prevalence is lower at 15.3%.³⁹

2.5.2 HYPERTENSION IN KATH

Out-patient attendance due to hypertension in the Ashanti region has also shown a steady increase since 2012.⁶³ Komfo Anokye Teaching Hospital (KATH), which is the largest hospital in the region and the second largest hospital in Ghana, currently lists hypertension as the leading cause of Out-Patient attendance. The public health unit of the Komfo Anokye Teaching hospital (KATH) recorded 786 new cases in hypertension in 2019 with 60% of these cases being female.¹⁹ These figures are reflected in hypertension being the number one cause of admission at KATH, and the 5th highest cause of mortality.¹⁹

Unsurprisingly, hypertensive disorders in pregnancy are currently the commonest cause of maternal mortality in the hospital.¹⁹ In the Family Medicine directorate of KATH, hypertension was the number one reason for out-patient attendance in 2019 with hypertensive complications being the number one cause of admission on the Family Medicine ward and also the number one cause of mortality.¹⁹

The fact that this trend has been consistent over the last decade with no signs of abatement, remains concerning⁶³ and on this basis, there remains a critical need to put in all necessary measures to stem the rise in hypertension and its complications.

2.6 HYPERTENSION MANAGEMENT

Management of hypertension is both pharmacological and non-pharmacological²² and optimized blood pressure control can only be achieved by utilizing both approaches to management.⁶⁴

Regardless of the cause of hypertension, its management is usually dictated by different guidelines which are provided by a variety of health organizations and are followed based on the dictates of local medical authorities.

Commonly used guidelines include those provided by the European Society of Hypertension (ESH) together with the European Society of Cardiology (ESC) providing the ESH/ESC guidelines in 2013,⁶⁵ guidelines by the Seventh Report of the Joint National Committee (JNC 7) on Prevention, Detection, Evaluation and Treatment of high blood pressure in 2003⁶⁶ and those provided by the American Heart Association (AHA), American College of Cardiology (ACC) and American Society of Hypertension (ASH) who together provide the AHA/ACC/ASH guidelines.

The American College of Cardiology (ACC), together with the Center for disease control and prevention (CDC) released guidelines on Hypertensive management initially in 2014 with a latest version in 2017 which is considered by the National Heart Lung and Blood Institute (NHLBI) to be the sequel to the JNC7 guidelines.⁶⁷ There has also been an Eighth Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of high blood pressure (JNC 8) released in 2014.⁶⁸

2.6.1 JOINT NATIONAL COMMITTEE GUIDELINES

In 1972, the United States National Heart Lung and Blood Institute (NHLBI) of the National Institute of Health (NIH) formed the National High Blood Pressure Educational Program (NHBPEP).⁶⁹ The ultimate goal of NHBPEP was to provide education on blood pressure control to health care professionals, patients and the general public in an effort to reduce morbidity and mortality from hypertension.

The NHBPEP eventually became responsible for coordinating a corporation of multiple professional and state agencies. One of the ways NHBPEP fulfilled its mandate was by creating the Joint National Committee on Detection, Evaluation and Treatment of high blood pressure (JNC). The JNC was a synergy of multiple bodies being coordinated by NHBPEP to identify segments of the population with hypertension as well as the proportion of people with hypertension who would be helped by antihypertensive medication and the right antihypertensives regimen to institute.

Between 1977 and 2014, eight reports have been issued by the JNC. The JNC reports have managed to make accessible current guidelines on hypertension and its management as well as simplify treatment regimens for clinicians. The very first report (JNC 1), was released in 1977 and suggested 24 drugs for the management of hypertension. JNC 7 on the other hand suggested 120 possible drugs for the control of hypertension and was 108 pages long.⁶⁹ JNC7 and JNC8 are the last 2 reports of the committee and these guidelines have been associated with significant improvement in hypertensive management outcomes. This is largely due to the guidelines being reflective of more accurate data.

Currently, the Chronic Care Clinic of the Family Medicine Directorate of KATH uses the JNC guidelines in the management of hypertension.

2.6.2 JNC 7 GUIDELINES

From the first to the seventh JNC reports, the guidelines released were based on consensus from the multiple organizations of NHBPEP. JNC 7 was produced after consensus from 39 professional organizations and 7 federal agencies.⁶⁹ JNC 7 recategorized hypertension into normal i.e. systolic blood pressure (BP) <120mmHg and <80mmHg diastolic blood pressure, pre-hypertension which is systolic blood pressure of 120-139mmHg and diastolic pressure of 80mmHg-89mmHg.

One of the reasons for the recategorization of hypertension was to place a greater emphasis on identifying prehypertension and strengthen preventive measures.⁶⁹ JNC 7 also set lower thresholds for blood pressure control in patients with diabetes as well as patients with chronic kidney disease.

Depending on the indication, first line antihypertensive therapy listed by JNC7 include calcium channel blockers, thiazide diuretics, beta blockers, angiotensin converting enzyme inhibitors, angiotensin receptor blockers and aldosterone antagonists.

Lifestyle modification guidelines are also part of JNC 7 and include weight reduction, DASH (dietary approaches to stop hypertension) diet, moderate alcohol consumption, dietary sodium restriction and aerobic physical activity.⁶⁹

2.6.3 JNC8 GUIDELINES

The Eighth JNC report released in 2014 took into consideration the genetic variation in response to various classes of antihypertensives especially among black people.

JNC 8 was meant to answer questions about the relationship between health outcomes and specific blood pressure values and also to assess if there would be differences in health outcomes depending on the type of antihypertensive used.⁶⁴

Based on the results of the Hypertension Optimal Trial (HOT) and the UK Prospective Diabetic Study (UKPDS trial),^{47,70} JNC8 increased the target blood pressure for patients with diabetes older than 18 to 140/90.⁷¹ The report also increased the target blood pressure for patients aged 60 and above with the recommendation that pharmacotherapy be initiated at a BP of greater than 150/90mmHg in persons 60 years and above. Loosening of the target blood pressure in patients older than 60 was based on the results of a Cochrane review which showed a reduced benefit when antihypertensive medication was initiated at blood pressure levels less than 150/90mmHg in the elderly.⁷²

Another departure from JNC7 recommendations was the removal of beta blockers as a first line drug for the treatment of hypertension. This update was based on meta-analysis that indicating beta blockers had reduced efficacy while increasing the chances of strokes in the elderly.⁷³

Based on moderate evidence, options for first line treatment for non-black patients per JNC 8 guidelines are thiazide diuretics, calcium channel blockers, angiotensin converting enzyme inhibitors and angiotensin receptor blockers.⁷¹

In black patients with uncomplicated hypertension, calcium channel blockers and thiazide diuretics are the recommended drugs for first line treatment.⁷³ Another recommendation was that treatment regimens for non-black populations or patients with chronic kidney disease are to include angiotensin converting enzyme inhibitors.⁷³

JNC 8 recommendations for initial therapy in the management of uncomplicated hypertension are to start a single agent for one month after which a second agent is to be added and after another month, a third agent in the absence of control.⁷¹

The eighth report of JNC unlike the seventh report, did not have consensus among committee members. It marked the first JNC report not to have been sanctioned by the

American Society of Hypertension, the American Heart Association and the American college of cardiology. Five of the 17 panel members disagreed on the decision to initiate antihypertensive therapy in patients above age 60 at a blood pressure of 150/90mmgh.

These members provided evidence through a dissenting opinion that it was more beneficial to keep management of blood pressure at 140/90mmHg in elderly persons.^{74,75} Other groups who criticized the new recommendations by JNC8 include the association of black cardiologists and the working group on women's cardiovascular health who both believe that raising the threshold at which blood pressure was to be controlled did not bode well for elderly blacks or elderly women.⁷⁶

The dissenting opinion also considered the total elimination of beta blockers as a first line drug extreme especially in patients younger than 60years.⁷⁷

There has also been some disagreement with the removal of beta blockers as first line medication in the management of hypertension.

The dissenting opinions written in response to the release of JNC8⁷⁸ coincided with alternative guidelines for the management of hypertension which are now being used by medical groups who previously adhered strictly to the JNC recommendations.⁶⁷ A summary of commonly used hypertensive management guidelines are tabulated below.[Table 2.1]

Table 2.1 Guidelines for the Management of Hypertension

Organization ^a	Year	Population	Target blood pressure
Seventh Report of the Joint national committee on prevention, detection, evaluation and treatment	2003	Adults excluding diabetics and those with chronic kidney disease.	<140/90mmhg

^a Table continued on next page

Organization ^a	Year	Population	Target blood pressure
of high blood pressure (JNC 7)		Adults with diabetes or chronic kidney disease	<130/80mmhg
Eight Report of the Joint National Committee on prevention, detection, evaluation and treatment of High blood pressure	2014	Adults older than age 60 and less than 18 who are diabetic or have chronic kidney disease.	<140/90mmgh
		Adults without diabetes or CKD who are 60 years or more	<150/90mmgh
European Society of hypertension/European Society of Cardiology (ESH/ECS)	2013	All adults excluding those with diabetes.	Less than or equal to 140-150mmhg systolic.
		Adults with diabetes	<85mmhg diastolic
American heart association/American College of Cardiology/American Society of Hypertension (AHA/ACC/ASH)	2015	Adults >80 years	<150/90mmgh
		Adults with hypertension and	<140/90mmgh

Organization ^a	Year	Population	Target blood pressure
		Coronary Artery Disease alone	
		Adults with MI, stroke, TIA, carotid artery disease, peripheral artery disease or abdominal aneurysm	<130/80mmgh
American Heart ^b Association/American College of Cardiology (ACC)/Centers for Disease Control and Prevention (AHA/ACC/CDC)	2014	All Adults	<140/90mmhg
American College of Cardiology/American heart Association (ACC/AHA)	2017	All adults	<130/80mmhg
American Society of Hypertension/International Society of Hypertension (ASH/ISH).	2014	Adults 18-79 years	<140/90mmhg or <130/80 in younger adults <150/90mmgh

^b Table continued on next page

Organization ^a	Year	Population	Target blood pressure
		Greater than or equal to age 80	
Department of Veterans Affairs/Department of Defense (VA/DoD)	2014	All Adults	<150/90mmgh or <150/85mmhg
American Diabetes Association (ADA)	2016	Diabetic Adults	<140/90mmgh Consider <130/80mmgh in younger adults
American Diabetes Association (ADA)	2017	Diabetic adults	<140/90mmgh For high risk for cardiovascular consider <130/80mmgh

2.6.4 PHARMACOTHERAPY IN HYPERTENSION

Medication for hypertension are varied with at least 10 classes of drugs available for use depending on guidelines, comorbidity and tolerance.⁷⁵ Commonly available classes of antihypertensives include diuretics, calcium channel blockers, angiotensin converting enzyme inhibitors, angiotensin II receptor blockers, vasodilators, aldosterone receptor antagonists, alpha 2 adrenergic agonists, renin inhibitors, endothelial receptor blockers and alpha blockers.

Common first line antihypertensives include:

1. Calcium Channel Blockers (CCBs)

Calcium Channel blockers (CCBs) are a group of drugs that work by blocking the entry of calcium into cells which are voltage dependent.⁷⁹ Cells of the coronary artery, peripheral arteries and the heart have the benefit of this action. With the reduction of calcium entry into cells, there is not only a reduction in the intracellular calcium concentration but also in muscle contractility. This leads to relaxation of blood vessels causing vasodilatation and in the case of the non-dihydropyridines calcium channel blockers, a reduction in the rate and contractility of the heart.⁷⁹

Common side effects of calcium channel blockers are constipation, headaches, dizziness, flushing, oedema and nausea with more serious side effects being congestive cardiac failure, atrioventricular blockade and sinus node depression.⁷⁹

The first generation of calcium channel agents include nifedipine, verapamil and diltiazem but they tend to be limited in use due to their short acting nature and associated side effects. Second and third generations of calcium channel blockers include manidipine, felodipine, nicardipine and amlodipine⁸⁰ and these have a better selectivity and thus better pharmacodynamics than the first generation calcium channel blockers.

Calcium channel blockers have been proven to effectively control grade I hypertension and are currently recommended by a number of guidelines as the first line treatment for black people with hypertension, elderly people with hypertension who have isolated systolic hypertension, people with hypertension who have metabolic syndrome, left ventricular hypertrophy, peripheral artery disease and a history of stroke to name a few.⁸¹

When used as monotherapy, CCBs have shown effectiveness in the reduction of renal complications and cardiovascular events in multiple clinical setting studies and are considered superior when compared to diuretics or beta blockers in the control of hypertension.⁷⁵

2. Diuretics

Diuretics are a group of drugs that function primarily by causing the kidneys to eliminate fluid from the body.⁸² Thiazide diuretics are a sub class of diuretics currently

used as first line treatment for hypertension. They normally function in the proximal part of the distal convoluted tubule where a significant amount of dilution of urine takes place.⁸³ These diuretics block the transport of sodium chloride transport resulting in moderate sodium excretion.

With continuous use, thiazide diuretics lead to a reduction in blood volume, cardiac output and a consequent reduction in vascular resistance.⁸³ Though there are unclear aspects of the mechanism of action of thiazide diuretics, it has been suggested that they cause an inhibition of the sympathetic nervous system, the renin angiotensin system or both.⁸³

Examples of thiazide diuretics include hydrochlorothiazide, chlorothiazide, epitizide, bendroflumethiazide, methyclothiazide and polythiazide.

Thiazide diuretics perform optimally at low doses and have increased side effects when given in high doses. Common side effects of thiazide diuretics include hypokalemia, impaired glucose tolerance, increased serum cholesterol and increased uric acid levels.

It is to be noted that in combination with beta blockers, intake of thiazide diuretics raise the possibility of developing diabetes.⁸³ Common side effects of diuretics are often mediated by variations in ethnicity, gender and age and are considered one of the first line drugs in a number of guidelines.⁸³

3. Beta Blockers

Beta blockers are drugs with varied mechanisms of action and ultimately work by blocking receptor sites for adrenalin and norepinephrine.⁸⁴ One mechanism of action of beta blockers is the lowering of cardiac output resulting in the reduction of blood pressure. Reduction of the activity of the baroreflex system causing an increase in vascular resistance has also been suggested as a possible mechanism of action as well as lowering of the central sympathetic activity with a resultant reduction in vascular tone, renin secretion and a subsequent reduction in the release of norepinephrine.⁸⁵

Beta blockers are classified as vasodilating, exemplified by celiprolol and nebivolol and non-vasodilating e.g. atenolol and metoprolol.⁸² There has been

disagreement on whether or not beta blockers are to be used as first line therapy in the management of hypertension with a systematic review suggesting that they should not be considered as first line therapy.⁸⁴ In comparison with other antihypertensives, beta blockers are less protective against strokes and total cardiovascular events.⁸⁶

Side effects of beta blockers include hallucinations, insomnia and depression, though these occur most frequently with lipid soluble beta blockers like propranolol and metoprolol which easily penetrate the blood brain barrier (BBB).

Impotence has also been noted as a side effect although it happens more often with non-vasodilating beta blockers.⁸²

4. Angiotensin Converting Enzyme (ACE) Inhibitors

Angiotensin Converting Enzyme (ACE) Inhibitors were first discovered in 1981 with the discovery of captopril. As a class of drugs, they act on the renin-angiotensin aldosterone system.⁸⁷ ACE inhibitors primarily block the conversion of angiotensin I to angiotensin II.

Since angiotensin II causes vasoconstriction, sympathetic activation as well as sodium and water retention, inhibiting its formation leads to a decrease in blood pressure. ACE inhibitors also block the breakdown of bradykinin, a potent vasodilator which acts by producing nitric oxide,⁸⁷ leading to a doubling effect in the reduction of blood pressure when ACE inhibitors are used, a feature not shared by angiotensin receptor blockers.⁸⁸ There are non-ACE paths which lead to some production of angiotensin II thus there is not a total blockade when using ACE-I⁸⁷ and ACE-I's also act by non-selective inhibition of angiotensin receptors.

Apart from its regular use in hypertensive management, ACE-I's are also typically used in heart failure, hypertension, diabetes, coronary artery disease and chronic kidney disease.⁸⁷

Numerous guidelines including those proposed by JNC, consider ACE inhibitors as first line therapy in the management of hypertension. The prevention of bradykinin breakdown which is advantageous in lowering blood pressure however has the disadvantage of causing cough and angioedema.⁸⁷

ACE-I mediated cough has been noted to have an increased rate among Asians (about three times its occurrence in Caucasians)⁸⁹ while the resultant angioedema tends to be higher in blacks with a study of US autopsy reports giving a high case fatality rate among blacks with angioedema from ACE inhibitors.⁹⁰ On account of this, and together with the fact that the effect of ACE-inhibitors in blacks is diminished, ACE -I's are usually not recommended as the first line of treatment of hypertension in black people.⁸⁹

Due to the comparable mechanism of action of ACE-I's with angiotensin receptor II blockers (ARBs), ARBs are often used as replacements due to less side effects.⁸⁴

It is worth noting that there has not been a difference between how well ACE- I and ARBs control blood pressure and how they both prevent cardiovascular events like myocardial infarctions, heart failure, strokes and renal disease.⁸⁸

5. Angiotensin II Receptor Blockers

Angiotensin receptor blockers (ARBs) were initially discovered in the 1990's and primarily function by binding to the angiotensin II receptors (AT₁) resulting in the inhibition of angiotensin II.⁹¹ Angiotensin II has multiple effects including but not limited to vasoconstriction, mitogenic activity, reactive oxygen species formation, cytokine production and aldosterone production; all of which play a role in the elevation of blood pressure.⁹¹

Angiotensin II is also involved in arteriolar contraction as one of the pathways in the development of hypertension.⁸³ Unlike ACE inhibitors, Angiotensin receptor blockers do not inhibit the breakdown of bradykinin which causes the common side effect of cough seen in ACE inhibitor use.⁹²

Some angiotensin receptor blockers are used in the management of heart failure like candesartan, irbesartan and losartan and generally have higher tolerability⁹³ than ACE receptors. Unique ARBs have been shown to have other positive side effects like the improvement of glucose metabolism which is seen with the use of Telmisartan and the reduction of uric acid seen when losartan is used.^{94,95} ARBs are tolerated extremely well when used alone or in combination with other antihypertensives which lends itself to daily dosing, a further source of convenience for patients.⁹⁶ Side effects of ARBs include

hyperkalemia, headaches, dizziness and flushing, other rarely reported side effects are nasal congestion and renal failure.⁸²

2.7 SOCIAL DETERMINANTS OF HYPERTENSION

As observed with most pathology, hypertension is affected by factors that affect a people's way of life, factors known as social determinants of health.⁹⁷

In the case of essential hypertension where an exact cause is usually not found, it is particularly important to study the mediators which influence the development of elevated blood pressure as well as what can be done about these determinants to produce positive health outcomes.⁹⁸

The list of social determinants that particularly affect hypertension include socioeconomic position, race and ethnicity, social support, culture and language, access to care, and residential/environmental factors.⁹⁹

Social determinants of hypertension can also be regrouped into psychological, behavioural and biological. Commonly, cardiovascular disease and risk factors are discussed using the latter categorization.⁹⁹ There is a paucity of data from the developing world on the effect of race and ethnicity on health, especially in the management of cardiovascular disease and most of the data that informs current recommendations are from developed countries.¹⁰⁰

2.7.1 SOCIOECONOMIC POSITION

Socioeconomic position is a determinant that encompasses a broad range of factors including but not limited to income, assets, educational attainment, employment status and occupational factors.¹⁰¹

People are usually classified as being in an advantaged or disadvantaged socioeconomic position. Those considered advantaged are people with higher educational attainment which usually translates into better occupational status as well as broader

employment options.⁹⁹ Persons with advantageous socioeconomic positions also have higher incomes, more assets and thus more wealth.⁹⁹

Socioeconomic position is affected by a multiplexity of factors and though hard to measure, it has been noticed to be related to cardiovascular outcomes. Persons with a more advantageous socioeconomic position have lower rates of cardiovascular morbidity and mortality.⁹⁹

The issue of disparity in health is also often looked at through the lens of socioeconomic positioning and people disadvantaged in this area are often at the bottom of the socioeconomic ladder in their local communities.¹⁰²

The commonest way of assessing socioeconomic position in epidemiology is by using the level of educational attainment. Higher educational attainment is linked to greater life expectancy and lower rates of cardiovascular morbidity and mortality.⁹⁹

This is easy to explain considering that people with lower educational attainment may not have the knowledge to implement health promoting behaviours like medication adherence or maintain consistent reviews with their health care provider when managing diseases in general and hypertension in particular.⁹⁹

Educational levels also often go hand in hand with critical thinking skills and educated people are more likely to approach their health care from a fact-based scientific point of view as against rumour-based remedies in their approach to healthcare. In a condition like hypertension which due to its asymptomatic nature, leaves room for scepticism when treatment options are considered.¹⁰³ There however is data that has found no significant relationship between education and hypertension.^{102,104}

Income is another critical component of socioeconomic position and similar to education, the more income a person has, the lower their morbidity and mortality when it comes to cardiovascular disease.¹⁰⁵ Although some studies have demonstrated that income has no effect on health outcomes, more data exists that indicates a significant decrease in cardiovascular mortality when family incomes are high.^{104,106}

Occupation has been shown to be a keen factor in the development of hypertension with occupants of highly placed occupational status from a societal point of view less likely to develop hypertension even though the evidence is not very strong.⁹⁹

In occupational studies, what has been determined to be true is the fact that job stability has an overall effect on health with job loss having a greater association with loss of health especially when there has been a prolonged period of unemployment or when there are problems with job stability.⁹⁹

Occupational stressors have been categorized into two; the amount of work required of an employee and the freedom to make decisions pertaining to their line of work.¹⁰⁷

Usually people in low socio economic classes tend to have heavier work- loads coupled with a limited degree of freedom.¹⁰⁷ That combination causes high occupational strain and this invariably affects health measures like blood pressure control.

Conversely, occupations which are associated with high socioeconomic groups may have a high workload but usually have associated decision making flexibility.

A combination of inadequate remuneration from an employer in the presence of a high work load and a lack of job flexibility have been shown to be associated with poorer health outcomes.¹⁰⁷

When talking about socioeconomic positioning, it is important to take a wide angled view as social deprivation in infancy is capable of affecting health in later life.⁹⁹ In the case of hypertension for instance, if there has been sustained sympathetic activity as a result of deprivation of food in childhood, there can be renal development problems which may lead to the development of hypertension in later life.¹⁰⁷ The good news however is that evidence also exists showing that upward social mobility over time has the ability to modify health parameters nullifying the expectation of poorer health outcomes.¹⁰⁶

Socioeconomic position has been used to predict health status and its assessment should be part of the holistic management of any patient.¹⁰¹ An interesting contradiction of the socioeconomic position argument is the finding by a meta-analysis that in low income countries, higher socioeconomic positioning has a greater association with the development of hypertension.¹⁰⁸ The explanation given is that persons with higher socioeconomic positions in low-income countries are more likely to lead sedentary lifestyles associated with urbanization. This association has a greater risk of access to unhealthy diets resulting in an increased likelihood of obesity,^{109,110} a trend that is more

obvious in the higher rates of hypertension observed in urban areas when compared to rural areas.¹⁰⁸

2.7.2 SOCIAL SUPPORT

Social support is yet another determinant of health with associated implications for the development of hypertension.¹¹¹

Social networks influence health primarily by influencing the behaviour of its members and determining access to resources available to members who are part of that network.¹¹²

One of the common measures of social support is marital status⁹⁹ and it has actually been found that being unmarried and without a close confidant can decrease the likelihood of survival in the aftermath of a cardiovascular complication.⁹⁹ Marriage on the other hand appears to confer a much more protective effect on men than women whereas relationships with friends are more beneficial to women when compared with men.¹¹³

The influence of a person's social network on behaviour can also not be discounted. Data currently exists showing that being friends with someone who develops obesity in a particular period of time increases significantly one's odds of developing obesity.⁹⁹

People who have a low socioeconomic status especially in low income countries have been shown to have strong family ties which are beneficial to their overall health.⁹⁹ A lot of studies on social determinants of health from developed countries focus on race with black people almost always being categorized as minorities or disadvantaged groups.¹¹⁴ The associated bias and racism faced by such groups is believed to be part of the disproportionate high levels of hypertension and recollection of negative racial encounters as well as being negatively stereotyped has been found to be associated with a rise in ambulatory blood pressure.¹¹⁵

There is a paucity of data concerning race and hypertension in countries in Africa which is unsurprising considering the phenotypic similarities across the continent.⁹⁹

Residence is a social determinant that often ties in with the social networks of an individual. This determinant often poses challenges to people with lower socioeconomic positions as they may often reside in areas with high crime, high noise and inadequate access to essential public amenities like electricity, clean water or green spaces to exercise.^{116–119}

People with lower socioeconomic positions may also be subject to environmental pollution, another factor that have been proven to be associated with elevated blood pressure.⁹⁹

Access to medical care is another important social determinant of hypertension and it consists of five components i.e. approachability, acceptability, availability and accommodation, affordability and appropriateness.¹⁰

Approachability has to do with being able to identify and utilize existing health services. In environments where screening for hypertension is available, the inability of a person or a group of people to locate and utilize that service would indicate a lack of approachability.¹⁰

Acceptability occurs when the way of life of a group of people fits into the kind of service offered. An example of a lack of acceptability occurs when a Jehovah Witness refuses blood or blood products as part of their care because it is against their religious beliefs.

Availability and accommodation have to do with the presence of physical structures that exist to provide health services which are accessible and easy to reach. A patient having to travel to a different region to access care because that is the only place he/she can receive antihypertensives indicates a lack of availability and accommodation. Similarly, a lack of access to a stroke centre in a community with high rates of hypertension is indicative of a lack of availability and accommodation.¹⁰

Affordability is present when an individual has enough economic resources to be able to get the care that they need. Affordability may be hampered by factors such as a lack of health insurance, a low income or high user fees needed to access healthcare.¹⁰

Appropriateness is what happens when a good fit occurs between services provided by a health institution and a patient's health needs that he/she is ready to fill,¹⁰

exemplified when a patient requiring admission for treatment of high blood pressure has access to a clean ward with decent amenities that he/she would otherwise have access to.

2.8 ADHERENCE IN HEALTH

Probably the most widely used definition of adherence is the one used by the World Health Organization¹²⁰ (WHO) which believes adherence to be the extent to which an individual's behavior corresponds with agreed recommendations from a health care professional.¹²⁰ Components of this behaviour include medication taking - in the context of medication adherence - following dietary counsel and lifestyle changes.

The above definition seeks to emphasize active participation of a patient who willingly agrees with the process and approach recommended by his/her health care provider as against the expectation that patients follow health dictates unwillingly.¹²⁰

The other side of the debate uses the word compliance and does not consider it inferior to the term adherence.¹²¹ Worldwide, compliance is still widely used and patients have been found to not have a difference in preference.¹²²

The school of thought that uses compliance argues that in the face of threatening health circumstances, changes are to be made depending on the direction given by physicians whether in behaviour or in the case of medication, time, quantity or frequency

Adherence to medication is thus considered to be the extent to which a person acts in accordance with the prescribed dosing intervals and doses of prescribed medications.¹²³

Increasing the effectiveness of adherence interventions may have a far greater impact on the health of the population than any improvement in specific medical treatment¹²⁴.

The above quote by the WHO is the perfect summary of why medication adherence holds such a pivotal position in health and its maintenance.

Antihypertensives which are routinely used in the management of hypertension have been found to improve blood pressure control resulting in a reduction of frequency

of complications from hypertension and their adherence are to be promoted to improve the well-being of the patient.¹²⁵

2.8.1 MEDICATION ADHERENCE

The World Health Organization (WHO) has described five dimensions of adherence. These dimensions which are indicative of factors influencing adherence include socioeconomic factors, therapy related factors, patient related factors, condition related factors and health care system related factors.¹²⁰

Socioeconomic factors that affect medication adherence are age, sex, marital status, family type, literacy, employment, family support, social support, annual income, and medical insurance.^{15,126–128}

Therapy related factors include drug regimen, treatment changes, side effects, dosing frequency and routes of administration.^{127–129}

Condition related factors include co morbid conditions, depression, quality of life, symptom and duration of hypertension.^{130–132} Health care system related factors include type of facility, waiting time, adherence counselling, patient clinician relationship, communication style, lack of team-based care, lack of knowledge, access to care as well as cost of care.^{127–129}

Patient related factors include denial of diagnosis, route of administration, perception of illness severity, perception of treatment efficacy, limited follow up, illness severity and impact of disease.^{127–129} Poor medication adherence is a complex interplay of these five dimensions.

Similar to most health disparity situations, low income countries and low income earners in high income countries tend to have lower medication adherence and thus higher proportions of complications that can potentially be forestalled by improving medication adherence.¹³²

2.8.2 SOCIOECONOMIC FACTORS OF ADHERENCE

One of the first socioeconomic factors usually considered in medication adherence is age.¹³³ Typically older patients with chronic conditions tend to be more adherent to medication but in certain circumstances, it has been discovered that middle aged patients tend to have better adherence than patients who are elderly.¹³⁴

The issue of age however is to be viewed in consideration with other social determinants of health as its role in medication adherence may not always be consistent as evidenced by a systemic review that found an inconclusive relationship between age and medication adherence.¹³⁵

Gender differences tend to dictate adherence with females more likely to adhere to medication than males. This is an unsurprising fact considering that health seeking behaviour is usually better among females.¹³⁶ In the management of hypertension for instance, males are more likely to remain undiagnosed and even after diagnosis are more likely to be non-adherent due to the higher risk-taking propensities among the male gender, a concept which is manifested in health. It is important however to consider the individual context as data exists that shows no relationship between adherence and gender.¹³⁷

Another socioeconomic determinant of adherence is educational attainment with several studies hypothesizing that patients with higher formal education are more likely to be involved in making good health decisions due to the fact that they can very easily understand and research information on their health.¹³⁸ Even though this hypothesis has been proven by some studies that assessed education and adherence,¹³⁸ other data has not found a consistent relationship between education and adherence.¹³⁹

Place of residence is also a socioeconomic influencer of medication adherence.¹⁴⁰ There usually tends to be a difference in medication adherence between people residing in urban and rural areas, with patients in urban areas more than three times as likely to adhere to chronic disease medication when compared with patients living in rural areas.¹⁴⁰ The effect of residence usually differs by geographical region with rural urban differences emphasized in developing countries whereas in the developed world the emphasis is usually between inner city dwellers and residents of the suburbs. Location has a strong association with income levels,¹⁴¹ which may account for data that links

place of residence to better medication adherence even though a systematic review and meta-analysis of data from East Africa suggests no significant relationship between location and medication adherence.¹⁴²

Monthly income is one of the critical socioeconomic factors that influence medication adherence,¹³ It is often associated with socioeconomic position and has a bearing on what a patient can and cannot afford. The implications of income in healthcare are particularly important in the developing world where subsidies from programmes such as health insurance may not be fully operational.¹⁴³

Even though patients with higher incomes have been found to be more adherent to medication,¹⁰³ there are exceptions to this rule.¹⁴⁴

Family support is also important as a socioeconomic determinant of medication adherence and can usually also be reclassified under social support.¹⁴⁵ In the management of diseases with stigma such as Acquired Immune Deficiency Syndrome (AIDS), family support tends to be invaluable to ensure good adherence considering that patients may be more reluctant to discuss their diagnosis or medication with friends.¹⁴⁶

Marital status is typically considered under family support even though there are gender-based disparities in the benefits of marriage¹¹³ and a systematic review assessing the relationship between marital status and adherence has reviewed several studies where no statistically significant relationship existed between both variables.^{122,145,147–151}

2.8.3 DISEASE RELATED FACTORS IN ADHERENCE

The disease or condition that is being considered when assessing adherence plays a very important part in predicting a patient's likelihood of adhering to their medication. Typically, acute conditions which require medication to be taken for a shorter period tends to have better medication adherence than observed in chronic conditions.¹³⁴ The presence of comorbid conditions also tends to decrease medication adherence especially in the presence of depression.¹⁵²

Co-morbid conditions, whether physical or psychosomatic, tend to increase pill burden which in a number of situations affects medication adherence negatively. Conversely, other data has found no relationship between comorbid conditions and

adherence when hypertension as a primary condition coexists with asthma, diabetes or cardiovascular disease.¹⁵³

Some studies have found a significant relationship between medication adherence and good disease control as in the case of persons with hypertension with good blood pressure control being up to three times more adherent when compared with adherence exhibited by those with hypertension with poor blood pressure control.^{147,154} The presence of symptoms, a frequent subjective measure of disease control has also been shown to cause a reduction in medication adherence as patients tend to believe that symptoms are caused by medication or that the medication has no effect.¹⁵⁵

Similar to a lot of socioeconomic influencers of adherence, mixed results exist as to the influence of disease control on medication adherence.^{150,155}

2.8.4 THERAPY RELATED FACTORS IN MEDICATION ADHERENCE

Therapy related factors have to do with the treatment being administered for disease control.¹⁵⁶ Factors like brand type, combination doses, drug properties as well as route of administration are all to be considered when assessing the influence of therapy to medication adherence.¹⁵⁶ Some patients have been shown to react poorly to drugs produced by certain manufacturers with the lack of access to the innovator drug due to prevailing economic conditions or a lack of stock.¹⁵⁷ Such patients are likely to stop taking their medication based on the side effects they may experience from these drugs with a resultant reduction in medication adherence.

Patients are also likely to have and maintain good adherence when there is a low pill count.¹⁵⁸ Reduction of the number of pills per patient is achieved by combination therapy and the physicians' consciousness of other conditions a patient may have when prescribing medication.

Chronic conditions are associated with increasing age and a greater pill count and usually the more drugs a patient has to take, the more likely it is that there will be missed doses and overall poor adherence.¹⁵⁸

Complex treatment regimens are also considered an impediment to good adherence with rigid therapies such as drugs that can only be taken after meals or only

taken at certain times of the day having a greater likelihood of generating non-compliance.¹⁵⁶ Simpler drug regimens are easier to understand and thus have a higher likelihood of being adhered to.^{156,159}

Drug changes -which may or may not be necessary- when not explained to a patient has a greater likelihood of leading to poor medication adherence.¹⁶⁰ This is often seen when a patient who has been on a particular therapy for a lengthy period of time has their medication changed. If associated education is not given, there is a greater chance that adherence will be reduced; however if the original dosing regimen is moved from a complex to a simple regimen, then it is likely that adherence will improve especially in patients with previous poor adherence.¹⁵⁹

Side effects of medication are usually one of the more common therapy related reasons affecting medication adherence.¹⁶¹ A number of patients will stop or reduce the medication that they are taking when they have negative side effects. Depending on physician access or patient attitude, side effects may or may not be reported.¹⁶¹

Reduction in adherence due to negative side effects can be anticipated and forestalled by a physician who gives appropriate pre-treatment counselling.¹⁶² When patients know what to do about side effects and are encouraged to report them early, adherence tends to not reduce. Drugs with greater side effects have been shown in the management of different diseases to cause a reduction in medication adherence and when replacement of these drugs is done with pharmaceuticals with minimal or no side effects, there is a tendency for adherence to improve.¹⁶³

2.8.5 PATIENT RELATED FACTORS IN MEDICATION ADHERENCE

Some studies classify certain socioeconomic factors as patient related¹³⁴ but in a number of medication adherence studies, factors that are related to a patient's attitude and traits are often considered as patient related factors.¹²⁹

A patient's knowledge about a disease and its treatment is of strong consideration when discussing patient related factors and it is not uncommon for a patient to believe that his/her condition will resolve after taking medication for a set period of time.¹⁶⁴ This often happens with chronic conditions like hypertension and diabetes when patients on realizing that their blood glucose levels or blood pressure levels have normalized are more likely to discontinue treatment.¹⁶⁵

Problems with adherence are also common in the management of cancers where patients may not necessarily understand the difference between remission and cure and may stop not just medication adherence but medical reviews.

Data exists showing that the more accurate information a patient has about their disease, its course and treatment, the more likely they are to adhere to the course of treatment whether it be long, short or intermittent.¹⁶⁴

Patient behaviours are also considered under patient related factors with lifestyle behaviours like alcohol and tobacco use being major influences. For instance, there is a relationship between excessive alcohol use and poor health and the use of excessive alcohol is also associated with an almost 90% reduction in medication adherence.¹⁶⁶ Alcohol use, especially in excessive doses could be pointing to underlying unhealthy coping mechanisms or unhealthy mental health states, neither of which promote medication adherence.¹⁶⁷

On the positive side, physical exercise, which is usually a personal habit is linked to positive health outcomes and beneficial in medication adherence¹⁶⁸ with patients who tend to engage in physical activity being up to six times more likely to adhere to their medication.¹⁵⁵ This is unsurprising considering the endorphin boost that physical exercise generates which translates into a healthier mental state and attitude.¹⁶⁹

A detailed history of patient habits is important and tends to be indicative of the likelihood of medication adherence.

A patient's personality type is also considered an important patient related factor affecting adherence considering that patients with neurotic personalities have been found to be less likely to adhere to their medication.¹³⁴

Forgetfulness is another patient trait that undermines adherence.¹⁷⁰ A number of chronic conditions tend to occur in the elderly and even after discounting age associated

dementia, a patient who is forgetful is unlikely to maintain good medication adherence, a situation which is considerably worsened when the forgetfulness is as a result of pathology.¹⁷¹

Another patient related factor is the coping mechanism after diagnosis of a disease requiring high levels of medication adherence.¹⁷² Coping is strongly tied to the mental state of a patient and when denial is a primary way by which someone copes with the bad news of a diagnosis, there is a higher chance that they would not adhere to the medication prescribed.¹⁷³

Denial for instance, is a common coping mechanism employed after being diagnosed with a chronic condition such as HIV. Usually, patients in denial may not take their medication or even suspend physician appointments due to the fact that they refuse to believe that such a diagnosis could be true for them.¹⁷⁴

Quality of life is another patient related factor with poor quality of life more likely to be associated with poor medication adherence.¹⁷⁵ Quality of life is often indicated by factors such as sleep patterns, appetite and social networks, all of which affect general health.¹⁷⁶ When these factors are in short supply, there usually is a concomitant reduction in medication adherence even though there is minimal data available showing a direct association between both variables.¹⁷⁷

The perceptions a patient has of a disease is also significant when considering the likelihood of that patient adhering to treatment. A lack of faith in the need for medication especially asymptomatic conditions such as hypertension,¹⁷⁸ usually leads to poorer medication adherence and when treatment scepticism is not countered by accurate patient education, resultant health outcomes will be negative. On the other hand, belief that a disease will resolve in a given period of time whether true or not, causes a greater chance of medication adherence especially over the set period.¹⁷⁸

2.8.6 HEALTH CARE SYSTEM RELATED FACTORS

Health care system relating factors have to do with the health system available to the patient. A common health care system factor especially in low and middle income countries is the distance to the hospital or health centre.¹⁴⁷ This factor equates to access

and hospital proximity making it more likely that a patient will attend and receive the necessary care and education needed for good medication adherence.¹⁴⁷ The further a hospital is from a patient, the more likely it is that adherence to medication suffers.¹⁴⁷

Distance to facility has a strong interplay with the economic situation of the patient since there usually is a higher cost of transportation associated with long distances creating financial impediments to overall care.¹⁷⁹

The availability of free medication with programmes like health insurance or disease specific programmes paid for by the government, is a significant determinant of medication adherence. Numerous studies have found improvements in medication adherence rates when medication is free.^{180,181} This is directly responsible for the success of the National Tuberculosis Program in Ghana. However, some contrasting data in some countries found that free medication led to the belief that the available drugs were substandard and thus no significant relationship between free medication and adherence was found.^{145,154,156}

Closely related to free medication is the presence of stock outs.¹⁸² This occurs when the drug prescribed by the health care provider is not available at the facility. The causes of this are multiple and includes late reimbursement of insurance funds,¹⁴³ delayed replenishment of medication by hospital facilities and breaks in the supply chain system created by a lack of funding from the government. This is often experienced in low and middle income countries in the supply of HIV medications or other free drugs which may or may not be produced locally.¹⁸³ Stock outs have been associated with poor medication adherence as well as poor health outcomes.¹⁸³

The relationship between providers and patients is another health system related factors affecting medication adherence which translates into trust on the side of the patient when it is good. High quality provider patient relationships increase the chances of adherence¹⁸⁴ as patients who feel as though they have little say in their medication or are being dictated to, are less likely to adhere to medication.¹⁸⁵ When patient contact time with physicians are improved and patient-centred care is being practised, patient satisfaction tends to be higher and with it, the likelihood of good medication adherence.¹⁸⁴

Unfavourable attitudes towards health care facilities or general medical mistrust which may be gotten from one's social network or bad publicity, lowers trust on the side of patients who may delay treatment or not attend that facility with the likely result being poor medication adherence.^{185,186}

2.8.7 MEASURING MEDICATION ADHERENCE

The commonest classification of the measures of medication adherence are subjective and objective.¹²⁰ Subjective measures are based on the patients' perception of how well they take their medication based on recommendations given by their health care provider. In the clinical setting, subjective measures are often used, however, they have the drawback in methodology as patients tend to over report on how adherent they are. In the past, over reporting was based on a natural tendency to please health care providers.¹³³

Objective measures of medication adherence, on the other hand, are based on the health care providers assessment of adherence and are generally considered superior to subjective measurements. Examples of objective measures of adherence include pill counts, electronic monitoring, secondary database analysis and biochemical measurements.¹⁸⁷ The draw back with objective measures of medication adherence is that they tend to be impractical, and are often too complex to execute in daily clinical scenarios.^{188,189}

Medication adherence measures may also be categorized as direct or indirect. Direct measures are usually objective whereas Indirect measures may be subjective or objective.¹⁹⁰

Pill counting is a common objective measure of adherence. It is an indirect objective measure which counts the number of doses taken between two planned appointments. When employing pill counts as a measure of adherence, the number of doses given is compared with the number of doses received by the patient and an adherence ratio calculated.¹³³ Directly Observed Treatment Short-Course (DOTS) is another direct and objective measure of adherence, even though it is more accurate, like

other direct measures, one of its drawbacks is the lack of in-depth information on contributory factors to medication non-adherence.¹³³

Of significant notation is the concept of “white coat” adherence which happens when patients have improved adherence to treatment around clinic visits¹⁹¹

There is no perfect way to assess medication adherence¹² but an adherence tool is expected to be user friendly, cheap, reliable, flexible and practical.¹³³ No single measure of adherence meets all of these criteria and it is expected that medication adherence be measured by more than one way although the use of multiple measures of adherence with the same weakness is discouraged. The bias of subjective measures which are solely on a patient’s perception of the truth and the impracticality of objective measures which may take too much time or be too expensive¹³³ can be avoided when a combination of both measures are used.

Logically, while a single tool is able to assess adherence to medication in low or moderately adherent patients,¹² a second measure confirms those findings. The natural expectation is that medication adherence tools compensate for the weaknesses of each other leading to a more accurate picture of adherence.¹²

2.8.8 MEDICATION ADHERENCE SCALES

As many as 43 validated self-reported adherence scales have been documented following a systematic review of medication adherence scales.¹⁸⁹ These are not inclusive of medication adherence scales not developed in the English-speaking world.

More than 90% of self -validated adherence scales in English examine various phases of executing a dosing regimen, from initiation, implementation and discontinuation. These scales have also been grouped into 5 categories that assess (i) Medication taking behaviour only. (ii) Medication taking behaviour and barriers to adherence. (iii) Barriers to adherence only. (iv) Medication adherence beliefs and (v) Medication adherence beliefs together with barriers to medication adherence.¹⁹²

In a systematic review of medication adherence measures, medication taking behaviours were defined by any missing doses taken and the frequency on prescription refills. Barriers to adherence were defined as a likelihood of forgetting to take medication

based on disease specific reasons, complexity of drug regimen and the side effects of medications.¹⁸⁹

There are a number of common medication adherence scales. The Self-Efficacy for Appropriate Medication Use Scale (SEAMS) which is a 13-item, 3 point-Likert-type scale with an emphasis on self-efficacy in chronic disease management. SEAMS has been validated in different chronic conditions and it measures barriers to medication adherence but has a major draw-back being the length of time required in its administration.^{188,193}

The Medication Adherence Report Scale (MARS) is another measure of medication adherence which delves into barriers to medication adherence as well as medication adherence beliefs.

MARS is a 10-question scale that assesses adherence behaviour, patient attitude to medication and disease control over the past 7 days.¹⁹⁴ It was created based on the Drug Attitude Inventory (DAI) which is usually used for measuring adherence in psychiatric settings. This scale is an improvement on the DAI and assesses medication taking behaviour and attitudes towards medication. MARS also has a greater validity and reliability when compared with the DAI.¹⁹⁴

The Hill-Bone Scale is an adherence measuring tool which reviews medication taking behaviour. It is a 14-point Likert scale with 3 subsections i.e. medication taking behaviour, appointment keeping¹⁸⁸ and sodium intake. The number of items that can be tested by the Hill-Bone Scale depends on the population and it has the advantage of performing better in black populations.¹⁹⁵ The 14 Item Hill-Bone scale has been validated in urban black populations while a 9 - Item version of the scale has been validated in community dwelling populations. The main weakness of the Hill-Bone scale is the lack of generalizability.¹⁸⁸

Other scales such as the Medication Adherence Questionnaire (MAQ) and the Brief Medication Questionnaire (BMQ) rank levels of adherence instead of defining adherence into just absent or present categories¹². The Brief Medication Questionnaire looks at medication taking behaviours and barriers to adherence. This questionnaire is divided into three screens; a regime screen which consists of 5 items, a belief screen, which has 2 items and a recall screen which also has 2 items. The different screens

evaluate how patients took their medications in the past week, how efficient the drugs are and what makes medication hard to take or easy to forget.¹³³ The BMQ is often used by health care professionals because it is self-administered, can assesses multiple drug regimens and does not require advanced training of health care professionals.¹³³

The Morisky Medication Adherence Scale (MMAS), was developed from the MAQ in 2008 by Morisky et al.¹⁹⁶ This 8-item scale has a 93% sensitivity and 53% specificity in very low-income minority patients with hypertension in a clinic setting.¹⁹⁷ MMAS has also been validated for use in sub-Saharan Africa,¹⁹⁸ is determined to have excellent reliability in other chronic conditions¹⁹⁹ and is currently the most accepted self-reported medication adherence measure worldwide.¹²

The first 7 items of MMAS have binary responses of yes and no while the last item has a 5-point Likert response. Some of the MMAS questions focus on underuse and forgetfulness in an attempt to identify the reasons for non-adherence which is true for both the original 8-item Morisky scale and the 4-item version.¹⁹⁹ Due to the ability of MMAS to identify non-adherence, it remains highly recommended as an adherence screening tool in clinic settings.¹⁹⁷

The table below [Table 2.2] gives a summary of common medication adherence scales.

Table 2.2 Common Medication Adherence Measuring Scales

Adherence Scale	Composition of original scale	Purpose	Usual Population	Advantages	Disadvantages
The Self-Efficacy for Appropriate Medication ^c Use Scale (SEAMS)	13- Item Likert scale	Barriers to adherence	Patients with Chronic Conditions	internal consistency in patients with high or low literacy	Time-consuming
Medication Adherence Report Scale (MARS)	10 Item Likert scale	Barriers to Medication	Patients with Chronic Mental illness esp.	Easy scoring Strong correlation	Limited generalizability

^c Table continued on next page

Adherence Scale	Composition of original scale	Purpose	Usual Population	Advantages	Disadvantages
MARS- 5 (Modified form)		Adherence Beliefs in Medication Adherence	Schizophrenia	with MAQ and DIA	
Hill-Bone Compliance Scale (Hill-Bone)	14-Item Likert Scale	Barriers to adherence Patient's medication-taking behaviour	Hypertensives Black Patients	High internal consistency in both primary and out-patient settings.	Limited generalizability
Medication Adherence Questionnaire (MAQ)	4 Item Binary Scale Questionnaire	Barriers to adherence	All validated conditions	Quick to administer Validated in the broadest range of diseases. Validated in patients with low literacy.	Comparatively short, mainly suitable for initial screening
Brief Medication Questionnaire (BMQ) ^d	3 screens with 9 Items	Patient's medication-taking behaviour Barriers to adherence	Diabetes Depression	Self-administration Evaluate multidrug regimes. Reduced need for practitioner training.	Time-consuming
Morisky Medication Adherence	8- Item Questionnaire	Barriers to adherence	All validated conditions	Higher validity and reliability in patients	Limited validity in some

^d Table continued on next page

Adherence Scale	Composition of original scale	Purpose	Usual Population	Advantages	Disadvantages
Scale (MMAS-8)				with chronic diseases than MAQ	conditions (e.g. Gout)
MMAS-4 (Original form)					

2.9 MEDICATION ADHERENCE IN HYPERTENSION

Globally, people who have hypertension and poor medication adherence are almost 1.5 times more likely to have uncontrolled hypertension than those with good medication adherence.²⁰⁰ Poor medication adherence increases the chances of hypertensive complications which increases short term morbidity and in the long term affects cardiovascular outcomes negatively, a problem seen especially in Africa.^{11,120,200–202} Conversely, good adherence has been proven to cause physical and mental improvement among those with hypertension leading to a longer life expectancy and a higher quality of life.²⁰³

Even though hypertension is often found to be asymptomatic, improvements in general well-being have been documented in people with hypertension with good adherence to their medication. Patients in Italy with good adherence to antihypertensives for example had consequent improvement in anxiety levels, drowsiness, libido, insomnia, headaches, mood and physical activity.¹²⁵ Similar results were observed in Spain, with an overall improvement in the quality of life when antihypertensive adherence was good.¹²⁵

The converse was also true with patients in the US recording lower physical and mental activity for patients with poor adherence to their antihypertensive medication.¹²⁵

2.10 MEDICATION ADHERENCE AND SOCIAL DETERMINANTS OF HEALTH.

As important as medication adherence is in the promotion of health in patients with hypertension, it is but a subset of health defining factors in the larger environment of the individual.¹⁰¹ Health has been rightly defined by the World health organization as the complete social, mental and physical well-being of the individual and not just the absence of disease.²⁰⁴

Inherent in this definition is the fact that there are multi-layered environmental factors which are necessary for the attainment, maintenance and restoration of health.

Medication Adherence is one of the influencers of health when taking patients with hypertension into account and much as it influences control of blood pressure, it is also influenced by non-medical factors called social determinants of health.⁹⁷

Social Determinants of health are environmental, economic, political and social conditions which have been recognized as influencing health outcomes worldwide.²⁰⁵ These determinants are said to be responsible for the disparity in equity worldwide when it comes to the attainment of health and are usually stratified according to socioeconomic class.²⁰⁶

Social determinants of health broadly account for the conditions under which people live, grow, work and age and may often intersect with the resources that are available to individuals, families and societies.²⁰⁵

Some of the main social determinants of health that influence medication adherence in people who have hypertension are:

- Income
- Education
- Social Inclusion
- Access to affordable health Services of decent Quality

Other social determinants of health are unemployment and job insecurity, housing, social protection, non-discriminatory access to affordable health care and availability of basic amenities in the environment.²⁰⁵

2.10.1 MEDICATION ADHERENCE AND INCOME

Few social determinants of health have as much impact globally as income. With disparities in income seen across every strata of life,²⁰⁷ income inequality often translates into health inequality due to the direct influence of income on life expectancy, mortality and incidence rate of chronic conditions like hypertension.²⁰⁸

Lower income groups generally have poorer health outcomes.²⁰⁷ The adverse effects of low income extends to cardiovascular outcomes with higher incomes associated with a lower cardiovascular mortality for people between the ages of 40 to 64 while with regards to hypertension, patients with lower incomes have higher rates of morbidity and mortality.²⁰⁷

Medication adherence in lower income people with hypertension have been found to be low. Interestingly, those with hypertension and poor medication adherence are more likely to die as a result of poor adherence leading to a complication of hypertension if they are from a low-income household.²⁰⁹ This is unsurprising considering health care needs often go unmet in situations where there is competition for very scarce resources.²¹⁰

Poverty invariably has a negative effect on health as diseases may go undiagnosed or even if diagnosed may remain untreated due to the financial inability to do so.²¹¹ Economic challenges also indirectly affect adherence with low- income patients being more likely to have increased job strain which may lead to poor adherence from stress-related forgetfulness.²¹²

2.10.2 MEDICATION ADHERENCE AND EDUCATION

Generally speaking, health education translates into positive health outcomes with studies demonstrating the importance of education in improving quality of life parameters such as physical well-being, mental function, sexual function and sleep.²¹³

In the management of hypertension, the incorporation of educational programmes have resulted in mixed findings with some studies finding an improvement in the quality of life of people with hypertension,^{125,213} while others have found no influence of

education on the quality of life when comparing groups with access to educational programmes on hypertension and those without.²¹⁴

Medication literacy is a key component of any effective educational program and is defined as the degree to which a person is able to obtain, comprehend, calculate and process patient specific information about their medication as well as make good medical and health decisions safely and effectively.²¹⁵

While general literacy has being shown to positively predict medication adherence,^{216–218} medication literacy in hypertension has been shown to be pivotal for safe medication use and persistent adherence.^{219,220}

A major problem in hypertension that education at diagnosis can solve, is the tendency for patients to underate the importance of consistent medication due to the often asymptomatic nature of high blood pressure.^{221–226} Similarly, patients without the right education after diagnosis often remain oblivious to the importance of consistent monitoring and control, leading to a drop off in what may initially be good adherence.²²⁷

Another problem potentially forestalled by educating people with hypertension, is when patients favour medication for symptomatic comorbid conditions at the expense of antihypertensive treatment.²²⁸

Results from studies on the effects of education on antihypertensive medication adherence have been mixed.

Whereas limited education has been found to be a barrier to adherence and thus blood pressure control on one hand,^{150,221,223–225,229–235} studies have found that a high knowledge of antihypertensive medication does not necessarily translate into improved adherence either to medication or to appointments.^{234,236}

2.10.3 MEDICATION ADHERENCE AND SOCIAL INCLUSION

Social integration has been found to be positively associated with a greater likelihood of medication adherence in hypertension²³⁷ with factors such as marital status and positive relationships with parents, children and neighbours being a determining

factor in those odds. The combination of social and communal support adds to an individual's sense of belonging as well as that of a family, improving its cohesion.²³⁸ Conversely, loneliness - defined as perceived discrepancy between expected and actual social relationships - has been associated with a yearly increase in systolic blood pressure.

When studied over a decade, some studies have shown no positive or negative association between social support and the development of hypertension but considering that hypertension is positively associated with advancing age, the effect of social support which has been shown to improve quality of life in the elderly cannot be discounted.²³⁹ Other studies indicate that social isolation fits in an interplay of psychosocial factors like work stress, personality type, mental health, housing instability and sleep quality; all of which have been found to be associated with the development of hypertension.²⁴⁰

Social relationships also have a bearing on medication adherence demonstrated by the fact that patients with unhealthy relationships tend to have poor medication adherence.^{228,233}

Ultimately, social and community resources are beneficial to any family and especially to families with multiple social problems.²⁴¹

2.10.4 MEDICATION ADHERENCE AND ACCESS TO AFFORDABLE HEALTH SERVICES OF DECENT QUALITY.

The attainment of blood pressure control is usually through a health care set up.²⁴² Similar to a number of developing economies, health care systems in developing economies like Ghana tend to be underfunded and overburdened, resulting in difficulty in access for patients.^{243,244}

Qualitative data from a number of low and middle income countries including Ghana have found that patients who live far away from the medical facility providing them care are less likely to adhere to their antihypertensives, and long travel times to access health care is associated with forgetting to take antihypertensives.²³²

The issue of access goes beyond proximity to a health facility with patients more likely to choose facilities with short wait times and longer periods of contact with

physicians.²²⁷ Related to facility access is the fact that patients with employers who encourage good health and provide their employees access to private facilities, have improved medication adherence.²³⁵

Social perception of a health facility also influences willingness to seek healthcare and the attitude of a patient's friends and family have been shown to exert an impact. If a patient is discouraged by his/her social circle from utilizing the services of a particular hospital, that patient is unlikely to seek help from that hospital²²⁷ even if the hospital in question has better proximity.

Relationships between facility health workers and patients is another sub-category influencing medication adherence. For instance, patients in Nigeria are more likely to adhere to medication if they are comfortable with their doctor^{223,227} and patients in Brazil who perceived their doctor as autocratic were found to have reduced medication adherence as a result of that relationship dynamic.^{150,224,232}

Another pull factor in a patient's decision to access care from a particular facility has to do with the availability of medication which is covered by insurance. In Ghana, of the patients who attend facilities unable to supply insurance accessed antihypertensives, about a fifth report low medication adherence and associated poor blood pressure control.²⁹

2.11 FAMILY DYNAMICS AND HYPERTENSION

One definition of family is a group of individuals with a continuing legal, genetic or emotional relationship.²⁴⁵ Another definition is two or more individuals who depend on each other for emotional, physical and economic support.²⁴⁶ Inherent in the latter definition is the concept that families have a unique set of resources available to their members which are critical to well-being and health.

Features of healthy families include a good outlook on life, healthy spirituality, communication, supportive members, and shared family time.²⁴⁶ Healthy families also draw psychosocial support from their immediate ecosystem which include friends, neighbors as well as community members.²⁴⁷

Support available to a family contributes to its resilience and the ability of that family to navigate crisis situations.²⁴⁶ Types of families include the nuclear family, the extended family, the blended family and the church family. These groups all play significant roles and tend to be uniquely equipped to provide necessary support to individual family members.²⁴⁸

2.12 FAMILY RESOURCES

Family Medicine is a branch of medicine that focuses on providing continuous and comprehensive care for all people and families from the cradle to the grave.²⁴⁹ It is a discipline that is not limited to a specific pathology and considers the individual in the context of the family.²⁴⁹

Unlike the approach to clinical care taken by traditional specialties, Family Medicine emphasizes the role the patient's family has on his or her health outlook including how well that family functions and the resources available to family members.²⁵⁰

Family resources are a major consideration in family dynamic studies and are often used to assess the contributions of families especially in the research fields of child welfare, individual health and policy planning.²⁵¹

Studied by different researchers, family resources are often seen as attributes that are protective against extreme stress levels as well as contribute to the overall well-being of family members. Inadequate family resources have been found to have a negative effect on the family as well as decreasing the likelihood of success of positive health interventions necessary for families in crisis situations.²⁴⁷

The two initial factors underpinning family resources described in the twentieth century were family income and socio-economic status. In the last few decades, family resources have been broadened to include personal time, social support and family time.²⁵² Beyond that, subjective views of family resources are considered vital in research because while objective measures like family income remains fairly constant, the

perceptions of individual family members in relation to resources tend to vary depending on power dynamics and access.

Subjective measures of resources better inform the overall impact of these resources on the individual basis.

Different studies assess family resources differently with a typical example being research on minors with disabilities taking particular interest in access to special needs facilities, whereas family resource studies in childhood education emphasize parental educational level and studies aimed at disadvantaged families pay more attention to family income levels.²⁵³

One of the first and commonest tools for assessing family resources that has been developed is the Family Resource Scale (FRS). Originally developed in 1987, the FRS was based on the family systems theory, social support literature and ecological studies.²⁵⁴ The FRS has been used in families with variable economic situations in the context of behavioural and psychosocial problems.²⁵⁴

The FRS assesses perceptions of family resources by family members across a wide variety of categories; it was originally used in research on a cohort of mothers who had children with disabilities. The initial FRS study assessed eight factors but has subsequently been broadened to study general family resources.²⁵⁴ The current FRS has thirty items assessing food, shelter, financial resources, time availability and healthcare while primarily targeting families with young children.²⁵⁴

In 1995, the FRS was reorganized into four subscales i.e. basic resources, financial resources, time and child care related resources as a means to assess child health outcomes.²⁵⁵

Basic resources are sub categorized into food, housing, clothing, furniture, telephone access, indoor plumbing, access to water and the ability to pay bills. Financial resource subcategories include having a good job, money for rent, entertainment money, funds for savings and money for vacations and travel. Time for self includes time to rest, personal time, time for one's spouse, time to talk, time to socialize, grooming time and time for friends and family. Time for family is a subcategory with only two assessment factors which are time for the family to be together and time for one's children.²⁵⁴

Another measure of family resources is the Family Inventory of Resources for Management (FIRM).²⁵⁶ This tool measures family resources in a bid to aid adaptation of families, assesses the opportunities and challenges of a family, as well as identify the need for potentially empowering family resources. The FIRM measures 69 items which are further subcategorized into 4 groups i.e. esteem and family communication, mastery and health, extended family support and financial well-being. The total score based on all four categories is the total FIRM score.²⁵⁶

The higher a family scores on the FIRM scale, the greater resources it has available and this translates indirectly into higher resilience of family members as well as a greater ability of the family to recover after a crisis.²⁵⁶

Following the assessment of family resources regardless of tool, interventions can be put in place to support families in resource limited areas which ultimately helps families improve resilience²⁵⁶ as well as cope with stressful life events such as a chronic or terminal medical diagnosis, psychosocial problems among family members or interpersonal relationship challenges.²⁵⁴

Self-management of family challenges in normative or traumatic stress situations can be done with insight into family resources²⁵⁷ and minimal professional input is required when family resources are adequate.

Family resources in family medicine were initially described by Dr Gabriel Smilkstein as he studied how to integrate information from family studies into the discipline.²⁵⁸ He defined family as a socially sanctioned relationship between non sanguinely related, cohabiting adults of the opposite sex with or without children which satisfies felt needs, mutually and symmetrically.²⁵⁸

As part of his body of work, Smilkstein stated that all families have intrinsic resources that meet the needs of that family daily. These resources enhance family nurturing²⁵⁸ and in the event of stressful life circumstances are put to the test.

Smilkstein categorized major family resources into social, cultural, religious, economic, educational, environmental and technological. He also included medical resources as a subcategory of technical resources.

According to Smilkstein, in stressful times, family resources are considered effective when certain criteria are met.

Social resources are effective when social interaction and communication is evident with well-balanced lines of communication from family members to non-family members like friends, social groups, clubs and other community organizations.

Cultural resources are effective when distinctive cultural pride and satisfaction are identified in the distinct ethnic group of the family.

Religious resources when effective, provide satisfying spiritual experiences and connection to other non-family groups with likeness of mind.

When economic stability is enough to provide reasonable satisfaction with the current financial status and supply the economic requirements of everyday life, economic resources are considered effective.

Effective educational resources are said to be present when the education of family members gives them the ability to solve or understand majority of problems the family faces on a daily basis.

Effective environmental resources include clean air, water and space for adequate work, play and life at home.

Technical resources are adequate when ease of access to medical help is available to the family.

In the event of inadequate family resources, stressful life events often provoke a crisis response.

Part of the duty of Family Physicians is to manage the stressful life events their patients may face using available family resources thus improving family function.

Based on the pioneering work of Smilkstein, a family resources questionnaire was developed by staff of the Supportive Palliative Hospice Medicine of the University of the Philippines (Philippine General Hospital) led by Dr M. Medina.⁷ This questionnaire is the SCREEM Based Family Resource Survey (SCREEM-RES) and has been validated with reliability analysis resulting in a Cronbach alpha of 0.80.⁷

The SCREEM-RES is an instrument with a 12-item questionnaire which includes six domains representing social, cultural, religious, economic, educational and medical resources. Each domain has 2 items in the form of questions that assess the effectiveness of that particular resource. Responses to each question /item are on a likert scale with respondents having the option to strongly agree, agree, disagree or strongly disagree.

The SCREEM-RES was used in a study of care giver strain in families dealing with childhood cancer and the resultant publication analyzed the varied family resources in the population sampled and their relative frequencies. One of the recommendations from the first SCREEM-RES study was for Family Physicians to regularly assess family resources. This current study aims to assess family resources in the context of essential hypertension, a significant global problem and one that is consistently faced by Family Physicians.

Results from this study are expected to throw more light on resources available to patients presenting with essential hypertension as well as examine blood pressure control and medication adherence, an area of interest to not just Family Physicians but to most categories of health care providers.

CHAPTER THREE

MATERIALS AND METHODS

3.1 SETTING

This study was done at the Chronic Care Clinic of the Family Medicine Directorate of the Komfo Anokye Teaching Hospital (KATH), Kumasi. Established as a community hospital in 1955 for communities in the city of Kumasi, KATH became a teaching hospital in 1975 to train medical students of the then University of Science and Technology. KATH is currently the second largest teaching hospital in Ghana with a bed capacity of 1,264.⁶³ Total out-patient attendance from all Directorates in the year 2019 was 353,108 with 34,539 admissions during the same period.¹⁹

Komfo Anokye Teaching Hospital offers training not only for medical, nursing and allied health students, it is a centre for post - graduate training and research and is accredited by the Ghana College of Physicians and Surgeons, the West African College of Physicians, the West African College of Surgeons, the Nursing and Midwifery Council of Ghana, the Ghana College of Nursing and the Ghana College of Pharmacists as a training centre.

The hospital has thirteen clinical Directorates, two non-clinical Directorates and eighteen units.¹⁹ Each Directorate has a management team tasked with running the daily activities of the Directorate and this management team remains answerable to the central management of the hospital.

Family Medicine was started in KATH under the then Polyclinic Directorate in 2005. The new unit was primarily tasked to undertake the training of Family Physicians. The Chronic Care Clinic was established in the year 2011 and has been run by mostly Family Physicians and Family Medicine residents ever since.

The Polyclinic Directorate was renamed the Family Medicine Directorate in 2014 and is presently one of the youngest directorates in KATH. The Family Medicine Directorate provides 24-hour primary out-patient care and in 2019 saw 22.8% of all out-patient visits of the hospital.

The Family Medicine Directorate operates seven consulting rooms, has a 22-bed in-patient capacity, and a staff strength of 199 which includes clinical, administrative and supporting staff. The directorate is mandated to undertake training of Family Physicians as well as offering specialized clinics including but not limited to the Rehabilitative Clinic, the Palliative Care Clinic and the Chronic Care Clinic.

After its establishment in 2011, the Chronic Care Clinic focused on managing patients with chronic diseases like hypertension and diabetes mellitus. In the past decade, more than 97% of clinic attendees are either hypertensive or have hypertension together with diabetes, obesity, and/or other cardiovascular risk factors. The other 3% of patients attending the Chronic Care Clinic have either diabetes mellitus or asthma as a stand-alone condition²⁵⁹.

Patients with hypertension attending the Chronic Care Clinic are managed using the JNC 7 and JNC 8 guidelines and when there is a suspicion of non-adherence to medication, counselling is given by the attending physician which is tailored to the reason for non-adherence. When necessary, medication protocols are adjusted to aid compliance (an example being the prescription of combination drug therapy).

3.2 RESEARCH DESIGN

A cross-sectional study was done using a structured questionnaire. Patient's past medical records were also accessed using the Lightweight Health Information Management System (LHIMS). The study questionnaire (Appendix 5) which was administered was based on the research objectives and consisted of questions drawn from the Ghana Demographic Health Survey (GDHS) to obtain demographic information, the Morisky 8-point Questionnaire (Appendix 3) to assess medication adherence, and the SCREEM Questionnaire (Appendix 4) to assess family resources.

3.3 SAMPLING PROCEDURE

Pre-testing of the questionnaire was done in the Chronic Care Clinic for one week before data was collected and prior to that, one study nurse who had experience working at the clinic was used as a research assistant and trained on the study protocol and participant traffic flow, while general training was given to the staff nurses taking clinical data for all Chronic Care Clinic attendees. Data collection was done between July and August 2020 by the Principal Investigator during the clinic hours from 8am to 2pm each weekday. Data from pretesting (which involved 20 clinic attendants), was not included in the final sample size.

An announcement was initially made to all Chronic Care Clinic attendants as they waited for registration by the department of biostatistics at the Out- Patient department waiting area of the Family Medicine Directorate.

A brief overview of the study was given to clinic attendants with emphasis on the fact that participation was voluntary.

Based on an expected clinic attendance of 125 patients per week, and a time frame of 6 weeks for data collection, we expected to reach our sample size of 105 participants after adjusting for dropouts during that time frame.

On each day of data collection, all patients attending the clinic had their blood pressure measurements and body mass indexes checked. Blood pressure measurements were taken using the Omron digital blood pressure monitor - model HEM 907 which is

used at the Chronic Care Clinic and is recalibrated daily with a mercury sphygmomanometer by staff of the KATH biomedical unit.

The cuff size used at the clinic is 14.5 x 30cm which fits most adult arm circumferences and is substituted with a smaller (20.5 x 28cm) or larger (27 x 35cm) cuff depending on the arm circumference of the patient. This quality control measure is to avoid errors from using a smaller cuff size for a patient with a larger arm circumference which would lead to a rise in systolic blood pressure, or a larger cuff size for a smaller arm which will lead to a falsely low systolic blood pressure. The weight and height of participants were measured using the Seca 767 digital scale equipped with a Seca 220 height rod which is capable of measuring the body mass index (BMI) in addition to the weight and height. The Seca machine is also recalibrated consistently by staff of the KATH biomedical unit.

The first five clinic attendants were given pink colored laminated cards with a green sticker on one side of one of the cards. The five cards before distribution were shuffled with the sticker on the ventral aspect of the card rendering it not visible to the participants or investigator. The dorsal part of the cards was then presented to participants for random selection. The participant who picked the pink card with the green sticker on the ventral aspect was selected and assessed for eligibility and when eligible, selected for the study and identified as the index participant. Every fifth person after the index participant was then selected and assessed for eligibility. If a selected participant was ineligible, the next patient in line was selected for eligibility and if eligible selected. This process was continued until all attendants of that day had had a chance to be selected.

Eligible patients had their blood pressure checked after resting for 5 minutes in the waiting area using the Omron HEM 907 digital blood pressure monitor. Participants were seated in a chair with firm back support and feet flat on the floor during blood pressure measurements and the BP cuff was used on the right arm. Blood pressure measurements were taken twice with a 5-minute interval and an average of both readings entered on the patient's digital records as the final blood pressure measurement. All participants also had their weight, height, and BMI measurements taken once with the Seca 767 digital scale.

Participants then entered the consulting room when it was their turn to be seen and their previous medical records were reviewed with an emphasis on determining a previous diagnosis of secondary hypertension and checking for documented chronic complications of hypertension as part of assessing eligibility by the Principal Investigator. The information leaflet (Appendix 1) and consent form (Appendix 2) were given to participants to read if they could and was read to them in English or Twi (Appendix 7 and 8) if they were not literate or elected not to read. Consent was then sought from participants with consent indicated by signing or thumb printing the consent document depending on their preference.

After obtaining consent, the participants were administered the study questionnaire (Appendix 5) by the Principal Investigator. On average, administration of the questionnaire lasted 6 minutes. The demographic information collected included age, sex, marital status, religion and level of education. Clinical information collected included blood pressure readings at the last documented appointment. Previous history of participants from their electronic medical records was also assessed to rule out a previous history of secondary hypertension and hypertensive complications like stroke, chronic kidney disease etc.

All interviews were conducted in the consulting room and the questions were translated and back translated into Twi and administration was done either in English or Twi based on participant preference. Upon completion of administration of the questionnaire, a pre- sealed pack containing a face mask was given to participants in appreciation of their time. Patients were then reviewed and managed for their routine care.

3.4 SAMPLE SIZE

No studies were found globally on Family Resources in patients with hypertension after an extensive literature search, hence the sample size of the cross-sectional study was calculated using the following preamble:

- a. The assumed proportion of adequate resources in patients with low medication adherence was 30%
- b. The assumed proportion of adequate resources in patients with medium/high adherence was 60%

Using the formulae below²⁶⁰

$$n = \frac{[Z_{1-\alpha/2} \sqrt{2\bar{p}(1-\bar{p})} + Z_{1-\beta} \sqrt{P_A(1-P_A) + P_B(1-P_B)}]^2}{\gamma^2} \quad (1)$$

$$N = \frac{r+1}{2r} \times n \quad (2)$$

Where P_A and P_B is the prevalence of the adequate resources in low and medium/high adherence patients respectively. $\gamma = P_A - P_B$, $\bar{p} = \frac{(P_A + P_B)}{2}$, $Z_{1-\alpha/2} = 1.96$ and

$$Z_{1-\beta} = 0.84.$$

N was calculated assuming equal numbers in the low and medium/high adherence groups. For an unequal group sized group comparison, N was assumed to be the sample size in the first group and rN the sample size in the second group. N was then given by the formulae (2) where r was the allocation ratio. In this case, twice as many participants were expected to be in the low adherence group compared to the medium/high adherence group thereby giving a ratio of 2.

Inputting the above values, the total number for the low adherence group was 63 and that for the medium/high adherence group was 32. Assuming a 10% non-completion rate, a minimum total of 105 persons were required for the study. A total of 110 participants were successfully enrolled into the study.

3.5 ELIGIBILITY

Inclusion Criteria

1. Patients (male or female) aged between 40 and 65 years.

The age limits were to reduce the likelihood of including patients with complications of hypertension, who may require more family resources for chronic morbid conditions and are more likely to under report on their SCREEM-RES as well as reduce the chances of including participants with secondary hypertension which is often seen earlier than age 40.

2. Attendants of the Chronic Care Clinic for at least 2 years.
3. Patients with the ability to provide informed consent.

Exclusion Criteria

1. Patients with documented secondary hypertension.
2. Patients with acute medical complications including but not limited to hypertensive urgency and hypertensive emergencies
3. Patients who were severely ill requiring urgent care.

3.6 DATA COLLECTION TOOLS AND INSTRUMENTS

Data collected using the questionnaire was primarily participant demographics, the SCREEM-RES, the MMAS-8, current blood pressure measurements and blood pressure measurements taken at the participant's last recorded visit to the clinic.

Although blood pressure targets for the Chronic Care Clinic depend on multiple factors including age, previous blood pressure measurements and the JNC guidelines, for purposes of this study and in accordance with current ESC guidelines, uncontrolled blood pressure was set at a systolic blood pressure $\geq 140\text{mmHg}$ and/or a diastolic blood pressure $\geq 90\text{mmHg}$ whereas controlled blood pressure was set at systolic blood pressure $< 140\text{mmHg}$ and/or a diastolic blood pressure of $< 90\text{mmHg}$.

The SCREEM- RES has 12 questions [Appendix 4] with two questions assessing each of the six domains (Social, Cultural, Religious, Economic, Educational and

Medical) of resources. Each question is considered a unit thus each domain has 2 units. The options for answering each question are a 4 item Likert scale ranging from strongly disagree to strongly agree with a score of 0 to 3 ie, Strongly Disagree = 0 Disagree=1, Agree=2, Strongly Agree =3 A maximum score of 3 is possible per unit (question), a maximum score of 6 is possible per domain and a maximum score of 36 is possible for all 6 domains (ie total family resources).

A total score of 0-18 for all 6 domains is indicative of inadequate total family resources while a score of 19-36 is indicative of adequate total family resources. A score of 0 - 3 for each domain is indicative of inadequate resources of that particular domain of resources whereas a score of 4 – 6 per domain indicates adequate resources for that particular domain.

A score of 0 -1 per item is indicative of inadequacy of that item whereas a score of 2-3 indicates adequacy of the item. The SCREEM-RES has been validated for use among the Filipino population and shown to have a Cronbach's alpha of 0.8 reflecting good internal consistency and reliability.²⁶¹

The Morisky 8 medication adherence scale (MMAS-8) is a structured self reported eight question scale assessing medication adherence initially developed for hypertension medication adherence. The first seven questions have binary options of yes and no which are scored 0 and 1 respectively and the last question has a 5 option likert scale and corresponding scores being Never/Rarely = 1, Once in a while = 0.75, Sometimes= 0.5, Usually = 0.25 and All the time = 0.

A total score of 8 indicates high medication adherence. A score of 6 to < 8 indicates medium medication adherence while a score of < 6 indicates low medication adherence. The MMAS - 8 has shown good validity among patients with hypertension in multiple settings including sub-Saharan Africa with a Cronbach's alpha of 0.8.^{198,262}

3.7 DATA MANAGEMENT AND ANALYSIS

The data was entered into EpiData (Version 4.2.0) and cleaned by the Principal Investigator. The data was then imported into STATA statistical software (Version 15) for analysis by the Principal Investigator with the help of the staff of the Research and Development (R&D) Unit of KATH.

Frequencies and descriptive statistics were calculated for adherence rates, family resources (individual and collective) and blood pressure control. Bi-variate analysis was done to calculate Chi-square statistics using family resources, blood pressure control and demographics as exposures and adherence rates as an outcome. Multivariate linear and logistic regression was calculated to evaluate the impact of confounding variables. The correlation between family resources and medication adherence was calculated using the Spearman's correlation coefficient. All calculations were done assuming a confidence interval of 95% and a 5% margin of error.

3.8 ETHICAL CONSIDERATIONS

Ethical approval (Appendix 10) for this study was obtained from the Komfo Anokye Teaching Hospital Institutional Review Board (KATH-IRB). The approval was obtained after permission to conduct the study had been obtained from the Family Medicine Directorate and registration of the study protocol with the KATH Research and Development Unit (KATH-R&D) (Appendix 11). One amendment was made to the study protocol regarding the study title and this was resubmitted for ethical approval which was granted (Appendix 12). All potential participants of the study were provided with an information leaflet explaining the purpose and benefits of the study. This leaflet was given to them to read or read to them by the Principal Investigator based on their preference and literacy level. Eligible potential participants who agreed to take part in the study were then taken through the consent process.

3.9 SAFETY AND PRIVACY

A high priority was placed on maintaining patient safety and privacy. All the interviews were conducted behind closed doors with only the Principal Investigator and research assistant thus participants were not privy to responses given by other participants. Participants had the option of answering study questions in the presence of a chaperone of their choice. All questionnaires were identified with a unique identification (ID) number and had no patient identifiers. Consent forms which had patient names were kept separate from the study questionnaire. All questions were designed to cause no emotional discomfort to participants and participants were informed of the right they had to decline a response to any question they were not comfortable with.

No procedures causing patient discomfort were undertaken as part of data collection. Hard copies of the questionnaires were kept in a locked cabinet with access available only to the principal investigator and after transcription the soft copies of the data was kept on a password protected computer which could only be accessed by the principal investigator.

CHAPTER FOUR

RESULTS

One hundred and seventeen (117) eligible participants were invited to participate in this study. Four (4) participants declined participation and three (3) other participants did not complete the questionnaire thus a response rate of 94% (110 participants) was obtained in this study. The data was collected in July and August of 2020.

4.1 DEMOGRAPHICS

Almost half of the participants (n= 49, 44.55%) were between the ages of 50 -59 years with the mean age being 56 years (SD 6.4) and the median age being 57 years (IQR 52:62). [Fig 4.1]. Females (n=94, 85.46%) and Christians (n=102, 92.73%) were in the majority [Fig 4.2] [Fig 4.3]. About half of the participants were married (n=54, 49.09%) while majority had basic education (n=84, 76.36%) [Fig 4.4] [Fig 4.5].

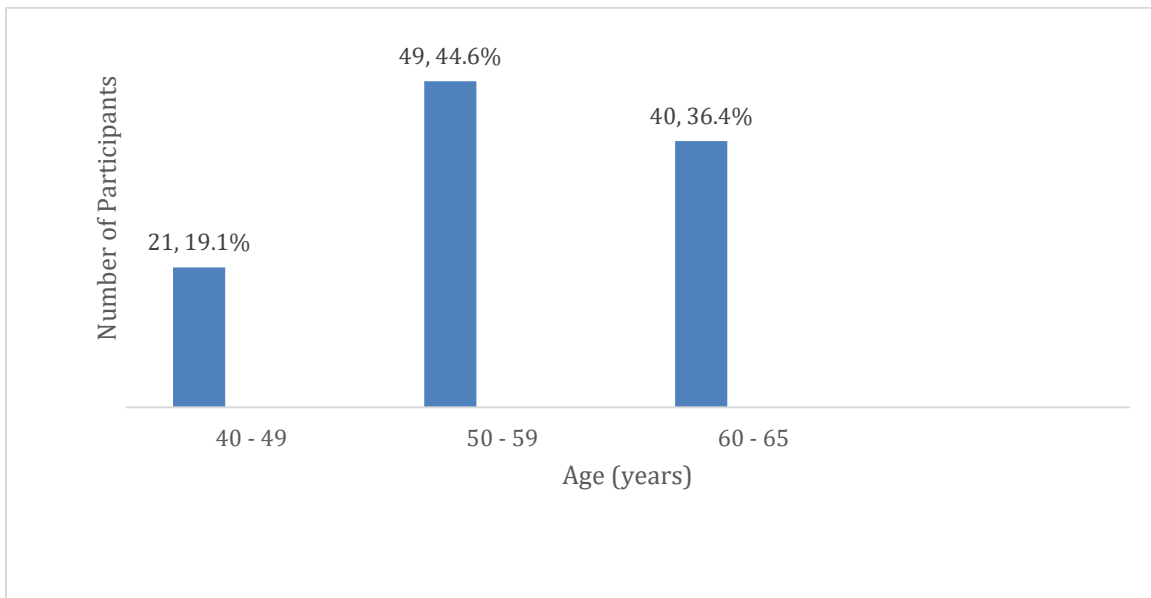


Fig 4.1 Age Distribution of Participants

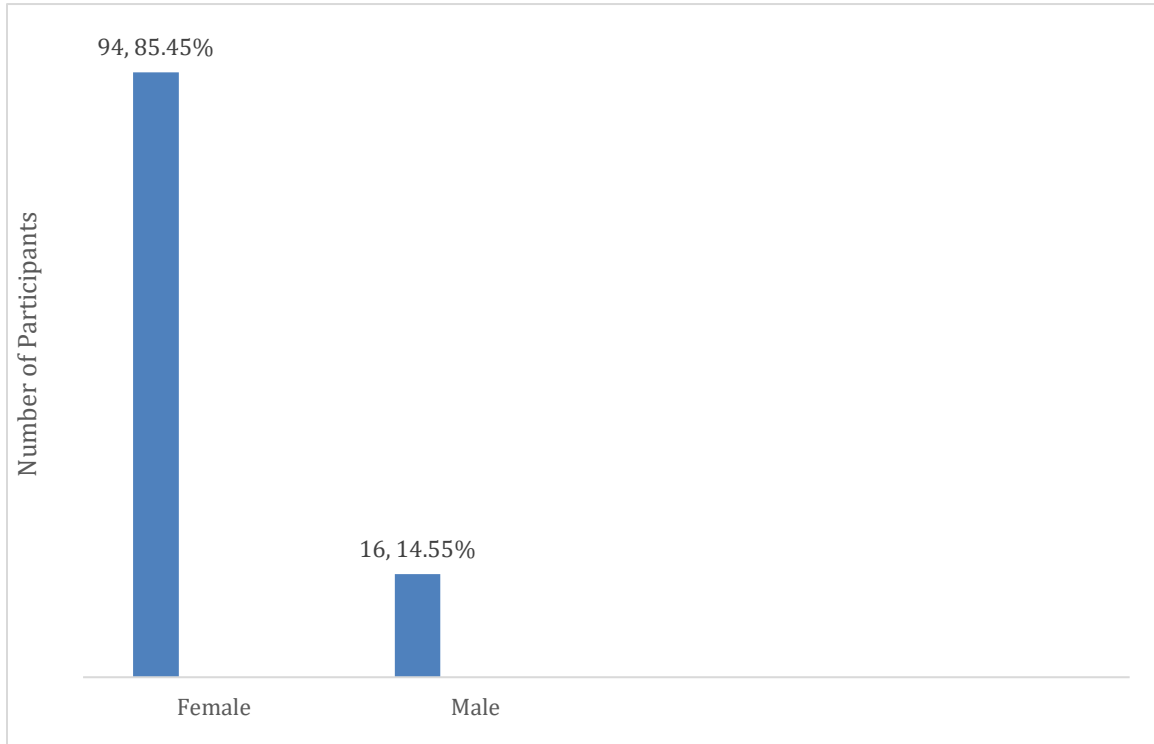


Fig 4.2 Sex Distribution of Participants

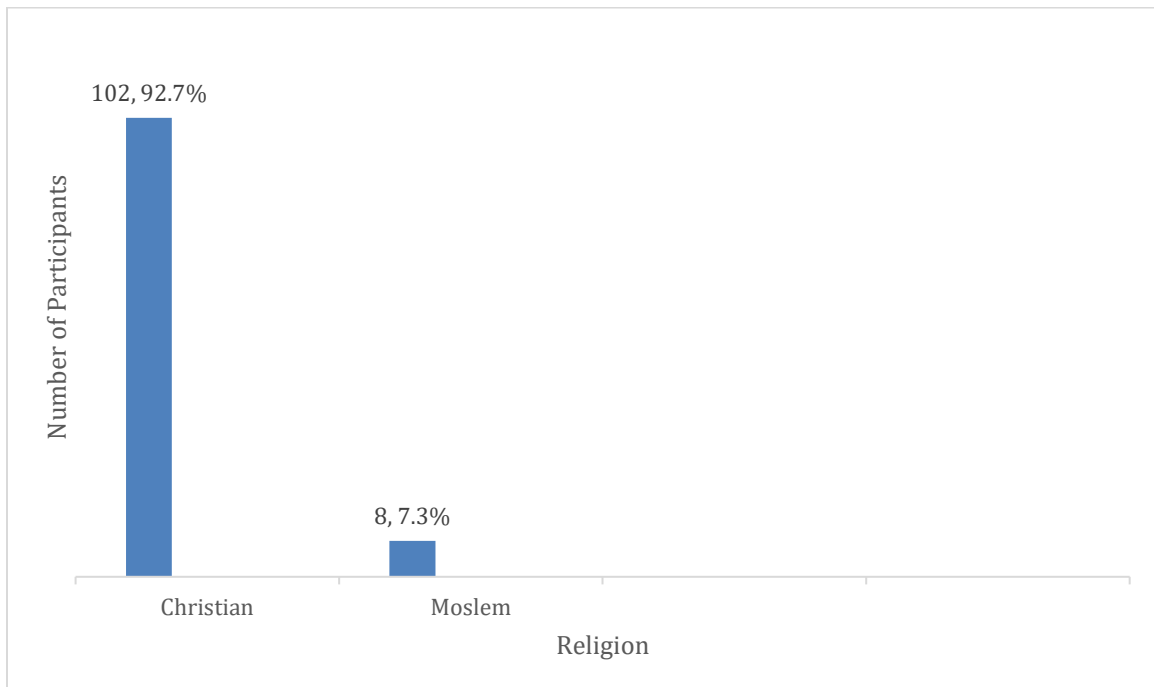


Fig 4.3 Religion of Participants

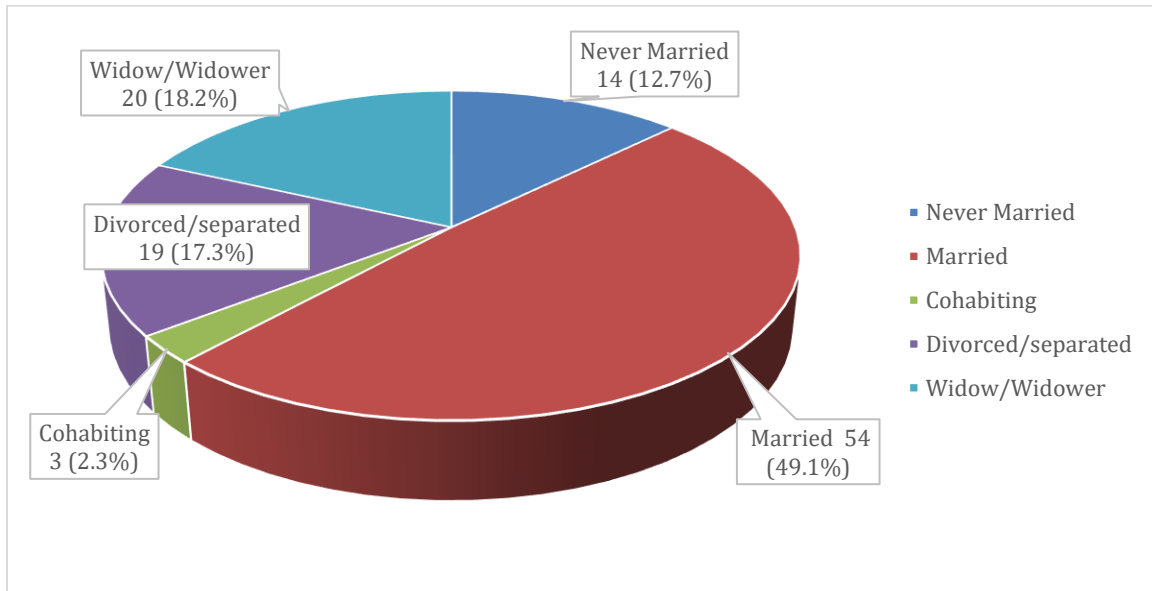


Fig 4.4 Marital Status of Participants

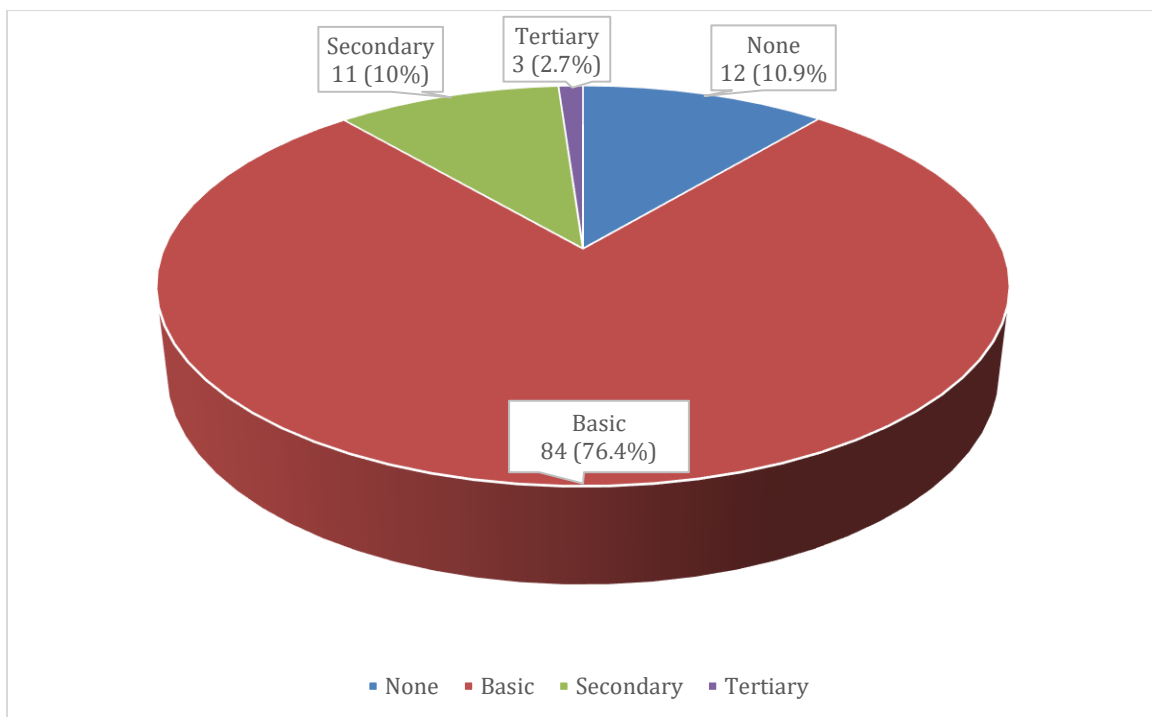


Fig 4.5 Educational Level of Participants

4.2 BLOOD PRESSURE CONTROL.

Majority of participants (n=65, 59.1%) had uncontrolled blood pressure ($\geq 140/90$ mmHg) at the time the data was collected. Participants had an average interval of 10.7 weeks between the current visit and their previous visit to the clinic. The average blood pressure of participants with poor control was 154/91mmHg, whereas that of those with good control was 124/78mmHg.

Blood pressure measurements at the previous visit revealed that majority of the same study population had controlled blood pressures at their last recorded visit to the clinic (n=66, 60%). [Fig 4.5]

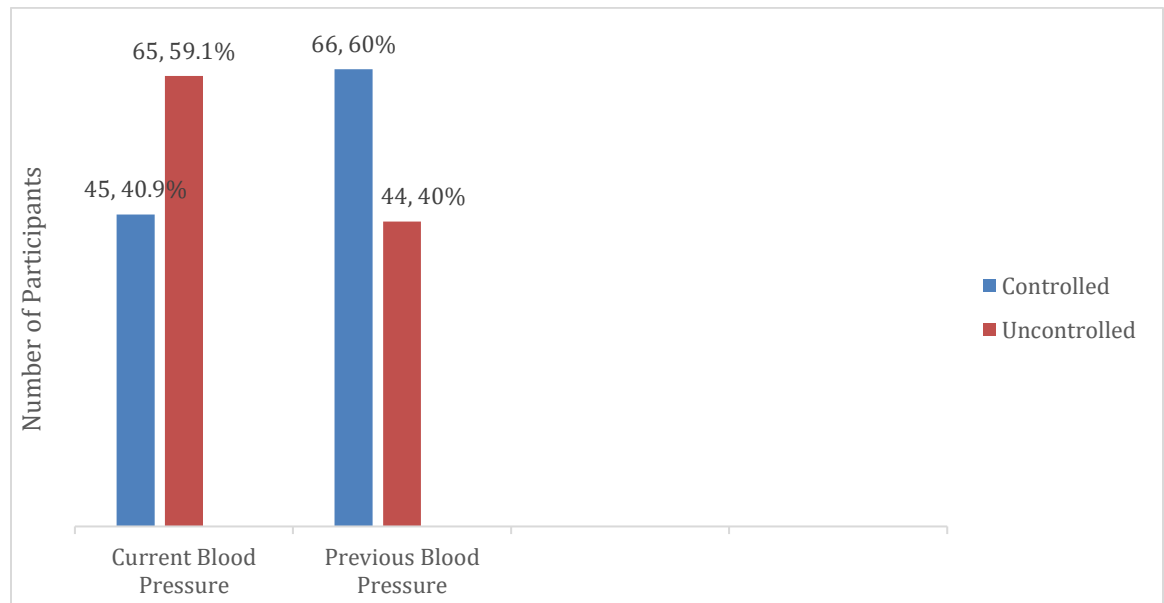


Fig 4.6 Blood Pressure Control at Current and Previous Visit

4.3 FAMILY RESOURCES OF PARTICIPANTS

Majority of study participants (n= 85, 77.3%) had adequate family resources with about a quarter (n=25, 22.7%) reporting inadequate resources [Fig 4.1]. The first item of the religious domain had the greatest positive response (105, 95.4%), while the first item of the economic domain had the least positive response (44, 40%) [Table 4.3].

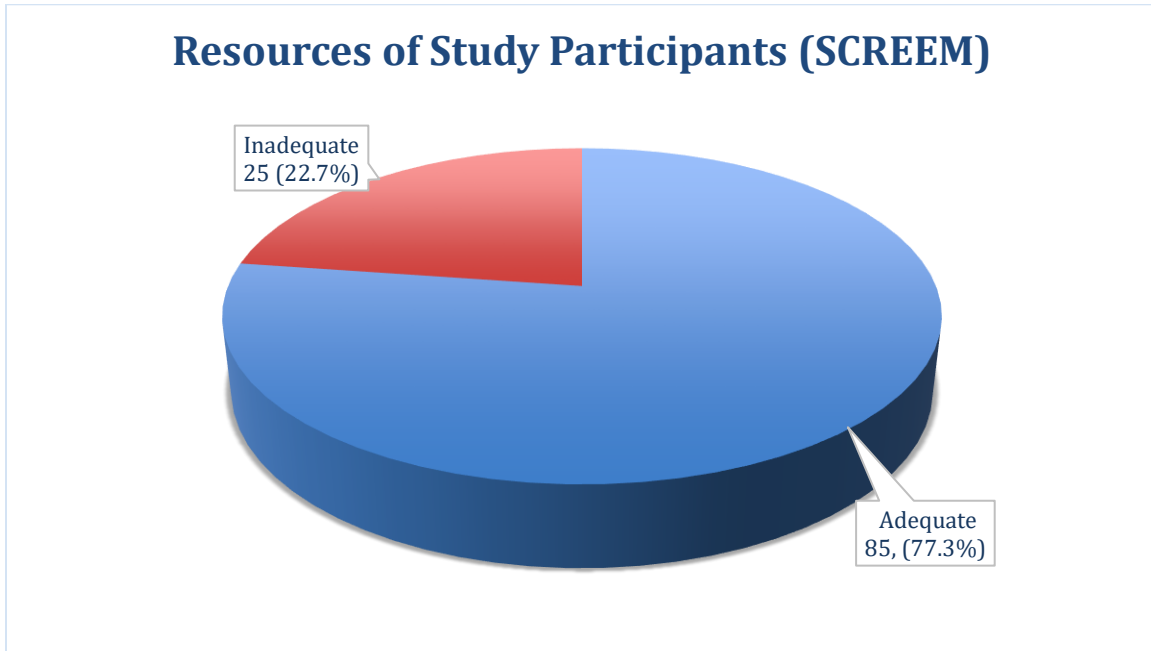


Fig 4.7 Family Resources of Study Participants

Table 4.3 SCREEM Results by Item

Resource	Question(Item)	Response n (%)			
		Strongly Agree	Agree	Disagree	Strongly Disagree
Social^e	We help each other in the family	22(20%)	6(57.3%)	23(20.9%)	2(1.82%)
	We are helped by friends and other members of the community	5(4.6%)	42(38.2%)	56(50.9%)	7(6.4%)

^e Table continued on next page

Resource	Question(Item)	Response n (%)			
		Strongly Agree	Agree	Disagree	Strongly Disagree
Cultural	Our culture gives our family Strength	24(21.8%)	68(61.8%)	17(15.5%)	1(0.9%)
	A culture of helping and corporation in our community helps our family	14(12.7%)	57(51.8%)	35(31.8%)	4(3.6%)
Religious	Our faith and religion helps our family	77(70%)	28(25.5%)	5(4.6%)	0(0%)
	We are helped by members of our church or other religious groups	26(23.6%)	47(42.7%)	32(29.1%)	5(4.6%)
Economic	Our family's savings is adequate for our needs	10(9.1%)	34(30.9%)	36(32.7%)	30(27.3%)
	Our family's income is adequate for our needs	5(4.6%)	42(38.2%)	54(49.1%)	9(8.2%)
Educational	Our education/knowledge is adequate to understand information about hypertension	16(14.6%)	62(56.4%)	30(27.3%)	2(1.8%)
	Our education/knowledge about hypertension is adequate to care for me	17(15.5%)	75(68.2%)	17(15.5%)	1(0.9%)
Medical	It is easy to access medical help in our community	9(8.2%)	64(58.2%)	35(31.8)	2(1.8)
	We are helped by doctors, nurses and health workers	21(19.1%)	61(55.5%)	25(22.7%)	3(2.7%)

4.3.1 FAMILY RESOURCE (BY DOMAIN).

Religious resources were reported to have the highest levels of adequacy (98%) followed by Educational Resources (71%), Cultural Resources (70%), Medical Resources (65%) and Social Resources (52%) while Economic Resources were reported as being the least adequate (34%). [Table 4.4]

Table 4.4 Family Resources of Participants (by Domain).

Resource (Domain)	Inadequate	Adequate
Social	58(52.7%)	52 (47.27%)
Cultural	40(36.4%)	70 (63.6%)
Religious	12(10.9%)	98 (89.1%)
Economic	75(68.8%)	34 (31.2%)
Educational	39 (35.5%)	71 (64.6%)
Medical	45 (40.9%)	65 (59.1%)

4.4 MEDICATION ADHERENCE.

Almost half of participants had medium adherence (n=50, 45.5%) while the other participants had either low (n=35, 31.8%) or high adherence (n=25, 22.7%). [Fig 4.2]
[Table 4.5]

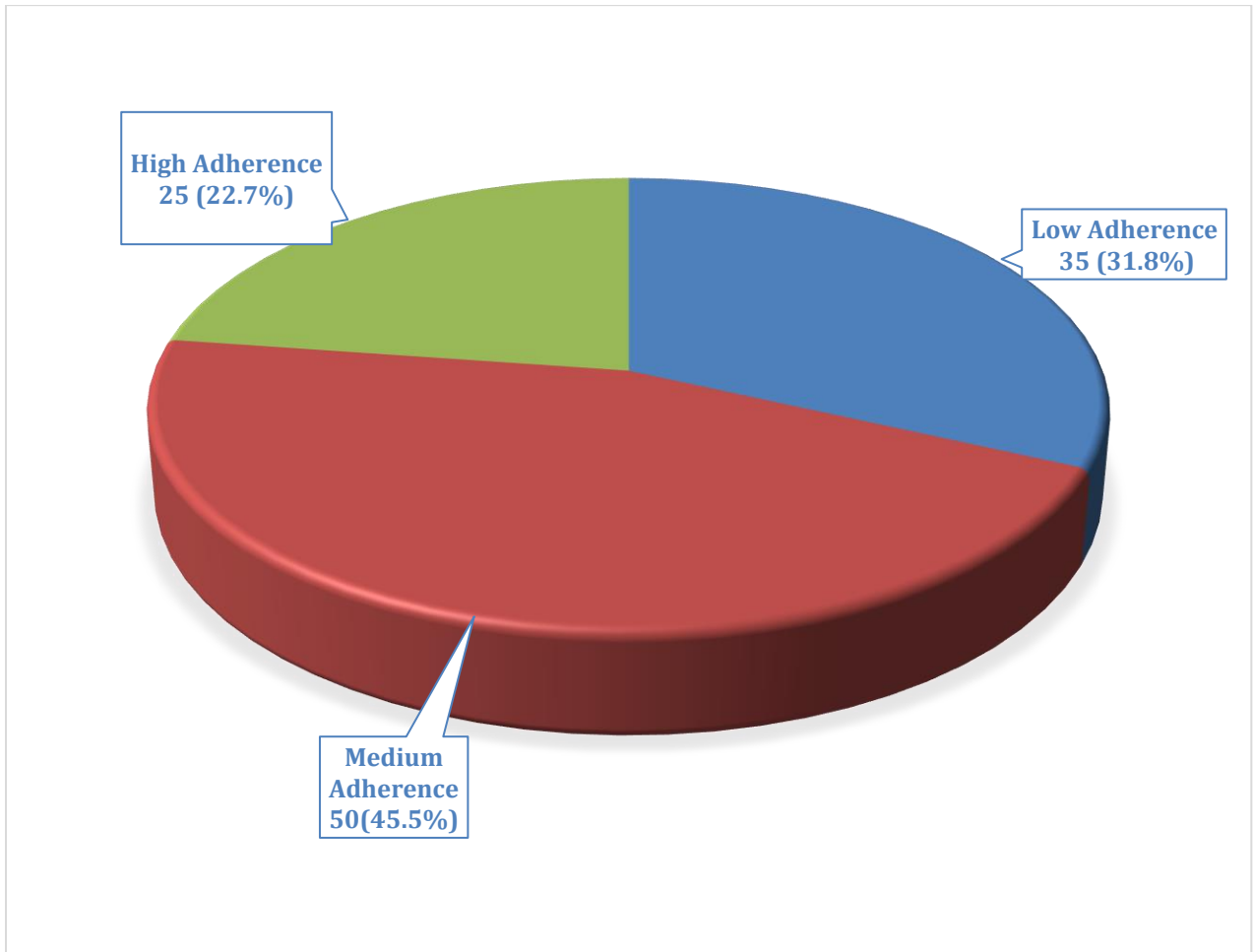


Fig 4.2 Medication Adherence of Study Participants

Table 4.5 Responses to Morisky-8 Questionnaire (Medication Adherence).

Question	Response	Number	Percentage
Do you sometimes forget to take your medication?	No	78	70.9
	Yes	32	29.1
Were there any days in the past two weeks when you did not take your medication?	No	71	64.6
	Yes	39	35.5
Have you ever cut down on your medication because you felt worse on taking it?	No	80	72.7
	Yes	30	27.3
When you travel or leave home do you sometimes forget to take your medication?	No	92	83.6
	Yes	18	16.4
Did you take your hypertensive medication yesterday?	No	21	19.1
	Yes	89	80.9
When you feel like your blood pressure is under control, do you sometimes stop taking your antihypertensives?	No	83	75.5
	Yes	27	24.6
Do you ever feel hassled about sticking to your blood pressure control drugs. ^f	No	70	63.6
	Yes	40	36.4

^f Table continued on next page

Question	Response	Number	Percentage
How often do you have difficulty remembering to take your antihypertensives? ^g	Never/Rarely	99	90.0
	Once in a while	0	0
	Sometimes	0	0
	Usually	0	0
	All the time	11	10.0

4.5 FAMILY RESOURCES AND DEMOGRAPHICS

Chi square analysis of Demographics and Family Resources as measured by the SCREEM questionnaire, revealed a statistically significant relationship between Family Resources and Marital status ($P=0.04$). There was no statistically significant relationship between family resources, and age, gender, religion or education. [Table 4.6]

Table 4.6 Bi-variant analysis between Family Resources (total) and Demographics

Demographic	Inadequate Resources	Adequate Resources	Total	X ²	p-Value
Gender				1.1	0.3
Male	2(12.5%)	14(87.5%)	16(14.5%)		
Female	23(24.47%)	71(75.53%)	94(85.5%)		
Age				0.2	0.9
40-49	4(19.1%)	17(81%)	21(19.1%)		
50-59	12(24.5%)	37(75.5%)	49(44.5%)		
60-65	9(22.5%)	31(77.5%)	40(36.4%)		
Religion				0.5	0.5

^g Table continued next page

Demographic	Inadequate Resources	Adequate Resources	Total	X²	p-Value
Christian	24(23.53%)	78(76.5%)	102(92.7%)	9.8	0.04
Moslem	1(12.5%)	7(87.5)	8(7.3%)		
Marital Status					
Never married	0(0%)	14(100%)	14(12.7%)		
Married	11(20.4%)	43(79.6%)	54(49.1%)		
Co-habiting	0(0%)	3(100%)	3(2.7%)	1.1	0.8
Divorced/Separated	8(42.11%)	11(57.9%)	19(17.3%)		
Widow/Widower	6(30%)	14(70%)	20(18.2%)		
Education					
None	3(25%)	9(75%)	12(10.9%)		
Basic	20(23.8%)	64(76.2%)	84(76.4%)	1.1	0.8
Secondary	2(18.2%)	9(81.8%)	11(10%)		
Tertiary	0(0%)	3(100%)	3(2.7%)		

4.6: DEMOGRAPHICS AND FAMILY RESOURCES BY DOMAIN.

When Family Resources were categorized by domain, there was a statistically significant relationship between social resources and religion (P= 0.04). [Table 4.7]

Table 4.7 Chi Squared Analysis of Family Resources (Domain) and Participant Demographics.

Resource	Demography	Inadequate	Adequate	Total	X²	p -Value
Social ^h	Gender				1.7	0.2
	Female	52(55.3%)	42(44.6%)	94(85.5%)		
	Male	6(37.5%)	10(62.5%)	16(14.5%)		
	Age				1.3	0.5
	40-49	10(47.6%)	11(52.4%)	21(19.1%)		
	50-59	24(49%)	25(51%)	49(44.5%)		
	60-65	24(60%)	16(60%)	40(36.4%)		
	Religion				4.2	0.04

^h Table continued on next page

Resource	Demography	Inadequate	Adequate	Total	X ²	p -Value
Cultural ⁱ	Christian	51(50%)	51(50%)	102(92.7%)	1.0	0.9
	Moslem	7(87.5%)	1(12.5%)	8(7.3%)		
	Marital Status					
	Never Married	6(42.9%)	8(57.1%)	14(12.7%)		
	Married	28(51.9%)	26(48.2%)	54(49.1%)	7.1	0.1
	Co-habiting	2(66.7%)	1(33.3%)	3(2.7%)		
	Divorced/Separated	11(57.8%)	8(42.1%)	19(17.3%)		
	Widow/Widower	11(55%)	9(45%)	20(18.2%)		
	Education				1.0	0.3
	None	7(58.3%)	5(41.7%)	12(10.9%)		
	Basic	48(57.1%)	36(42.9%)	84(76.4%)		
	Secondary	3(27.3%)	8(72.7%)	11(10%)		
	Tertiary	0(0%)	3(27.3%)	3(2.7%)	0.4	0.8
	Gender					
	Female	36(38.3%)	58(61.7%)	94(85.5%)		
	Male	4(25%)	12(75%)	16(14.5%)		
	Age				0.5	0.4
	40-49	8(38.1%)	13(61.9%)	21(19.1%)		
	50-59	19(38.78%)	30(61.2%)	49(44.5%)		
	60-65	13(32.50%)	27(67.5%)	40(36.4%)		
	Religion				6.3	0.2
	Christian	38(37.3%)	64(62.8%)	102(92.7%)		
	Moslem	2(25%)	6(75%)	8(7.3%)		
	Marital Status					
	Never Married	1(7.14%)	13(92.9%)	14(12.7%)		
	Married	22(40.7)	32(59.3%)	54(49.1%)		
	Co-habiting	1(33.3%)	2(66.7%)	3(2.7%)		

ⁱ Table continued on next page

Resource	Demography	Inadequate	Adequate	Total	X ²	p -Value
Religious ^j	Divorced/Separated	7(36.8%)	12(63.2%)	19(17.3%)	6.9	0.4
	Widow/Widower	9(45%)	11(55%)	20(18.2%)		
	Education					
	None	4(33.3%)	8(66.7%)	12(10.9%)		
	Basic	34(40.5%)	50(59.5%)	84(76.4%)		
	Secondary	2(18.2%)	9(81.8%)	11(10%)		
	Tertiary	0(0%)	3(100%)	3(2.7%)		
	Gender				0.4	0.5
	Female	11(11.7%)	83(88.3%)	94(85.5%)		
	Male	1(6.3%)	15(93.8%)	16(14.5%)		
	Age				1.4	0.5
	40-49	1(4.8%)	20(95.2%)	21(19.1%)		
	50-59	7(14.3%)	42(85.7%)	49(44.5%)		
	60-65	4(10%)	36(90%)	40(36.4%)		
	Religion				0.02	0.9
	Christian	11(10.8%)	91(89.2%)	102(92.7%)		
	Moslem	1(12.5%)	7(87.5%)	8(7.3%)		
	Marital Status				6.3	0.2
	Never Married	0(0%)	14(100%)	14(12.7%)		
	Married	4(7.4%)	50(92.6%)	54(49.1%)		
	Co-habiting	1(33.3%)	2(66.7%)	3(2.7%)		
	Divorced/Separated	4(21.1%)	15(79%)	19(17.3%)		
	Widow/Widower	3(15%)	17(85%)	20(18.2%)		
	Education				2.2	0.5
	None	2(16.7%)	10(83.3%)	12(10.9%)		
	Basic	10(11.9%)	74(88.1%)	84(76.4%)		
	Secondary	0(0%)	11(100%)	11(10%)		
	Tertiary	0(0%)	3(100%)	3(2.7%)		

^j Table continued on next page

Resource	Demography	Inadequate	Adequate	Total	X ²	p -Value
Economic	Gender				0.3	0.6
	Female	64(68.1%)	30(31.9%)	94(85.5%)		
	Male	12(75%)	4(25%)	16(14.5%)		
	Age				3.5	0.2
	40-49	13(61.9%)	8(38.1%)	21(19.1%)		
	50-59	31(63.3%)	18(36.7%)	49(44.5%)		
	60-65	32(80%)	8(20%)	40(36.4%)		
	Religion				1.4	0.2
	Christian	72(70.6%)	30(29.7%)	102(92.7%)		
	Moslem	4(50%)	4(50%)	8(7.3%)		
	Marital Status				5.1	0.3
	Never Married	9(64.3%)	5(35.7%)	14(12.7%)		
	Married	33(61.1%)	21(38.9%)	54(49.1%)		
Educational	Co-habiting	3(100%)	0(0%)	3(2.7%)		
	Divorced/Separated	15(79%)	4(21%)	19(17.3%)		
	Widow/Widower	16(80%)	4(20%)	20(18.2%)		
	Education				0.8	0.9
	None	7(58.3%)	5(41.7%)	12(10.9%)		
	Basic	59(70.2%)	25(29.8%)	84(76.4%)		
	Secondary	8(72.7%)	3(27.3%)	11(10%)		
	Tertiary	2(66.7%)	1(33.3%)	3(2.7%)		
	Gender^k				0.6	0.5
	Female	32(34%)	62(66%)	94(85.5%)		
	Male	7(43.8%)	9(56.3%)	16(14.5%)		
	Age				1.9	0.4
	40-49	8(38.1%)	13(61.9%)	21(19.1%)		
	50-59	14(28.6%)	35(71.4%)	49(44.5%)		
	60-65	17(42.5%)	23(57.5%)	40(36.4%)		

^k Table continued on next page

Resource	Demography	Inadequate	Adequate	Total	X ²	p -Value
Medical ¹	Religion				0.7	0.4
	Christian	35(34.3%)	67(65.7%)	102(92.7%)		
	Moslem	4(50%)	4(50%)	8(7.3%)		
	Marital Status				3.2	0.5
	Never Married	3(21.4%)	11(78.6%)	14(12.7%)		
	Married	19(35.2%)	35(64.8%)	54(49.1%)		
	Co-habiting	1(33.3%)	2(66.7%)	3(2.7%)		
	Divorced/Separated	6(31.6%)	13(68.4%)	19(17.3%)		
	Widow/Widower	10(50%)	10(50%)	20(18.2%)		
	Education				2.4	0.5
	None	5(41.7%)	7(58.3%)	12(10.9%)		
	Basic	29(34.5%)	55(65.5%)	18(76.4%)		
	Secondary	5(45.5%)	6(54.6%)	11(10%)		
	Tertiary	0(0%)	3(100%)	3(2.7%)		
	Gender				2.0	0.2
	Female	41(43.6%)	53(56.4%)	94(85.5%)		
	Male	4(25%)	12(75%)	16(14.5%)		
	Age				1.7	0.4
	40-49	6(28.6%)	15(71.4%)	21(19.1%)		
	50-59	21(42.9%)	28(57.1%)	49(44.5%)		
	60-65	18(45%)	22(55%)	40(36.4%)		
	Religion				0.04	0.8
	Christian	42(41.2%)	60(58.8%)	102(92.7%)		
	Moslem	3(37.5%)	5(62.5%)	8(7.3%)		
	Marital Status				2.8	0.6
	Never Married	7(50%)	7(50%)	14(12.7%)		
	Married	18(33.3%)	36(66.7%)	54(49.1%)		

¹ Table continued on next page

Resource	Demography	Inadequate	Adequate	Total	X ²	p -Value
	Co-habiting	1(33.3%)	2(66.7%)	3(27.3%)		
	Divorced/Separated	9(47.4%)	10(52.6%)	19(17.3%)		
	Widow/Widower	10(50%)	10(50%)	20(18.2%)		
	Education				2.6	0.5
	None	6(50%)	6(50%)	12(10.9%)		
	Basic	34(40.5%)	50(59.5%)	18(76.4%)		
	Secondary	5(45.5%)	6(54.6%)	11(10%)		
	Tertiary	0(0%)	3(100%)	3(2.7%)		

4.7 BLOOD PRESSURE CONTROL AND DEMOGRAPHICS

A bivariate analysis was performed to explore any association between patient demographics and blood pressure control, at the current and previous visit. No statistically significant relationship was demonstrated between blood pressure control at the previous and current visit and patient demographics. The details of the bivariate analysis are presented in Tables 4.8 and 4.9 below.

Table 4.8 Chi Squared analysis of Current Blood Pressure Control and Participant Demographics.

Demographics	Controlled BP	Uncontrolled BP	Total	X ²	p -value
Age^m				0.7	0.7
40-49	9(42.9%)	12(57.1%)	21(19.1%)		
50-59	18(36.7%)	31(63.3%)	49(44.5%)		
60-65	18(45%)	22(55%)	40(36.4%)		
Gender				0.09	0.8

^m Table continued on next page

Demographics	Controlled BP	Uncontrolled BP	Total	X²	p -value
Female	39(41.5%)	55(58.5%)	94(85.5%)		
Male	6(37.5%)	10(62.5%)	16(14.5%)		
Religion				0.04	0.8
Christian	42(41.2%)	60(58.8%)	102(92.7%)		
Moslem	3(37.5%)	5(62.50%)	8(7.3%)		
Marital Status				1.4	0.9
Never Married	4(28.6%)	10(71.4%)	14(12.7%)		
Married	23(42.6%)	31(57.4%)	54(49.1%)		
Co-habiting	1(33.3%)	2(66.7%)	3(2.7%)		
Divorced/Separated	9(47.4%)	10(52.6%)	19(17.3%)		
Widowed	8(40%)	12(60%)	20(18.2%)		
Education				3.6	0.3
None	4(33.3%)	8(66.7%)	12(10.9%)		
Basic	38(45.3%)	46(54.8%)	18(16.4%)		
Secondary	2(18.2%)	9(81.8%)	63(57.3%)		
Tertiary	1(33.3%)	2(66.7%)	11(10%)		

Table 4.9 Chi- Square analysis of Blood Pressure Control at last Visit and Participant Demographics.

	Controlled BP	Uncontrolled BP	Total	X²	P-value
Age				4.5	0.1
40-49	14(66.7%)	7(33.3%)	21(19.1%)		
50-59	24(49%)	25(51%)	49(44.5%)		
60-65	28(70%)	12(30%)	40(36.4%)		
Gender				0.1	0.7
Female	57(60.6%)	37(39.4%)	94(85.5%)		
Male	9(56.3%)	7(43.8%)	16(14.5%)		
Religionⁿ				0.4	0.5
Christian	62(60.8%)	40(39.2%)	102(92.7%)		
Moslem	4(50%)	4(50%)	8(7.3%)		
Marital Status				1.5	0.8
Never Married	7(50%)	7(50%)	14(12.7%)		
Married	32(59.3%)	22(40.7%)	54(49.1%)		

ⁿ Table continued on next page

Cohabiting	2(66.7%)	1(33.3%)	31(28.2%)		
Divorced/Separated	11(57.9%)	8(42.1%)	19(17.3%)		
Widowed	14(70%)	6(30%)	20(18.2%)		
Education				3.2	0.4
None	8(66.7%)	4(33.3%)	12(10.9%)		
Basic	50(59.5%)	34(40.5%)	84(76.4%)		
Secondary	5(45.5%)	6(54.6%)	11(10%)		
Tertiary	3(100%)	0(0%)	3(2.7%)		

4.8 MEDICATION ADHERENCE AND DEMOGRAPHICS.

There was no statistically significant relationship between medication adherence and the demographic characteristics of the sample population after bivariate analysis. [Table 4.10]

Table 4.10 Chi-Squared Analysis of Demographics and Medication Adherence.

Demographics	Low Adherence	Medium/High Adherence	Total	X ²	P- value
Age				2.1	0.4
40-49	5(23.8%)	16(76.2%)	21(19.1%)		
50-59	19(38.8%)	30(61.2%)	49(44.5%)		
60-65	11(27.5%)	29(72.5%)	40(36.4%)		
Gender				3.2	0.07
Female	33(35.1%)	61(64.9%)	94(85.5%)		
Male	2(12.5%)	14(87.5%)	16(14.5%)		
Religion				0.2	0.7
Christian	33(32.4%)	69(67.7%)	102(92.7)		
Moslem	2(25%)	6(75%)	8(7.35)		
Marital Status^o				4.0	0.4
Never Married	4(28.6%)	10(71.4%)	14(12.7%)		
Married	19(35.2%)	35(64.8%)	54(49.1%)		
Cohabiting	0(0%)	3(100%)	3(2.7%)		
Divorced/Separated	8(42.1%)	11(57.9%)	19(17.3%)		
Widowed	4(20%)	16(80%)	20(18.2%)		

^o Table continued on next page

Demographics	Low Adherence	Medium/High Adherence	Total	X ²	P- value
Education				0.2	1.0
None	4(33.3%)	8(66.7%)	12(10.9%)		
Basic	26(31%)	58(69.1%)	84(76.4%)		
Secondary	4(36.4%)	7(63.6%)	11(10%)		
Tertiary	1(33.3%)	2(66.7%)	3(2.7%)		

4.9 BLOOD PRESSURE CONTROL AND MEDICATION ADHERENCE.

Using Bivariate analysis, there was no statistically significant relationship determined between blood pressure control (current or previous) and medication adherence. [Table 4.11] [Table 4.12]

Table 4.11 Medication Adherence and Blood Pressure Control (Current Visit).

BP Control	Low Adherence	Medium/High Adherence	Total	X ²	P-value
				0.02	0.9
Controlled BP	14(31.1%)	31(68.9%)	45(40.9%)		
Uncontrolled BP	21(32.3%)	44(67.7%)	65(59.1%)		

Table 4.12 Medication Adherence and Blood Pressure Control (Previous Visit).

B.P Control	Low Adherence	Medium/High Adherence	Total	X ²	P-value
				0.0	1.0
Controlled BP	21(31.8%)	45(68.18%)	66(60%)		
Uncontrolled BP	14(31.8%)	30(68.2%)	44(40%)		

4.10 FAMILY RESOURCES AND CURRENT BLOOD PRESSURE CONTROL

There were no statistically significant relationships between participant's Family Resources and Blood Pressure Control on bivariate analysis [Table 4.13] [Table 4.14]

Table 4.13 Chi-Square Analysis of Family Resources and Current Blood Pressure Control

Resource Domain	Controlled BP	Uncontrolled BP	Total	X²	P-value
Social				0.5	0.5
Adequate	23(51.1%)	29(44.6%)	52(47.3%)		
Inadequate	22(48.9%)	36(55.4%)	58(52.7%)		
Cultural				0.1	0.8
Adequate	28(40%)	42(60%)	70(63.6%)		
Inadequate	17(42.5%)	23(57.5%)	40(36.4%)		
Religious				0.0	1.0
Adequate	40(40.8%)	58(59.2%)	98(89.1%)		
Inadequate	5(41.7%)	7(58.3%)	12(10.9%)		
Economic				0.0	1.0
Adequate	14(41.2%)	20(58.8%)	34(30.9%)		
Inadequate	31(40.8%)	45(59.2%)	76(69.1%)		
Educational^p				0.7	0.4
Adequate	27(38%)	44(62%)	71(64.5%)		

^p Table continued on next page

Resource Domain	Controlled BP	Uncontrolled BP	Total	X²	P-value
Inadequate	18(46.2%)	21(53.9%)	39(35.5%)		
Medical				0.3	0.6
Adequate	28(43.1%)	37(56.9%)	65(59.1%)		
Inadequate	17(37.8%)	28(62.2%)	45(40.9%)		
Total				0.0	0.9
SCREEM					
Adequate	35(41.2%)	50(58.8%)	85(77.3%)		
Inadequate	10(40%)	15(60%)	25(22.7%)		

Table 4.14 Chi-squared Analysis of Family Resources and Blood Pressure Control at last Visit

Resource Domain	Controlled BP	Uncontrolled BP	Total	X²	P-value
Social				1.6	0.21
Adequate	28(53.9%)	24(46.2%)	52(47.3%)		
Inadequate	38(65.5%)	20(34.5%)	58(52.7%)		
Cultural				0.0	1.0
Adequate	42(60%)	28(40%)	70(63.6%)		
Inadequate	24(60%)	16(40%)	40(36.4%)		
Religious				1.3	0.26
Adequate	57(58.2%)	41(41.9%)	98(89.1%)		
Inadequate	9(75%)	3(25%)	12(10.9%)		
Economic				3.4	0.06
Adequate	16(47.1%)	18(52.9%)	34(30.9%)		
Inadequate	50(65.8%)	26(34.2%)	76(69.1%)		
Educational^q				2.1	0.14
Adequate	39(54.9%)	32(45.1%)	71(64.5%)		

^q Table continued on next page

Resource Domain	Controlled BP	Uncontrolled BP	Total	X²	P-value
Inadequate	27(69.2%)	12(30.8%)	39(35.5%)		
Medical^r				0.2	0.69
Adequate	40(61.5%)	25(38.5%)	65(59.1%)		
Inadequate	26(57.8%)	19(42.2%)	45(40.9%)		
Total				0.9	0.35
SCREEM					
Adequate	49(57.7%)	36(42.4%)	85(77.3%)		
Inadequate	17(68%)	8(32%)	25(22.7%)		

4.11 FAMILY RESOURCES AND MEDICATION ADHERENCE

There were no statistically significant relationship or correlation between Family Resources and Medication Adherence. [Table 4.15] [Table 4.16]

Table 4.15 Chi-Squared Analysis of Family Resources and Medication Adherence

Resources	Low Adherence	Medium/High Adherence	Total	X²	P-value
Social				0.4	0.55
Adequate	18(51.4%)	34(45.3%)	52(47.3%)		
Inadequate	17(48.6%)	41(54.7%)	58(37.3%)		
Cultural				0.9	0.33
Adequate	20(57.1%)	50(66.7%)	70(63.6%)		
Inadequate	15(42.9%)	25(33.3%)	40(36.4%)		
Religious				2.1	0.15
Adequate	29(82.9%)	69(92%)	98(89.1%)		
Inadequate	6(17.1%)	6(8%)	12(10.9%)		
Economic				0.6	0.42
Adequate	9(25.7%)	25(33.3%)	34(30.9%)		
Inadequate	26(74.3%)	50(66.7%)	76(69.1%)		

^r Table continued on next page

Resources	Low Adherence	Medium/High Adherence	Total	X²	P-value
Educational				1.1	0.30
Adequate	25(71.4%)	46(61.3%)	71(64.5%)		
Inadequate	10(28.6%)	29(38.7%)	39(35.5%)		
Medical				0.1	0.78
Adequate	20(57.1%)	45(60%)	65(59.1%)		
Inadequate	15(42.9%)	30(40%)	45(40.9%)		
Total SCREEM				0.3	0.61
Adequate	26(74.3%)	59(78.7%)	85(77.3%)		
Inadequate	9(25.7%)	16(21.3%)	25(22.7%)		

Table 4.16 Correlation analysis between Family Resources and Medication Adherence.

Resource	Correlation	P-Value
Social	0.08	0.39
Cultural	-0.09	0.37
Religious	-0.08	0.43
Economic	-0.08	0.39
Educational	0.12	0.22
Medical	-0.07	0.45
Total Resources	-0.02	0.85

4.12 BIVARIATE AND MULTIVARIATE ANALYSIS

Logistic regression of Family Resources and Medication Adherence showed no statistically significant relationships. [Table 4.17] [Table 4.18]

Table 4.17 Bivariate logistic regression of adherence and Family Resources(domains)

Variable (Reference)	Odds Ratio	P-Value	CI
Family Resources	0.78	0.610	0.31-2.00
+Age	0.78	0.610	0.31-2.00
+Gender	0.740	0.740	0.33-2.21
+Age and Gender	0.86	0.750	0.33-2.22

Table 4.18 Bivariate and Multivariate logistic regression of Medication

Variable (reference)	Odds Ratio	P-Value	CI
Social Resources	1.28	0.551	0.57-2.85
Cultural Resources	0.67	0.335	0.29-1.52
Religious Resources	0.42	0.161	0.13-1.41
Economic Resources	0.68	0.40	0.28-1.67
Educational Resources	1.58	0.30	0.66-3.76
Medical Resources	0.89	0.78	0.39-2.00

CHAPTER FIVE

DISCUSSION

This study in its attempt to establish available family resources in the management of essential hypertension and the relationships between those resources and medication adherence sampled 110 patients who are regular attendees of the KATH Family Medicine Chronic Care Clinic.

Total family resources were deemed adequate by almost two thirds (77.3%) of participants, however the various domains of family resources had variable levels of adequacy as did the units of the various domains. From highest to lowest adequacy, family resources when categorized by domain were in the order of Religious (89%), Educational (64.6%), Cultural (63.6%), Medical (59.1%) and Social (47.3%) with Economic resources (30.9%) considered least adequate.

5.1 PARTICIPANT DEMOGRAPHICS

The study participants were overwhelmingly female with an almost 6:1 female to male ratio. This was consistent with the findings of a study done at the Chronic Care Clinic on family function²⁵⁷ using the Family APGAR tool²⁵⁷ where females similarly outnumbered males by almost 5 to 1. This finding is also consistent with a study done examining metabolic syndrome at the Komfo Anokye Teaching hospital.²⁵⁸

It has been found that females tend to have better health seeking behaviours than males²⁵⁹ and our results were consistent with that theory since female participants were more likely to consistently seek medical care which includes care for hypertension.

It is also possible that men in the Ashanti region tend not to seek care for hypertension even after diagnosis, as evidenced by data showing higher rates of uncontrolled blood pressure in Ghanaian men even when the majority of the sampled population is female.²⁶⁰

Men were also more likely to decline consent to participate as evidenced by the fact that of the four people that declined participation but were deemed eligible for this study, three (75%) were men.

The majority of the study participants in this study were between the ages of 50 to 59 followed by the age category of 60-65. The average age of participants was 56 with less than 20% of participants being between the ages of 40 to 49. This is consistent with essential hypertension studies since diagnosis is often after the fourth decade and is associated with advancing age.²⁶¹ The restriction on age of participants during sampling in the attempt to exclude participants with complications of hypertension²⁶² and patients with secondary hypertension³⁹ was also partially responsible for this result.

Patients with secondary hypertension were excluded since it was expected that they might skew the data to reflect control of hypertension as a result of possible elimination of the underlying cause of the hypertension,^{263,264} as in cases where the successful management of hyperthyroidism results in the normalization of blood pressure.²⁶⁵

A Ghanaian study with similar demographics explored medication adherence among diabetics attending the Korle-Bu Teaching Hospital, the largest teaching hospital in Ghana. Females outnumbered males in the study and a little under 40% of participants were considered adherent to antidiabetic medication.²⁶⁶ It is also worth mentioning that the study on family function among participants attending the KATH Chronic Care Clinic with no age ceiling, had a majority of participants between the ages of 57 to 69 years.²⁵⁷

Most of the participants were Christians. This is reflective of the religious landscape in Ghana which is majority Christian at 71.2%. The Moslem population in Ghana is about 17.6% percent with a majority of Moslems concentrated in the Northern, North East, Upper East and Upper West regions of Ghana.²⁶⁷

In a general pooling of participants in southern Ghana, the study results are fairly consistent with not just national demographics but regional religious figures. In the Kumasi Metropolis, the adult Christian population is about 84.5%, thus a sample population of 92.7% being Christian, was a close reflection of study site demographics.⁵⁶

There were no atheists or traditional believers among study participants even though traditional religious adherents and other religion attendants constitute about 5% of the populace in Ghana while atheists and irreligious persons constitute about 6% of the populace.²⁶⁷

Majority of participants in this study had some form of formal education and only about 11% of participants had no education. Ghana's literacy rate according to the world bank is at 79 percent which ranks the country as 23rd in Africa when it comes to literacy.²⁶⁸ The percentage of non-educated participants (11%) was lower than expected from national figures, but that may be because the study was carried out in an urban area where people are more likely to have had some education, or because hypertensives with some education are more likely to seek medical help than those without as reflected in a systematic review assessing knowledge of cardiovascular disease risk in sub-Saharan Africa.²⁶⁹

There is a gender gap in education in Ghana with about 19% of females having no education as against 9% of males. Even though there is an educational gap between male and female, this has significantly improved from the year 2003 when 45% of females had no education as against 27% of their male counterparts.²⁷⁰ Females still lag behind educationally for a country with an almost 1:1 male to female ratio.²⁷¹ Education in Ghana is also stratified by age with 60% of women between the ages of 15-49 having some education while 70% of males in the same age category are educated.²⁷⁰

Given that majority of participants were female and older, there was a higher likelihood of lower educational levels even though majority of participants had some education. The fact that only 3 participants (2.7%) had tertiary education while more than a third had only basic education is helpful in defining educational attainment in this particular cohort. Of the 3 participants that had tertiary education, one had been to the teacher training college, one had received university education and only one participant had post graduate education.

Based on the educational trends in Ghana, it is expected that if the sample population had been younger and more male, the educational levels might have improved. With more participants having higher education, blood pressure control as well as economic resources would likely be higher.

Since one of the resources measured by this study was education and considering the importance of education in medical literacy and overall health,²⁷² it was important to determine the baseline educational level of study participants to be able to form objective

opinions on how much participants would be able to understand the dynamics of hypertension as related to medication adherence and ultimately blood pressure control.²⁷³

Most of the participants were married and there was a statistically significant relationship between marriage and family resources ($P=0.04$) with married participants more likely to have adequate family resources. This may be explained by the social capital gained with marriage which in a Ghanaian context goes beyond the joining of two lives.

Marriage is often associated with the joining of families resulting in a broader social network for spouses. This creates access to social help than would be available through in-laws and friends of spouses; relationships that tend to persist even after the loss of a spouse through death or divorce.²⁷⁴

Marriage is also a source of children with grown children often offering social as well as economic support. It is quite common at the Chronic Care Clinic of KATH to have grown children accompanying parents on hospital visits. This is but one of the varied forms of support obtained from marriage that has been demonstrated as advantageous to health and the management of disease, chronic or otherwise.^{275–277}

Based on the finding that most of the participants were married, it is a safe assumption that the family formed with one's spouse was a primary consideration in the responses about available family resources.

5.2 PARTICIPANT RESOURCES

The most available resource among participants were religious resources. In the premier study assessing Family Resources using the SCREEM-RES tool which was done in the Philippines,²⁷⁸ religious resources were also found to be the most available family resource. Both studies were done in two middle income countries considering Ghana's recent economic reclassification²⁷⁹ and the long standing economic designation of the Philippines.²⁸⁰

Ghana and the Philippines have large numbers of their populace being religious adherents considering the religious population in the Philippines has been found to be upwards of 98%²⁸¹ while that in Ghana has similarly high figures of close to 90%.²⁶⁷

Faith tends to be quite a significant part of life in developing countries as compared with more westernized societies.²⁸² Interestingly, of the two questions that assessed religious resources, i.e. “Our faith and religion helps our family” and “We are helped by members of our church or other religious group”, the former had the highest agreement and even though five participants disagreed with the first statement, no participant strongly disagreed with that same statement.

While 95.5% of participants agreed that faith and religion helped their family, the question concerning family help obtained from the church or other religious groups did not elicit as strong a response (66.3%) indicating that religious resources had more to do with personal faith as against social help provided by religious communities. This was also concurrent with the Filipino study where 97.8% of participants agreed with the statement that religion helped their family while fewer participants (84.4%) agreed that they were helped by church or religious groups.²⁷⁸ Such results could indicate that appealing to patients through their unique religious beliefs when addressing the importance of medication adherence might improve health outcomes.

Similar to the Filipino study,²⁷⁸ the resource considered least available was economic. Both countries being middle income countries with significant health system challenges including affordability^{283–285} could be responsible for this result.

One of the most significant factors affecting individuals and population health is financial. A common way of assessing economic wellness on the individual level is with individual income.²⁰⁴ Cost of accessing care at primary care facilities²⁸⁶ as well as the cost of medication is a major barrier to medication adherence in a number of developing economies.²⁸⁶ This is exemplified by patients with hypertension in Ethiopia being twice as likely to adhere to their antihypertensive medication if the drugs are free or nearly free.¹⁴⁶ Better adherence has also been noticed in Nigerian hypertensives with access to free hypertensive drugs,²¹⁹ and even when good adherence exists, it is not sustained among low income earners evidenced by a ten-year adherence rate study in a high income country where participants with lower incomes had progressively worsening medication adherence after 2 years.²⁰³

Ghana has a National Health Insurance Scheme (NHIS) which has been operational since 2003,²⁸⁵ and is accessible to all Ghanaians regardless of pre-existing

health condition once they pay the annual premium. NHIS is also available at no charge to members of the Social Security and National Insurance Trust (SSNIT) which is a public trust that primarily covers the formal industry in the country.²⁸⁷

In spite of this avenue to access health services including care for hypertension, the NHIS has been fraught with challenges in recent years. One major problem facing the NHIS is regular delays in payment of claims from the insurance scheme to the health care providers.²⁸⁵ This invariably causes interruptions in service, resulting in out of pocket payments locally known as “cash and carry” being demanded of scheme subscribers for health care providers to be able to meet operational costs.²⁸⁵

Inadequate coverage for health delivery by the NHIS also results in patients being required to make payment to meet insurance shortfalls in order to access auxiliary services like laboratory²⁸⁵ services as well as compensate for medication shortages.²⁸⁸

Assessing economic resources among our sample population was done using two statements i.e. “Our Family’s savings is adequate for our needs” and “Our Family’s income is adequate for our needs”. Both statements garnered enough disagreement (60% and 57.2% respectively) to make the economic resource category the least available as perceived by study participants.

Ghana’s Gross domestic product (GDP) is pegged at \$65.5 billion with a GDP per capita of \$2202.31. In context of the GDP per capita across the continent which ranges from about \$126.9 in Somalia to \$17,448 in Seychelles, Ghana has the 11th highest GDP per capita in sub-Saharan Africa. Cost of living aside, the significantly lower GDP when compared with the GDPs of high-income economies²⁸⁹ make for the predictable conclusion that neither savings nor income are considered sufficient by participants.

The GDP of the Philippines is almost five times that of Ghana at \$330.9 billion even though both countries are categorized as middle-income economies²⁸¹ and although the GDP per capita in the Philippines of \$3850²⁸⁰ is almost double that in Ghana, results were remarkably similar when economic resources were assessed in both jurisdictions.

It is also possible that personal financial habits were responsible for the responses considering that income is more of a function of GDP²⁹⁰ than savings. This is buttressed by the fact that Ghana’s recorded gross savings rate in 2019 was 22.1%,²⁹¹ while the Philippines with a higher GDP during the same period had a gross savings rate of

14.26%²⁹¹ and the USA which has one of the highest GDPs in the world had a savings rate of 18.2%.²⁹¹

After assessing all family resources by unit, the following ranking was observed.

1. Faith helped the family (95.5%) **2.** There was adequate education to care for the patient (83.68%). **3.** Culture strengthened the family (83.6%). **4.** There was enough help from the family (77.3%) **5.** There was adequate help from health care providers (74.6%). **6.** There was adequate education to understand the illness (71%). **7.** There was adequate medical care available in community (66.4%). **8.** There was adequate help from religious groups (66.3%). **9.** A culture of help existed within the community (64.5%). **10.** There was adequate help from the community (42.8%). **11.** Family income was considered adequate (42.8%). **12.** Family savings were adequate (40%).

Cumulatively, a positive overall picture of adequate family resources was reported by the sample population.

The Filipino study showed some similarity in ranking with the resource per unit from greatest to least being **1.** Faith helped the family (97.8%). **2.** There was adequate help from health care providers (96.7%). **3.** There was enough help from the family (94.5%). **4.** Culture strengthened the family (91.1%). **5.** A culture of help existed within the community (88.9%). **6.** There was adequate help from religious groups (84.4%). **7.** There was adequate education to care for the patient (83.3%), **8.** There was adequate help from the community (82.2%), **9.** There was adequate education to understand the illness (76.7%), **10.** There was adequate medical care available in the community (61.1%) **11.** Family savings were adequate (19.1%) **12.** Family income was considered adequate (16.7%).

Resource wise, the current study and the Filipino study found the same resource being most available i.e. religious and least available i.e. economic. This is likely due to the fact that both countries are middle income economies with highly religious populations. It is likely that the resource distribution in a high-income country with a lower population of religious people would yield different results.

5.3 SOCIAL RESOURCES AND RELIGION

When assessed by domain, social resources were found to have a statistically significant relationship with religion with Christians likely to have more family resources. This result is not surprising, based on the current religious demography of Ghana.

Southern Ghana in particular has a majority of Christians²⁷⁰ and the vast majority of Moslems in the south tend to be migrants from the northern part of Ghana who often live in poorer clusters called Zongos. Migrant Moslems may not necessarily have the support of their native communities depending on how cohesive or non - cohesive their current environment is and that would explain a lack of resources in general.

It can also be theorized that since social resources were assessed using supportive family and friends, more extrafamilial support is available among Christian/Church groups as compared to other religions.²⁹²

Surprisingly, there was no statistically significant relationship between education and resources even though all participants with tertiary education reported adequate family resources and there is data showing a significant relationship between educational levels and medical knowledge.²⁷³

There was also no other statistically significant relationship between the family resource domains and age or sex. The significant relationship between total family resources and marital status was also not repeated when the various domains of family resources were analysed against marital status.

5.4 MEDICATION ADHERANCE IN PARTICIPANTS

Medication adherence as measured by the Morisky 8-point medication adherence scale (MMAS) found 31.8% of participants had low adherence to antihypertensive medication, 45.5% had medium adherence and 22.7% of participants had high adherence.

As a result of the focus on low adherence being a challenge in hypertensive control, adherence was recategorized before analysis. Participants with low medication adherence were put in one group (31.8%) while participants with medium and high

adherence were placed in a second group (68.2%). A greater population with medium to high medication adherence was a positive finding for patient care at the KATH Chronic Care Clinic.

Results of medication adherence studies in hypertension have been mixed with some studies finding good adherence in majority of their sample population^{227,293} while other studies have found poor adherence in majority of their sample population.^{211,294}

One possible reason for the finding that majority of participants had medium and high medication adherence is because medication adherence was subjectively reported²⁹⁵. It is possible that patients answered questions favouring higher levels of adherence because of the belief that the interviewer, a health care provider herself, was more likely to appreciate answers that suggested compliance with prescribed medication.

Medication adherence, when analysed against age, gender, marital status and educational level showed no statistically significant relationship, although it was noted that all participants with tertiary education had moderate/high medication adherence. This most likely is an indication that clinic participants receive similar counselling on hypertension and consequently antihypertensive medication.

It is still not known if participants are exposed to other information on hypertension outside of the clinic which influences their adherence one way or the other.

There was no correlation found between family resources and medication adherence. This could be due to the fact that the sample population was of a lower socio-economic group as evidenced by educational levels. It could also be because medication adherence was subjectively measured or that the SCREEM tool was not appropriate for the population sampled.

5.5 BLOOD PRESSURE CONTROL IN PARTICIPANTS

Although not explicitly stated as an objective, it was found that majority of participants in this study had uncontrolled blood pressure (i.e. BP $\geq$ 140/90mmhg) and while there is a possibility that those values reflect the state of blood pressure control of Chronic Care Clinic attendants, it was also noted that majority of these same participants (66%) had controlled blood pressure (BP < 140/90mmhg) at their previous visit to the

clinic. A possible explanation for this disparity is that at the time the data was collected, the clinic had just been restarted after a month's suspension following the lockdown of Kumasi and Accra as a result of the COVID-19 pandemic.

Based on the documented effects of the pandemic on mental health,^{296,297} there is the possibility that a baseline anxiety existed among patients due to news of the pandemic. The fact that participants were in a health facility where COVID-19 patients were being managed could have contributed to fear of contracting the virus by study participants translating into higher blood pressure values than would normally be observed pre-pandemic. This theory is supported by the fact that almost every clinic attendant had an initial blood pressure measurement that was higher the first time it was taken than the value obtained 5 minutes later.

On the other hand, it is not uncommon to have poorly controlled blood pressure in majority of the populace of a hypertensive clinic^{294,298} even though some studies have found blood pressure control to be better in patients who regularly attend hypertensive clinics.²⁹⁹

Blood pressure control when analysed against participant age, gender, marital status and educational levels showed no statistically significant relationship. This was true for blood pressure control at the time of data collection and also true for blood pressure control at the previous visit of the study participants.

There was also no statistically significant relationship between blood pressure control and medication adherence as assessed by the MMAS-8.

Knowing that the better the medication adherence, the better the blood pressure control,¹⁹⁷ there was an expectation of a strong positive correlation between medication adherence and blood pressure control. This was not the case for either past or current blood pressure control of study participants, however existing evidence from a meta-analysis of antihypertensive adherence studies and blood pressure control revealed no statistical significance between both variables.¹⁹⁷

It should be noted that other ways of assessing medication adherence (apart from the MMAS) have in some cases found statistically significant relationships between blood pressure control and medication adherence.²⁹

The hypothesis that family resources had a positive association with medication adherence was not proven by the results of this study. No statistically significant relationships were established between family resources and medication adherence thus the adequacy of family resources had no influence on medication adherence. This was true when family resources were analysed in totality against medication adherence and also when family resources were analysed by domain against medication adherence.

These findings may be different if another measure of medication adherence is used or a different tool for assessing family resources replaces the SCREEM questionnaire used.

5.6 STUDY LIMITATIONS

It is possible that due to the fact that participants were interviewed at the same premises where they received their care and the interview was conducted by a health care provider known to participants, adherence levels were overstated in order to appear compliant with previously prescribed treatment regimens. The age limitation put on study participants in an attempt to reduce patients with complications of hypertension could also have altered the availability of resources found as it is possible that a more elderly population might have offered better insight into family resource allocation.

It is also to be noted that self reported tools such as the MMAS-8 and SCREEM-RES may possibly overstate or understate outcomes since they are subjective measures. The fact that data was collected a few months after the COVID-19 pandemic, could have coincided with a general level of anxiety among patients resulting in an attendant rise in blood pressure levels which may not have been present pre-pandemic.

It is also possible that the poor blood pressure control observed was due to the fact that patients had defaulted on their medication because the clinic had been previously suspended in line with the COVID-19 restrictions initially imposed by the management of the directorate which had resulted in a lack of access to a consistent supply of antihypertensives.

Another challenge faced in outlining the discussion was that family resource studies are limited, and following extensive literature searches, only one other study was found to have been done using the SCREEM questionnaire. This particular limitation resulted in restrictions when comparing the results of this study with existing data from family resource studies.

To the best of knowledge, this is the first study on the relationship between family resources and hypertension in Africa using the SCREEM tool. Considering that Family Medicine as a residency programme in Ghana is just two decades old, this study from a relatively young program contributes invaluable insight for the practise of Family Medicine in similar population groups across the continent.

This body of work also offers a practical family - based perspective that may influence the approach of non-communicable disease management by Family Physicians.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

There was no established relationship between family resources and medication adherence for patients with essential hypertension attending the Chronic Care Clinic of the Komfo Anokye Teaching Hospital. The most available family resource was religious with the least available resource being economic. Medication adherence to antihypertensives was moderate to high in majority of respondents however blood pressure control was poor among the majority of participants and did not correlate with self-reported medication adherence.

6.2 RECOMMENDATIONS

This study leaves room to re-examine blood pressure control at the Chronic Care Clinic of the KATH Family Medicine Directorate under more stable conditions that existed pre pandemic after continuity of care has been re-established.

It is also recommended that future studies on medication adherence be done with a more objective measuring scale and that further studies on family resources be undertaken especially when it comes to the impact of these resources on health in order to give health care providers a more rounded assessment of the individual patient.

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APPENDIX 1

PATIENT INFORMATION LEAFLET

THE RELATIONSHIP BETWEEN FAMILY RESOURCES AND DRUG ADHERENCE IN ESSENTIAL HYPERTENSION.

This study is being conducted by Dr Constance Opoku of the Family Medicine Directorate of the Komfo Anokye Teaching Hospital

We are studying how available family resources affects how people attending this clinic with hypertension take their medicine. We want to see if there are things that help you to take the drugs that you are given. Our goal is to improve how medicine is taken as instructed by your doctor. We will talk to about 105 patients attending the Chronic Care Clinic held by the Family Medicine Directorate in the Komfo Anokye Teaching Hospital for the next 6 weeks. Participants of this study will be selected in a random and fair manner to give everyone a chance to participate in the study.

We will ask questions about how you take your medicine and the family resources that are available to you. The interview will take between 5 -10 minutes and will be done during your appointment with the doctor. There will be no charge to you for being in this study. We will also be using information from your folder to get a better picture of the topic above.

The study may add a little bit of time to your consulting time at the hospital. We hope the information you provide will help us understand the support people with hypertension have available to them and may help us know how that support affect whether patients take their drugs as prescribed.

This study is voluntary and totally confidential, and you are under no obligation to participate. Your answers will be on a form different from the consent form and no one will be able to trace your answers back to you. The only exception will be if it is very difficult for you to take your medicines, a note may be made in your folder so that you will receive extra support to help you take your medicine in future appointments.

You may decide to withdraw your consent to participate in this study whenever you choose to during the interview. If you decide to not participate or withdraw your consent at any time during the study, there will be no effect on your medical care, and you will not suffer any consequences. We will not attach your name to your responses but would assign random numbers to keep the information you share with us private. You may ask any question about this study now or in the future by contacting Dr Constance Opoku on 0546677888.

Further, if you have any concern about the conduct of this study, your welfare or your rights as a research participant, you may contact:

The Office of Chairman

Komfo Anokye teaching Hospital Institutional Review Board

Kumasi

Tel:03220223014

APPENDIX 2

CONSENT DOCUMENT

I have fully explained this research to.....and have given sufficient information about the study, including that on procedures, risks and benefits, to enable the prospective participant make an informed decision to or not to participate.

DATE.....

NAME.....

I have read the information on this study or have had it translated into a language I understand. I have also talked it over with the interviewer to my satisfaction. I understand that my participation is voluntary (not compulsory).

I know enough about the purpose, methods, risk and benefits of the research study to decide that I want to take part in it.

I understand that I may freely stop being part of this study at any time without having to explain myself.

I have received a copy of this information leaflet and consent form to keep for myself.

NAME.....

DATE.....

SIGNATURE/THUMBPRINT.....

I..... certify that the information given to..... in the local language, is a true reflection of what I have read from the study participant information leaflet attached.

Witness Name.....

Witness Signature/ thumbprint.....

APPENDIX 3

MORISKY 8 - ITEM QUESTIONNAIRE

1. Do you sometimes forget to take your medication?

1- No 0-Yes

2. People sometimes miss taking their hypertension drugs for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your hypertensive drugs?

1- No 0-Yes

3. Have you ever cut back or stopped taking your anti-hypertensives without telling your doctor, because you felt worse when you took it?

1- No 0-Yes

4. When you travel or leave home, do you sometimes forget to bring along your hypertension drugs?

1- No 0-Yes

5. Did you take your hypertensive drugs yesterday?

1-No 0-Yes

6. When you feel like your blood pressure is under control, do you sometimes stop taking your anti-hypertensives?

1-No 0-Yes

7. Taking drugs for hypertension is a real inconvenience for some people. Do you ever feel hassled about sticking to your blood pressure control drugs?

1- No 0-Yes

8. How often do you have difficulty remembering to take all your anti-hypertensives?

1-Never/Rarely
0.75-Once in a while
0.5-Sometimes
0.25-Usually
0- All the time

APPENDIX 4

SCREEM QUESTIONNAIRE

1. We help each other in our family (Social)

0-Strongly Disagree
1-Disagree
2-Agree
3-Strongly Agree

2. We are helped by friends and other members of the community (Social)

0-Strongly Disagree
1-Disagree
2-Agree
3-Strongly Agree

3. Our Culture gives our family Strength. (Cultural)

0-Strongly Disagree
1-Disagree
2-Agree
3-Strongly Agree

4. A Culture of helping and corporation in our community helps our family.
(Cultural)

0-Strongly Disagree
1-Disagree
2-Agree
3-Strongly Agree

5. Our faith and religion helps our family (Religious)

0-Strongly Disagree
1-Disagree
2-Agree
3-Strongly Agree

6. We are helped by members of our church or other religious groups (Religious)

0-Strongly Disagree

- 1-Disagree
- 2-Agree
- 3-Strongly Agree

7. Our Family's savings is adequate for our needs (Economic)

- 0-Strongly Disagree
- 1-Disagree
- 2-Agree
- 3-Strongly Agree

8. Our Family's income is adequate for our needs (Economic)

- 0-Strongly Disagree
- 1-Disagree
- 2-Agree
- 3-Strongly Agree

9. Our education/Knowledge is adequate to understand information about the illness (Educational)

- 0-Strongly Disagree
- 1-Disagree
- 2-Agree
- 3-Strongly Agree

10. Our education/knowledge is adequate to care for the patient (Educational)

- 0-Strongly Disagree
- 1-Disagree
- 2-Agree
- 3-Strongly Agree

11. It is easy to access medical help in our community. (Medical)

- 0-Strongly Disagree
- 1-Disagree
- 2-Agree
- 3-Strongly Agree

12. We are helped by doctors, nurses and health workers (Medical)

- 0-Strongly Disagree
- 1-Disagree
- 2-Agree

3-Strongly Agree

APPENDIX 5

STUDY QUESTIONNAIRE

ASSOCIATION BETWEEN FAMILY RESOURCES AND DRUG ADHERENCE IN ESSENTIAL HYPERTENSION.

Study ID

Interview date /.../2020

Interviewer:

Time interview Started

Sex of Respondent

Thank you for participating in this study.

The first questions are about simple information.

1. What is your age? (In years)

2. What is your religion?

- 1- Moslem
- 2- Christian
- 3- traditional
- 4- Other-specify.....

3. Are you married?

- 0- No, never married
- 1- Yes, Married
- 2- Not married but living with someone as if married
- 3- Divorced/Separated
- 4- Widow/Widower
- 5- Refused to answer

4. What is the highest level of school you have attended?

.....

- | | |
|----------------|---------------------------------|
| 1- None | 5-Islamic Arabic |
| 2-Primary | 6- University |
| 3-Junior High | 7- Other tertiary, specify..... |
| 4- Senior High | 8- Post graduate |

The next set of questions are about the help you have from your family.

5. We help each other in our family

.....

- 0-Strongly Disagree
- 1-Disagree
- 2-Agree
- 3-Strongly Agree

6. We are helped by friends and other members of the community.

.....

- 0-Strongly Disagree
- 1-Disagree
- 2-Agree
- 3-Strongly Agree

7. Our Culture gives our family Strength.

.....

- 0-Strongly Disagree
- 1-Disagree
- 2-Agree
- 3-Strongly Agree

8. A Culture of helping and corporation in our community helps our family

.....

- 0-Strongly Disagree
- 1-Disagree
- 2-Agree
- 3-Strongly Agree

9. Our faith and religion helps our family

.....

- 0-Strongly Disagree

- 1-Disagree
- 2-Agree
- 3-Strongly Agree

10. We are helped by members of our church or other religious groups.

- 0-Strongly Disagree
- 1-Disagree
- 2-Agree
- 3-Strongly Agree

11. Our Family's savings is adequate for our needs.

- 0-Strongly Disagree
- 1-Disagree
- 2-Agree
- 3-Strongly Agree

12. Our Family's income is adequate for our needs

- 0-Strongly Disagree
- 1-Disagree
- 2-Agree
- 3-Strongly Agree

13. Our education/knowledge is adequate to care for me

- 0-Strongly Disagree
- 1-Disagree
- 2-Agree
- 3-Strongly Agree

14. It's easy to access medical help in our community.

- 0-Strongly Disagree
- 1-Disagree
- 2-Agree
- 3-Strongly Agree

15. We are helped by doctors, nurses and health workers

- 0-Strongly Disagree
- 1-Disagree
- 2-Agree

3-Strongly Agree

The next set of questions are about your experience in taking your drugs for hypertension

16. Do you sometimes forget to take your medication?
.....
1- No 0-Yes
17. People sometimes miss taking their hypertension drugs for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your hypertensive drugs?
.....
1- No 0-Yes
18. Have you ever cut back or stopped taking your anti-hypertensives without telling your doctor, because you felt worse when you took it?
.....
1- No 0-Yes
19. When you travel or leave home, do you sometimes forget to bring along your hypertension drugs?
.....
1- No 0-Yes
20. Did you take your hypertensive drugs yesterday?
.....
1- No 0-Yes
21. When you feel like your blood pressure is under control, do you sometimes stop taking your anti-hypertensives?
.....
1- No 0-Yes
22. Taking drugs for hypertension is a real inconvenience for some people. Do you ever feel hassled about sticking to your blood pressure control drugs?
.....
1- No 0-Yes
23. How often do you have difficulty remembering to take all your anti-hypertensives?
.....
1-Never/Rarely
0.75-Once in a while

0.5-Sometimes
0.25-Usually
0- All the time

The rest of the information will be obtained from your medical records.

Blood Pressure today..... Blood pressure at last Review..... Date of Last Review.....

Date of first attendance at Chronic Care Clinic.....

Thank you for your time and cooperation.

Time interview ended.....

APPENDIX 6 STUDY

QUESTIONNAIRE (TWI)

ASSOCIATION BETWEEN FAMILY RESOURCES AND DRUG ADHERENCE IN ESSENTIAL HYPERTENSION.

Study ID

Interview date /.../2020

Interviewer:

Time interview Started

Sex of Respondent (Obaa/Obarima)

Yɛ da wase se wabɛ ka dwumadie yi ho.

Yɛ bɛ di kan abisa wo ho aɛm kakra.

24. W'adi nfie sɛn?

25. Wo yɛ

1-Kramoni

2- Kristoni

3- Bosomso ni

4- Bibi fofro (den?)

26. Wo yɛ

6- Obi a wonware da,

7- Owarefo

8- Obi a wone obi wo ho

9- Obi a wagyaɛ awareɛ

10- Okunafo

11- Wonma mmuaɛ

27. Wo kɔɔ Sukuul si sɛn?

- | | |
|------------------|------------------------|
| 1- Mankɔ bi | 5-Makaranta |
| 2-Primary Sukuul | 6- Sukuu Pɔn |
| 3-JSS | 7- Sukuu Pɔn(diɛhen) |
| 4- SSS | 8- Wo twamu Sukuu Pɔn? |

Yɛ bɛ busa wu mmoa a wonya fi w'abusuafo hɔ

28. Yɛ boa yɛho yɛho wo yɛn abusua mu.

- 1-Me ne wo yɛ adwen paa
- 2-Me ne wo yɛ adwen
- 3-Me ne wo nnyɛ adwen
- 4-Me ne wo nnyɛ adwen koraa

29. Yɛ nya mmoa firi yen nnanfofo hɔ ne yɛ mpatamu foɔ hɔ

- 1- Me ne wo yɛ adwen paa
- 2-Me ne wo yɛ adwen
- 3-Me ne wo nnyɛ adwen
- 4-Me ne wo nnyɛ adwen koraa

30. Sɛniɛ yɛ yɛ yɛ nniema, ma abusua no tintim.

- 1-Me ne wo yɛ adwen paa
- 2-Me ne wo yɛ adwen
- 3-Me ne wo nnyɛ adwen
- 4-Me ne wo nnyɛ adwen koraa

31. Yenya mmoa fi yen mpatamufoɔ hɔ a ɛboa yen abusua

- 1-Me ne wo yɛ adwen paa
- 2-Me ne wo yɛ adwen
- 3-Me ne wo nnyɛ adwen
- 4-Me ne wo nnyɛ adwen koraa

32. Yɛ gyidie wɔ Nyame mu boa yen abusua

- 1-Me ne wo yɛ adwen paa

- 2-Me ne wo ye adwen
- 3-Me ne wo nnye adwen
- 4-Me ne wo nnye adwen koraa

33. Ye nya moa fi kuo a ye ne won som Nyame.

- 1-Me ne wo ye adwen paa
- 2-Me ne wo ye adwen
- 3-Me ne wo nnye adwen
- 4-Me ne wo nnye adwen koraa

34. Abusua sika a yesie, eso nea yehia nyinaa.

- 1-Me ne wo ye adwen paa
- 2-Me ne wo ye adwen
- 3-Me ne wo nnye adwen
- 4-Me ne wo nnye adwen koraa

35. Yen abusua sika a yenza no, so nea ehia yen nyinaa

- 1-Me ne wo ye adwen paa
- 2-Me ne wo ye adwen
- 3-Me ne wo nnye adwen
- 4-Me ne wo nnye adwen koraa

36. Yen nnimdiee wo abusua no mu boa ma mehwe me pressure no

- 1-Me ne wo ye adwen paa
- 2-Me ne wo ye adwen
- 3-Me ne wo nnye adwen
- 4-Me ne wo nnye adwen koraa

37. Enye din se yebenya apomuden mmoa wo yen mpata mu

- 1-Me ne wo ye adwen paa
- 2-Me ne wo ye adwen
- 3-Me ne wo nnye adwen
- 4-Me ne wo nnye adwen koraa

38. Ye nya mmoa fi adokta foɔ, anurse foɔ ne won a won wo ayaresabea

- 1-Me ne wo ye adwen paa

- 2-Me ne wo ye adwen
- 3-Me ne wo nnye adwen
- 4-Me ne wo nnye adwen koraa

Ye bebusa wo nsem afa mogyaboroso yadeε nduro no ho.

39. Eye a wowure fi se wobefa w'aduro?

.....

1- Daabi 0-Aane

40. Eto da bi a ebimu kae nanso won nfa won aduro? Nawotwe mienu a atwamu yi, da bi wo ho a w'anfa w'aduro?

.....

1- Daabi 0-Aane

41. Wagylae wo mmogyaboroso aduro abre a wanka ankyere wo dokota esan se wo fa a na wo ho ye wo basabasa?

.....

1- Daabi 0-Aane

42. Se wo tu kwan a, eya wowure tumi fi se wode w'aduro beko

.....

1- No 0-Yes

43. Wo faa w'aduro enora?

.....

1- Daabi 0-Aane

44. Se eye wo se wo mogya boroso no ko fom a, eya wotumi gyae w'aduro no fa?

.....

1- Daabi 0-Aane

45. Eye a mogyaboroso aduro fa no tumi ha nkrofo bi nom. Wotumi bre w'aduro fa no?

.....

1- Daabi 0-Aane

46. Eya eye din mma wo se wobekae afa wo mogyaboroso aduro no?

.....

1-Entaye enye me sa
0.75-Dakoro bi wo ho a
0.5-Ewo ho a
0.25-Etae si
0- Etae si paa

Nea aka no yebe fa afiri wo ho nsɛm a yatwerɛ dada

Blood Pressure today..... Blood pressure at last Review..... Date of Last Review.....

Date of first attendance at Chronic Care Clinic.....

Yɛ da wase.

Time interview ended.....

APPENDIX 7

PATIENT INFORMATION LEAFLET (TWI)

THE RELATIONSHIP BETWEEN FAMILY RESOURCES AND DRUG ADHERENCE IN ESSENTIAL HYPERTENSION.

Nnipa a wore di dwumadie yi ye Dr Constance Opoku a wɔye adwuma wɔ Family Medicine Directorate a ɛwo Ɔkomfo Anokye ayaresabea

Yɛ pe sɛ yesua sɛnɛ abusua boa nnipa a wɔn wɔ mmogya borosoɔ, titriw sɛnɛ ɛtumi boa ma won fa aduro. Yɛ pe se yehu sɛ nnoɔma bi wɔ hɔ a ɛboa ma wɔn tumi fa w'aduro no.

Yɛn botae ne sɛ yebeboa ama obiaa afa ne mogyaboroso aduro sɛnɛ ɛwo se ɔfa. Yɛ ne nnipa beye se wɔha ne enum a wɔn ba be hwe wɔn mmogya boroso wɔ Family Medicine Clinic yi ɛwo nnawotwe nsia a ɛda yɛn anim yi. Yɛbe mma oibara kwan se ye betumi ayi wɔn aka dwumadie yi ho.

Yɛbe busa wo nsem afa sɛnɛ wofa waduro ne abusua mmoa a wo nya. Nsembusa yi bɛdi beye se sima du na dokota a wobehwe wo no, ono ara na obe bisa wo nsem no

Sɛ yedi wo ka dwumadie yi ho a, wontua sika biara. Yɛ be fa wo ho nsem bi a yennim dada nso aka ho.

Dwumadeɛ yi be see wo mmre kakra. Yɛ wo gyidie sɛ nsem a wo be ka akyerɛ yɛn no, ɛbe boa ama yɛn atumi aboa wɔn a wɔwɔ mogya boroso na ɛbe san aboa ama yɛn ahu mmoa a wɔn a wɔwɔ mmogyaboroso no nya fi abusua mu, ne sɛnɛ saa mmoa no ma wɔn tumi fa wɔn mogyaboroso aduro.

Dwumadie yi nnye nhyɛ, na nea wobe ka akyerɛ yɛn biara ni hɔ a yɛbe ka akyerɛ oibara. Wommuae no bwo krataa fofrɔ a wodin eni so nti oibara a wobe fa krataa biara ntumi nhu se wo na wama mmuae a ewo so no. Se yehu sɛ aduro fa no ye won din a, yebetumi akwerɛ agu wayaresa krataa no so sɛnɛ ɛbeyɛ a yebetumi aboa wo yie.

Wo betumi agyae nsembusa no mmuae abere biara a wope. Sɛ wo pe se woyi woho firi dwuma die yi mu a, ɛnha wapɔn muden hwe koraa. Se wowɔ asembusa bi wɔ dwumadie die yi ho a, wobetumi afere Dr Constance Opoku ewo ahomatrofo 0546677888 so.

Se wowɔ ɔhaw bi fa sɛnɛɛ yeredi dwumadie yi a, wo betumi afɛ panyimu a
ɔhwɔdwumadie yi so ewo ahomatrofo 03220223014 anaa sɛ wobetumi atwerɛ no krataa a
ɛwɔ

The Office of Chairman

Komfo Anokye teaching Hospital Institutional Review Board

Kumasi.

APPENDIX 8

CONSENT DOCUMENT (MPAEMUKA)

Ma kyerekyere dwumadie yi mu akyere..... ena
makerkyere nnoma a ebetumi aboa ne nea ebeha afa dwuma die yiho. Ma ye wie sedee
ebe ye a, nnipa yi betumi asi ne bo se wo be ka dwumadie yi ho anaa se wobe yi neho afri
mu.

DATE.....

NAME/ EDIN.....

Makan asem a efa dwumadie yi ho anaa se obi akyerekyere me wo kasa a mete asee mu
ama mate asee. Me ne dokota a wore busa nsem yi so adi nkomo afa dwumadie yi ho ama
me ho ato me. Mate asee se, dwumadie yi nye nhy na me de me pe ena ewura dwumadie
yi mu.

Mate asee, ahu dwumadie yi ho nfaso ena me se mepɛ se meka dwumadie yi ho.
Me te asee se me tumi yi meho firi dwumadie yi mo eberɛ biara a mepɛ a menmma
nkyerekyeremu biara.

Manya krataa yi bi a ekyere dwumadie yi ne krataa a metim ahye se me ka
dwumadie yi ho.

NAME/EDIN.....
.....

DATE.....

SIGNATURE/THUMBPRINT/AHYENSODEE.....
.....

Me..... gyitum se nsem
a yaka akyere.....wo twi kasa no mu no eye nea yatwere agu
krataa a ekyerekyere dwumadie no pe pe pe.

Dansini Din.....

Dansinii Ahyensodee.....

APPENDIX 9

REVIEWED FELLOWSHIP PROPOSAL SUBMISSION

KOMFO ANOKYE
TEACHING HOSPITAL



P.O. BOX 1934
KUMASI - GHANA
Tel: 233-51-22301 - 4
Fax: 233-51-24654 / 24621
E-mail: kath@kathksi.org
Website: www.kathksi.org

18th May 2020

The Vice Rector
Ghana College of Physicians and Surgeons
Accra.

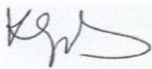
Dear Sir,

REVIEWED FELLOWSHIP PROPOSAL – DR CONSTANCE OPOKU

Kindly find attached the revised proposal "Association between Family Resources and Drug Adherence in Hypertensive Management at the Chronic Care Clinic of Komfo Anokye Teaching Hospital."

This proposal is in response to the comments from the second reviewer and has been revised by the fellowship candidate with input from myself and two other supervisors.

Thank you for your consideration.

Yours  faithfully,

A Centre of Excellence

APPENDIX 10

ETHICAL APPROVAL

KOMFO ANOKYE TEACHING HOSPITAL		P. O. Box 1934 KUMASI - GHANA Tel: +233 - 3220 - 22301- 4 Fax: +233 - 3220 - 24654/24621 Website: www.kathhsp.org
Our Ref. No: <u>KATH-IRB/AP/002/19</u>		
Your Ref. No:		
Komfo Anokye Teaching Hospital Institutional Review Board		
3 rd December 2019		
Dr. Constance Afra Opoku, Family Medicine Directorate, Komfo Anokye Teaching Hospital, P. O. Box KS 1934, Kumasi.		
Dear Dr. Opoku,		
Ethics Approval		
Protocol title:	The Association between Family Resources and Drug Adherence in Essential Hypertension at the Chronic Care Clinic of Komfo Anokye Teaching Hospital	
Study site:	Family Medicine Directorate Chronic Care Clinic, Komfo Anokye Teaching Hospital, Kumasi, Ghana.	
Sponsor:	Self-funded.	
We are writing in response to your correspondence of 21st October 2019 requesting the Komfo Anokye Teaching Hospital Institutional Review Board (KATH-IRB) to review the research study referenced above.		
The proposed research study went through Full Board Review meeting of 5 th November 2019 and we are pleased to inform you that KATH-IRB has given approval for the following study documents:		
• Protocol version 2, last updated on 25th November 2019 • Informed Consent Form version 2, last updated on 25th November 2019 • Case Report Form version 2, last updated on 22nd October 2019		
Approval for the study is in effect until 2 nd December 2020 and it is the responsibility of the Principal Investigator to maintain the study in good standing at the Komfo Anokye Teaching Hospital. The Board anticipates to be notified of the actual start date of your project.		
Prior to the expiration of the study approval, you must submit to the KATH-IRB an "Application for Continuing Review" along with provision of "Annual Report" when the study is ongoing, or a "Termination Report" if the research has been completed.		
Page 1 of 2 <u>A Centre of Excellence</u>		

You must hastily report to the KATH-IRB should a modification to the research be proposed, and without delay if an unanticipated development occurs before the next required review. Regulations do not permit you to modify conduct of the study in its present form prior to ethics approval; except where urgent action is required to eliminate an apparent immediate hazard to a study subject or other person. It is of utmost importance data generated from this study must be used for the intended purposes only.

Thank you.

Sincerely,

A handwritten signature in blue ink, appearing to read 'K. Danso', is positioned above the printed name.

Prof. Kwabena Antwi Danso, BSc, MB ChB, FWACS, FGCS, FACOG
Chairman, KATH-IRB

APPENDIX 11

R & D CERTIFICATION OF REGISTRATION



KOMFO ANOKYE TEACHING HOSPITAL
RESEARCH AND DEVELOPMENT UNIT (R & D)
CERTIFICATE OF REGISTRATION

REG. NO: *RD/CR19/216*...

This is to certify that

Prof/Dr/Mrs/Mr/Ms... *Opoku Constance Afra*.....
has registered his/her proposed study titled *The Association between*.....
Family Resources and Drug Adherence in Essential Hypertension at.....
the Chronic Care Clinic of Komfo Anokye Teaching Hospital......
..... with the Research and Development Unit.

Date: *17-October-2019*.....

Name of issuing officer

Signature

Mr. Isaac Boakye.....

K/19/0210836 *

*Receipt number must tally with pay-in slip from the bank

Note

This certificate does not constitute ethical clearance for the conduct of the study but proof of registration of study with KATH. Ethical clearance from the Committee of Human Research, Publications and Ethics (CHRPE) is required to conduct the study in KATH. Copies of all relevant regulatory approvals including CHRPE must be submitted to the R&D Unit prior to commencement of the study.

Version RD/REG-30TH MAY, 2019

Please note: All previous versions of the certificate of registration becomes obsolete

Form expires 30TH JUNE, 2020

APPENDIX 12

AMENDMENT APPROVAL

**KOMFO ANOKYE
TEACHING HOSPITAL**



P. O. Box 1934
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Tel: +233 - 3220 - 22301- 4
Fax: +233 - 3220 - 24654/24621
Website: www.kathsp.org

Our Ref. No: KATH-IRB/AM/003/19

Your Ref. No:

Komfo Anokye Teaching Hospital Institutional Review Board

20th July 2020

Dr. Constance Opoku,
Family Medicine Directorate,
Komfo Anokye Teaching Hospital,
P. O. Box KS 1934.

Dear Dr. Opoku,

Amendment Approval

Protocol title: Association between Family Resources and Drug Adherence in Hypertensive Management at the Chronic Care Clinic of Komfo Anokye Teaching Hospital

Study site: Family Medicine Directorate, Chronic Care Clinic of Komfo Anokye Teaching Hospital, Kumasi.

Sponsor: Self-funded

I write in response to your correspondence dated 23rd June 2020 requesting an amendment to the approved protocol with KATH-IRB reference number KATH-IRB/AP/003/19.

The amended protocol was reviewed and I am pleased to inform you that KATH IRB has now given approval for the following study document:

- *Protocol version 3 last updated on 19th June 2020*

Should any revision to the study, or other unanticipated development occur prior to the next required review, you must inform the KATH IRB without delay.

Thank you.

Page 1 of 2

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Sincerely,



Prof. Kwabena Antwi Danso, BSc, MB ChB, FWACS, FGCS, FACOG
Chairman, KATH-IRB

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