UNIVERSITY OF CAPE COAST

TREATMENT ADHERENCE, COGNITIVE FUNCTION AND QUALITY OF LIFE AMONG PEOPLE LIVING WITH HYPERTENSION IN SELECTED HEALTH CENTERS IN THE SUNYANI MUNICIPALITY, GHANA

SERWAA CAROLYN ODRISCOLL

2024

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BY

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Thesis submitted to the Department of Health Physical Education and Recreation of the Faculty of Science and Technology Education, College of Education Studies, University of Cape Coast, in partial fulfilment of the requirements for the award of Master of Philosophy Degree in Health Education

2024

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature: ..... Date: .....

Name: Serwaa Carolyn Odriscoll

Supervisors' Declaration

We hereby declare that the preparation and presentation of this thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast

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ABSTRACT

This study aimed to investigate the relationship between treatment adherence, cognitive function, and quality of life (QoL) among people living with hypertension in Sunyani Municipality, Ghana. A cross-sectional study was conducted in selected health centres (Bono regional hospital, municipal hospital, and SDA hospital). Participants living with hypertension (n = 600) completed questionnaires assessing treatment. Data were analysed using descriptive statistics, correlations, and regression analysis. Overall, 81.6% of participants reported a high level of adherence. Also, 94% of the participants had a lower cognitive failure score. Whereas, QoL was reported as moderate within the physical, psychological, and environmental domains, except for the social domain, which was reported as high (M = 62.30, SD = 17.31), (M = 65.66, SD = 15.00), (M = 61.82, SD = 17.17) and (M = 73.67, SD = 18.14), respectively. Cognitive function showed a significant, negatively weak association with adherence (r = -0.184, P = 0.001). Higher QoL was also associated with better adherence (r = 0.283, P = 0.000). Cognitive function significantly correlated with QoL (r = -0.136, P = 0.004), even though the association was weak. Regression analysis revealed age, sex, alcohol consumption, exercise, employment status, and bodyweight control as factors affecting treatment adherence among the hypertensive ($\beta = 0.21$, $p<0.005$), even after controlling other factors. Interventions targeting QoL must consider cognitive health and treatment adherence in achieving positive overall health outcomes for individuals living with hypertension in Ghana.

KEY WORDS

Treatment Adherence

Conitive Function

Quality of Life

Hypertension

Health centers

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DEDICATION

To God, My Father (Mr. Robert Oppong) and the family

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LIST OF ACRONYMS

BP	Blood Pressure
CDC	Centers for Disease Control and Prevention
CF	Cognitive Function
CFQ	Cognitive Failure Questionnaire
DBP	Diastolic Blood Pressure
GHS	Ghana Health Service
HPER	Health Physical Education and Recreation
HRQOL	Health Related Quality of Life
mmHg	Millimeters of Mercury
Qol	Quality of Life
SBP	Systolic Blood Pressure
TA	Treatment Adherence
TAQPH	Treatment Adherence Questionnaire for Patients with Hypertension
UCC	University of Cape Coast
WHO	World Health Organization
WHOQOL-BREF	World Health Organization Quality of Life -BREF

CHAPTER ONE

INTRODUCTION

Background to the Study

Globally, hypertension is one of the major causes of mortality (World Health Organization [WHO], 2021). According to the WHO (2022), hypertension accounts for 7.5 million deaths worldwide, 12.8% of all deaths, and 57 million life years adjusted for disabilities. From 1990 through 2019, the global trend in hypertension has shifted, with the shift in the burden of hypertension from high-income to low- and middle-income nations (Zhou et al., 2021). Hypertension is still on the rise in Sub-Saharan African countries including Ghana. Evidence from a WHO research indicates the prevalence of hypertension in Ghana is 50.7% (Calys-Tagoe et al., 2020).

According to Anto et al. (2023), hypertension is one of the leading five causes of disease in Ghana, with a prevalence of 19–48%. One out of every four adults in Ghana is affected by hypertension, and this high prevalence has been persistent for decades, with a similar occurrence in both rural and urban populations (Bosu & Bosu, 2021). According to data available, the prevalence of hypertension in Ghana is increasing in tandem along with the wave of rural-urban migration, leading to changes in lifestyle and dietary habits (Atibila et al., 2021). A systematic review in Ghana discovered that the trend of hypertension has shifted from the northern to the southern regions, with the highest occurrence (30.7%) observed in the southern part of the country (Atibila et al., 2021). In the middle belt of Ghana, which includes Sunyani, hypertension is found in 29% of the population (Bosu & Bosu, 2021). However, a study revealed a prevalence of 22.7%, specifically in the Sunyani

community (Dosoo et al., 2019). When blood pressure is excessively high, hypertension occurs. This results from the circulation of blood against the arteries. Diagnosis is based on consistent diastolic blood pressure measurements ≥90 mm Hg or systolic blood pressure readings ≥140 mm Hg (WHO, 2021).

According to Poulter et al. (2015), hypertension is categorized into two. This classification includes; primary and secondary hypertension. Primary hypertension occurs when the cause of the condition is unknown (Berta et al., 2019). Secondary hypertension occurs due to a comorbidity or dysfunction, including chronic kidney disease and other cardiovascular diseases (Charles et al., 2017). The burden of hypertension can be ascribed to modifiable and non-modifiable risk factors. Behavior, knowledge, awareness, and perception influence risk factors for hypertension (Dosoo et al., 2019). Other modifiable predisposing factors of hypertension include obesity, inactivity, smoking, alcohol, and salt consumption (Mohamed et al., 2018). For instance, A research in Ghana by Lamptey et al. (2017), BMI and circumference of the waist were identified as risk factors, while hypertension control was 1.3%. Socio-demographic characteristics such as gender, genetics, and family history are identified as other non-modifiable risk factors for hypertension (Konlan et al., 2022). Hypertension is known to have several adverse effects on human health (WHO, 2021).

Hypertension can lead to death, illness, and other cardiac events such as renal failure, heart attack, and stroke (Petrie et al., 2018). In Ghana, 4.7% of all hospitalisations and 15.3% of deaths were due to hypertension in 2017 (Ghana Health Service, 2018). It accounted for the third-highest rate of

admissions and the highest rate of deaths in Ghana in 2017 (Ghana Health Service, 2018). Another study at Bono Regional Hospital found that 58% of patients had comorbidities from previous blood pressure records (Fordjour et al., 2020). This is associated with a lower success rate for hypertensive patients in achieving treatment goals (Adoma, 2019).

Hypertension cannot be cured; nonetheless, it can be managed. Blood pressure control relies on antihypertensive drug adherence; however, effective management requires both pharmaceutical and non-pharmacological treatments (Poulter et al., 2020). The pharmaceutical treatment for hypertension includes calcium channel blockers (CCBs), angiotensin-converting enzyme (ACE) blockers or ace inhibitors (ARBs), beta-blockers, and diuretics (Krylevska, 2019). Non-pharmaceutical treatments for hypertensive treatments include lifestyle interventions, antihypertensive medications, physical activity, and dietary changes (Mogaka et al., 2022). Adherence to antihypertensive treatment is vital for blood pressure control. Poor adherence induces complications and elevates the likelihood of cardiovascular events, lowering overall clinical outcomes (Lui et al., 2022).

Treatment adherence is the degree to which a person's actions, such as taking medication, following a diet, and making lifestyle changes, are consistent with the recommendations of a healthcare provider (WHO, 2013). Treatment adherence is a multifaceted phenomenon influenced by multiple factors. These elements are categorised into five: Patient-related, socioeconomic, disease-related, treatment-related, and healthcare-related variables (WHO, 2013). These factors may pose an adverse effect or positive impact on adherence and overall health (Gast & Mathes 2019). Although

detection of hypertension has improved worldwide, levels of treatment and control vary among countries (Müller-Nurasyid, 2021; Zhou et al., 2021). Adherence to long-term treatments for chronic illness is around 50% in developed nations, with an even lower rate in developing countries jeopardising treatment effectiveness (Reyes-García et al., 2022; WHO, 2013). A research conducted in 12 sub-Saharan African nations revealed low (30.8%), medium (33.6%), and high (35.6%) adherence to antihypertensive medications, indicating low adherence overall. Similar results emerged from a scoping analysis by Sorato et al. (2021) in the eastern part of sub-Saharan Africa, which reported 78 to 94.9% of non-among individuals with hypertension.

The rate of adherence among hypertensives is no different in Ghana. Research based on national demographic data found that patients had hypertension control rates of 23.8% (Sanuade et al., 2018). Another study found that the middle belt had hypertension control rates of 41.3% (Dosoo et al., 2019). A cross-sectional study at Komfo Anokye Teaching Hospital and Kwame Nkrumah University of Science and Technology Hospital revealed that 49.2% and 52.9% of participants were non-adherent. The increase in non-adherence has contributed to an increase (50.4%) in uncontrolled blood pressure levels in Ghana (Adomako et al., 2021). This may be due to a lack of adherence to blood pressure control while taking medication (Adoma, 2019; Fordjour et al., 2020). In addition, low control rates may be due to inequitable access to medicines, universal health coverage, and low implementation of targeted public health measures, all of which contribute to the overall burden

of hypertension (Adoma, 2019; Dosoo et al., 2019; Fordjour et al., 2020; Forouzanfar et al., 2017; Zhou et al., 2021).

Hypertension diagnosis, treatment, and control rates in Sub-Saharan Africa are below 40%, 35%, and 10–20%, respectively (Mills et al., 2016; Yuyun et al., 2020). North African countries have lower awareness level, treatment, and hypertension control, particularly in rural areas (Okello et al., 2020; Zhou et al., 2021; Zhou et al., 2022). Hypertension prevalence in East and West Africa is high, with low awareness and poor treatment and control observed (Okello et al., 2020). In Ghana, poor adherence is attributed to the challenges associated with universal health coverage for hypertension (Koduah et al., 2021). Low adherence to hypertension treatment in Ghana is influenced by patient, healthcare-related, socioeconomic, and demographic factors, as well as patient and healthcare-related factors (Abeasi et al., 2022; Bosu et al., 2019; Okai et al., 2020; Sanuade et al., 2018).

Cardiovascular disease, including stroke, is a major risk factor for decline in cognition (Markino et al., 2021). Studies show that 17.5 million global fatalities were due to cardiovascular diseases (Ofori-Asenso & Garcia, 2016). In 2020, strokes accounted for 1 in 6 fatalities as a result of cardiovascular illness. Ischemic strokes, which include cases of no blood flow to the brain, contributed to 87% of all strokes in another study (Uzuner & Uzuner, 2023). Consequently, a cross-sectional study in Ghana, found cognitive dysfunction in half of the stroke survivors (Sarfo et al., 2017). Vascular cognitive dysfunction and other CVDs were attributed as risk factors for cognitive decline (Sanuade et al., 2021).

Cognitive function is a "term used to describe the performance of mental processes, involves comprehension, reasoning, remembering, problem solving, decision-making, and attention" (Fisher et al., 2019). Cognitive function aids in solving problems, planning, and decision-making (Uchmanowicz et al., 2019). The main domains of cognitive function include learning, attention, memory, and executive function (Driscoll, 2017; Harvey, 2022; Mancuso et al., 2020). Learning can be described as a long-term change in behaviour mechanisms due to exposure to environmental events (Klausmeier, 1992). Attention is the cognitive process that apprehends focus and responds to relevant stimuli (Filley, 2002). Memory refers to the capacity to retain information for adaptive purposes, including data from all sensory modalities and verbal and non-verbal data (Miyake & Shah, 1997). Executive function refers to mental processes that successfully control and coordinate other cognitive abilities such as planning, focus, and memory to meet a goal (Denckla, 2005).

Although cardiovascular disease is associated with cognitive decline, it is becoming evident that the actual CVD events (such as; diabeties high blood pressure, and obesity) result in adverse changes in brain structure and cognition function (Johansen et al., 2020; Stewart, 2019). CVD risk factors impair cognitive function, leading to cerebral hypoperfusion, hypoxia, emboli, and infarctions, resulting in vascular and degenerative brain lesions (Adoma, 2019; Akinyemi et al., 2019; Dzifa et al., 2021; Matsuda, 2020; Sanuade et al., 2021; Song et al., 2020). Several studies on hypertension in Sub-Saharan Africa have reported that hypertensive-associated risk factors (age, family history, midlife hypertension, obesity, lack of physical inactivity, lifestyle or

sedentary behaviors, and other comorbidities) elevate the likelihood of lower cognitive functioning (Feinkohl et al., 2018; Roche et al., 2022; Santisteban & Iadecola, 2018; Twinamasiko et al., 2018).

Quality of life (QoL) refers to a person's perception of their position in life regarding goals, anticipations, principles, and concerns, including the values and cultural systems they abide by (WHO, 2021). It is a standardised indicator that is used to measure, analyze, or describe a person's socioeconomic status or progress (Wenzel et al., 2017). QoL encompasses an individual's social, psychologicaland physical well-being (Marquez et al., 2020). Life expectancy, population health, determinants of mortality and effects of health status on psychosocial well-being are measures of QoL (Park et al., 2018). Hypertension significantly impacts an individual's health, social, economic, and financial well-being (Macquart de Terline et al., 2019). A study by Pan et al. (2019), noted that non-adherence to antihypertensive therapy and lifestyle changes negatively impacts the QoL of persons with hypertension. To reduce the burden of hypertension at the patient level and increase positive hypertension control outcomes, QoL must be considered (Xiao et al., 2019).

Numerous studies have been carried out regarding the QoL among people living with hypertension (Ha et al., 2014), treatment adherence of individuals living with hypertension (Shafazand et al., 2004), and cognitive function of people living with hypertension (Reitz et al., 2007). Nevertheless, limited studies have been conducted on the correlation between treatment adherence, cognitive function and QoL among people living with hypertension (Uchmanowicz et al., 2018).

Statement of the Problem

Treatment adherence is a risk factor for increasing negative hypertension outcomes (Hamrahian, 2020). Globally, long-term therapy adherence for cardiovascular diseases such as hypertension is between 50 and 70% (WHO, 2013). Treatment adherence for chronic diseases is less than 45% in nations with low and middle-incomes, especially those in sub-Saharan Africa like Ghana (Opoku et al., 2020). According to Twumasi-Ankrah (2017), in a study conducted in Accra, approximately 50% of hypertensive patients at the Ridge Hospital had lower adherence rates. Similarly, another cross-sectional study conducted in Ghana's Upper West region found lower treatment adherence rates (Abeasi et al., 2022).

Although hypertension control levels are improving worldwide, recent studies in sub-Saharan Africa continue to report lower adherence among people with hypertension (Algabbani & Algabbani, 2020). Evidence from the literature shows a significant increase in the incidence of other cardiovascular events, hospitalizations, mortality, uncontrolled hypertension cases, and poor clinical outcomes in Ghana (Koduah et al., 2021; Okai et al., 2020; Sanuade et al., 2018). According to data from Ghana's District Health Information Management System (DHIMS), high blood pressure and cardiovascular events were the leading causes of death in 2017. Of the 13,198 deaths reported in 2017, 2,024 deaths (15.34%) were attributed to hypertension and cardiovascular disease (Ghana Health Service, 2018).

Furthermore, factors influencing poor treatment adherence in Ghana have been identified as one of the challenges to achieving universal healthcare coverage for hypertension (Koduah et al., 2021). Lower adherence to

antihypertensive medications hinders effective treatment, reduces patients' quality of life, and places an additional burden on limited healthcare system resources (Schutte et al., 2021; Twumasi Ankrah, 2017). In addition, non-adherence puts patients at risk of significant disease progression, death, and increased healthcare costs (Calys-Tagoe et al., 2020; Twumasi Ankrah, 2021). Uncontrolled hypertension due to poor treatment adherence also increases the patient's disease burden (Burnier & Egan, 2019).

Lower cognitive function is significant risk factor for cardiovascular events, lower life expectancy, poor QoL, higher hospitalisation rates, and higher healthcare costs (Angermann & Ertl, 2018). Globally, hypertension is identified as a major risk factor for Alzheimer's disease, vascular dementia, and cognitive decline (Canavan & O'Donnell, 2022; Walker et al., 2017; WHO, 2013). However, there are limited research on the correlation between cognitive function and cardiovascular disease in Ghana. The focus of several studies on the association between cognitive function and cardiovascular disease has been on dementia and cognitive dysfunction in stroke, HIV, and diabetic patients (Ashong et al., 2018; Sarfo et al., 2017; Sarfo et al., 2021).

Poor adherence to treatment in hypertensive patients, including difficulties with medication, diet, and exercise, is linked to lower cognitive function (Hayash et al., 2022). Poor patient compliance and adherence can lead to lower cognitive function and QoL. A systematic review revealed that individuals with cognitive decline often exhibit poor adherence to medication, ranging from 10.7% to 38% (Smith et al., 2017). Another study by Uchmanowicz et al. (2018) reported that poor adherence in older adults with high blood pressure may effect a deterioration in cognitive function.

Particularly with regard to visuo-spatial and executive functions, hypertension is linked to cognitive dysfunction among the elderly (>80 years), often due to frailty, absence of regular physical exercise and other comorbidities (Burnier et al., 2020). Given these circumstances, there is a need for research on the relationship between cognitive function and hypertension (Ungavari et al., 2021).

Hypertension significantly affects the quality of life of individuals, placing an extensive burden on their daily lives. High blood pressure can lead to difficulties in physical functioning, vitality, general health, and psychosocial functioning (Murepa, 2018; Sarzyska et al., 2021; Tetteh et al., 2020). Non-communicable diseases (NCDs) cause approximately 41 million mortalities each year, accounting for 71% of all fatalities and 15 million premature deaths (WHO, 2023). Global standardised age for prevalence of hypertension (30–79 years) is reported as 32% in women and 34% in men. Life expectancy in low- and middle-income nations remains low despite stable worldwide age-standardised prevalence, which is similar to 1990 levels of global age-standardized prevalence, designated as 32% in females and 32% in males (Zhou et al., 2021). Hypertension, among other cardiovascular diseases, is prevalent in Sub-Saharan Africa, with lower QoL (Yuyun et al., 2020). Studies conducted in Ghana reveal poor quality of life among individuals with hypertension (Kretchy et al., 2019; Boima et al., 2022). A study found that the overall health-related quality of life (HRQoL) at Korle-Bu Teaching Hospital, Accra, is relatively low at 14.0% (Boima et al., 2022). Poor QoL increases the likelihood of hypertension-related comorbidities like kidney failure, stroke, diabetes, and even death (Tannor et al., 2019).

Researchers have primarily examined treatment adherence, cognitive function, and QoL in individuals with hypertension independently. In Ghana, studies conducted on hypertension focused on treatment adherence (Adoma, 2019; Atinga, Yarney, & Gavu, 2018; Kretchy et al., 2014; Nyaaba et al., 2018; Okai et al., 2020), cognitive function (Kretchy et al., 2014), and QoL (Kretchy et al., 2019) among people living with hypertension. Limited research exists on treatment adherence, cognitive function, and QoL among people with hypertension in Sunyani Municipality. Therefore, it was imperative to examine the association between treatment adherence and cognitive function and QoL among people living with hypertension within the health centres in Sunyani Municipality, Ghana.

Purpose of the Study

This study aimed to investigate the association between treatment adherence, cognitive function, and QoL among people living with hypertension in selected health centres in Sunyani Municipality.

Research Questions

1. What is the level of treatment adherence among people living with hypertension in Sunyani Municipality?
2. What is the level of cognitive function among people living with hypertension in Sunyani Municipality?
3. What is the level of QoL among people living with hypertension in Sunyani Municipality?
4. What is the association between cognitive function treatment adherence and QoL among people living with hypertension?

5. What factors influence treatment adherence among people living with hypertension in Sunyani Municipality?

Significance of the Study

The findings of this study will help inform hypertensive patients on how treatment adherence and cognitive function may influence their quality of life. The study will offer insights for hypertensive patients on how to effectively manage these variables for a healthier lifestyle. The study's findings could aid Bono Regional, Municipal, and SDA hospitals in planning hypertension treatment programs, thereby reducing complications and comorbidities associated with hypertension. This study's findings will guide national policies and programmes for hypertensive treatments, assisting the Ghana Health Service and Ministry of Health in planning and implementing effective care. This research's findings will add to the existing literature on strengthening hypertensive care and management systems.

Delimitations

This study was limited to hypertensive patients aged 18 and above in Bono Regional, Municipal, and SDA Hospitals, who received treatment for over six months.

Limitations

Findings may not be applicable to individuals with hypertension outside of the selected health centers in Sunyani, limiting the generalizability of the results. This is because the samples were chosen purposively. Reliance on self-reported data for variables like treatment adherence, cognitive function, and quality of life may have introduced bias due to inaccuracies or social desirability bias. Also, the study's cross-sectional design limited the

ability to establish causality between variables and only provides a snapshot of the relationship at a specific point in time. Again, the study's focus on treatment adherence, cognitive function, and QoL may overlook other potentially relevant factors influencing hypertension management and outcomes.

Definition of Terms

Cognitive Function: Cognitive function is a "term used to describe the performance of mental processes, include learning, thinking, logic, recollection, solving problems, making decisions, and attention" (Fisher, Chacon, & Chaffee, 2019).

Hypertension: Hypertension is "refered to as an increased systolic blood pressure of 140 mm Hg or greater and/or diastolic blood pressure of 90 mm Hg or greater in adults (>18 years) based on the average of two or more properly measured, seated blood pressure readings on each of two or more visits" (WHO, 2005)**.**

Treatment Adherence: "Treatment adherence is "the degree to which an individual behaves or responds to medication, dieting, or adaptation to a lifestyle change as recommended by a health or clinical practitioner" (WHO, 2003).

Quality of Life (QoL): "A person's perception of their position in life regarding goals, anticipations, principles, and concerns, including values and cultural systems they abide by" (WHO, 2021).

Organisation of the Study

The research was divided into five sections. The research was divided into five sections; chapter one covered the background of the study, statement

of the problem, purpose of the study, research questions, significance of the study, delimitation, and limitations. The second chapter reviewed literature on treatment adherence, cognitive function, and QoL among people with hypertension. This chapter explored theories such as the Contextual Model of Health-Related Quality of Life (Ashing-Giwa-CM-HRQoL). Chapter three focused on the methodology of the study: research design, population, and sampling procedures employed. Chapter three provides an in-depth discussion of the research instrument, its validity and relaibility, the pre-test, data collecting procedures, and data analysis. The results and discussion are presented in the fourth chapter. The fifth chapter includes a summary, conclusions, main findings, and recommendations.

CHAPTER TWO

LITERATURE REVIEW

The purpose of this study was to investigate the association between treatment adherence, cognitive function and QoL among people living with hypertension in selected health centres in Sunyani Municipality. To be able to understand the necessary empirical and theoretical issues between treatment adherence, cognitive function and QoL, this chapter reviewed existing literature and related theories on treatment adherence, cognitive function and QoL among persons with hypertension under the following sub-headings:

1. Theoretical Base of the Study
2. Concept of Hypertension
3. Treatment Adherence and Hypertension
4. Factors influencing Treatment Adherence among People Living with Hypertension
5. Cognitive Function and Hypertension
6. Quality of Life and Hypertension
7. Treatment Adherence, Cognitive Function and Quality of Life among People Living with Hypertension
8. Conceptual Framework

Theoretical Review

Ashing-Giwa Contextual Model of Health-Related Quality of Life (Ashing-Giwa-Cm-Hrqol Model)

The Ashing-Giwa Contextual Model of Health-Related Quality of Life was propounded in 2005 by Kimlin Tam Ashing-Giwa (Sosnowski et al., 2017). This model was constructed primarily to explain how the quality of life of cancer

patients is determined. Ashing-Giwa-CM-HRQoL is a comprehensive framework for understanding health-related quality of life (HRQOL). This model takes into account the physical, psychological, social and emotional factors that can impact an individual's well-being. The Ashing-Giwa-CM-HRQoL model emphasizes the importance of considering these different aspects of a person's life to provide holistic care and support.

This proposed study is nested in the Contextual Model of Health-Related Quality of Life by Ashing-Giwa (2005) (Ashing-Giwa-CM-HRQoL). The model has two levels: macro and micro. The macro level also referred to as the systemic level is made up of external variables that affect how well a person functions and how quickly they recover. According to Muzzatti and Annunziata (2013), the major domains of the macro variables in Ashing-Giwa-CM-HRQoL's model are socioeconomic, cultural, demographic and medical care factors. Age and gender are among the demographic factors that affect QoL; medical-related factors include access to healthcare and the quality of health services. Social support, life hardship, and socioeconomic status are other socioeconomic determinants of QoL (Pedro, 2010). The micro level, also known as the individual level, refers to an individual's traits that impact their functioning and recovery (Wippold et al., 2020). These traits fall under psychological variables, including depression, anxiety, anger, hope, exuberance and low self-esteem (Drury, 2020). At the micro level, factors like disease type, symptom characteristics, injury severity, general health conditions, associated diseases, knowledge, beliefs, self-efficacy and health behaviors are considered (Sosnowski et al., 2017).

The Ashing-Giwa-CM-HRQoL model is considered ideal for this study because it has been validated (Ashing-Giwa & Lim, 2011, Ashing-Giwa & Lim,

2008, Ashing-Giwa & Lim, 2009) and used in several settings and among chronically ill patients (Lim, 2018).

Application of the Ashing-Giwa Contextual Model of Health-Related Quality of Life

The Ashing-Giwa Contextual Model of HRQOL provides a comprehensive framework for understanding the multidimensional nature of HRQOL and its influence on treatment adherence and cognitive function in hypertensive patients. By considering these contextual factors, the model provides a holistic understanding of HRQOL beyond the traditional biomedical approach. These factors interact with each other and shape the overall HRQOL experienced by individuals with chronic illnesses.

Firstly, according to the Ashing-Giwa Contextual Model, individual factors play a crucial role in treatment adherence. These include demographic characteristics (such as age, gender, and socioeconomic status), health beliefs and attitudes, knowledge about the condition and treatment options. This model suggests that individuals who fail to adhere to their prescribed treatment plan may experience reduced physical, psychological and social well-being. However, many hypertensive patients struggle with adherence due to various factors such as side effects, complexity of medication regimens and lack of social support. A study by Shahin et al. (2019) indicated that patients who have a good understanding of their condition and the importance of adhering to their treatment are more likely to be adherent. A similar study found that female hypertensive patients are twice as likely to adhere to medication compared to male patients (Tibebu et al., 2017). Additionally, according to Burnier et al. (2020), adherence is better among persons aged 65 to 80 years compared to younger hypertensive adults (<50 years).

The Ashing-Giwa Contextual Model also recognizes that treatment adherence is not solely determined by individual factors but is also influenced by broader contextual factors. It highlights the role of environmental factors in treatment adherence. Healthcare policies and societal norms can also impact treatment adherence by influencing the availability and affordability of treatments (Atinga et al., 2018). A study by Pan et al. (2022) indicated that hypertensive patients living in urban areas are more likely to adhere to treatment than those in the rural dwellings. Access to healthcare services is crucial in ensuring individuals have the necessary resources to adhere to their treatment plans. Living in an environment with limited access to healthcare facilities or lacking transportation options can hinder treatment adherence. A study reported that factors such as insurance coverage, interactions between patients and pharmacists and pharmacy reimbursement can also pose challenges to accessing treatment, negatively impacting patient's adherence (Ashing-Giwa, 2005).

Furthermore, impairments in cognitive function can significantly impact an individual's ability to understand and adhere to treatment recommendations. Cognitive function plays a vital role in the overall well-being and HRQOL of hypertensive patients. Cognitive decline is common in individuals with hypertension, and it can negatively affect their ability to manage their condition and engage in self-care activities. Hessler et al. (2021) demonstrated that poor cognitive function was associated with lower HRQOL scores in hypertensive patients. Additionally, one study India reported that hypertension was not independently related to cognitive function. However, socio-demographic factors such as older age, female gender, lower education and rural residence were independently associated with poorer cognitive test scores (Farron et al., 2020). One other study discovered

that 35% of hypertensive patients had dementia, while 7.7% had cognitive impairment. Patients with cognitive decline tended to be older, have lower education levels, and perform worse on daily activities (Yamoto et al., 2022). The model indicates that recognizing these contextual factors can help address barriers to higher cognitive function and improve HRQoL among hypertensive individuals, subsequently enhancing health outcomes among persons with hypertension.

Moreover, QoL encompasses various domains such as physical, psychological, and social well-being. The Ashing-Giwa Contextual Model emphasizes that hrqol is influenced by both individual-level and contextual factors. For individuals living with hypertension, the physical symptoms associated with the condition can have a profound impact on their HRQoL Physical symptoms such as fatigue, pain and limitations in physical functioning subsequently, impacts overall wellbeing (Bueno et al., 2019). Likewise, the psychological dimensions of HRQoL, such as feelings of depression and anxiety, play a significant role in shaping the perceived qol of the hypertensive (Saini et al., 2022). More importantly, the Ashing-Giwa Contextual Model suggests that HRQoL is not solely determined by the presence of hypertension but also by the coping strategies employed and the level of social support received by individuals in managing the associated challenges and stress of hypertension. According to Adoma (2019), qol is positively associated with the coping strategies and social support that aids in the management of hypertension.

In conclusion, the Ashing-Giwa Contextual Model of HRQOL recognises that treatment adherence is not an isolated outcome but is interconnected with cognitive function and overall quality of life. Treatment adherence is essential for managing health conditions effectively, which in turn can improve cognitive function and overall QoL. Conversely, poor treatment adherence can lead to

worsening health outcomes, cognitive decline and reduced QoL. Hence, the implications of Ashing-Giwa's model on hypertension are significant for understanding treatment adherence, cognitive function and quality of life among individuals with hypertension. It also emphasizes the importance of culturally sensitive health practices and interventions that help improve hypertension outcomes. By considering factors such as socioeconomic status, cultural beliefs, psychological distress and health care utilization, health professionals and policy makers can develop tailored interventions for the unique needs of hypertensive patients.

Concept of Hypertension

Hypertension is a major public health issue, accounting for 45% of the global burden of disease. It occurs when blood pressure is consistently elevated in blood vessels, creating a persistent impact on artery walls (WHO, 2013). Blood pressure is measured in millimeters of mercury (mmHg) and recorded as two numbers: systolic blood pressure over diastolic blood pressure (Araujo-Castro et al., 2022). To diagnose hypertension, blood pressure readings must be taken over several days, ideally twice daily, in the morning and evening (Woolsey et al., 2017). The average of two or more systolic blood pressure readings on subsequent visits must consistently be greater than or equal to 140, or the diastolic blood pressure measurement should be greater than or equal to 90 mm Hg in at least two consecutive visits (WHO, 2021). Hypertension often shows no symptoms, but severe cases can be symptomatic (Hou et al., 2020). Diagnostic tests for hypertension include blood glucose, serum potassium, urinalysis and lipid tests (Balwan & Kour, 2021).

History and Prevalence of Hypertension

Hypertension dates back to 2600 BC causing over 9.4 million deaths annually (WHO, 2021; Wolf et al., 2018). Between 1975 and 2015, adult cases increased from 594 million to 1.13 billion, primarily in low- and middle-income countries (WHO, 2021). The number doubled between 1990 and 2019, with two-thirds residing in low- and middle-income countries (WHO, 2023). Hypertension is expected to reach 1.56 billion by 2025, with an estimated 1.28 billion adults aged 30-79 worldwide affected (WHO, 2023). However, an increase in hypertension prevalence has been observed in Sub-Saharan Africa, with systolic hypertension increasing by 82% between 1990 and 2016(Bosu et al., 2019). In Ghana, the prevalence of hypertension is 50.7%, with one in four adults affected in both rural and urban areas (Calys-Tagoe et al., 2020). Similar studies have reported higher prevalence rates ranging from 19% to 48% (Atibila et al., 2021; Bosu & Bosu, 2021). This indicates a high prevalence of hypertension in Ghana.

Classifications of Hypertension

According to Weber et al. (2014), hypertension can be classified into two types: primary or essential hypertension.

a) ***Primary Hypertension***: Essential hypertension is a prevalent type of hypertension, influenced by environmental, genetic and epigenetic factors (Li et al., 2023). Often essential hypertension is accompanied by other cardiovascular risk factors such as overweight, diabetes and hyperlipidemia (Chaudhary, 2022). Essential hypertension is diagnosed when blood pressure is above 140/90 mm Hg, accounting for 95% of hypertension cases (Thakur et al., 2021).

b) ***Secondary Hypertension***: Secondary hypertension is a type of that is caused by another medical condition or disease. It affects 5%-10% of hypertensive patients and may be caused by renal parenchymal disease, thyroid disease, obstructive sleep apnea, cushing syndrome and primary hyperaldosteronism (Antit et al., 2022). Diagnosis is based on severe resistance, acute blood pressure and suggestive symptoms (Charles et al., 2017).

c) ***Other types of hypertensions include:***

i. ***Pre-hypertension;*** Pre-hypertension is defined as having systolic blood pressure between 120-139 mmHg and diastolic between 80-89 mmHg (Carey et al., 2018). This type of high blood pressure increases the risk of developing hypertension and cardiovascular diseases, such as heart attack and stroke (Fu et al., 2022).

ii. ***Malignant hypertension***: Malignant hypertension or resistant hypertension occurs when systolic blood pressure exceeds 180 mmHg and diastolic pressure below 120 mmHg, despite triple drug treatment (Wenzel, 2021). It is a severe form of high blood pressure that can damage multiple organs such as the brain, heart, kidneys and other organs (WHO, 2021). This condition is a medical emergency that requires immediate care.

Risk Factors Associated with Hypertension.

Hypertension is influenced by modifiable and non-modifiable risk factors. Modifiable risk factors for hypertension can be managed or mitigated through lifestyle modifications and medication. These include lack of exercise, unhealthy diet, obesity and excessive alcohol consumption (Dosoo et al., 2019). Healthy habits such as regular exercise, a balanced diet, maintaining a healthy weight and limiting alcohol consumption can lower blood pressure and reduce the complications

associated with hypertension (Mohamed et al., 2018). Modifiable risk factors associated with hypertension include:

a) ***Behavioral Factors***: Behavioural factors are actions or habits that people choose to engage in, such as smoking, drinking alcohol, eating an unhealthy diet or being physically inactive (Mohamed et al., 2018). Alcohol consumption can raise blood pressure by stimulating the nervous system and interfering with the balance of fluids and electrolytes in the body (Sobrino et al., 2019). Additionally, stress can trigger the release of hormones that constrict blood vessels and increase heart rate (Balwan& kour, 2021). These factors can influence the risk of developing hypertension which can lead to heart disease, stroke, kidney failure and other health problems (Hu et al., 2021). Changing these behavioral factors can help lower blood pressure and prevent complications.

b) ***Environmental Factors***: Environmental factors are among the risk factors that can influence hypertension. Environmental factors such as air pollution, noise pollution, temperature and altitude can increase blood pressure by causing inflammation, oxidative stress and by activating the sympathetic nervous system (Felizardo et al., 2019). Also, it has observed that colder temperatures have a chronic effect on blood pressure, with inverse short-term associations in different populations and climates (Brook et al., 2011). These factors may interact with other risk factors such as genetics, lifestyle and diet to increase the likelihood of developing hypertension (Bruno et al., 2018).

c) ***Dietary factors;*** Dietary factors are important modifiable risk factors for hypertension, which is a major contributor to cardiovascular disease and mortality (Noale et al., 2020). Some of the dietary factors that may influence

blood pressure include salt intake, potassium intake, BMI and dietary habits (Chagas et al., 2023). Reducing sodium chloride in meals is critical for lowering blood pressure, with studies showing a strong association between sodium consumption and hypertension (Challa et al., 2021). High sodium in populations such as northern Japan and the southeastern USA has been observed to be a major contributor to hypertension, while low-salt diets lower it (Hayabuchi, et al., 2020). Additionally, obesity puts extra strain on the heart and blood vessels as it increases the production of hormones that raise blood pressure (Shim et al., 2020).

d) ***Socio-economic Factors***: Socioeconomic factors are important determinants of health and well-being as they can influence the risk of developing hypertension. Age, gender, educational level and income, occupation, and living conditions are some socioeconomic variables for hypertension (Badr et al., 2021). These factors can affect the exposure to stress, unhealthy behaviors, access to health care and environmental quality (Van Kamp et al., 2022). In a recent study by Qin et al. (2022), it was found that individuals with lower annual household income have a 1.35-fold higher risk of developing hypertension than individuals with higher annual household income. These factors can directly and indirectly affect blood pressure (Raghupathi & Raghupathi, 2020).

e) ***Type 2 Diabetes;*** hypertension and type 2 diabetes have similar causes and disease processes, so there is considerable overlap between the two diseases (Egan et al., 2010). Approximately 78% of people with diabetes are affected by hypertension (Sowjanya Naha et al., 2021). High blood glucose levels can

damage various organs and tissues in the body, including blood vessels (Sun et al., 2019). This can increase the risk of developing high blood pressure.

Non-modifiable factors such as gender, genetics and age contribute significantly to the development of hypertension, although they cannot be modified (Budreviciute et al., 2020). Some of these factors are discussed below:

i. ***Family History or Genetics***: Genetics is one of the factors that can influence the development of hypertension. It refers to the inherited traits that affect how the body regulates blood pressure, such as the activity of certain enzymes, hormones and receptors (Ding et al., 2023). A family history of hypertension increases the risk of developing the disease, but the exact pattern of inheritance is uncertain (Mills et al., 2020)

ii. ***Age***; Age significantly increases the risk of hypertension. Approximately 60% of individuals aged 60 and above have high blood pressure, with 75% of women and 60% of men affected (Oliveros et al., 2020). High systolic blood pressure risk increases from 35 to 79 years, while high diastolic blood pressure risk declines after 50-65 years (Cheng et al., 2022).

iii. ***Sex***: Sex is a significant risk factor for hypertension, with men being more susceptible to the condition compared to women (Watz et al., 2023). Men have a higher prevalence of hypertension across all age groups, even after accounting for body mass index and smoking status (Vo et al., 2023). A study by Gillis and Sullivan (2016), indicated that Men are more likely to develop hypertension at a younger age than women. This disparity is attributed to hormonal and blood vessel structural differences (Gerdts et al., 2020).

In summary, hypertension is caused by a combination of factors that influence each other. Although there is no known cure, stress management, regular blood pressure monitoring and blood pressure regulation are recommended strategies for people living with hypertension. Notwithstanding, hypertension can be treated by pharmacological and non-pharmacological therapies.

Pharmacological Treatment of Hypertension: More than 100 blood pressure medications, including antihypertensive classes, statins, antiplatelet agents, thiazide diuretics, calcium channel blockers, Angiotensin-Converting Enzyme Inhibitors and beta blockers, have been developed since the 1950s to treat hypertension (Wright et al., 2018). These drugs can be administered as double pill combinations, single pills, fixed-dose combinations or combination therapies (Carey et al., 2018). The different classes of antihypertensive work in different ways to lower blood pressure.

Non-Pharmacological Treatment of Hypertension; Non-pharmacological treatments are lifestyle interventions that aim to effectively control hypertension through changes in diet, physical activity, weight, stress and alcohol consumption, often in conjunction with medical advice (Dhungana et al., 2022). These interventions aim to lower blood pressure and reduce the risk of other cardiovascular events associated with hypertension.

Treatment Adherence and Hypertension

Adherence to treatment is crucial for controlling blood pressure and minimising complications. It involves aligning one's behaviour with healthcare professional recommendations, such as medication, diet and lifestyle changes (WHO, 2003). Adherence to pharmacological treatment involves taking the prescribed medication at the specified time in the recommended dosage (Ailani et

al., 2021). Non-pharmacological treatment, on the other hand, involves lifestyle changes, such as maintaining a healthy diet and managing stress (Rippe, 2018).

Despite the availability of effective medications, there has been limited improvement in outcomes. Adherence to treatment among cardiovascular diseases ranges from 40 to 60%, suggesting that approximately 50% of prescribed treatments are not adhered to, globally (Lip et al., 2022). According to literature, over half of patients diagnosed with hypertension discontinue treatment during the first year after diagnosis, and only 80% of those who continue adhere to their prescribed therapy (Pallangyo et al., 2022). One study reported that one in five new prescriptions is never filled, and of those that are, 50% are not properly administered in terms of timing, dosage, frequency, and duration (Gupta et al., 2017). This suggests an urgent need for strategies to improve treatment adherence for better outcomes.

Classification of Treatment Adherence

Over the years, the concept of treatment adherence has been divided into two categories: primary and secondary adherence (Krass et al., 2015). Primary adherence refers to the act of filling out a prescription, while secondary adherence involves the proper administration and continuation of the treatment (Eicher et al., 2019). In addition to that, there are three phases of treatment adherence which include initiation, implementation and discontinuation. These three distinct phases are discussed below:

a) ***Initiation:*** Initiation of treatment adherence involves a patient starting a prescribed treatment regimen, committing to following guidelines, taking medications and /or engaging in therapy (Feldman et al., 2017). Initiation occurs when a patient takes their first dose of a prescribed medication

(Kaplan & Price, 2020). It is crucial as it marks the beginning of a patient's journey towards better health outcomes.

b) ***Implementation***: Implementation in treatment adherence involves ensuring patients follow prescribed treatments as suggested by healthcare providers (Kaplan & Price, 2020). It encompasses following therapy, dosing history (intervals, durations, and dosages) and administration details (Feldman et al., 2017). Effective implementation strategies, such as educational interventions, reminders, simplifying prescription and enhancing physician-patient relationships, can help overcome barriers and improve treatment adherence (Eicher et al., 2019).

c) ***Persistence***: Persistence is the consistent adherence to a treatment plan until it is discontinued (Choudhry et al., 2022). It encompasses the duration from initiation to discontinuation (Feldman et al., 2017). It is crucial for medication adherence as it reflects long-term commitment. Strategies to improve persistence include patient education, regular follow-up appointments, reminder systems and addressing barriers (Kaplan & Price, 2020).

Risk Factors Associated with Treatment Adherence among People with Hypertension

Factors influencing treatment adherence include socio-economic variables, treatment-related variables, disease-related variables, patient-related variables and healthcare related factors (WHO, 2003). These factors are interconnected. Following is a discussion of these five categories of factors that influence a patient's adherence to their treatment:

i. ***Socioeconomic Factors***: Socioeconomic factors play a vital role in determining patient's adherence to treatment (Macquart De Terline et al., 2019; Sandoval et al., 2018). Income, age, access to healthcare and social support are significant socioeconomic determinants of poor adherence to pharmacological treatment (Montealegre et al., 2022). One study by Nagamine et al. (2023) indicated that hypertensive patients who were married and had higher education were associated with better adherence. The interplay of these variables may impact the knowledge and attitudes of patients towards treatment.

ii. ***Therapy-related Factors***; Therapy-related factors, such as adverse reactions, discomfort and drug use duration influence treatment adherence among persons with hypertension (Kvarnström et al., 2021). Other factors include administration method, treatment period, side effects, drug class, and regimen complexity (Gast & Mathes, 2019). Drug combinations, behavioural change, taste and storage of drugs have a predominant impact adherence as well. A study by Butler et al., (2023) indicates that simple, daily single-pill combinations are associated with better antihypertensive therapy adherence. Patients who accomplish therapeutic targets more rapidly require fewer alterations in their treatment regimen and are more likely to adhere to treatment (Unger et al., 2020). Whereas patients who often undergo multiple changes to their medication regimens, and experience adverse effects, are less likely to adhere to treatment (Burnier & Egan, 2019).

iii. ***Disease-related factors***: In addition, adherence to treatment can also be challenging, especially when medication is associated with adverse side effect. The presence of side effects or adverse reactions to medications can

discourage adherence (Fernandez-Lazaro, et al., 2019). Patients with acute side effect tend to adhere more, while patients experience chronic side effect may only take 50% of prescribed medications (WHO, 2021). Patients may struggle to incorporate their medications into their daily lives as well, particularly with irregular working hours or shifts (Kvarnström et al., 2021). All of these factors together may affect the adherence of patients to treatment.

iv. ***Patient-related Factors***: Patient-related factors are the attributes of the patient that determine their compliance or noncompliance with the prescribed treatment regimen. Some of the patients-related factors include patients' beliefs, attitudes, knowledge, motivation, self-efficacy, perceived benefits and barriers, social support and coping skills (Kvarnström et al., 2021). These factors can influence patients' decisions to initiate, maintain or discontinue antihypertensive therapy (WHO, 2003). Individuals who have a better understanding of disease and treatment benefits are more likely to be adherent (Shahin et al., 2019). Additionally, a patient's psychological, emotional and physical well-being can also affect adherence (Levine at al., 2021).

v. ***HealthCare System-Related Factors***: Healthcare services aim to provide high-quality care to patients, including risk-free and clinically effective treatments (WHO, 2021). However, challenges like poor healthcare access, long waiting periods and treatment segregation can hinder adherence to medication (Kvarnström et al., 2021). High costs associated with inadequate clinic healthcare delivery systems and services can negatively impact patients' well-being and adherence (Stawicki et al., 2022). Other factors such

as insurance coverage, interactions between patients and pharmacists and pharmacy reimbursement can also pose challenges to accessing treatment, negatively impacting hypertension control (Kardas et al., 2022).

Level of Treatment Adherence among People Living with Hypertension, Global

The level of adherence among people with hypertension varies in different regions of the world. Globally, there is a substantial adherence to hypertensive therapy. According to the meta-analysis by Lee et al. (2022), the adherence rates to antihypertensive treatment across the world range from 27% to 40%. Similarly, another study reported that the global prevalence of medication adherence among hypertensive patients is 45.3%, which is still low (Abegaz et al., 2017).

Several studies conducted in specific regions provide insights into local adherence patterns. A cross-sectional study conducted in Romania found that 20.3% had moderate adherence, 9.9% had low adherence, and 69.8% had high adherence in individuals with hypertension (Tilea et al., 2018). Similarly, another study conducted in Pakistan found that 25.6% of hypertensive patients had high medication adherence, 36.7% had moderate medication adherence, and 37.8% had poor medication adherence (Noreen et al., 2023). Algabbani and Algabbani (2020), found that 57.4% of patients with good understanding levels were adherent, while the majority (73.5%) with poor knowledge did not follow their treatment regimen. Another study conducted in Asia by Chowdhury et al. (2020) investigated adherence to antihypertensive medication in Bangladesh. The study revealed that only 37.9% of hypertensive patients were adherent to their prescribed medications. These regional variations may be influenced by factors such as healthcare infrastructure, access to medications and patient awareness.

Age appears to be a factor influencing adherence. Younger hypertensive individuals, particularly those under 50, tend to exhibit lower adherence compared to older individuals aged 65-80 (Burnier et al., 2020). Similarly, a study of 379,658 hypertensive individuals under 65 revealed low adherence and non-persistence in treatment between 2007 and 2014, with rates ranging from 42.3% to 40.2% respectively. Lower risks for non-persistence and low adherence in those starting treatment with angiotensin-converting enzyme inhibitors was observed (Tajeu et al., 2019). Another study conducted in Mei, indicated that ages ≥ 71 years and an oral medication regimen complexity (MRCI) score ≥ 19.5 were risk factors for poor medication adherence. Adherence and BP control were poor in the group with an oral MRCI score ≥ 19.5, regardless of age (Wakai et al., 2021). Lower risks for non-persistence and low adherence in those starting treatment with angiotensin-converting enzyme inhibitors was observed. This suggests that interventions to improve adherence may need to be tailored to different age groups.

Also, there are gender differences among the level of adherence in hypertension. Some studies found that male patients had poor adherence rates compared to younger patients, while others reported that women had higher adherence rates. A study by Park et al. (2013) indicated that 64% of the 241 male patients with a median age of 75 had a poor adherence (41%) rate to antihypertensive treatment, in contrast to younger patients. Another study suggested of the 63.6% of participants who were adherent to anti-HTN treatment, women had higher adherence compared to men (69% vs 58%, P<10−4). Adherence was significantly correlated with age but negatively by the quantity of pills, metabolic illnesses and chronic diseases (Lefort et al., 2018). However, a recent meta-analysis found no significant differences in adherence to AHT among the various sexes (ORs

1.04, 95% CI 1.00 to 1.09, P=0.07.) Regardless among patients aged 65 and older was lower self-reported adherence was observed (ORs 0.84, 95% CI 0.72 to 0.97, P=0.02) (Biffi et al., 2020). These gender-based differences may be associated with various factors, including age, the complexity of treatment regimens and the presence of other chronic diseases.

In addition, studies indicate that fixed-dose combinations and simplified regimens are associated with better adherence. A study conducted in Romania, results indicated that fixed-dose antihypertensive combinations were significantly related to strong adherence (P =0.001). In comparison to participants receiving an unchanged regimen, those whose antihypertensive regimen was changed to a new medication class demonstrated better adherence (p = 0.001) (Tilea et al., 2018). Furthermore, cross-sectional research carried out in the US reported that out of the 484,493 patients who started oral anti-hypertensive treatment, 22,266 started multi-pill combinations, 383,269 started single therapies and 78,958 started fixed-dose combinations. Patients who started on fixed-dose combinations were 13% more likely to adhere (RR: 1.13, 95% CI: 1.11–1.14) and 9% more likely to be persistent than those who started on a single anti-hypertensive treatment. Additionally, refill rates were marginally higher among initiators of fixed-dose combinations (Lauffenburger et al., 2017). Simplifying treatment regimens was observed to improve adherence rates among hypertensive patients.

Also, evidence from literature exhibited that adherence to lifestyle modifications such as dietary changes and physical activity varies. A Korean study found that only 79.7% and 77.5% of hypertensive individuals reported good diets and reduced salt intake, respectively (Shim et al., 2020). Likewise, another survey reported that among the hypertensive, 20% consumed less salt, 80% controlled

alcohol, and 50% were active and had a normal body weight (Kim & Kong, 2015). Also, another study conducted in Malaysia among 2156 participants indicated that in comparison to respondents without hypertension, those 40–49 years with hypertension were 7.3% less likely to engage in high-intensity physical activity. Among hypertension patients 60, the likelihood of engaging in little physical activity was 12.3% greater (Cheah et al., 2023).

In summary, these studies from various countries and regions capture global perspectives on treatment adherence among hypertensive. They recognise that cultural, socioeconomic, and healthcare system differences may influence adherence. These contextual factors are important considerations in understanding adherence patterns. However, vast differences in research methodologies as well as different settings and study areas may influence the diversity in findings as reported. This highlights the need for further research as a striking balance for these findings established in the existing literature.

Level of Treatment Adherence among People Living with Hypertension in Africa

In Africa, studies have shown that treatment adherence among individuals living with hypertension is often suboptimal, leading to poor health outcomes and increased healthcare costs. A study conducted in Sub-Saharan Africa by Nkhata et al. (2020) found that adherence to antihypertensive medication was suboptimal, with only 35% of participants adhering to their prescribed medications. A meta-analysis including hypertension patients showed a wide variation in treatment adherence rates, ranging from 8.9% to 96.8% in numerous studies from different parts of Africa (Shin & Konlan, 2023).

Also, there is a wide variation in adherence rates across different studies and regions in Africa. Studies conducted in different parts of Africa have reported varying rates of non-adherence. A similar study conducted in Korle-Bu Hospital, the University of Port Harcourt Teaching Hospital, Apapa General Hospital in Lagos, and University College Hospital in Ibadan indicated that 66.7% of hypertensive patients did not adhere to their medications (Bioma et al., 2022). Similarly, a cross sectional study in Nigeria by Adeoye et al. (2019), revealed that 4.1% as high treatment adherence, moderate adherence as 68.9%, and low adherence as 27% in patients with hypertension. Also, a cross-sectional survey in Eritrea with 335 respondents, showed 72.8% had a poor adherence to antihypertensive treatment (Mebrahtu et al., 2021). Another study in Egypt found that with low adherence (46.12%) to medications among hypertensive patients (Hussein et al, 2020).

Despite the overall trend of suboptimal adherence, some studies reported more positive findings. One study found that of hypertensive individuals with a good BP control (67.5%) had high adherence (55.5%), while those who had unregulated bp had poor adherence (32.5%) ($\chi 2 = 14.526$; df = 1; $P < 0.001$) (Ibrahim et al., 2022). Similarly, a study by Adomako et al. (2021) found that 50% of patients with hypertension in Africa adhered to their treatment plans, indicating that successful adherence interventions are possible. Another study conducted in Nigeria, revealed that half of the respondents (52.6% and 61.2%) exhibited a high level of spirituality and good medication adherence (Omonijo et al., 2023).

Nevertheless, evidence of poor adherence with to non-pharmaceutical measure among hypertensive patients in specific African countries was noted. A recent cross-sectional study of 276 hypertension patients found among non-alcoholic consumers and non-smokers, 48.2%, 44.9%, 21.45%, and 29% followed

recommended antihypertensive medications, physical activity levels, weight management guidelines and a low-sodium diet, respectively (Niriayo et al., 2019). Another study conducted in Ethiopia revealed a low dietary adherence (32%) among persons with hypertension (Feleke et al., 2022). However, these findings suggest that a significant proportion of hypertensive patients in Africa do not only adhere to their prescribed antihypertensive medications but to recommendations of lifestyle modification as well. These findings highlight the importance of non-pharmaceutical measures in hypertension management. However, this variation could be influenced by factors such as access to healthcare, socioeconomic conditions, and cultural factors. Understanding these variations is crucial for tailoring interventions to improve adherence (Shin & Konlan, 2023).

Evidence suggests that age may influence adherence rates. One study reported that individuals who took a maximum of three tablets (73.1%) and were younger (74.2%) exhibited higher adherence (Usman et al., 2019). In contrast, a study in Ethiopia indicated that, of 75.1% who were adherent to antihypertensive medication, individuals 60 years and above were significantly associated with good medication adherence (AOR=0.33, 95% CI: 0.11, 0.98) (Teshome et al., 2017). However, one study conducted in Algeria found that there was no significant difference in treatment adherence between male and female hypertensive patients (Moussouni et al., 2022).

In conclusion, the research conducted in Africa regarding treatment adherence among individuals living with hypertension exhibit suboptimal adherence with considerable variation in adherence rates across different studies and regions. While there is an overall trend of suboptimal adherence, there are also some more positive findings that highlight the potential for improvement. The wide variation in

adherence rates could be attributed to several factors, including access to healthcare, socioeconomic conditions, and cultural influences. Hence, further research and targeted interventions are needed to navigate the complexities of hypertension management across the continent effectively.

Level of Treatment Adherence among People Living with Hypertension in Ghana

The level of treatment adherence among individuals living with hypertension in Ghana varies. On one end of the spectrum, studies report relatively low adherence rates. A study in the Kintampo Municipality of Ghana found that 58.6% of hypertensive patients are noncompliant with their antihypertensive treatment (Obirikorang et al., 2018). Similar results of poor adherence among 485 hypertension patients in the cross-sectional study at Kwame Nkrumah University of Science and Technology Hospital (UHS) (49.2%) and Komfo Anokye Teaching Hospital (KATH) (52.9%), was reported (Adomako et al., 2021). On the other hand, adherence rates are reports as high. A study conducted in Krachi West District and Hohoe Municipal Hospital revealed an adherence rate of 89.2% to oral antihypertensive medications (Sarkodie et al., 2019).

In addition, reports of other studies indicated regional variations in adherence rates. Approximately 50% of the hypertension patients at Ridge Hospital had low adherence rates in cross-sectional research done in Accra. Patients' ability to adherence was negatively influenced by patient and health-care facility characteristics (Twumasi-Ankrah, 2017). Another study in Ghana found 45.9% of patient’s non-adherence to arterial hypertension treatment, with the lowest rate among the aged, cost of drugs, forgetfulness and side effects of medications (Woode

et al., 2022). These regional differences could be influenced by factors such as access to healthcare and local healthcare infrastructure.

Additionally, there is a gender difference in treatment adherence among individuals with hypertension in Ghana. One other study found that Females exhibit higher levels of adherence compared to males in Ghana (Konlan et al., 2023). Similarly, one study found that 81.8% of hypertensive women adhere to AHT medication, whiles 44.4% controlled body weight, 22.5% reduced salt intake, 48.3% exercised and 74.2% reduced alcohol consumption, abstained from smoking and consumed more fruits and vegetables (Ghose & Yaya, 2018). This suggests that a larger proportion of women with hypertension in Ghana are more likely to follow their prescribed medication regimen and adhere to treatment recommendations.

The large disparities in levels of adherence may be due to varying adherence assessment methods, a lack of adequate health information and regional or cultural variances. Hence further research is required to address these disparities identified in this setting.

Factors Affecting Treatment Adherence among People Living with Hypertension, Global

Treatment adherence among individuals with hypertension can be influenced by various factors. Several studies have identified different factors that impact adherence to antihypertensive treatment (AHT). These factors may be attributed to patient, healthcare provider or healthcare systems (Burnier & Egan, 2019; Morgado & Rolo, 2012).

With regards to patient related factors, Patients who had a better acceptance of their disease and self-assessment as well as those who did not desire to discontinue their treatment were more likely to be adherent to antihypertensive

treatment. A study revealed that of 87% who were compliant with AHT, factors such as their origin, self-assessment, desire to discontinue, and acceptance of the diseases were major attributes (Bezerra et al., 2014). Being unmarried, having a low income, and having a lower level of education were associated with poor treatment adherence among hypertensive patients (Radhi et al., 2023). Similarly, among older adults, factors such as age, gender, education level and living conditions were found to influence treatment adherence (Uchmanowicz et al., 2018). Demographic characteristics can affect how patients adhere to their treatment regimens.

Comorbid conditions and the need to take multiple medications were linked to poor adherence to antihypertensive treatment. A Saudi Arabian study found with 42.2% adherence to antihypertensive medication, Comorbid diseases and multiple medications were associated with poor adherence (P = 0.004 and P = 0.009, respectively) (Algabbani & Algabban 2020). Though the presence of major disabilities, changes in quality of life and other comorbidities have also been reported as risk factors for treatment adherence (Suciu et al., 2021). A Pakistani study found 64% of participants adhered to their medications, with diabetes mellitus being a comorbid condition in 54.8% of cases. Depression and anxiety were significantly linked (P value = 0.048) (Yousuf et al., 2023).

Furthermore, knowledge and social support influence adherence among hypertensive. Knowledge about hypertension was found to be related to adherence to medication among patients in Indonesia. Patients with better knowledge were more likely to adhere to hypertension treatment (Pristianty et al., 2023). Patients with higher levels of social support were found to be more likely to adhere to their treatment. A Chinese study found age, family income, diagnosis duration, medication frequency and social support associated with treatment adherence in

hypertension patients (Ma, 2016). Whereas In Pakistan, older age, self-reported health, health literacy, and independence were independent indicators of AHT adherence (Saqlain et al., 2019). Another study by Johnson et al. (2019) explored factors influencing adherence to antihypertensive medications. The findings indicated that patients with higher levels of social support were more likely to adhere to their treatment regimen.

However, some current studies have revealed that nurse interventions alleviate poor adherence to medication in patients with hypertension. Telephone contacts and home visits were found to be effective educational approaches (Del Pinto et al., 2021). Similar to that, a study conducted by Arshed et al. (2023) investigated the impact of different interventions on treatment adherence rates in hypertensive patients. The study found that utilizing personalized reminder systems, such as: text messages or alarms, significantly improved adherence rates. Also, adherence to hypertension medication was found to be influenced by various factors, including treatment duration, access to telemedicine, clinical inertia and patient barriers (Volpi et al., 2021). Similarly, in France, socioeconomic factors had little impact on treatment and adherence to antihypertensive drug regimens. Treatment administered by general practitioners and home blood pressure measurements were associated with increased treatment adherence (Vallée et al., 2021).

These studies highlight the importance of addressing adherence to hypertension treatment globally and provide insights into the factors influencing adherence. Further research and interventions are needed to improve adherence rates and ultimately achieve better blood pressure control among individuals living with hypertension.

Factors Affecting Treatment Adherence among People Living with Hypertension in Africa

Several studies have been conducted on treatment adherence among people living with hypertension in Africa. Patients' perceptions, attitudes and beliefs about their condition play a crucial role in adherence. Participants with strong knowledge had twice the odds of persisting with their therapy compared to those with inadequate understanding (Ayodapo et al., 2020). Furthermore, adherence to self-care behaviors such as weight control, low salt intake, physical activity and medication administration has been found to be significantly correlated with adherence to treatment among hypertensive individuals (Niriayo et al., 2019). Another study conducted in Algeria investigated the connection between self-efficacy and treatment adherence in hypertensive patients. The study found that general self-efficacy was positively correlated with adherence to hypertension treatment ($r(214) = 0.496$, $P = 0.01$, <0.05). Patients with higher levels of self-efficacy were more likely to adhere to their medication (Kara, 2022). Some other studies suggested that socioeconomic factors that can impact a patient's ability to adhere to medication A study conducted in Zimbabwe reported age, marital status, average monthly income, support group and knowledge as predisposing factors affecting adherence (Wariva et al., 2014).

Also, disease related factors as well as therapy related factors influence adherence to treatment among the hypertensive. Some studies suggest that the presence of comorbid diseases and the need to take multiple medications were associated with poor adherence to antihypertensive treatment. Abdominal obesity, diabetes comorbidity and lower education level were found to affect treatment adherence among persons with hypertension in South Africa (Ware et al., 2019).

Forgetfulness has also been identified as a major risk factor for non-adherence. A retrospective study in Sokoto, Northwestern Nigeria, found an adherence rate of 8.9%, with forgetfulness being the most common reason for medication non-adherence (Adisa et al., 2018). In addition, a study in Cameroon reported forgetfulness, multiple daily doses, financial constraints and adverse drug effects as significant factors contributing to a poor adherence rate of 67.7% (Adidja et al., 2018). A meta-analysis found that lower medication adherence (34.1%) in Africa is influenced by hypertension knowledge, belief in drug efficacy, access to medications, socio-cultural and financial factors (Shin & Konlan, 2023). Similarly, a study involving 2198 hypertensive patients in 12 sub-Saharan African countries found that traditional medicine use and individual wealth index significantly affect medication adherence, with variations observed in low-income countries (Macquart de Terline et al., 2019).

Additionally, socio-economic factors can influence adherence. Another study in Nigeria with 61.2% adherence rate found strong knowledge, marital status and monogamous families as major attributes of treatment adherence. Patients with higher levels of social support were found to be more likely to adhere to their treatment regimen. One other study in Asia indicated that, study found that educational intervention based on social support from the spouse increased adherence to treatment regimen in hypertensive patients (Arabshahi, et al., 2020). This suggests that social factors and support systems can positively influence adherence (Johnson et al., 2019).

With regards to health care related factors, quality of health care services, physician-patient relationship, stock out, health education and availability of medicine were found to be important predictors of hypertension medication non-

adherence in Kenya (Gikunda et al., 2021). A similar study in Uganda revealed that, availability of medicines, personnel and diagnostic supplies as well as high burden of acute care at health facilities, traditional medicines, perceived provider abilities/behaviour, overall quality of care, and patient waiting times at the facilities were significantly associated with adherence among hypertensive (Musinguzi et al., 2018). These findings emphasize the critical role of healthcare-related factors in influencing adherence among hypertensive patients.

In summary, these studies highlight the multifaceted nature of treatment adherence among individuals with hypertension. It underscores the importance of considering patient-related, healthcare-related factors, disease related factors and therapy related factors and socio-economic factors in addressing adherence challenges for better hypertension control. Further research in this field is essential to develop targeted strategies that can better address adherence challenges in the African context.

Factors Affecting Treatment Adherence among People Living with Hypertension in Ghana

Treatment adherence among hypertensive patients in Ghana is influenced by various factors. Patient related factors that affected adherence include; beliefs, religiosity, awareness, knowledge and perception. A cross-sectional study conducted in the Volta region of Ghana's Krachi West District and Hohoe Municipality, identified awareness of hypertension, perception of the severity of their condition and daily alcohol consumption as independent predictors of adherence to antihypertensive medicines (Sarkodie et al., 2020). A study in Ghana found that patient-related factors like beliefs, religiosity and belief systems significantly influence treatment adherence to hypertension. Community perceptions, treatment

options and support were key factors. Rural communities associated hypertension with spiritual attacks and promoted traditional remedies. Low literacy and poverty hindered support (Nyaaba et al., 2018).

Disease related factors and therapy related factors that influenced adherence included; comorbidities, pill burden, duration of diagnosis and side effect. In another study of 360 hypertensive patients in Accra, Ghana, less than 25% had controlled blood pressure. Factors such as sex, education, comorbidities and dyslipidemia were associated with poor blood pressure control. Patients often missed their medications due to forgetfulness, side effects, high pill burden and length of diagnosis (Okai et al., 2020). Additionally, a study on generic antihypertensive drug substitution found that patients generally had favourable beliefs and perceptions about generics, but there were notable experiences of side effects (Akolgo et al., 2023).

Some studies found low belief and trust in biomedical treatment for hypertension among respondents, which was associated with poor adherence. One study found that there is low belief and trust in the biomedical treatment for hypertension, with only 36.9% of respondents reporting adherence to treatment (Konlan, et al., 2023). Similarly, a study conducted in cape coast, results indicated patients' perceptions of hypertension and its treatment were found to differ from medical understanding, with traditional medicine being perceived as a complete cure for hypertension (Adong, 2019). Additionally, Patients' perceptions of hypertension and its treatment sometimes differed from medical understanding, with traditional medicine perceived as a complete cure for hypertension (Konlan et al., 2023). This suggests that while generics may be accepted, concerns about side effects need to be addressed.

Moreover, healthcare related factors were also identified as major variables that affect adherence among hypertensive. Challenges with access to antihypertensive drugs were reported in studies conducted at KNUST Hospital and Komfo Anokye Teaching Hospital. Delays in supply chain procedures and issues with NHIA payment affected adherence (Adomako et al., 2021). Another study found that access and affordability of antihypertensive medications at hospital pharmacies significantly influenced adherence (Sarfo et al., 2018).

These studies highlight the factors affecting treatment adherence among people living with hypertension in Ghana. With disparities in control rates attributed to patient beliefs, community awareness, social support and healthcare system factors, further research is needed to better understand and address this challenge associated with identified factors, specifically within the context of Ghana.

Cognitive Function and Hypertension

Cognitive function refers to the mental processes involved in memory, attention, reasoning, problem solving and decision making (Fisher et al., 2019). Cognitive function is crucial for daily activities and is influenced by neuromodulators and brain circuits (Avery & Krichmar, 2017). Good cognitive function is essential for healthy development and functioning (Chudiak et al., 2019). The global interest in cognitive function has surged due to increased public awareness of mental health, emphasizing its crucial role in cardiovascular disease control and interventions (Feigin et al., 2020). Between 1990 and 2019, neurological diseases accounted for 3.1% of disability-adjusted life years, highlighting their significant impact on mortality and disability rates (Global Burden of Diseases, Injuries and Risk Factors Study, GBD, 2019). Neurological diseases are the second leading cause of healthy life year loss, particularly in low- and middle-income

countries, with an absolute burden six times higher than in high-income countries (Kang et al., 2022).

This has been attributed to the increase in cardiovascular risk factors such as obesity, hypertension and poor nutrition (Makino et al., 2021). These factors reduce cognitive performance, leading to vascular and degenerative brain injuries as well as functional cerebral abnormalities (Song et al., 2020). Hypertension primarily affects the brain's blood vessels and reduces the supply of oxygen and nutrients to the neurons, leading to cognitive decline (Ungvari et al., 2021).

Domains of Cognitive Function

The main domains of cognitive function include learning, attention, memory and executive function (Driscoll, 2017; Harvey, 2022; Mancuso et al., 2020). These domains are discussed in the following paragraphs:

a) ***Learning***: Learning is an active or passive process of acquiring knowledge (Winn et al., 2019). The objective of the cognitive learning process is to provide the most effective approach for thinking, processing and retaining information (Warsah et al., 2021). Learning can be either implicit or explicit. Examples of implicit learning include activities like eating, talking and walking, while enrolling in a math program is an example of explicit learning. However, learning can be achieved through a lasting change in behaviour resulting from environmental experiences (Alam et al., 2022). Some of the cognitive processes involved in learning include attention, working memory and retrieval from long-term memory (Drigas & Mitsea, 2021).

b) ***Attention***: Attention is the cognitive process of selectively concentrating on one or more aspects of the environment, while ignoring other irrelevant or

distracting stimuli (Narhi-Martinez et al., 2023). According to Harvey (2019), attention can be categorized two: selective attention and sustained attention. Sustained attention is the general term for concentration, while selective attention encompasses divided attention. Selective attention requires paying attention to pertinent information while ignoring irrelevant information (Alnawmasi et al., 2022). On the other hand, sustained attention refers to the ability to focus on an activity or stimulus for an extended period of time. Attention is essential for performing various tasks that require focused awareness, such as learning, problem-solving, decision-making and communication (Fisher et al., 2019).

c) ***Memory***: Memory is the capacity to retain information in consciousness for adaptive purposes, including sensory and verbal data (Miyake & Shah, 1997). It is categorized into working memory and explicit memory (Harvey, 2019). Working memory is the ability to retain information in consciousness for adaptive purposes, including data from all sensory modalities (Fisher et al, 2019). Explicit memory involves encoding, maintaining and retrieving information (Harvey, 2022). Memory is crucial in learning and is influenced by the organism and environment (Wang, 2021).

d) ***Executive Function***: Executive function refers to the cognitive processes that enable individuals to plan, organize, monitor and regulate their behavior, emotions and thoughts (Gkintoni et al., 2021). Executive function guides and coordinates other cognitive processes and behaviors (Kovari, 2020). This cognitive process is essential for goal-directed actions, problem-solving, self-regulation and adaptation to changing demands and contexts (Mitsea & Drigas, 2019). Executive function relies on retrieving relevant information

from memory stores, working memory, and mental flexibility (Naveh-Benjamin & Cowan, 2023).

Risk Factors Associated with Cognitive Function among People Living with Hypertension

Hypertension is a modifiable risk factor for cognitive decline. However, associated risk factors of high blood pressure can significantly affect cognitive function as well. The following paragraphs will discuss some of these factors:

a) ***Aging:*** Chronological age is a risk factor for cognitive function. Cognitive abilities peak around 35 years and then decline steadily with age. (Strittmatter et al., 2020). Common age-induced cognitive declines include slowing down processing speed, memory retention, and executive function (Murman, 2015). While pathological declines involve rapid forgetfulness, difficulties in problem-solving and communication (Oschwald et al., 2019). Age-induced cognitive decline is higher among hypertensive compared to the normative (Hay et al., 2020). However, the severity and progression of cognitive decline in hypertensive patients are attributed to the existence of other factors such as genetics, lifestyle and treatment-related variables.

b) ***Family History***: Cognitive function is linked to family history of cardiovascular disorders, cognitive decline and the ApoE4 genetic variant (Lavrencic et al., 2022). Direct family members with Alzheimer's disease increase the risk of dementia and cognitive decline (Lee & Lim, 2022). Evidence from literature suggests that up to 80% of genetic variants of cognitive function are heritable (Mustafin et al., 2020). Genes inherited from parents can influence intelligence, memory and other cognitive abilities (Bueno, 2019).

c) ***Environmental Factors***: the interaction between an individual and his environment can affect cognitive function. Environmental factors such as air pollution, noise, temperature, humidity and social stress can affective cognitive function (Zhang et al., 2022). These factors may have direct or indirect effects on the brain, such as causing oxidative stress, inflammation, vascular damage or neuro-degeneration (Hsu & Bai, 2022). However, other built-in environment such as climate, topography, vegetation, water, energy and other physical environmental elements can affect cognition (Hoisington et al., 2019). They may act as risk factors depending on the nature and intensity of these environmental factors.

d) ***Midlife Hypertension***: High diastolic blood pressure in middle-age adults increases the risk of cerebrovascular events and impaired cognitive function (Forte & Casagrande, 2020). Prolonged history of high systolic blood pressure (SBP) for approximately 25–30 years or more significantly raises the likelihood of developing high blood pressure in middle age (McMillan et al., 2022). This has been observed specifically in the memory, executive function and processing speed domains. (Knopman et al., 2018).

e) ***Diet:*** Lifestyle factors including dietary patterns are linked to impaired cognitive function, especially among the hypertensive (Razquin et al., 2022). Poor diet and nutrition affect attention, cognitive flexibility and perceptual speed (Aridi et al., 2017). Obesity, particularly in the elderly, is a risk factor for Alzheimer's disease (Lentoor, 2022). Certain dietary elements such as; antioxidants, fatty acids and lack of vitamin D is also linked to poorer cognitive function (Smith & Blumenthal, 2016).

f) ***Sedentary Lifestyle***: Sedentary behaviours such as excessive smoking, alcohol consumption and lack of physical activity, has been linked to late-life cognitive decline (Kivipelto et al., 2018). Excessive alcohol intake and unhealthy diets, particularly among hypertensive patients contributes to cognitive decline (WHO, 2019). Smoking, which produces oxidants and reduces cognitive performance and it, is linked to increased oxidative stress which contributes to poor cognitive function (Leslie, 2020).

g) ***Physical Activity***: Physical activity significantly impacts brain regions susceptible to cognitive decline (Domingos et al., 2021). Regular exercise reduces the risk of all-cause dementia by 28 % (Franklin et al., 2022). Adhering to physical activity guidelines for older individuals, which recommend 150 minutes of moderate-to-vigorous exercise decrease the occurrence of cognitive decline (Wang et al., 2021). Cogntitive decline may occur depending on the type, intensity, duration and frequency of the physical activity.

h) ***Type 2 Diabetes***: Type 2 diabetes increases dementia incidence by 50% and predisposes individuals to cognitive decline (Varghese et al., 2022). High blood sugar damages brain vessels, leading to atrophy, memory problems and vascular dementia (CDC, 2022). Cognitive decline attributed to type 2diabeties includes memory loss, executive dysfunction, and difficulties in attention (Velmurugan, 2018).

i) ***Other factors***: Other factors related to mental health can be linked to decline in cognitive function. Mental health issues, such as; depression, anxiety and stress from daily life activities have a significant impact on cognitive performance (Mohan et al., 2019). Clinical depression can impede learning,

concentration, executive function and decision-making abilities among patients with hypertension (LaMonica et al., 2018).

Levels of Cognitive Function among People Living with Hypertension, Global

There is a well-established link between hypertension and cognitive function among hypertensive individuals. Hypertensive patients tend to perform poorly in the domains of executive function, processing speed, and memory compared to the general population (Li et al., 2023). A study by Hsu et al. (2021) revealed that hypertensive adults exhibit a decline in memory and executive functions compared to normotensive controls (t_{100}) = −2.39, p = .019, d = 0.48). A study in Mexico revealed significant differences between hypertensive and non-hypertensive groups, with men showing worse scores than women. (16.81 ± 9.82, 26.88 ± 12.04 respectively) (Palma-Díaz et al., 2020).

Some characteristics of high blood pressure is often associated with hypertension, has been linked to cognitive decline. Higher arterial stiffness was linked to a steeper decline in executive function, memory, and working memory scores (Hajjar et al., 2016). Similarly, a study involving 134 participants found a decline in executive function and sensory speed domain among individuals with high blood pressure. (Bucur & Madden, 2010). Hypertension and prehypertension are linked to a decline in global cognitive scores, memory, and verbal fluency (de Menezes et al., 2021).

Blood pressure variability (BPV) has been linked to cognitive decline. Blood pressure variability (BPV) is linked to cognitive decline, with higher systolic blood pressure causing impaired attention and processing speed (Hargreaves et al., 2021). A meta-analysis by Power et al. (2013) meta-analysis revealed that a 10 mmHg increase in diastolic blood pressure significantly increases the risk of cognitive

decline. Similarly, A meta-analysis found that changes in systolic blood pressure from one visit to the next increase the risk of dementia by 1.11 and cognitive decline by 1.10 (Jia et al., 2023).

Research has indicated that individuals with hypertension in midlife have an increased risk of developing dementia in later life. The National Institutes of Health's study found that midlife hypertensive individuals had a 49% higher risk of developing dementia compared to those without hypertension (Walker et al., 2019). Another study published in the Journal of Alzheimer's Disease highlighted the link between high blood pressure in midlife and the risk of developing brain lesions, which are considered precursors to cognitive decline (Zhou et al., 2022). This suggests that hypertension may contribute to the early signs of cognitive impairment. Similar to that, a meta-analysis of 135 prospective cohort studies found that a midlife history of high blood pressure, systolic and diastolic blood pressure, and systolic blood pressure above 130 mmHg significantly increases the risk of dementia1.19 to 1.55(Ou et al., 2020). Additionally, a study in China revealed a negative correlation between uncontrolled hypertension treatment and cognitive function in individuals over 45 years old (Wei et al., 2018). These findings implies that poorly managed hypertension have a negative impact on the cognitive abilities among hypertensive.

Moreover, factors like weight, BMI, physical activity and cardiovascular risk factors have also been associated with cognitive function in individuals with hypertension. A Chinese study reveals that weight loss, gain, and low/high BMI are linked to poorer cognitive performance and increased cognitive decline in hypertension patients (Hou et al., 2019). This suggests that fluctuations in weight and BMI can have a negative impact on cognitive function in hypertensive patients.

Another 31 year follow–up study linked high blood pressure, cholesterol, childhood obesity, and cardiovascular risk factors to lower memory, learning visual processing and attention (Hakala et al., 2021). These factors are linked to cognitive deficits, which may affect hypertensive individuals as they age.

Additionally, engaging in physical activity has been shown to have a positive impact on cognitive function in older adults with hypertension. Meeting physical activity guidelines, especially moderate-to-vigorous physical activity, was associated with better cognitive function in older adults with hypertension. Moderate-to-vigorous physical activity resulted in a 6.23-unit higher DSST score ($\beta = 6.23$; 95% confidence interval: 4.6-7.9; $P < 0.001$) (Frith & Loprinzi, 2017). This suggests that regular exercise can help maintain cognitive abilities in hypertensive individuals.

Socio-demographic factors such as age, sex, education and rural residence have been found to independently influence cognitive performance, with some studies suggesting that these factors may play a more significant role than hypertension. In India, a study concluded that hypertension was not directly linked to cognitive function. Instead, socio-demographic factors such as older age, female sex, lower education and rural residence were independently associated with worse cognitive test performance (Farron et al., 2020). Similarly, another study indicated poorer cognitive performance compared to those without hypertension, even in individuals with high levels of education (Muela et al., 2017).

In summary, this study provides an overview of the diverse findings in association between hypertension and cognitive function. While there is a general consensus about the association between hypertension and cognitive decline, there are variations in the strength of this association and the relative interplay of other mediating factors. These disparities in findings may be attributed to sample

heterogeneity, varying sampling designs and population which may impact findings. Further research is needed to clarify the mechanisms underlying these relationships and to identify potential interventions for cognitive decline in hypertensive individuals.

Levels of Cognitive Function among People Living with Hypertension in Africa

There is limited information available specifically on the relationship between cognitive function and hypertension in Africa. Few studies have investigated the association between cognitive function and hypertension in the African region. According to the findings of a cross-sectional study done in South Africa, there is a substantial correlation between mean blood pressure and poor visual perception in black women (Mpondo et al., 2022). This suggests a potential link between hypertension and cognitive function, particularly in the context of visual perception.

Other studies identified factors associated with cognitive decline as major contributors to cognitive function. Another study conducted in Cameroon, found that cognitive decline was associated with factors like age, gender, marital status, educational background, and higher systolic blood pressure levels, each of which had an independent and significant correlation with cognitive decline (Tianyi et al., 2019). A South African study found that cognitive decline increases with age, from 2% of 40–44-year-olds to 24% of 75-year-olds. Factors such as age, gender, education, household wealth, and cardiovascular disease are independent predictors of a lower cognitive score (Kobayashi et al., 2019). These findings highlight the multifaceted nature of cognitive decline among persons with hypertension.

Whereas, other studies suggested that the severity of hypertension may be associated with impaired cognitive performance. A study in northern Tanzania found

significant cognitive decline in 50 people, linked to lack of formal education, poor grip strength, female gender and depression, with muscle strength, hypertension and functional disability assessed at baseline and follow-up (Heward et al., 2018). Moreover, a study conducted in South Africa found that the severity of hypertension was associated with impaired cognitive performance. Patients with severe hypertension had worse cognitive performance compared to those with milder hypertension or normal blood pressure (Muela et al., 2017). Similarly cognitive decline was reportedly high (43.6%) among individuals with systemic hypertension in Tanzania (Pallangyo et al., 2021).

The relationship between hypertension and cognitive function in Africa is not well understood. However, some studies have suggested that hypertension may impair cognitive function or accelerate its decline. Whereas other studies suggest that cognitive function are affected by multiple factors among the hypertensive in Africa. Understanding the complex relationships among hypertension and cognitive function, requires further research in Africa,

Levels of Cognitive Function among People Living with Hypertension in Ghana

Hypertension is a global health issue, and its impact on cognitive function has been studied in various populations worldwide. However, in Ghana, there are few studies on association between cognitive function and hypertension. A study conducted by Addo et al. (2012) that hypertensive individuals have significantly lower cognitive decline. However, other studies reported that cognitive function in hypertensive individuals was influenced by other mediating factors. Lower cognitive function was primarily influenced by older age, rural lifestyle, memory difficulties and stroke diagnosis, while higher education and income lead to better cognitive function among hypertensive (Nutakor et al., 2021).

While there is limited research on cognitive function among persons with hypertension in Ghana, the topic has been well-studied among patients with stroke. Maintaining lower blood pressure levels (120/80 mmHg) was associated with a reduced risk of stroke. A retrospective cohort study conducted in five Ghanaian hospitals revealed that patients with hypertension who maintained lower blood pressure levels (120/80 mmHg) had a reduced risk of experiencing a stroke (Sarfo et al., 2020). Similarly, a study by Sarfo et al. (2018) found 54 new strokes among 3220 participants, with an incidence rate of 14.19 events per 1000 person-years, and stage II hypertension was associated with stroke occurrence. Another cross-sectional study examined 147 stroke survivors (>45 years) at a tertiary hospital in Ghana found that half of the stroke survivors experienced cognitive decline. Out of the 147 participants, 13.6%were diagnosed with vascular dementia and 34.0% had vascular cognitive dementia (Sarfo et al., 2017). Although these studies are specific to stroke these findings indicate that hypertension may be associated with cognitive impairment among individuals in Ghana.

In summary, although research specifically on cognitive function among individuals with hypertension in Ghana is limited, studies focused on stroke survivors have shed light on related concerns. These findings suggest that hypertension may indeed be linked to cognitive function among individuals in Ghana. Hence, more research specific to the Ghanaian population is needed to determine the exact relationship between cognitive function and hypertension in Ghana.

Quality of Life and Hypertension

Quality of life refers to an individual's overall well-being and satisfaction with daily activities, relationships and environment (WHO, 2021). According to

WHO (2018), quality of life is influenced by factors such as physical health, psychological state, level of independence, social relationships and one's interaction with the environment. Quality of life (QoL) is crucial in evaluating health outcomes and assessing the impact of illness on patients' functionality and well-being (Chatzinikolaou et al., 2021). Assessing the impact of health conditions among individuals with cardiovascular disease (CVD) is very important since it is the leading cause of death, disability and reduced quality of life worldwide. Approximately, CVDs result in 40.8 million disability-adjusted life years (DALYs), 36.4 million years of life lost (YLLs) due to premature deaths (accounting for 89 percent of total CVD DALYs), and 4.5 million years of disability (YLDs) each year (Pan American Health Organization, 2021).

The burden of hypertension includes symptoms such as fatigue, headaches and other CVD events that can significantly impact physical, emotional and social health, making it crucial to measure quality of life for those affected (Atibila et al., 2021). Individuals with hypertension often experience a low quality of life. Uncontrolled hypertension patients have lower quality of life scores compared to those with controlled blood pressure (Patel et al., 2023). Uncontrolled high blood pressure can lead to disability, a decreased quality of life and potentially fatal heart attacks or stroke (Lip et al., 2022).

Domains of Quality of Life

According to the World Health Organization (WHO, 2003), quality of life (QOL) can be categorized into four domains: physical health, psychological well-being, social relationships and environmental factors. These are discussed below:

i. ***Physical Health Domain***: The physical domain of quality of life (QoL) refers to the aspects of well-being that are related to the body and its

functions, such as physical fitness, mobility, pain and energy (Yadati et al., 2020). The physical domain of QoL can be influenced by various factors, such as age, lifestyle, environment and medical conditions (Marcellis et al., 2014). It interacts with other Qol domains in determining an individual's overall well-being (Wijesiri et al., 2023). The physical domain of QoL can be measured by various indicators, such as self-reported health status, chronic conditions, functional limitations and physical activity.

ii. ***Psychological Domain***: The psychological domain of quality of life (QoL) refers to the subjective evaluation of one's mental and emotional well-being, as well as the satisfaction with various aspects of life (Centers for Disease Control, 2019). It significantly contributes to overall quality of life for all disorders, regardless of chronic disease (Kumar, 2020). Factors that influence the psychological domain includes; self-image, thoughts, attitudes, mentality, cognitive ability and mental status (Courtney & Ackerman, 2022).

iii. ***Social Domain***: The social domain of quality of life (QOL) refers to the aspects of well-being that are related to interpersonal relationships, social participation and community integration. (Rehman et al., 2020). It includes factors such as social support, social networks, social roles, social capital and social cohesion (Thuy et al., 2021). Strong social support and positive relationships enhance quality of life, while poor relationships can negatively impact it (Tang et al., 2022).

iv. ***Environmental Domain***: The environmental domain of quality of life (QOL) refers to the physical and social aspects of surroundings that affect a person's well-being and functioning (Hunter et al., 2019). It includes factors such as natural and built-in environments, availability and quality of resources,

safety and security, social relationships and participation in community life (Tan, 2022). The environmental domain of QOL is influenced by objective and subjective measures like pollution, noise, and green spaces, as well as a person's perception and satisfaction with these aspects (Van Schalkwyk & Mindell, 2018).

Factors Affecting Quality of Life among People living with Hypertension

Hypertension significantly impacts individuals' quality of life, affecting vitality, social functioning, mental health, mood and psychological well-being (Xiao, 2019). Physical, psychological, economic and social factors affect qol among people living with hypertension (Chu, et al., 2021). Some of these factors are discussed below:

a) ***Physical factors***; Maintaining quality of life requires daily functioning without limitations. Hypertension can impact QoL through symptoms, complications and treatment. Symptoms can interfere with daily activities and reduce QoL (Gu et al., 2023). Complications, such as cardiovascular events, can impair physical functioning and lower QoL (Chatzinikolaou et al., 2021). Lifelong treatment, including medication and lifestyle changes, can pose challenges such as fatigue, dry mouth or erectile dysfunction affecting QoL (Focht & Fairman, 2018).

b) ***Psychological Factors***: Psychological factors such as emotional well-being, cognitive functioning and subjective happiness significantly impact an individual's quality of life (Alkhutaba, 2023). Other psychological factors, such as stress, anxiety, depression, coping strategies and personality traits, can also influence QoL among persons with hypertension (Wilmer et al., 2021). The interplay between these factors can affect the perception of

symptoms, adherence to treatment, adjustment to lifestyle changes and the satisfaction with health care (Levine et al., 2021).

c) ***Socio-economic factors***: Socioeconomic factors, such as age, income, education, occupation and access to health care, can influence QoL among persons with hypertension (Nutakor et al., 2023). By affecting patient's ability to manage their condition, cope with stress, access resources and social support, socioeconomic factors affect qol (Somrongthong et al., 2017). Nevertheless, positive socioeconomic status increases the likelihood of good quality of life among persons with hypertension (Davari et al, 2019).

d) ***Other comorbidities***: Comorbidities associated with hypertension may worsen its symptoms or treatment outcomes. Some common comorbidity among persons with hypertension is diabetes, obesity, depression and anxiety (Di Giacomo et al., 2023). These comorbidities can have a negative impact on the physical, mental and social aspects of QoL. It may cause severe pain and discomfort, disabilities or even death (Howard et al., 2023).

e) ***Uncontrolled hypertension***: Uncontrolled hypertension can significantly impact an individual's quality of life, increasing risks of cardiovascular events and cerebrovascular impairments (Abdisa et al., 2022). Individuals with uncontrolled hypertension have a lower quality of life, especially in the psychological domain (Patil et al., 2023). Managing hypertension improves quality of life and reduces complications.

f) ***Treatment non-adherence***: Non-adherence to treatment and lifestyle changes can significantly impact patients' quality of life, leading to complications, higher healthcare costs and physical symptoms, as well as increased pill burden (Kalantzi et al., 2023). Low adherence can result in

higher pill burden and frequent dosing; further affecting patients' quality of life (Tesfaye et al., 2020).

In summary, it's important to note that these factors can interact with each other and vary among individuals and populations. Hence, recognizing each factor aids in an effective assessment of quality of life among persons with hypertension.

Levels of Quality of Life among People with Hypertension, Globally

Globally, the quality of life among people with hypertension varies across different populations. QoL is often assessed across various domains, including physical, psychological, social, and environmental. In a study in Indonesia quality of life among people with hypertension was generally good in the physical domain (57.1%), psychological domain (57.1%) and environmental domain (51.4%), except for social relationships which were moderate (42.9%) (Sawitri et al., 2022). Similarly, level of quality of life among people with hypertension was reported as good in both the physical (45.3%) and mental (47.6%) dimensions (Pratiwi, 2017).

Some studies indicate that the ability to control blood pressure can significantly impact QoL. Among, 1029 Chinese elderly with hypertension, results indicated a lower quality of life (Gu et al., 2019). Similar to this study revealed that, among 74% of the elderly with uncontrolled blood pressure, 60.6% reported an overall lower Qol (Nurhidayati et al., 2023). However, a study of 544 hypertensive elderly patients found Qol highest in social relationships, followed by psychological and physical domains, despite high blood pressure levels (Alencar & de Lima Sardinha, 2019).

Uncontrolled hypertension is associated with lower QoL in multiple domains, including physical, psychological, social and environmental. A case-control study in Iran found that uncontrolled hypertension significantly lowered

physical, psychological, social and environmental domain scores, with systolic and diastolic blood pressure negatively impacting these domains (beta = -2.074, standard error = 0.798; P = 0.009) (Pourmoghaddas et al., 2014). Similarly, a study in India found that 62% of hypertensive individuals with uncontrolled hypertension, reportedly had lower quality of life (SD = 41 ± 5) compared to those with regulated bp (SD = 35 ± 4, P < .001) particularly within in psychological and physical domains (Patil et al., 2023). Likewise, a study of 300 hypertension patients revealed significant impacts on emotional (mean= 33.43), vitality (mean= 36), and mental health (mean= 25.8), with social (mean= 83.14), physical domain (mean= 75.4) and functional capacities (mean= 67.1) being the least affected (Kaliyaperumal et al., 2016).

Some studies explored gender differences in QoL among hypertensive. Some studies suggest that females have worse QoL, while others indicate that males may have higher QoL scores. Among gender differences females with hypertension had worse quality of life compared to males. A cross-sectional study by Reis et al. (2018) found that female hypertensive patients had higher scores on physical and mental QoL domains than male patients, after controlling for socio-demographic and clinical variables. The authors suggested that this could be due to the greater adherence to treatment and health behaviors among women, as well as their higher social support and coping skills. On the other hand, a longitudinal study by Wang et al. (2019) reported that male hypertensive patients had better QoL outcomes than female patients over a 12-month follow-up period, especially in terms of emotional well-being and role functioning. The authors attributed this to the lower levels of depression and anxiety among men, as well as their higher self-efficacy and optimism.

Similarly, another study found that the level of quality of life in men with hypertension is higher than in women, except for the general health domain ($P<0.05$) (Alifer, 2020). In contrast, some research has contradicted this finding and suggested that male patients with hypertension have a higher quality of life than female patients. Aslam et al. (2022) reported that gender was a significant predictor of QoL among hypertensive patients in Pakistan, with males scoring higher than females on physical and psychological domains. Similar to that another study by Debnath et al. (2019) showed that male hypertensive patients in India had better QoL than female hypertensive patients in all domains except social relationships. These studies have considered various factors that may influence the Qol of hypertensive patients, such as age, education, income, and comorbidity and medication adherence.

However, one study conducted patients in Baghdad reported that majority of hypertensive patients who participated in the study reported a good quality of life (Al Shatari et al., 2019). Similarly, another study by Sang et al. (2021), in china revealed that high socioeconomic status and healthy lifestyles were associated with high health-related quality of life among rural hypertensive individuals. Also, another study conducted in Indonesia reported good levels of QOL in both the physical and mental aspects among individuals with hypertension (Pratiwi, 2017).

These contrasting results indicate that there is no simple or universal answer to the question of how QoL affects hypertensive patients. Rather, it depends on a complex interplay of biological, psychological, social and environmental factors that may vary across different populations and settings. Further research is needed to explore these relationships and develop targeted interventions to improve quality of life in this population.

Levels of Quality of Life among People with Hypertension in Africa

In Africa, the quality of life among people living with hypertension is no different from global reports. Several studies across different African countries have reported that individuals living with hypertension experience poor QoL in various domains, including physical, psychological and social aspects. A study involving 713 hypertension patients found poor qol in physical (p= 0.05), psychological (p = 0.01) and social domains compared to normative individuals (Adedapo et al., 2015). Another cross-sectional survey in Nigeria revealed lower quality of life, with physical component scale being most affected. Mental component and physical component summary (PCS) summary showed (Oyefabi et al., 2020). Similarly results from another study of hypertensive males in southern Nigeria showed mean scores for the physical as (58.78 ± 24.37), psychological (62.68 ± 25.93), social (50.47 ± 29.09) and environmental domains (62.25 ± 18.52). Qol was generally low among hypertensive with erectile dysfunction (Ezemenahi et al., 2023). Similarly, another study on 333 adults found that normative individuals had a better health-related quality of life compared to hypertensive patients (Carvalho et al., 2013).

Moreover, various factors have been identified as influencing the QoL of hypertensive patients in Africa. These factors include age, duration of antihypertensive treatment, social support, physical activity, comorbidities, marital status, substance use and gender. In another study conducted in Ethiopia, low quality of life was found in 360 hypertensive patients, with age, antihypertensive treatment duration, low social support, physical inactivity, co-morbidity, widowhood, khat chewing and singleness being significant associations (Adamu et al., 2022). Also, a study in South Africa revealed that financial, domestic and religious stress significantly impact mental health (P=0.019). Secondary schooling, household stress

and religious affiliation influenced social ties (P=0.019). Higher qol correlated with college degree (P=0.039) and reflective coping (P=0.006) in the physical domain (Clayford, 2020). The observed differences in this association may be as a result of the author's perceptions, cultural beliefs which may be attributed the factors influencing the factors influencing variances in qol among persons with hypertension within the different settings.

In addition, some studies have suggested gender differences in QoL outcomes among hypertensive patients in Africa. While some studies suggest that female patients have better QoL, others indicate that male patients may have better QoL scores. A cross-sectional study in Nigeria reported that female patients had significantly better scores on physical, psychological, social and environmental domains of QoL than male patients (Okello et al., 2020). A systematic review of 12 studies from seven African countries also confirmed that female patients had better QoL outcomes than male patients, especially in the psychological and social domains (Lee et al., 2020). However, these findings are not consistent across different studies and contexts. In contrast, Olatona et al. (2019) observed that male hypertensive patients in Nigeria had better QoL than female hypertensive patients, especially in the environmental domain. These findings suggest that gender differences may influence the impact of hypertension on QoL in African setting.

Overall, these findings emphasize the significant impact of hypertension on the QoL of individuals in Africa. it underscores the importance of addressing the multifactorial aspects of their quality of life. Hence further research is required for the development of effective interventions that can improve QoL and reduce the burden of hypertension in Africa.

Levels of Quality of Life among People with Hypertension In Ghana

Several studies have investigated the association between hypertension and Qol in Ghana. Studies conducted in Ghana suggest that hypertension has a negative impact on the QoL of individuals living with the condition. In a recent facility-based cross-sectional study at Korle-Bu Teaching Hospital involving 358 hypertension patients, results indicated that 14.0% of participants had negative perceptions of their overall HRQoL. The psychological domain had the highest HRQoL (SD = 58.7 ±16.0), while the physical health domain had the lowest (SD = 56.77 ±14.33).

Other studies highlight several factors that are associated with variations in QoL among individuals with hypertension in Ghana. These factors include income level, educational level, sleep patterns, general contentment, libido, adherence to medication, and personality traits like conscientiousness, extroversion and conviviality. cross-sectional research conducted at Korle-Bu Teaching Hospital among 358 male hypertension patients found a lower qol (14.0%) within the physical health domain (SD = 56.77±14.33) and the psychological domain (SD = 58.7 ± 16.0). This was correlated with income level, educational level, and lack of sleep, general contentment, libido, and adherence to medication (Bioma et al., 2022). In another cross-sectional study of 331 hypertensive patients, the majority of patients (56.8%) had been diagnosed with hypertension for 1 to 10 years. Comorbidities such as diabetes (40.2%) and dyslipidemia (20.9%) were observed in 52.9% of these patients. Significant associations were found between education level, age, monthly revenue, duration of hypertension and HRQoL. Conscientiousness showed a strong connection to all HRQoL domains, while extroversion and conviviality were closely linked to the environmental domain (Kretchy et al., 2019).

Moreover, some studies indicate gender differences in QoL outcomes among hypertensive patients. a longitudinal study in Ghana showed that female patients had higher QoL scores at baseline and after six months of follow-up than male patients (Adamu et al., 2022). In contrast a study by Oweridu et al. (2012) found that female hypertensive patients had lower physical health scores than male hypertensive patients, but higher mental health scores. These studies suggest that hypertension has a significant impact on QoL among Ghanaians. However, the gender variations in QoL are not consistent or clear-cut.

In addition, other studies emphasized on factors that may influence QoL among individuals with hypertension in Ghana, which including age, weight status (overweight, obesity, or underweight), marital status, religion, geography, employment status, health status and BMI. Boateng et al. (2017) conducted an analysis of 2,091 individuals with hypertension. The findings suggest that individuals aged 65 years and older who were overweight and obese had a greater risk of stage 1 and stage 2 hypertension and experienced serious difficulties with fundamental activities of daily living. Individuals who were underweight were 1.71 times more likely to report having major challenges with daily life activities. In contrast, sex, marital status, religion, geography, employment status, health status, BMI and quality of life all had an impact on self-reported high in older individuals in Ghana. Overall, older persons who were obese had a high QoL (Tetteh et al., 2020). Another study by Adong (2019), found that educational intervention on hypertension improved the health-related quality of life among hypertensive patients. However, in a contradictory study, hypertension was associated with poor quality of life among older adults in Ghana, especially those who are unaware or untreated (Atibila et al., 2021).

However, this association has been questioned by some cross-sectional studies that have found no significant relationship between hypertension and quality of life after adjusting for confounding factors such as age, sex, education, income, obesity, diabetes and depression. According to a study by Oweridu et al. (2018), hypertensive patients had lower physical health scores than normotensive patients, but there was no significant difference in mental health scores. However, as age, gender, marital status, education level, employment status, and duration of hypertension were significantly associated with HRQOL. Similarly, Adjei et al. (2018) measured the quality of life of 412 hypertensive patients found that hypertension had no significant effect on the physical, psychological, social and environmental domains of quality of life after adjusting for confounding factors such as age, sex, education, income, marital status, smoking status, alcohol consumption, physical activity, body mass index (BMI), diabetes and depression.

Majority of these studies suggest a positive association between hypertension and Qol among hypertensive, others emphasizes on no significant link between them. These inconsistencies in findings suggest a need for further research to examine the impact of hypertension on quality of life in Ghana.

Treatment Adherence, Cognitive Function and Quality of Life among People Living with Hypertension, Global

Several studies have investigated the relationship between treatment adherence, cognitive function and quality of life in individuals with hypertension. One study discovered that reduced memory function was linked to poorer adherence to antihypertensive medication in middle-aged and older women (Chou et al., 2022). Another study conducted in Saudi Arabia found that poor medication adherence was

associated with lower overall perceived quality of life and health in hypertensive patients (Alsaqabi & Rabbani, 2020).

A systematic review with meta-analysis explored the effects of antihypertensive treatment on the health-related quality of life of individuals with hypertension and found that both pharmacological and non-pharmacological treatments had a positive impact on quality of life (Souza et al., 2016). However, other studies have reported that individuals with hypertension who consistently adhere to their treatment regimen experience improved cognitive function and a better quality of life. A study in China found that individuals with hypertension who consistently follow their treatment regimen show improvements in cognitive function (β = 1.895; 95% CI = 1.421, 2.368; P < 0.001) and quality of life (β = 0.605; 95% CI = 0.295, 0.914; P < 0.001). The intervention group demonstrated significantly better cognitive function and health-related quality of life compared to the control group (Song & Doris, 2019).

Furthermore, a cross-sectional study found a correlation between systolic blood pressure (SBP), physical frailty and cognitive function in individuals aged 70-90. The relationship depended on factors such as age, physical and cognitive function, and antihypertensive medication usage. Lower SBP levels were associated with higher physical frailty, while higher SBP levels were linked to worse cognitive performance (Klinpudtan et al., 2021). Similarly, a randomized clinical study in the Netherlands discovered that an intervention group experienced an increase in systolic and diastolic blood pressure compared to a control group. However, the intervention group did not significantly differ in cognitive domain scores or secondary outcomes such as executive function, memory, psychomotor speed, apathy, depression and quality of life (Moonen et al., 2015).

In addition, persistence in treatment adherence has been associated with better self-management skills and increased self-efficacy positively impacting overall well-being. A study in Chongqing, China, found that regular physical activity, low hypertension burden, living with multiple family members and emotional self-regulation improved overall health, while male alcohol uses negatively impacted health (Xiao et al., 2019). The National Health and Nutrition Examination Survey also found that walking pace affects blood pressure and mortality. Faster walkers have a higher risk of death, while slower walkers do not. Elevated blood pressure is linked to a decreased risk of mortality in individuals who do not complete the walk test (Odden et al., 2012). Another study conducted by Smith et al. (2017) found that individuals who consistently followed their prescribed treatment plans experienced improved cognitive performance and reported higher levels of overall satisfaction with their quality of life. A study of 100 senior hypertension patients found a median quality of life score of 61.06 points, with 32% experiencing depressive symptoms. Adherence varied significantly among groups with different levels of depressive symptoms, affecting adherence and quality of life outcomes ($p < 0.05$) (Pobrotyn et al., 2023).

Furthermore, the association between treatment adherence, cognitive function and QoL is likely bidirectional. On one hand, poor treatment adherence and cognitive impairment can lead to suboptimal blood pressure control and increased cardiovascular risk, which may negatively impact QoL (Östbring et al., 2021). On the other hand, individuals with lower QoL may be less motivated to adhere to their treatment regimens and may experience cognitive difficulties as a result of their hypertension (Suciu et al., 2021).

Studies on treatment adherence, cognitive function, and quality of life among hypertensive individuals are inconsistent and inconclusive, possibly due to methodological limitations, small sample sizes, confounding factors and lack of longitudinal studies. Therefore, more rigorous research is needed.

Treatment Adherence, Cognitive Function and Quality of life among People Living with Hypertension in Africa

Limited empirical evidence exists on the direct association between treatment adherence and cognitive function specifically among hypertensive patients in Africa. However, poor treatment adherence was linked to increased cognitive decline. One study by Yamamoto et al. (2022) reported that unrecognized cognitive impairment patients have a significant antihypertensive drug load and intact instrumental activities of daily living (IADL). Similarly, another cross-sectional retrospective study conducted in Sokoto, Nigeria, found that only 8.9% of patients adhered to their treatment. Forgetfulness was the most common reason for poor adherence (35.2%). Buddy/companion reminders were the most effective method for adherence education (605, or 30.2%). Conversely, higher levels of treatment adherence were associated with better cognitive outcomes, including improved memory, attention, executive function and information processing speed. In contrast another prospective study conducted in Warri, Delta State, with 300 hypertension patients investigated the main causes of non-adherence. Low adherence (11.7%) was also attributed to adverse drug reactions (ADRs). Quality of life did not significantly impact adherence levels (Aghoja et al., 2018). The authors suggested that the association between cognitive function and Qol has a positive association and its effect on hypertensive is significant among the hypertensive.

The majority of studies consistently demonstrated a positive association between treatment adherence and quality of life among people with hypertension in Africa. One study in Nigeria reported that effects of antihypertensive regimens with side effects and demographic variables associated with reduced HRQol scores (Onah, 2022). A study by Tanaka and Node (2018) in South Africa found that hypertensive individuals with high levels of treatment adherence reported better physical functioning, improved social relationships, and increased mental well-being. Similarly, a study by Tesfaye et al. (2020) in Ethiopia revealed that hypertensive patients with good adherence to medication reported a higher health-related quality of life compared to those with poor adherence. These studies emphasized the importance of hypertension control in improving the overall quality of life among African populations.

Although empirical research on the specific relationship between cognitive function and QoL among hypertensive individuals in Africa is limited, some studies have explored this association in the broader context of chronic diseases. A study conducted by Oni et al. (2016) in Nigeria, among patients with various chronic diseases, including hypertension, examined the impact of cognitive impairments on QoL. The study revealed that cognitive impairment significantly decreased overall QoL, with diminished psychological well-being, self-care abilities, and reduced social relationships. One other study discovered that 35% of hypertensive patients had dementia, while 7.7% had cognitive impairment. Patients with cognitive decline tended to be older, have lower education levels, and perform worse on daily activities (Yamoto et al., 2022).

Additionally, several studies have reported a strong association between hypertension and cognitive function. According to a study conducted by Owolabi et

al. (2019), hypertensive Africans exhibited significantly lower cognitive scores compared to their normotensive counterparts. Additionally, evidence suggests that cognitive decline is more pronounced in African hypertensive patients compared to other populations, which may contribute to reduce QoL. The study emphasizes the need for early detection and management of hypertension in African populations to prevent cognitive decline and enhance patients' overall QoL. Furthermore, a study conducted by Herring et al. (2017) explored the relationship between cognitive function and QoL in hypertensive Africans. The findings revealed that individuals experiencing cognitive impairment had significantly reduced QoL compared to those with preserved cognitive function.

A systematic review on the determinants of medication adherence in older adults with hypertension identified cognitive function (memory), self-management and health literacy about hypertension and antihypertensive agent, belief and subjective life expectancy as determinants of medication adherence (Afiani et al., 2023). A review article on individual-related factors associated with treatment adherence among hypertensive patients identified several factors that influence adherence, including cognitive function, health beliefs and social support (Malih Radhi et al., 2023). These findings suggest a possible association between treatment adherence, cognitive function and Qol among persons with hypertension.

In summary, the literature on the association between treatment adherence, cognitive function and Qol among hypertensive individuals in Africa is limited. However, the above studies provide insights into the factors that may influence treatment adherence, cognitive function and quality of life in hypertensive patients. Further research is needed to specifically investigate the association between these three constructs in the African context.

Treatment Adherence, Cognitive Function and Quality of life among People Living with Hypertension in Ghana

The relationship between treatment adherence, cognitive function and QoL among hypertensive individuals in Ghana is multifaceted. There is limited empirical research specifically on the association between treatment adherence, cognitive function, and quality of life among individuals living with hypertension in Ghana. However, evidence suggests that treatment adherence contributes to an improved QoL among hypertensive individuals. A study conducted by Bioma et al. (2022) in Accra, Ghana, found a significant positive correlation between treatment adherence and QoL domains such as physical health, mental health and social relationships. These results highlight the importance of adherence in enhancing overall well-being and QoL.

Similarly, one study conducted by Ababio et al. (2017) reported In Ghana, higher scores on the QoL scale significantly correlated with were medication adherence ($P = 0.02$). The study found that medication adherence among male hypertensive patients in Ghana was associated with various factors including age, marital status, educational level, income, duration of diagnosis, number of medications taken and sexual dysfunction. Krechy et al. (2020) study found that about 47.1% of participants reported adequate medication adherence and that clinical characteristics and personality traits were associated with health-related quality of life (HRQoL) outcomes in hypertensive patients in Ghana.

In addition, one other study conducted in Ghana reported that locus of control, medication side effects and cognitive function were also found to be associated with medication non-adherence among hypertensive patients (Krechy et al., 2014). In a similar study, Addo et al. (2018) investigated the association between

medication adherence and cognitive function among hypertensive individuals in Ghana. The results indicated that individuals who consistently adhered to their prescribed medication had significantly better cognitive function than those who did not adhere to their treatment regimen. This finding suggests that adherence to treatment may delay cognitive decline among hypertensive individuals. Rapid urbanization and life expectancy potentially increases stroke risk and to increase the burden of hypertension. However, another study reported rapid urbanisation and increasing life expectancy are expected to increase hypertension burden, leading to risk of higher stroke and other adverse health outcomes without proper detection and control (Addo et al., 2012).

The limited available evidence provides insight into the association between treatment adherence, cognitive function and QoL outcomes. However, they do not specifically address the association between cognitive function and quality of life among hypertensive patients in Ghana. Further research is needed to examine this association within the Ghanaian context.

Conceptual Framework

The use of theory provides a framework and empirical evidence for finding answers and offering broad explanations for research findings. The current study is based on the contextual model of health-related quality of life developed by Ashing-Giwa (Ashing-Giwa, 2005). The Ashing-Giwa-CM-HRQoL model consists of two levels: macro and micro. The macro level, also known as the systemic level, includes external variables that influence a person's functioning and recovery. These variables encompass socioeconomic, cultural, demographic and medical care-related factors, which are the major domains in the Ashing-Giwa-CM-HRQoL model. Demographic factors such as age and gender, as well as medical-related factors like

access to healthcare and quality of health services, are known to impact quality of life (Pedro, 2010). Socioeconomic determinants such as social support, life hardship and socioeconomic status also play a role in determining quality of life (Muzzatti & Annunziata, 2013).

On the other hand, the micro level, also referred to as the individual level, consists of an individual's traits that influence their functioning and recovery (Wippold et al., 2020). These traits fall under psychological variables, including depression, anxiety, anger, hope, exuberance and low self-esteem (Drury et al., 2020). Disease-specific factors such as the type of disease, symptom characteristics and degree of injury, as well as general health conditions, associated diseases, knowledge and health beliefs, self-efficacy, and health behaviors, are also considered at the micro level (Sosnowski et al., 2017). The Ashing-Giwa-CM-HRQoL model is an ideal choice for this study as it has been validated (Ashing-Giwa and Lim, 2011; Ashing-Giwa and Lim, 2008; Ashing-Giwa & Lim 2009) and used in various settings among chronically ill patients (Lim, 2018). The conceptual framework guiding the study is depicted in Figure 1.

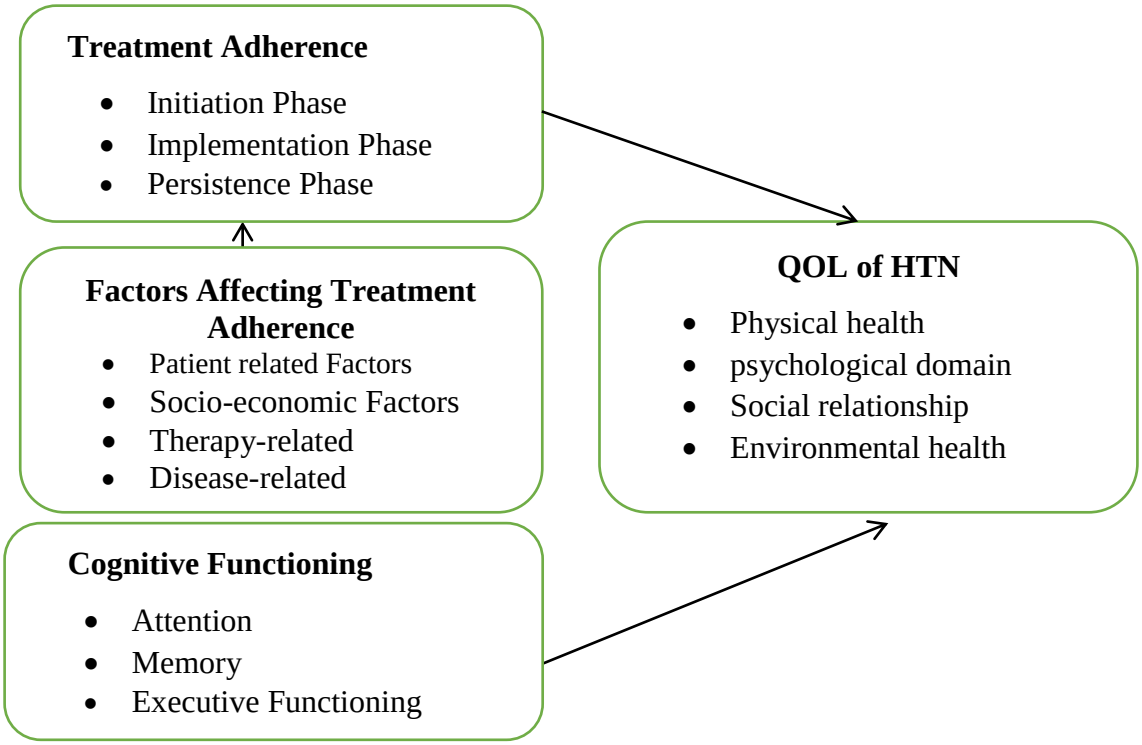

Figure 1: Components of the concept of the quality of life conditioned by health at the macro level.
Source: Adapted contextual model –hrqol (ASHING-GIWA, 2004)

Treatment Adherence Domain

The treatment adherence domain includes the initiation, implementation and execution stages. The period between a prescription and the first dose of a drug is known as the initiation period (Kaplan & Price, 2020). In the initiation stage, the study measures the period between receiving a prescription and taking the first dosage of a treatment. However, the implementation stage is the adherence on the part of the patient between the patient's dose schedule and the recommended schedule during the interim between the start and end of treatment (Feldman et al., 2017). In the implementation stage, this study measures the patient's dosing regimen, along with past dosing history (e.g., intervals, durations and dosages), as well as any other details pertaining to how and when therapy is applied (Feldman et al., 2017). In addition, the persistence phase involves the duration and frequency of

unplanned interludes, which include an extended time period of sequential missed doses (Feldman et al., 2017). In this stage, this study measures the interval between the start of the treatment and its eventual termination (Kaplan & Price, 2020).

Cognitive Function

This domain of the conceptual framework focuses on the cognitive processes involved in mental functioning. These processes include learning, attention, memory and executive function. Learning is an active and immersive process that engages the senses and has long-term benefits (Klausmeier, 1992). In this study, learning will be measured by assessing optimal thinking, comprehension and retention of information. Attention is the cognitive process that allows us to focus and respond to relevant stimuli (Filley, 2002). In this study, attention will be assessed based on selective attention and sustained attention. Selective attention involves paying attention to important information while ignoring irrelevant information, while sustained attention refers to the ability to focus on an activity or stimulus for a prolonged period (Fisher et al., 2019).

Memory refers to the ability to retain information in consciousness for adaptive purposes, including data from various sensory modalities and both verbal and non-verbal data (Miyake & Shah, 1997). In this study, memory will be assessed based on the ability to encode, maintain and retrieve information from both short-term and long-term storage (Song et al., 2020). This assessment will focus on knowledge, thought processes and judgment (Kelso & Tadi, 2021). Executive function refers to the mental processes that control and coordinate other cognitive abilities, such as planning, focus and memory, to achieve a goal (Denckla, 2005). In this study, executive function will be assessed based on several domains, including

mental flexibility, verbal fluency, planning, working memory and inhibitory control (Faria et al., 2015).

Quality of Life

This domain of the conceptual framework includes the domains of the WHOQoL BREF scale; physical domain, psychological domain, environmental health and social relationship. The physical health domain includes mobility, functional capacity, energy, pain and sleep (Puranik et al., 2021). Among the psychological domain measures are self-image, thoughts, attitudes, self-esteem, learning ability, mental focus, religion and mental status (Prabhu et al., 2023). The social relationships domain includes relationships, social support and sexual status (Song et al., 2022). The environmental health domain encompasses financial resources, safety, health and social services, the living physical environment, opportunities to learn new skills and knowledge, recreation and the general environment (Puranik et al., 2021). In this study the Qol of participants will be assessed based on physical domain, psychological domain, environmental health and social relationship of per the WHOQOL-BREF scale.

Treatment Adherence, Cognitive Function and Quality of Life

This part of the conceptual framework focuses on the association between treatment adherence, cognitive function and quality of life. In this study, the possible association between treatment adherence, cognitive function and QoL among persons with hypertension will be explored. This study proposes that cognitive function may mediate the relationship between adherence and QoL, as well as moderate the effect of adherence interventions on QoL. Also, the potential mechanisms of this association, such as the impact of hypertension and medication on brain structure and function and the role of cognitive factors in influencing

adherence behavior and QoL will be investigated. Furthermore, some implications of this association for clinical practice and research, such as the need to assess and monitor cognitive function in hypertensive patients, to tailor adherence interventions to their cognitive profile and to evaluate the effects of adherence improvement on cognitive function and QoL will be highlighted.

Factors Affecting Treatment Adherence

This part of the conceptual framework includes factors affecting treatment adherence. In this study, these factors are grouped into five on the basis of the categorisation (WHO, 2013). These categories include socio- economic variables, treatment-related variables, disease-related variables, patient-related variables and system-related variables related to the health care system. Under socioeconomic factors, the researcher seeks to explore factors such as level of education, sex, age and employment status (Little et al., 2021). Under treatment-related factors, the study seeks to explore variables such as method of administration, duration, frequency, dosages and the side effects of the medication (Hassen et al., 2022). However, with respect to patient-related variables, factors such as self-efficacy, knowledge and health beliefs will be explored (Halvorsen et al, 2022). Also, disease-related factors such as the type of disease and the severity of the disease will be explored (Borreani et al., 2020).

CHAPTER THREE

RESEARCH METHODS

This study aimed to investigate the association between treatment adherence, cognitive function, and quality of life (QoL) among people living with hypertension in selected health centres in Sunyani Municipality. This chapter discussed the research methodologies; research design, study area, target population, sampling procedure, data collection instrument, mode of data collection, and analysis that were used in this study.

Research Design

The study used a descriptive-correlational design based on a positivist paradigm. In research studies, descriptive correlational design is used to provide static images of situations and establish the relationship among variables (McBurney & White, 2009). In this design, the researcher described and measured the degree to which two or more variables or sets of scores are associated (Creswell, 2012). A correlational research design was chosen because it aids in determining the direction and strength of each relationship between variables (Seeram, 2019). Again, correlational research was chosen because it can employ in generating hypotheses that can be tested (Curtis et al., 2016). Furthermore, variables in a correlational study cannot be manipulated, reducing researcher bias, which is one of the reasons it will be used for this study (Seeram, 2019). Also, a correlational study provides a good starting point for investigating a phenomenon for the first time (Curtis et al., 2016). Again, a correlational study helps to generate massive quantity of data on a phenomenon in a short period of time (Lau, 2017). Moreover, correlational research design generates data that can be used to predict the future (Friedman et al., 2022).

On the other hand, there are some limitations in the correlation research design. Correlational design cannot predict causal-effect relationships between variables, as such, further experimental studies may be required. Therefore, the researcher was sure to interpret the findings appropriately. The advantages of the correlational design exceed its disadvantages, and it has been proven to be a successful design in multiple academic and social science studies (Coe et al., 2021). As a result, it was the most appropriate design for this study.

Study Area

Sunyani Municipality was the research area for this study. Sunyani Municipality is one of Ghana's 123 administrative districts. It covers a total land area of 829.3 square kilometres and is located between the latitudes of 70 20'N and 70 05'N and the longitudes of 20 30'W and 2010'W (Mensah et al., 2020). Sunyani is in the western part of the Bono Region (Prempeh, 2015). It serves as the administrative centre for the Bono region (Adusu et al., 2021). According to Ghana's population census of 2020, Sunyani had a settlement population of 193,595 people (Ghana Statistical Service, 2021). The district has a youthful population with a population pyramid of a road base that gradually decreases a modest amount of the aged population, with the population aged 0–15 represented as 31.3% of the population, ages 15–65 accounting for 65.2% of the total population, and 3.5% representing 65 years and older. In Sunyani, females account for 50.2%, while males account for 49.8% (Ghana Statistical Service, 2021). Within the municipality, approximately 80.0% of the population lives in urban areas, while 19.2% lives in rural areas. The total age dependency ratio (the proportion of the population of working age who is dependent) for Sunyani municipality is 60.7 (Ghana Statistical Service, 2021). Sunyani municipality is a multicultural community that has several cultural and

ethnic diversities, with the majority of the population being Akan's (Opare et al., 2018). While the people of Sunyani speak Twi as their native language, most of the community members can communicate in English. Sunyani's economy is primarily agrarian, with about 48% employed in agriculture.

According to Ghana Statistical Services (2013), households in two-thirds of the municipality are engaged in non-agricultural activities. Sunyani Municipality is predominantly urban in terms of settlement, with the majority of the municipality's residents living in an urban area (GSS, 2014). The population of the municipality is primarily located in three communities: About 83 percent of the population lives in Sunyani, Abesim, and New Dormaa, with the remaining 17 percent split among the other communities (Ghana Statistical Service, 2021). The city of Sunyani has three major hospitals, namely Bono Regional Hospital, Sunyani Municipal Hospital, and Seventh Day Adventist (SDA) Hospital. All three major hospitals in Sunyani were selected for this study, purposely for recruiting all hypertensive patients seeking treatment in the selected hospitals.

Population

The target population for this study emcompassed all hypertensive patients on antihypertensive treatment at the health centres in the Sunyani Municipality, which was estimated at 3,483. A hypertensive patient is a person whose systolic blood pressure is 140 mm Hg or higher or a diastolic blood pressure of 90 mm Hg or higher (WHO, 2021).

Hypertensive individuals' characteristics include a higher SBP of 140 mm Hg or a higher DBP of 90 mm Hg, as well as related hypertension symptoms (such as migraines in the morning, bloody noses, abnormal heart rhythms, loss of vision, and ear buzzing) (WHO, 2021). Although according to WHO (2021), hypertension is

estimated to affect 1.28 billion adults aged 30 to 79 worldwide, with two-thirds living in low to middle-income countries, this study included all hypertensive patients aged 18 and above, including young adults and the elderly. Moreover, this study also included all socioeconomic status, literacy levels, income, and employment/occupation status, as well as cross-cultural comparisons of hypertensive patients.

The population included in the study consisted of all consenting hypertensive patients 18 years and older (mentally stable) who had been given a diagnosis of hypertension for at least 6 months and were seeking treatment at the three selected hospitals in Sunyani during the period of data collection. Pregnancy-induced hypertension and hypertension caused by contraceptive use or hormone replacement therapy, hypertensive cases with psychiatric illnesses, hypertensive individuals with acute illness cases necessitating admission, very ill patients who cannot communicate or offer informed consent, as well as others who failed to give consent, were excluded. However, the accessible population for the study consisted of hypertension individuals seeking treatment in Bono Regional Hospital, Sunyani Municipal Hospital, and Seventh Day Adventist (SDA) Hospital available at the time of the study. The total number of hypertensive patients in this selected hospital was 3,483. That is 2,303 at Bono Regional Hospital, 485 at Sunyani Municipal Hospital, and 695 at Seventh Day Adventist (SDA) Hospital. The sample for the study was drawn from the accessible population (Majid, 2018).

Sampling Procedures

The study utilised a sample size of 600 hypertension clients recruited from the selected hospitals in Sunyani municipality. Out of the eleven health centres in the Bono region, three hospitals were selected for this study. The sampled hospitals

for this research included Bono Regional Hospital, Sunyani Municipal Hospital, and Seventh Day Adventist (SDA) Hospital. This selection was done because the selected hospitals are the only health centres operating hypertensive clinics in the Sunyani Municipality. Also, according to a cross-sectional descriptive study carried out by Atibila et al. (2022) among HPT patients who often visit clinics at chosen hospitals in Ghana's Brong Ahafo area, results showed a significant prevalence of non-adherence (63.7%), with Bono Regional Hospital, Sunyani Municipal Hospital, and SDA Hospital accounting for 8%, 4%, and 4% of that prevalence, respectively. The estimated total number of hypertensive patients seeking treatment in the three sampled hospitals, namely Bono Regional Hospital, Sunyani Municipal Hospital, and Seventh Day Adventist (SDA) Hospital, is displayed in Table 1.

Table 1- Population of the Study

Name of Hospital	Total number of hypertensive patients on antihypertensive treatments
Bono Regional hospital	2,303
Sunyani Municipal hospital	485
Seventh-day Adventist (SDA) hospital	695
Total	3,483

Source: Record section of the hospitals (2021)

From Table 1, the total number of hypertensive patients from the selected hospital is 3,483. This was the accessible population from which the sample for this study was drawn.

Sample Size Determination

The researcher used Gay and Diehl (1992) sample size determination methods, as cited in Kissi-Abrokwah, to arrive at the desired sample size for the study (2019). Gay and Diehl (1992) recommended selecting 10% for generalisation when the population is larger than 100 units. Furthermore, for calculating sample size, using Krejcie and Morgan's (1970) provided sampling formulas, a sample of

346 participants was sufficient for a population of 3,483. However, according to Kumar (2018), the sample size is determined by three factors: the researcher's level of confidence in the results, the degree of accuracy required to estimate population metrics, and the expected level of volatility in the key measure under investigation. In most cases, the probability of incorporating the population mean within the confidence interval is 95% or 99% (Gray 2009). Many studies, according to Gray (2009), consider a confidence level of 95% to be reasonable. A 95% confidence level, according to Kothari (2004), indicates that the sample findings reflect the actual status of the population 95 times out of 100 (or.95 in 1), versus 5 times out of 100 (or.05 in 1). The study was carried out with a 95% level of confidence. According to Gray (2009), many studies consider a 95% confidence level to be reasonable. The following was the formula used for calculating sample size for this study according Gay and Diehl (1992)

$$: SS = \frac{Z^2 * (P) * (1-P)}{C^2}$$

Where:

SS = sample size

Z= z value (e.g. 1.88 for 95% confidence level)

P= percentage picking a choice expressed as a decimal (0.5 used for sample size needed)

C= confidence interval expressed as a decimal (e.g., 0.04 = ±4)

$$SS = \frac{(1.96)^2 * (0.5) * (1-0.5)}{(0.04)^2} = \frac{3.8416 * (0.5) * (0.5)}{0.0016}$$

$$\frac{3.8416 * 0.25}{0.0016} = \frac{0.9604}{0.0016} = 600.25 \sim 600$$

As a result, the sample size for this study was 600 people recruited from the selected hospitals in Sunyani municipality. A sample size of 600 people was

provided as a representative sample of the population, which will aid in statistical inference or generalization. However, due to the non-returnability of the questionnaire, the calculated sample size was increased by 5%, which is 630.

Confidence Interval: A confidence interval represents the probability that a parameter falls between two values around the mean (Wang, 2022). Confidence intervals measure the level of uncertainty or certainty in a sampling procedure (Hazra, 2017).

Confidence Level: It is given as a percentage and indicates the frequency with which the confidence interval encompasses the true percentage of the population that would select a certain response (Guo et al., 2022). At the 94% confidence level, you can be 94% certain. The 95% confidence level was used in the vast majority of cases (Hazra, 2017).

To ensure a fair representation of all groupings in the sample, the proportion for each subgroup was calculated. Table 2 shows the proportional distribution of participants.

Table 2: Proportional Distribution of Participants for Selected Hospitals

Hospital	Number of patients	Proportion sampled	Percentage (%)
Bono Regional hospital	2,303	417	66
Sunyani Municipal hospital	485	88	14
Seventh Day Adventist (SDA) hospital	695	125	20
Total	3,483	630	100

To collect data from the 600 hypertension clients selected for the study. A non-probability sampling approach was adapted. The study region and municipality were purposefully chosen. The Bono Region was selected because it is identified as one of the regions in Ghana with a higher prevalence of hypertension (Bosu & Bosu, 2021). Similarly, Sunyani Municipal was also selected as the study area using a

purposive sampling technique due to its status as the most urbanised place as the capital of the Bono region (Kodaman et al., 2016). As noted by Bosu and Bosu (2021), based on population distribution, urban areas in Ghana have a higher prevalence of hypertension than rural areas. Also using the purposive sampling technique, a register of the total hypertensive patients in the hypertensive clinics was obtained from the three hospitals, namely Bono Regional Hospital, Sunyani Municipal Hospital, and SDA Hospital. The register obtained was used to draught the sampling frame for which the samples from each hospital were selected for the study. Purposive sampling was used to select the three hypertensive clinics out of the eleven hospitals in Sunyani. The three selected hospitals are the only healthcare facilities that operate hypertensive clinics. The application of the purposive sampling technique was due to its appropriateness for facility-based studies and also based on study context (Etikan et al., 2016). Proportional sampling approach was employed to determine the sample size for each clinic in the study.

The sample size (600) was proportionately distributed to the clinics, as indicated in Table 2, based on the register of patients visiting each of the identified hypertensive clinics. Proportional-to-size sampling was selected because it provides an uneven probability where there is a likelihood of choosing a sample proportional to its size (Cohen et al., 2017; Harrison, Reilly, & Creswell, 2020; Skinner, 2014). Lastly, convenience sampling was used to access the sampled respondents in each of the selected hospitals. Convenience sampling was selected due to the limited time for the study and its feature of accessibility (Acharya et al., 2013).

Demographics Characteristics among Participants of the Study

Table 3 depicts the demographic features of the 600 hypertensive patients who took part in this study. The patients' average age was 59. The majority of the

patients were between the ages of 48 and 64. The percentage of male patients was approximately 29.7% (n = 187), while females were 70% (n = 442). In terms of religion, 90% (n = 542) of patients identified as Christians, and a majority of respondents (59%, n = 376) were married. The majority of patients (41.6%) (n = 262) had basic educational qualifications. With regards to employment level, 47.5% (n = 299) of participants were employed, 21.4% (n = 135) were unemployed, and 31.1% (n = 196) were retirees, respectively.

Table 3: Descriptive Summary of Demographics Characteristics for Respondents of the Study

Characteristics	Number(n)	Percentage (%)
Age (years)		
Below 47	113	17.9
48-64	271	43.0
65-80	225	35.7
81and above	21	3.3
Sex		
Male	187	29.7
Female	442	70
Religion		
Christian	542	86
Muslim	76	12.1
Traditional	2	0.3
Others	10	1.6
Marital level		
Single	80	12.7
Married	376	59
Divorced	73	11
Widowed	101	16
Educational level		
Non-formal education	146	23.4
Basic	262	41.6
Secondary	101	16
Tertiary	121	19.2
Employment Status		
Not employed	135	135
Employed	299	299
Retired	196	31.1

Source: Field Survey (2022)

Health Related Characteristics among Respondents of the Study

The majority of patients (69.7%) received antihypertensive treatment for 6–12 years. More than half of the patients had their blood pressure under control, with 60.3% (n = 380) having systolic less than 140 mmHg and 88.7% (n = 539) having diastolic less than 90 mmHg. Furthermore, a significant majority of patients (56.20%) reported being overweight based on their BMI. Health-related characteristics are presented in Table 2.

Table 4: Descriptive Summary for Health-Related Characteristics of Respondents of the Study

Characteristics	Number(n)	Percentage (%)
How long(years you have been on hypertensive treatment)		
6months-12years	440	69.9
12- 24	164	26.0
24 and above	26	4.1
Blood pressure(Systolic Bp)		
Less than 140m mHg	380	60.3
141-159mmHg	159	25.2
160-179mmHg	70	11.1
Above 180mmHg	21	3.3
Blood pressure(Diastolic Bp)		
Less than 90mmHg	539	88.9
91-99mmHg	42	6.7
100-109mmHg	20	3.2
109mmHg	9	1.4
Body Mass Index(BMI)		
Underweight	41	6.5
Normal	235	37.3
Overweight	354	56.2

Source: Field Survey (Serwaa, 2022)

Data Collection Instrument

A questionnaire was used to collect data. Three existing questionnaires on treatment adherence, cognitive function, and QoL were adapted and used to collect data for this study. These include the Treatment Adherence Questionnaire for Patients with Hypertension (TAQPH), the Cognitive Failure Questionnaire, and the WHO Quality

of Life (BREF) scale. The questionnaire included a total of 88 items. The questionnaire was put into four sections: section A (demographics of respondents), section B (treatment adherence scale), section C (WHOQOL-BREF scale), and section D (cognitive failure questionnaire).

Treatment Adherence Questionnaire for Patients with Hypertension (TAQPH)

Treatment adherence is measured with an adapted version of the Treatment Adherence Questionnaire for Patients with Hypertension (TAQPH) by Ma et al. (2012). TAQPH examines adherence to both pharmaceutical and non-pharmacological treatment which includes four Likert-type responses (1 = never, 2 = sometimes, 3 = most of the time, 4 = always). *This 28-item instrument originally consisted of six variables (F1 - Medication = 9 items; F2 - Diet = 9 items; F3 - Stimulants = 3 items; F4 - Weight control = 2 items; F5 - Exercise = 2 items; and F6 - Stress relief = 3 items).* A higher score from the summation of all the values representing each item indicates better adherence. TAQPH was selected for this study because it includes both the pharmacological and non-pharmacological domains of hypertension treatment, which is essential in evaluating adherence to treatment for hypertension.

Again, this instrument was selected because it has been widely used by researchers to assess treatment adherence among people living with hypertension. For example, Esquivel Garzón and Díaz Heredia (2019), in a study conducted in Columbia, stated that the content validity score was 0.91 and the Cronbach's alpha for the entire scale was 0.74. Also, in another study by Dehghan et al. (2020), the TAQPH scale showed greater stability as well as good acceptance and internal consistency (Cronbach's = 0.76). This demonstrates that the TAQPH is a reliable instrument that is appropriate for assessing treatment adherence.

Cognitive Failure Questionnaire (CFQ)

An adapted version of the Cognitive Failure Questionnaire (CFQ) was used to screen cognitive function in this study. The Cognitive Failure Questionnaire (CFQ) was propounded by Broadbent et al. (1982) and was used to assess deficits in attention, memory, and motor function. The CFQ has twenty-five (25) items that assess four different aspects of cognitive function: attention, perception, memory, and motor functioning. The Cognitive Failure Questionnaire was graded on a scale of 0 to 100, with scores of >48 considered high CFQ scores. A higher score denotes subjective cognitive failure. The CFQ has been validated and widely used in clinical practise and research since its inception in 1982. According to Ekici et al. (2016), Cronhbach alpha was 0.90-0.93 in the Turkish version. Also, according to Day et al. (2012), 0.85 denotes a high internal consistency. According to Volosin et al. (2023), the Hungarian version was 0.920.

Who Quality of Life Scale (WHOQOL-BREF)

The WHOQOL-BREF scale was adapted for assessing QoL in this study. WHOQOL-BREF scale was developed by the WHO in 1995. Questions from this instrument originate from multiple statements made by people with and without disease, as well as health practitioners, about QoL, health, and well-being (Skevington et al., 2004). The WHOQOL BREF is categorised into four QoL domains, which include physical health (7 items), psychological health (6 items), social relationships (3 items), and environmental health (8 items) (Purba et al., 2018). The physical health domain includes mobility, daily tasks, functional capacity, vitality, discomfort and sleep. The psychological domain measurements include a sense of self thoughts, attitudes, self-worth and mindset, capacity for

learning, mental focus, spirituality, and state of mind. Relations, social support, and sexual orientation are all components of the social relationships domain.

The environmental health domain includes financial resources, safety, social and health care, surroundings, opportunities for learning, leisure activities, and the environment as a whole (Puranik et al., 2021). Each item on the WHOQOL-BREF was scored on a five-point ordinal scale that ranges from 1 to 5. Subsequently, the scores were linearly transformed to a 0–100 scale (Vahedi, 2010). Shayan et al. (2020) stated Cronbach alpha as 0.79 in an Afghan population. Also, Almarabheh et al. (2021) stated the Cronbach alpha as 0.91 in a Bahraini population. WHOQOL-BREF was regarded as the most appropriate for this study as a result of its widespread use by recent researchers and high internal consistency.

Validity

It is critical to establish reliability and validity in any study. The content validity of an instrument, according to Golley et al. (2017), ensures that the items of that instrument are fully represented and detailed enough to represent and measure an assumed objective and variable. To ensure that the questionnaire guide for the study was valid, it was first given to my supervisors for review, suggestions, and correction. Experts in the field of hypertension treatment were also consulted to confirm the instruments' content and validity.

Reliabilty

A pre-test was employed in order to determine the reliability of the data collection instruments. Even though the instruments were already reliable with high reliability coefficients, they were pretested to ensure their reliability in Ghana. Pre-testing was conducted with 63 patients seeking hypertensive treatments from the Dr. Asare Clinic in Sunyani. This was done on the basis of Creswell and Clark's

(2017) recommendation on the use of 10% of the sample size for pilot-testing the research instrument. The Cronbach's alpha test and the McDonald omega test were used to to ascertain the reliability of each of the items on the questionnaire.

Results for the overall reliability test for an adapted version of the Treatment Adherence Questionnaire for Patients with Hypertension (TAQPH) by Ma et al. (2012) using Cronbach alpha were 0.679. According to Nawi et al. (2020), a cronbach alpha of 0.6 to 0.8 is acceptable; hence, this instrument was accepted for data collection. For quality of life, the McDonald Omega reliabilty test was done to assess the reliability of Section C. The result yielded a reliability of 0.611 for QoL (WHOQOL-BREF scale). According to Ramachandran et al. (2021), a McDonald's omega score of ≥0.6 is considered acceptable; hence, the whoqol-bref scale was deemed reliable for this study.

Data Collection Procedure

An introductory letter and ethical clearance were acquired from the Department of Health, Physical Education and Recreation and Ghana Health Service, respectively. The introductory letter and ethical clearance (GHS-ERC: 024/02/23) were used to seek permission from the three hospitals in Sunyani municipality for data collection. The directors of the three hospitals will be consulted for approval for the study at the hypertensive clinic. After completing the required protocols and permission obtained, data was collected during clinical hours. A brief summary of the research's purpose and significance was explained to the participants. Participants were assured of confidentiality, and they were asked to participate voluntarily. Consented participants who agreed to participate in the study signed a written or verbal informed consent before questionnaires were given to them. By interpreting the items on the questionnaire, i assisted patients who were

unable to complete it on their own. To assist in the collection of data for the study, Six Research Assistants (RAs) were selected and trained (fieldwork) for each hospital used in the study. The RA's were designated among the selected hospitals, thus the BAR Hospital, SDA hospital and Sunyani Municipal hospital. These RA's were chosen based on their expertise, knowledge of the location for questionnaires will also be translated into Twi, the native language of the people of Sunyani, for participants who are uneducated. The collection of data for the study lasted for about three months. All information gathered was be kept private and confidential

Ethical considerations are important in any research project, and this study took that seriously. The respondents' privacy and anonymity were protected. These ethical concerns were addressed because respondents were not expected to reveal their identities. The opinions of the respondents were treated with the utmost respect and confidentiality. It was specified that the report obtained from respondents will be kept confidential in order to protect the participants and their institutions' rights and ensure the study's credibility. Participants were given consent papers to fill out, demonstrating their willingness to participate in the study. Respondents were informed that they could opt out of the study. As required by the "University of Cape Coast's Institutional Review Board", completed questionnaires will be stored for three years before being discarded.

Data Processing and Analysis

The data collected was coded into the Statistical Package for Social Science (SPSS) and cleaned for missing data and appropriateness of the data for analysis. SPSS was used to organise and categorise the survey data (SPSS Version 26). Based on the different developers' interpretations, the total score of responses on the various inventories was calculated. To facilitate parametric data analysis, composite

scores of the various inventories were calculated based on the assumptions identified. Data was analysed according to research questions.

Research Question 1: What is the level of treatment adherence among people living with hypertension in Sunyani Municipality?

In order to answer research question one, descriptive statistical analysis, specifically mean and standard deviation, were used to describe the level of treatment adherence among hypertensive patients. The Likert scale ranges from 1 to 4. A higher score from the summation of all values representing each item was considered better adherence, and a lower score on the summation representing each item was considered low adherence. The total score ranged from 28 to 112. A score of 85.99–112 indicated high adherences, while a score less than 57–85 showed moderate adherence; however, a score of 28–56 was considered low adherence (Ma et al., 2012).

Research Question 2: What is the level of cognitive function among people living with hypertension in Sunyani Municipality?

To answer research question two, descriptive statistics were used to describe the level of cognitive function among hypertensive patients, specifically the mean and standard deviation. This statistical analysis was selected because the researcher wants to ascertain the average level of cognitive function in the study (Armstrong & Kepler, 2018). Scores were graded on a scale of 0 to 100, with scores of >48 considered high CFQ scores (Voortman et al., 2019).

Research Question 3: What is the level of QoL among people living with hypertension in Sunyani Municipality?

The level of QoL among hypertensive patients was described using descriptive statistics, specifically the mean and standard deviation, to answer the

third research question. This analysis was selected because the researcher wants to ascertain the average level of adherence in the study (Armstrong & Kepler, 2018). Since there is no universal scale for scoring QOL, the mean score of items in each domain was used to calculate the domain score (Burckhardt & Anderson, 2003; WHO, 1996).

Physical health: (6-Q3) + (6-Q4) +Q10+Q15+Q16+Q17+Q18)

Psychological health: Q5+Q6+Q7+Q11+Q19+ (6-Q26)

Social relationship: Q20+Q21+Q22

Environmental health: Q8+Q9+Q12+Q13+Q14+Q23+Q24+ Q25

The formula shown below was used to convert each raw scale score to a scale from 0 to 100.

$$transformed\ scale\ = \left(\frac{Actual\ raw\ score - lowest\ possible\ raw\ score}{Possible\ raw\ score\ range}\right) \times 100$$

The score of 0–33 was interpreted as low QoL; moderate QoL when score was 34 to 66 and a score of 67–100 was explained as high QoL (Iriawan et al., 2021).

Research Question 4 What is the association between treatment adherence, cognitive function and QoL among people living with hypertension?

It is evident in the literature that, depending on the context and cultural background, a relationship could exist between patients' treatment adherence and QoL. In the same way, a relationship could exist between cognitive function and QoL. This has propelled the researcher to test for the significant relationship between cognitive function, treatment adherence, and QoL among hypertensive patients in the Ghanaian context. To achieve this, the Spearman rank correlation was used for the analysis. The Spearman rank correlation was utilised based on the assumption that all the variables were measured on a categorical scale (Morgan et al., 2014). In the analysis, correlation (r) was used to determine the degree and

direction of the relationship between the two independent variables (Cognitive Function-CF and Quality of Life-QoL), (Treatment Adherence-TA and Quality of Life-QoL), as well as (Cognitive Function-CF and Treatment Adherence-TA). The correlation was tested at a 0.05 level of confidence, two-tailed. To obtain the scores for cognitive function (CF), treatment adherence (TA), and quality of life (QoL), all the items measuring these constructs on the questionnaire were computed on the Likert scale to form a single item using the SPSS software (version 25.0). In performing the PPMCC analysis, the homoscedasticity assumption was checked as well.

Research Question 5: What factors influence treatment adherence among people living with hypertension in Sunyani Municipality?

In order to answer research question four, which is factors influencing treatment adherence among hypertensive patients, a binary logistic regression model was used in the analysis. Binary logistic regression was used because the outcome variable (treatment adherence) was captured as a binary ordinal category whereby an index score of adherences or no adherence was generated from a scale of 28 items using the Treatment Adherence Questionnaire for Patients with Hypertension (TAQPH). Following Dehghan et al. (2020), TAQPH is the simplest way to measure adherence to both pharmacological and non-pharmacological treatments. One reason why binary logistic regression was used to analyze the outcome variable (treatment adherence) which was initially captured into three levels in research question 1 is to simplify the interpretation of the results (van Smeden et al., 2019). Binary logistic regression can model the probability of adhering to a treatment versus not adhering, regardless of the level of adherence (Ochen, et al., 2022). This is useful since the main research question is about the factors that influence adherence in general,

rather than the degree of adherence (DiMatteo, 2004; Zeber et al. 2013). A higher score from the summation of all values representing each item was considered adherence, and a lower score on the summation representing each item was considered no adherence. Total score ranges between 41- 164.

$$Y^*_i = \sum_{k=i}^{k} \beta_k X_{ki} + \varepsilon_i \ldots\ldots\ldots\ldots\ldots (1)$$

$$P(Y_i > j) = \frac{\exp(X_i \beta - k_j}{1 + \left[\exp\left(X_i\beta - k_j\right)\right]}, j = 1, 2, 3,$$

Where j represent the number of categories which implies that 1 represent high adherence, 2 indicating moderately adherence and 3 captures low adherence.

Chapter Summary

This Chpter discussed the detail, methodology that was used in this study to collect and analyse the data. This chapter also covered the study's philosophical assertion, research approach, research design, the population, the sample, and sampling procedure, instruments, reliability of the study, pretest of data collecting instruments, and data processing and analysis procedures. The study discussed how an adapted descriptive correlational study was used to investigate the relationship between treatment adherence, cognitive function, and quality of life in hypertensive people. The following chapter will present the findings and a discussion of the data collected for the purpose of the study.

CHAPTER FOUR

RESULTS AND DISCUSSION

The purpose of this study was to determine the association between treatment adherence, cognitive function, and QoL among people living with hypertension in some selected health centres in Sunyani Municipality. This chapter presents an overview of results and discussion of the findings for this study. The results were presented in accordance with the research questions.

Research Question One: What Is the Level of Treatment Adherence among People Living with Hypertension in Sunyani Municipality?

The purpose of this research question was to assess the level of treatment adherence among people living with hypertension in Sunyani Municipality. A four-point Likert scale was used to assess adherence levels. Scores were aggregated into high, moderate, and low adherence levels. A score of 85.99–112 indicated high adherence, 57–85 indicated moderate adherence, and a score of 28–56 indicated low adherence (Ma, 2016). The results are presented in Figure 1. Results indicated that 81.6% (n = 514) of participants had high levels of treatment adherence, 16.3% (n = 103) had a moderate level of adherence, and 2.1% (n = 13) had lower levels of adherence.

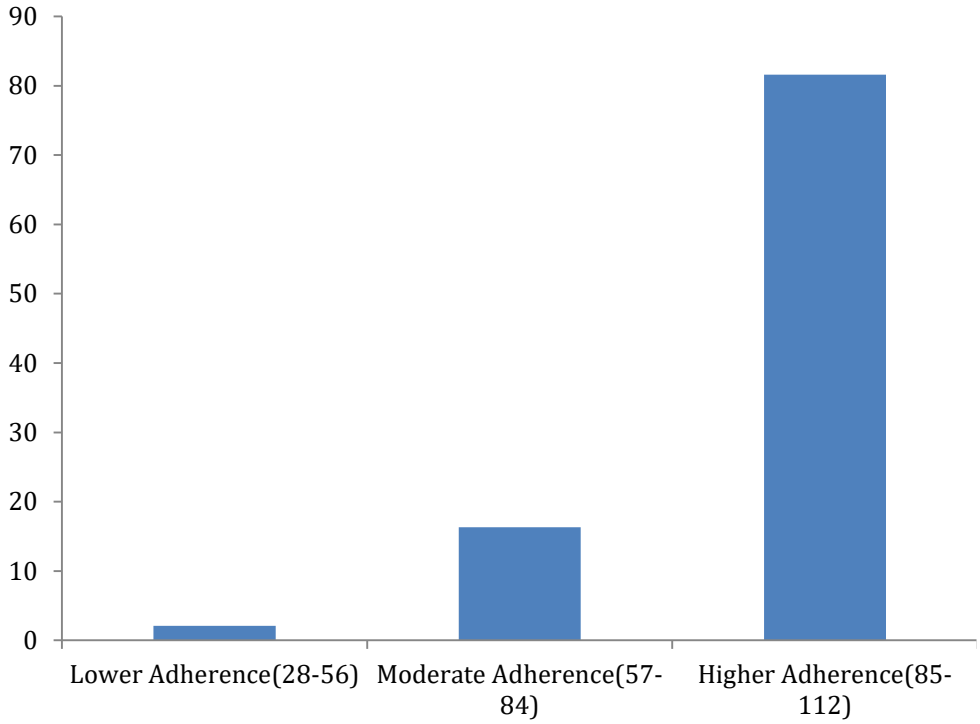

Figure 2: Level of Treatment Adherence

Source: Field Survey (2022)The performances of the participants on individual constructs of the five dimensions were further assessed, and the total score for each domain was calculated. Each possible score for an individual domain was divided by the number of levels for the mean score. This was used to determine the cutoffs for the three levels of adherence. For medication adherence, scores 0–12 were classified as low adherence, 12–24 were moderate adherence, and 25–36 represented high adherence. For diet adherence scores, 0–12 indicated low adherence, 12–24 indicated moderate adherence, and 25–36 indicated high adherence. With regards to stimulants, scores 0–4 indicated low adherence, 5-8 indicated moderate adherence, and 9–12 indicated high adherence. For exercise, a score of 0-2.7 indicated low adherence, 2.8–5.4 indicated moderate adherence, and 5.5–8.0 indicated high adherence. For weight control, a score of 0-2.7 indicated low adherence, 2.8–5.4 indicated moderate adherence, and 5.5–8.0 indicated high adherence. For stress relief, scores 0–4 indicated low adherence, 5-8 indicated

moderate adherence, and 9–12 indicated low adherence. As shown in Table 5, among the five dimensions of TAQPH, the results showed a mean score of 31.93, indicating a high level of medication adherence. A mean score of 30.48 in the diet adherence category denoted a high level of adherence. The stimulant's mean score was 11.06, which indicates high adherence. The average score for exercise was 6.29, showing moderate adherence. Also, the mean score for weight control was 5.72, indicating high adherence. The mean score for stress relief was 9.60, indicating high adherence.

Table 5: Descriptive Summary for Dimensions of Treatment Adherence

Dimensions	Possible Scores	Minimum-maximum	Mean Score	Level of Adherence
Total adherence rate	28-112	28-112	95.10	High
Medication adherence	9-36	9-36	31.93	High
Diet adherence	9-36	9-36	30.48	High
Stimulants	3-12	3-12	11.06	High
Exercise	2-8	2-8	6.29	High
Weight control	2-8	2-8	5.72	High
Stress relief	3-12	3-12	9.60	High

Source: Field Survey (2023)

The findings of the current study show that a substantial majority (81.6%) of participants demonstrated high treatment adherence, indicating a commitment to managing their hypertension. This high adherence rate suggests that a significant proportion of individuals with hypertension in the Sunyani Municipality are actively following their prescribed treatment regimens. Achieving high adherence among people with hypertension is crucial for effectively managing the condition and reducing the risk of complications (Rabi et al., 2020). Greater adherence to hypertension treatment makes achieving treatment targets more likely. High adherence has been associated with older age, lifestyle modifications like a good

diet, knowledge and understanding of the disease and antihypertensive treatment, and weight control (Andualem et al., 2020). Other factors that may contribute to high adherence include clear communication between patients and healthcare professionals, the use of technology, strong support systems, and favourable socioeconomic factors (Burnier & Egan, 2019). Together, these individual and healthcare system factors likely supported the majority of participants' commitments to managing their condition through consistent treatment adherence.

The high adherence rate found in this study is consistent with findings from other recent studies on hypertension management. Pobrotyn et al. (2023) studied elderly hypertensive patients in Poland and found that 63% demonstrated high adherence to their antihypertensive treatment. Similarly, Sarkodie et al. (2020) examined adherence among hypertensive Ghanaians and reported high adherence levels. Sarkodie et al. (2020) further identified patients' knowledge of their disease, assessment of disease severity, and alcohol consumption as primary predictors of adherence. These studies demonstrate adherence rates comparable to the current study and highlight factors influencing medication-taking behaviour. Together, the findings suggest that high adherence is achievable when individuals understand their condition and perceive the importance of treatment. Maintaining such adherence levels across populations can optimise hypertension management and outcomes.

There are several factors that contribute to adherence among individuals with hypertension. Age has been identified as a plausible factor for improved adherence to treatment in this population (Burnier et al., 2020). According to Sharma et al. (2018), hypertensive patients between the ages of 48 and 63 years demonstrate better adherence to antihypertensive treatment. However, individuals with hypertension between the ages of 65 and 80 years report even higher levels of treatment

adherence compared to those less than 65 years of age (Burnier et al., 2020). Another study conducted by Malih Radh et al. (2023) found that older age was associated with better medication adherence in hypertensive patients aged 60 years. Additionally, a study with a mean age of 63.6 years reported better adherence to lifestyle modifications (Obikorang et al., 2019). This is similar to the mean age, which is 59.6 years, demonstrating a significant reason for high adherence in this study. It is important to acknowledge that while age may play a role in improved adherence, individual differences remain significant.

The distribution of sex may be a determining factor in the level of adherence to treatment among individuals diagnosed with hypertension. According to the results of this study, 70% of respondents were female, which may be a plausible reason for the high adherence observed. Previous research has indicated a significant difference in treatment adherence based on gender in the management of hypertension. A study conducted by Lefort et al. in 2018 revealed that out of the total participants, 63.6% were adherent to anti-hypertensive treatment, with women demonstrating higher adherence rates compared to men (69% vs. 58%, P<10−4). Similar study by Usman et al. (2019) reported that female hypertensive patients exhibited higher medication adherence rates compared to their male counterparts (52.7%). Additionally, another study discovered that hypertensive women displayed better adherence to medication (81.8%), body weight control (44.4%), salt intake (22.5%), exercise (48.3%), reduction in alcohol consumption (74.2%), abstinence from smoking, and increased consumption of fruits and vegetables (Ghose & Yaya, 2018). These findings may be influenced by various factors, including socioeconomic status, education, culture, and personal beliefs.

Social support is another significant determinant that may influence the level of adherence among individuals with hypertension. The involvement of family members in the process of medication management has been shown to have a positive impact on an individual's adherence to antihypertensive treatment, and this could have contributed to the high adherence level among the participants. Numerous studies have demonstrated a strong association between social relationships and improved adherence. Ojinnaka et al. (2023) conducted research that revealed a higher likelihood of medication adherence among married hypertensive patients. Similarly, Ayodapo et al. (2020) found that marital status and residing in monogamous households were correlated with a higher adherence rate of 62%. Peer support groups have also been proven to offer emotional and informational support, thereby facilitating the effective management of hypertension (Gohar et al., 2019). Furthermore, instrumental social support plays a significant role in promoting adherence by providing practical assistance with various aspects of treatment. For instance, having someone remind patients to take their medications or assist in organising pill boxes has been shown to enhance medication adherence (Sniezek & Siddiqui, 2013).

The control of blood pressure can also have an impact on adherence to hypertension treatment. From the results of the study, majority of the participants had their blood pressure under control. 60.3% had their systolic less than 140 mmHg, and 88.7% had their diastolic less than 90 mmHg. This may have been attributed to high adherence among participants in the study. Additionally, numerous studies have discovered that better adherence is associated with controlled blood pressure. Kjeldsen and Os (2019) reported a significant correlation between controlled blood pressure and improved adherence. Vallee et al. (2020) observed

that hypertensive individuals with blood pressure lower than 140/90 mmHg demonstrated better adherence. Similarly, Ibrahim et al. (2019) found that those with regulated blood pressure had higher adherence (55.5%) compared to those with uncontrolled blood pressure (32.5%). Tilea et al. (2018) also reported high adherence (69.8%) among hypertensive individuals, of which 54.7% had well-managed blood pressure. Factors such as patient education, lifestyle modifications, and weight control can influence blood pressure regulation among individuals with hypertension (Ozemek et al., 2020). Achieving the target blood pressure may positively reinforce the behaviour of taking medication. Taken together, these studies indicate that adherence is linked to treatment efficacy, suggesting a likely bidirectional relationship. Maintaining controlled blood pressure through lifestyle changes and medication may sustain high adherence over time.

In summary, the finding of this study emphasisizes the relevance of evaluating and promoting treatment adherence among individuals with hypertension in the Sunyani Municipality. High adherence rates are associated with better health outcomes and a decreased burden of hypertension-related complications. Encouragingly, the majority of participants in this study demonstrated a high level of adherence, indicating a commitment to managing their condition. These findings demonstrate that participants in this study are generally adhering. This is in alignment with the dimensions of the Ashing-Giwa Contextual Model of Health-Related Quality of Life theory, indicating that high levels of adherence may contribute to a higher level of QoL. The constructs of the theory reinforce the idea that treatment adherence is an essential component in determining health-related QoL, and the participants in the study are effectively managing them, contributing to their overall well-being. Hence, it is essential for healthcare providers and

policymakers to persist in their efforts to support those with moderate and lower adherence levels. Tailored interventions, improved patient-provider communication, and addressing potential barriers to adherence can further enhance treatment adherence rates and, subsequently, improve the overall health and well-being of individuals with hypertension in the Sunyani Municipality.

Research Question Two: What is the Level of Cognitive Function among People Living with Hypertension in Sunyani Municipality?

The purpose of this research question was to assess the level of cognitive function among people living with hypertension in Sunyani Municipality. A 5-point Likert scale was used to assess cognitive function levels. Scores were aggregated into high and low cognitive functions. A score of >48 indicates high cognitive failure, and scores ≤48 indicate lower cognitive failure (Voortman et al., 2019). A higher score denotes subjective cognitive failure, and a lower score denotes good cognitive function. The results are presented in Figure 2. Results indicated that 94% (n = 592) of the participants had lower cognitive failure (with scores ≤48). This indicates that the majority of participants in the study demonstrated good cognitive function, as their scores fell below the threshold for cognitive failure. While 6% (n = 38) of the participants had higher cognitive failure (with scores > 48). This smaller group of participants exhibited a higher degree of subjective cognitive failure, which suggests some cognitive difficulties.

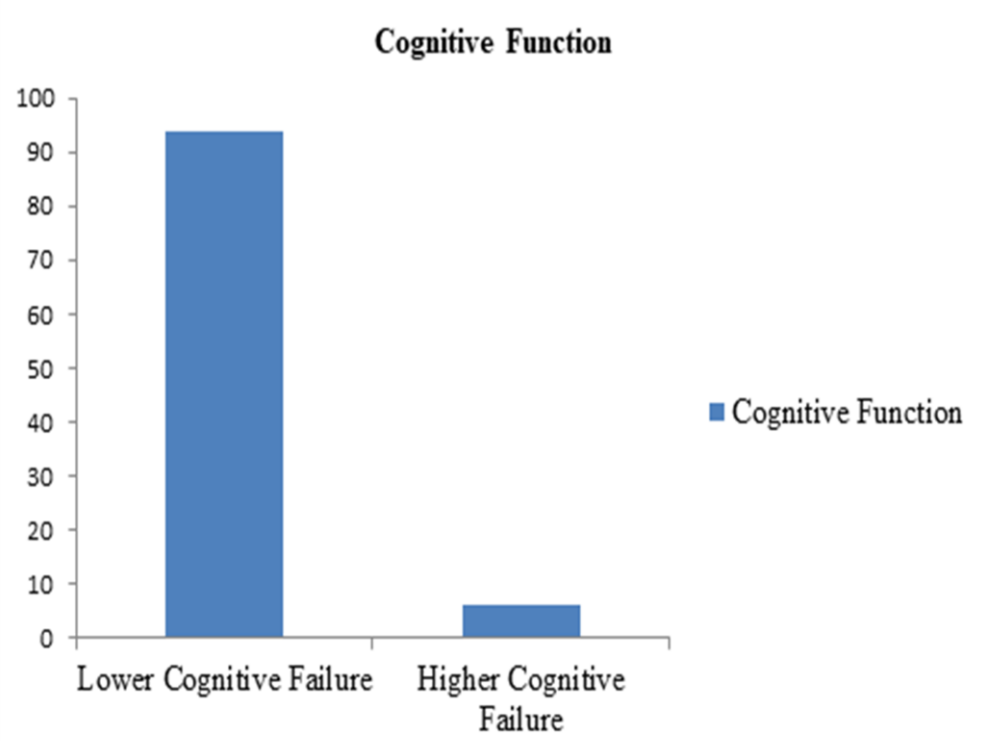

Figure 3: Level of Cognitive Function
Source: Field Survey (2022)

Notwithstanding, the Cognitive failure questionnaire was grouped into three dimensions as established by Rast et al. (2009). To assess the performance of the participants on individual construct, total score for each domain was calculated. Each possible score for an individual domain was divided by the number of levels for the mean score. This was used to determine the cut-off scores for the two levels of cognitive function. A score of 0–14 for forgetfulness indicated low cognitive failure, whereas a score of 15–28 indicated high cognitive failure. Also, a score of 0–15 suggested a lower cognitive failure for distraction, and a score of 16–30 indicated a higher cognitive failure. The mean score was reported as 6.86 for forgetfulness, 7.66 for distractions, and 7.89 for false triggering, indicating a lower cognitive failure in each domain, respectively. This is illustrated below in Table 6. The results show that, on average, participants exhibited lower cognitive failure in the dimensions of forgetfulness, distraction, and false triggering. This indicates that,

as a group, participants experienced relatively minor cognitive failures in these specific constructs, as measured by the Cognitive Failure Questionnaire.

Table 6: Descriptive Summary for Dimensions of Cognitive Failure Questionnaire

Dimensions	Minimum –maximum	Mean	Level of cognitive failure
Forgetfulness	0-28	8.63	Lower cognitive failure
Distractions	0-30	6.85	Lower cognitive failure
False Triggering	0-28	6.98	Lower cognitive failure

Source: Field Survey (2022)

Overall, the findings of this study show that the majority of participants had lower cognitive failure scores, indicating good cognitive function. Whereas, a small proportion of participants had higher cognitive failure scores, suggesting subjective cognitive difficulties in that group. This suggests that maintaining good cognitive function is crucial to reducing the risk of cognitive decline in individuals with hypertension (Bliss et al., 2021). These findings were in tandem with a study conducted by Frith and Loprinzi (2017) in the United States that revealed adhering to physical exercise guidelines was linked to enhanced cognitive function among individuals with hypertension. Similar to that, another study by Smith et al. (2022) found that individuals with resistant hypertension experienced improved cognitive performance.

Factors such as compliance with the Dietary Approaches to Stop Hypertension (DASH) diet and lower obesity levels were associated with greater changes in tissue oxygenation index, increased flow-mediated dilation, and reduced stroke risk (Smith et al., 2022). Improving and sustaining good cognitive function is essential for achieving positive cognitive outcomes and better control of blood pressure (Bliss et al., 2021).

One plausible reason for the good cognitive function may be environmental factors such as nutrition and lifestyle choices (Hsu & Bai, 2022). Adapting to a healthy lifestyle can reduce the risk of cognitive decline (Jia et al., 2023). A balanced diet is also essential for cognitive health. Certain nutrients, such as omega-3 fatty acids, have been linked to better cognitive function among hypertensive individuals (Dighriri et al., 2022). Additionally, social interaction has been shown to have a beneficiary effect on cognitive function (Czeszumski et al., 2020), with hypertensive individuals who engage in social and group activities exhibiting better cognitive function in later life (Li et al., 2021). Also, sedentary behaviours such as smoking and a lack of physical activity are linked to late-life cognitive decline (Kivipelto et al., 2018). Nonetheless, limiting alcohol consumption and smoking, particularly in hypertension patients, also contributes to lower cognitive decline (WHO, 2019).

Regulated blood pressure can significantly impact cognitive function among hypertensive individuals. High blood pressure can lead to small blood vessel damage in the brain, contributing to cognitive decline (Di Chiara et al., 2022). Maintaining healthy blood pressure levels ensures adequate blood flow to the brain (Song et al., 2020). A study conducted by Streit et al. (2019) revealed that patients undergoing antihypertensive treatment with a systolic blood pressure (SBP) of 130 mm Hg or higher experienced fewer declines in cognitive function compared to those with an SBP below 130 mm Hg. Similarly, a meta-analysis conducted by Power et al. (2013) demonstrated that a 10 mmHg increase in both systolic and diastolic blood pressure significantly raises the risk of cognitive decline. Additionally, Manning et al. (2019) emphasised the importance of promptly and effectively reducing blood pressure in neurological hypertensive emergencies, as failure to do so can lead to substantial

morbidity and mortality. Adopting healthy lifestyle behaviours, such as maintaining a nutritious diet, engaging in regular exercise, managing stress, adhering to medication regimens, and regularly monitoring blood pressure, plays a pivotal role in regulating blood pressure and enhancing cognitive function (Diab et al., 2023).

Also, engaging in physical activity may improve cognitive function in hypertensives. Physical activity significantly impacts brain regions susceptible to cognitive decline (Bherer et al., 2023; Domingos et al., 2021). Regular exercise reduces the risk of all-cause dementia by 28% (Franklin et al., 2022). Adhering to physical activity guidelines for individuals, which recommend 150 minutes of moderate-to-vigorous exercise, decreases the occurrence of cognitive decline among the hypertensive (Wang et al., 2021). By increasing blood flow to the brain, reducing inflammation, and enhancing neuroplasticity, physical activity enhances cognitive abilities (Quigley et al., 2020). This implies that engaging in physical activity can have a positive impact on cognitive function, particularly in individuals with hypertension. Hence, incorporating physical activity into the lives of individuals with hypertension may aid in the maintenance of good cognitive health.

Adherence to antihypertensive therapy may also significantly safeguard cognitive function and lessen the risk of cognitive decline associated with hypertension. By consistently taking prescribed medications, blood pressure levels can be regulated, reducing the risk of hypertensive-induced cognitive decline (Yang et al., 2021). Furthermore, elevated serum bicarbonate levels, which are intended to lower blood pressure, have been independently linked to better global cognitive and executive performance in hypertensive adults (Dobre et al., 2018). Additionally, another study has reported that hypotensive therapy in patients with arterial

hypertension can result in an increase in brain perfusion and improvements in attention, psychomotor speed, and mentation (Ogoh & Tarumi, 2019).

In summary, these findings emphasise the significance of evaluating and monitoring cognitive function in individuals who have hypertension. Cognitive well-being is a critical component of overall health, and preserving cognitive function is vital for maintaining independence and a high quality of life, particularly as an individual's age increases. However, it is important to note that cognitive function can be influenced by various factors, such as level of education, coexisting medical conditions, and lifestyle choices, apart from age. For individuals identified as having significant cognitive decline, healthcare professionals should consider conducting more comprehensive assessments to determine the extent and specific nature of cognitive impairment. Detecting cognitive issues early enables timely interventions and support, which may involve adjusting medications, cognitive rehabilitation, and lifestyle adjustments.

For individuals with lower cognitive failure, maintaining cognitive health should be a priority. Lifestyle factors such as physical activity, a balanced diet, cognitive stimulation, and social engagement can significantly contribute to the preservation of cognitive well-being. Healthcare providers should incorporate cognitive assessments and cognitive health discussions into routine hypertension management to promote overall health and well-being among their patients.

Research Question Three: What is the Level of Quality of Life among People Living with Hypertension in Sunyani Municipality?

The purpose of this research question was to assess the level of quality of life (Qol) among people living with hypertension in Sunyani Municipality. A five-point Likert scale was used to assess QoL. Scores were aggregated into high, moderate,

and low QoLs. A score of 0–33 indicated low QoL, a score of 34–66 indicated moderate QoL, and a score of 67–100 indicated high QoL (Iriawan et al., 2021). Results are presented in Table 7. There was moderate physical and psychological health QoL among the participants, with a mean score of (M = 62.30, SD = 17.31) and (M = 65.66, SD = 15.00), respectively. The participants reported high QoL in terms of social health with a mean score (M = 73.67, SD = 18.14) and moderate QoL in terms of environmental health with a mean (M = 61.82, SD = 17.17). The Skew/SE values for all 4 domains were less than 1.96.

Table 7: Descriptive Summary for Domains of QOL among Respondents of the Study

Domains	Mean	Median	Skewness	S. E	Skew/SE
Physical	62.30±17.31	63.00	.176	.097	0.18
Psychological	65.66±15.00	69.00	-.242	.097	0.24
Social	73.67±18.14	75.00	-.477	.097	0.49
Environmental	61.82±17.17	63.00	-.023	.097	0.02

Source: Field Survey (2022)

The findings of this current study showed a moderate level of QoL in the physical health domain. This suggests that individuals with hypertension in the Sunyani Municipality perceive their physical well-being to be moderately satisfactory. Factors such as blood pressure control, physical symptoms, and overall health status likely influenced this perception. Also, participants in the study reported a moderate level of psychological health-related QoL. This domain encompasses aspects of mental well-being, emotional health, and cognitive functioning. The finding indicates that individuals with hypertension in the municipality may experience some psychological challenges related to their condition, which could impact their overall QoL.

However, participants in this study reported a high level of QoL in terms of the social health domain. This domain assesses factors related to social relationships, support systems, and the ability to engage in social activities. The high score suggests that participants feel well supported and have satisfying social interactions despite their hypertension. Strong social support can be a significant positive factor in their overall QoL. These findings indicated a generally good QoL among people with hypertension. A good QoL is essential to reducing the burden of hypertension and improving hypertension outcomes. Hence, a good QoL implies positive well-being and the achievement of BP targets as well. Blood pressure control, medication adherence, healthy life choices, social support, socioeconomic factors, access to healthcare, and stress management are some of the factors attributed to a good QoL among the hypertensive population (Patil et al., 2023; Uchmanowicz et al., 2018; Xiao et al., 2019).

This was in accordance with existing evidence from the literature, which suggests a significant association between QoL and hypertension. A study conducted in Indonesia reported that individuals with hypertension generally had good QoL in the physical domain (57.1%), psychological domain (57.1%), and environmental domain (51.4%), with the exception of social relationships, which were high (42.9%) (Sawitri et al., 2022). Similarly, another study conducted in Indonesia reported good levels of QoL in both the physical and mental aspects among individuals with hypertension (Pratiwi, 2019). Although these findings are in concordance with the present study, the novelty of this study indicates differences in cultural perspective, which may have major notable attributions as well as variances in research methodologies and design. Notably, this study emphasised data from

different health centres for generalization, which was a limitation to the compared studies, although these studies indicated similar results.

One reason for a good QoL among people with hypertension is their blood control level. According to a study by Lee et al. (2020), individuals with well-controlled blood pressure tend to report a higher self-rated QoL compared to those with uncontrolled hypertension. Similarly, another study by Parikh et al. (2021) found that a significant reduction in both systolic (130.60 ± 4.06 to 124.20 ± 0.60 mmHg) and diastolic (85.62 ± 5.55 to 79.21 ± 0.73 mmHg) blood pressure was associated with improved self-rated QoL in comparison to individuals with uncontrolled hypertension. This suggests that maintaining healthy blood pressure levels positively impacts an individual's QoL. This study indicated obesity, gender, and a lack of social interaction impacted poorer QoL among individuals with uncontrolled hypertension.

This is in accordance with the results of the study, with more than half of the patients having their blood pressure under control (represented by 60.3% having their systolic pressure less than 140 mmHg and 88.7% having their diastolic pressure less than 90 mmHg). These factors are part of the bio-psychological domain of the model, which addresses the overall health status of an individual and the presence of other comorbidities, as well as specific medical factors such as treatment adherence, stage of diagnosis, and other disease-related factors that can affect QoL. According to Ashing-Giwa-CM-HRQoL, disease-related factors play a significant role in affecting the QoL. It emphasises that these factors influence the health-seeking behaviour of individuals, which in turn affects their daily function as well as their overall wellbeing.

Additionally, physical activity may be another reason for the moderate-to-high QoL domain scores. Exercise has shown significant improvements in different domains of QoL, encompassing physical health, psychological well-being, and environmental aspects for hypertensive individuals. One study found that exercise can lead to a significant improvement in the domains of QoL for individuals with hypertension (Song et al., 2021). Studies have demonstrated that regular physical activity positively affects overall well-being, as evidenced by reductions in systolic blood pressure and subsequent improvements in health. Another study by Naci et al. (2019) indicated that vigorous aerobic exercise reduces systolic blood pressure in adults with hypertension through endurance (-8.69), dynamic resistance (-7.23), and a combination of both (-13.51, 5-7 mm Hg), leading to overall health improvement. This is a significant health benefit, as high blood pressure is a key risk factor for other CVDs; reducing systolic blood pressure can contribute to overall health improvement.

The findings align with the study's observations, where a substantial percentage of respondents (70.8%) reported high adherence to exercise, potentially correlating with the observed high QoL as implied by the Ashing-Giwa-CM-HRQoL model. The model underscores the importance of contextual and individual factors in shaping health behaviours. It emphasises how socio-economic conditions and cultural influences can either facilitate or hinder the adoption of healthy behaviours like exercise. That is, access to resources for exercise, such as gym memberships or safe spaces for physical activity or exercise. as well as cultural factors that may shape perceptions about exercise and physical activity, influencing whether individuals engage in these behaviours or not. By recognising the intricate interplay of diverse factors influencing health behaviours, the Ashing-Giwa-CM-HRQoL

model specifically addresses the QoL experienced by individuals, particularly those living with chronic conditions such as hypertension.

Moreover, social support may be another reason for a good QoL. The impact of social support on QoL among individuals with various health conditions, including hypertension and pulmonary hypertension, is evident in studies emphasising its significance. A study showed high QoL in hypertensive patients in social relationships, followed by psychological and physical areas, despite high blood pressure levels (Larrisa et al., 2019). Another study by Shang et al. (2023) reported that higher social support correlated with better physical and psychological QoL in patients with pulmonary hypertension. However, the similarities between these studies emphasise that these studies underscore the universal influence of factors beyond individual health aspects, encompassing socio-ecological and cultural contexts that shape QoL. Ashing-Giwa-CM-HRQoL highlights the pivotal role of factors like marital status and family support in influencing QoL.

Social support aids in managing health, adherence to treatment plans, and coping with illness, as shown in research comparing psychological and social domains between marital statuses. In a study, it was found that the psychological and social domains of QoL were higher in the married group than in the divorced group, although the physical domain was better in the divorced group (Hamedani Salar & Kermansaravi, 2021). This suggests that marital status can impact different aspects of well-being. Additionally, a study by Davari et al. (2019) reinforces the significance of economic well-being in determining overall QoL. According to Ashing-Giwa-CM-HRQoL, socioeconomic status can affect access to healthcare, living conditions, and the ability to manage chronic conditions effectively. The

model underscores the necessity of social support as a crucial determinant of a favourable quality of life (Pedro, 2010).

Furthermore, adherence to treatment plays a pivotal role in determining the QoL for individuals managing hypertension, as evidenced by various studies. A study by Park et al. (2018) revealed that both medication adherence and health literacy have a substantial impact on the health-related QoL of hypertensive patients, with exercise and subjective health exerting a greater influence. Another study also indicated that good medication adherence is associated with a better quality of life, although there may be other variables at play (Marciel et al., 2016). Additionally, maintaining good mental health can also play a role in improving the QoL for individuals with hypertension. These findings resonate with the current study's results. From the current study, high mean scores in medication adherence (31.93), diet (30.48), stimulants (11.06), weight control (6.29), exercise (5.72), and stress relief (9.60) suggest robust adherence behaviours within these categories, implying a good QoL. These findings indicate a strong commitment to health-related practices, potentially contributing to better health outcomes and overall well-being among the individuals studied. However, it is important to note that these factors of adherence are influenced by a person's cultural, social, and healthcare access factors, aligning with Ashing-Giwa's perspective. Ultimately, improving QoL for hypertensive individuals involves not just treating physical symptoms but also addressing health behaviours, environmental influences, and socio-cultural contexts.

In conclusion, this study provides valuable insights into the multifaceted nature of QoL among individuals living with hypertension in the Sunyani Municipality. This underscores the relevance of the interplay of both individual and contextual factors in understanding QoL among persons with hypertension, as

indicated by Ashing-Giwa-CM-HRQoL. While there are areas of moderate QoL, particularly in the domains of physical and psychological health, there is a noteworthy high QoL in terms of social health. Furthermore, environmental health QoL was moderate. These findings emphasise the importance of considering the holistic well-being of individuals with hypertension. Healthcare providers and policymakers in the Sunyani Municipality should acknowledge the significance of social support in enhancing QoL and should consider interventions that address psychological and environmental factors to further improve the overall well-being of this population.

Research Question Four: What is the Association between Treatment Adherence, Cognitive Function and Quality of Life among People Living with Hypertension?

The purpose of the research question was to assess the association between treatment adherence, cognitive function, and QoL among people living with hypertension. To analyse the association between cognitive function and QoL, treatment adherence and QoL, as well as CF and treatment adherence, Spearman's rank correlation was conducted. A Likert scale was used to assess treatment adherence, cognitive function, and QOL levels. The results are illustrated below in Table 8. Test results indicated a negatively weak association between cognitive function (CF) and quality of life (QoL), r (628) = -0.136, P = 0.004. However, among Treatment Adherence (TA) and Quality of Life (QoL), results indicated a positive moderate association, r (628) = 0.283, P = 0.000. Moreover, with the test of association between cognitive function (CF) and treatment adherence (TA), results indicated a negatively weak association (r = -0.184, P = 0.001). In this analysis, cognitive function was represented by cognitive failure.

Table 8: Association between Treatment Adherence, Cognitive Function and Quality of Life

	QoL	TA	CF
Quality of Life (QoL)	1	.283	-.136
Treatment Adherence (TA)	.283	1	-.184**
Cognitive Function (CF)	-.136	-184**	1

Note: **correlation is significant at the .01(two-tailed), Source: Field Survey (2022).

The overall findings found a negatively weak association between cognitive function and QoL. This suggests that as cognitive function decreases, QoL also increases, although the association is weak. Lower cognitive function, even to a limited extent, appears to have a modest but discernible influence on QoL in this population. One possible reason for this association is that individuals with lower cognitive function may struggle with daily activities such as self-care, work, and social interactions, leading to decreased QoL. The study found a potential link between higher cognitive decline and difficulties managing daily tasks in 6% of participants, which could have a detrimental impact on their overall well-being. However, the majority (94%) reported good cognitive function, aligning with the observed high QoL. This indicates the pivotal role of cognitive function in quality of life.

Secondly, the study found a moderately positive association between treatment adherence and QoL. This suggests that individuals who adhere to treatment recommendations may experience better quality of life. This association suggests that adherence to treatment might result in improved health outcomes, subsequently enhancing QoL. That is, individuals with chronic medical conditions who adhere to their treatment plan may experience fewer symptoms and complications, positively impacting their quality of life. This is emphasised in the

results of the present study, with a majority of participants reporting higher adherence (81.6%), potentially contributing to the observed high QoL in the study. This highlights the pivotal role that adherence to treatment plays in enhancing the overall well-being of hypertensive individuals.

The study found a weakly negative association between cognitive function and treatment adherence. This suggests that individuals with lower cognitive function may struggle with adhering to treatment recommendations. One possible reason for this association is that lower cognitive function may make it more difficult for individuals to remember to take medications or follow other treatment recommendations. Additionally, lower cognitive function may impact an individual's ability to understand and follow treatment instructions. Despite a majority of participants (94%) reporting lower cognitive decline, the study observed a remarkably high adherence rate (81.6%). This suggests that, while lower cognitive function might affect treatment adherence, the majority of participants subjectively perceived their cognitive abilities as good, possibly indicating other influential factors impacting adherence.

This study underscores the interconnection among cognitive function, QoL, and treatment adherence in individuals with hypertension. It aligns with a Chinese study demonstrating that consistent adherence to treatment regimens led to enhanced cognitive function and QoL ($\beta = 1.895$; 95% CI = 1.421, 2.368; $P < 0.001$) and QoL ($\beta = 0.605$; 95% CI = 0.295, 0.914; $P < 0.001$) (Song & Doris, 2019). Similarly, another study observed a significant relationship between systolic blood pressure (SBP), physical frailty, and CF, which was influenced by the usage of antihypertensive medication (Klinpudtan et al., 2021).

In addition, the impact of psychosocial variables, including social support, mental health, and emotional well-being, on treatment adherence and QoL may be one of the reasons for these observed associations. One study highlighted the significant link between modifiable psychosocial factors, particularly illness perceptions, and HRQoL in chronically ill individuals (Van Wilder et al., 2022). Another study suggested that higher social support, good patient-physician relationships, better mental health, more bodily pain, and unemployment predict higher medication adherence among individuals with CVDs (Al-Noumani et al., 2023).

In summary, this study highlights the interconnectedness of these three factors in the lives of individuals with hypertension. Cognitive function, treatment adherence, and QoL are interdependent; hence, understanding these associations is crucial for holistic care among persons with hypertension in Sunyani municipality. Healthcare providers should consider the cognitive and psychosocial aspects of their hypertensive patients when developing programmes for treatment. Targeted interventions that address cognitive function and provide support for adherence may lead to improved QoL outcomes.

Research Question Five: What Factors influence Treatment Adherence among People Living with Hypertension in Sunyani Municipality?

The purpose of this reaearch question was to assess the factors that influence treatment adherence among people living with hypertension in Sunyani Municipality. To answer this research question, binary logistic regression was conducted to find which predictor variables (age, sex, educational level, BMI, marital status, employment status, alcohol consumption, exercise, and bodyweight control) influenced treatment adherence (a dependent variable) among persons living

with hypertension in Sunyani Municipality. The results indicated that the overall Binary logistic regression model significantly predicted treatment adherence among persons living with hypertension in Sunyani Municipality (-2LogL = 126.588, X_2 = 73.620, P = 0.000). The Nagelkerke R^2 of 0.61 showed that the independent variables explained 61% of the variance in factors affecting treatment adherence in the municipality.

Also from Table 9, statistically significant variations were found in the odds of factors affecting treatment adherence within age and educational level. Results indicated that older age was associated with adherence compared to younger age (AOR = 41.864, 95% CI = 0.027–0.062, P = 0.001). Each unit increase in age was associated with a 4.1% increase in the odds of treatment adherence.

Also, sex showed statistical significance; females had higher odds of treatment adherence by 1.137 than males (AOR = 1.137e-03, 95% CI = 3.503-500.224, P = 0.003). Also, those who consumed alcohol had 87.0% lower odds of adhering to treatment compared to those who did not (AOR = 1.7076e-03, 95% CI = 1.644–177.296, P = 0.048). Patients who were engaging in less regular exercise had lower odds of adherence compared to those engaging in regular exercise. As exercise decreased, so did adherence (AOR = 1.5238e-04, 95% CI = 1.901–122.083, P = 0.013). Higher body weight control was linked to higher odds of adherence (AOR=1.0866e-03, 95% CI=-1.598-73.868, P=0.017). However, no statistically significant variations were found in the odds of factors affecting treatment adherence with educational level (AOR=1.098e-04, 95%, CI=0.479-27.6, P=0.185), marital status (AOR=1.242e-04, 95%, CI=0.151-10.168, P=0.345), BMI (AOR=0.973, 95%, CI=0.823-1.150, P=0.679), and employment (AOR=1.028, 95%, CI=0.116-9.1, P=0.185).

Table 9: Parameter Estimates for Regression Analysis for Factors affecting Treatment Adherence

	Beta	Adjusted Odds Ratio	P-Values	Std Error	Wald	DF	Lower CI	Upper CI
Constant	-3.679	5.71e-07	0.231	2.505	1.434	1	-20.495	-10.864
Age	0.115	41.864	0 .001	0.035	10.589	1	1.051	1.230
Sex	-3.101	1.137e-03	0.003	1.053	8.664	1	3.503	500.224
Level of Education	-1.325	1.098e-04	0.185	0.999	1.758	1	1.644	177.296
Alcohol Consumption	-2.202	1.7076e-03	0.048	1.116	3.898	1	1.644	177.296
Exercise	-2.427	1.5238e-	0.013	.982	6.104	1	1.901	122.083
Body Weight	-2.297	1.0866e-03	0.017	0.958	5.745	1	1.598	73.868
Marital Status	-0.850	1.242-04	0.345	0.901	0.892	1	0.151	10.168
Employment Status	0.353	1.028	9.1	1.067	0.110	1	0.823	0.116
BMI	-0.032	0.973	0.679	0.077	0.171	1	0.823	1.150

Source: Field Survey (2022)

Overall, the study found age, sex, alcohol consumption, exercise, and bodyweight control to be significant predictors of treatment adherence among persons living with hypertension in Sunyani Municipality. These findings suggest that the identified factors may affect the motivation, awareness, and ability of the patients to follow their prescribed medication and lifestyle changes. Hence, health care providers should consider these factors when designing and implementing interventions to improve the adherence to and outcomes of hypertension. These findings align with a study conducted in Korea that reported that age, gender, smoking, alcohol consumption, and physical activity significantly influenced treatment adherence (Gil, 2020). Similarly, another study by Thuong et al. (2022) indicated that sex, alcohol consumption, age, exercise, and medication adherence were significant predictors of treatment adherence.

Age is a significant predictor of treatment adherence among people with hypertension. The findings showed that age was a significant predictor of treatment adherence among the participants. The older the participants were, the more likely they were to adhere to the prescribed treatment regimen. This means that for every

one-year increase in age, the likelihood of having moderate adherence increased by 4.4%. Research suggests that as an individual's age increases, they become more conscientious about their health, resulting in improved adherence to hypertension treatment. According to Burnier et al. (2020), adherence among individuals aged 65 to 80 years is better compared to younger hypertensive adults (<50 years). Additionally, another study found that older hypertensive patients aged 55 and above were 10 times more likely to adhere to antihypertensive treatment compared to young adults aged 18–39 (Teshome et al., 2017). A cross-sectional study of 299 patients with chronic conditions in primary care found that older age was associated with higher adherence to medication, with an adjusted odds ratio of 1.31 per 10-year increment (Fernandez-Lazaro et al., 2019). These studies indicate that older individuals may have higher odds of falling into the high treatment adherence category compared to the no treatment adherence category, depending on the context and measurement of adherence.

Furthermore, sex is another factor that influences treatment adherence among individuals with hypertension. Specifically, females exhibit higher adherence rates to hypertension treatment in comparison to males in this study. This aligns with the literature, as a study by Tibebu et al. (2017) found that female hypertensive patients are twice as likely to adhere to medication as compared to their male counterparts. Similarly, another study reported that the adherence rate was 69% higher in females compared to males (Lefort et al., 2018). In contrast, a meta-analysis of 129 studies found that men consistently demonstrated higher adherence to antihypertensive medication compared to women, with an overall odds ratio of 1.23 (95% CI: 1.12-1.35) (Hajjar et al., 2015). According to Goussous et al. (2015), there is no statistically significant association between sex and treatment among hypertensives.

However, this current study reported a similar trend, as females have a 3.064 times greater likelihood of higher adherence compared to males. These differences in adherence could be influenced by factors such as age, gender, comorbidities, patients' knowledge about the disease, and the number of medications (Mzoughi et al., 2022).

Again, alcohol consumption is another predictor of treatment adherence among people with hypertension. The current study suggests lower treatment adherence among patients with higher alcohol consumption compared to those who did not. This finding aligns with existing research suggesting a negative association between alcohol consumption and medication adherence in hypertensives. According to Kwon et al. (2018), heavy alcohol drinkers with hypertension had significantly lower medication adherence compared to moderate drinkers and non-drinkers. A similar study reported that patients who were not limiting alcohol were 89% less likely to adhere to antihypertensive therapy (Asgedom et al., 2018). This may be attributed to factors such as alcohol's impact on self-management, physiological interactions, commodities, and psychosocial factors (Lemp et al., 2022).

Additionally, physical activity is one of the factors that influences treatment adherence among people with hypertension. The findings of the current study suggest that hypertensive individuals who engage in fewer physical activities are less likely to have higher treatment adherence. This aligns with existing research suggesting a positive association between regular exercise and treatment adherence among hypertensives. One study indicated that physically inactive hypertension patients were less likely to adhere to their antihypertensive treatments (AOR = 0.029, 95% CI: 0.004-0.215) (Berisa et al., 2018). Similar to that, another study

found that low levels of physical activity were associated with decreased medication adherence in individuals with hypertension (Choi et al., 2017). Another study indicated that individuals who exercised frequently were six times more likely to adhere to their treatment (AOR = 5.88, 95% CI: 2.49–13.89) (Gebreyohannes et al., 2019). This finding may be attributed to improved overall health, enhanced self-management skills, and improved cognitive function (Lopes et al., 2021; Xie et al., 2020).

BMI is a predictor of adherence to a healthy lifestyle among hypertensive patients (Mohebbi et al., 2021). It underscores the importance of weight management and serves as a practical and measurable goal that patients can work toward as part of their overall hypertension management and cardiovascular health improvement (Wadden et al., 2020). While research findings suggest a complex relationship between body weight and medication adherence, the findings of this current study suggest a negative association where higher weight is associated with lower adherence, differing from the more common observation of positive associations reported in many studies.

However, some research aligns with the result of the current study, suggesting additional factors may be at play. A study in Korea reported that hypertensive people had a lower dietary adherence score than normotensive people and that dietary adherence was inversely associated with BMI (Shim et al., 2022). One study suggests that patients who are obese are 1.7 times less likely to adhere to hypertensive treatment as compared to those who are not (Abass et al., 2020). Also, a higher BMI was associated with non-adherence to a healthy lifestyle, indicating that obese hypertensive patients are less likely to make significant changes in their diet or physical activity (Kimani et al., 2019). These findings suggest that body

weight may be a barrier to following the guidelines for the prevention and treatment of hypertension. However, other factors such as knowledge, self-efficacy, perceived risk, and depression may also influence medication and dietary adherence among hypertensive patients (Ferreira et al., 2024).

Overall, the study's findings suggest that demographic factors such as educational level, BMI, employment, and marital status may not be the primary factors of treatment adherence among individuals living with hypertension in the Sunyani Municipality. However, other factors, such as age, sex, alcohol consumption, exercise, and bodyweight control, may play more critical roles in influencing treatment adherence in this specific population. These findings highlight the importance of non-demographic factors and specific health behaviours such as alcohol consumption, exercise, and bodyweight control in influencing treatment adherence and, consequently, HRQoL in individuals with hypertension.

This emphasises the multidimensional nature of HRQoL in the Ashing-Giwa-CM-HRQoL framework, as it considers factors beyond demographics like clinical markers, mental health, and social determinants of health. Hence, informing the development of a comprehensive HRQoL intervention that addresses these factors within the context of hypertension further research may be needed to explore these identified factors and their impact on treatment adherence in more detail.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The purpose of this study was to investigate the association between treatment adherence, cognitive function, and QoL among people with hypertension in selected health centres in Sunyani Municipality. The study's summary, findings, conclusions, and recommendations are the primary focus of this chapter.

Summary

Globally, hypertension stands as a leading cause of mortality, contributing to fatal outcomes, illnesses, and cardiovascular events including heart attacks, strokes, cardiac failure, and renal failure. The impact of hypertension stems from a mix of modifiable and non-modifiable risk factors. Behaviors such as obesity, inactivity, smoking, alcohol consumption, and salt intake fall into the modifiable category, while gender, genetics, and family history are considered non-modifiable. Managing hypertension is an ongoing requirement, demanding both pharmaceutical and non-pharmacological interventions for effective control. Studies have underscored the repercussions of poor adherence, revealing heightened complications and an increased risk of cardiovascular events, thereby impacting overall clinical outcomes.

Treatment adherence, a critical component of blood pressure control, is influenced by a myriad of factors. Knowledge, socio-demographic elements, beliefs, patient-provider relationships, support, comorbidities, and polypharmacy all play roles in either facilitating or hindering adherence. Predictors of treatment adherence in Ghana include income, education level and duration of diagnosis, pill burden, and comorbidities. Cultural and societal factors, encompassing religion, spiritual beliefs, community and social support, and socioeconomic status, exert influence by shaping perceptions, attitudes, and behaviours related to hypertension management.

Cognitive function emerges as a substantial risk factor, impacting cardiovascular health, life expectancy, quality of life, hospitalisation rates, and healthcare costs. Globally, high blood pressure is recognised as a notable risk factor for cognitive decline, Alzheimer's disorder, and dementia due to vascular disease. Cognitive functions, including learning, attention, memory, and executive functions facilitating problem solving, planning, and decision-making, are adversely affected by risk factors associated with high blood pressure. Poor adherence to hypertension treatment, encompassing challenges in medication adherence, diet, and exercise, is linked to lower cognitive function and a diminished Qol. Despite the global relevance of this issue, there is a dearth of studies examining cognitive function in the context of hypertension in Ghana.

To address the burden of hypertension and enhance positive outcomes in hypertension control, it is imperative to consider quality of life (QoL). Hypertension significantly impacts an individual's physical, vital, health, and psychosocial dimensions. Non-communicable diseases, with hypertension at the forefront, contribute to a substantial portion of global deaths, particularly affecting life expectancy in low- and middle-income countries, notably in Sub-Saharan Africa. The Ghanaian Health Information Management System identifies hypertension and cardiovascular diseases as leading causes of death. Adherence to treatment emerges as a cornerstone for effective disease management, influencing cognitive function and overall quality of life. Conversely, poor adherence leads to deteriorating health outcomes, cognitive decline, and diminished QoL. The research gap in Ghana regarding hypertension treatment adherence, cognitive function, and quality of life necessitates this study, aiming to unravel the associations among these factors in Sunyani Municipality.

The research employed an 88-item questionnaire to assess patients' treatment adherence, cognitive function, and quality of life (QoL). This comprehensive tool also gauged various demographic factors, including sex, age, religion, education, marital and employment status, duration of hypertension treatment, and body mass index (BMI). To ensure the questionnaire's robustness, it underwent pre-testing with 63 patients, yielding favourable reliability coefficients. The Cronbach alpha reliability coefficient ranged from 0.679 to 0.843 for treatment adherence and cognitive function, while the McDonald omega test generated a coefficient of 0.611 for QoL. Data was collected from Bono Regional Hospital, Sunyani Municipal Hospital, and Seventh-day Adventist (SDA) Hospital.

The first two questions was analysed with frequencies and percentages. Concurrently, The third the question of the study assessed using the mean and standard deviation. The fourth question utilised Spearman rank correlation for examination. Finally, the study employed ordinal logistic regression to examine the factors influencing treatment adherence among patients with hypertension at the selected hospitals.

Key Findings:

1. The study found high adherence to hypertension treatment in Sunyani Municipality. However, a noteworthy proportion demonstrated suboptimal adherence (moderate or low).
2. The study found that the majority of hypertensive patients (94%) had good cognitive function, while a few (6%) reported subjective difficulties. This suggests preserved cognitive abilities despite the condition.
3. Participants reported moderate QoL across physical, psychological, and environmental domains, implying average well-being in these aspects.

Notably, the social domain exhibited high QoL scores, indicative of strong social relationships and support networks.

4. The study found that cognitive function (cognitive failures) and QoL were strongly and negatively related. On the other hand, treatment adherence and QoL were positively linked. However, the relationship between cognitive function and treatment adherence was weak.
5. Age, sex, alcohol, exercise, and weight control were found to be predictors of treatment adherence. As age increased, the odds of treatment adherence increased. With regards to sex, females had higher odds of treatment adherence than males. Also patients engaging in less regular exercise had lower odds of adherence compared to those engaging in regular exercise, Higher body weight control was lnked to higher odds of adherence,

Conclusion

The following conclusions have been drawn based on the findings:

1. Although the majority of patients showed high adherence, this suggests that participants are complying with the recommendations of the medical practitioners. This, in the long run, implies a positive response to treatment. However, a significant minority did not achieve the recommended level of adherence.
2. It can be concluded that hypertension may not primarily impair cognitive abilities in the majority of cases, as most patients displayed good cognitive function, with only a small minority reporting subjective difficulties. However, this may affect some aspects of self-perception and awareness of cognitive health.

3. It can be concluded that hypertension management extends beyond physical health, which implies that social support, addressing psychological and environmental factors are also crucial for patients' QoL and well-being.
4. It can be concluded that improving cognitive function and treatment adherence can enhance the QoL of hypertensive patients. However, cognitive function may not directly affect treatment adherence.
5. It can be concluded that treatment adherence among hypertensive patients is dependent on patients' age, sex, alcohol, exercise, and weight control. This highlights the importance of socio-demographic factors and specific health behaviours (alcohol consumption, exercise, and bodyweight control) in influencing treatment adherence and hypertension management.

Recommendations

The following are suggested as recommendations for this study:

1. It is recommended to continue supporting and encouraging the high adherence observed among the majority of patients by reinforcing positive treatment behaviours. This can be achieved through regular follow-ups, positive reinforcement, and education on the benefits of sustained treatment adherence, to ensure continued positive health outcomes and enhance overall management of hypertension.
2. It is recommended to continue promoting healthy lifestyle practices, such as regular physical activity, balanced diet, and medication adherence, to maintain a good cognitive function in hypertensive patients**.**
3. It is recommended to focus on strengthening the physical, psychological, and environmental aspects of QoL for hypertensive patients through targeted interventions, such as stress management, lifestyle modifications, and

environmental improvements. At the same time, the positive aspects of the social domain should be maintained and further supported.

4. Hypertension management should consider cognitive and psychological factors, which affect QoL and require more research. Longitudinal studies must be conducted to further understand the association between cognitive function, adherence, and QoL among people with hypertension.
5. Hypertension management programmes must consider key socio-demographic factors such as age, sex, and health behaviours like exercise, and weight control for better outcomes.

Recommendations for Further Studies:

1. Further studies can consider widening the sample pool to include individuals from various demographics and regions in order to establish generalizability of the results beyond Sunyani health centers.
2. Other studies can employ randomized sampling techniques to minimize selection bias and increase the likelihood of a sample that accurately represents the target population, instead of purposive sampling.
3. Other studies may consider conducting a longitudinal study to track changes in variables over time and establish causal relationship to provide a more comprehensive understanding of the dynamic nature of hypertension management and its impact on cognitive function and QoL.
4. Further studies may employ mixed method approach which combines quantitative data collection methods with qualitative approaches to gain deeper insights into participants' experiences, perceptions and behaviours related to hypertension management.

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APPENDIX A

UNIVERSITY OF CAPE COAST

COLLEGE OF EDUCATION STUDIES

DEPARTMENT OF HEALTH, PHYSICAL EDUCATION AND RECREATION

QUESTIONNAIRE FOR FACILITY BASED DATA

Dear Respondent

I am Serwaa Carolyn O'driscoll, an MPHIL (Health Education) student at the Department of HPER, UCC. I am contacting you to participate in this academic research study: **"Treatment Adherence, Cognitive Function and Quality of Life among People Living with Hypertension at selected Health Centers in Sunyani Municipality."** This research aims to investigate the association between treatment adherence, cognitive function, and QoL among people living with hypertension in selected health centers in Sunyani Municipality. Your participation in this study requires that you complete an 87 -items survey. This may take between 30 to 45 minutes of your time. You were selected among a poll of participants and your responses will be analysed as a group. Your participation in this study is entirely voluntary. You are free to discontinue participating, if you find the need to. You are assured this study poses no harm to you, except for your time. By participating in this study, you are assisting in the development of reliable strategies to improve treatment adherence and cognitive function and quality of life of people living with hypertension in Ghana. No personal information that will identify you is required.

Signature……...

Date……..

QUESTIONNAIRE

Height……..

Weight…….. **Location……**

Section A: Economic and Demographic Characteristics						
1.	Age					
2.	Sex	1. Male 2. Female				
3.	BP Value					
4.	Employment status	1. Not employed 2. Employed 3. Retired				
5.	Educational Level	1. No formal education 2. Basic 3. Secondary 4. Tertiary				
6.	Marital Status	1. Single 2. Married 3. Divorced 4. Widowed				
7.	Religion	1. Christian 2. Muslim 3. Traditional 4. Others				
8.	How long(years have you been on hypertension treatment)	……..				
	Section B: Treatment Adherence **Instructions:** Read the statements below carefully and then indicate [√] in the box corresponding to whether you comply with each of the following statements below.					
	Item		**All of the time**	**Most of the time**	**Some of the time**	**Never**
9.	Have you complied with the medical doctor's instructions for taking your medications daily?					
10.	Have you complied with the dosages of the medications as indicated by the medical doctor to be consumed daily?					
11.	Have you complied with the schedule indicated by the, medical doctor for the prescribed medications?					
12.	Have you ever stopped taking prescribed medications?					

13.	Have you ever increased or decreased the dosages of your medication without the recommendations of your medical doctor?				
14.	Have you continued taking the prescribed medications even if you don't the hypertension symptoms?				
15.	Have you ever forgotten to take prescribed medications?				
16.	Have you ever stopped taking prescribed medications when you felt that the symptoms have improved?				
17.	Have you ever kept using the medications in spite of feeling that the symptoms are worsened?				
18.	Have you complied with low salt diet?				
19.	Have you complied with low fat diet?				
20.	Have you complied with low cholesterol diet?				
21.	Have you reduced the intake of sugar and sweets?				
22.	Have you increased consumption of roughage?				
23.	Have you increased the intake of fresh vegetables?				
24.	Have you increased intake of fresh fruits?				
25.	Have you increased consumption of grain?				
26.	Have you increased the intake of low fat dairy products?				
27.	Have you reduced the intake of coffee?				
28.	Have you limited consumption of alcoholic beverages?				
29.	Have you stopped smoking?				
30.	Have you performed physical activity at least 5 times per week?				
31.	When performing an exercise, have you dedicated at least 30 minutes to it?				
32.	Have you been able to control the amount of food consumed?				
33.	Have you been able to control your body weight?				
34.	Have you set aside some time to relax daily?				
35.	Have you adopted forms to relieve stress or tension?				
36.	Have you controlled yourself emotionally when faced with unforeseen events?				

	Section C: Quality of Life (QOL) **Instructions**: Please respond to the following statements by marking [√] the column that most accurately represents your opinion of the extent to which you agree or disagree to these statements.					
37.	How would you rate your quality of life?	**Very poor**	**Poor**	**Neither poor nor good**	**Good**	**Very googd**
38.	How satisfied are you with your health?	**Very unsatisfying**	**Unsatisfying**	**Neither satisfying and unsatisfying**	**satisfying**	**Very satisfying**
The following questions ask about how much you have experienced certain things in the last four weeks.						
		Not at all	**A little**	**A moderate amount**	**Very much**	**An extreme amount**
39.	To what extent do you feel that physical pain prevents you from doing what you need to do					
40.	How much do you need any medical treatment to function in your daily life?					
41.	How much do you enjoy life?					
42.	What extent do you feel your life to be meaningful?					
		Not at all	**A little**	**A moderate amount**	**Very much**	**An extreme amount**
43.	How well are you able to concentrate?					
44.	How safe do you feel in your daily life?					

45.	How healthy is your physical environment?					
The following questions ask about how completely you experience or were able to do certain things in the last four weeks						
		Not at all	**A little**	**Moderately**	**Mostly**	**Completely**
46.	Do you have enough energy for everyday life?					
47.	Are you able to accept your bodily appearance?					
48.	Have you enough money to meet your needs?					
49.	How available to you is the information that you need in your day-to-day life?					
50.	To what extent do you have the opportunity for leisure activities?					
		Very poor	**Poor**	**Neither poor or good**	**good**	**Very good**
51.	How well are you able to get around?					
		Very dissatisfied	**Dissatisfied**	**Neither dissatisfied or**	**satisfied**	**Very satisfied**

				satisfied		
52.	How satisfied are you with your sleep?					
53.	How satisfied are you with your ability to perform your daily living activities?					
54.	How satisfied are you with your capacity for work?					
55.	How satisfied are you with yourself?					
56.	How satisfied are you with your personal relationships?					
57.	How satisfied are you with your sex life?					
58	How satisfied are you with the support you get from your friends?					
59.	How satisfied are you with the conditions of your place of living?					

60.	How satisfied are you with your access to health services?					
61	How satisfied are you with your transport?					
		Never	**Seldom**	**Quite often**	**Very often**	**Always**
62.	How often do you experience negative feelings emotions?					

	Section D: Cognitive Function—Cognitive Failure Questionnaire (CFQ) (Adapted from Broadbent, Cooper, FitzGerald, & Parkes, 1982). Instructions: The following questions are about minor mistakes which everyone makes from time to time, but some of which happen more often than others. We want to know how often these things have happened to you in the past 6 months. Please mark [√] the column that best reflects your response to each of the following statements.					
		Very often	**Quiet often**	**Occasionally**	**Very rarely**	**Never**
63.	Do you read something and find you haven't been thinking about it and must read it again?					
64	Do you find you forget why you went from one part of the house to the other?					
65.	Do you fail to notice signposts on the road?					
66.	Do you find you confuse right and left when giving directions?					
67.	Do you bump into people?					
68.	Do you find you forget whether you've turned off a light or a fire or locked the door?					
69.	Do you fail to listen to people's names when you are meeting them?					
70.	Do you say something and realize afterwards that it might be taken as insulting?					
71.	Do you fail to hear people speaking to you when you are doing something else?					
72.	Do you lose your temper and regret it?					
73.	Do you leave important letters unanswered for days?					
74	Do you find you forget which way to turn on a road you know well but rarely use?					
75	Do you fail to see what you want in a supermarket (although it's there)?					
76	Do you find yourself suddenly wondering whether you've used a word correctly?					
77	Do you have trouble making up your mind?					
78	Do you find you forget appointments?					
79	Do you forget where you put something like a newspaper or a book?					
80	Do you find you accidentally throw away the thing you want and keep what you meant to throw away – as in the example of throwing					

	away the matchbox and putting the used match in your pocket?					
81	Do you daydream when you ought to be listening to something?					
82	Do you find you forget people's names?					
83	Do you start doing one thing at home and get distracted into doing something else (unintentionally)?					
84	Do you find you can't quite remember something although it's "on the tip of your tongue"?					
85	Do you find you forget what you came to the shops to buy?					
86	Do you drop things?					
87	Do you find you can't think of anything to say?					