KNOWLEDGE, ATTITUDE, PRACTICES, AND KNOWLEDGE RETENTION TOWARDS HYPERTENSION AMONG CAREGIVERS OF HYPERTENSIVE PATIENTS IN NENO, MALAWI: A RURAL SETTING

CHIKONDI MALUWA

**MASTER OF SCIENCE
IN HEALTH SCIENCES RESEARCH**

**CHIANG MAI UNIVERSITY
JUNE 2024**

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CHIKONDI MALUWA

A THESIS SUBMITTED TO CHIANG MAI UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN HEALTH SCIENCES RESEARCH

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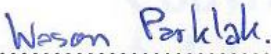
CHIKONDI MALUWA

THIS THESIS HAS BEEN APPROVED TO BE A PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE
IN HEALTH SCIENCES RESEARCH

Examination Committee:

…………………………………Chairman
(Assoc. Prof. Dr. Narongsak Noosorn)

…………………………………Member
(Asst. Prof. Dr. Kanokwan Kulprachakarn)

…………………………………Member
(Dr. Wason Parklak)

…………………………………Member
(Dr. Hataichanok Chuljerm)

Advisory Commitee:

…………………………………Advisor
(Asst. Prof. Dr. Kanokwan Kulprachakarn)

…………………………………Co-advisor
(Dr. Wason Parklak)

…………………………………Co-advisor
(Dr. Hataichanok Chuljerm)

19 June 2024

b

Dear Assistant Professor Dr. Kanokwan Kulprachakarn, Family, and Friends,

I deeply appreciate your unwavering support and understanding. Your assistance has been invaluable in bolstering my strength and fostering my success. You have empowered me with the courage to persevere, even during moments when I was tempted to surrender.

c

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patience, unwavering support, moral encouragement, and prayers throughout my master's program and beyond. Finally, I thank God almighty for His grace that has seen me through. It is not by my own capabilities but through His unconditional love.

Chikondi Maluwa

e

หัวข้อวิทยานิพนธ์	ความรู้ ทัศนคติ การปฏิบัติ และการเก็บรักษาความรู้เกี่ยวกับโรคความดันโลหิตสูงของผู้ดูแลผู้ป่วยโรคความดันโลหิตสูงในเนโน ประเทศมาลาวี บริเวณชนบท
ผู้เขียน	นายชิคอนดิ มาลูวา
ปริญญา	วิทยาศาสตรมหาบัณฑิต (การวิจัยวิทยาศาสตร์สุขภาพ)
คณะกรรมการที่ปรึกษา	ผศ. ดร. กนกวรรณ กุลประชากานต์ อาจารย์ที่ปรึกษาหลัก
	ดร. วสันต์ ภาคลักษณ์ อาจารย์ที่ปรึกษาร่วม
	อ.ดร. หทัยชนก จุลเจิม อาจารย์ที่ปรึกษาร่วม

บทคัดย่อ

โรคความดันโลหิตสูงซึ่งเป็นปัญหาด้านสาธารณสุขที่สำคัญ เป็นปัจจัยเสี่ยงของการเกิดโรคหัวใจและหลอดเลือด ผู้ดูแลเป็นบุคคลสำคัญในการจัดการโรคความดันโลหิตสูงโดยการให้การสนับสนุนผู้ป่วยในการรับประทานยาและตรวจวัดความดันโลหิต การศึกษานี้ได้ทำการตรวจสอบความรู้ ทัศนคติ และการปฏิบัติของผู้ดูแล (KAP) และปัจจัยกำหนดของความรู้ ทัศนคติ และการปฏิบัติของผู้ดูแลต่อโรคความดันโลหิตสูงและการเก็บรักษาความรู้ของผู้ดูแลหลังการให้สุขศึกษา

ผู้วิจัยทำการศึกษาไปข้างหน้าในเมืองนีโน ประเทศมาลาวี ซึ่งเป็นพื้นที่ชนบท ผู้ดูแลผู้ป่วยโรคความดันโลหิตสูง จำนวน 422 คน จากคลินิกดูแลผู้ป่วยเรื้อรังแบบบูรณาการ (IC3) ได้ลงทะเบียนเข้าร่วมในการศึกษานี้ แบบสอบถามแบบมีโครงสร้างถูกใช้เพื่อเก็บรวบรวมข้อมูลพื้นฐาน หลังได้รับข้อมูลสุขศึกษา และข้อมูลในสัปดาห์ที่หก โดยใช้โปรแกรม SPSS V 22.0 ในการคำนวณคะแนน KAP สถิติเชิงพรรณนา ผู้วิจัยเปรียบเทียบการเปลี่ยนแปลงคะแนนพื้นฐานในด้านความรู้ ทัศนคติ และการปฏิบัติ ความสัมพันธ์ระหว่าง KAP และระหว่าง KAP กับลักษณะทางประชากรศาสตร์ทางสังคมโดยใช้การทดสอบ Wilcoxon signed-rank ความสัมพันธ์ของ Pearson และการทดสอบ t-test อิสระ ตามลำดับ

ในบรรดาผู้ดูแล จำนวน 422 คนที่เข้าร่วมการศึกษา จำนวน 248 คน (58.8%) มาจากคลินิก IC3 ของโรงพยาบาลชุมชนลิซุงวิ (Lisungwi) จำนวนและ 174 คน (41.2%) มาจากโรงพยาบาลเขตนีโน 267 คน

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(63.2%) เป็นผู้หญิง โดยมีอายุเฉลี่ย 44.94 ปี ที่พื้นฐาน คะแนนความรู้ ทัศนคติ และการปฏิบัติมีค่าเฉลี่ย และส่วนเบี่ยงเบนมาตรฐานคือ 9.50 (38.0%) (SD=1.92), 16.76 (93.1%) (SD=1.31) และ 25.24 (78.9%) (SD=3.10) ตามลำดับ พบความสัมพันธ์เชิงบวกที่สำคัญระหว่างความรู้และการปฏิบัติ (r=+0.252; p<0.001) และความรู้และทัศนคติ (r=+0.255; p<0.001) แต่ไม่มีความสัมพันธ์อย่างมีนัยสำคัญระหว่าง ทัศนคติและการปฏิบัติ (r=+0.0.64; p=0.190) อายุมีความสัมพันธ์อย่างมากกับทัศนคติ (r=+0.233; p<0.001) แต่ไม่ใช่กับความรู้ (r=+0.034; p=0.490) หรือการปฏิบัติ (r=+0.043; p=0.382) ในการประเมิน พื้นฐาน คะแนนความรู้เฉลี่ยพื้นฐานคือ 9.50 (38.0%) และเพิ่มขึ้นเป็น 21.08 (84.3%); p= <0.001 ทันที หลังจากได้รับสุขศึกษา และลดลง 2.1% เหลือ 20.54 (82.2%); p=0.000 ทันทีในสัปดาห์ที่หกหลังได้รับ สุขศึกษา ทัศนคติดีขึ้นจาก 16.76 (93.1%) ที่พื้นฐานเป็น 17.74 (98.6%) ที่สัปดาห์ที่หก ในทำนองเดียวกัน การปฏิบัติคะแนนเพิ่มขึ้นจาก 25.24 (78.9%) ที่พื้นฐานเป็น 27.42 (85.7%) ในสัปดาห์ที่หก มี ความสัมพันธ์เชิงบวกระหว่าง KAP ในขณะที่อายุมีความสัมพันธ์เชิงลบกับความรู้ (r=-0.146; p=0.003) มี ความแตกต่างอย่างมีนัยสำคัญระหว่างระดับการศึกษาที่แตกต่างกันเกี่ยวกับการเก็บรักษาความรู้ p=0.009 ในการประเมินสัปดาห์ที่หก

ผู้ดูแลผู้ป่วยโรคความดันโลหิตสูงแสดงความรู้และการปฏิบัติที่ไม่ดีพร้อมกับทัศนคติเชิงบวกต่อโรคที่ เป็นพื้นฐาน มีการเก็บรักษาความรู้ในเชิงบวกและดีในกลุ่มผู้ดูแลผู้ป่วยโรคความดันโลหิตสูงหลังการให้ สุขศึกษาในสัปดาห์ที่หก ด้วยความรู้ที่ดีขึ้นและความสามารถในการรักษาความรู้ไว้ส่งผลให้ทัศนคติและ การปฏิบัติดีขึ้น ผู้ดูแลจึงเป็นรากฐานที่สำคัญสำหรับการดูแลผู้ป่วยโรคความดันโลหิตสูงอย่างต่อเนื่อง และปรับปรุงการดูแลผู้ป่วยโรคความดันโลหิตสูงให้ดีขึ้น

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Thesis Title	Knowledge, Attitudes, Practices, and Knowledge Retention Towards Hypertension Among Caregivers of Hypertensive Patients in Neno, Malawi: A Rural Setting
Author	Mr. Chikondi Maluwa
Degree	Master of Science (Health Sciences Research)
Advisory Committee	Asst. Prof. Dr. Kanokwan Kulprachakarn Advisor
	Dr. Wason Parklak Co-advisor
	Dr. Hataichanok Chuljerm Co-advisor

ABSTRACT

Hypertension, a major public health concern, is a leading risk factor for cardiovascular diseases. Caregivers are essential for managing hypertension by supporting patients in medication adherence and blood pressure monitoring. This study examined caregivers' knowledge, attitude, and practices (KAP) and the determinants of KAP towards hypertension and caregivers' knowledge retention after health education.

The authors conducted a prospective cohort study in Neno, Malawi, a rural setting. 422 caregivers were enrolled from the Integrated Chronic Care Clinic (IC3). A structured questionnaire was used to collect baseline, post-health education, and week six data. Using SPSS V 22.0, we determined KAP scores, descriptive statistics. The authors compared changes from baseline in mean knowledge, attitude, and practices (KAP) scores, correlation between KAP and between KAP and social demographic characteristics using Wilcoxon signed-rank test, Pearson correlation, and independent t-test respectively.

Among the 422 caregivers who participated in the study, 248 (58.8%) were from Lisungwi Community Hospital IC3 clinic and 174 people (41.2%) from Nino District Hospital IC3 clinic, 267 (63.2%) were females, and had a mean age of 44.94 years. At baseline, the scores of knowledge, attitude, and practices had respective means and standard deviations of 9.50

(38.0%) (SD=1.92), 16.76 (93.1%) (SD=1.31), and 25.24 (78.9%) (SD=3.10). Strong positive correlations were found between knowledge and practice (r=+0.252; p<0.001) and knowledge and attitude (r=+0.255; p<0.001). But there was no significant relationship between attitude and practice (r=+0.0.64; p=0.190). Age was strongly associated with attitude (r=+0.233; p<0.001) but not with knowledge (r=+0.034; p=0.490) or practice (r=+0.043; p=0.382) at baseline assessment. The baseline mean knowledge score was 9.50 (38.0%) and rose to 21.08 (84.3%); p= <0.001 immediate post-health education and a 2.1% decrease to 20.54 (82.2%); p= <0.001 at week six from the immediate post health education score. Attitude improved from 16.76 (93.1%) at baseline to 17.74 (98.6%) at the six-week mark. Similarly mean practice score rose from 25.24 (78.9%) at baseline to 27.42 (85.7%) at week six. There was a positive correlation between KAP while age had a negative correlation with knowledge (r=-0.146; p=0.003). There was a significant difference between different education levels on knowledge retention p=0.009 at week six assessment.

Caregivers of individuals with hypertension exhibited poor knowledge and practices, accompanied by a positive attitude towards the disease at baseline. There was a positive and good knowledge retention among caregivers of hypertensive patients after health education at the week six mark. With improved knowledge and the ability to retain it resulting in improved attitude and practices, caregivers are a cornerstone for continued and improved hypertension care for the patients.

i

CONTENTS

LIST OF TABLES

k

LIST OF FIGURES

Page

l

LIST OF ABBREVIATIONS

ACE	Angiotensin-converting enzyme
AIDS	Acquired Immunodeficiency Syndrome
BMI	Body mass index
CHW	Community health worker
COPD	Chronic obstructive pulmonary disease
CVD	Cardiovascular disease
DHSS	Director of Health and Social Services
HIV	Human Immune Virus
IC3	Integrated Chronic Care Clinic
KAP	Knowledge, attitude, and practices
LMIC	Low- and Middle-income countries
MM HG	Millimeters of Mercury
NCDs	Non-communicable diseases
PI	Principal Investigator
RIHES	Research Institute for Health Sciences
SPSS	Statistical package for social science
WHO	World Health Organization

LIST OF SYMBOLS

*	Multiplication
/	Division
>	More than
<	Less than
^	To the power
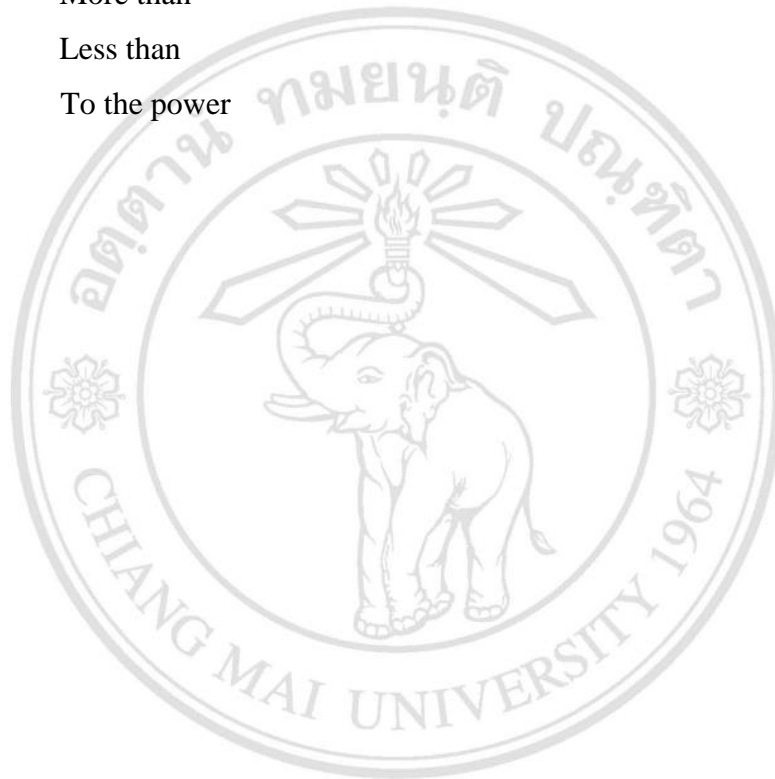
CHAPTER 1

Introduction

1.1 Background

Non-communicable diseases (NCDs) are responsible for 74% of all deaths worldwide, with 41 million people dying each year, 17 million of whom are under 70 years old. 77% of these deaths occur in low- and middle-income countries (LMICs), where 86% of those affected live. Cardiovascular diseases cause the most deaths at 17.9 million annually, followed by cancers (9.3 million), chronic respiratory diseases (4.1 million), and diabetes (2.0 million, including kidney disease deaths caused by diabetes) [1].

Hypertension is a chronic, non-communicable condition that affects 1.13 billion people worldwide and is a major public health concern [2]. Though it is a noncommunicable disease on its own, it is also one of the risk factors for developing cardiovascular diseases. LMICs face similar NCD-related health issues to high-resource countries, such as obesity, diabetes mellitus, coronary heart disease, hypertension, and cardiovascular disease. Given the cost of medical treatment in low-resource countries, prevention efforts should prioritize reducing reliance on expensive treatments for NCDs. Healthcare systems need to take a more public health-oriented approach to persuade people to make healthier lifestyle choices and prevent the development of NCDs [3].

In Malawi, NCDs are the second most common cause of death after HIV/AIDS, accounting for 37% of adult deaths. Hypertension is particularly prevalent in Malawi, with the highest rate among surrounding countries at 33%. Diabetes is the second major cause of morbidity among individuals aged 25 and older in Malawi, accounting for 6% of cases, followed by asthma at 5% [4].

The role of caregivers in managing hypertension is crucial, as they remind patients to take their medication and monitor their blood pressure. Caregivers need to be informed and supported, and access to healthcare resources needs to be improved to effectively prevent and control hypertension. Caregivers' knowledge, attitudes, and practices about hypertension management may differ, which could affect patient outcomes. Evaluating

1

caregivers' knowledge retention capabilities is therefore important to pinpoint areas where focused interventions may be required [5]

Caregivers play a vital role in providing ongoing care for hypertensive patients. The standard of care they provide depends on their knowledge, which influences their attitude and behaviors toward managing and preventing hypertension [6]. Malawian hospitals face the challenges of understaffing and inadequately trained medical personnel to manage non-communicable diseases (NCDs) [7]. As a result, family members and relatives also known as caregivers take a central role in helping their loved ones in the absence of health services provider. They provide physical and emotional support to patients. In Africa, caregivers are often relatives or family members of the patient and most of them are illiterate [8]. They play a vital role in managing the condition and enhancing health outcomes by helping patients adhere to treatment plans and adopt necessary lifestyle changes [9].

Health education is crucial in disease prevention and reducing the impact of non-communicable diseases (NCDs) by raising awareness within communities [10]. Effective strategies should start at the individual to community, and healthcare service levels to achieve this goal [11]. Knowledge retention is a significant concern globally, as it plays a critical role in influencing behavioral changes in individuals [12]. Insufficient knowledge often acts as a barrier to seeking medical attention, following advice from health personnel, and adhering to follow-up appointments, potentially leading to complications [13].

Caregivers always struggle to retain disease information, which may lead to stress and anxiety [14]. Health education and training improve the knowledge and quality of care they provide to their loved ones [15]. Frequent communication with healthcare providers enhances knowledge retention [16]. As such health education is the cheapest strategy in preventing hypertension and reducing its burden.

This research presents a comprehensive assessment of knowledge, attitude, and practices towards hypertension and their determinants among caregivers of hypertensive patients and an evaluation on the effectiveness of health education on knowledge retention among these caregivers in Neno, Malawi. A rural setting.

2

1.2 Research Objectives

The aims of this research are as follows:

1.2.1 Main Objective

To assess knowledge, attitude, and practices towards hypertension amongst caregivers of hypertensive patients and to evaluate effectiveness of health education on knowledge retention.

1.2.2 Specific objectives

1) To assess the level of knowledge, attitude, and practices towards hypertension among caregivers of hypertensive patients.

2) To explore the determinants of hypertension related knowledge, attitude of caregivers towards hypertension management and prevention and their current practices in managing and preventing hypertension in their patients.

3) To evaluate the effectiveness of health education on hypertension in improving knowledge retention and adherence to hypertension prevention and management methods among caregivers.

1.3 Scope of Research

1.3.1 Scope of the study population

The study was conducted in the rural district of Neno, Malawi, which has a population of 146,236 and is considered one of the hardest-to-reach areas in the country. In 2018, Neno enrolled over 3,000 hypertensive patients in its integrated chronic care clinics. The study targeted caregivers of these hypertensive patients because they are responsible for caring for the patients in the absence of healthcare providers and are closest to the patients daily.

1.3.2 Scope of content

This research explores the knowledge, attitudes, and practices (KAP) of caregivers towards hypertension and examines the retention of this knowledge over time in a rural setting in

3

Neno, Malawi. The study focused on caregivers of hypertensive patients, assessing their understanding and behaviors regarding hypertension prevention and management and their ability to retain health education information.

By enrolling 422 caregivers from the Integrated Chronic Care Clinics (IC3) in Neno, this study utilized structured questionnaires to gather baseline data on KAP, and follow-up data immediately after health education, and six weeks later.

The key objectives include:

1) Assessing KAP Levels: Measuring the initial knowledge, attitudes, and practices of caregivers concerning hypertension.

2) Identifying Determinants of KAP: Exploring the factors influencing KAP and knowledge retention, such as demographic characteristics (age, gender, education level) and the duration of care provided.

3) Evaluating Effectiveness of Health Education: Determining how much knowledge is retained by caregivers immediately after health education and six weeks post-education.

The research employed statistical methods to analyze changes in KAP scores over time and to identify correlations between KAP components and demographic factors. Through this study, the researchers aim to highlight the important role of caregivers in managing hypertension in rural communities and provide insights into improving health education strategies to enhance care for hypertensive patients.

By focusing on a rural setting in Malawi, the research addresses the unique challenges and opportunities in low-resource environments, contributing valuable knowledge to public health practices and policy development aimed at combating hypertension and NCDs in similar contexts.

1.3.3 Scope of time period

Utilizing the IC3 clinics of Neno district hospital and Lisungwi community hospital, the study was conducted from November 2023 to February 2024.

1.4 Operational Definition

1.4.1 Knowledge

The level of understanding and awareness that caregivers have regarding hypertension, including its risk factors, symptoms, treatment options, and potential complications. This was measured using a validated questionnaire.

1.4.2 Attitude

The caregivers' beliefs, opinions, and emotional responses towards hypertension and caring for hypertensive patients. A validated questionnaire was used to assess their attitudes towards hypertension.

1.4.3 Practices

The behaviors and actions that caregivers undertake in caring for hypertensive patients, including monitoring blood pressure, administering medications, and providing lifestyle recommendations. This was measured caregivers' self-report of these activities using a validated questionnaire.

1.4.4 Knowledge retention

The extent to which caregivers retain and apply the knowledge they have gained about hypertension, its management and prevention. This was assessed through follow-up assessment of their knowledge, attitudes, and practices 6 weeks after initial assessment and health education.

1.4.5 Caregivers

Are individuals who provide physical and/or emotional care to individuals who are unable to care for themselves due to illness, disability, or aging. They can be family members, friends, or healthcare professionals who assist with activities of daily living such as bathing, dressing, and feeding, as well as provide emotional support, companionship, and medication management.

5

1.4.6 Non employed

These are individuals who don't do any income activities to sustain their day-to-day living, e.g. farmers.

1.4.7 Employed

These are individuals whose day-to-day activities are for the purpose of generating income, e.g. Businesspeople.

CHAPTER 2

Literature Review

2.1 Introduction and Topic of Content

This section outlines reviewed literature of past related studies to give a description of the current situation and identify gaps in an area of study. The section starts with trend of Noncommunicable diseases (NCDs) globally and in Malawi, followed by an overview of hypertension, caregivers and knowledge retention and ends with conceptual framework.

2.2 Noncommunicable Diseases

Noncommunicable diseases (NCDs) account for a significant percentage of all global deaths, with 74% of annual fatalities (41 million) being attributed to them. Shockingly, 17 million individuals die prematurely each year due to NCDs, with 86% of those affected living in low- and middle-income countries. In these countries, NCD-related fatalities comprise 77% of all deaths. Cardiovascular diseases cause the most NCD deaths annually (17.9 million), followed by chronic respiratory diseases (4.1 million), cancer (9.3 million), and diabetes (1.1 million), including 2 million deaths from kidney disease caused by diabetes [1].

Common risk factors, including tobacco use, inactivity, excessive alcohol consumption, and unhealthy diets, contribute to the high mortality rate associated with NCDs. Identification, screening, and therapy are key to managing NCDs, but these measures require significant healthcare budgets and resources, which many low- and middle-income countries cannot afford [17].

Fortunately, more than 80% of NCD-related deaths can be prevented by addressing common risk factors like smoking, poor diets, physical inactivity, and excessive alcohol consumption [3]. Education on risk factor modification and NCD prevention is crucial in reducing the prevalence of NCDs in these countries [18].

To effectively treat chronic NCDs, primary care models must prioritize patients and communities, employ innovative service delivery methods, and utilize new

7

communication technologies. As NCDs continue to increase in incidence and healthcare costs rise, it is imperative to create healthy and sustainable environments to prevent illness and provide quality healthcare [4].

Common, avoidable risk factors like physical inactivity, poor diet, and harmful alcohol and cigarette use have long been associated with significant health hazards [19]. Communities in low- and middle-income countries are particularly vulnerable to NCDs due to factors such as increased urbanization, lack of education and understanding about diseases, and limited access to medical facilities [20].

Smoking, physical inactivity, excessive alcohol consumption, poor eating habits, and other unhealthy behaviors are all behavioral risk factors for noncommunicable diseases (NCDs) such as cancer, chronic respiratory disease, and cardiovascular disease (CVD) which includes hypertension, elevated total cholesterol, obesity, and diabetes. A healthy lifestyle can reduce the risk of these illnesses since these risk factors are controllable. Conversely, we are unable to change our sex, age, race, or family history of sickness (genetic background), which have been shown to be risk factors for several NCDs. For instance, disparities in socioeconomic status frequently result in poor health among a population [21]. The top six major risk factors associated with the global burden of NCDs are high blood pressure (13%), smoking (9%), elevated blood glucose levels (6%), physical inactivity (6%), risky alcohol drinking (5.9%), and obesity/overweight (5%) [22].

To increase the effectiveness of public health initiatives, attention should be given to the main risk factors for NCDs, such as dietary choices, physical activity levels, smoking, and alcohol intake. These are crucial components of health promotion and disease prevention for the reduction of NCDs. Adolescent behaviors have long-term effects on the development of NCDs in later life. Therefore, to benefit both adults and adolescents equally, it is important to use all available resources to spread knowledge and practice throughout the family and community. To manage the rising NCD epidemic, prompt action is necessary if the afore-mentioned goal is to be met [23].

Despite the fundamental capacity of communities to address the burden of NCDs, one study conducted in Ethiopia demonstrated a significant level of inadequate understanding about NCDs among the communities [24]. It would be advantageous for the public to

undertake a comprehensive health promotion strategy to reduce the burden of NCDs. Additionally, specific activities are needed at practice and policy levels to target underprivileged populations such as low-income individuals, those without access to radios or television, people who do not receive information from health experts, and others [24].

Preventing non-communicable diseases (NCDs) and promoting early healthcare-seeking behaviors are essential to reduce their burden and ensure continuity of care in low- and middle-income countries (LMICs) [25]. Community health workers (CHWs) are playing a crucial role in this effort by motivating, educating, and assisting rural and underprivileged urban populations in adopting measures to reduce NCD risk and improve their health [20]. Their involvement in the community enhances adherence to interventions, encourages enrollment in screening, and raises awareness of NCDs. Community health workers are particularly vital in supporting health promotion and the prevention and control of NCDs, serving as a link between the health system and the community [26]. These CHWs work hand in hand with caregivers in provision of care to the patients. One CHW is assigned to several households, and he/she is not always available when the need arises.

Implementing targeted population-based prevention measures is the main strategy for preventing NCDs, as most of the cardiovascular disease (CVD) risk factors are preventable and controllable, such as poor diet, inactivity, smoking, obesity, and alcohol misuse. While individual and socio-environmental factors can affect the development of CVDs, increasing knowledge of CVD and its modifiable risk factors is a critical component for modifying health behaviors and lifestyles [27].

Hypertension is one of the most common CVD risk factors, causing 47% of coronary heart disease cases and 54% of stroke cases worldwide. Clinical hypertension only accounts for about half of this burden, with mild forms of hypertension being the main contributor. Smoking increases the risk of developing hypertension, lung cancer, CVD, and chronic obstructive pulmonary disease (COPD) [28]. Regular physical activity reduces the risk of CVD mortality by 37% compared to sedentary behavior [29]. Exercise has a beneficial impact on several cardiovascular risk factors and disease processes, and recreational running has been shown to lower the risk of cardiovascular mortality [30]. The increasing burden of chronic illnesses calls for interventions that focus on lifestyle

9

changes at both individual and population levels [31].

2.3 NCDs in Malawi

Malawi, a small country located in South-Eastern Africa with a population of around 19 million, is consistently ranked as one of the world's poorest nations. Non-communicable diseases (NCDs) are responsible for 37% of all deaths in Malawi, and this percentage is on the rise in Sub-Saharan Africa (SSA) [32]. Malawi has the highest prevalence of hypertension in adults (33%) compared to its neighboring countries. Hypertension (morbidity rate: 33%), diabetes (morbidity rate: 6%), and asthma (morbidity rate: 5%) are the main causes of morbidity in individuals over the age of 25 [4].

Risk factors for NCDs in Malawi include smoking, harmful alcohol use, a diet high in salt, physical inactivity, low fruit intake, elevated blood glucose levels, and high blood pressure [33]. To address the NCD epidemic in Malawi, implementing a health promotion plan to increase awareness of the most common NCDs among medical professionals and the general public could be more effective than intervention at a later stage. Public health promotion programs, modeled after successful HIV campaigns that have utilized print materials, Television shows, and outdoor billboards, could be used to raise awareness and emphasize individual perceptions of NCDs. However, addressing the emergence of risk behaviors linked to an increasingly sedentary, calorie-dense, and "Westernized" urban lifestyle requires a comprehensive health promotion campaign to address the increasing burden of NCDs across low- and middle-income countries [34].

2.4 Hypertension

Hypertension, also known as high blood pressure, is a chronic condition where the blood pressure reading consistently measures above 130/80 millimeters of mercury (mm Hg). According to American Heart Association, a person is considered to be healthy when the blood pressure reading is less than 120/80 mm Hg; has elevated blood pressure when the reading is 120-129/ <80 mm Hg; has stage 1 hypertension when the reading is 130-139/80-89 mm Hg; has stage 2 hypertension when the reading is 140 or higher/ 90 or higher mm Hg; and a person is considered to be in crisis when the reading is >180/ > 120 mm Mg [35]. This condition poses a significant public health challenge as it affects millions of people worldwide and increases the risk of renal failure, heart disease, and other health problems.

10

Various factors may cause hypertension, including genetics, lifestyle choices, and underlying medical conditions. A study found that lifestyle factors such as diet, exercise, excessive alcohol consumption, and smoking contribute to 50% of the variation in blood pressure, while hereditary factors account for the remaining 50% [36]. Age, gender, family history, obesity, diabetes, and stress are additional factors that can lead to high blood pressure [37]

The diagnosis of hypertension usually involves taking blood pressure measurements at different times. The American College of Cardiology and the American Heart Association recently updated their guidelines for diagnosing and managing hypertension, defining it as a blood pressure reading of 130/80 millimeters of mercury (mm Hg) or higher [37]. Other tests, such as blood tests, urine tests, and electrocardiograms, may also be conducted.

The treatment of hypertension typically involves lifestyle modifications, medication, or a combination of both. Lifestyle modifications may include weight loss, exercise, and a healthy diet with a focus on reducing sodium intake and increasing potassium intake. Diuretics, ACE inhibitors, angiotensin receptor blockers, calcium channel blockers, and beta-blockers are typical medications used to manage hypertension [37].

Hypertension often goes undetected, and if left untreated, it can lead to serious medical problems such as arteriosclerosis, heart failure, heart attack, renal disease, stroke, and abnormal heart rhythm. According to projections, 1.28 billion people aged 30 to 79 globally, two-thirds of whom live in low- and middle-income countries, have hypertension. Unfortunately, only 42% of those with hypertension are identified and treated, and only 21% have it under control. This makes hypertension a significant contributor to early death worldwide. The World Health Organization has set a global noncommunicable disease target to reduce the prevalence of hypertension by 33% between 2010 and 2030 [38].

Sub-Saharan Africa has a high prevalence of hypertension, which is a significant risk factor for cardiovascular disease. A comprehensive analysis of literature showed that estimates for the prevalence of hypertension in Malawi ranged from 15.8% to 32.9%. Unfortunately, most cases of hypertension go undetected, untreated, or are not effectively managed. Risk factors linked to hypertension include aging, cigarette use, excessive

11

alcohol use, obesity, physical inactivity, insufficient intake of fruits and vegetables, and high body mass index (BMI) [39].

2.5 Caregivers

These are individuals who assist and provide care to patients, including family members, friends, and healthcare professionals. In Africa, caregivers are typically relatives or family members of the patient [40]. For patients with hypertension, caregivers play a crucial role in managing the condition and improving health outcomes by supporting patients to adhere to treatment and make necessary lifestyle changes [9]. Caregiver roles include:

1) Monitoring and recording blood pressure: Caregivers help patients keep track of their blood pressure readings by regularly monitoring and recording them. This information can be shared with healthcare providers to help make informed treatment decisions.

2) Encouraging medication adherence: Caregivers remind patients to take their medications as prescribed, help them manage side effects, and ensure that they have an adequate supply of medication.

3) Providing emotional support: A hypertension diagnosis can be overwhelming and stressful for patients. Caregivers offer emotional support and encouragement to help patients cope with the challenges of living with a chronic condition.

4) Promoting healthy lifestyle changes: Hypertension can often be managed through lifestyle changes such as diet and exercise. Caregivers help patients make these changes by providing healthy meals, encouraging physical activity, and helping patients avoid triggers that can worsen their condition.

5) Coordinating medical appointments: Caregivers schedule visits, coordinate transportation, and ensure that patients have all the necessary information and documentation for their appointments.

6) Advocating for patients: Caregivers serve as advocates for patients by communicating with healthcare providers, insurance companies, and other stakeholders to ensure that patients receive appropriate care and support.

7) Providing practical assistance: Caregivers provide practical assistance to hypertensive patients, such as preparing meals, running errands, and managing household tasks. This assistance reduces the burden on patients and helps them focus on managing their condition.

12

2.6 Knowledge retention

The retention of knowledge is a common concern, as people tend to forget information they have learned over time. However, forgetting is a necessary function of the brain that allows us to focus on more recent and relevant information. Factors that can affect the retention of educational information include the creation of associations with another knowledge [41].

Studies have been conducted to determine the retention of knowledge among medical professionals. In the United States of America, a study on physicians' knowledge retention regarding bioterrorism found no significant differences between posttests administered one month and six months after the pretest [42]. Another study in South Korea found no significant differences in scores between groups taught via web-based methods and traditional methods [43].

Knowledge retention is a major concern in many countries, as it plays a crucial role in bringing about behavioral change among individuals [12]. Inadequate knowledge is a common barrier to seeking medical attention and complying with regular follow-up, which can lead to complications [13]. Education is key to preventing diseases and their complications, and increasing awareness among communities can help reduce the burden of non-communicable diseases (NCDs) [10]. This can be achieved if the strategies start from the individual-level to community, and healthcare service levels [11].

2.7 Caregivers and Knowledge retention

Caregivers often struggle with retaining information about the disease of the person they are caring for, which can lead to increased stress and anxiety [14]. However, caregivers who receive education and training on the disease and its management are better equipped to retain information and provide high-quality care. In fact, interventions that provide ongoing education and support for caregivers have been shown to improve their knowledge and understanding of the disease, as well as their ability to provide care [15]. Additionally, caregivers who are more involved in the care of their loved ones tend to have higher levels of knowledge about the disease, prevention, and its management [44].

Effective communication between healthcare providers and caregivers is crucial for knowledge retention. Caregivers who have frequent and open communication with

13

healthcare providers have better knowledge retention about the patient's condition, medication, and other management [16].

2.8 Conceptual Framework

The potential contributing factors to hypertension prevention and control include sociodemographic characteristics such as gender, marital status, educational attainment, age, and religion, as well as awareness of and attitudes toward hypertension. Increased public knowledge of hypertension has been shown in numerous studies to result in better preventative and control measures. Public awareness that focuses on individual needs also leads to better attitudes and practices, as well as knowledge retention [24]. Furthermore, sociodemographic factors such as sex, education level, and age group have been found to be significantly related to the degree of practice for the prevention and management of hypertension [45].

The conceptual framework for this study examined the relationship between knowledge, attitude, and practices of caregivers of hypertensive patients, as well as their knowledge retention. The study explored the factors that contribute to the knowledge, attitude, and practice of caregivers of hypertensive patients, as well as their ability to retain information over time. The Health Belief Model, which suggests that individual beliefs and perceptions influence health behaviors and outcomes, served as the basis for this study [46]. The Conceptual framework (Figure 2.1) indicates the relationships between socio-demographic, Knowledge, Attitude and Practices towards hypertension and knowledge retention.
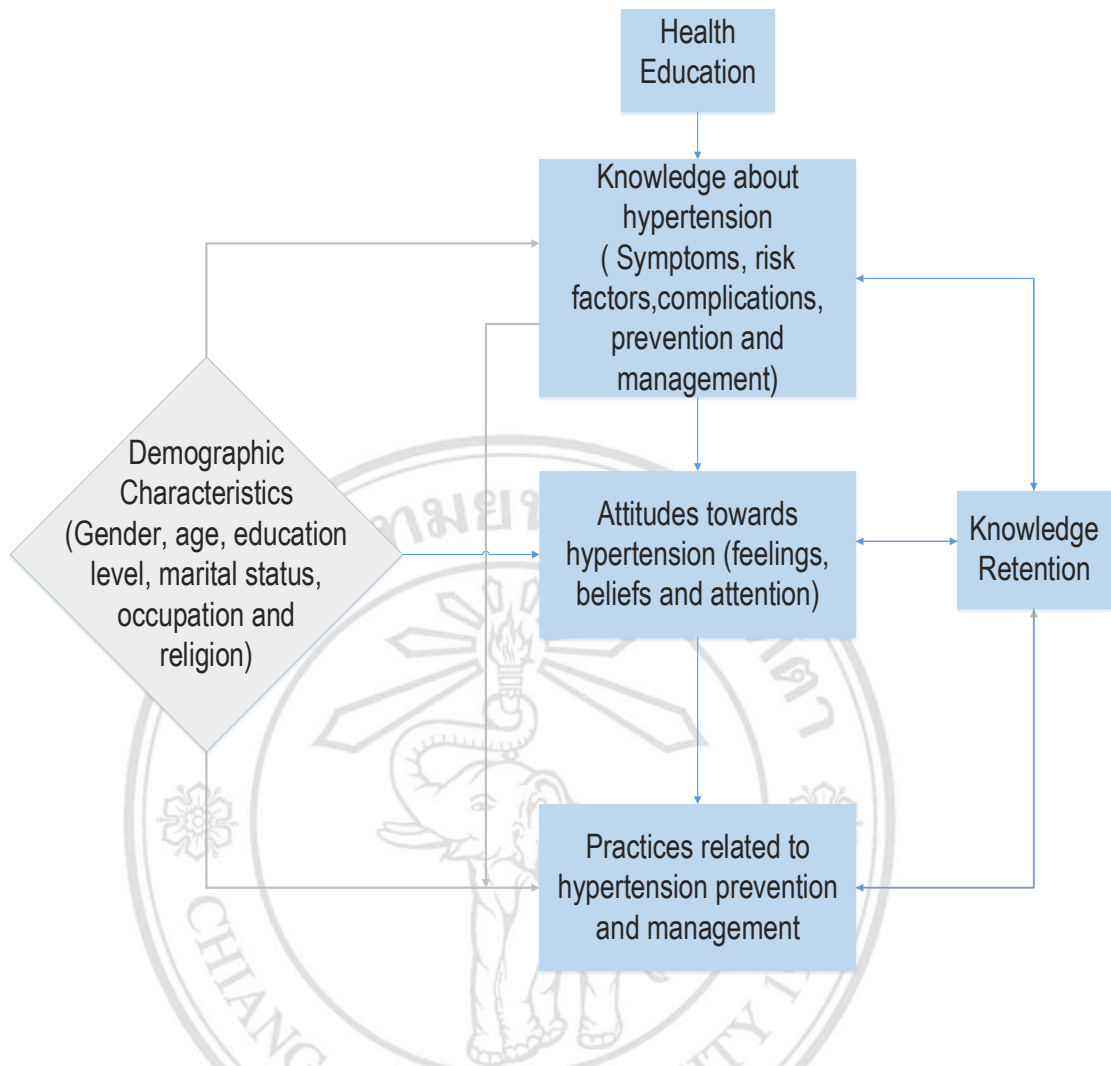
Figure 2.1 The Conceptual framework.

2.8.1 Independent variables

Demographic characteristics (Gender, age, education level, marital status, occupation and religion) and health education

2.8.2 Dependent variables

Knowledge, attitude, practices and knowledge retention.

CHAPTER 3

Material and Method

3.1 Research design

This was a prospective cohort study in Neno, Malawi a rural setting utilizing the Integrated Chronic Care Clinics (IC3) at Neno District Hospital and Lisungwi Community Hospital. Neno district has a population of 146,236. In 2018, there were more than 3000 patients enrolled in IC3 of which 60% were due to hypertension. Twenty percent of the enrolled hypertensive patients defaulted from care [4].
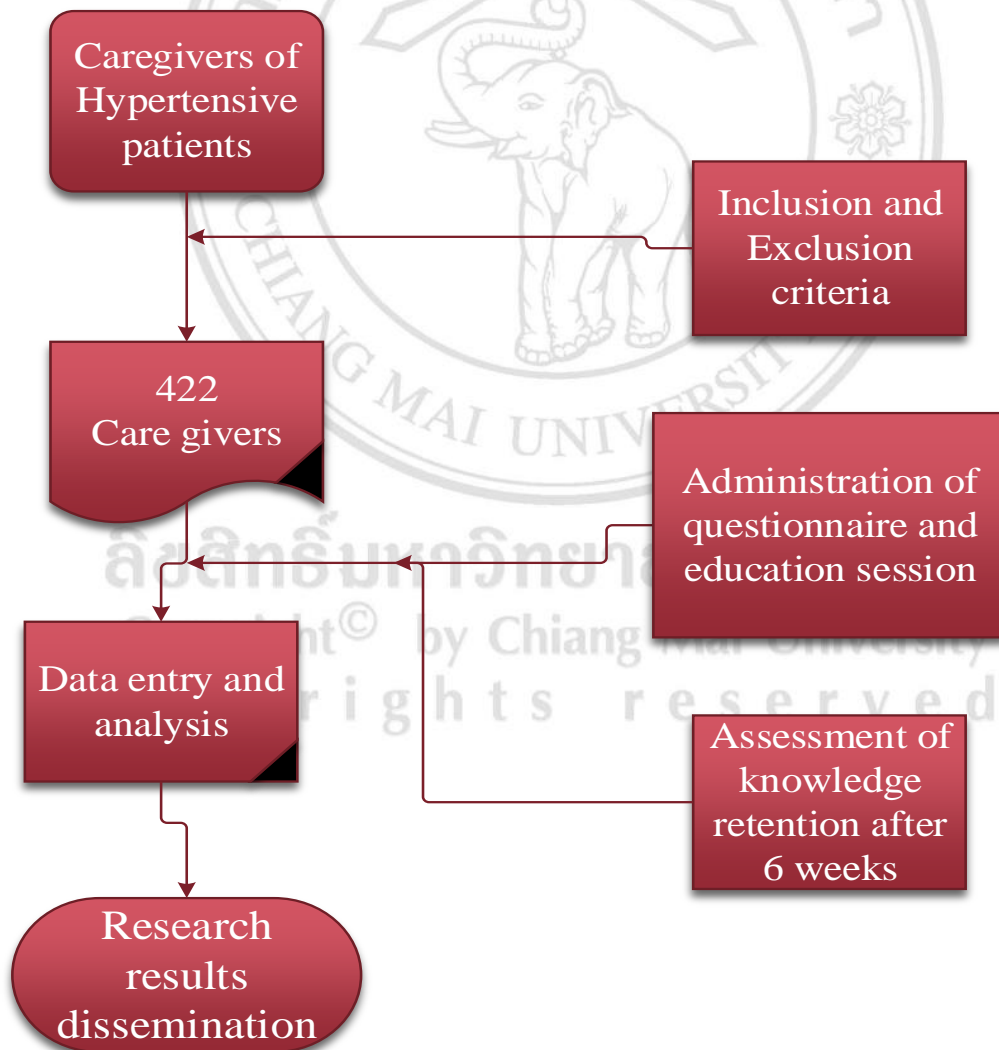
Figure 3.1 Flow diagram of the study design.

3.2 Research Methodology

3.2.1 Sampling Method

A systematic random sampling technique was used in this study. The participants were selected from the Integrated Chronic Care Clinic (IC3) at Neno District Hospital and Lisungwi Community Hospital. These were caregivers who came to the clinic with their patients. All patients come to the clinic at their appointed time. They all receive health education talk, and they queue to meet health services providers. We invited every third caregiver after they had received the service for an interview.

3.2.2 Sample Size

The sample size was calculated using the formula: $n = (Z^2 * P * (1-P)) / E^2$ where: n = sample size Z = the z-score for the level of confidence (1.96 for 95%) P = expected proportion or prevalence E = the margin of error (0.05) [47].

Assuming a prevalence of 50% for adequate knowledge, attitude, and practice, and a margin of error of 5%, the sample size was: $n = (1.96^2 * 0.5 * (1-0.5)) / 0.05^2 = 384$. Considering the dropout rate of 10% [48], the total sample size was: $n = 384 + (10\% * 384)$ n = 422.

3.2.3   Inclusion criteria

1) Caregivers of hypertensive patients who were aged 18 years or older.

2) Caregivers who have been providing care for at least 6 months.

3) Caregivers who were willing to participate in the study and provide informed consent.

4) Caregivers who had access to a phone or internet connection for follow-up assessments.

3.2.4 Exclusion criteria

1) Caregivers who had a history of hypertension or any other chronic illness.

2) Caregivers who had cognitive impairments that may affect their ability to

17

comprehend the study questions.

3) Caregivers who had a history of psychiatric illness.

4) Caregivers who were unable to commit to the study timeline or schedule.

3.2.5 Research tool and data collection

Data was collected from November 2023 to February 2024 using a structured questionnaire that was developed based on literature review and expert opinions [49-57]. The questionnaire was approved by the Research Institute for Health Sciences questionnaire approval committee on July 3, 2023, with approval number [002/ 2023] before use. The structured questionnaire comprised of two parts:

Part 1: Demographic information of caregivers which included:

Age, gender, education level, relationship with the patient, location (village), occupation, religion and date of diagnosis.

Part 2: Knowledge, attitude, and practice of caregivers towards hypertension, its management and prevention. In the Knowledge section, a total score of 25 was allocated and participants received 1 point for every correct answer and 0 points for incorrect answers. For the Attitude section, a 3-point Likert scale was utilized, with response options including 1) "Disagree", 2) "Not sure", and 3) "Agree". A total score of 18 was allocated. Similarly, in the Practice section, a 4-point Likert scale was employed, with response options: 1) "Never", 2) "Rarely", 3) "Sometimes", and 4) "Always". A total score of 32 was allocated.

The interviewer conducted health education following the baseline assessment. Health education included an overview of hypertension, signs, and symptoms, risk factors, prevention, and management. Subsequently, another assessment was administered to evaluate the caregivers' acquired knowledge soon after the health education. This session took at least 30 to 40 minutes per participant. The assessment of knowledge retention was conducted six weeks after the immediate post-health education, and we employed the same structured questionnaire used during both the baseline and immediate post-health education assessments.

The initial and post-health education assessments were done in person because the participants were already at the clinic. The Knowledge retention assessment was done

using a phone interview to reduce the transportation cost of the participants as well as to avoid inconveniences because it was outside the clinic visiting date (Fig. 3.2).

Before data collection, participants were informed about the objectives of the study and procedure. An informed consent form was signed by those who were willing to take part in the study. The data collector read the questions to the participants and recorded the answers. No names were recorded during data collection and participants' identification numbers were used.

At the end of each data collection, the data was checked for completeness. All data were entered into a password protected computer in excel form only accessible by the Principal Investigator (PI) to ensure safety of participants information.
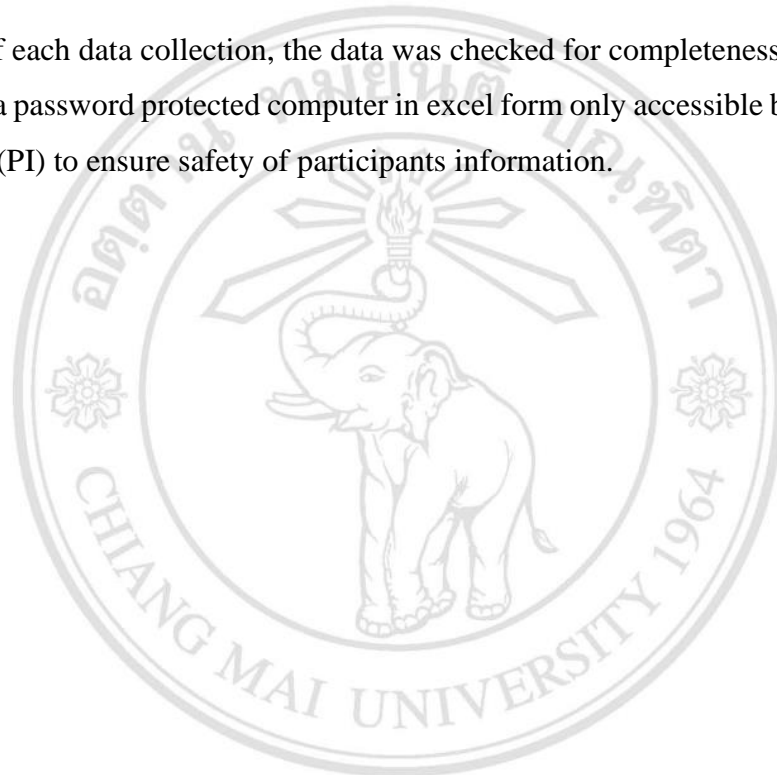
At the IC3 clinic:
Caregivers escorting hypertensive patients
attending the IC3 clinic were assessed for
eligibility.

Eligibility:
422 caregivers passed the eligibility criteria
and were approached for consent.

Baseline assessment:
All 422 caregivers enrolled and participated in
the baseline assessment and were given health
education regarding hypertension after the
assessment.

**Immediate post-health education
assessment:**
After the health education, all 422 participants
participated in the immediate post-health
education assessment.

Six week follow up:
Using a phone call, all the 422 caregivers
managed to participate in the six-week follow-
up.

Figure 3.2 Participants enrollment.

3.2.6 Ethical Committee approval

The study was approved by the Research Institute for Health Sciences (RIHES), Chiang Mai University Ethics Committee, Thailand [Approval No.60/2023], and Malawi National Health Sciences Research Committee [Protocol # 23/10/4216]. We also got permission from the Neno District Health Office to conduct the study in Neno. Before data collection, participants were briefed on the study's objectives and procedures, and written informed consent was obtained from all participants. The respondents were free to discontinue their involvement in the study at any time, as it was entirely voluntary. Additionally, they were free to decline to respond to any questions that made them uncomfortable. All their privacy was protected during the research.

3.2.7 Data management and Statistical analysis

Each section of the KAP assessment was graded based on allocated scores. Using the measures and cut-off points from other studies [49, 51, 53, 56, 57], the participants' overall knowledge, attitude and practices were categorized as good, moderate/fair, or poor if the total score was 80–100%, 60–79%, or less than 60%, respectively.

The data extracted from Microsoft Excel was imported into Statistical Package for Social Science (SPSS) version 22.0. Descriptive statistics, including counts, percentages, and proportions for all categorical variables, were computed. To determine the total KAP scores for each respondent regarding hypertension, responses to each question were appropriately scored and summed for each section. The mean score was then used to assess the level of KAP related to hypertension and its contributing factors at baseline, post-health education, and during the week six assessments, as well as to evaluate knowledge retention. The Wilcoxon signed-rank test was used to compare the initial and the two post-health education scores. The correlation between KAP scores and between KAP and age and length of stay in care was examined using a Pearson correlation test. Additionally, the variation in KAP scores among different sociodemographic groups was analyzed using an independent t-test.

CHAPTER 4

Results and Discussion

4.1 Results

4.1.1 Sociodemographic Characteristics of Hypertensive Patients' Caregivers

Among the 422 interviewed caregivers, 267 (63.3%) were female, 54 (12.8%) were from 18 to 34 years, and 76 (18.0%) were above 54 years. The mean age of participants was 44.94 ± 9.89. More than half (63.0%, n = 266) of the caregivers were spouses, and 25.8% (n = 109) were children. Among the caregivers, 63.7% (n = 269) had at least primary education. Most caregivers were farmers (58.5%, n = 247). All the participants were Christians, with more than half (61.4%, n= 259) of their patients being in care for 1-5 years. Additionally, most of them (97.8%, n= 413) got their knowledge from a healthcare provider (Table 4.1).

Table 4.1 Socio-demographic characteristics of hypertensive patients' caregivers (n=422).

Characteristics	Males, n (%)	Females, n (%)	Total, n (%)
Age (years)			
18-34	15 (3.6)	39 (9.2)	54 (12.8)
35-44	40 (9.5)	125 (29.6)	165 (39.1)
45-54	62 (14.7)	65 (15.4)	127 (30.1)
> 54	38 (9.0)	38 (9.0)	76 (18.0)
Level of education			
No education	4 (1.0)	14 (3.3)	18 (4.3)
Primary	83 (19.6)	186 (44.1)	269 (63.7)
Secondary	64 (15.2)	58 (13.7)	122 (28.9)
Tertiary	4 (1.0)	9 (2.1)	13 (3.1)
Relationship with patient			
Child	20 (4.7)	89 (21.1)	109 (25.8)
Spouse	117 (27.7)	149 (35.3)	266 (63.0)

22

Characteristics	Males, n (%)	Females, n (%)	Total, n (%)
Parent	17 (4.0)	27 (6.4)	44 (10.4)
Others	1 (0.2)	2 (0.5)	3 (0.7)
Location			
Neno Hospital	65 (15.4)	109 (25.8)	174 (41.2)
Lisungwi	90 (21.4)	158 (37.4)	248 (58.8)
Patient's date of Diagnosis/Duration in care			
<1 year (6-11 months)	23 (5.5)	24 (5.7)	47 (11.2)
1-5 years	88 (20.9)	171 (40.5)	259 (61.4)
6-10 years	33 (7.8)	66 (15.6)	99 (23.4)
>10 years	11 (2.6)	6 (1.4)	17 (4.0)
Occupation			
Farmers	72 (17.1)	175 (41.4)	247 (58.5)
Business	65 (15.4)	58 (13.7)	123 (29.1)
Employed	14 (3.3)	21 (5.0)	35 (8.3)
None	4 (1.0)	13 (3.1)	17 (4.0)
Religion			
Christianity	155 (36.7)	267 (63.3)	422 (100)
Muslim	0	0	0
Others	0	0	0
Source of knowledge			
Health care provider	150 (35.5)	263 (62.3)	413 (97.8)
Internet	9 (2.1)	8 (1.9)	17 (4.0)
Support group	0 (0.0)	0 (0.0)	0 (0.0)
Community health worker	3 (0.7)	12 (2.8)	15 (3.6)
Others	2 (0.5)	1 (0.2)	3 (0.7)

4.1.2 Knowledge regarding hypertension at baseline

The knowledge score had a median of 9.00, a total mean and standard deviation of 9.50±1.92, and minimum and highest scores of 5 and 19, respectively. Out of all the

23

participants, 10.2% (43) correctly answered the risk factors of hypertension, while the rest responded partially correctly, with 100% of the participants mentioning excessive salt intake. On complications, 3.1% (13) correctly answered, and the rest partially responded correctly, and all the participants said stroke. 15.4 % (65) answered correctly on the prevention of hypertension, and the rest of the respondents partially answered correctly. Minimal salt intake was mentioned by all the participants. Less than half of the respondents, 46.2% (195), knew the normal measurement of the blood pressure reading. However, 1.0% (4) participants were able to know how often the blood pressure should be monitored, with 96.0% (405) partially having an idea of how often the blood pressure should be monitored (Table 4.2).

The majority of the participants, 94.8% (400), responded partially correctly to what hypertension is, 4.1% (17) answered correctly what hypertension is, and 1.2% (5) gave wrong answers.

Table 4.2 Knowledge score at baseline about hypertensive among caregivers along with the respective mean score, median and standard deviation (n=422).

Characteristics	Correct n (%)	Partially correct n %)	Wrong n (%)	Mean	Median	SD
What is hypertension?						
Males	10 (2.4)	141 (33.4)	4 (1.0)	1.0	1.0	0.2
Females	7 (1.7)	259 (61.4)	1 (0.2)			
Risk Factors of Hypertension						
Males	18 (4.3)	137 (32.5)	0 (0.0)	2.5	2.0	0.9
Females	25 (5.9)	242 (57.3)	0 (0.0)			
Signs and symptoms of hypertension						
Males	95 (22.5)	59 (14.0)	1 (0.2)	1.5	2.0	0.5
Females	124 (29.4)	139 (32.9)	4 (1.0)			
Complications of hypertension						
Males	4 (1.0)	151 (35.8)	0 (0.0)	1.2	2.0	0.5
Females	9 (2.1)	258 (61.1)	0 (0.0)			
Prevention of hypertension and its complications						
Males	20 (4.7)	135 (32.0)	0 (0.0)	1.9	1.0	0.7
Females	45 (10.7)	222 (52.6)	0 (0.0)			

24

Characteristics	Correct n (%)	Partially correct n %)	Wrong n (%)	Mean	Median	SD
How often should blood pressure be monitored?						
Males	1 (0.2)	154 (36.5)	0 (0.0)	1.0	1.0	0.2
Females	3 (0.7)	251 (59.5)	13 (3.1)			
What is the normal BP reading?						
Males	92 (21.8)	0 (0.0)	63 (14.9)	0.5	0.0	0.5
Females	103 (24.4)	0 (0.0)	164 (38.9)			

Note: SD: Standard Deviation; Correct: Those who managed to get half of the answers correctly and above; Partially correct: Those who got one answer correctly and above but less than half; Wrongly: Those who got none of the answers correctly.

4.1.3 Attitude regarding hypertension at baseline assessment

Minimum and maximum attitude scores were 13 and 18, respectively, and the overall mean attitude score was 16.76±1.31, with a median of 17. Of those who took part, 415 or 93.8% believed that hypertension was a serious condition. Nevertheless, 95% (401) of the participants thought that hypertension can be managed with medication and lifestyle changes, and 96.6% (408) agreed that caregivers play an important role in the management of hypertension. Among the participants, 55.2% (233) felt confident in their ability to take care of a hypertensive patient, while 39.1% (165) were not sure, and 5.7% (24) disagreed with having confidence in caring for the hypertensive patient. 96.9 % (409) felt supported by the health care professional in caring for the hypertensive patient. However, 53.6% (226) participants thought that they had enough information about hypertension while 34.8% (147) were not sure if they had enough information and 11.6% (49) disagreed with having enough information about hypertension (Table 4.3).

Table 4.3 Distribution of caregivers' responses to attitude items at baseline about hypertension along with the respective mean score and standard deviation (n=422).

Attitude Items	Frequency	Percent	Mean	SD
Included in Scoring System for Attitude				
Hypertension is a serious condition				
Agree	415	98.3	3.0	0.2

Attitude Items	Frequency	Percent	Mean	SD
Disagree	2	0.5		
Not sure	5	1.2		
Hypertension can be managed with medication and lifestyle changes				
Agree	401	95.0	3.0	0.3
Disagree	2	0.5		
Not sure	19	4.5		
Caregivers play an important role in managing hypertension				
Agree	408	96.7	3.0	0.2
Disagree	2	0.5		
Not sure	12	2.8		
You are confident in your ability to manage the patient's hypertension				
Agree	233	55.2	2.5	0.6
Disagree	24	5.7		
Not sure	165	39.1		
You are supported by healthcare professionals in managing the patient's hypertension				
Agree	409	96.9	3.0	0.2
Disagree	2	.5		
Not sure	11	2.6		
You have enough information about hypertension to effectively care for a hypertensive patient				
Agree	226	53.6	2.4	0.7
Disagree	49	11.6		
Not sure	147	34.8		

Note: SD: Standard Deviation.

4.1.4 Practice regarding hypertension at baseline assessment

The minimum and maximum practice scores were 14 and 32, respectively, and the overall mean practice score was 25.24±3.10 with a median of 25. Among the participants, 74.6% (315) always made sure that patients took their medication as prescribed by the doctor, while 33.9% (143) of the participants always encouraged patients to make lifestyle changes. Nonetheless, 17.5% (74), 69.9% (295), 60.2% (254) and18.7% (79) of participants consistently monitored blood pressure regularly, always kept the blood

26

pressure readings, always communicated with the health care professionals about the patient's management and always accompanied the patient to the doctor's appointment, respectively. Almost half (50.7%, n=214) of the participants rarely helped the patient with meal planning, and 44.3% (187) sometimes prepared meals for the patient that met hypertension's dietary guidelines (Table 4.4).

Table 4.4 Distribution of caregivers' responses to practice items about hypertension at baseline along with the respective mean score and standard deviation (n=422).

Practice Items	Frequency	Percent	Mean	SD
Included in Scoring System for Practices				
Do you ensure that the patient takes their medication as prescribed?				
Always	315	74.6	3.7	0.5
Sometimes	95	22.5		
Rarely	12	2.8		
Never	0	0.0		
Do you encourage the patient to make lifestyle changes such as exercising and eating a healthy diet?				
Always	143	33.9	3.3	0.6
Sometimes	262	62.1		
Rarely	15	3.6		
Never	2	0.5		
Do you monitor the patient's blood pressure regularly?				
Always	74	17.5	3.0	0.7
Sometimes	211	50.0		
Rarely	135	32.0		
Never	2	0.5		
Do you keep a record of the patient's blood pressure readings?				
Always	295	69.9	3.6	0.7
Sometimes	92	21.8		
Rarely	32	7.6		
Never	3	0.7		
Do you communicate with healthcare professionals about the patient's hypertension management?				
Always	254	60.2	3.5	0.7

Practice Items	Frequency	Percent	Mean	SD
Sometimes	127	30.1		
Rarely	40	9.5		
Never	1	0.2		
How often do you accompany the patient to doctor's appointments?				
Always	79	18.7	3.0	0.6
Sometimes	265	62.8		
Rarely	74	17.5		
Never	4	0.9		
How often do you prepare meals for the patient that meet dietary guidelines for hypertension?				
Always	70	16.6	2.8	0.7
Sometimes	187	44.3		
Rarely	157	37.2		
Never	8	1.9		
Do you help the patient with meal planning?				
Always	65	15.4	2.5	0.8
Sometimes	118	28.0		
Rarely	214	50.7		
Never	25	5.9		

Note: SD: Standard Deviation.

4.1.5 Level classification and summary of total scores of knowledge, attitude, and practice

The KAP (Knowledge, Attitude, and Practices) assessment were categorized scores into three levels - good (80-100%), moderate/fair (60-79%), and poor (less than 60%). For knowledge, participants scoring 20-25 points were considered to have good knowledge, 15-19 points was moderate/fair, and 0-14 points was poor. Attitude was scored similarly, with 14-18 points as good, 11-13 as moderate/fair, and 0-10 as poor. Practice scores were grouped into good (26-32 points), moderate/fair (19-25 points), and poor (0-18 points). Table 4.5 and 4.6, Fig 4.1 shows the total score thresholds for each category.

Table 4.5 Level classification and summary of total scores of KAP towards hypertension among caregivers at baseline assessment (n= 422).

Percentage of total score (%)	Knowledge			Attitude			Practice			Level
	Scores	n	%	Scores	n	%	Scores	n	%	
80-100	20-25	0	0	14-18	421	99.8	26-32	182	43	Good
60-79	15-19	64	15.2	11-13	1	0.2	19-25	234	55	Moderate/fair
<60	0-14	358	84.8	0-10	0	0	0-18	6	2	poor

Table 4.6 Level classification and summary of total scores of KAP towards hypertension among caregivers at week six assessment (n= 422).

Percentage of total score (%)	Knowledge			Attitude			Practice			Level
	Scores	n	%	Scores	n	%	Scores	n	%	
80-100	20-25	249	59	14-18	422	100	26-32	422	100	Good
60-79	15-19	158	37	11-13	0	0	19-25	0	0	Moderate/fair
<60	0-14	15	4	0-10	0	0	0-18	0	0	poor
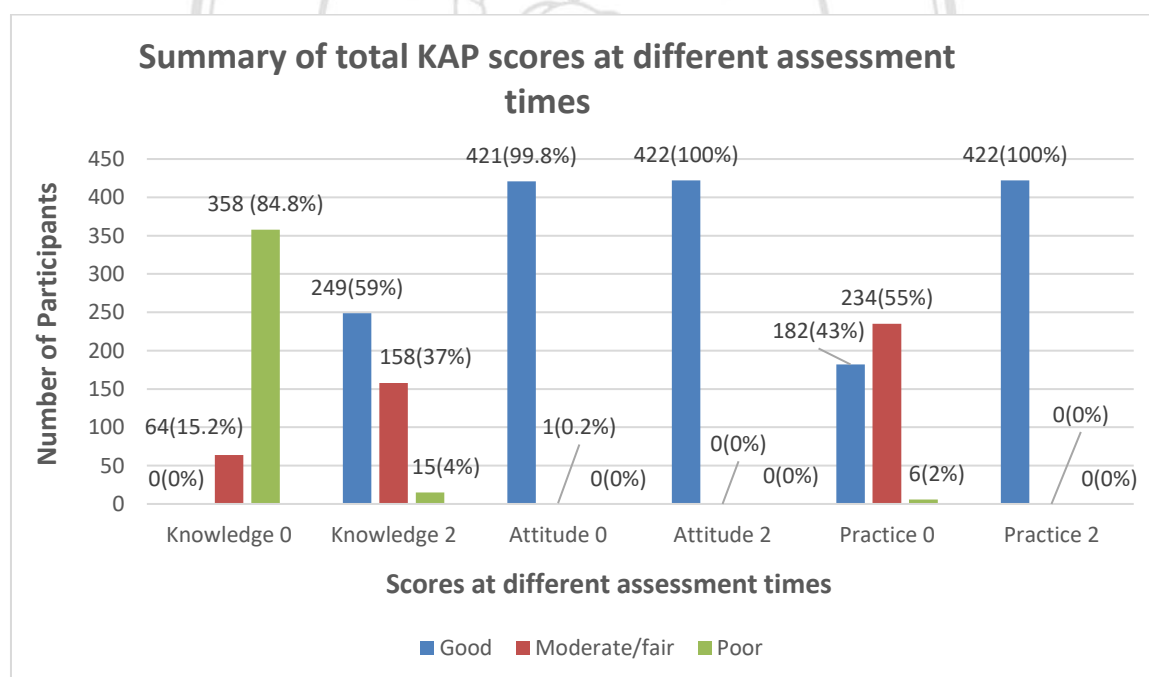
Figure 4.1 Participants' summary of total KAP scores at different assessment times.

4.1.6 Correlation between KAP regarding hypertension at baseline

To examine the link between the KAP scores, a bivariate analytic model was used to determine the correlation (Table 4.7). Regarding hypertension, knowledge exhibited a

substantial fair, positive connection with attitude (r=+0.255; p<0.001) and practice (r=+0.252; p<0.001). On the other hand, there was no statistically significant difference in attitude and practice about hypertension (r=+0.064; p=0.190).

Table 4.7 Pearson Correlation Test, correlations between knowledge, attitude, and practice about hypertension at baseline (n=422).

Variables	*r*-value	*p*-value	Interpretation
Knowledge and Attitude	+0.255	<0.001	Fair, positive correlation
Knowledge and Practice	+0.252	<0.001	Fair, positive correlation
Attitude and Practice	+0.064	0.190	No correlation

4.1.7 Association between KAP scores regarding hypertension and sociodemographic characteristics at baseline

The KAP total scores were utilized to compare several sociodemographic variables, including age, length of stay in care, gender, educational attainment, employment, and caregiver-patient relationship at baseline assessment.

1) Correlation between KAP scores regarding hypertension and age at baseline

To assess the relationship between age and the KAP scores associated with hypertension at baseline, a bivariate analysis model was utilized to quantify the correlation (Table 4.8). Age did not correlate with either the knowledge score (r=+0.034; p=0.490) or the practice score (r=+0.043; p=0.382). However, age and attitude score showed a substantial fair, positive correlation (r=+0.233; p<0.001).

Table 4.8 Pearson Correlation Test, correlations between age and total scores for knowledge, attitude, and practice about hypertension at baseline (n=422).

Variables	*r*-value	*p*-value	Interpretation
Age and Knowledge Score	+0.034	0.490	No correlation
Age and Attitude Score	+0.233	<0.001	Fair, positive correlation
Age and Practice Score	+0.043	0.382	No correlation

2) Correlation between KAP scores regarding hypertension and duration in care at baseline

To investigate the association between the length of stay in care and the KAP scores for hypertension, the correlation was evaluated using a bivariate analysis model. There was no link found between the duration in care and the knowledge, attitude, and practice scores (r=+0.024; p=0.627), (r=-0.089; p=0.066), and (r=+0.083; p=0.089), respectively (Table 4.9).

Table 4.9 Correlations between duration in care with total scores of KAP regarding hypertension using Pearson Correlation Test at baseline (n=422).

Variables	*r*-value	*p*-value	Interpretation
Duration in care and Knowledge Score	+0.024	0.627	No correlation
Duration in care and Attitude Score	-0.089	0.066	No correlation
Duration in care and Practice Score	+0.083	0.089	No correlation

3) Comparing KAP regarding hypertension between different genders, educational levels, occupations, and the relationship of the caregiver to the patient at baseline assessment

Table 4.10 presents the findings of a statistical analysis comparing the KAP for hypertension in males (n = 155) and females (n = 267), using an independent t-test; between participants who were employed and non-employed; non-employed participants (n = 264) included farmers, students, and housewives; employed participants (n = 158) included business people and those employed in various sectors; between individuals with higher and lower levels of education, with higher levels of education (n = 135) including secondary and college education, and lower levels of education (n = 287) including those with no education and only primary education; as well as between individuals who had a blood relationship and those who did not, participants with a blood relationship (n = 153) included the patient's parent and child, while those without a blood relationship (n = 269) included spouses and other individuals. Between the groups under comparison, there were notable variations in knowledge and attitudes about hypertension, with p-values ranging from <0.001 to 0.034, all less than 0.05. With a p-value of 0.020, the gender group showed significant differences in practice. Nevertheless, p-values of more than 0.05, ranging from

31

0.110 to 0.841, indicated no significant differences in hypertension practice amongst the groups under investigation (Table 4.10, Fig. 4.2).

Table 4.10 Association of total scores of KAP hypertension with different socio-demographic factors using independent t-test (n=422).

Groups being compared	n	Knowledge scores		Attitude scores		Practice scores	
		Mean (SDᵃ)	p-value	Mean (SDᵃ)	p-value	Mean (SDᵃ)	p-value
Gender							
Male	155	9.8 (1.9)	0.007	17.1 (1.2)	<0.001	24.8 (3.4)	0.020
Female	267	9.3 (1.9)		16.6 (1.3)		25.5 (2.9)	
Education Level							
Lower[b]	287	9.1 (1.6)	<0.001	16.5 (1.3)	<0.001	25.2 (2.8)	0.452
Higher[c]	135	10.4 (2.2)		17.3 (1.1)		25.4 (3.6)	
Occupation							
Non-employed[d]	264	9.1 (1.6)	<0.001	16,3 (1.3)	<0.001	25.3 (2.7)	0.841
Employed[e]	158	10.1 (2.2)		17.5 (1.0)		25.2 (3.6)	
Relationship with the patient							
Blood relation[f]	153	9.2 (1.7)	0.034	16.6 (1.4)	0.023	24.9 (2.9)	0.110
No-blood relation[g]	269	9.6 (2.0)		16.9 (1.3)		25.4 (3.2)	

Note: [a]Standard deviation; [b]Primary and no education; [c]Secondary and college education; [d]Farmers, students and housewives; [e]Business people and those employed in different sectors; [f]Participants who were children and parents of the patients; [g]Spouces and others.
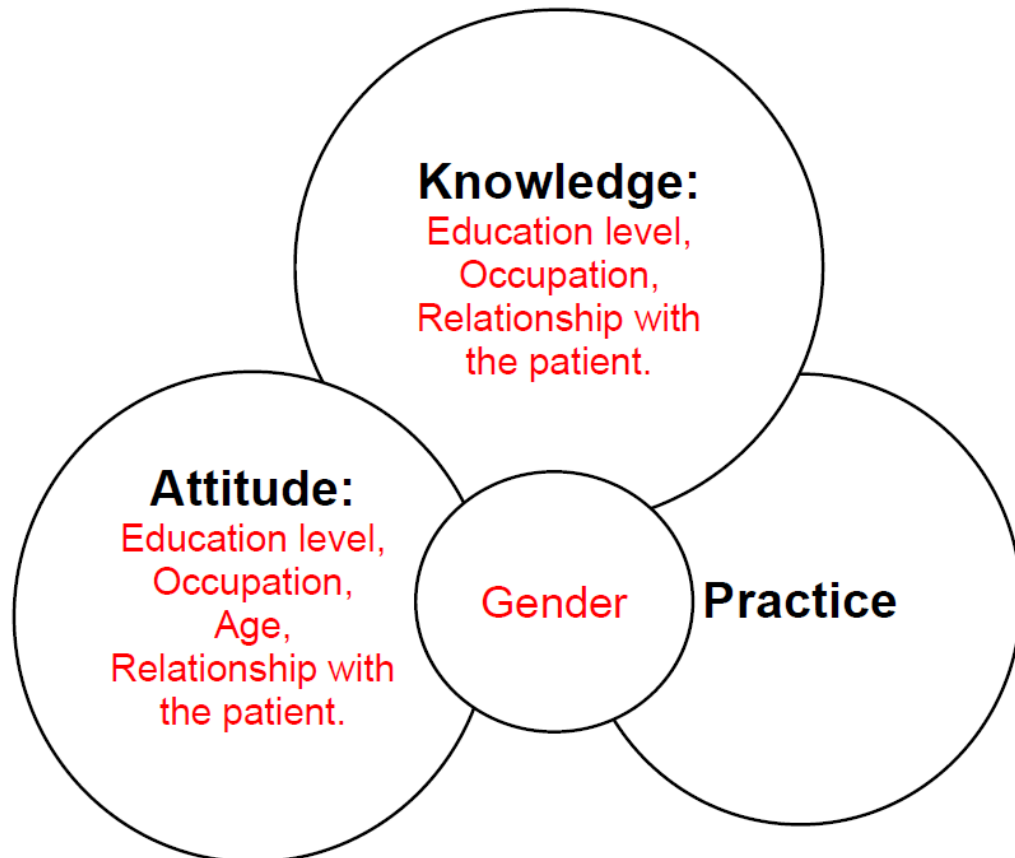
Figure 4.2 Determinants of KAP among caregivers of Hypertensive patients.

4.1.8 KAP assessment at different assessment times

Following the health educational session, a significant increase in the mean Knowledge, Attitude, and Practice (KAP) scores was observed among all participants compared to baseline measurements (Table 4.11, Fig. 4.3). Participants demonstrated notable improvement in knowledge, with scores rising from a baseline mean of 9.5 (38%) to 21.08 (84.3%, p 0.000) immediately post-education. All 422 participants enrolled in the study successfully completed the six-week assessment period. However, at the end of six weeks, the mean knowledge score showed a 2.1% decrease to 20.54 (82.2%, p <0.001) compared to the immediate post-education score of 21.08 (84.3%). In terms of attitude, there was an increase in the mean score from the baseline of 16.76 (93.1%) to 17.74 (98.6%, p <0.001) at six weeks. Similarly, the mean practice score also increased from 25.24 (78.9%) at baseline to 27.42 (85.7%, p <0.001) at six weeks. It's worth noting that no immediate post-health education assessment was conducted for attitude and practice.

33

Table 4.11 KAP assessment scores at different assessment times (n=422).

	Baseline (Assessment 0)		**Immediate post-health education (Assessment 1)**			**Week Six (Assessment 2)**			
	n	**Mean (%) (SD)**	***n***	**mean (%) (SD)**	***p-*value***	***n***	**mean (%) (SD)**	***p-*value***	***p-*value^**
Knowledge	422	9.50 (38.0) (1.92)	422	21.08 (84.3) (2.06)	<0.001	422	20.54 (82.2) (3.32)	<0.001	<0.001
Attitude	422	16.76 (93.1) (1.31)				422	17.74 (98.6) (0.66)	<0.001	
Practice	422	25.24 (78.9) (3.10)				422	27.42 (85.7) (1.12)	<0.001	

1. * Wilcoxon signed-rank test compared to baseline

2. ^ Wilcoxon signed-rank test compared to post-health education

3. SD Standard deviation
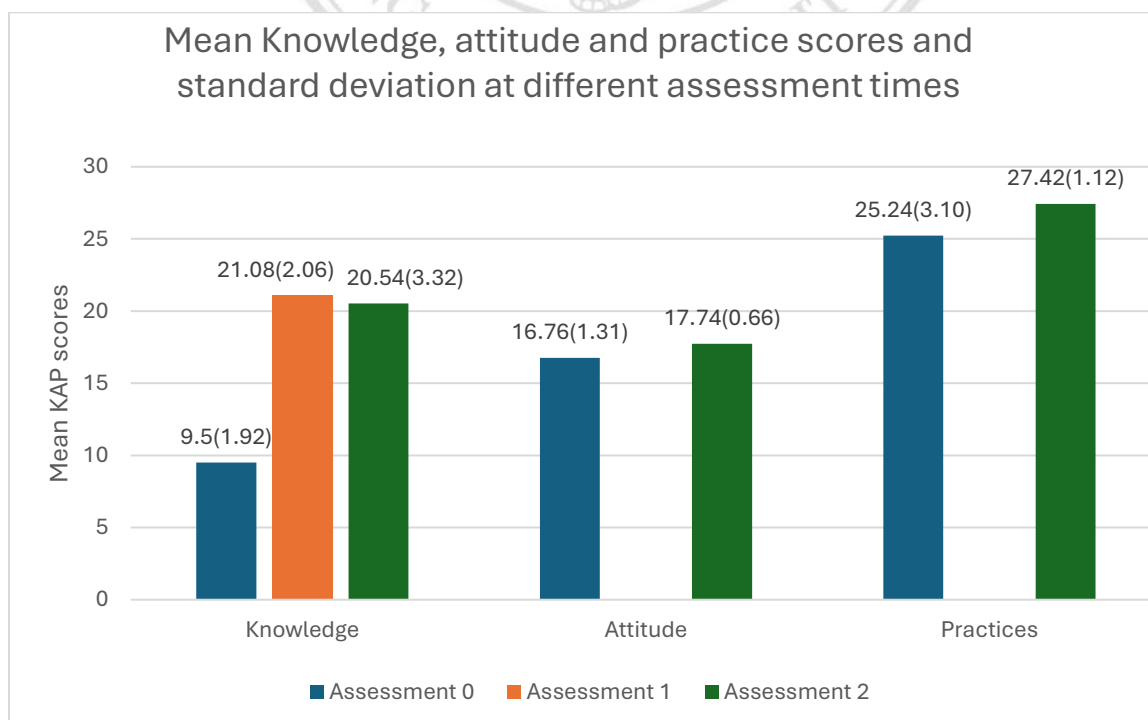
Figure 4.3 Mean KAP scores and standard deviation at different assessment times.

4.1.9 Comparison of Correlation between KAP regarding hypertension at different assessment times

To compare the relationship between KAP scores at baseline and those at six weeks post-health education, a bivariate analytic model was employed to ascertain the correlation (Table 4.12). In terms of hypertension, knowledge demonstrated a notably significant positive association with attitude (r = +0.255; p < 0.001) and practice (r = +0.252; p < 0.001) at baseline. Conversely, there was no statistically significant correlation between attitude and practice regarding hypertension at baseline (r = +0.064; p = 0.190). However, following post-health education at week six, a fair positive correlation emerged between knowledge and attitude, knowledge and practice, and attitude and practice concerning hypertension (r = +0.381; p = <0.001), (r = +0.396; p = <0.001), and (r = +0.217; p = <0.001), respectively.

Table 4.12 Pearson Correlation Test, correlations between KAP hypertension at baseline and six weeks post-health education (n=422).

Variables	Baseline			Six weeks		
	r-value	*p*-value	Interpretation	*r*-value	*p*-value	Interpretation
Knowledge and Attitude	+0.255	<0.001**	A fair, positive correlation	+0.381	<0.001**	A fair, positive correlation
Knowledge and Practice	+0.252	<0.001**	A fair, positive correlation	+0.396	<0.001**	A fair, positive correlation
Attitude and Practice	+0.064	0.190	No correlation	+0.217	<0.001**	A fair, positive correlation

** Correlation is significant at the 0.01 level (2-tailed)

4.1.10 Comparison of correlation between KAP scores regarding hypertension and age at different assessment times

To examine the connection between age and KAP scores concerning hypertension both at baseline and six weeks after health education, we employed a bivariate analysis model to assess the relationship (Table 4.13). The analysis revealed that age did not exhibit any significant correlation with either the knowledge score (r=+0.034; p=0.490) or the practice score (r=+0.043; p=0.382) at baseline assessment. However, there was a

35

noteworthy and positive correlation between age and attitude score at baseline (r=+0.233; p<0.001). Conversely, following health education at the six-week mark, no correlation was found between age and attitude score (r=-0.061; p=0.221) or age and practice score (r=-0.028; p=0.562). Notably, there was a negative correlation observed between age and knowledge score at the six-week mark post-health education (r=-0.146; p=0.003).

Table 4.13 Pearson Correlation Test, correlations between age and total scores for knowledge, attitude, and practice about hypertension at baseline and at six weeks post-health education (n=422).

Variables		Baseline			Six weeks		
		r-value	*p*-value	Interpretation	*r*-value	*p*-value	Interpretation
Age and Knowledge		+0.034	0.490	No correlation	-0.146	0.003**	Negative correlation
Age and Attitude		+0.233	<0.001**	A fair, positive correlation	-0.061	0.221	No correlation
Age and Practice		+0.043	0.382	No correlation	-0.028	0.562	No correlation

** Correlation is significant at the 0.01 level (2-tailed)

4.1.11 Comparing knowledge retention regarding hypertension between different genders, educational levels, and occupations amongst caregivers of hypertensive patients

We employed an independent t-test to conduct a statistical comparison of knowledge retention for hypertension across different demographic groups. Specifically, we compared males (n = 155) and females (n = 267), individuals with higher levels of education (n = 135), which included secondary and college education, and those with lower levels of education (n = 287), encompassing individuals with no education and only primary education. Additionally, we compared participants based on their employment status: non-employed participants (n = 264), consisting of farmers, students, and housewives, and employed participants (n = 158), including businesspeople and individuals employed in various sectors. The results revealed a significant difference in knowledge retention among different education level groups (p=0.009), whereas no significant differences were observed in attitude and practice. There were no significant differences observed in knowledge retention based on gender or occupation (Table 4.14).

36

Table 4.14 Comparison of knowledge retention between different socio-demographic factors using independent t-test (n=422).

Groups being compared	n	Knowledge scores		Attitude scores		Practice scores	
		Mean (SD)	*p*-value	Mean (SD)	*p*-value	Mean (SD)	*p*-value
Gender							
Male	155	20.27 (3.29)	0.209	17.70 (0.70)	0.342	27.35 (1.09)	0.334
Female	267	20.69 (3.34)		17.77 (0.64)		27.46 (1.14)	
Education Level							
Lower level of education	287	20.83 (3.39)	0.009*	17.76 (0.64)	0.375	27.49 (1.14)	0.089
Higher level of education	135	19.03 (3.09)		17.70 (0.71)		27.29 (1.07)	
Occupation							
Non-employed	264	20.79 (3.23)	0.138	17.74 (0.67)	0.967	27.47 (1.12)	0.281
Employed	158	20.23 (3.46)		17.75 (0.66)		27.35 (1.12)	

*Significant at p < 0.05

4.2 Discussion

This prospective cohort study aimed to assess knowledge, attitude, and practices and their determinants towards hypertension and to evaluate the effect of health education on knowledge retention among caregivers of hypertensive patients. The study was conducted in a rural setting where formal education is limited. Our study showed that 84.8% of the caregivers had limited knowledge regarding hypertension at baseline and improved tremendously after health education. Almost all the caregivers (97.8%) got their knowledge from the healthcare provider, which is different from the study conducted in Bangladesh, where most of the caregivers got the information from the internet and other platforms [57], indicating the state of poverty and illiterate in which the study population is. The study showed that most caregivers were spouses (63.0%), followed by children

37

(25.8%) of the patients. This is also the case in studies conducted in Bangladesh and Nigeria about caregivers of hypertensive patients [8, 57], as these are the family members that are always close by. More than half (61.4%) of the patients being taken care of have been in care for at least 1 to 5 years. All the caregivers were Christians.

The study found improvements from baseline in participants' knowledge (38.0%), immediately post-health education (84.3%) and at six weeks (82.2%), demonstrating the importance of health education and the ability to retain knowledge by the caregivers. Interestingly, even though participants in this study had varying educational backgrounds, changes in immediate post-health education knowledge were similar to those found in previous research [58-60].

The study revealed that, despite having a positive attitude towards managing hypertension, caregivers struggled with practices related to diet and nutrition needs of hypertensive patients at baseline and even at week six assessments. In rural Malawi, food security, limited availability of fruits and dietary practices are critical components of effective hypertension management. Food security, defined by consistent access to sufficient and nutritious food, is often challenged by poverty, seasonal food shortages including fruits, and reliance on subsistence farming. These conditions lead to diets that are predominantly maize based, lacking diversity, and often deficient in essential nutrients [61]. For caregivers of hypertensive patients, these limitations pose significant barriers to adhering to recommended dietary practices. Economic constraints further complicate the situation, forcing households to opt for cheaper, less nutritious foods that are typically high in carbohydrates and low in other essential nutrients [62].

High salt intake is a well-documented risk factor for hypertension, exacerbating blood pressure by increasing water retention and blood volume [33]. In Malawi, traditional dietary practices and limited access to diverse foods mean that salt-rich foods are commonly consumed, both for their flavor and preservative properties. Cultural habits around cooking and food preparation often involve significant use of salt, posing a challenge to reducing sodium intake as part of hypertension management [63]. Post-educational intervention, caregivers showed improved understanding and practices regarding salt reduction. However, maintaining these changes requires ongoing support and practical solutions that respect local dietary habits and economic realities. Addressing these challenges through comprehensive educational programs, community support

38

initiatives, and policies aimed at enhancing food security and reducing salt intake is essential for improving hypertension outcomes in such resource-limited settings like Malawi.

Female caregivers generally had less scores in knowledge and attitude with more scores in practice at baseline as compared to their male counterparts the study has found. Post health education, females scored higher in knowledge, exhibited more positive attitudes towards hypertension management, and demonstrated better practices related to patient care.

This gender disparity could be attributed to several socio-cultural factors prevalent in rural settings like Neno. Women often assume the primary caregiving role within families, giving them more direct involvement and responsibility in managing chronic conditions such as hypertension [8]. This greater involvement may result in a deeper understanding of health issues and more proactive health behaviors. Additionally, women may have more frequent interactions with healthcare providers, which can enhance their overall health literacy and familiarity with managing health conditions.

It was also noted that higher educational levels were associated with better knowledge, attitudes, and practices (KAP) scores regarding hypertension at baseline. Caregivers with secondary or higher education demonstrated significantly greater knowledge about hypertension, more positive attitudes towards managing the condition, and better practices compared to those with primary or no formal education.

However, at the six-week follow-up, lower educational level was associated with better KAP scores. This unexpected finding could be attributed to the fact that those who have higher education may have felt overconfident in their existing knowledge and therefore did not pay as much attention to or retain the information provided during the health education sessions. In contrast, those with lower education levels may have been more engaged and receptive to learning about hypertension management, leading to greater gains in knowledge, more positive attitudes, and improved practices over the period under study.

This association emphasizes the importance of education in empowering caregivers with the knowledge and skills necessary for effective health management. Higher education levels are typically associated with improved health literacy, critical thinking, and the

ability to understand and apply health information [64]. This is particularly crucial in managing chronic diseases like hypertension, where ongoing monitoring and adherence to treatment protocols are essential.

The study's findings highlight the need for educational interventions that are accessible and comprehensible to all caregivers, regardless of their educational background. Simplified educational materials and training sessions tailored to the needs of those with lower educational.

The observed positive correlation between knowledge, attitude, and practices (KAP) shows the interrelationship of these factors in influencing hypertension care. Caregivers with improved knowledge demonstrated more positive attitudes and better practices towards hypertension management, indicating the holistic impact of education on caregiver behavior. The results showed an increase in the attitude (from 93.1% to 98.6%) of caregivers towards hypertension with a remarkably good practice (from 78.9% to 85.7%) at week six post-health education, this is in line with a study conducted in Thailand which showed a positive impact after health education was given to caregivers [65]. This also agrees with other studies conducted in sub–Saharan Africa which found that improved knowledge after health education led to improved attitude and practice [66-68].

4.2.1 KAP regarding hypertension

Among all chronic diseases, hypertension is the most prevalent and serious health issue in the globe [69]. Lack of awareness of this illness can hurt one's mindset and potentially contribute to the increased prevalence of hypertension due to poor dietary and lifestyle choices [70]. The study's findings indicate that participants' knowledge regarding hypertension was poor at baseline, similar to a study conducted in Ghana about hypertension among people living in rural communities [71]. These results are contrary to the results of the study about caregivers of hypertensive patients conducted in Bangladesh [57]. This may be the case since nearly all the respondents obtained a great deal of information regarding hypertension from healthcare providers. The study setting, the subjects' low socioeconomic status, and illiteracy were the leading causes of their low knowledge score [72].

According to the participants' responses in this study, 89.8% of the participants partially

40

responded correctly on risk factors, of which excessive salt intake was the most mentioned, and some attributed the disease to stress at baseline. These results are similar to those studies conducted in Benin, Philippines, China, Zimbabwe, and Bangladesh [55, 73-76]. Few participants (15.4%) correctly answered questions about the preventive measures of hypertension. On complications, only 3.1% of participants could correctly single out the complications, with the remaining partially answered correctly, with stroke being the most mentioned complication at baseline assessment. This is consistent with research done in Saudi Arabia [5]. Almost all the participants (95.6%) partially knew how often blood pressure should be monitored, while 46.2% knew the normal blood pressure measurement. This indicates that patients risk developing complications due to limited knowledge regarding blood pressure monitoring among caregivers [77].

Half of the participants (51.9%) at baseline, were able to mention signs and symptoms of hypertension, with heart palpitations topping the list. This emphasizes the significance of identifying high blood pressure early on as one of the key elements in reducing the rate at which hypertension develops [78]. These results are similar to the results of a study conducted in Ethiopia, which demonstrated a significant level of inadequate knowledge about hypertension among the communities [24].

At baseline assessment the participants demonstrated a positive attitude towards hypertension. Of those interviewed, 98.3% agreed that hypertension is a serious illness that, if left unchecked, can result in major problems, and 95.0% believed that medicine and lifestyle modifications could effectively control hypertension. These findings are consistent with a scoping review of hypertension in Sub-Saharan Africa which found out that most of the subjects have good attitudes regarding hypertension [68]. Almost half (46.4%) and (44.8%) did not feel having enough information about hypertension, and hence they were not confident in caring for hypertensive patients, respectively. Nonetheless, 96.9% felt supported by the health care professionals in their caring role. This is the outcome of community health workers' participation in Malawi's hypertension management program [79].

Over half of the practice items had subpar performance, with results falling below 50% at baseline. This is in line with research from Malaysia, where participants scored poorly on hypertension-related practices, below 50.0%. [80]. Though 74.6% ensured that their patients were taking drugs as prescribed by the doctor, less than half (33.9%) were able

41

to encourage patients on lifestyle changes like physical activity and healthy diet. Medication adherence is similar to another study conducted in Malawi [81], which denotes the severity of the disease as one of the factors leading to good adherence. Only a few participants (17.5%) could monitor patients' blood pressure regularly, this could be due to the study setting and the Malawian health system, where health facilities are far from reach [82]. This puts communities at risk as there are a lot of gains when hypertension is diagnosed early [83]. Over half (60.2%) of the participants could communicate with healthcare providers when a problem arises, and more than half (69.9%) could keep their patients' blood pressure readings.

During the initial assessment, only a few (18.7%) were able to accompany the patient to doctor appointments; this is because most of the patients were stable and were back to their day-to-day activities. Less than a quarter (16.6%) and (15.4%) of participants were able to prepare meals that met dietary guidelines and managed to help patients with meal planning respectively. This is because of poverty, low socioeconomic status, and food insecurity faced by the participants, resulting in eating whatever is available [62]. There is a need to incorporate food security in the prevention and management of NCDs in LMICs as this may improve availability of health diet within the communities.

4.2.2 Correlation between KAP regarding hypertension

The cumulative knowledge and attitude scores, as well as the cumulative knowledge and practice scores pertaining to hypertension, showed a significant but fair positive connection. It was shown that higher knowledge was linked to a more positive attitude about hypertension among the participants. This outcome suggests that individuals possessing a greater understanding of hypertension tend to exhibit a more positive attitude toward hypertension prevention and management. The observed findings align with a study in Malaysia that identified a noteworthy correlation between knowledge and attitude related to hypertension within the studied population [80].

The study also found a strong positive correlation between knowledge and the implementation of practices related to hypertension among the respondents. A clear link exists between possessing accurate knowledge and adopting appropriate practices. For instance, individuals' awareness that excessive salt intake is linked to elevated blood pressure tends to reduce their salt consumption. Conversely, individuals who wrongly

thought that regular alcohol use did not increase the risk of hypertension were more inclined to overindulge in alcohol.

It's interesting to note that within the study population, there was no significant association found between attitude and practice regarding hypertension at baseline. This implies that better attitudes could result in something different than better practices. For example, even though most responders agreed that a healthy diet and increased physical activity could help manage hypertension, they did not aggressively encourage their patients to adopt these lifestyle changes. This could be due to poor knowledge and the low social economic status which prohibits people from adopting lifestyle changes such as eating healthy diets and most of these people are farmers and farming is a physical activity on its own. These findings are similar to a study conducted in Nigeria [84] while these findings contradict another study's results from Lebanon, which revealed a significant relationship between the research population's attitude and practice about hypertension. In that study, individuals with a positive attitude were more likely to exhibit better practices in the prevention and management of hypertension [51].

4.2.3 Determinants of knowledge, attitude, and practice

Age and attitude regarding hypertension in the population under study showed a significant correlation. Interestingly, while age positively correlated with attitude, no such correlation was observed concerning hypertension-related knowledge and practices scores at baseline. This implies that as individuals age, their attitude toward hypertension tends to become more favorable, yet their knowledge and actual practices in managing hypertension remain unaffected. This highlights the need to consider age in the planning and execution of health care strategies because as people grow old, they tend to forget easily hence a need for continued health education and their weak body may inhibit them from doing physical activities.

Notably, in this study, Knowledge, Attitude, and Practice (KAP) levels related to hypertension among caregivers were unaffected by the length of time the patient received care. Despite the varying durations in care, there was no significant difference in the KAP scores among the respondents. This may be because the respondents were caregivers and not patients themselves [51].

Furthermore, the study unveiled a noteworthy gender-related association with KAP

43

concerning hypertension in the study population demonstrating the role women in caring for the sick in most of the LMICs. In contrast, factors such as educational level, occupation, and the relationship with the patient demonstrated a significant association with knowledge and attitude, showing no notable correlation with practices related to hypertension. This highlights the relationship of different factors which help in shaping individuals' perceptions and behaviors toward hypertension, emphasizing the need for a clear approach in addressing these variety of aspects [85]. The closer the relationship and the higher the occupation the better the understanding and perception of diseases.

Hypertension is influenced by modifiable and non-modifiable risk factors [27]. In Malawi, modifiable factors include smoking, diabetes, unhealthy diet, excessive alcohol use, and stress. Non-modifiable factors are age, gender, and family history [33]. Studies conducted in Malawi have shown that hypertension prevalence increases with age in both genders [86]. Managing lifestyle choices is crucial for prevention, as combining these factors escalates the risk of cardiovascular disease [87]. Education level was found to be a positive factor that affects our participants' KAP levels. This was expected as higher education level increases awareness regarding health issues and provides access to the required information [64]. Therefore, directing efforts towards organizing educational programs, with a primary emphasis on reaching caregivers, older populations, and rural communities, can contribute significantly to elevating the Knowledge, Attitudes, and Practices (KAP) level [88]. Additionally, it is crucial to tailor awareness, treatment, and prevention strategies to align with the specific needs of each community and country [72].

4.2.4 Health education and knowledge retention

Our study found that there was good knowledge retention above 90% at week six although the knowledge score was (82.2%) 2.1% lower than the immediate post-health education score (84.3%) which is the same findings of other studies on knowledge retention [89, 90] which found a decrease in the knowledge score after some time suggesting the need for continued health education. Another study on knowledge retention in the Netherlands found no difference in knowledge retention at different testing times after the initial test [91].

The study revealed a negative correlation between age and knowledge retention. This suggests potential challenges in educating older caregivers. Tailored educational

44

strategies may be necessary to effectively address knowledge retention among this demographic group. The older the person gets the less he is going to retain the knowledge gained. This is similar to the study conducted on knowledge retention in denture care which found that the older the participant the less he or she is likely to remember how to care for the dentures [92]. This suggests the need to consider age when using health education as an intervention in disease prevention and management.

The education level of the participants had an impact on the retention of knowledge our study has found. The significant difference in knowledge retention observed across different education levels highlights the importance of considering socioeconomic factors in designing educational interventions. Future efforts should strive to come up with culturally sensitive and linguistically appropriate educational means and materials to ensure equitable access to knowledge among caregivers from different educational backgrounds. The findings of this study suggest that the relationship between educational level and knowledge retention may be more complex than previously thought. Contrary to the common assumption that higher education leads to better knowledge retention [93], the study found that those with lower levels of education demonstrated better knowledge retention and a more positive attitude with good caregiving practices. This study highlights the need to re-examine the assumptions about the relationship between educational level and knowledge retention, particularly in the context of caregiving. It suggests that factors beyond formal education, such as personal motivation, cultural influences, and practical experience, may play a significant role in shaping an individual's knowledge retention and caregiving abilities.

Although health education is done almost daily at the clinic to the clients by the health care provider before they start rendering services, the baseline knowledge score was still poor at 38.0%. After one-on-one health education sessions, there was an increase in the knowledge gained to 84.3% at immediate post health education and knowledge retained at week six assessment was 82.2%. Our findings highlight the need for tailored educational approaches to address different caregiver needs, emphasizing the importance of integrating caregiver education programs into routine healthcare services to strengthen hypertension prevention and management in resource-limited settings. With shortages in human resources in rural areas often coupled with the responsibility burden of clinicians [94], health education is a key to preventing and managing diseases. Lack of knowledge results in bad attitude and poor practices affecting the quality of care [95].

45

The findings of this study emphasize the crucial role of health education in enhancing hypertension prevention and management, particularly in resource-limited settings like rural Malawi. The significant increase in knowledge scores immediately post-health education, although with a slight decrease at the six-week mark, suggests the effectiveness of health education in imparting knowledge to caregivers and retaining it, subsequently resulting in improved attitude and good practice. As most of the risk factors for hypertension are modifiable through lifestyle changes, our study gives an insight into how health education can be more useful in enhancing lifestyle changes among communities.

4.2.5 Study strengths and limitations

The study strengths include firstly, the utilization of a prospective cohort design, allowing for the examination of knowledge retention and its impact on caregiver behavior over time and secondly, a large sample size (422 caregivers) enrolled in the study, provided a substantial sample size, enhancing the statistical power and reliability of the findings. However, the study has some limitations. The six-week period is shorter to conclude a long-term knowledge retention therefore there is a need to conduct a longitudinal cohort study to assess knowledge retention for a longer period. The study was only conducted in rural areas facing the challenge of generalizability hence the need for a study that will look at both rural and urban areas.

46

CHAPTER 5

Conclusion

The baseline assessment revealed that caregivers generally held favorable attitude towards hypertension prevention and management. However, this was tempered by significant gaps in their actual knowledge and suboptimal caregiving practices. Factors such as education levels, occupation, age, and gender were found to impact KAP scores.

Importantly, the study demonstrated the powerful impact that a tailored health education program could have in addressing these knowledge and practice gaps. Immediately after the educational session, caregivers' knowledge scores improved markedly across the board. Even more encouragingly, the study found that much of this newfound knowledge was retained by participants even six weeks later. This sustained improvement in knowledge translated to better attitude and continued adoption of recommended hypertension prevention and management practices. Of note, practices related to healthy diet were limited both at baseline and week six assessments due to food insecurity.

These results emphasize the need to address food insecurity, the important role that caregivers play in supporting hypertension management and highlight the immense potential of health education initiatives to empower this crucial group. By improving food security, boosting caregiver knowledge, enhancing their awareness, and promoting the adoption of healthy behaviors, such programs can have a profound and lasting impact on hypertension outcomes. This is particularly important in resource-limited settings like rural Malawi, where caregivers often serve as the frontline providers of chronic disease care.

To maximize the benefits of health education, future interventions should be carefully tailored to address the unique needs and barriers faced by different caregiver subgroups. Particular attention should be paid to developing culturally relevant programs that resonate with lower-educated, older, and female caregivers - the very individuals identified as most at risk of knowledge deficits in this study.

47

Investing in targeted, evidence-based health education for caregivers represents a promising and cost-effective strategy for improving hypertension prevention and management in resource-constrained settings. By empowering this critical population with the knowledge and skills to provide high-quality care, we can work towards reducing the growing burden of noncommunicable diseases and improving quality of life for patients. Further research is needed to evaluate the long-term effectiveness and scalability of such interventions across diverse contexts.

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APPENDIX A

Data Collection Tool

Name of Interviewer: _____ **Date:** _____
Identification Number: _____ **IC3 Clinic:** ◯ Lisungwi Hospital ◯ Neno Hospital
Phone Number: _____

Section 1. Demographic Data

1.1. Age:		1.2. Gender	◯ Male
			◯ Female
		1.3. Education Level	◯ No education
			◯ Primary school
			◯ Secondary school
1.4. Relationship with the patient	◯ Spouse		◯ College graduate
	◯ Child		
	◯ Parent		
	◯ Other (specify)		
1.5. Location/village:			
1.6. Diagnosis date of Hypertension:			
1.7. Occupation:			
1.8. Religion:			

Section 2. Knowledge, Attitudes and Practices

2.1. Knowledge of caregivers towards hypertension
Note:
(1) for Correct answer ($\sqrt{}$ = correct answer for interviewers' reference)
(0) for Wrong answer

ITEM	CONTENT	YES	NO	INT REF
1. What is hypertension	A disease that affects the heart and blood vessels			$\sqrt{}$
	High blood sugar			
	High blood pressure			$\sqrt{}$
	Affect only older people			
2. Risk factors of hypertension	Smoking			$\sqrt{}$
	Age			$\sqrt{}$
	Obesity			$\sqrt{}$
	Sedentary lifestyle			$\sqrt{}$
	Excessive salt intake			$\sqrt{}$
	Excessive alcohol intake			$\sqrt{}$
	Heredity			$\sqrt{}$
	Poor diet			$\sqrt{}$

58

3.	Signs and symptoms of hypertension	Headache			√
		vomiting			
		Fever			
		General body pains			
		Heart palpitations			√
		Sweating			
		General body weakness			
4.	Complications of hypertension	Heart attack			√
		Stroke			√
		Kidney damage			√
		Heart failure			√
		Dementia			
5.	Prevention of hypertension and its complications	In hypertensive patients, drinking alcohol does not cause complications.			
		Minimize salt intake			√
		Patients with high blood pressure do not need to quit smoking.			
		High levels of stress can lead to a temporary increase in blood pressure.			√
		Patients with high blood pressure should not eat fruits and vegetables to increase blood sugar.			
		Physical activity can help keep you at a healthy weight and lower your blood pressure.			√
		Patients with high blood pressure when suffering from illness such as nausea, vomiting should seek medical attention.			√
6.	How often should Blood pressure be monitored in hypertensive patient	Daily			√
		Weekly			√
		Monthly			√
		Every 3-6 months			√
		Only when the patient is feeling unwell			
		No need for monitoring			
7.	What is a normal BP reading?	120/80 mmHg			√
		130/80 mmHg			
		140/90 mmHg			
		150/100 mmHg			
		Any reading			
8.	Health education	Have you received any health education or training on hypertension?			√ yes
9.	If yes from the item 8, where did you get the information?	Healthcare provider			√
		Internet			√
		Support group			√
		Community health worker			√
		Other (please specify)			√

2.2. Attitudes of caregivers towards Hypertension
Note:
(3) for Agree; (2) for Not sure; (1) for Disagree

ITEM	CONTENT	Agree	Not sure	Disagree
1	Do you think hypertension is a serious condition?			
2	Do you think that hypertension can be managed with medication and lifestyle changes?			
3	Do you think that caregivers play an important role in managing hypertension?			
4	Do you feel confident in your ability to manage the patient's hypertension?			
5	Do you feel supported by healthcare professionals in managing the patient's hypertension?			
6	Do you feel like you have enough information about hypertension to effectively care for a hypertensive patient?			

2.3. Practices of caregivers
Note:
(4) for Always; (3) for Sometimes; (2) for Rarely; (1) for Never

ITEM	CONTENT	ALWAYS	SOMETIMES	RARELY	NEVER
1	Do you ensure that the patient takes their medication as prescribed?				
2	Do you encourage the patient to make lifestyle changes such as exercising and eating a healthy diet?				
3	Do you monitor the patient's blood pressure regularly?				
4	Do you keep a record of the patient's blood pressure readings?				
5	Do you communicate with healthcare professionals about the patient's hypertension management?				
6	How often do you accompany the patient to doctor's appointments?				
7	How often do you prepare meals for the patient that meet dietary guidelines for hypertension?				
8	Do you help the patient with meal planning?				

CURRICULUM VITAE

Author's Name   Mr. Chikondi Maluwa

Education   2017: B.Sc. (Anaesthesia and Intensive Care), Faculty of
                       Medicine, Kamuzu University of Health Sciences, Malawi.
                       2013: Dip. (Anaesthesia and Intensive Care), Faculty of
                       Clinical Medicine, Malawi College of Health Sciences,
                       Malawi.

Experience   August 2017 - Present: Associate Anaesthesiologist, Ministry of
                       Health, Neno district Health office, Neno, Malawi.
                       January 2021 to Present: Part time lecturer in Anaesthesia and
                       Intensive Care Medicine, Malawi College of health Sciences,
                       Malawi.

61