

**ENSIGN GLOBAL COLLEGE, KPONG
EASTERN REGION, GHANA**

**BARRIERS TO SELF-MONITORING OF BLOOD PRESSURE: A
STUDY AMONG HYPERTENSIVE PATIENTS AT THE HO
TEACHING HOSPITAL IN THE VOLTA REGION OF GHANA.**

BY

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DECLARATION AND CERTIFICATION

I declare that this submission is my own work towards the Master of Public Health (MPH) degree, and that to the best of my knowledge, it contains no material formerly issued by another person nor material which has been approved for the honours of any other degree of the University, except where due accreditation has been made in the text.

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DEDICATION

To God be the glory. I solemnly dedicate this work to my understanding and ever supportive husband, Dr. Joshua Amegbletor, and my enduring children, Honourable Josiah, Highness Jesusian, and Heavenly Joshuana, for the neglect they suffered as a result of my absence from home.

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May the almighty God richly bless and replenish everyone a hundredfold of their contributions.

LIST OF ABBREVIATIONS

BP	Blood Pressure
CVD	Cardiovascular Disease
DBP	Diastolic Blood Pressure
ESH	European Society of Hypertension
GHS	Ghana Health Service
GP	General Physician
HCP	Health Care Provider/Professional
HTH	Ho Teaching Hospital
IPD	Individual Patient Data
LMIC	Low- and Middle-Income Country
mmHg	Millimetre of Mercury
MOH	Ministry of Health
NCDs	Non-communicable Diseases
OPD	Out- Patient Department
SMBP	Self-monitoring of Blood Pressure

OPERATIONAL DEFINITION OF TERMS

Self-monitoring of blood pressure	Measuring of one's own blood pressure at home using a self-monitoring device.
Self-monitoring device	Instrument used in measuring one's own BP without the assistance of a health care professional.
Barrier	Factor such as the personal characteristics of a patient, institutional policies/protocols, and health care providers' characteristics, that inhibits a hypertensive patient from self-monitoring his/her blood pressure.
Personal characteristics of patients	Socio-demographic characteristics of age, sex, marital status, educational level, occupation/income status, religious belief, awareness, knowledge, forgetfulness, lack of time, and other co-morbidities.
Health care providers' characteristics	Attitude, perception and communication skills in relation to self-monitoring.

ABSTRACT

Introduction

Hypertension has been a global public health problem. However, hypertension control is low. Regular self-monitoring of blood pressure by hypertensive patients is one sure way of improving their health. This study sought to explore their knowledge about self-monitoring, how they practice it and any barriers to the practice.

Methodology

It was a cross-sectional quantitative study where hypertensive patients who regularly attend Hypertension clinics at the Ho Teaching Hospital were assessed. A structured questionnaire was administered by interviewers or self-administered during patients' normal visits to their physicians for review. Data analysis was done using STATA Statistical/Data Analysis software.

Results

A total of 315 respondents, involving 146 males (46.3%) and 169 females (53.7%) took part in the study. Majority were aged between 30 and 50+ years. Majority of the respondents, 123 (39.1) had lived with hypertension more than 4 years, with diabetes affecting 67 (21.3%) of them. The study found that 52.7% of respondents had heard about SMBP. The proportion of respondents who were currently self-monitoring with their personal BP apparatus was 28.9%.

Conclusion

The main barriers to the practice of self-monitoring identified were low educational level, lack of awareness and lack of money to purchase a personal BP apparatus.

Patients' inability to practice SMBP was largely personal, but was also influenced by access to information/education from HCP.

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CHAPTER 1

INTRODUCTION

1.1 Background Information

A mean systolic blood pressure of 140mmHg or higher, a diastolic blood pressure of 90mmHg, or the usage of antihypertensive drugs are all signs of an individual having hypertension (Gu *et al.*, 2002). One of the biggest threats to public health is hypertension, a major risk factor for cardiovascular disease and a significant but controllable risk factor for heart failure, chronic renal disease, hemorrhagic and ischemic stroke, and coronary artery disease (Oliveros *et al.*, 2020). Because hypertension frequently goes undiagnosed for years or even decades, it is commonly referred to as a "silent killer." The majority of hypertensive individuals do not exhibit any symptoms. Therefore, the only way to detect it is to check one's blood pressure (BP) frequently (Wake, Bekele and Tuji, 2020). We can make the most of the early warning signals by constantly testing blood pressure. Although most hypertension treatments include taking medications, lifestyle modifications, especially nutrition, be almost as effective (Moschonis and Karatzi, 2020a).

Self-monitoring and self-management of blood pressure are efficient approaches to lower blood pressure in patients with hypertension. The BP-SMART partnership used data from 25 studies and patients in a study to conduct an Individual Patient Data (IPD) meta-analysis of trials investigating the efficacy of blood pressure self-monitoring. Self-monitoring decreased blood pressure, and this reduction increased stronger with the level of co-intervention, according to the analyses (Tucker *et al.*, 2020).

Research conducted on the knowledge and awareness of Self-monitoring of blood pressure(SMBP) by hypertensive patients showed that 70% were not introduced to SMBP (Wake, Bekele and Tuji, 2019). The majority of respondents (91.9%) did not

know how to use the device; 41.2% were not able to afford the device; Self-BP monitoring was not important to 15.4% of respondents; 14.1% believed that SMBP is not helpful; Self-monitoring BP devices were unknown to 88.6% of respondents, and 28.7% said they were unreliable. 20.1% had literacy issues; 86.4% were never instructed to use a blood pressure monitor; 2.2% of participants said that healthcare providers discouraged them from utilizing self-monitoring their blood pressure, and 3.3% reported that healthcare professionals did not use their results as hurdles (Wake, Bekele and Tuji, 2020).

This study will improve knowledge of blood pressure self-monitoring and enable a more precisely focused application of this intervention (Tucker *et al.*, 2015)

1.2 Problem Statement

According to the global burden of hypertension study, 9.2% of all deaths are caused by hypertension-related causes, and 25% of adults worldwide have hypertension. Over a billion people are thought to have experience hypertension at this time (Daar *et al.*, 2007). In 2025, this number is projected to rise to about two billion. Recent studies done in Ghana and other sub-Saharan African nations show that cardiovascular diseases (CVDs) are becoming more common at a concerning rate (Konlan *et al.*, 2020).

Non-communicable diseases (NCDs) such as hypertension cause an estimated 29 million deaths annually, or more than half of all fatalities in low- and middle-income nations (36 million NCD deaths worldwide). Before the age of 60, almost 30% of these deaths take place (Daar *et al.*, 2007). According to a study conducted, the prevalence of hypertension in Ghana's population is estimated to be 30.3%, or roughly one in three people, making it an urgent public health concern that needs to be addressed

immediately (Atibila *et al.*, 2021). In developing nations, hypertension has become a serious public health issue because of its increased prevalence and negative repercussions on ailing healthcare systems. Despite being a manageable risk factor for cardiovascular disease, hypertension has not received essential attention in Ghana due to various conflicting demands for scarce healthcare resources (Atibila *et al.*, 2021). According to a comprehensive review study on non-communicable diseases (NCDs) in Africa, hypertension is the main risk factor for cardiovascular diseases (CVDs) across the continent, and the socioeconomic burden that unexpected fatalities have on families is catastrophic for country economies (Zieme *et al.*, 2015).

In patients with co-morbidities related to hypertension, self-monitoring of blood pressure (SMBP) causes clinically substantial BP reductions and can be advised as a component of a larger management strategy in routine clinical practice (Adekunle *et al.*, 2018). According to studies, to increase the likelihood of BP control at follow-up, patients with stroke or obesity should be given self-monitoring therapies in combination with systematic medication titration, pharmacist support, education, or lifestyle changes (Tucker *et al.*, 2020). However, the use of SMBP has not been widespread in Ghana's healthcare system (Adekunle *et al.*, 2018).

Thus, this study aims to investigate a cross-section of hypertensive patients at the Ho Teaching Hospital (HTH), emphasising the obstacles to applying SMBP.

1.3 Rationale of Study

Heart failure, myocardial infarction, and stroke are just a few cardiovascular (CVD) outcomes of hypertension. Systemic hypertension's asymptomatic nature can delay diagnosis and start the best treatments (Oliveros *et al.*, 2019). The prevalence of hypertension increases with age, from 27% in people under 60 to 74% in people over

80, as with many other disorders. The Framingham Heart Study found that more than 90% of participants with normal blood pressure (BP) at age 55 ultimately developed hypertension (Oliveros *et al.*, 2019).

Self-monitoring is beneficial for those with hypertension. This study aimed to lighten the degree of hypertension patients' participation in treating their diseases (Hodgkinson *et al.*, 2019). To better the health and longevity of hypertensive patients, policymakers and healthcare professionals will be more knowledgeable about how to best integrate the practice of SMBP into the healthcare system through this study (Koranteng Tannor *et al.*, 2022).

To serve as a reference point for future studies, this study also aimed to offer baseline data on using SMBP at the Ho Teaching Hospital. The hospital's medical staff will invariably have empirical data on the use of SMBP in patients that can improve patient BP management, track the progression of target organ damage, and prevent unexpected cardiovascular fatalities.

1.4 Conceptual Framework

Controlling blood pressure is the main objective in treating hypertension patients to avoid consequences like target organ damage (Oliveros *et al.*, 2019). In Fig.1.1, the patient, the General Physician (GP), to achieve their objective, the entire healthcare system must work together. The patient is at the centre of this partnership, keeping tabs on their blood pressure and talking with their doctor.

However, this social connection may not exist due to the patient's ignorance of SMBP or lack of ownership of a self-monitoring device. The patient's socioeconomic status, such as their degree of education or financial capacity to purchase and own self-monitoring equipment, may also have an impact. Additionally, the absence of

institutional regulations and protocols in healthcare facilities, with discouraging attitudes and views, and a lack of knowledge or education from HCP, may be why SMBP is not practised (Tucker *et al.*, 2020).

This study aimed to evaluate these variables and how they impact a hypertensive patient's use of SMBP.

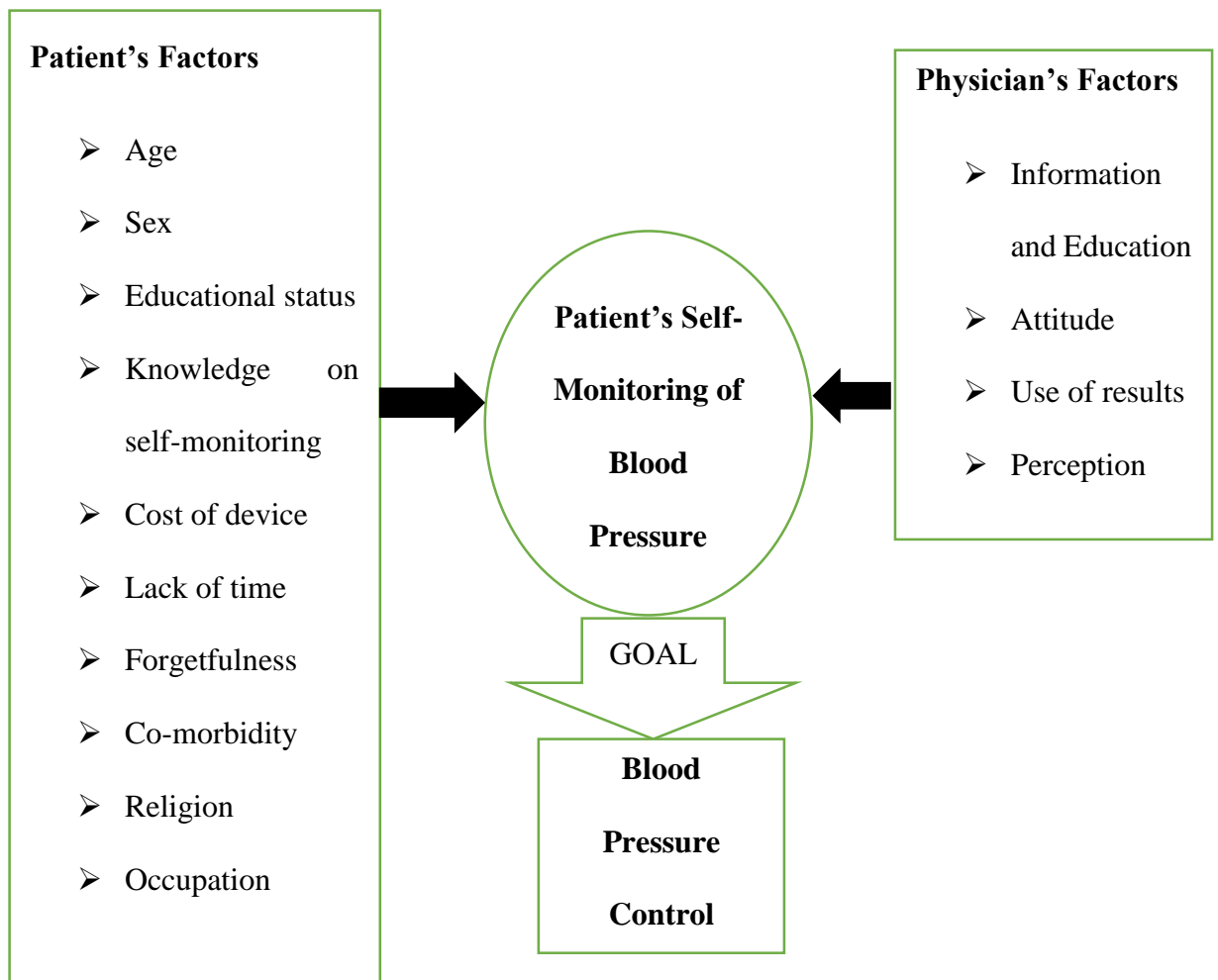


Fig 1.1: Conceptual Framework

Source: Modified Conceptual Framework of Charles Lwanga Deong Zieme

1.5 Research Questions

1. What is the level of knowledge of self-monitoring of blood pressure among hypertensive patients in the Ho Teaching Hospital?

2. What is the prevalence of self-monitoring of blood pressure among the Ho Teaching Hospital's hypertensive patients?
3. What are the inhibiting factors to self-monitoring of blood pressure among hypertensive patients in the Ho Teaching hospital?

1.6 General Objectives

To assess the barriers to the practice of self-monitoring of blood pressure among hypertensive patients at the Ho Teaching Hospital in the Volta Region of Ghana.

1.7 Specific Objectives

1. To assess the knowledge of self-monitoring of blood pressure among hypertensive patients in Ho Teaching Hospital.
2. To describe the self-monitoring of blood pressure among hypertensive patients in the Ho Teaching Hospital.
3. To identify barriers to self-monitoring blood pressure among patients in Ho Teaching Hospital.

1.8 Profile of Study Area

Formerly known as Volta Regional Hospital and more often referred to as Trafalgar, Ho Teaching Hospital has evolved into the local teaching hospital in Ho, Ghana's Volta Region with a medical out-patient department (OPD) and several other departments. General Physicians treat hypertensive patients in the medical OPD (GP).

The hospital is located in the Ho Central District of the Ho Municipality. It operated as the main referral facility for the Volta Region before it was renovated to become a teaching hospital in 2019 to support the University of Health and Allied Sciences. On April 29, 2019, the Hon. Kwaku Agyemang Manu, Minister of Health, officially

designated the hospital as a teaching hospital after undergoing a rigorous certification procedure by all of Ghana's health professional regulatory bodies and the health facilities regulatory authority. The facility could accommodate 240 patients when it was in service. Because of its advantageous location, it can offer specialist medical services to residents of the Volta Region and beyond. Customers from the Federal Republic of Nigeria, Benin and Togo also use the hospital. With its new standing, the teaching hospital is well-positioned as the premier destination for medical tourists, offering cutting-edge tertiary care, medical education, and research.

Map of Volta Region

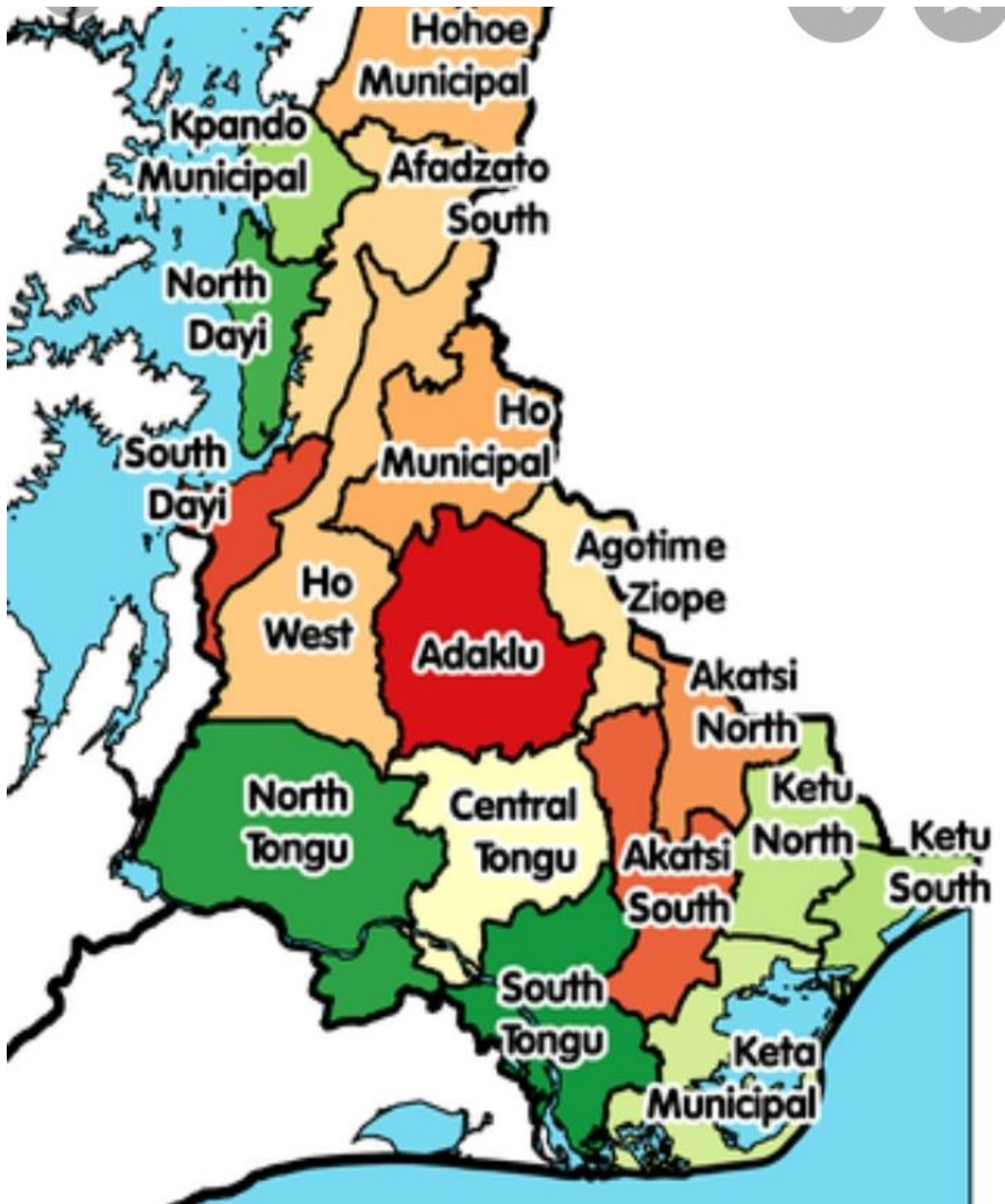


Fig 1.2 Map of the Volta Region

Source: Google maps

Map Showing Ho Teaching Hospital



Fig. 1.3 Map of Ho Teaching Hospital

Source: Google Maps

1.9 Scope of Study

This research was done at the Ho Teaching Hospital to determine what prevents hypertensive patients from self-monitoring their blood pressure. The study focused on three main barriers: patient, health system, and physician variables. The study looked into the socio-demographic characteristics, illness history of participants, awareness/knowledge and practice of self-monitoring by the participants. The scope of the study was delimited to include hypertensive patients diagnosed with high blood pressure in not less than six months.

The write-up concludes with recommendations to reduce the barriers to SMBP among hypertensive patients.

1.10 Organization of Report

The significance of the topic, scope, issue statement, importance of the study, objectives, research questions, and conceptual framework are all explained in Chapter 1. The review of the literature on the subject under inquiry is presented in Chapter 2. The methodology, covering the study's population, sampling, data management and analysis, ethical considerations, and study limitations, is covered in Chapter 3. The results of data analysis are discussed in Chapter 4 and are shown in graphs and tables. Chapter 5 analyses the findings and makes comparisons with the literature on earlier studies by other researchers. The conclusions and suggestions are presented in Chapter 6.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter examined papers on hypertension and its treatment concerning blood pressure self-monitoring. Using keywords like "hypertension," "self-monitoring and blood pressure not blood glucose," "home BP monitoring," "efficacy of self BP monitoring," "barriers to self-monitoring," "treatment of hypertension," and "guidelines for self-monitoring," a thorough web search was conducted. The four themes listed below were used to synthesis the relevant information that was accessed: The following factors affect self-monitoring: a) the burden of hypertension; b) the practice of self-monitoring; c) the schedule, technique, and tools utilized in self-monitoring; d) barriers inhibiting the practice of SMBP.

2.2. Burden of Hypertension

An average systolic blood pressure (SBP) greater than or equal to 140 mm Hg, average diastolic blood pressure (DBP) greater than or equal to 90 mm Hg, or self-reported current use of antihypertensive drugs are all considered to be hypertension (Gu *et al.*, 2002).

The prevalence of hypertension is higher, particularly in low- and middle-income countries (LMIC), and it substantially impacts cardiovascular disease, kidney failure, early deaths, and disabilities (Sanuade *et al.*, 2018). The growing hypertensive population's insufficient blood pressure control is a significant factor in the rising burden of non-communicable diseases (NCDs) in low- and middle-income countries (Atibila *et al.*, 2021).

According to a population-based study conducted in Ghana, cardiovascular morbidity and mortality and the prevalence of hypertension are both rising. Although hypertension was becoming more common, many people were still ignorant of their blood pressure or the consequences associated with it (Koranteng Tannor *et al.*, 2022). According to a study conducted in Ghana, urban dwellers had a higher prevalence of hypertension; however, therapy for hypertension was unaffected by place of residence (Adekunle *et al.*, 2018). The Greater Accra region has the highest prevalence of hypertension (19.4%), then the Ashanti region (16.6%) and the Upper West region (7.6%). The percentage of people who were aware of hypertension ranged from 32.8% in the Central region to 54.0% in the Greater Accra region of Ghana (Adekunle *et al.*, 2018). Additionally, whereas the Ashanti area had the highest rate of hypertension therapy (96.1%), the Greater Accra region had the lowest rate (81.9%). Residents of the Upper East region had the best hypertension control (62.3%), while those in the Western region had the worst (42.3%). The Ewe had the highest frequency of hypertension (16.2%), and the Mole Dagbani had the lowest rate (9.7%) (Sanuade *et al.*, 2018).

2.3. Practice of Self-Monitoring

One method of assessing a patient's BP level is self-monitoring (Wake, Bekele and Tuji, 2020). Both hypertension patients and healthy individuals engage in this activity. Regularly having patients check their own BP at home can be beneficial. Multiple readings over a lengthy period can help define genuine pressure. Since no medical personnel are present, any distortions brought on by the "white coat effect" can be avoided (McAlister and Straus, 2001).

A study looking at the impact of self-monitoring on hypertensive patients revealed that it can be advised as a component of a larger management strategy in routine clinical practice and reduces BP in patients with co-morbidities related to hypertension by a clinically significant amount (Shimbo *et al.*, 2020). To increase the likelihood of BP management at follow-up, some limited data suggests that patients with stroke or obesity may be targeted for self-monitoring therapies paired with systematic medication titration, pharmacist support, education, or lifestyle changes (Tucker *et al.*, 2020).

Appropriate monitoring is necessary for the early diagnosis of hypertension and its subsequent therapy. With the support of international recommendations, self-monitoring of blood pressure (SMBP) is being utilized more frequently for this purpose. Home blood pressure measurements are superior to office or hospital blood pressure readings in that they more accurately diagnose hypertension, better forecast end organ damage, and increase patient involvement in their management (Hodgkinson *et al.*, 2019).

2.4. Schedule, Process, and Tools employed in SMBP

Self-monitored blood pressure, according to the Centers for Disease Control and Prevention, entails a patient regularly using instruments for measuring and recording blood pressure on an individual basis outside of a clinical setting, public, or community setting, typically at home (Hodgkinson *et al.*, 2019).

Several suggestions have been made regarding the proper way to measure blood pressure. Guidelines from the Japanese Society of Hypertension advised taking two readings simultaneously, averaging them over 5-7 days (Konlan *et al.*, 2020). The National Institute for Health and Care Excellence (NICE), the American Heart

Association, the American Society of Hypertension, and the European Society of Hypertension all advise that blood pressure (BP) be measured twice, one minute apart, in the morning and once in the evening on at least three and preferably seven consecutive days. After discarding the values from the first day, the average of the subsequent readings should be used (Hodgkinson *et al.*, 2019).

An individual normally uses an oscillometer to measure their blood pressure. Devices for self-measured blood pressure monitoring that automatically inflate and deflate the BP cuff are recommended over those that need the patient to manually inflate and deflate the cuff because they are simpler to use. Using adequately sized cuffs with upper arm self-measured blood pressure monitoring devices detect BP in the brachial artery (Shimbo *et al.*, 2020).

2.5 Barriers inhibiting the practice of self-monitoring of blood pressure

According to a study, patients' worries about the intrusiveness and severity of the SMBP procedure would be the hurdles pertinent to this combined domain. Additionally, there were worries that patients wouldn't fully follow the SMBP protocol because of poor health literacy, inappropriate cuff sizing or positioning, non-validated devices, selective recording of preferred BP values, and forgetting to return the BP log (Kronish *et al.*, 2017). Providers were also concerned that patients would record inaccurate blood pressure measurements (for example, at times of heightened anxiety or when feeling unwell) (Carter *et al.*, 2018).

Another study obtained 23.5% of the vote for SMBP barriers due to the environmental context. In this area, patients mentioned the expenses of home blood pressure monitors and the time clinicians spent teaching patients about the SMBP procedure and analyzing test findings. Concerns about a lack of cognitive abilities related to the need

for skills in data analysis and teaching patients the SMBP process. A lack of understanding of SMBP was also noted (Kronish *et al.*, 2017). Significant obstacles to SMBP included the validity of test results and the dependability of home blood pressure monitors.

The fact that store-bought home blood pressure monitors come in different quality ranges and cannot be relied upon to take reliable readings also caused worry among the participants. Insufficient incentive to muster the effort to obtain several blood pressure readings presented a significant obstacle to SMBP testing (Breaux-Shropshire *et al.*, 2018). While some participants thought it would be simple to add morning and evening blood pressure checks to one's daily schedule, others thought patients would need to reschedule their plans and would not want to. Participants noted that patients could forget to take their blood pressure readings and worried that missed readings would affect test results (Kronish *et al.*, 2017).

Participants recommended that clinicians urge patients to set alarms, reminding them to take their blood pressure regularly to combat predicted forgetfulness. (Gondi *et al.*, 2021).

CHAPTER 3

METHODOLOGY

3.1 Research Methods and Design

This research adopted a cross-sectional study that measured data variables collected at a point in time for a sample population. A quantitative method was used to collect and analyse data since the study used a questionnaire to measure the prevalence and knowledge of SMBP in hypertensive patients in HTH.

3.2 Data Collection Techniques

Three research assistants were hired and trained to help with data collection, and a printed structured questionnaire was utilised to collect data. In the first three weeks of July 2022, data was gathered. The closed-ended survey asked about the respondents' socio-demographic details, history of hypertension and any co-occurring diseases, and knowledge of, use, and barriers to SMBP (Appendix I). Each participant was chosen during their routine GP appointment. To prevent clinic operations from being disrupted or affecting blood pressure readings, interviews were conducted while patients waited to be seen by their GP. The participant read the participant's information sheet (or had it read to them) and signed/thumb-printed the consent form once the patient passed the eligibility requirement. The interviewer then asked the participant questions from the questionnaire.

All COVID-19 guidelines were meticulously followed during data collection.

3.3 Study Population

All hypertensive patients who visited a hypertension clinic were included in the study population. By consulting the patient folder's medical records, the diagnoses of every patient were verified.

3.3.1 Inclusion Criteria

1. Persons who agreed to take part in the study.
2. Persons > 18 years old.
3. Individuals diagnosed with hypertension for not less than six months.
4. Persons undergoing treatment with antihypertensive drugs since diagnosis was made.

3.3.2 Exclusion Criteria

1. Patients who have not yet started treatment for hypertension.

3.4 Study Variables

The following dependent and non-dependent variables were used in the study.

3.4.1 Outcome Variable

Self-monitoring of blood Pressure

3.4.2 Independent Variables

1. Patient-related factors: These included the patient's awareness or knowledge of self-monitoring, possession of a device for doing so, the price of the device, a lack of time, forgetfulness, co-morbidity, degree of education, position in the workplace, marital status, religion, sex, and age.

2. Physician/Health System Factors: These included institutional protocols, patient education/information from HCPs, attitude and perspective of HCPs, and utilisation of self-monitored findings.

Table 3.1 Description of variables

Category	Variable	Scale of Measurement
Outcome	Self-monitoring of blood pressure	Binary
Independent	Patient factors	
	Sex	Binary
	Age	Categorical
	Marital status	Categorical
	Occupation	Categorical
	Educational level	Categorical
	Awareness/knowledge	Binary
	Ownership of self-monitoring device	Binary
	Cost of device	Binary
	Physician's factors	
	Use of self-monitored results	Binary
	Encouraged patient to self-monitor	Binary

3.5 Sampling Technique

A hypertension clinic was opened daily at the Ho Teaching Hospital with a patient turnout of not less than 80 per day. Data was collected within 3 weeks with about 100 questionnaires per week. Study participants were selected using a systematic sampling method where every third person was selected and a questionnaire administered.

3.5.1 Sample Size Calculation

Cochran's procedure for estimating sample size at a 95% confidence level with 5% precision was used to determine the sample size for this investigation. With an average prevalence of hypertension at 30.3% in Ghana, Atibila *et al.* (2021) estimated the sample size as calculated below using Cochran's formula.

The formula is

$$n = \frac{Z^2 \times pq}{e^2}$$

where,

n = sample size, (Cochran, 1977).

Z = Reliability coefficient for 95% confidence translated to z-score of 1.96.

p = prevalence of hypertension in Ghana (30.3%).

q = 1- p

e = margin of error set at 0.05

Therefore:

$$n = \frac{(1.96)^2 \times 0.30(1 - 0.30)}{(0.05)^2} = 322.69 \approx 323$$

Adding a 10% non-response rate to the generated sample size,

(323+32.3=355.3 \cong 355), the operational size was brought to 355 respondents.

3.6 Pretesting the Questionnaire

The questionnaire was pretested at the Ho Municipal Hospital in the Ho Central District to assess respondents' understanding and estimate the duration it would take to administer each questionnaire. The Ho Municipal Hospital provides preventive and curative health services for children and adults, including reproductive health services. Pretesting also evaluated the reliability of the questionnaire. There were no corrections made to the questionnaire after pretesting.

3.7 Data Handling

All information gathered through questionnaires was checked for accuracy and completeness. With the aid of Microsoft Excel 2016, the data was entered. Before data analysis, the research tool (questionnaire) containing the data was coded, cleaned, and saved in Microsoft Excel and a drop box. The hard copy questionnaires containing the fieldwork participants' responses were kept secure.

3.8 Data analysis

The data responses from the completed questionnaires were cleaned, merged, and analyzed using STATA version 14. Before analysis, the data was cleaned by running frequencies of inconsistently coded data. Simple proportions and means were used to characterize the category and numerical data. The socio-demographic features of respondents, their medical histories, their knowledge of SMBP, and the barriers preventing them from using it were all summarized in descriptive statistics. To further analyze the data and describe the connections between self-monitoring of blood pressure and the independent variables of knowledge and religion, logistic regression

and Pearson chi-square tests were used. Significant relationships between the outcome and independent variables were demonstrated using a 95% confidence interval.

3.9 Ethical Considerations

The Ensign Global College of Public Health's Ethics Review Committee granted the study's ethical approval. The Ho Teaching Hospital was contacted for administrative support. Respondents were informed about the purpose of the study before commencement. All respondents were assured their participation was voluntary and could withdraw from the study if they wished. No identifiers like names were used, and the data collected were kept confidential but made available to persons related to the study.

3.10 Limitations of Study

This study's use of a cross-sectional study design, which makes it impossible to demonstrate causal links between variables, was one of its weaknesses. Besides, data collected was self-reported with the possibility of over and under-reporting, which the researcher cannot validate.

It is possible some of the respondents could state self-monitoring of Blood Pressure to please the researcher while they do not, which could affect the accuracy of responses regarding the research.

Lastly, the questions were asked based on a period of the past six months and beyond. Thus, it is possible that some incorrect data was given due to forgetfulness or recall bias.

3.11 Assumptions

From this research, it was expected that there would be evidence that shows the level of self-monitoring of BP among hypertensive patients. It is also likely that the study will help to reveal some of the barriers to self-monitoring, which are global health concerns.

CHAPTER 4

DATA ANALYSIS AND RESULTS

4.0 Introduction

This chapter describes the study's findings and presents the interpretations as well. STATA Statistics was used for the data analysis. Four headings were used to show the data: socio-demographic traits, medical history, awareness/knowledge, practice, and obstacles to hypertensive patients' self-monitoring of blood pressure.

4.1 Socio-demographic characteristics

The socio-demographic characteristics of the respondents show that out of 315 respondents interviewed, 169 (53.7%) were female. Out of 315 respondents interviewed, 105 (34.6%) were within the age group of 41-50 years, 102 (32.4%) of the respondents had Primary education, and more than 60% were married or living with their partners. Out of 315 respondents interviewed, 283 (89.8%) were Christians, and 133 (42.2 %) of the respondents were self-employed.

Table 4.1: Summary of sociodemographic characteristics

CHARACTERISTICS	FREQUENCY (N = 315)	PERCENTAGE (%)
SEX		
Male	146	46.3
Female	169	53.7
AGE GROUP		
20-30	46	14.6
31-40	62	19.7
41-50	105	33.3
51+	102	32.4
EDUCATION		
No formal education	18	5.7
Primary	101	32.1
Middle / JHS	53	16.8
Secondary / SHS / Voc. / Tech	87	27.6
Tertiary	56	17.8
MARITAL STATUS		
Single / Never married	61	19.4
Currently married	208	66.0
Widowed	40	12.7
Divorced / Separated	6	1.9
RELIGION		
Christianity	283	89.8
Islam	26	8.3
African Traditional	6	1.9
OCCUPATION		
Unemployed	25	7.9
Public servant	55	17.5
Self-employed	133	42.2
Private employee	32	10.2
Retired / Elderly	70	22.2

4.2. Illness History

Out of 315 respondents interviewed, 123 (39.1%) were told by the doctor that they had hypertension four years ago, and 117 (37.1%) had the doctor's information about hypertension three years ago. Also, 69 (21.9 %) of the respondents were told by the doctor that they had hypertension for one to two years, whilst 6 (1.9%) of the respondents had the information from the doctor less than a year before the data collection.

Table 4.2. Illness History

4.2.1: Duration of living with hypertension

Response	Frequency	Percent (%)
Less than a year	6	1.9
1-2 years	69	21.9
Three years	117	37.1
4 years+	123	39.1
Total	315	100

Source: Authors' computation using STATA Version 14

In table 4.2.2, out of 315 respondents interviewed, 124 (39.4%) had been visiting the hypertension clinic at Ho Teaching Hospital a year before data collection, and 99 (31.4%) had been visiting the hypertension clinic at Ho Teaching Hospital for two years. Also, 50 (15.9 %) of the respondents saw the hypertension clinic at Ho Teaching Hospital for three years, 22 (6.9%) of the respondents visited the hypertension clinic at Ho Teaching Hospital for less than a year, whilst 20 (6.4%) of the respondents have been visiting hypertension clinic at Ho Teaching Hospital for four years.

Table 4.2.2: Duration of visiting the hypertension clinic at Ho Teaching Hospital

Response	Frequency	Percent (%)
less than a year	22	6.9
One year	124	39.4
Two years	99	31.4
Three years	50	15.9
Four years and above	20	6.4
Total	315	100

Source: Authors' computation using STATA Version 14

4.2.3. Visit to other hypertension clinics

Out of 315 respondents interviewed, 248 (78.7%) had not visited any hypertension clinic apart from Ho Teaching Hospital, whilst 67 (21.3%) visited other hypertension clinics apart from Ho Teaching Hospital.

Table 4.2.3: Visit to other hypertension clinics in the last two years.

Response	Frequency	Percent (%)
Visit to another hypertension clinics	67	21.3
Did not visit other hypertension clinics	248	78.7
Total	315	100

Source: Authors' computation using STATA Version 14

4.2.4. Respondents living with other chronic diseases

Out of 315 respondents interviewed, 201 (63.8%) were not told if they had any other chronic disease, 67 (21.3%) were informed by the doctor of having Diabetes as another chronic disease, whilst 3 (1.0%) were told by the doctor of having cancer as another chronic disease. 44 (13.9%) of the respondents have other disease conditions such as Chronic Kidney disease, Sickle Cell Disease and Cardiomyopathies.

Table 4.2.4: Respondents living with other chronic diseases

Response	Frequency	Percent (%)
None	201	63.8
Diabetes	67	21.3
Cancer	3	1.0
Others	44	13.9
Total	315	100

Source: Authors' computation using STATA Version 14

4.3. Awareness and Knowledge

Out of 315 respondents interviewed, 96 (30.5%) knew the normal blood pressure and had also heard about it. About 48% of the respondents knew the correct value for normal blood pressure, while 223 (70.8%) did not have a self-monitor blood pressure machine.

Table 4.3: Awareness / Knowledge

Response	Frequency	Percent (%)
Knowledge of normal blood pressure		
Yes	96	30.5
No	219	69.5
Value for normal BP (N = 96)		
120/80	48	15.2
120-139/80-89	35	11.1
140-159/90-98	13	4.1
Knowledge on SMBP		
Yes	166	52.7
No	149	47.3
Ownership of SMB machine		
Yes	92	29.2
No	223	70.8

Source: Authors' computation using STATA Version 14

4.4. Practice of Self-monitoring of BP

Out of 315 respondents interviewed, 201 (81.4%) were currently monitoring their blood pressure by using a self-monitoring machine, 43 (79.6%) checked their BP before taking medication also, 29 (59.2%) checked their BP sitting down, 39 (79.6%) did not check their BP while lying down, 49 (100%) of the respondents did not check the BP while standing, 38 (77.6%) did not check their BP as and when they like, in

addition, 43 (87.8%) of the respondents informed Doctor/nurse immediately when checked BP and is above normal also more than 90% of the respondents adjust their lifestyle/medication based on their results whilst more than 50% checked their BP once a week.

Table 4.4: Practice of self-monitoring of blood pressure

Response	Frequency	Percent (%)
Do you currently self-monitor your BP? (N = 315)		
Yes	91	28.9
No	224	71.1
Do you check your BP before taking medication? (N = 91)		
Yes	63	69.2
No	28	30.8
Do you check your BP sitting in a chair? (N = 91)		
Yes	69	75.8
No	22	24.2
Do you check your BP lying down? (N = 91)		
Yes	22	24.2
No	69	75.8
Do you check your BP while standing? (N = 91)		
Yes	0	0
No	91	100
Do you check your BP as and when you feel like doing it? (N = 91)		
Yes	11	12.1
No	80	87.9
Do you write down your BP results in a book/ chart after checking? (N = 91)		
Yes	68	74.7
No	23	25.3
Do you inform your Doctor /nurse when your BP is above normal? (N = 91)		

Yes	83	91.2
No	8	8.8
Do you adjust your lifestyle/medication based on your results after checking? (N = 91)		
Yes	85	93.4
No	6	6.6
How often do you check your BP? (N = 91)		
Once a day	21	23.1
More than once a day	3	3.3
Once a week	54	59.3
More than once a week	13	14.3

Source: Authors' computation using STATA Version 14

4.5. Barriers to self-monitoring of BP

Out of 315 respondents interviewed, 222 (70.5%) had no money to buy a self-monitoring BP machine, 259 (82.2%) of the respondents said it is not important to self-monitor also, 247 (78.4%) of the respondents claimed self-monitoring has no benefit to them and 239 (75.9%) of the respondents said doctor/nurse never asked them to do self-monitoring and 263 (83.5%) of the respondents claimed that doctor /nurse discouraged them from self-monitoring, 74 (23.5%) said doctor /nurse used their self-monitored BP results, 75 (23.8 %) did not have time to do self-monitoring of their blood pressure.

Table 4.5: Barriers to self-monitoring of BP

Response	Frequency	Percent (%)
Don't have money for an SMBP device		
Yes	222	70.5
No	93	29.5
SMBP not important		
Yes	259	82.2
No	56	17.8
SMBP not beneficial		
Yes	247	78.4
No	68	21.6
HCP never asked to self-monitor		
Yes	239	75.9
No	76	24.1
Being discouraged by HCP		
Yes	263	83.5
No	52	16.5
HCP used self-monitored BP results		
Yes	74	23.5
No	241	91.4
Did not have time to self-monitor your BP		
Yes	75	23.8
No	240	76.2
HCP informed on abnormal BP		
Yes	98	31.1
No	217	68.9

Source: Authors' computation using STATA Version 14

4.6. Relationship between self-monitoring of blood pressure and the independent variables (simple logistic regression)

The association between SMBP and the independent variables, such as the socio-demographic and other characteristics of respondents, was ascertained using a Pearson Chi-squared analysis. The basic logistic regression shown in Table 4.6 was used to analyze further the statistically significant factors ($p < 0.05$). In the research, it was discovered that religion substantially predicted self-monitoring ($p < 0.05$).

Table 4.6: Association between SMBP and other factors (simple logistic regression)

Variable	COR (95% CI)	p-value
Educational level	1.0 (0.96 – 1.02)	0.652
Marital status	1.0 (0.96 – 1.00)	0.664
SMBP not important	1.0 (0.96 – 1.00)	0.184
Lack of money for SMBP device	1.0 (0.96 – 1.01)	0.149
Being discouraged by HCP	1.0 (0.95 – 1.01)	0.089
Co-morbidity	1.4 (0.96 – 2.14)	0.058
Religion	0.6 (0.38 – 0.79)	0.012

In a multiple logistic regression to ascertain the degree of association with religious denominations, respondents who practiced African traditional religion were twice more likely not to self-monitor their blood pressure than those who were Christians, as shown in Table 4.7 below.

Table 4.7: Factors associated with no SMBP (multiple logistic regression)

Religion	COR (95% CI)	p-value	AOR (95% CI)	p-value
Christianity	Ref			
Islam	0.6 (0.35 – 1.10)	0.112		
African Traditional	0.1 (0.03 – 0.68)	0.040	0.1 (0.03 – 0.72)	0.019

CHAPTER 5

DISCUSSION

5.1. Introduction

This study examined the barriers to self-monitoring of BP among hypertensive patients of the Ho Teaching Hospital in the Volta region of Ghana. Concerning the study's objectives, which included determining patients' awareness of and knowledge of SMBP, how patients practice SMBP, and hurdles relating to patients' self-monitoring, this chapter describes the study's primary findings in depth. Conceptually, this study aimed to pinpoint patients, healthcare facilities, and professional characteristics that may impede hypertensive patients from self-monitoring their blood pressure. SMBP seeks to promote personal healthcare management among hypertension patients with the overall objective of lowering blood pressure to tolerable levels (Deong Zieme, 2015).

The main outcomes of this study showed that barriers to performing SMBP were patient-centred factors and HCP variables, with average awareness of SMBP (52.7%) and extremely low knowledge of how to practice SMBP. The subject of this conversation is this.

5.2. Awareness and Knowledge

In this study, 52.7% of the respondents were found to have heard about the practice of self-monitoring, which was lower than the 70.5% awareness level of respondents measured by a similar study in the U.S.A (Breux-Shropshire *et al.*, 2018). This percentage may reflect the systematic efforts made by HCP to inform and educate patients on beneficial behaviours that can speed up the recovery from disease or improve their health status. It could be because these respondents frequently attended

Specialists Hypertension Clinics, where qualified professionals provide customers with accurate information.

This level of awareness among the respondents may also be attributed to the mass-media communication channels, such as radio, television, newspapers, and the internet, which carry commercials and promotions on health items. Additionally, the respondents' average literacy rate (45.4%) could raise their awareness, as formal education may encourage positive behaviour (Moschonis and Karatzi, 2020).

In the study's assessment of respondents' knowledge of SMBP, it was discovered that 15.2% of participants remembered the value of normal blood pressure (120/80 mmHg). In comparison, 28.9% of participants claimed they could self-monitor their blood pressure if given the self-monitoring device. Since most of the respondents stated that their Health Care Provider (HCP) educated them, the low level of knowledge among the respondents may be related to the HCP's poor quality of health education. This ignorance could lead to incorrect application, bad practice, and incorrect interpretation of results from self-monitoring, complicating the management of hypertension and decreasing blood pressure control. This corroborates a similar study by Gondi *et al.* (2021). Since practice is the experimenting of knowledge, it is unprejudiced to conclude that respondents' lack of sufficient information would lower their sense of self-worth and hinder them from engaging in SMBP.

5.3. Practice of SMBP

In a study, respondents' low incidence of SMBP was lower than the worldwide frequency of 70% among hypertensive patients in underdeveloped nations (Breux-Shropshire *et al.*, 2018). The low proportion in our study could result from the focus of SMBP on patient self-monitoring using personal BP monitoring equipment at home.

Additionally, anecdotal research reveals that patients in Ghana visit "BP Monitoring Vendors" at private venues, pharmacies, or streets to check their blood pressure (Tucker *et al.*, 2020). Most patients have low economic status due to their occupation, level of education, and sickness, making it difficult for them to purchase personal self-monitoring devices, which range in price from GHC 200 to GHC 400.

It is also clear from this study that a significant percentage of respondents who were unable to distinguish between correct practice and incorrect practice may have failed due to unclear instructions on how to perform SMBP, as indicated in a related study by Wolz *et al.* (2000). These results suggest that the correct method of self-monitoring was not well communicated to respondents by HCP, BP Monitoring Vendors, or sales/promotions' representatives of health care products/services. Given that most patients received information or instructions from HCP, it is likely that the educational material was either misunderstood. According to the conceptual framework, giving patients information and insufficient or incorrect education could be a significant roadblock to the practice of SMBP (Carter *et al.*, 2018). Due to their ignorance of which behaviours were appropriate or inappropriate, most respondents engaged in self-monitoring in violation of the guidelines set forth by ESH and other organisations (Hodgkinson *et al.*, 2019). Other patients might not have sought treatment if they had not followed the recommended instructions or lacked formal education. This study can therefore infer that the practice of self-monitoring among the study population's patients was extremely subpar, and HCP at the Ho Teaching Hospital should pay close attention to the patients' assimilation of pertinent health information and education while warning them against unreliable sources of health information.

5.4. Barriers to the practice of SMBP

This study's main goal was to identify barriers preventing hypertensive patients from independently monitoring their blood pressure without the assistance of their HCP. However, because institutional rules were not investigated or HCPs were not questioned, the findings were restricted to the personal aspects of the respondents. (Konlan *et al.*, 2020). After a thorough examination of the data, it was discovered that the reasons that had varying degrees of restriction on the practice of self-monitoring among the respondents were lack of awareness and lack of money for respondents to purchase personal BP apparatus.

Decision-making related to self-monitoring requires access to information on SMBP and subsequent internalisation of the practices involved. Some study participants had little knowledge about SMBP, which may be the only explanation for their lack of SMBP practice (Carter *et al.*, 2018). The number of respondents who practice SMBP may rise as the study community becomes more aware of it; nevertheless, the opposite outcome is also conceivable. Patients may be encouraged to practice SMBP if the HCP and other health partners provide adequate information and instruction. It is crucial in Ghana because people trust the health information they receive from HCP, particularly doctors and nurses. The respondents' lack of understanding of general practice protocols for self-monitoring supported similar findings by Hodgkinson *et al.* (2019). They found that hypertension patients in primary care facilities did not use SMBP due to their ignorance of blood pressure.

Self-care initiatives cannot be taken until one is adequately informed and educated about the advantages, significance, and steps involved in self-monitoring.

Furthermore, a similar study by Shimbo *et al.* (2020) found that respondents mentioned a lack of funds as the reason they did not exercise SMBP. Most respondents who cited

a lack of money for purchasing personal BP apparatus as their reason for not practising
SMBP verified this finding.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.0 Introduction

This research investigated barriers to SMBP by hypertensive patients in the Ho Teaching Hospital. This chapter details conclusions and recommendations based on the findings from the study.

6.1 Conclusion

Chronic diseases burden individuals, groups of people, nations, and the entire world. Self-awareness of one's hypertension, early diagnosis, and self-management are all effective ways to prevent and manage it. When used with other therapies, including motivational counselling, education on hypertension, and active involvement of healthcare professionals, SMBP can be used by healthcare providers to diagnose hypertension and track the efficacy of the antihypertensive medication. In the Ho Teaching Hospital, 28.9% of hypertension patients self-monitored their blood pressure. It is anticipated as more individuals, particularly patients, become more aware of the importance of self-care behaviors in preserving and advancing their health. In addition to the efforts of HCP in the comprehensive management of hypertension, patients' desire to be involved in managing their illness through self-monitoring and adopting the right activities might be a complementary approach. However, since 259 (82.2%) of respondents did not see the significance of SMBP, patients should be provided with adequate training and instruction on the importance, procedures, and techniques of self-monitoring, accurate recording and interpretation of results, and appropriate actions to take after self-monitoring. Similar to how SMBP encourages people without hypertension to engage in routine monitoring, which facilitates discussions about

hypertension with HCP and may result in lifestyle adjustments and medication adherence that support a better understanding of their health status and hypertension management. Patients and HCPs can benefit most from the practice by avoiding needless sudden strokes and deaths if maximum awareness about SMBP is spread among patients and the general public. SMBP is institutionalized in our healthcare system, and HCPs accept, adopt, and monitor SMBP as an additional management protocol.

6.2. Recommendations

The following are recommended based on the above conclusion:

1. Ghana Health Service, in collaboration with Pharmacy Council, should create more well-being centres/sites for hypertensive patients to walk in and check their blood pressure easily.
2. HCPs in the Ho Teaching Hospital, especially doctors and nurses should encourage hypertensive patients to self-monitor and train them on the correct procedures/techniques of SMBP
3. An approved booklet should be provided for patients to record and report outcomes of SMBP results for interventions.

6.2.1 Recommendations for Future Research

Further research should be conducted on factors that prevent HCP from using self-monitored results from hypertensive patients.

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APPENDIX A: STUDY QUESTIONNAIRE

STUDY QUESTIONNAIRE ON THE BARRIERS TO SELF-MONITORING OF BLOOD PRESSURE BY HYPERTENSIVE PATIENTS

Respondent's ID Number:

Name of Facility:

Date of Interview:

Name of Interviewer:

A: SOCIODEMOGRAPHIC CHARACTERISTICS

Please, tick the appropriate box

1. What is your sex?
 - a) Male
 - b) Female
2. What is your age (as at your last birthday) (please write)
3. What is your highest educational level completed.
 - a) No formal education
 - b) Primary
 - c) Middle/JSS/JHS
 - d) Secondary/SSS/SHS
 - e) Vocational/technical
 - e) Tertiary (university/polytechnic/college)
4. What is your marital status?
 - a) Single, never married
 - b) Currently married or living with partner
 - c) Widowed
 - d) Divorced/separated
5. What is your religion?
 - a) Christianity
 - b) Islam

- c) African Traditional Religion
 - d) Other (specify).....
6. What is your occupation?
- a) Unemployed
 - b) Public servant (gov't)
 - c) Self-employed (trading/artisan/vocational, etc.)
 - d) Private business employee
 - e) Retired/elderly
 - f) Other (specify).....

B: ILLNESS HISTORY

Let us start with the history of hypertension in you. Tick the appropriate box

7. How many years now since you were told by a Doctor that you have hypertension? (write the number of years)
8. How many years now have you been visiting hypertension clinic at Ho Teaching Hospital?
9. Have you visited any other hypertensive clinic apart from the Ho Teaching Hospital in the last two years?

Yes

No

10. Have you been told by a Doctor to have any other chronic disease?
- a) None
 - b) Diabetes
 - c) Cancer
 - d) Other (specify).....

C: AWARENESS/KNOWLEDGE

Tick the appropriate answer.

11. Do you know the normal Blood Pressure?
- a) Yes
 - b) No
12. If Yes to Q3, what is the value of the normal blood pressure?mmHg.

13. Have you heard about self-monitoring of BP (i.e. personally checking your BP)?

a) Yes

b) No

14. Do you own a personal self-monitoring BP machine?

a) Yes

b) No

D: PRACTICE

15. Do you currently self-monitor your BP (i.e. check your BP by yourself using a self-monitoring BP machine)?

a) Yes

b) No (if No, go over to Question number 25)

Now, let me find out how you self-monitor your BP. For each of the statements in 16 – 24, indicate ‘Yes or No’ in the boxes provided to your right.

16 I check my Blood Pressure before taking my medication.

a) Yes

b) No

17. I check my BP sitting on a chair.

a) Yes

b) No

18. I check my BP lying down.

a) Yes

b) No

19. I check my BP while standing.

a) Yes

b) No

20. I check my BP as and when I feel like doing it.

a) Yes

b) No

21. I write down my BP in a book/chart after checking.

a) Yes

b) No

22. After checking, if my BP is above normal I see/inform my doctor/nurse immediately.

a) Yes

b) No

23. I adjust my lifestyle/medication based on my results after self-checking.

a) Yes

b) No

24. I check my BP;

a) once a day

b) more than once a day

c) once a week

d) more than once a week

e) once a month

E: BARRIERS

Now I would like to know why you do not self-monitor. For each of the statements 25 – 33, indicate by ticking whether Yes or No.

25. I don't have money to buy the machine for self-monitoring. Yes No

26. It is not important to self-monitor my BP. Yes No

27. Self-monitoring of BP has no benefits for me. Yes No

28. My doctor/nurse never asked me to self-monitor. Yes No

29. My doctor/nurse discourages me from self-monitoring. Yes No

30. I used to self-monitor but my doctor/nurse does not use my self-monitored BP results.

Yes No

31. Due to forgetfulness. Yes No

32. I do not have time to self-monitor my BP. Yes No

33. If Yes to 32; why do you not have time?

.....

THANK YOU.

APPENDIX B:
INFORMATION SHEET FOR PARTICIPANTS
“BARRIERS TO SELF-MONITORING: A STUDY AMONG
HYPERTENSIVE PATIENTS IN THE HO TEACHING HOSPITAL, HO.

Introduction

My name is Delight Elikem Kotoku, a Master of Public Health student at Ensign Global College, Kpone, Ghana. I am carrying out a research in this health facility to identify the factors that prevent hypertensive patients from monitoring their BP levels in their homes. I would be grateful if you could be one of my participants. Kindly read (or have it read to you) the information provided in this paper for details about your participation.

Study Procedure

I have a set of questions I will like to ask you for very short answers. It will take about fifteen minutes to complete. You may simply say Yes or No, or choose among a number of suggestions I will read to you.

Benefits

This study will not offer you any direct or immediate benefits following your participation. However, the study will help us suggest ways of improving the care of hypertensive patients.

Risks and Discomfort

Your participation in this study will not in any way negatively affect the services you receive from this hospital. You will however be inconvenienced by spending your time to respond to my questions, and the difficulty of providing answers to some of the questions that may border around personal information.

Confidentiality

I am not recording your name. Every piece of information you give me will be known to me only and meant purposely for this study. The completed questionnaire will be stored in my personal electronic email inbox. Your name will not be mentioned anywhere in connection with this information when compiling and analyzing the set of data collected, or publishing any report emanating from this study.

Voluntary participation and withdrawal

Your decision to participate in this study is purely voluntary. If you do not feel like answering a particular question, you are free not to do so. If in the course of answering the questions you decide not to continue, you are also free to do so. Then we will stop the interaction. But this decision will not affect you in any way.

Contacts

If you have questions regarding this study, or clarification on any aspect of your participation, kindly contact me on

DELIGHT ELIKEM KOTOKU

ENSIGN GLOBAL COLLEGE

KPONE

Tel. no. 0246503736

Email: delightamen@gmail.com

PARTICIPANT’S CONSENT

I have read (or it has been read to me) all the details about my participation in this study. I have understood everything and cleared my mind of all doubts by asking questions for clarification. I have not denied myself of any right by taking part in this study. I willingly volunteer to be a participant in your study as indicated by my signature/thumbprint below:

Signature

.....

Thumbprint

