Exploring Awareness and Healthy Lifestyle Behaviours for the Prevention of Hypertension in Rural Communities in Central Uganda

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I would like to dedicate this PhD to my husband (Mr. Rumunya Samuel) and children (Matthew, Shadrach, Martha, and Simeon) for their wonderful support and patience.

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I also dedicate this PhD to the people of Wakiso District who are passionate about the prevention of hypertension as well as the district health officers for having allowed me to conduct this research.

Declaration

I attest that the regulations and code of conduct for PhD degree programs at the University of Salford were followed when completing the work in this thesis.

To the best of my knowledge and belief, this study does not include any previously published or written work by another individual unless specifically referenced in the text, nor does it contain any material previously submitted for any other academic award at any university. This thesis is the candidate’s original work. The author’s opinions are the only ones that are expressed in this dissertation.

Signed:

Date: 27th May 2024

Abstract

Background

Globally, hypertension is a major risk factor for mortality and most deaths occur in low- and middle-income countries. The prevalence of hypertension is highest in the rural communities of Central Uganda where awareness is lowest. There is limited evidence about the primary prevention of hypertension in Uganda, yet most of risk factors are preventable. This study aims to explore awareness and individual healthy lifestyle behaviours for the prevention of hypertension in rural communities of Central Uganda.

Methods

A sequential explanatory mixed methods research study was conducted. A multistage sampling technique was used to identify study sites and participants. A survey and focus group guide were used to collect quantitative and qualitative data respectively. Data were analyzed using descriptive statistics, bivariate analysis, and logistic regression models. Results are presented in frequencies, percentages, and Odds ratios (OR). The statistical analysis was carried out using Stata version 13. Qualitative data was analyzed using framework analysis and a narrative contiguous approach was used for data integration.

Results

Overall, 562 participants were included in the quantitative study, and of these 66.73% were female, 54.27% were aged 18-37 years, and only 7.12% had completed a tertiary level of education. Approximately 60% knew their hypertension status. Only 5% of participants were able to mention 3-4 types of foods that prevent hypertension. Bivariate analysis indicates that the risk of being hypertensive increases with one's age; being educated to at least the primary level was found to be associated with a reduced risk of being hypertensive when compared to having no education at all; OR=0.48 (95% CI: 0.26-0.89) for primary, 0.20 (95% CI: 0.10-0.39) for secondary, and 0.33 (0.14-0.81) for tertiary level education. Not performing moderate physical intensity activities were found to have a significantly increased likelihood of being hypertensive compared to participants whose usual work involved moderate physical intensity (OR = 0.51; 95% CI: 0.34-0.76). Moreover, the risk of acquiring hypertension reduces with the increasing number of hours of performing moderate intensity activities (3-4 hours OR = 0.61; 95% CI: 0.41-0.90 ** and 5-10 hours OR = 0.26; 95% CI: 0.14-0.48 ***).

The qualitative study included 32 participants. Four themes emerged from the framework analysis: (i) socio-cultural issues related to hypertension, (ii) socio-economic factors related to hypertension, (iii) knowledge and perception about hypertension, and (iv) proposed interventions for the prevention of hypertension. The consumption of bitter berries, a family-centered care approach, and cultural practices for food preparation were perceived to be key in the prevention of hypertension.

Conclusion

The findings from this research have significant policy implications particularly targeted interventions focusing on a family-centered approach care for the prevention of hypertension in rural communities of Uganda and across low- and middle-income countries with similar settings. This study has uncovered traditional practices for the prevention of hypertension in the communities surveyed. A key example is the use of bitter berries in the prevention of hypertension. However, clinical trials are required to further examine the effectiveness of bitter berries in the regulation of blood pressure in the adult population.

Key words

Hypertension, healthy lifestyle behaviours, prevention

Key

* = p-value = ≤ 0.01 to ≤ 0.05

** = p-value = <0.01 to ≤ 0.009

*** = p-value = < 0.009

1 Chapter One: Introduction and Background

1.1 Chapter Overview

This chapter presents an introduction to this thesis, which explored awareness and lifestyle behaviours for the prevention of hypertension in rural communities in Uganda. Statistics for the prevalence of hypertension globally and in low- and middle-income countries, including Uganda, are presented. The chapter then discusses current knowledge about the prevention of hypertension, healthy lifestyle behaviours that influence the prevalence of hypertension and effective interventions for the prevention of hypertension. The chapter also describes the research problem and significance of this study and elucidates the theoretical dimensions and motivation underpinning the study.

1.1.1 Introduction

Globally, hypertension is the leading cause of premature death and cardiovascular diseases (CVDs). Furthermore, global estimates indicated that the number of people with hypertension increased from 594 million in 1975 to 1.13 billion in 2015 (WHO, 2019), and is likely to exceed 1.6 billion by 2025 (Fuchs & Whelton, 2020; Mills et al., 2016; Wang et al., 2020; WHO, 2019). A recent global study that included 195 countries reported that the number of hypertensive cases had more than doubled from 7.7 million in 1990 to 17.1 million in 2017, and the number of hypertensive fatalities and disability-adjusted life years had also increased significantly, reaching 925,675 cases and 16.5 million, respectively (Dai et al., 2021).

The prevalence of hypertension in low- and middle-income countries has been estimated at 32.3%, with the highest estimates coming from the Latin America and Caribbean region (39.1%, 95% confidence interval [CI]: 33.1%–45.2%) (Sandelowski, 2000). Furthermore, the African region had the highest prevalence of hypertension among adults aged 25 years and above (46%) and the Americas had the lowest (35%) (Mills et al., 2016; WHO, 2013). However, many risk factors for hypertension are preventable. The World Health Organization (WHO) regions demonstrated disparities in the distribution of the prevalence of hypertension, with the highest prevalence in the African WHO region (27%) and lowest in the American region (17%), which supported earlier estimates (WHO, 2019). This is further supported by a study that was conducted in East and West Africa in seven communities. Results showed that 25% of participants had high blood pressure, 40% were ignorant of it, 50% of those who were aware received treatment, and only 50% of those who received treatment had regulated blood pressure (Okello et al., 2020). However, according to a more recent survey conducted by the World Hypertension League, Africa currently seems to have the greatest prevalence of hypertension globally, with rates for both sexes combined among those over 25 years old approaching 46% (Parati et al., 2022). Although the prevalence of hypertension is Africa is high, the diagnosis, treatment, and management of hypertension face several obstacles in Africa, including inadequate patient knowledge, restricted access to healthcare services, overworked healthcare systems, issues with the health staff, shortage of inexpensive medication, and noncompliance with medication schedules (WHO, 2023b).

A study conducted across six different Sub-Saharan African regions reported that there was a significant difference in the prevalence and awareness of hypertension across these regions and recommended the need for country-specific awareness programs (Gómez-Olivé et al., 2017). In that study, the South African sites showed the highest prevalence (ranging from 41.6% to 54.1%), and Burkina Faso showed the lowest prevalence (15%). Analysis of the prevalence stratified by sex showed that in Agincourt, Dikgale, and Nairobi, women had higher rates of hypertension than men, whereas men had significantly higher rates than women in Nanoro (Burkina Faso). However, the prevalence of hypertension increased with age in both sexes (Gómez-Olivé et al., 2017). An epidemiological study conducted in Uganda showed that the overall prevalence of hypertension was 26.4%, with the highest prevalence (28.5%) in Central Uganda and the lowest (23.3%) in the Northern region (Guwatudde et al., 2015). Overall, the prevalence of hypertension in Uganda is high compared with the WHO 2000–2025 age-standardized prevalence of 19.5% (Ahmad et al., 2001). Moreover, the age-standardized prevalence rates in Uganda were reported to range from 19.8% to 30.50% in earlier investigations (Kotwani et al., 2013; Maher, Waswa, Baisley, Karabarinde, & Unwin, 2011; Mondo, Otim, Musoke, Orem, & Akol, 2016; Morgan, 1998; Musinguzi & Nuwaha, 2013; Wamala, Karyabakabo, Ndungutse, & Guwatudde, 2009). Based on this previous literature, it was evident that the prevalence of hypertension in Uganda was established approximately eight years prior to the current study. In addition, most of these studies used a quantitative approach to establish the prevalence and none attempted to explore the reasons as why the prevalence has consistently remained high. This then highlighted the need to determine the current prevalence of hypertension in the Central Region of Uganda. The prevalence statistic was then used to explore why the prevalence remained high, as well as propose preventive measures to the prevention of hypertension by using a qualitative approach.

Concerningly, the overall rate of awareness of hypertension in Uganda was reported to be very low at 7.7%, with awareness being significantly lower among rural communities compared with urban communities (12.1%) (unadjusted p=0.001) (Guwatudde et al., 2015). In that study, body mass index (BMI) and age were significantly associated with the prevalence of hypertension. Bloch (2016) revealed that between 2000 and 2010, high-income countries were able to show substantial improvements in awareness about hypertension (58.2%–67.0%) compared with low-income countries, which reported considerably lower rates of awareness (32.3%–37.9%). It is therefore imperative to pay serious attention to the significant and growing differences in the global burden of incorrectly treated hypertension, and potentially adjust the approaches used to raise awareness and help prevent hypertension. The World Heart Federation indicated that by 2025, the global rate of hypertension control is expected to have increased by 25% (Adler et al., 2015). However, achieving this objective requires a significant decrease in the burden of hypertension across the world. It is therefore important to focus on achieving controlled blood pressure for people with hypertension, which is a challenge in low- and middle-income countries as their healthcare systems are challenged by limited resources. Therefore, the prevalence of hypertension in low- and middle-income nations could be reduced by population-based changes in healthy behaviours such as sodium intake, exercise routines, and weight management (Bloch, 2016). This highlighted a need to assess people’s knowledge and awareness about hypertension in rural communities, which may inform policymakers about implementing effective awareness programmes and reducing the high rates of hypertension in these areas.

Hypertension is described as a silent killer (WHO, 2019). The best approach to address hypertension is via prevention before it manifests (Zheng, Li, & Cai, 2014). In the Framingham study conducted in Massachusetts in the US, the risk for developing hypertension was associated with blood pressure history, BMI, parental history, and smoking habits (Parikh et al., 2008). Therefore, because hypertension and its impacts disproportionately affect neglected and underprivileged communities, public health interventions for hypertension have potential to reduce CVDs across a range of groups at risk (Ferdinand et al., 2012). Moreover, evidence has shown that public health approaches have greatly reduced the morbidity and mortality associated with hypertension in high-income countries (Bloch, 2016). This implies that when people are informed about their blood pressure status and associated risk factors, the incidence of hypertension may be reduced.

In Uganda, a nationwide epidemiological survey was conducted across rural and urban communities using the WHO stepwise (STEPS) approach for the surveillance of non-communicable diseases (Guwatudde et al., 2015). This survey instrument has three steps: a questionnaire, physical measurements, and biometric measurements. The STEPS approach is an important framework for obtaining data on risk factors for non-communicable diseases. The tool is flexible and can be modified to accommodate country-specific interests (Guthold et al., 2011; Riley et al., 2016; WHO, 2020). Guwatudde et al. (2015) established that many participants in their study had heard of and even seen people with hypertension, but their understanding of the disease remained limited. Another study conducted in Eastern Uganda among people aged 35–60 years found that hypertension was associated with increasing age and being overweight (Wamala et al., 2009). In addition, people who lived in rural areas were more likely to be hypertensive compared with those in peri-urban areas (p=0.013) (Wamala et al., 2009). However, Guwatudde et al. (2015) did not find any significant difference in the prevalence of hypertension between rural and urban communities.

Most people with hypertension are not aware of their status, which calls for the reinforcement of existing efforts to prevent hypertension (WHO, 2014). This also highlights the need to focus on the high prevalence of hypertension and the low rates of hypertension awareness in Uganda. Any opportunity that may inform efforts to prevent the disease must be considered. For this reason, this study sought to explore awareness and healthy lifestyle behaviours for the prevention of hypertension in rural communities in Central Uganda.

1.1.2 Background

Hypertension is the leading preventable risk factor for mortality in both developed and developing countries worldwide (Bloch, 2016; Ferdinand et al., 2012; Krousel-Wood, Muntner, He, & Whelton, 2004). Furthermore, hypertension contributes to 45% of deaths due to heart diseases, with 51% of this mortality attributable to stroke (WHO, 2013). African Caribbean-born people have a 50% higher prevalence and incidence of hypertension than American people. However, the African Caribbean has a lower rate of awareness of hypertension compared with America (Kumar, 2013). Moreover, hypertension accounts for more than 10 million preventable deaths globally each year (Patel et al., 2016), and about 75% of people with hypertension (1.04 billion) live in low- and middle-income countries (Mills, Stefanescu, & He, 2020). A person is supposed to start taking antihypertensive medication when their blood pressure is ≥140/90 mmHg.

However, antihypertensive medications are costly, and adherence is a challenge, especially in poorly resourced settings. Importantly, many of the predisposing factors for hypertension can be prevented (Unger et al., 2020). Based on this evidence, the need to explore healthy lifestyle behaviours for the prevention of hypertension has become imperative in Uganda, which is a resource-limited country (Owor, 2020).

Globally, the burden of hypertension is high, with four in every 10 adults over age 25 years being at risk for premature death and disability (Khalsa et al., 2014; Lane et al., 2012; Lim et al., 2012). Prevention of hypertension is essential to reduce CVDs and improve the quality of life of individuals. The risk factors associated with CVDs include smoking, poor diet, lack of exercise, and excessive alcohol intake (Adrega, Ribeiro, Santos, & Santos, 2018; Lee, Kim, & Kang, 2019). Aging is a long-term risk factor for developing hypertension. In high-income countries, older age groups (≥60 years) are most affected by hypertension (Mills et al., 2016) and this was also evident in the US (Nwankwo, Yoon, & Burt, 2013). In contrast, the most affected age group in low- and middle-income countries is those aged 40–59 years (Mills et al., 2016). In addition, males in both high-income and low- and middle-income countries tend to have a higher prevalence of hypertension than females (Mills et al., 2016). These findings have been further supported by a systematic review and meta-analysis conducted in Cameroon, which reported that the hypertension prevalence was 34.3% among men and 31.3% among women (Mbanya et al., 2019). Guwatudde et al. (2015) reported that aging and BMI were the only significant non-modifiable and modifiable risk factors, respectively, that were associated with the risk for developing hypertension. Although other risk factors were not statistically significant in that study, other potential confounding factors may explain those findings (Vernon, Laville, & Jackson, 1990). Therefore, it is important to consider both modifiable and non-modifiable risk factors for hypertension prevention. Guwatudde et al. (2015) found that many people were not aware that they were hypertensive. Lack of awareness is therefore a public health threat that may eventually increase a country's healthcare burden (Guwatudde et al., 2015). This highlights the importance of exploring knowledge about hypertension, healthy lifestyle behaviours, and the prevalence of hypertension to establish context-specific recommendations for preventive measures. Other studies also identified the need for blood pressure surveillance, information regarding prevalence, and improved knowledge about the diagnosis, treatment, and management of hypertension in their respective nations (Khalsa et al., 2014; Lane et al., 2012).

Approximately 80% of CVD-related mortality occurs in low- and middle-income countries. Evidence shows that public health strategies and policies, such as promoting healthy living, evidence-based clinical practice, and community preventive practices, can help to prevent hypertension (Ferdinand et al., 2012). The World Hypertension League (WHL) developed a needs assessment tool to support the development of hypertension prevention and control programs. Findings from that assessment indicated that among the societies assessed, developing educational resources was ranked among the most important (10 of 14) actions (Khalsa et al., 2014). In addition, a need for customized guidelines was identified because of differences in economic status, ethnicity, and language across the studied countries. Furthermore, the WHL study identified a need for developing national programs involving hypertension prevention, screening, and control, with an emphasis on education for the public and healthcare professionals (Khalsa et al., 2014). Evidence from the WHL study highlighted the need for every country or community to assess and identify appropriate preventive measures for hypertension. However, a study conducted in Nepal reported an increasing burden of non-communicable diseases, mainly because their healthcare system was focused on the curative instead of the preventive and promotive aspects of health (Oli, Vaidya, Subedi, & Krettek, 2014).

Hypertension is a public health issue because of the morbidity and associated costs for society (Gaziano, Bitton, Anand, & Weinstein, 2009). To reduce the occurrence of hypertension, healthcare professionals should detect hypertensive individuals early and encourage preventative actions. The targeted method is used to treat patients with hypertension, but it has also successfully been employed to prevent hypertension in people who are at high risk for the disease (Whelton, Carey, & Aronow, 2018). A study from China reported that implementing a community intervention program that included lifestyle changes and hypertension education for rural communities was a potent strategy to lower the prevalence of hypertension and enhance long-term health outcomes (Huang et al., 2011b). Similarly, a study conducted in Uganda identified the need for sustainable interventions to assist in reducing the burden of hypertension in Ugandan communities (Guwatudde et al., 2015).

1.1.1.1 Definition of hypertension

Hypertension is also known as raised blood pressure or high blood pressure, and is usually asymptomatic (Zhou et al., 2021). Blood pressure represents the amount of force applied to the main arteries by circulating blood (WHO, 2019). For many people, hypertension is a silent disease with no symptoms. It is often only detected when a person visits their local primary healthcare center or hospital for an unrelated condition and their blood pressure is checked (WHO, 2019). If not diagnosed and treated early, hypertension causes damage to the arteries supplying major organs in the body, such as the heart, kidney, brain, and eyes. It may also increase the risks for stroke, ischemic heart disease, and renal failure (WHO, 2019). The focus of the present study was the primary prevention of hypertension. In primary prevention, a susceptible population or person is the target of primary preventative strategies. Primary prevention aims to stop a disease before it ever starts. Consequently, its intended audience is healthy people. Conversely, secondary prevention targets healthy-appearing people with subclinical disease and emphasizes early disease identification (Kisling & Das, 2021).

The definition of hypertension used in this study was adopted from the American College of Cardiology/American Heart Association and National Institute for Health and Care Excellence (NICE) guidelines (Jones, McCormack, Constanti, & McManus, 2020). Hypertension is defined as a systolic blood pressure of ≥140 mmHg and diastolic blood pressure of ≥90 mmHg (Armstrong & Bull, 2006; Flack & Adekola, 2020; Jones et al., 2020; Unger et al., 2020; Whelton et al., 2017; Whelton et al., 2022). NICE further defines hypertension in three stages based on blood pressure measurement and severity (Table 1): grade one is blood pressure ≥140/90 mmHg; grade two is blood pressure ≥160/100 mmHg; and grade three is a systolic blood pressure of ≥180 mmHg or a diastolic blood pressure of ≥110 mmHg (Jones et al., 2020). However, the NICE NG136 of 2019 recommends that the blood pressure measurement should be <140/90 mmHg in all adults younger than 80 years and <150/90 mmHg for people older than 80 years (Jones et al., 2020).

It is important that before making a diagnosis of hypertension, the blood pressure is taken in both arms and if the difference in blood pressure is greater than 15 mmHg, the blood pressure in the arm with a higher blood pressure is repeated (Muntner et al., 2019; NICE, 2023). When the blood pressure remains ≥140/90 mmHg, another blood pressure is taken and then the last two blood pressures are recorded (NICE, 2023). On the other hand, a persistent clinic blood pressure of ≥140/90 mmHg suggests the need for an ambulatory blood pressure monitoring (ABPM). An average ABPM or home blood pressure monitoring (HBPM) average of ≥135/85 mmHg confirms a diagnosis of hypertension. Once using the ABPM, is important to note that the blood pressure is taken twice every hour and an average of fourteen readings is taken to confirm the diagnosis of hypertension (NICE, 2023). On the other hand, when using the HBPM, the person has to be seated and two blood pressure measurements are taken with an interval of one minute and this is repeated for seven days and thereafter, although the average blood pressure readings of the last six days is considered for the diagnosis to be confirmed, and it is preferably done in the morning and evening (NICE, 2023). Previous studies have defined hypertension differently where they took an average of the last two blood pressures if a participant had done three blood pressures and an average of two if they had a record of two blood pressures (Geldsetzer et al., 2019). Although (Ntaganda et al., 2022) used the average of three blood pressure measures in their study, they used a one-minute interval between measurements. This implies that if the NICE guidelines of 2023 are applied in the different studies, the prevalence rates would most likely be higher then what they are now.

Table 1: Classification of blood pressure levels of the British Hypertension Society

Category	**Systolic blood pressure (mmHg)**	**Diastolic blood pressure (mmHg)**
Blood pressure		
Optimal	<120	<80
Normal	<130	<85
High normal	130–139	85–89
Hypertension		
Grade 1 (mild)	140–159	90–99
Grade 2 (moderate)	160–179	100–109
Grade 3 (severe)	≥180	≥110
Isolate systolic hypertension		
Grade 1	140–159	<90
Grade 2	≥160	<90

(Williams et al., 2018)

1.1.1.2 Knowledge about hypertension prevention

Prevention of hypertension in primary care is important and helps to avert the complications and costs associated with later hypertension management (Whelton et al., 2002). For populations to be able to implement preventive measures and achieve prevention, they need to know about hypertension and the correct interventions to employ. This was supported by a study conducted by the National High Blood Pressure Education Program Coordinating Committee that focused on the primary prevention of hypertension (Whelton et al., 2002). That study identified a need for individuals to gain more knowledge on the effectiveness of dietary and lifestyle modifications to prevent hypertension and therefore made recommendations for further research (Whelton et al., 2002). Furthermore, knowledge about hypertension and its prevention has an important role to play in the prevention of hypertension (Sengwana & Puoane, 2004; Williams, Baker, Parker, & Nurss, 1998).

Knowledge about diseases or illnesses increases with increasing education levels and socioeconomic status, and is not related to the age of an individual (Kasl & Cobb, 1966). A mixed methods study conducted in Ghana revealed that there was an association between participants' level of education and knowledge about hypertension, with a high level of knowledge found among educated participants (Agyei-Baffour, Tetteh, Quansah, & Boateng, 2018). Furthermore, a systematic review and meta-analysis from Africa found that hypertension was common among people with no formal education (Kaze, Schutte, Erqou, Kengne, & Echouffo-Tcheugui, 2017). Another study conducted among hypertensive and non-hypertensive people in rural areas of China revealed that the hypertension knowledge score among those diagnosed with hypertension was approximately 26% compared with 20% among non-hypertensive participants (Wang, Kong, Wu, Bai, & Burton, 2005). This implied that when a person suffers from a disease or condition, it is likely that they will have more knowledge about that disease/condition compared with someone who does not have the disease. In addition to education level, other factors that influence individuals' levels of knowledge about hypertension include marital status, health status, reading health-related materials regularly, history of blood pressure checks, and joining hypertension workshops facilitated by health workers (Wang et al., 2005). A significant finding in another study was that participants who had a high school education level were able to tell the difference between systolic and diastolic blood pressure and had received information about hypertension from their medical team compared with who had no high school education (Oliveria, Chen, McCarthy, Davis, & Hill, 2005).

Place of residence has also been associated with the risk for developing hypertension. A study conducted across high-, middle-, and low-income countries in five continents (17 countries including three high-income countries, seven upper-middle-income countries, three low- and middle-income countries, and four low-income countries) examined baseline participant characteristics for the Prospective Urban Rural Epidemiology (PURE) project to determine the prevalence, awareness, treatment, and control of hypertension (Chow et al., 2013). The findings showed that awareness of hypertension was similar in rural and urban communities in high-income countries. However, awareness was considerably lower in rural communities versus urban communities in low-income countries (Chow et al., 2013).

Shaikh et al. (2011) assessed knowledge about risk factors for hypertension among medical students at the Gulf Medical University Ajman, in the United Arab Emirates (UAE) and showed that the majority (70%) of participants knew some risk factors for hypertension such as stress, high BMI, and high cholesterol levels. However, approximately 86% of participants did not know that low physical activity levels and use of oral contraceptives were risk factors for developing hypertension. In addition, almost 50% of the participants did not know that old age, genetic predisposition, and male gender were non-modifiable risk factors for hypertension (Shaikh et al., 2011). This suggested that an individual's educational background determines how much they know about preventing hypertension. Spencer, Phillips, and Ogedegbe (2005) conducted a study in rural communities of Ghana that revealed there were statistically significant relationships between being normotensive and age and employment status. Participants with normal blood pressure were younger (42 vs. 61 years), had a lower BMI (24 kg/m^2 vs. 27 kg/m^2), and were more likely to be employed (74% vs. 64%) than participants with hypertension (all values significant at $p<0.05$). Moreover, ideas that emerged when participants were asked what they believed to be the causes of high blood pressure included stressors from daily living, traumatic life events, coexisting medical disorders, and behavioural elements (Spencer et al., 2005).

Based on the evidence provided, most available studies focused on knowledge about secondary prevention of hypertension and factors that influenced the knowledge that individuals may have. Furthermore, those studies indicated that low knowledge levels were more common in rural than urban communities (Chow et al., 2013). However, few studies have concentrated on the knowledge that people held pertaining to primary prevention of hypertension.

1.1.1.3 Healthy lifestyle behaviours that influence the prevalence of hypertension

Most approaches to the prevention of hypertension have largely focused on early diagnosis, treatment, and rehabilitation. However, this leaves the management cycle for hypertension incomplete without primary prevention of the disease, despite three-quarters of all CVDs being preventable using lifestyle modifications (Perk et al., 2012; Perk et al., 2013). Moreover, with the increasing prevalence of hypertension and projected 60% prevalence globally by 2025, the prevention of hypertension is a major public health concern (Kearney et al., 2005). Several lines of evidence suggest there are different lifestyle behaviours that influence the prevalence of hypertension. These include modifiable lifestyle factors such as physical activity, alcohol consumption, smoking, and nutrition patterns (Alsinani et al., 2018; National High Blood Pressure Education Program: Working Group on Primary Prevention of Hypertension, 1993; Perk et al., 2013). Many studies have emphasized that hypertension is preventable through lifestyle modifications (Alsinani et al., 2018; Perk et al., 2012). Lifestyle is defined as an individual's healthy and unhealthy behaviours that can impact their health status (Shafieyan et al., 2016). Previous studies showed that the most important risk factors in an individual's lifestyle were low physical activity, smoking, poor diet (Wang et al., 2005; WHO, 2002), and alcohol consumption (Defo et al., 2017; Zheng et al., 2014). In addition, low socioeconomic status has been associated with an increased number of risk factors that an individual may have and therefore an increased predisposition for hypertension (Khan et al., 2013). This was demonstrated in a study conducted among public-sector workers in Angola that showed that people in low socioeconomic areas had higher incidences of hypertension (Capingana et al., 2013), which was possibly attributable to their inability to afford healthy foods. Details of specific lifestyle behaviours are discussed in the following sections.

1.1.1.3.1 Physical activity

Given the increasing prevalence of hypertension globally, physical activity has been suggested as a preventive measure for hypertension at the primary prevention level (Diaz & Shimbo, 2013), because it lowers peripheral vascular resistance (Hegde & Solomon, 2015). Physical activities involve the use of the musculoskeletal system to make movements that result in the use of energy. Physical activities include the activities that an individual performs in relation to their work as well as specific activities performed for the purposes of health promotion and disease prevention (Caspersen, Powell, & Christenson, 1985). Other components of physical activity include exercise (deliberate and regular) and physical fitness, which refers to an individual's ability to perform physical activities without experiencing fatigue (Caspersen et al., 1985).

Performing adequate physical activity is important for reducing obesity, which in turn helps to prevent hypertension. A study conducted among Vietnamese individuals independently linked age, educational attainment, BMI, and physical activity to hypertension in both men and women (Do, Geleijnse, Le, Kok, & Feskens, 2015). Although adequate physical activity is associated with a reduced likelihood of developing hypertension, the population of Vietnam tends to live a relatively sedentary lifestyle because of the country's rapid industrialization, urbanization, and modernization; people therefore had low physical activity at work, moving to and from work, and during their free time (Do et al., 2015).

The Global Physical Activity Questionnaire (WHO, 2005) indicates that each week, individuals should engage in at least 150 minutes of moderate-intensity physical activity, 75 minutes of vigorous-intensity physical activity, or an equivalent combination across three domains (work, travel, and leisure). Physical activities are categorized as vigorous-intensity if they cause a significant increase in breathing or heart rate, and as moderate-intensity if they cause a smaller increase in breathing or heart rate. In both categories, physical activities should be performed continuously for at least 10 minutes (Armstrong & Bull, 2006). However, a study conducted in Bangladesh rated physical exercise as low for performing housework, medium for walking and swimming, and adequate/high when performing sports, heavy lifting, or jogging (Ali, Mohanto, Nurunnabi, Haque, & Islam, 2022).

Studies from China and Vietnam classified physical activity as low, moderate, and high based on the self-report Global Physical Activity Questionnaire Analysis Guide and using metabolic equivalent (MET) minutes per week (Cai, Liu, Zhang, Li, & Wang, 2012). The number of days (per week) and minutes (per day) that participants spent engaging in moderately intense sports activity, walking, moderately intense household activity, and moderately intense farming were recorded. Physical activity duration was multiplied by the MET values for each activity. The low, moderate, and high categories were obtained if participants engaged in any combination of walking, moderate-intensity, or vigorous-intensity activities for at least 600 MET minutes each week, 600–3,000 MET minutes each week, and ≥3,000 MET minutes each week, respectively (Do et al., 2015). Similarly, a study from Iran categorized physical activity as low, moderate, and high using the International Physical Activity Questionnaire-Short Form. This tool uses self-reported physical activities performed to estimate MET minutes and number of days/weeks spent performing physical activities (Mirzaei, Mirzaei, Gholami, & Abolhosseini, 2021). That study revealed that 50% of adults had low physical activity and 75% were overweight or obese. Moreover, people with higher levels of education, more physical activity, and lower BMI had a lower prevalence of hypertension ($p<0.0001$) than those with low education, less physical activity and higher BMI (Mirzaei, Mirzaei, Gholami, & Abolhosseini, 2021).

Performing adequate physical activity is important for reducing obesity, which in turn helps to prevent hypertension. Vuillemin et al. (2005) investigated the relationship between meeting public health recommendations for moderate and vigorous physical activity in adults (aged ≥35 years) and health-related quality of life. That study found there was a significant relationship between leisure-time physical activity and health-related quality of life among both men and women. This was consistent with the Physical Activity Guidelines for Americans Health and Services (2008), which asserted that health-related outcomes increased with increasing physical activities, intensity, and longer performance duration. This suggested that sufficient physical activity reduced a person's chances of developing hypertension, which was supported by a systematic review and meta-analysis involving randomized clinical trials (more than 5000 participants) focused on exercise training for blood pressure (Cornelissen & Smart, 2013). The findings of that study showed that exercise training substantially reduced both systolic and diastolic blood pressure. Similarly, the WHO recommends that adults aged 18–64 years engage in 150 minutes of moderate-intensity aerobic physical activity or 75 minutes of vigorous aerobic physical activity per week (WHO, 2011). In addition, it is recommended that adults increase their moderate aerobic physical activities to 300 minutes (or 150 minutes of vigorous aerobic activities) to maximize the health benefits (WHO, 2010). This highlights the positive relationship between increased physical activity and health benefits, including the primary prevention of hypertension. This was further supported by a study conducted in rural and urban communities of Cameroon that found a reduction in BMI and blood pressure with increased physical activity, although that study could not show a dose-response relationship between physical activity and health benefits

(Sobngwi et al., 2002). Furthermore, a recent systematic review and meta-analysis (Wamba, Takah, & Johnman, 2019) found a reduction in diastolic blood pressure for one study, but failed to draw conclusions for another study that did not have a follow-up of participants.

Moreover, a study conducted in urban Uganda to establish the determinants of raised blood pressure showed a statistically significant difference in the odds ratio (OR) between raised blood pressure and moderate-to-vigorous intensity activities for more than 4 hours a week (Chin et al., 2017). Although that study was conducted in urban Uganda and yielded significant findings, there is no evidence of similar findings in rural communities. Therefore, it is necessary to clarify the status of healthy lifestyle behaviours (e.g., physical activity) for the prevention of hypertension in rural communities in Uganda.

1.1.1.3.2 Alcohol consumption

Previous research from developed countries established that a reduction in alcohol consumption reduced blood pressure in both hypertensive and normotensive individuals (Klatsky, 1996; Skliros et al., 2012; Ueshima et al., 1993). This was confirmed in several randomized controlled trials involving people from different geographical locations and cultural backgrounds that showed a positive relationship between a reduction in alcohol consumption and reduced blood pressure (Cushman et al., 1996; Cushman, 2001; Cushman et al., 1994). Various factors play roles in determining the effects of alcohol on blood pressure (Potter & Beevers, 1985). Alcohol intake immediately results in vasodilation, and continuous intake of alcohol leads to increased blood alcohol levels (Potter & Beevers, 1985). However, blood pressure changes are normally seen around 24 hours after alcohol intake, which suggests that the effect of alcohol on blood pressure is not influenced by long-term structural damage (Moreira, Fuchs, Moraes, Bredemeier, & Duncan, 1998). Therefore, studying alcohol consumption among normotensive populations may contribute to efforts for primary prevention of hypertension.

In addition, a meta-analysis involving 15 randomized control trials (total of 2234 participants) that were published before June 1999 aimed to evaluate the impact of alcohol reduction on blood pressure (Xu & Ragain, 2005). That analysis revealed that the general pooled estimates of the effect of alcohol decrease on systolic and diastolic blood pressure were −3.31 (95% CI: −2.52 to −4.10) mmHg and −2.04 (95% CI: −1.49 to −2.58) mm Hg, respectively ($p=0.0001$ for both). The association between alcohol and hypertension has also been studied in urban communities in Accra Ghana, and high levels of alcohol consumption were linked with hypertension (Afrifa–Anane, Agyemang, Codjoe, Ogedegbe, & de-Graft Aikins, 2015). Similarly, a cross-sectional study conducted in Rukungiri (South-Western Uganda) reported that factors that were significantly associated with hypertension included high consumption of alcohol (OR=2.28, 95% CI: 1.42–3.64), tertiary education (OR=1.91, 95% CI: 1.03–3.56), older age (OR=1.42, 95% CI: 1.27–1.59), and high BMI (overweight: OR=1.95, 95% CI: 1.37–2.79; obesity: OR=5.07, 95% CI: 2.79–9.21). Those authors also found a high prevalence of hypertension in the investigated rural district, which later guided their recommendation for further research to determine the distribution and determinants of hypertension in other parts of the country (Wamala et al., 2009). However, most research to date has focused on secondary prevention of hypertension rather than primary prevention; a reduction in the prevalence of hypertension and effective management would yield better results if primary prevention is given due consideration (Diaz & Shimbo, 2013).

1.1.1.3.3 Smoking

Buttar, Li, and Ravi (2005) found that 80% of heart diseases could be prevented by modifying risk factors. Smoking is thought to be one such factor. A systematic review of studies conducted in low- and middle-come countries revealed the prevalence of hypertension was significantly higher in non-smokers compared with smokers in most countries (Sarki, Nduka, Stranges, Kandala, & Uthman, 2015). This was further supported by Green, Jucha, and Luz (1986), and it was later concluded that the role of smoking in hypertension was unclear. In contrast, Sarki et al. (2015) found that in Asia, smoking was an independent risk factor for hypertension and there was a higher prevalence of hypertension among smokers compared with non-smokers. However, the proportion of hypertension among non-smokers was thought to be attributable to smokers reporting themselves as non-smokers (Sarki et al., 2015).

In the US, less than 50% of the population is protected from secondary smoking because anti-smoking laws have not been reinforced in most public places, such as bars, restaurants, and workstations (Bauer, Briss, Goodman, & Bowman, 2014). However, this issue could be overcome by programs that focused on communities, schools, workplaces, and restaurants as well as high-risk populations (Burt et al., 1995). It is important to note that smoking cessation alone may not prevent hypertension among individuals. For example, a study from China found that ageing was a major non-modifiable risk that lead to an increased prevalence of chronic diseases, for which hypertension was the main risk factor (Wang et al., 2005). Moreover, it was estimated that between

2000 and 2040, death due to CVDs in China would increase by 200% (Wang et al., 2005), which calls for the development of appropriate measures to curb the situation.

Furthermore, a study conducted in Korea considered the effects of different types of smokers, including hidden smokers, and evaluated the association between smoking and hypertension using innovative variables and a population-based sample (Kim & Lee, 2019). The results of their multivariate logistic regression analysis revealed that current and former smoking were not associated with hypertension (OR=1.25, 95% CI: 0.99–1.57 and OR=1.20, CI: 0.90–1.60, respectively). Although there was no connection between smoking and hypertension, when gender was not considered, regarding the cotinine-verified smoking status and smoking cessation services (SCS), the adjusted ORs in the relationship between smoking and hypertension in female smokers were 1.44 (95% CI: 1.02–2.04) and 1.46 (95% CI: 1.05–2.02), respectively (Kim & Lee, 2019). This evidence emphasized that as there are numerous risks for hypertension, prevention of hypertension requires a comprehensive exploration of the role of different healthy lifestyle behaviours, including smoking.

1.1.1.3.4 Nutrition patterns

Zheng et al. (2014) described the estimation of hypertension risk from lifestyle factors using a case study from Pizhou City, Jiangsu Province, China. That study aimed to create a combined model that replicated the illness grade of an individual patient based on lifestyle factors and a simple health profile using the surrogate signature model. Although fasting blood sugar was a significant indicator of hypertension, other indicators could be created with minimal errors. Zheng et al. (2014) noted that a surrogate signature was made up of health profile and lifestyle features used in risk screening. The identified risk factors for developing hypertension were: age; arterial pulse; fasting plasma glucose; BMI; sleep quality; intake of salt, oil, and alcohol; and stress. When fasting plasma glucose data were absent, diet-related factors were considered, such as the amount of food consumed, money spent on food, and type of meats eaten. Importantly, the surrogate model did not require full knowledge of the individual’s health. That study reported several interesting findings. The use of animal fats was found to reduce the risk of developing hypertension, whereas divorce increased the chance of developing hypertension; these factors may offer good indicators to consider in the prevention of hypertension. However, the surrogate model had limitations because its lifestyle pattern comprised compound behaviours related to multiple historical, geological, economic, cultural, and ethnic influences. Therefore, further studies were recommended to compare the different parameters (Zheng et al., 2014).

A large and growing body of literature has investigated sodium consumption and its relationship with blood pressure. Sodium intake is regulated by the nervous system and must therefore be maintained within a normal range (i.e., 136–146 mEq/L) (Pohl, Wheeler, & Murray, 2013) as too much or too little intake may cause damage to body tissues (Grillo, Salvi, Coruzzi, Salvi, & Parati, 2019). Intake of excess amounts of sodium causes fluid retention, which in turn increases blood volume and blood pressure (Grillo et al., 2019; Guyton, 1991; Wenstedt et al., 2022). Evidence from a systematic review and meta-analysis of randomized trials revealed that a modest reduction in salt intake significantly reduced blood pressure in both normotensive and hypertensive individuals, irrespective of their sex and ethnic background (He, Li, & MacGregor, 2013). Similarly, a more recent systematic review and meta-analysis that included studies from six Sub-Saharan African countries found that salt-limiting interventions were effective in reducing blood pressure (Wamba et al., 2019). However, those findings may not be representative of the general Sub-Saharan African population, and there is a need for a larger-scale study. Furthermore, a study that was conducted to establish the salt content in instant noodle formulations in 10 countries found that the sodium levels were high but differed across countries; noodles in China had the highest amount of sodium (1944 mg/100 g; range: 397–3678 mg/100 g) compared with New Zealand (798 mg/100 g; range: 249–2380 mg/100 g) (Farrand et al., 2017). That study found that on average, a noodle packet accounted for 35%–95% of the daily salt consumption (<5 g) recommended by the WHO; 37% of the instant noodles were within limits of South African targets, 45% satisfied Pacific Island region targets, and 62% met the 2017 United Kingdom targets (Farrand et al., 2017). These findings indicated a need to monitor the salt content in noodles worldwide to prevent some incidences of hypertension given that they are an increasingly popular food choice (Wang & Labarthe, 2011). Interestingly, a study conducted in West Africa that compared salt intake between rural and urban communities revealed that rural communities consumed more salt compared with urban communities (Kerry et al., 2005). This finding was one of the motivations for the present researcher to conduct this study in rural communities in Uganda and explore their practices regarding salt intake and its association with blood pressure.

Nabatanzi et al. (2022) studied the micronutrients in wild edible berries (*Basella alba*, *Termitomyces microcarpus*, *Cucurbita pepo*, and *Solum anguivi*) that grow in Mabira forest in

Uganda. These berries were referred to as wild edible berries because they grew on their own in the forest without being subjected to pesticides and contaminated water for irrigation. The findings of that study showed that wild edible berries were associated with the prevention of pre-eclampsia (hypertension in pregnancy) and obesity among children aged 6–12 years. *B. alba*, *T. microcarpus*, *C. pepo,* and *S. anguivi* (commonly known as "katunkuma" in Central Uganda) were reported to contain sodium, potassium, calcium, phosphorus, magnesium, and some trace minerals, such as manganese, copper, and iron. The content of these minerals varied across the different species. Because potassium and sodium are the primary electrolytes and significant cations in body cells, the high potassium content in contrast to the low amounts of sodium in these wild edible berries was a crucial nutritional characteristic (Nabatanzi et al., 2022). Potassium and sodium are necessary for osmotic pressure and blood volume maintenance (Neal et al., 2021). However, in both pregnant women and school-age children, potassium and sodium must be taken in regulated amounts to prevent hypertension (Nabatanzi et al., 2022). Although the population in the study by Nabatanzi et al. (2022) differed from that in the present study, the findings offered some direction regarding the association between wild edible berries and the prevention of hypertension that could be explored further. However, limited literature is currently available regarding the consumption of edible berries grown on farmland and people's experiences with the prevention of hypertension.

The findings reported by Nabatanzi et al. (2022) regarding the role of wild edible berries in regulating blood pressure appeared to be similar to those of Vendrame, Adekeye, and Klimis-Zacas (2022), who studied different types of berries and the role of berry consumption in regulating blood pressure. Anthocyanins, condensed tannins, and ellagic acid are three kinds of polyphenols that may contribute to the potential of these berries for lowering blood pressure (Grosso et al., 2022). The name "polyphenols" refers to a vast class of naturally occurring plant secondary metabolites, which include four main classes: phenolic acids, flavonoids, stilbenes, and lignans. Many of these compounds are known to have vascular, anti-inflammatory, anti-thrombotic, and antioxidant properties that make them highly protective against CVDs (Durazzo et al., 2019). The ability to modulate blood pressure to treat and prevent hypertension has frequently been mentioned as one of their therapeutic benefits (Durazzo et al., 2019) (Hügel, Jackson, May, Zhang, & Xue, 2016). However, there is varying evidence about the role of berry consumption and its association with blood pressure regulation. Current knowledge indicates that although eating berries frequently is advised because of their multiple health benefits, blood pressure regulation does not appear to be the main reason for doing so (Vendrame et al., 2022). This necessitates the exploration of people's experiences with the use of berries and their role in the prevention of hypertension in the general adult population.

Saturated fats consumed in large amounts are stored in various body tissues, including the blood vessels. This eventually causes the narrowing of arteries, which then requires the heart to pump blood at a higher pressure (DiNicolantonio, Lucan, & O'Keefe, 2016; Hu, 2007). A study that investigated the effects of dietary saturated and monounsaturated fatty acids found that consumption of monounsaturated fats reduced both diastolic and systolic blood pressure compared with the intake of saturated fats (Rasmussen et al., 2006). These findings implied that a reduction in saturated fat intake yielded positive results in reducing blood pressure. However, limited studies have investigated the types and quantities of fats that people in rural communities consume.

1.1.1.4 Prevalence of hypertension globally

Hypertension has increasingly been seen as a serious public health problem throughout the world (Kearney et al., 2005; Salem et al., 2018; Wamala et al., 2009). Globally, the prevalence of hypertension ranges from 4% to 78%, with the highest prevalence in low- and middle-income countries (Salem et al., 2018). A systematic review and meta-analysis conducted in Africa reported that the prevalence of hypertension was 55.2% in 2017 (Kaze et al., 2017). In Uganda, a study that assessed geographical differences in the prevalence of hypertension reported an overall prevalence of 31.5% (Lunyera et al., 2018). In the same study, demographic characteristics such as education, monthly income and occupation were not significant in explaining the lower prevalence of hypertension in West Nile and the Northern region, and further studies were recommended to explore the impact of epidemiological shifts (e.g., dietary and lifestyle changes) on the development of hypertension. However, urbanization was thought to contribute to the high prevalence of hypertension in the Central Region of Uganda (Lunyera et al., 2018). Chin et al. (2017) asserted that BMI was the major contributing factor to the high prevalence of hypertension, although other studies associated hypertension prevalence with other factors such as random blood sugar, increased alcohol intake, waste-to-hip ratio, and education level (Maher et al., 2011; Nakibuuka et al., 2015).

Sarki et al. (2015) reported that the prevalence of hypertension was higher among non-educated populations compared with educated populations in low- and middle-income countries.

These findings were consistent with a study conducted in Buikwe District in Uganda, which found that the prevalence of hypertension among uneducated people was three times higher than that among educated people (i.e., tertiary or high school education) (Musinguzi & Nuwaha, 2013). Existing literature from the region on the prevalence of hypertension is extensive and covers different regions in Uganda. However, few studies have focused on the prevalence of hypertension in rural communities of Central Uganda to try and identify possible risk factors for the increasing prevalence of hypertension in that region.

1.1.1.5 Individuals' experiences in hypertension prevention

A qualitative study was conducted among 27 patients with hypertension who were referred to health centres affiliated with the Tehran University of Medical Sciences in Iran to explore their experiences before they became hypertensive (Shamsi, Nayeri, & Esmaili, 2017). Findings from that study showed that participants were both negligent and ignorant about lifestyle modifications, such as nutrition, obesity, exercise, and smoking, which could have helped them to prevent hypertension (Shamsi et al., 2017). Furthermore, participants felt that their disease (hypertension) was a result of their experience of stressful events. Participants also believed that their family background (e.g., poor nutrition in the family, inheritance, and involvement in conflicts) exposed them to the risk for developing hypertension. Other participants believed that job stress, poverty, urbanization, and chemical agents might have contributed to the development of the disease. Moreover, a study from Nepal among hypertensive participants revealed that they believed that implementing and maintaining lifestyle modifications was difficult because their knowledge about the disease was low and people never thought about hypertension until they acquired the disease (Oli et al., 2014). In addition, Chang et al. (2019) conducted a qualitative study to explore challenges to hypertension and diabetes management in rural Uganda; their participants reported that they only went to the hospital when they were too sick to perform their usual routine activities. In addition, participants associated hypertension with stress and a genetic predisposition, and some believed the disease could be acquired at random without specific associated factors. The belief that stress causes hypertension led participants to make sedentary lifestyle choices (e.g., watching television) as a means of blood pressure management (Chang et al., 2019).

Barriers to the prevention of hypertension may include: cultural norms; failure to follow health education instructions; lack of funding for health education services, space for physical activities, healthy foods, and physical exercise programs in schools; food served in restaurants;

high salt content in foods; and the high cost of foods that are low in sodium and calories (Schwartz, Guwatudde, Nugent, & Kiiza, 2014). Limited studies have been published concerning the healthcare costs associated with the prevention of hypertension and other non-communicable diseases in Uganda (Schwartz et al., 2014), despite it being less costly to focus on prevention than treatment (Brouwer et al., 2015).

Low levels of education and knowledge, and unavailability of cardiovascular care greatly increase CVDs and disparities. In the US, it was noted that these disparities included an increased prevalence of severe hypertension, death due to coronary heart disease, stroke, and higher mortality in black people compared with non-Hispanic white people due to CVD (Ferdinand et al., 2012). However, few studies have investigated people's experiences with the prevention of hypertension. This was supported by Gyarfas (1996), who asserted that the worldwide experience of hypertension control and care was placed on early diagnosis and treatment as opposed to the primary prevention of hypertension. Based on the evidence provided by most of these studies, experiences about prevention of hypertension were collected from hypertensive individuals and there was scanty information of experiences among normotensive individuals, despite prevention of the disease reducing the healthcare burden due to hypertension (Huang et al., 2011b). Furthermore, a study from Ghana that explored the feasibility and acceptability of pharmacist-led prevention of hypertension in the community reported that pharmacists could promote lifestyle modifications in communities and thereby help in the prevention of hypertension (Marfo & Owusu-Daaku, 2016). This supports the need to explore people's experiences with primary prevention of hypertension in rural communities.

1.2 Statement of the problem

Worldwide, hypertension is the most significant modifiable risk factor for both CVD and overall mortality (Roth et al., 2018; Stanaway et al., 2018). The incidence of various cardiovascular events, including stroke, myocardial infarction, sudden death, heart failure, peripheral artery disease, and end-stage renal disease, were independently correlated with office blood pressure, which is a preventive strategy if individuals measure their blood pressure regularly (Britton, Gaziano, & Djoussé, 2009; Kalaitzidis & Bakris, 2010). Interestingly, the age-standardized prevalence of hypertension fell by 2.6% in high-income countries between 2000 and 2010 but rose by 7.7% in low- and middle-income nations. During the same period, the rates of awareness about hypertension were higher in high-income countries compared with low- and middle-income countries (67.0% in 2010 vs. 37.9% in 2000 and 32.3% in 2010 vs. 37.9% in 2000, respectively) (Mills et al., 2016). However, control and prevention of hypertension depend on people being aware of the disease (Musinguzi & Nuwaha, 2013).

The prevalence of hypertension in Uganda is around 26.4%, with the highest prevalence reported in Central Uganda (Guwatudde et al., 2016). After accounting for demographic factors, the prevalence of hypertension was much lower in the North and West Nile than in the Central Region; therefore, it is necessary to conduct more research to ascertain the causes of this disparity (Lunyera et al., 2018). Despite being entirely preventable, hypertension is a major contributor to the global epidemic burden of non-communicable diseases (Khalsa et al., 2014). Bloch (2016) reported that many countries used public health approaches and guidelines for the prevention of hypertension in their communities. For example, the Dietary Approach to Stop Hypertension (DASH) diet was successful in decreasing blood pressure (Appel et al., 1997; Sacks et al., 2001). The DASH diet has a high concentration of fruits, vegetables, whole grains, nuts, legumes, lean protein, and low-fat dairy products, along with a significantly lower concentration of refined sugar, saturated fat, and cholesterol than regular diets (Appel et al., 1997). Compared with sodium restriction or the DASH diet alone, the combination of low sodium intake plus the DASH diet was found to significantly lower blood pressure (Juraschek, Miller, Weaver, & Appel, 2017; Sacks et al., 2001).

Although awareness of hypertension is important for the uptake of prevention measures, awareness of hypertension in Uganda, particularly in the Central Region, is low (7.7%) (Guwatudde et al., 2015). Furthermore, the age-standardized prevalence was 19.8% in a rural community in Uganda (Kotwani et al., 2013). . Given the limited healthcare resources in Uganda, research must be directed to preventive measures (Zikusooka, Kyomuhang, Orem, & Tumwine, 2009). Important interventions such as health education, counseling about lifestyle behaviours, and screening for hypertension in rural communities are deemed important to prevent hypertension, especially with society or community involvement (Ofili & Ncama, 2015). These preventive measures are vital to reduce the morbidity, mortality, and disability caused by hypertension, but must be country-specific to be effective (Khalsa et al., 2014). Community-based screening programs, such as the Sustainable East Africa Research in Community Health (SEARCH), uses multi-disease prevention and treatment services that integrate human immune deficiency syndrome (HIV) and non-communicable disease treatments in Uganda (Kotwani et al., 2013) . However, the prevalence of hypertension in Uganda has remained high, with rural communities having the highest prevalence and lowest awareness rates (Mustapha et al., 2022). Although the majority of people in Uganda live in rural communities (Guwatudde et al., 2015), there is limited information concerning awareness and healthy lifestyle behaviours for the prevention of hypertension in these rural communities. Previous studies in Uganda assessed the awareness and prevalence of hypertension from a quantitative perspective (Kotwani et al., 2013; Musinguzi & Nuwaha, 2013) but none explored why awareness and prevalence had persistently remained low and high, respectively. In addition, no study has explored healthy lifestyle behaviours and possible interventions that may be effective for the prevention of hypertension in rural communities in Uganda. A PhD study conducted in Central Uganda used a qualitative design to explore perceptions of the social determinants of hypertension (Busulwa, 2022). Therefore, there is need to explore awareness and healthy lifestyle behaviours to prevent hypertension in rural communities in Central Uganda. Exploring awareness and healthy lifestyle behaviours for the prevention of hypertension will provide recommendations regarding the prevention of hypertension among people in rural communities on potentially effective strategies, which may eventually reduce both the prevalence of hypertension and the associated healthcare burden.

1.3 Significance of the Study

Although it is avoidable, hypertension is a hidden killer that contributes to morbidity and mortality in rural areas (WHO, 2013). Emphasis has been placed on the secondary prevention of hypertension in Uganda, although prevention of hypertension at the primary level is vital in preventing morbidity, mortality, and disability (Musinguzi & Nuwaha, 2013). The purpose of community hypertension prevention programs is to strengthen awareness, and in the long run, reduce the complications associated with hypertension. These community programs also enhance community change and reduce the risks for hypertension. However, in Sub-Saharan Africa, including Uganda, there is limited information about awareness and control of hypertension (Musinguzi & Nuwaha, 2013) despite the increasing prevalence (Mayega et al., 2012; Wamala et al., 2009). The findings from this study will inform policy on strategies to support the primary prevention of hypertension in rural communities in Central Uganda and may possibly be extended to other low- and middle-income countries with similar settings. In addition, new knowledge generated from this study will update the education sector regarding inclusion in nursing curricula, which will later influence community practices. Furthermore, evidence obtained from this study will add to the body of knowledge about hypertension awareness and healthy lifestyle behaviours to prevent hypertension at the community level. The gaps identified in this study will also generate new research ideas.

1.4 Justification for the Study

In Sub-Saharan Africa and Uganda, little is known about awareness of hypertension and healthy lifestyle behaviours for the prevention of hypertension (Musinguzi & Nuwaha, 2013). Moreover, the prevalence of hypertension is high and awareness is remarkably low (Guwatudde et al., 2015). Most people only learn that they have hypertension after experiencing its repercussions through experiencing related comorbid conditions (Agarwal, 2019; Balwan & Kour, 2021). Uganda's health sector remains significantly underfunded, mainly relying on private sources of financing and the requirement for individuals to fund their healthcare. Public spending on health is considerably below the Abuja target of 15% agreed to by the Government of Uganda, coming in at 9.6% of overall government spending (Zikusooka et al., 2009). Therefore, there is a need to explore public awareness and preventative healthy lifestyle behaviours for hypertension before an individual experiences its physical impact, which will ultimately reduce the societal healthcare burden. However, few studies have explored people's experiences regarding awareness of and healthy lifestyle behaviours for the prevention of hypertension in rural communities. This study will inform people in rural communities about the prevention of hypertension and healthy lifestyle behaviours that will reduce the prevalence of hypertension. In turn, this will inform practice about preventive interventions for hypertension in rural communities in Central Uganda.

1.5 Motivation for the Study

As a nurse with a Bachelor of Science in Nursing, I spent time working in the outpatient department of a large private-for-profit hospital in Uganda. On several occasions, I admitted patients with stroke and a history of convulsions, but history revealed no positive history of hypertension. However, physical assessment showed they had blood pressure readings ranging from 160/110 mmHg to 210/130 mmHg, which were too high in comparison with a normal blood pressure (≤120/80 mmHg). When I completed my bachelor's degree in 2010, I was employed as a clinical instructor at a university in Uganda. This involved teaching community health nursing to nursing students. As part of the teaching process, I supervised students' community clinical placements where students would perform family and community assessments, diagnoses, and interventions in people's homes or at a community level. One of the disabling health conditions that these students and I witnessed in these communities was stroke, which is a complication of hypertension. Stroke is a serious public health concern in Uganda and leaves people with neurological impairments (WHO, 2015).

As a nurse, I bought a blood pressure machine for personal use at home. To ascertain its functionality, I decided to take my blood pressure and that of the family members in my household. To my surprise, my husband's blood pressure ranged from 178/115 mmHg to 197/120 mmHg on five different readings taken at 5-minute intervals. Even though his blood pressure was high, he did not complain of any symptoms. He had complained of a headache and fatigue, which he associated with the stressful kind of work that he does. Headache is one of the most common symptoms among people with chronic hypertension (Cirillo, Stellato, Lombardi, De Santo, & Covelli, 1999; Thomas, 2007), and mild to moderate headache (Hansson, Smith, Reeves, & Lapuerta, 2000) is considered an initial sign of hypertension (Friedman et al., 2017). These experiences were insightful and made me realize that many people do not know about hypertension as a disease and how they can prevent it. In addition, the majority do not have access to home blood pressure monitoring kits. These experiences provided the basis for my interest in exploring awareness and healthy lifestyle behaviours for the prevention of hypertension.

The low number of nurses with high-level degrees may be a contributing factor to some healthcare challenges in the community (Asiimwe, Muwema, & Drake, 2019). In most cases, nurses wait for doctors to initiate research studies and then assist them in collecting data. Nurses often have great ideas about what they see regarding patient care; however, they may not have the confidence to conduct research to address some of these issues and often leave it to those they think can (Albin & Perry, 2016). Uganda's healthcare system is also burdened with a high number of people with non-communicable diseases, and hypertension is the major cause of morbidity and mortality. This was confirmed in a study conducted in Kasese, a district in Western Uganda, where it was discovered that hypertension was the leading non-communicable disease that burdened the healthcare system (Mondo et al., 2016). However, if nurses had research knowledge at a higher level, they could potentially spearhead some research projects to inform practice and reduce the burden of non-communicable diseases such as hypertension (Shalala et al., 2011). This challenge motivated me to explore awareness and healthy lifestyle behaviours for the prevention of hypertension in rural communities.

In summary, the healthcare system in Uganda faces many challenges in meeting the healthcare needs of the population (Nabukeera, 2016). I believe that an important way to reduce the burden of hypertension is to prevent it at the primary level by exploring people's awareness of hypertension and healthy lifestyle behaviours to support the prevention of hypertension, which will lead to the development of appropriate interventions. The knowledge generated from this study will inform policy and practice on awareness and healthy lifestyle behaviours for the prevention of hypertension, which will help to reduce the prevalence of hypertension and associated healthcare burden in rural communities.

1.6 Healthcare System in Uganda

The population of Uganda is around 47,729,952 people (2023 est.) with approximately 95% of the population aged ≤54 years (The World Factbook, 2023); 75.7% of the population live in rural areas (Uganda Bureau of Statistics, 2020). Of note, the large population constrains the already stretched healthcare resources, which highlights the need to focus on preventive healthcare measures (Central Intellegence Agency, 2021). In Uganda, primary healthcare and non-communicable diseases (inclusive of hypertension) are given high priority, although implementation of public health preventative measures remains insufficient (Government of Uganda, 2010; Meghani et al., 2021). The Uganda healthcare system operates on a decentralized system basis (Kamwesiga, 2011) across the 146 districts (Electoral Commission, 2020). The district health teams are headed by district health officers (DHOs), who work with a team of other healthcare professionals and political heads in each district. Ugandan health facilities are categorized into three types: government-owned, private not-for-profit, and private for-profit. Of these, 45.16% are Government, 14.44% are private not-for-profit, and 40.29% are private for-profit; around 0.10% are community-owned facilities (Ministry of Health [MoH], 2023). Overall, Uganda has four national referral hospitals, 17 regional referral hospitals, 62 general hospitals in different districts, and four levels of health centres (IV, III, II, and I) (MoH, 2023). A level IV health center (health sub-district) receives referrals from several level III health centers in that district. These level III health centres frequently provide ambulatory care in addition to maternity health services. The next level (health centre level II) is dispensaries, which mainly provide outpatient services. Level I health centres are the lowest level of healthcare. These are found at the village level and are managed by volunteer village health teams (VHTs) who link the community to health facilities and also help to facilitate health promotion, service delivery, community participation, and empowerment (Kamwesiga, 2011). Private not-for-profit facilities are privately owned by individuals or non-governmental organizations, and the government of Uganda provides support for 20% of their annual budget. Private for-profit facilities and traditional medicine practitioners account for approximately 50% of the healthcare system and patients have to pay out of pocket for these categories of healthcare facilities (Kamwesiga, 2011). Given that about 50% of Ugandan healthcare facilities require individual patients pay for every visit themselves, healthcare financing in Uganda is constrained and cannot manage the healthcare demands of the growing population. Therefore, many people may not receive quality care if they cannot afford to pay (Zikusooka et al., 2009). This means research endeavors need to prioritize preventive measures.

1.7 Chapter Summary

This chapter discussed the background of healthy lifestyle factors associated with the prevention of hypertension from global, regional, and local (Uganda) perspectives. In addition, the prevalence and awareness of hypertension were discussed. Evidence shows that rural communities in the Central Region of Uganda have a high prevalence and low awareness of hypertension. However, no previous study has attempted to explore why the prevalence has persistently remained high and the awareness rate remained particularly low. In addition, evidence indicates that previous studies focused on the prevalence, awareness, and control of hypertension among hypertensive individuals. However, hypertension is preventable with healthy lifestyle modifications or changes in behaviours. Therefore, the present study sought to explore the awareness of hypertension and healthy lifestyle behaviours for the prevention of hypertension in two rural communities in Central Uganda.

2 Chapter Two: Theoretical Dimensions Related to this Study

This study adapted concepts from the Health Belief Model because people's beliefs affect their behaviour and how they respond to healthcare interventions (Washburn, 2020). However, other theories were reviewed before selecting the Health Belief Model. The focus of the present study was to explore awareness and healthy lifestyle behaviours for the prevention of hypertension. Therefore, this chapter explains the theoretical models and theory that were considered before choosing the Health Belief Model that informed this study.

2.1 Potential Models and Theories Related to this Study

Hypertension is a silent killer as one can remain asymptotic and manifest with complications after a long period of time (Sawicka et al., 2011). For that reason, it is very important to consider its prevention at the earliest opportunity possible. To prevent hypertension, it is important to gain an understanding of people's knowledge about hypertension and any preventive measures that they may know. Furthermore, establishing the healthy lifestyle behaviours practiced and the prevalence of the condition is imperative to understand what people do.

To identify possible interventions for the prevention of hypertension, some theories and models were analyzed to establish the most suitable and applicable model to explain the concepts that guided this study. All the theories discussed focus on the individual's health behaviour change.

2.2 Theory of Planned Behaviour (TPB)

The Theory of Planned Behaviour is one of the most commonly used behavioural theories and has similarities with theories that utilize the cognitive approach to explain behaviours related to the individual's behaviours and attitudes (Morris, Marzano, Dandy, & O'Brien, 2012). The theory gets its contracts from the Theory of Reasoned Action (Fishbein & Ajzen, 1977) which emphasises that intention to act is the most important predictor of one's behaviour and involves behaviours and attitudes. The theory has three major constructs which include attitudes towards behaviour, subjective norms, and perceived behavioural control. Evaluation of beliefs about a behaviour and the outcome of the behaviour (positive and negative outcomes) determines the attitude towards the behaviour. Also, the normative beliefs and motivation to comply lead to subjective norms (social pressures perceived by individuals about what others think they should do and their feelings towards complying) and beliefs about capability and control (the ease with which one can execute a behaviour) determine the perceived behavioural control. The three constructs lead to the intention to act and hence change one's behaviour (Morris et al., 2012; Munro, Lewin, Swart, & Volmink, 2007).

TPB is best for predicting behaviour and retrospective analysis of health behaviour (Morris et al., 2012; Taylor et al., 2007). This implies that when one knows that a behaviour can result in a positive outcome, it may be a motivator for them to perform the behaviour. Also, when pressures from others increase, one is motivated to perform a behaviour. Similarly, when one has control over a certain behaviour, the intention to perform it increases. However, the TPB does not yield positive results for interventions that require a change of behaviour (Taylor et al., 2007; Webb, Sniehotta, & Michie, 2010). It may be useful in predicting factors that influence behavioural change (Hardeman et al., 2002). Therefore, this is not an appropriate theory to guide the current study as the theory focuses on predicting behaviour and retrospective analysis of health behaviour. This implies that it focuses on secondary and tertiary levels of prevention, but the current study focuses on primary prevention of hypertension.

2.3 Stages of Change (Transtheoretical Model)

Stages of Change Model also known as Transtheoretical Model is a cognitive model with different stages of motivation for change of behaviour (Prochaska, Johnson, & Lee, 2009) . These stages include precontemplation, contemplation, preparation, action, and maintenance. Precontemplation is a stage of complete awareness of the problem but with no intention to change behaviour; contemplation is where one is aware and has thoughts to change behaviour; preparation is a stage where there is awareness of a problem and intentions to take action for behaviour change; action stage is where the individual takes the initiative to change behaviour to solve a problem; and maintenance is where an individual strives to prevent reoccurrences of a problem or maintain the positive behaviour (Morris et al., 2012; Prochaska et al., 2009).

The Stages of Change Model was initially developed to explain and guide interventions to stop smoking behaviour but is currently used in many addictive behaviours. This is because people in the same stage of change may be experiencing the same problems and hence similar interventions may be effective for them (Marshall & Biddle, 2001; Prochaska et al., 2009). The Stages of Change Model has the strength of considering change as something dynamic and not an "all or nothing" occurrence. (Marshall & Biddle, 2001). It has also been postulated that previous pieces of evidence indicate that change occurs in a linear manner (Prochaska & DiClemente, 1983) but newer studies indicate that the stages of change go through a cyclic pattern before behaviour change is achieved (Prochaska, DiClemente, & Norcross, 1993). However, it has been criticized for not having a clear-cut difference between the stages or when a transition from one stage to another occurs and it does not explain why some individuals change faster than others (Morris et al., 2012). Based on the explanation provided, the Theory of Planned Behaviour addresses secondary and tertiary levels of prevention. However, the current study aims to explore primary prevention of hypertension focusing on awareness and healthy lifestyle behaviours.

2.4 The Health Belief Model

In the 1950s when the Health Belief Model was developed, the main focus of the US Public Health Service Department was the prevention of diseases rather than the management of illnesses (Rosenstock, 1974). During that time, it was not considered the responsibility of public health services to diagnose and treat illnesses and manage medication adherence (Rosenstock, 1974). However, the most challenging issue at that time was non-compliance with preventive measures among the public and attendance of screening for asymptomatic diseases such as tuberculosis, cervical cancer, dental disease, rheumatic fever, polio, and influenza (Hochbaum, 1958). Rosenstock (2000) noted that the earliest concepts of the Health Belief Model assumed that for an individual to take preventive measures for any disease, that person must believe that they are susceptible to that disease. In addition, the individual must understand the severity or seriousness of the problem in their life, acknowledge that taking action would be beneficial to reduce the effects of the disease and appreciate the barriers to action such as cost, inconvenience, pain, and embarrassment (Rosenstock, 1974).

Therefore, the Health Belief Model was revised to cover six concepts: perceived susceptibility, which is the individual’s perception of the risk of acquiring a disease; perceived severity, or an individual’s feeling about the seriousness of acquiring the disease; perceived benefits of the usefulness of various interventions available to decrease endangerment from the disease; perceived barriers, or the individual’s feelings about the hindrances to performing an endorsed health action; cue to action, which is the incentive needed to decide to accept a suggested health action; and self-efficacy, or an individual’s ability to execute a certain behaviour (Boskey, 2016; Morris et al., 2012; Munro et al., 2007; Rosenstock, 1974; Zare et al., 2016). The model was originally designed for health behaviour aspects but is also used to explain behavioural change in other sectors.

However, the Health Belief Model has been criticized for a variety of reasons, including being inadequate as a foundation for comprehending and influencing human behaviours. It also does not pay enough attention to how societal expectations and norms influence human decision-making and how much human behaviour is automatic and predictable. In addition, it ignores how institutional influences outside of the power of an individual lock that individual into particular behavioural patterns (Morris et al., 2012). For example, when an individual is working in an institution, there may be work-related stressors that occur because of work-related demands. The individual may not have immediate solutions to that kind of stressor until the task or cause of the stress is accomplished.

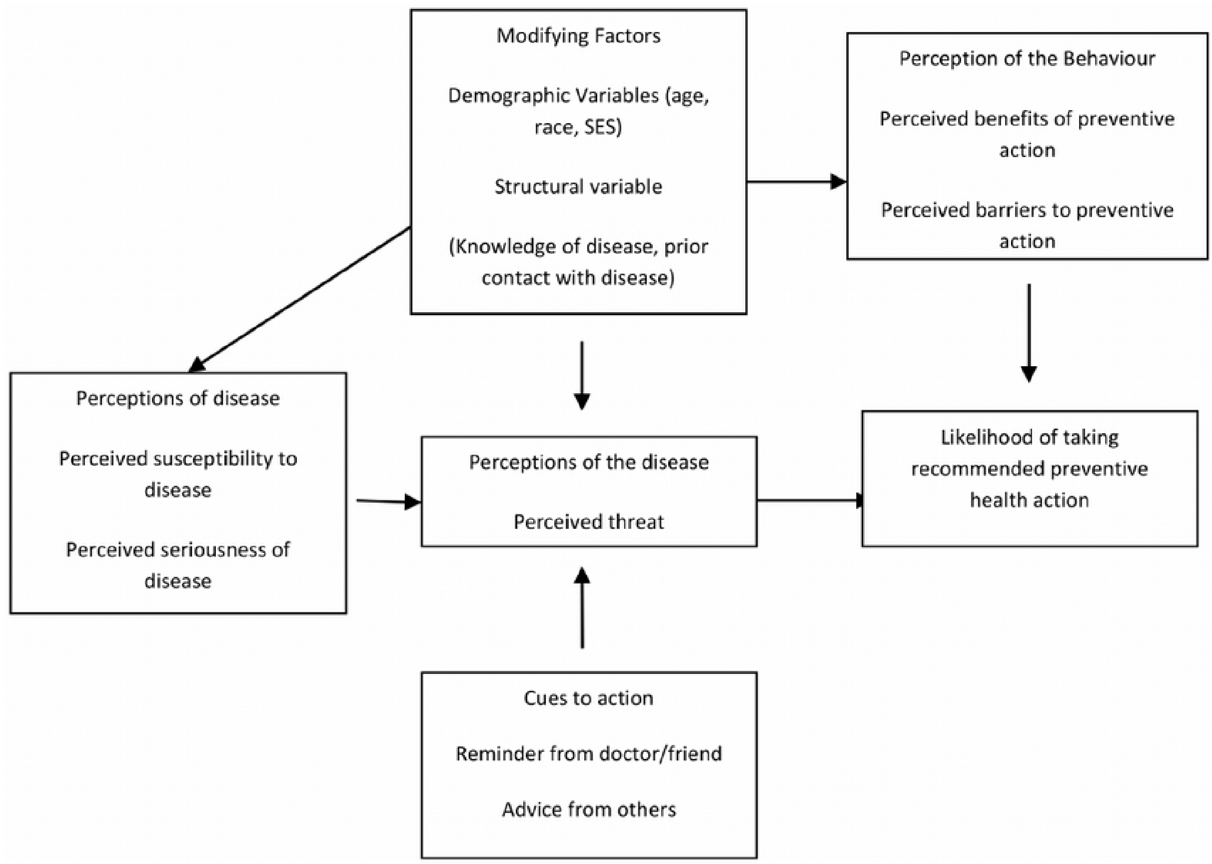


Figure 1: The Health Belief Model
(Glanz, Rimer, & Viswanath, 2008)

A previous study tested the Health Belief Model to determine if it could predict coronary heart disease-related preventive behaviours among women (Rosenstock, 1990). Several predictors for CVD prevention were tested, and the results showed that susceptibility to CVD, perceived seriousness of the CVD, knowledge of risk factors, and general health motivation showed changes in preventive behaviours. These findings supported the use of the Health Belief Model (Rosenstock, 1990) in developing interventions that require health behaviour change (Ali, 2002). In the same study, susceptibility to and the seriousness of CVD were considerably different between women who were on hormone replacement therapy and those who were not. Women who perceived themselves as susceptible to CVD and believed the disease was serious were more likely to use hormone replacement therapy. However, when perceptions of susceptibility and seriousness were examined among women who were taking drugs for hypertension, diabetes, and high cholesterol levels, there were no significant differences between those taking drugs and those not taking drugs (Ali, 2002). This finding was potentially attributable to the influence of participants' religious affiliations and beliefs as they were recruited from churches. It has been found that religious affiliation may influence behaviours positively or negatively (Koenig et al., 1999). A similar study was conducted in Israel to examine protective behaviours among older people to prevent them from acquiring skin cancer. That study used the Health Belief Model (Rosenstock, 1990) to explain how a change in beliefs using sun-exposure messages and self-examination influenced behavioural change. The findings indicated that among the constructs of the Health Belief Model, salience (feeling that doing something about disease prevention is more important than any other thing) was a good predictor of the studied behaviour compared with susceptibility, as even when participants felt vulnerable to skin cancer, they did not adopt preventive measures (Carmel, Shani, & Rosenberg, 1996). Importantly, some confounding factors (e.g., age differences) may explain such findings (Vernon et al., 1990).

2.4.1 Reasons for Selecting the Health Belief Model

Several theories and models were reviewed when selecting an appropriate theoretical framework for this study, such as the stages of change model and the Theory of Planned Behaviour (TPB). However, given the evidence above, the constructs of the Health Belief Model were considered the best approach to explain and predict behaviours for disease prevention (Hochbaum, Rosenstock, & Kegels, 1952), which was the major focus of the present study. The Health Belief Model (Rosenstock, 1990) was developed with a focus on assessing failure to adapt to disease prevention measures (Hochbaum, 1958; LaMorte, 2022). The main idea in the Health Belief Model is the need to prevent sickness or recover good health if one is already sick, along with the confidence that a specific health act will avert or treat a disease. Therefore, what the individual chooses to do is determined by their perceptions of the benefits and barriers related to certain health behaviours (LaMorte, 2018; Rosenstock, 1974). The study by Ali (2002) clearly explained that some constructs (i.e., susceptibility and seriousness) of the Health Belief Model were effective in predicting behaviour change, but other constructs were not explained. Conversely, Carmel et al. (1996) reported that salience (thinking about the disease) was a major predictor of behaviour change.

This study aimed to explore healthy lifestyle behaviours for the prevention of hypertension. According to Rosenstock (1990), the Health Belief Model was considered the most appropriate model for this study because its constructs can explain preventive behavioural changes. For example, perceiving that anyone can acquire hypertension may act as a motivator for a behaviour change. Similarly, knowing that hypertension is dangerous to health and that it is preventable may mean prevention initiatives are easily adopted. In addition, feeling competent to perform a behaviour with minimal challenges can be a motivator for both changing behaviour and maintaining the new behaviour (Morris et al., 2012).

However, many researchers consider that the TPB is best for predicting behaviour and retrospectively analysing health behaviour (Morris et al., 2012; Taylor et al., 2007). This theory suggests that when an individual knows that a behaviour can result in a positive outcome, it may be a motivator to perform that behaviour. Furthermore, when pressures from others increase, the individual is more motivated to perform a certain behaviour. Similarly, when an individual has control over a certain behaviour, the intention to perform that behaviour increases. The TPB does not yield positive results for interventions that require a change of behaviour (Taylor et al., 2007; Webb et al., 2010), although it may be useful in predicting factors that influence behavioural change (Hardeman et al., 2002). In addition, the TPB helps to identify cognitive ideas for change instead of how these cognitions could be changed. Therefore, it may not offer suggestions to solve an identified problem (Morris et al., 2012). This means that the TPB is not ideal for explaining effective interventions for the prevention of hypertension although it helps to predict behaviour, it may not explain how the behaviour can be changed, which was a major component of the present study.

The Stages of Change Model (Prochaska, Redding, & Evers, 1997) was initially developed to explain and guide interventions to stop smoking behaviour but is currently used in many addictive behaviour change programmes. This is because people in the same stage of change may experience the same problems, meaning similar interventions may be effective (Marshall & Biddle, 2001; Prochaska et al., 2009). This implies that the Stages of Change Model focuses on the need to change addictive behaviour (Morris et al., 2012), which is at the level of secondary prevention. Therefore, the Stages of Change Model mainly applies to secondary and tertiary preventive measures, which target people who are already addicted and need to find solutions to change their addictive behaviour. However, the focus of this study was the primary prevention of hypertension. The Stages of Change Model may not explain the required behaviour change at the primary level of prevention, whereas the Health Belief Model does. Therefore, the Health Belief

Model (Rosenstock, 1990) will guide in explaining some concepts in this study that are helpful in the prevention of hypertension at the primary level.

2.4.2 Implications of Health Belief Model to Prevention of Hypertension

In this study, perceived susceptibility and perceived seriousness of the disease were measured by assessing the knowledge of participants in rural communities about the prevention of hypertension. If individuals at high risk for developing hypertension know about its prevention, they will likely have high perceived seriousness of the disease. Therefore, there is a likelihood of such individuals adopting recommended health actions if they believe that doing so will avert the situation and avoid a diagnosis of hypertension. In addition, when individuals have competence in terms of what to do and how to do it, it increases the chances of compliance and therefore reduces the risk for hypertension. This was supported by a study that was conducted among individuals with suicidal ideas (Gipson & King, 2012). The use of the Health Belief Model assumes that if the patient's perceived seriousness for negative outcomes is low, then the likelihood of following the clinician's recommendations would also be low, thereby resulting in negative outcomes and vice versa (Gipson & King, 2012). Perceived benefits in this study were assessed by ascertaining whether an individual's lifestyle had a relationship with the risk for developing hypertension, cues to action and self-efficacy were evaluated by exploring the experiences that people in rural communities had in relation to hypertension.

2.4.3 Chapter Summary

This chapter offered a detailed discussion of the Health Belief Model concerning how it can inform the prevention of hypertension. Before choosing this as the model with the best fit to guide this study, other possible models (e.g., the TPB and Stages of Change Model) were reviewed. However, the TPB is ineffective in explaining interventions that call for a behaviour change, although it may help identify the variables that affect that change. Consequently, it may not provide solutions to the issue regarding prevention and may not explain how interventions can be modified, which were major considerations in the present study. The Stages of Change Model emphasizes the requirement to alter addictive behaviour at the level of secondary and tertiary prevention. This study emphasized the prevention of hypertension; the Stages of Change Model does not adequately describe the required behaviour change at the primary level of prevention, whereas the Health Belief Model does.

The Health Belief Model was considered the most suitable for this study as its constructs explain behavioural changes that are preventative. Importantly, the Health Belief Model emphasizes that changes in behaviours are related to the perceived seriousness of the disease, perceived susceptibility to the disease, barriers, benefits, threats, and cues to action, which when followed closely can lead to changes in behaviours. If a person knows that they can develop hypertension, understands how dangerous it is, and acknowledges the importance of prevention, possible hindrances to prevention, and the possible complications associated with hypertension, they may be motivated to perform whatever actions are required to prevent hypertension.

3 Chapter Three: Scoping Review of the Literature

3.1 Introduction to the Scoping Review

This chapter presents a review of the literature regarding awareness of hypertension and healthy lifestyle behaviours for the prevention of hypertension in low- and middle-income countries. A scoping review of the literature was conducted to assess current knowledge on the topic and identify gaps in the literature (Munn et al., 2018) concerning healthy lifestyle behaviours for the prevention of hypertension in rural communities. Scoping reviews are a sort of knowledge synthesis that employs a systematic and iterative technique to find and synthesize an existing or developing body of literature on a certain topic (Thomas, Lubarsky, Durning, & Young, 2017). Although there are many reasons for conducting a scoping review, the major reasons are to map the size, scope, and nature of the body of literature on a subject to identify any gaps in the literature (Maggio, Larsen, Thomas, Costello, & Artino Jr, 2021; Peters et al., 2020; Thomas et al., 2017). Conducting a scoping review is generally performed in a team. For this study, the scoping review team comprised the present researcher and the research supervisors. Starting a scoping review entails: (i) specifying the research problem; (ii) locating pertinent studies; (iii) deciding which research to include in the review; (iv) data gathering, collation, and summarization; (v) reporting the results; and (vi) consultation with stakeholders (optional) (Munn et al., 2018).

The scoping review protocol for this study (Appendix A) was developed and registered with Open Science Framework (a digital object identifier was provided: https://doi.org/10.17605/OSF.IO/WNZUE). The scoping review was consistent with the Joanna Briggs Institute guidelines as follows.

Title of the Scoping Review

Exploring Awareness and Healthy Lifestyle Behaviours for Prevention of Hypertension in Low-and Middle-income Countries: A Scoping Review

Review Questions

The research questions were formulated using the people or population, concept, and context (PCC) framework (Peters et al., 2020).

Participants

Participants included in the study were adults aged 18 years and above.

Concept

Studies that explored healthy lifestyle behaviours for the prevention of hypertension, including dietary modifications, salt intake, alcohol consumption, smoking, and physical activity, that focus on primary prevention were included. Studies focusing on the secondary prevention of hypertension were excluded.

Context

The context was studies conducted in low- and middle-income countries.

3.2 Review Questions

1. What knowledge does the general adult population (aged 18 years and above) have about the prevention of hypertension in low- and middle-income countries?
2. What healthy lifestyle behaviours influence the prevalence of hypertension among the general adult (aged 18 years and above) population in low-and-middle-income countries?
3. What is the prevalence of hypertension among the general adult (18 years and above) population in low- and middle-income countries?

3.3 Types of Evidence

During the data search process, a search strategy with key terms and medical subject headings (MeSH) terms for the different databases was used across five databases (PubMed, CINAHL, Medline EbscoHost, SciELO Citation Index, and Open Grey). The search terms and summary of the number of articles identified from each of these databases are shown in Table 2. The search was restricted to studies from low- and middle-income countries, published in the English language, and articles that were published within the last 14 years. The original search was limited to a 10-year period (2010–2019), but the search was later updated (1st January 2010 to 7th May 2024). In addition, the participants in the included studies were aged 18 years and above. Systematic reviews were excluded at the time of data extraction because it is not recommended to add systematic reviews to scoping reviews, as they are regarded as secondary research studies. Scoping reviews are used to analyse and identify knowledge gaps, clarify ideas and characterizations in the literature, highlight essential elements and issues linked to a concept, and map how research on the studied subject has been conducted. They may also serve as a prelude to systematic reviews (Munn et al., 2018; Peters et al., 2017).

3.4 Search strategy

Identifying both published and unpublished papers was the goal of the search approach. An initial limited search of CINAHL and PubMed was conducted to locate articles on the subject. A comprehensive search technique was then developed using the keywords found in the titles and abstracts of pertinent publications as well as index/MeSH terms used to characterize the articles (see Appendix B). The search strategy, including all identified keywords and index terms, was adapted for each database and information source. The reference lists of all included studies were checked to identify additional relevant studies. Only countries in low and-middle-income countries were included in the scoping review. This was performed using the limiter for geography in which the study was conducted and during the screening process as part of the inclusion criteria. This was because some databases did not have the option of adding all the individual countries found in low and-middle-income countries. In addition, many articles did not include the words "low and-middle-income countries" and where it was, authors stated it differently in different articles for example "low and-middle-income countries" or "low-and middle-income countries" or "low-income countries or middle-income countries". This meant that adding it to the search strategy would mean leaving out many articles that would have otherwise fit the inclusion criteria.

The screening of articles was done using the title and abstract using the search terms, scope (low- and middle-income countries), and aim of the study. This helped to ensure that all relevant articles were included in the study.

3.5 Evidence for screening and selection

In total, 1,596 articles were retrieved; of these, 71 articles were included in the review (15 articles were obtained from the references of the included articles) (see the PRISMA-ScR flow diagram in Figure 2). A detailed data extraction form is attached in Appendix C.

Table 2: Search Strategy and Number of Articles Retrieved

Database	**Specific search strategy for the database**	**Limits**	**Number of articles 1st January 2010 to 7th May 2024**
CINAHL	"Primary prevention" OR "prevention" OR "preventive measure*" AND (MH "Hypertension") OR "hypertension" OR (MH "Hypertension") OR "high blood pressure" OR (MH "Hypertension") OR "raised blood pressure" AND "salt" OR (MH "Sodium Chloride, Dietary") OR "alcohol" OR (MH "Alcohol Drinking") OR (MH "Smoke") OR "smok*" OR (MH "Smoking") OR "physical activit*" OR (MH "Life Style") OR (MH "Life Style Changes") OR "Health lifestyle behavio*" AND "Aware*"	Limiters: Published date: 2010/01/01–2023/12/31 Expanders: Apply equivalent subjects Narrow by subject age: all adult Narrow by language: English Search modes: Boolean/Phrase	130 identified; one record was not available = 132
PubMed	(((Aware* AND (alladult[Filter])) AND (Diet* OR salt OR alcohol OR smok* OR "physical activit*" OR "Health lifestyle behavio*" AND (alladult[Filter]))) AND	English and 10 years	365

	(“hypertension” OR “high blood pressure” OR “raised blood pressure” AND (alladult[Filter]))) AND (“Primary prevention” OR prevention OR “preventive measure*” AND (alladult[Filter]))		
Medline	(MH “Primary Prevention”) OR “Primary prevention” OR (MH “Primary Prevention”) OR “prevention” OR “preventive measure*” AND (MH “Hypertension”) OR “hypertension” OR (MH “Hypertension”) OR “high blood pressure” OR “raised blood pressure” OR (MH “Hypertension”) AND (MH “Diet”) OR “Diet*” OR (MH “Diet, Healthy”) OR (MH “Sodium Chloride”) OR (MH “Sodium Chloride, Dietary”) OR “salt” OR (MH “Alcohol Drinking”) OR “alcohol” OR “smok*” OR (MH “Physical Fitness”) OR “physical activit*” OR (MH “Life Style”) OR (MH “Healthy Lifestyle”) OR (MH “Health Behavior”) OR “Health lifestyle behavio*” AND (MH “Awareness”) OR “Aware*”	English and 10 years	341
SciELO Citation Index	“Primary prevention” OR prevention OR “preventive measure*” AND hypertension OR “high blood pressure” OR “raised blood pressure” AND Diet* OR salt OR alcohol OR	English, cardiology system, cardiology, 2010–2023	116

	smok* OR "physical activit*" OR "Health lifestyle behavio*" AND Aware*		
Open Grey	"Primary prevention" OR prevention OR "preventive measure*" AND hypertension OR "high blood pressure" OR "raised blood pressure" AND Diet* OR salt OR alcohol OR smok* OR "physical activit*" OR "Health lifestyle behavio*" AND Aware*		642

3.5.1 Introduction to the PRISMA-ScR figure

The PRISMA-ScR flow diagram (Figure 2) shows that a total of 1596 articles were retrieved after the searches. After removing duplicates, 878 articles remained for screening using the title and abstract. Following this screening, 113 articles were considered for a full review, of which 56 articles were included in the study; 15 additional articles were retrieved from the reference lists of the included studies, giving a total of 71 articles in the scoping review.

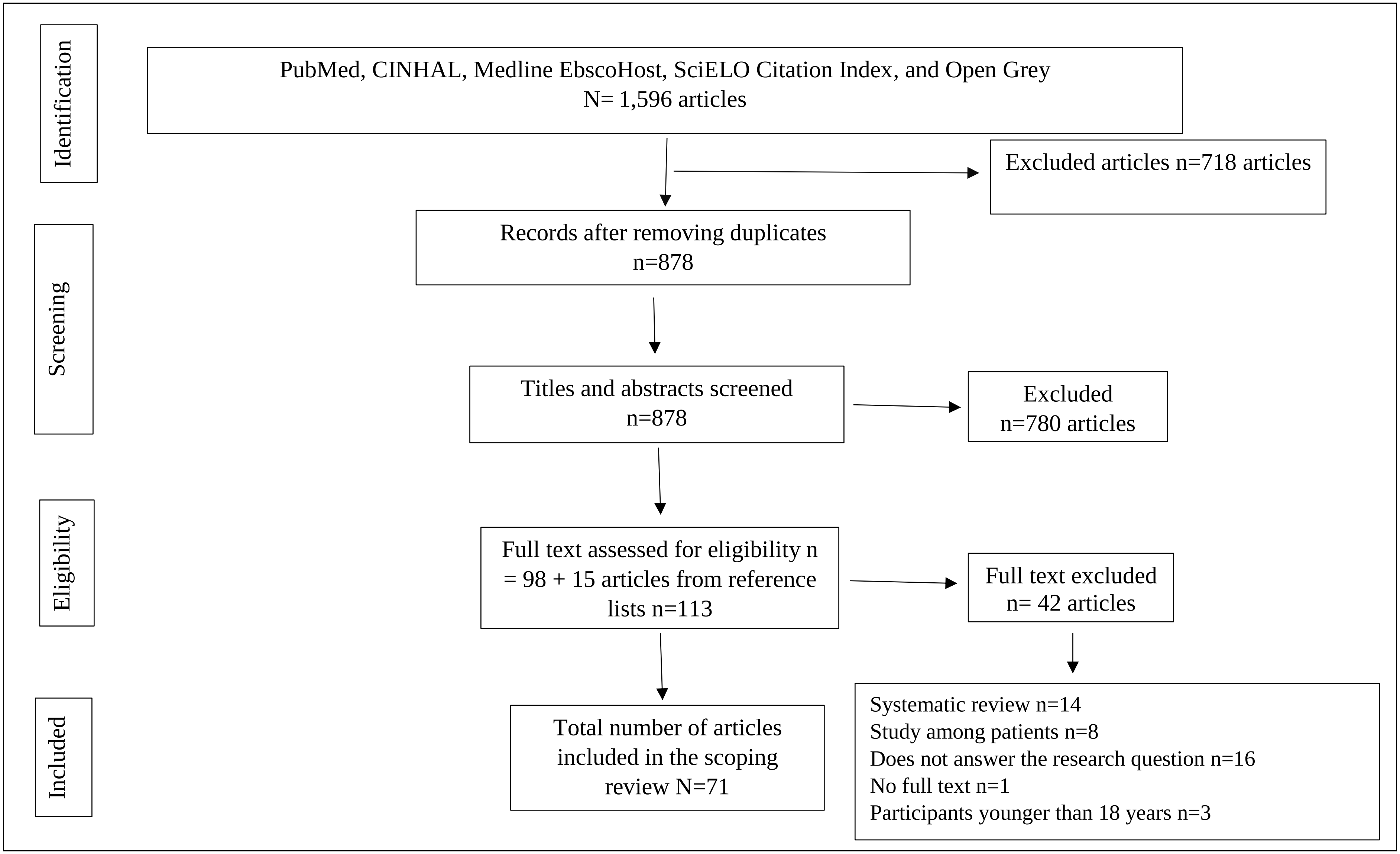


Figure 2: PRISMA-ScR Flow Diagram for the Scoping Review

3.6 Review Findings

The findings from the review are presented under different subheadings to describe awareness, healthy lifestyle behaviours for the prevention, and prevalence of hypertension in low- and middle-income countries. A detailed explanation of how hypertension was explained in different studies has also been provided. In addition, the clinical protocol of how blood pressure was measured is presented. These factors informed this study during the process of data collection. The findings are presented under three subheadings: awareness and knowledge about the prevention of hypertension in low- and middle-income countries; sociodemographic modifiable and non-modifiable risk factors for hypertension; and individual healthy lifestyle behaviours that influence the prevalence of hypertension.

3.6.1 Definition of Hypertension in Low- and Middle-Income Countries

Hypertension is also known as raised blood pressure or high blood pressure, and is usually asymptomatic (Zheng et al., 2014). If not diagnosed and treated early, hypertension causes damage to the arteries that supply major organs in the body (e.g., heart, kidney, brain, and eyes). It has also been associated with risks for stroke, ischemic heart disease, and renal failure (Cao et al., 2016). Previous studies in low- and middle-income countries noted that the presence of hypertension can be defined through self-reported taking of antihypertensive medications (Awoke, Awoke, Alemu, & Megabiaw, 2012; Cai et al., 2012; Camara et al., 2016; Cherfan et al., 2018; Joshi et al., 2014; Lin et al., 2012; McCormack, 2019; Mohamed et al., 2018; Muhihi et al., 2020; Musinguzi & Nuwaha, 2013; Zaki et al., 2021; Zhang et al., 2013; Zhao et al., 2013). Other researchers defined hypertension as a blood pressure of 140/90 mmHg, self-reported taking of medication, or self-report of having been told by a medical practitioner about the diagnosis (Bi et al., 2014; Helelo, Gelaw, & Adane, 2014).

It is important that before a diagnosis of hypertension is made, careful blood pressure measurement is taken by a trained person using a well-calibrated and validated sphygmomanometer (blood pressure machine) (Awoke et al., 2012; Do et al., 2015; Lin et al., 2012; Mirzaei et al., 2021; Mustapha et al., 2022; Zhang et al., 2013). Blood pressure measurements for this study were undertaken using an Omron BP786N blood pressure machine. Omron BP786N is an electronic blood pressure machine that has been validated in a study involving 85 participants that mainly focused on diastolic blood pressure (Omron Health Care Insurance, 2014). Similarly, previous studies reported having used validated Omron blood pressure machines, although they were of different brands (Omron HEM8712 was used in Ethiopia, the OMRON M2, Kyoto, Japan device was used in Kenya and Rwanda, OMRON Model M6 was used in Uganda, and Omron HBP-1300 was used in Malaysia) (Awoke et al., 2012; Mohamed et al., 2018; Mustapha et al., 2022; Ntaganda et al., 2022).

3.6.2 Clinical practice protocols/policies

Based on the studies included in this review, differences were noted in the number of times blood pressure was measured as well as the time interval between blood pressure measurements. An average of two blood pressure readings were reported in studies conducted in Lebanon, Vietnam, China, and Ethiopia. However, the time interval between the measurements ranged from 3 to 30 minutes (Awoke et al., 2012; Cherfan et al., 2018; Lin et al., 2012; Zhang et al., 2013). When the difference between the two blood pressure readings was ≥10 mmHg or ≥5 mmHg (systolic and diastolic respectively), a third blood pressure reading was taken, and the average of the last two measurements was considered as the final blood pressure recorded for analysis (Awoke et al., 2012; Do et al., 2015). Other studies conducted in Ethiopia, Uganda, Rwanda, Iran, and Malaysia reported three blood pressure measurements were taken for each participant at a time interval from 1 to 10 minutes, and the average of these three measurements was recorded (Helelo et al., 2014; Mirzaei et al., 2021; Musinguzi & Nuwaha, 2013; Ntaganda et al., 2022; Zaki et al., 2021). In studies conducted in Kenya and Uganda, three blood pressure measurements were taken at intervals of 3–15 minutes, and the average of the last two readings was recorded and considered for the analysis (Mohamed et al., 2018; Mustapha et al., 2022).

3.6.3 Awareness and Knowledge about Prevention of Hypertension in Low- and Middle-Income Countries

Prevention of hypertension before an individual acquires the disease helps to avert the associated complications and management costs (Jongen et al., 2019). However, for populations to be able to effectively implement preventive measures, they require information about hypertension interventions. A mixed methods study conducted in South Africa assessed what the participants knew, thought, and recommended for the prevention of hypertension (Jongen et al., 2019). Those researchers identified a need for individuals to gain more knowledge about the effectiveness of dietary and lifestyle modifications for hypertension prevention and recommended further research in this area (Jongen et al., 2019).

The implementation of primary prevention for hypertension requires individuals to be aware of their hypertension status. Awareness of hypertension is commonly defined as individuals self-reporting having been diagnosed with hypertension by a doctor or taking any antihypertensive drugs (Abdul-Razak et al., 2016; Bi et al., 2014; Liu, 2011; Mohamed et al., 2018; Zhao et al., 2013). The rates of awareness of hypertension were reported in 16 studies from low- and middle-income countries included in the scoping review. The rates of awareness of a hypertension diagnosis ranged from 9.5% in Nigeria (Abdulsalam, Olarewaju, Abdus-salam, & Olugbenga-Bello, 2014) to 54.3% in China (Zhang et al., 2013). The majority (4/16) of the studies that reported the prevalence of awareness were conducted in China, and reported a wide range in rates of awareness (15.9%–54.3%) (Cao et al., 2016; Dong, Ge, Ren, Fan, & Yan, 2013; Lin et al., 2012; Zhang et al., 2013). Similarly, four studies from East Africa reported the rates of awareness of hypertension although the range was wide and rates were low (between 6% (n= 44/735) in Uganda and 34.3% (n= 302/880) in Tanzania) (Guwatudde et al., 2015; Muhihi et al., 2020) compared with China. Other studies also reported about the low levels of awareness; a cross sectional study conducted in Rwanda stated that 82.6% (752/910) which represented 18% of the participants with lack of awareness about the diagnosis (Ntaganda et al., 2022). The situation was not any different in a Nigerian cross-sectional study where the awareness was reported to 10.7% among the hypertensive participants (Abdulsalam et al., 2014). This evidence suggested that Uganda has the lowest prevalence of awareness of hypertension in the region, yet none of the studies found explored why the high prevalence has persistently remained high as well as the low rates of awareness about the disease. This this affirms the need to conduct a mixed methods study to explore current statistics regarding rates of awareness of hypertension, as lack of awareness may be a barrier to hypertension prevention.

Age has been associated with awareness of hypertension (Zhao et al., 2013), with awareness highest among participants aged ≥60 years in Malaysia (Abdul-Razak et al., 2016). In Uganda, awareness increased linearly with age (Musinguzi & Nuwaha, 2013), which was consistent with a study from Vietnam, where the reported rates of awareness were 37.3% for those aged 40–59 years and 78.3% for those aged 60–69 years (Hien, Tam, Tam, Derese, & Devroey, 2018). Furthermore, in China, the reported ORs for hypertension awareness were 2.83 for age 45–59 years and 5.37 for age ≥60 years (Zhang et al., 2013). This indicates that interventions for the prevention of hypertension should also target young people, as the evidence suggests that they have particularly low levels of awareness.

Gender was also linked to the rate of awareness in many studies. This was consistent with a study conducted in Nigeria where the overall rate of awareness was 9.5%, but awareness was higher (57.1%) among female participants. Similar findings were reported in Kenya, Rwanda, and China, where the rate of awareness of hypertension diagnosis was 28.9%–56.8% among women compared with 27.4%–51.7% among men (Joshi et al., 2014; Wang et al., 2013; Zhang et al., 2013). Moreover, a study that focused on the dynamics of hypertension prevalence and awareness from 1991 to 2011 revealed that among hypertensive patients, the overall awareness had improved from 33.7% to 54.9%, although a greater improvement was realized among women compared with men (28.7% to 51.7% among men and 38.8% to 58.7% among women) (Guo et al., 2015). Hien et al. (2018) found that age, gender, and alcohol consumption were independent predictors of awareness of hypertension. Muhihi et al. (2020) reported that the OR for awareness was 2.47 among women, and awareness was high among those with high socioeconomic status and alcohol drinkers. Furthermore, after considering factors such as sex, knowledge, belief, age, and years of schooling, awareness was linked to more behaviours that promoted healthy salt consumption (Zhang et al., 2016).

Awareness of hypertension was also associated with an individual's place of residence. Generally, the rate of awareness of hypertension was reported to be low, although rural residents had the lowest prevalence of awareness. Bangladesh reported an awareness rate of 61.4% among rural residents and 37.9% among urban residents, In contrast, a cross-sectional study design was employed for the survey, which was carried out in Uganda between March and July 2014 reported a significantly lower rate among rural residents than urban residents (6.0% [n= 44/735] vs. 12.1% [n= 36/298]; unadjusted $p=0.001$) (Ali et al., 2022; Guwatudde et al., 2015). Furthermore, in Tanzania, awareness of hypertension was low among alcohol drinkers and those with normal BMI (both $p<0.01$) (Muhihi et al., 2020).

Knowledge about the prevention of hypertension was reported in only three of the 71 articles included in this scoping review. A mixed methods study conducted in Nigeria reported that 51.6% of the participants had a limited understanding of hypertension risk factors and prevention strategies (Gebrihet et al., 2017). Similarly, the focus group discussions revealed a dearth of information regarding hypertension prevention strategies (Gebrihet et al., 2017). In addition, Tan et al. (2022b) conducted a study in Malaysia that adapted the six constructs of the Health Belief Model. During that survey, perceived severity was measured when participants were asked different questions that were allocated different ratings; one question (i.e. "How harmful is hypertension to your health?") with a response option on a 3-point ordinal scale (3 = greatly, 2 = slightly, 1 = not at all) was used to gauge perceived severity. Perceived benefits were measured by asking participants whether lowering high blood pressure improved a person's health, as well as whether lowering blood pressure even a little bit improved health (3-point response option: 3 = yes, 2 = somewhat, 1 = no). Self-efficacy was measured by three items (e.g., "Can people do things to control their blood pressure?") with responses on a 3-point scale (3 = yes, 2 = somewhat, 1 = no). Knowledge of hypertension was evaluated using questions adapted from Oliveria et al. (2005) and translated into Malay by Mohammed, Hassan, Suhaimi, and Ali (2021). This knowledge subscale (scored from 1 to 10) included questions about what hypertension is, how harmful it is to health, how reducing blood pressure affects hypertension (2 points), how to interpret blood pressure readings (5 points), and whether behaviour can affect blood pressure (Oliveria et al., 2005). Based on the analysis using this scale, participants had moderately good hypertension knowledge (mean=6.8/10, standard deviation [SD]=2.2) and understood the severity of hypertension (mean=2.6/3, SD=0.5), the advantages of blood pressure control (mean=4.7/6, SD=0.7), and the ability to prevent hypertension (mean=6.6/9, SD=0.8) (Tan et al., 2022b). A study from Bangladesh showed that men were more knowledgeable about hypertension than women (55.3% vs. 49.7%), and urban inhabitants were more knowledgeable than rural residents (61.4% vs. 37.9%) (Ali et al., 2022). These findings also suggested that it was necessary to investigate the knowledge of hypertension among rural dwellers as they demonstrated low knowledge levels.

Interestingly, of the studies included in the scoping review, only two used a mixed methods design. One of these studies was conducted in South Africa to ascertain what participants knew, thought, and proposed about the prevention and management of hypertension (Jongen et al., 2019). Three themes emerged from the qualitative arm of that study as follows. (i) Perceptions and misperceptions of hypertension: participants perceived the cause of hypertension was stress or anxiety, adding salt to food, women were perceived to cause high blood pressure in men because of lack of effective communication, lack of respect, failure to compromise, poverty, eating a lot of fats, and a family history of hypertension. (ii) Hypertension prevention and management challenges on the community level: participants shared their experiences about the long waiting times and the long distances to the hospital that made the prevention and management of hypertension challenging. (iii) Recommendations to raise awareness about hypertension in the community: door-to-door visits to diagnose and raise awareness of hypertension were strongly advised (Jongen et al., 2019).

The other mixed-method epidemiological survey study was conducted in Nigeria and identified a lack of knowledge about ways to prevent high blood pressure (Gebrihet et al., 2017). Findings from the focus group discussions in that study revealed that the participants knew that hypertension was preventable and identified the reduction of coffee (impact of caffeine), salt, and fat in their diets as some prevention factors. However, because of the lack of knowledge about risk factors, some participants perceived hypertension to be caused by God (Gebrihet et al., 2017).

Interestingly, having a family history of hypertension led to increased hypertension awareness, treatment, and management by close to three times compared with having no family history (Zhao et al., 2018). However, despite this favourable outcome, overall awareness levels remained too low. To improve the prevention, management, and control of hypertension among the rural population in Northwest China, it was recommended that public health initiatives and "doable" techniques should be adopted. In addition, older adults, obese people, and those with a family history of hypertension should receive special attention, whereas younger adults should be made more aware of the problem and receiving treatment (Zhao et al., 2018). These factors are important and can be translated into the Ugandan context where the rates of awareness are low (Guwatudde et al., 2015).

Primary prevention of hypertension is associated with individuals' knowledge and awareness of hypertension. However, considering the concerningly low rates of awareness of hypertension among rural residents in low- and middle-income countries, particularly in Uganda, it is important to explore the status of people's knowledge and awareness in these communities.

3.6.4 Prevalence of Hypertension in Low- and Middle-Income Countries

Hypertension is a serious challenge that is faced by people in low- and middle-income countries. Of the 71 studies included in the scoping review, 30 reported the prevalence of hypertension. However, 11 of these studies reported the prevalence of hypertension in East Africa. The prevalence of hypertension was generally high in some study sites in low-and-middle-income countries, and ranged between an overall prevalence of 15.7% in Kakyerere Parish in Mbarara District, Uganda (Kotwani et al., 2013) to 49.4% (95% CI: 44.27%–54.51%) in Malaysia in a study that focused on data from a Community Salt Study (Zaki et al., 2021). In East Africa, the prevalence ranged from 15.7% (Uganda) (Kotwani et al., 2013) to 29.3% (Tanzania) (Muhihi et al., 2020). However, four studies reported the prevalence of hypertension in Uganda, with the highest average prevalence from the four regions in the country to be 26.4% (Guwatudde et al., 2015) and the lowest prevalence of 15.7% in Mbarara District, Western Uganda (Kotwani et al., 2013). Guwatudde et al. (2015) conducted a country-wide study across all four regions of Uganda and found that the prevalence of hypertension was highest in the Central Region (28.5%) and lowest in the Northern Region (23.3%). The other two studies conducted in Rakai District, South Central Uganda and Buikwe District, Eastern Uganda, reported prevalence rates of 20.8% and 21.8%, respectively (Musinguzi & Nuwaha, 2013; Mustapha et al., 2022). These findings confirmed that the prevalence of hypertension was highest in Central Uganda. However, the most recent prevalence estimate was reported in 2015, which calls for the need to establish the current prevalence in Central Uganda and explore the possible explanations for this prevalence.

Various sociodemographic characteristics have been associated with the prevalence of hypertension in different studies from low- and middle-income countries. These included individuals' education, age, socioeconomic status, marital status, and urban/rural residence, as discussed in the subsequent paragraphs.

The level of education attained by an individual was reported to influence the prevalence of hypertension in different studies. In some studies, a primary (basic) level of educational attainment was associated with a high prevalence of hypertension, whereas in others, a high prevalence of hypertension was associated with high education attainment. In Malaysia, an overall prevalence of 47.9% (95% CI: 47.0%–49.0%) was reported but was higher (58.7%) among participants who had only attained a basic level of education (Abdul-Razak et al., 2016). Another study from Malaysia discovered that those with primary and secondary levels of education had a higher prevalence of hypertension (33.77%, 95% CI: 27.40%–40.78% and 48.02%, 95% CI: 43.16%–52.92%, respectively) compared with those who had attained a tertiary education level (formal post-secondary education or college/university degree or diploma) (Zaki et al., 2021). Similar findings were reported in China, where higher levels of hypertension and lower educational attainment were related for participants who had a primary level of education or were illiterate (ORs of 1.22 and 1.43, respectively) compared with those who had completed college (Zhang et al., 2013). Other studies from China and Iran showed that the prevalence of hypertension decreased as education levels increased (Hügel et al., 2016; Mirzaei et al., 2021). A study from Lebanon also reported a lower prevalence of hypertension among educated women (Cherfan et al., 2018). Although education attainment is recognized as an independent predictor of hypertension (Do et al., 2015), findings from different countries are conflicting regarding the nature of the association between hypertension and level of education attainment. This highlights the need for further studies to establish the exact status of this relationship.

3.6.5 Non-Modifiable Risk Factors for Hypertension

Hypertension is also associated with non-modifiable risk factors such as age, family history, and gender. Individuals need to understand and work on the modifiable risk factors for hypertension prevention when they have any of the non-modifiable risk factors for hypertension. Age and family history of hypertension have been identified as important non-modifiable risk factors for hypertension (Abdulsalam et al., 2014; Awoke et al., 2012; Guwatudde et al., 2015; Wang et al., 2013). Studies conducted in Uganda, Guinea, Lebanon, and China showed that the prevalence of hypertension increased with an increase in age (Camara et al., 2016; Cherfan et al., 2018; Guwatudde et al., 2015; Huang et al., 2011a; Twinamasiko et al., 2018; Zhang et al., 2013). In India, Nigeria, and Tanzania, the prevalence of hypertension among participants aged 60 years and above was noted to increase sharply to over 50% (Abdulsalam et al., 2014; Balsari et al., 2017; Muhihi et al., 2020). As age is a non-modifiable risk factor, regular blood pressure measurements for older people are important at the community level (Awoke et al., 2012; Helelo et al., 2014; Muhihi et al., 2020) to reduce the complications associated with hypertension (Twinamasiko et al., 2018).

The prevalence of hypertension was found to be higher among men compared with women in China and Guinea, (Hien et al., 2018; Lin et al., 2012; Zhao et al., 2018), although a higher prevalence was found among women in studies conducted in Kenya and Botswana (Joshi et al., 2014; Keetile, Navaneetham, & Letamo, 2015). The conflicting results in these studies indicated there was a need to conduct a mixed methods study to explore reasons for these differences in the prevalence of hypertension between male and female participants.

A family history of hypertension is another non-modifiable risk factor associated with hypertension (Awoke et al., 2012; Lin et al., 2012; Zhao et al., 2018). This implies that individuals with a positive family history of hypertension need special attention to ensure they can prevent hypertension before they acquire it.

3.6.6 Modifiable Risk Factors for Hypertension

Modifiable risk factors contribute to the high prevalence of hypertension, and these include marital status, place of residence, stress, BMI, smoking, alcohol consumption, and dietary patterns. Marital status was reported to influence the prevalence of hypertension, as those that were widowed had the highest prevalence of hypertension (49.5% and 49.2% in Buikwe District in Uganda and in Guinea, respectively) and increase likelihood of acquiring hypertension (OR=3.3) (Sinha et al., 2023) compared with married and divorced people (Camara et al., 2016; Musinguzi & Nuwaha, 2013). However, in Ethiopia and Malaysia, the prevalence of hypertension was reported to be higher among married participants (Awoke et al., 2012; Zaki et al., 2021). Furthermore, in Lebanon and India, married men had the highest prevalence of hypertension (Cherfan et al., 2018; Kumar & Misra, 2021), whereas in Pizhou City in China, divorcees were more likely to develop hypertension compared with single or married people, and women who had children frequently had a higher risk for hypertension (Zheng et al., 2014)

Findings from several studies conducted in Malaysia, Nigeria, Ethiopia, Bangladesh, Guinea, Lebanon, and Vietnam reported that the prevalence of hypertension was higher among rural compared with urban residents (Abdul-Razak et al., 2016; Abdulsalam et al., 2014; Ali et al., 2022; Awoke et al., 2012; Camara et al., 2016; Cherfan et al., 2018; Do et al., 2015). An epidemiological study conducted in Western Uganda revealed that hypertension was a significant problem in rural Uganda (Kotwani et al., 2013). . In contrast, a study conducted in Buikwe District, Eastern Uganda, found no difference in the prevalence of hypertension between rural and urban residents (21.7% in both groups) (Musinguzi & Nuwaha, 2013). However, Guwatudde et al. (2015) conducted a country-wide study and reported that the prevalence of hypertension was highest (28.5%) in Central Uganda compared with other regions but found no significant difference between rural and urban residents. Based on evidence reported by (Kotwani et al., 2013), the fact that over 70% of the population in Uganda lives in rural communities and that awareness of hypertension remains low (Guwatudde et al., 2015), it is important to explore awareness and healthy lifestyle behaviours for the prevention of hypertension in rural communities in Central Uganda.

Another modifiable risk factor for hypertension is stress. In a Nigerian study (N=367), only five (6.0%) participants with considerable levels of stress were predisposed to hypertension, compared with 79 (94.0%) with negligible levels of stress; stress was an independent variable that contributed in a distinctive and significant way to the model in addition to sex, insufficient sleep, and obesity (Abdulsalam et al., 2014) . Family-related stress or anxiety issues, such as quarrelling with children/spouse or being unable to support the family because of unemployment, were found to be major contributors to the development of hypertension (Abdulsalam et al., 2014) . In addition, a mixed methods study conducted in South Africa with 451 participants (229 females, 222 males) for the quantitative survey and six focus groups for the qualitative arm reported that participants perceived high blood pressure to be typically caused by women (Jongen et al., 2019). That study reported the absence of communication, a woman's unwillingness to compromise, and disrespect were perceived to contribute to high blood pressure among men. Another study from Uganda associated stress because of a lack of employment, deteriorating health, traumatic events, and the need to embrace a culture that supported alcohol consumption among older people with the risk for hypertension (Kabwama et al., 2016).

3.6.7 Individual Healthy Lifestyle Behaviours that Influence the Prevalence of Hypertension

Various health lifestyle behaviours are associated with the prevalence of hypertension, including lack of physical activity or exercise, smoking, alcohol consumption, and certain nutritional patterns. These factors are all important for hypertension prevention at the community level.

3.6.7.1 Physical Activity

Ali et al. (2022) found that only 10% of participants in their study were accustomed to high or acceptable levels of physical exercise, whereas 42.6% were accustomed to low levels of exercise. Physical activity has been defined differently across cultural boundaries and in some studies set in different low- and middle-income countries. For example, in a study conducted in Bangladesh, physical exercise was rated as low for housework, medium for walking and swimming, and adequate/high for sports, heavy lifting, or jogging (Ali et al., 2022).

Performing an adequate amount of physical activity is important for reducing obesity, which in turn helps to prevent hypertension. Furthermore, along with age, educational attainment, and BMI, physical activity was independently linked to hypertension in both men and women in a study involving Vietnamese individuals (Do et al., 2015). This finding was attributed to the Vietnamese population adopting sedentary lifestyles because of the country's rapid industrialization, urbanization, and modernization (Do et al., 2015). In studies from China and Vietnam, self-reported physical activity was classified as low, moderate, and high based on the Global Physical Activity Questionnaire Analysis Guide using MET minutes/week (Cai et al., 2012; Do et al., 2015). This questionnaire was developed by the WHO in 2002 as a component of their STEPS approach for physical activity monitoring in chronic disease risk factor surveillance (WHO, 2019). The number of days/week and minutes/day spent in moderately intense sports activity, walking, moderately intense household activity, and moderately intense farming can be recorded and multiplied by MET values to determine the METs for these activities. The MET values for walking, moderate and vigorous household activity, moderate and vigorous farming, and moderate and vigorous sports activity in the study from China were 4.0, 8.0, 4.0, 3.5, 7.0, 3.0, and 8.0, respectively (Cai et al., 2012). In the Vietnamese study, ratings of low, moderate, and high were obtained if participants engaged in any combination of walking, moderate-intensity, or vigorous-intensity activities for at least 600 MET minutes/week, 600–3,000 MET minutes/week, and ≥3,000 MET minutes/week, respectively (Do et al., 2015). Similarly, a study from Iran categorized physical activity as low, moderate, and high using the International Physical Activity Questionnaire-Short Form, which uses self-reported physical activities to estimate MET/minutes and number of days/week spent performing physical activities (Mirzaei et al., 2021). Findings from that study revealed that 50% of adults had low physical activity and 75% were overweight or obese. Moreover, people with higher levels of education, more physical activity, and lower BMI had a lower prevalence of hypertension than their counterparts with low education, low physical activity, and high BMI ($p<0.0001$) (Mirzaei et al., 2021). Given that recall and social desirability biases may affect self-report data, it is recommended that further research uses subjective and objective methods to determine the kind, intensity, duration, setting, and location of physical activity (Hart, Ainsworth, & Tudor-Locke, 2011).

In Mbarara, South-Western Uganda, a study that assessed the prevalence of hypertension, awareness, and the relationship between a sedentary lifestyle and hypertension among adults revealed that the mean systolic blood pressure was statistically significantly higher in those who reported sedentary work compared with those who reported more active work (129.3 mmHg vs.

122.6 mmHg; p=0.0034) (Twinamasiko et al., 2018). However, commuting by foot or bicycle for at least 10 consecutive minutes did not yield a significant result. In that study, recreation or leisure was defined as activities that involved sitting, lying down, or standing without sustained physical exercise for longer than 10 minutes. Their multivariable analysis showed age, obesity, and sedentary work remained in the final model; significantly higher rates of hypertension were found in older people and those with sedentary work, but levels of significance reduced with obesity (Twinamasiko et al., 2018). Based on these findings, Twinamasiko et al. (2018) advocated for periodic blood pressure checks to establish hypertension status, inclusion of more fruits and vegetables in the diet, and an active lifestyle in both work and leisure to help prevent hypertension. These findings highlighted the need to conduct further studies to establish the prevalence of hypertension and activity levels among individuals as well as their dietary patterns.

Furthermore, a cross-sectional national survey conducted in Uganda evaluated adult physical activity levels across their work, travel, and leisure (Guwatudde et al., 2016). The median weekly duration and corresponding interquartile ranges (IQR) for each category were calculated to evaluate the duration of physical activity. The IQR refers to the second and third quartiles, or the centre half of a dataset and explains how far apart these parts of the dataset are from each other (Taylor, 2018). WHO (2010) recommended that individuals engage in at least 150 minutes of moderate-intensity physical activity each week, 75 minutes of vigorous-intensity physical activity, or an equivalent combination. Activities during work, travel, and leisure can be used to complete the recommended amount of activity. Guwatudde et al. (2016) showed that the majority of participants were involved in moderate-intensity work-related (49.6%) physical activities, followed by moderate-intensity travel-related physical activities (25.2%) and work-related vigorous-intensity physical activities (19.8%) (Guwatudde et al., 2016). The moderate-intensity work-related physical activity that individuals engaged in for the longest had a median weekly duration of 990 (IQR 150–1800) minutes. This was followed by travel-related physical activity, which had a median weekly duration of 240 (IQR 70–600) minutes (Guwatudde et al., 2016). However, meeting the WHO recommended amount of physical exercise each week had no significant relationship with participants' risk for developing hypertension. However, BMI and level of education were significantly related to meeting the WHO physical activity recommendations. Participants who were obese (BMI $\geq$30 kg/m^2) and those who had attained a university education level were less likely to meet the WHO physical activity recommendations than other participants (Guwatudde et al., 2016). This finding could be explained by educated people being less active because they are likely to be office-based, which may contribute to increased body weight in the absence of physical activity (Streeter, Roche, & Friedlander, 2021).

In a study from Kenya, Walekhwa and Kisa (2021) found that their participants (N=4352) reported an average duration physical activity of 6±4.2 hours per day. Furthermore, physical exercise of less than 30 minutes/day was associated with a systolic blood pressure 3.8 mmHg higher than that of participants with at least 60 minutes of physical activity per day (Walekhwa & Kisa, 2021). This implied that 60 minutes of physical activity could be ideal to reduce blood pressure and prevent hypertension.

In Malaysia, several facilitators and barriers have been associated with physical activity performance and the prevention of hypertension, with regular exercise required to achieve optimal outcomes in terms of reduced blood pressure (Tan et al., 2022b). Performing regular exercise was linked to motivators such as the desire to keep fit (76.6%), relieve stress (70.1%), have a good appearance (28%), and motivation by friends and family (8.4%). Enablers of blood pressure measurement were routine appointments or opportunistic screening during doctors' appointments in health facilities (68.4%) and free community screenings (27.8%). Conversely, barriers to performing physical activity included lack of time and lack of motivation (Tan et al., 2022b). It is therefore important that barriers and facilitators are identified and addressed in any interventions that aim to prevent hypertension. In addition, the assessment of these barriers and facilitators needs to be country specific.

3.6.7.2 Smoking

Hypertension prevention requires assessment of smoking as a risk factor for hypertension. Many studies in low- and middle-income countries have confirmed the association between smoking and hypertension. Abdul-Razak et al. (2016) found that the majority (75.6%) of participants in their Malaysian study had never smoked cigarettes, 12.9% were current smokers, and 11.5% were ex-smokers. The prevalence of hypertension was ranked highest among ex-smokers (58.3%) followed by current smokers (48.0%) (Abdul-Razak et al., 2016). However, findings from a study conducted in India showed that 50.7% of the participants were smokers in some form, and tobacco users had a higher prevalence of hypertension (39%) compared with non-users (28%) ($p=0.001$) (Balsari et al., 2017). Another study from Iran reported the prevalence of smoking was 33%, although being a current smoker was not associated with a higher prevalence of hypertension than other groups, but the control of hypertension was low among current smokers (Hien et al., 2018). However, in rural Indonesia, the likelihood of being hypertensive was found to be three times higher among smokers (p=0.01) than non-smokers (Mulia & Prajitno, 2020).

Furthermore, findings from studies conducted in China and Rwanda reported that smoking was a significant risk factor for hypertension (Cai et al., 2012; Cao et al., 2016; Lin et al., 2012; Ntaganda et al., 2022), and both low levels of educational attainment and smoking were associated with the risk for developing hypertension (Cao et al., 2016). Interestingly, a study from Uganda indicated that those that were current smokers had a reduced likelihood of being hypertensive (80% lower odds) compared with ex-smokers (Ntaganda et al., 2022). Based on the premise that smoking is a risk factor for hypertension, Tong, Low, Ismail, Trevena, and Willcock (2011) explored men's health-seeking behaviours and revealed that the barriers to seeking healthcare included busy schedules, the desire to be with fellow smokers, and a perception that they were not susceptible to illness. Yet, stopping to smoke was perceived to reduce blood pressure by 40.3 of the participants in a study carried in India (Rakesh et al., 2023). These findings warrant careful consideration and need further exploration to support the prevention of hypertension.

3.6.7.3 Alcohol

Several studies from low- and middle-income countries assessed the association between alcohol and hypertension, although these studies reported divergent results. Research conducted in Malaysia, India, Lebanon, China, Tanzania, Botswana, and Rwanda showed a significant relationship between the prevalence of hypertension and alcohol consumption (Abdul-Razak et al., 2016; Asgary, Galson, Shankar, O'Brien, & Arole, 2013; Cherfan et al., 2018; Guo et al., 2015; Keetile et al., 2015; Kumar & Misra, 2021; Muhihi et al., 2020; Ntaganda et al., 2022). A study from Botswana found that both men and women who drank alcohol had a slightly higher percentage of hypertension than those who did not drink alcohol (Keetile et al., 2015).

An epidemiological study from Uganda reported that the prevalence of hypertension was not statistically significant among alcohol users, but hypertension prevalence was higher (34.0%) among alcohol consumers compared with those that did not drink (24.1%) (Guwatudde et al., 2016). However, other research from Vietnam, Tanzania, and Uganda reported there was no association between alcohol consumption and the prevalence of hypertension (Guwatudde et al., 2015; Hien et al., 2018; Muhihi et al., 2020). Given the divergent findings regarding the association between hypertension and alcohol consumption in low-and-middle-income countries, it is important to further assess this association to better inform efforts to prevent hypertension.

3.6.7.4 Nutritional patterns and their association with the prevention of hypertension

The nutritional patterns of individuals are pertinent in the prevention of hypertension. These patterns include the use of cooking oil, salt consumption, fruits, and vegetable consumption, and having a balanced diet, as discussed in the subsequent paragraphs.

Nutritional pattern or diet is a modifiable risk factor for hypertension. Any individual can change their diet to prevent hypertension if they know what to do. A study from Nepal explored the facilitators of healthy eating in a work environment using in-depth interviews and focus group discussions with 33 participants (four focus group discussions and nine in-depth interviews with support staff, supervisors, and health professionals who worked 8-hour day or night shifts and those who were on call during regular business hours) (Tamrakar et al., 2020). Participants in that study described healthy eating as eating a balanced diet, which comprised meals that contained a combination of carbohydrates, proteins, fats, minerals, and vitamins and eaten in proportions that reflected the individual's level of physical activity (Tamrakar et al., 2020). Furthermore, most participants agreed that eating stale (Basi) and unsanitary food qualified as unhealthy eating (Tamrakar et al., 2020). Although the participants were able to mention what a healthy diet entailed, they reported some barriers that prevented them from adopting a healthy diet at their workplace, such as the lack of food options and higher prices for healthy food. However, participants indicated they were willing to pay for healthy food when they could afford the cost (Tamrakar et al., 2020).

3.6.7.5 High-fat diet and its association with hypertension prevention

Obesity that arises from unhealthy eating habits, such as excessive amount of fatty and starchy foods, red meat, oil, and fried or high-sugar foods is believed to cause hypertension (Okop, Mukumbang, Mathole, Levitt, & Puoane, 2016). In a mixed methods study conducted in Nigeria, the findings from a focus group discussion showed that some participants believed hypertension could be prevented by avoiding consuming a lot of fat in their diet (Gebrihet et al., 2017). However, the survey results showed that most participants (n=442, 84.8%) claimed to consume oil and saturated fat in their diet. In addition, they omitted to mention a suggested dietary regimen or what foods to eat and what to avoid (Gebrihet et al., 2017), which suggested that their knowledge of healthy eating practices was limited. Furthermore, the results showed the need for programs emphasizing how to achieve a balanced diet and lifestyle that works within a modest income, and recommended public campaigns to educate people on the advantages of reducing the quantity of salt and fast food and encouraging consumption of fresh produce, vegetable oils (e.g., sunflower oil), and other healthy food options (Gebrihet et al., 2017).

Tamrakar et al. (2020) conducted a study in Nepal and found that most participants believed that fatty and "fast foods," such as packaged quick noodles, chips, and soft drinks, were unhealthy for them. The avoidance of fatty and fast foods is known to contribute to the prevention of hypertension, but knowledge and behaviours are often counter to this. Although these studies reported findings regarding the use of fast foods and cooking oil or fat, there were limited studies that reported similar findings in Uganda.

3.6.7.6 Salt consumption and its association with hypertension prevention

Previous research has shown that salt intake is a significant predictor of hypertension. In one study, the risk for developing hypertension was more than twice as high for participants who admitted using raw table salt in their diet compared with those that did not (adjusted OR [aOR]=2.27, 95% CI: 1.73–2.99, p=0.001) (Muhihi et al., 2020). Findings from a community-based survey in Ethiopia also showed that participants who added salt to their food had a higher likelihood of being hypertensive (aOR=6.55, 95% CI; 2.31–18.53) compared with those who did not add salt (Helelo et al., 2014). Furthermore, the risk for developing hypertension increased with greater amounts of salt consumed daily (Huang et al., 2011a). This is further supported by a baseline cluster randomized controlled trial which reported that 80.3% of the participants said that salt reduction in the diet reduces blood pressure (Rakesh et al., 2023). However, the frequency of adding salt at mealtimes did not appear to be associated with hypertension in Uganda (Guwatudde et al., 2015).

3.6.7.7 Vegetable and fruit consumption and the association with hypertension prevention

Vegetables and fruits have previously been studied regarding their relationship with hypertension, although the findings from different studies showed conflicting results. An epidemiological study from Nigeria showed that most respondents (82.1%) claimed to consume fruits, but only 17.1% consumed fruits ≥2 days per week, whereas good fruit intake is defined as consuming fruits on at least 3 days/week (Gebrihet et al., 2017). In the same study, approximately 96% of respondents reported that they ate vegetables, although only 26.5% ate vegetables at least three times/week (Gebrihet et al., 2017). In addition, respondents who did not eat fruit had a higher likelihood of having hypertension than those who ate fruit (aOR=4.31, 95% CI: 1.74–10.66) (Gebrihet et al., 2017). This was further supported by a study from Ethiopia that found that adults who excluded vegetables from their weekly diets for more than 3 days/week were around two times more likely to be hypertensive (aOR=2.30, 95% CI: 1.17–4.51) than those who regularly ate vegetables (Helelo et al., 2014). Based on these findings, it can be concluded that consuming vegetables is helpful in the prevention of hypertension.

Furthermore, a study from Malaysia noted that fruit and vegetable intake was low (Tan et al., 2022a). Therefore, a comprehensive public health intervention framework was recommended to increase awareness, change attitudes, and improve adults' behaviours regarding eating sufficient fruits and vegetables each day to help prevent CVD (Tan et al., 2022a). Similarly, a study conducted in Uganda advocated for the inclusion of fruits and vegetables in the diet, although the consumption of fruits and vegetables did not show a significant association with hypertension (Twinamasiko et al., 2018).

An impact evaluation of a community intervention study conducted in Kenya reported significantly low fruit and vegetable intake in both the case and control groups (van de Vijver et al., 2016). Self-care behaviours related to diet, such as eating more than five servings of fruits and vegetables each day, were found to have comparable motivators, including disease prevention (range 60%–68.8%), the desire to lose weight (range 40%–47.3%), and personal preference (range 1.8%–8.6%) (Tan et al., 2022b). However, the high prices of fresh fruits and vegetables and healthy food may be a barrier to a healthy diet for low and middle-income families (Tamrakar et al., 2020). In a study by Cherfan et al. (2018), hypertensive people consumed less harmful foods including "fast food," fried food, meat, and sweets than non-hypertensive people. Furthermore, hypertensive individuals had higher mean scores of adherences to Lebanese mediterranean diet compared with non-hypertensive individuals (13.4±2.6 vs. 12.1±2.7, p=0.001), which indicated that those with hypertension more closely adhered to the Lebanese mediterranean diet. The evidence presented in these studies suggests it is important to explore the association between vegetables/fruits consumption and hypertension in Uganda, especially as few studies have documented this in relation to the prevention of hypertension in this setting.

Using a qualitative approach, a study from Uganda revealed that many participants preferred using traditional over Western remedies in treating hypertension (Busulwa, 2022). It was also noted that because herbs were less expensive and more widely accessible than contemporary treatments, many participants preferred local medications. Members of the community commonly purchased or prepared *Vernonia amygdalina* (*mululuza*), *Newtonia buchananii* (*empewere*), *Kigelia africana* (*omusa*), *Prunus Africana* (*entaseesa), Tithonia diversifolia* (*ekimyula*), *S. anguivi* (*katunkuma*), *Tamarindus indica* (*omukooge*), and *Punica granatum* (*enkomamawanga*), among other local/traditional medications and herbs (Busulwa, 2022). However, the use of these herbs in the prevention of hypertension was not reported.

3.6.7.8 BMI and its association with hypertension prevention

BMI is categorized as underweight, normal, overweight, or obese, each of which has an expected range. Individuals are classified as underweight at a BMI of 15–19.9 kg/m^2, normal at a BMI of 20–24.9 kg/m^2, overweight at a BMI of 25–29.9 kg/m^2, and obese at a BMI of 30–35 kg/m^2 (Weir & Jan, 2019). Obesity is a modifiable risk factor for hypertension and has been linked to diet, lifestyle, and lack of exercise (Okop et al., 2016). During focus group discussions in a study that was conducted in South Africa, participants held the view that poor eating habits, such as consuming excessive amounts of fatty and starchy foods, red meat, oil, and fried or junk food, could lead to obesity (Okop et al., 2016). Some participants also believed that stress, a lack of exercise, socioeconomic status, and limited access to fresh produce were major causes of obesity (Okop et al., 2016).

Investigations of the relationship between hypertension and BMI demonstrated that the prevalence of hypertension gradually increased as BMI values increased (Helelo et al., 2014; Muhihi et al., 2020; Zhang et al., 2013). This has been further strengthened by several studies conducted in low-and-middle-income countries, which showed that being obese (30–35 kg/m^2) had a significant association with a high prevalence of hypertension (range 15.7%–49.4%) (Ali et al., 2022; Awoke et al., 2012; Cherfan et al., 2018; Gebrihet et al., 2017; Helelo et al., 2014; Joshi et al., 2014; Kotwani et al., 2013; Mohamed et al., 2018; Muhihi et al., 2020; Zaki et al., 2021). In other studies, BMI was reported to be an independent risk factor for hypertension (Do et al., 2015; Zhang et al., 2013; Zhao et al., 2018), with the prevalence of hypertension increasing with increasing BMI and waist circumference (Ali et al., 2022; Lin et al., 2012; Wang, Zhang, Wang, Liu, & Wang, 2014). Based on this evidence, overweight and obesity are risk factors for hypertension. It is important to note that this is a modifiable risk factor that can help in the prevention of hypertension.

3.6.8 Methodologies used in studies included in the scoping review

The studies included in this scoping review used different research methodologies. However, the majority (79% [n = 56 articles]) were quantitative cross-sectional studies, which included population-based studies and surveys. Only one of the 71 (2% n= 3 articles) studies were cluster randomized controlled trial and 3% used mixed methods, as shown in Chart 1.

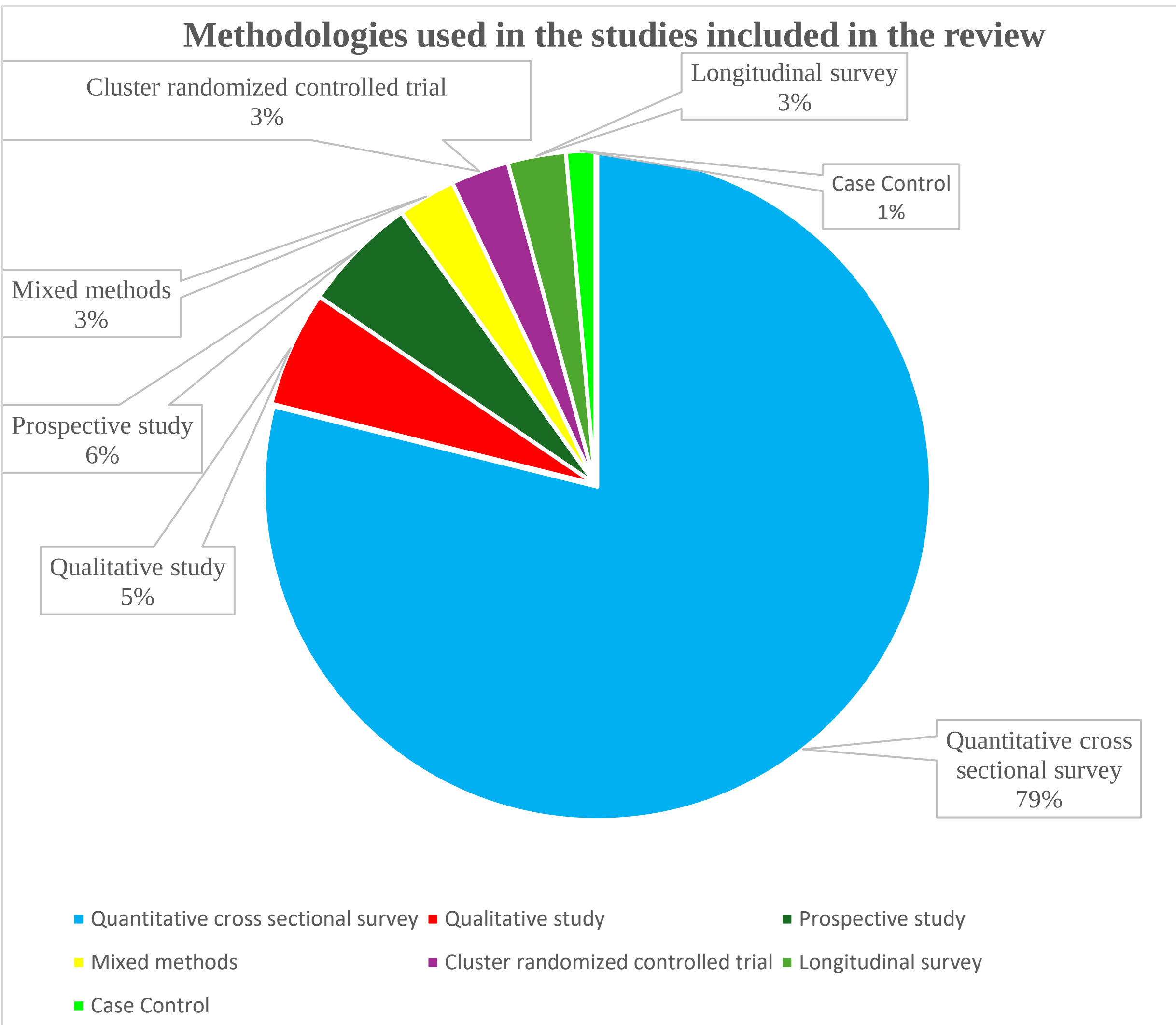


Chart 1: Methodologies Used in Studies Included in the Scoping Review

3.6.9 Distribution of Studies by Study Country

Overall, the studies included in the scoping review were conducted in 17 different low- and middle-income countries, as shown in Chart 2. The majority (23% [15/71] of the studies included in the scoping review were conducted in China and 11% (7/71) were conducted in Uganda, of which six were quantitative surveys and one was a qualitative study. None of these studies explored healthy lifestyle behaviours using mixed methods. Based on this gap in the literature, the present researcher saw a need to explore healthy lifestyle behaviours for the prevention of hypertension in Uganda using a mixed methods approach.

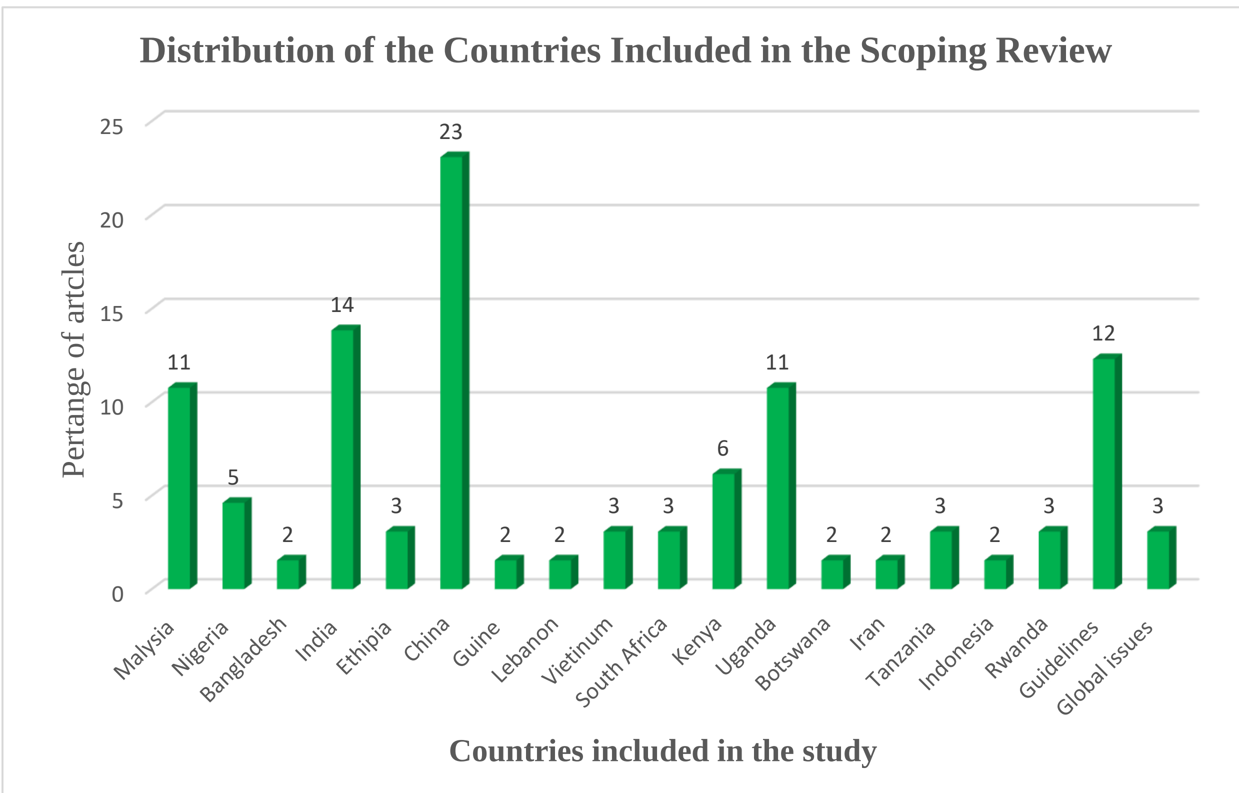


Chart 2: Distribution of the Countries Included in the Scoping Review

3.7 Chapter Summary

This scoping review aimed to identify healthy lifestyle behaviours for the prevention of hypertension in low- and middle-income countries. The research questions were developed using the PCC framework that covers the population, concept, and context. Data were retrieved from five databases (PubMed, CINAHL, Medline EbscoHost, SciELO Citation Index, and Open Grey) using specific search terms. The included studies were published between 2010 and 2023. Overall, 71 articles were included in the review. The findings were presented using a PRISMA-ScR flow diagram for scoping reviews (see Figure 2).

Awareness of hypertension was reported as generally low in most studies, despite it being a critical component of the prevention of hypertension. Of the countries covered by studies included in the scoping review, Uganda registered the lowest rates of awareness of hypertension. Furthermore, particularly low levels of awareness were reported among young people, which highlighted the need to conduct a study that included all adults aged 18 years and over, as they are all susceptible to hypertension. It is necessary to explore the status of awareness of hypertension in the general adult population in Uganda, as the findings can inform practice regarding improving public awareness to support hypertension prevention.

The prevalence of hypertension was also high among rural dwellers, but no study had explored the possible explanations for this finding. Is it therefore imperative to conduct a mixed methods study that will provide possible explanations. The prevalence of hypertension in low- and middle-income countries is generally high, but concerningly, the awareness of hypertension is low. Importantly, many of the established risk factors for hypertension are modifiable, although some are not modifiable, such as age, gender, family history of hypertension, and comorbid conditions implicated in hypertension (e.g., diabetes and coronary heart disease). Modifiable risk factors for hypertension include physical activity, smoking, alcohol consumption, nutritional patterns (e.g., salt, vegetable/fruit, and meat consumption), and BMI.

Public knowledge about the causes of hypertension and its prevention is essential, but few studies have been conducted in this area. In addition, although many studies assessed levels of awareness and the prevalence of hypertension in the general public, few explored possible explanations as to why hypertension prevalence has remained high. In Uganda, the prevalence of hypertension is highest in Central Uganda, with rural communities having the lowest levels of awareness about hypertension along with a high prevalence. However, few studies sought to explain the geographical differences in hypertension prevalence. In addition, few studies assessed participants' knowledge regarding the prevention of hypertension, despite most of the risk factors for hypertension being preventable. To address this knowledge gap, this study aimed to explore the knowledge and awareness of hypertension, the prevalence of hypertension, and healthy lifestyle behaviours for the prevention of hypertension in rural communities in Uganda.

Based on the findings of this scoping review, this PhD study was developed to explore awareness and healthy lifestyle behaviour interventions for the prevention of hypertension in rural communities in Central Uganda. The identified gaps in the literature, as discussed above, were further explored in a local context and explanations sought through qualitative findings. The next chapter explains the methods and philosophical underpinnings that guided this study to acquire relevant data to answer the research questions.

4 Chapter Four: Methods

This chapter presents the research paradigm or philosophical worldview that guided this research and discusses the methods that were used to conduct this study. This includes an explanation of the research paradigm and how it is related to the sequential explanatory mixed methods design adopted for this study (Creswell, 2013). In addition, a detailed description of the methods used for data collection and data analysis is presented, along with a discussion of the ethical considerations.

This study aimed to explore awareness and individual healthy lifestyle behaviours for the prevention of hypertension in two rural communities (Mende and Kasengejje) in Uganda. Effectively answering the research questions required both quantitative and qualitative approaches, as outlined below.

4.1 Research Questions

1. What is the level of knowledge about preventing hypertension among individuals living in the Mende and Kasengejje communities?

2. What individual healthy lifestyle behaviours influence the prevalence of hypertension in these two rural communities in Uganda?

3. What is the prevalence of hypertension in these two rural communities in Uganda?

4. What are individuals' experiences of preventing hypertension in these two rural communities in Uganda?

4.2 Research Paradigm or Philosophical Worldview

This section presents the paradigm or philosophical worldview that underpinned the methodology used in this research and provides a detailed explanation of how it was applied to this study. Different research paradigms are described to demonstrate how the most appropriate paradigm was selected for this study. In addition, the chosen (pragmatic) paradigm is explained to show how it links to the constructs set out in the Health Belief Model (Rosenstock, 2000) that was used to discuss some of the findings from this study.

4.2.1 Research Paradigm and Philosophical World View Used in this Study

A research paradigm is a framework or set of beliefs about science and scientific knowledge that is used to explain a phenomenon (Kuhn, 1970). The research paradigm also guides the researcher's worldview or way of thinking (Mackenzie & Knipe, 2006), which ultimately influences the way they interpret their research data (Kuhn, 1970). Similarly, the way a researcher views the world determines the methodological approaches that they choose to use in their research (Mackenzie & Knipe, 2006). Previous researchers asserted that a paradigm is a belief about the knowledge to be studied, the methodology to be used, and the criteria established for confirming validity (Mac Naughton, Rolfe, & Siraj-Blatchford, 2010). Crotty (1998) also related the research paradigm to the theoretical perspectives that form the philosophical underpinnings that inform the research methodology. Paradigms are therefore important because they guide the researcher about what is to be studied, how it should be studied, and how the findings should be interpreted. Different paradigms have been developed to explain different methodological approaches to research. Given the importance of the research paradigm, various paradigms were considered before selecting the most appropriate paradigm for the present study.

Paradigms can be differentiated by the three dimensions to which they apply: ontology (reality), epistemology (knowledge), and methodology (how research is conducted) (Hanson, Creswell, Clark, Petska, & Creswell, 2005). In addition, axiology is another philosophy that focuses on the values and ethical considerations of what is right and wrong, or how things should be performed (Morgan, 2007). Details of the ethical considerations for this study are discussed later in this chapter.

4.2.1.1 Pragmatic Paradigm

The worldview reinforced by the pragmatic paradigm includes actions, situations, and consequences, and no antecedent conditions are applied (Creswell & Clark, 2017). The pragmatic paradigm is important in answering "what" and "how" research questions, and is commonly used in studies that adopt a mixed methods design (Creswell, Fetters, & Ivankova, 2004). A consideration of the aims of other paradigms (i.e., positivist, post-positivist, and interpretivist paradigms) showed that none of these paradigms explained a mixed methods approach, as was employed in this study. Therefore, the pragmatic paradigm was considered suitable to provide an explanation that could address the questions that this study sought to answer.

An important aspect of the pragmatic philosophy is that the researcher focuses on the research problem and question(s). In addition, the researcher uses all available methods to find solutions to address the research question and aims (Tashakkori, Johnson, & Teddlie, 2020; Tashakkori & Teddlie, 2009). Rather than paying attention to the philosophical assumptions of the research methods to be used, pragmatists adopt a flexible approach to the research methods to be applied, and therefore consider the research method that is important in answering a specific research question (Onwuegbuzie & Johnson, 2006). The pragmatic worldview is consistent with a mixed methods approach where the focus is first placed on the research problem and then a pluralistic approach is used to develop knowledge about the problem (Creswell & Creswell, 2018).

4.2.1.2 Positivist paradigm

Positivists believe that only a single objective reality exists (Creswell & Creswell, 2005; Hudson & Ozanne, 1988). A positivist research approach begins with clear objectives, hypotheses, and methodology (Carson, Gilmore, Perry, & Gronhaug, 2001; Creswell & Creswell, 2005). It is also important to note that in the positivist paradigm, no social fact can have scientific meaning without being connected with other social facts (Crotty, 1998; Park, Konge, & Artino, 2020), as it aims to demonstrate causal associations between the dependent and independent variables. For example, the risk for hypertension (dependent variable) is associated with physical activity (independent variable). In addition, positivists adopt a neutral position to reduce any bias that could be created by their feelings, and data analysis is undertaken to identify a single objective reality using statistical tests (Creswell & Creswell, 2005; Park et al., 2020). Positivists commonly use a quantitative research approach in which causes and effects can be established by testing a theory to predict outcomes (Ngulube, 2019; O'leary, 2004; Ponterotto, 2005).

The present study sought to answer both quantitative and qualitative research questions that required both objective and subjective information to be collected from participants. Conducting this research using a positivist paradigm could appropriately answer the quantitative research questions but would leave the qualitative questions unanswered. Given that a single objective reality exists within the positivist paradigm, this was not considered an appropriate paradigm to guide the researcher's thinking and research methods in the present study.

4.2.1.3 Post-positivism

The post-positivist paradigm suggests reality can only be "imperfectly and probabilistically" comprehended (Lincoln & Guba, 1985). In addition, the post-positivist paradigm was developed following criticism of positivism for the use of scientific and empirical research methods to study humans (Mack, 2010). Objectivist epistemology and critical realism ontology are two concepts that are associated with the post-positivist worldview (Annells, 1997). A critical realist ontology suggests that rigorousness, accuracy, logical reasoning, and attention to evidence are necessary, just as they are in positivism; however, unlike positivism, this is not limited to what can be physically witnessed (Crossan, 2003). In addition, Popper (2005) asserted that linking a cause to the effect cannot be obtained by the construction of meaning. Instead, that study argued that scientific approaches may be strengthened to produce objective social science research and emphasized that there is no absolute truth. Furthermore, scientific theories may not be concretized as “true,” but can be made up to be close to the absolute truth (Popper, 2005). This was supported by another study (Crotty, 1998) that stipulated that a certain level of objectivity can be obtained as opposed to absolute objectivity. Post-positivist thinking affirms the importance of politics, morals, and passion in research, and this approach allows the researcher to take a holistic view of the research problem (Ryan, 2006). In addition, post-positivism offers a useful strategy for gathering data by combining various research techniques and maintains the premise that there is no absolute truth (Henderson, 2011). Importantly, post-positivism embraces the truths obtained from individuals’ experiences by using phenomenological, grounded theory and other interpretive methodologies (Clark, 1998). Post-postivist paradigm was not appropriate to guide the current study because none of these qualitative study designs were applied based on the aim of the study.

4.2.1.4 Interpretivist paradigm

The interpretivist paradigm assumes that there are multiple realities of knowing that are relative or subjective (Tuli, 2010), which implies that knowledge is acquired socially or subjectively. Interpretivism uses flexible frameworks to obtain knowledge and information from people (Carson et al., 2001). Interpretivists believe there is a mutual interaction between the researcher and the research participants. The researcher enters the field of study with limited knowledge and an open mind ready to acquire knowledge from participants (Crotty, 1998). Interpretivism aims to appreciate and deduce meanings rather than generalizing and predicting cause and effect relationships for a phenomenon (Hudson & Ozanne, 1988). Interpretivism focuses on exploring meanings, motives, reasons, and experiences that people may have about a certain phenomenon (Bernard, 2013; Hudson & Ozanne, 1988). In addition, interpretivism uses qualitative approaches to obtain multiple realities regarding the phenomenon under investigation (Edirisingha, 2012; Ngulube, 2019).

In this study, the interpretivist paradigm could have been used to guide the researcher in exploring participants’ experiences regarding the prevention of hypertension. This involved using focus group discussions to help the researcher gain an understanding of participants' practices to prevent hypertension (Subudhi & Mishra, 2019). However, interpretivism could not provide answers to the quantitative research questions, which required objectivity. Therefore, this was not considered suitable as a standalone paradigm to guide this study. The advantages and disadvantages of the various research paradigms are discussed in Table 3.

Table 3: Advantages and disadvantages of the positivist, postpositivist, interpretivist, and pragmatic paradigms

Advantages	**Disadvantages**
Positivist paradigm	
Methods and techniques for gathering and analysing data based on facts and statistics may permit "replication for different groups or subsets of the population in social situations" (Johnson & Onwuegbuzie, 2004). Allows for verification efforts to find a single, unchanging truth (Lincoln & Guba, 1985).	It is not possible to study phenomena connected to the intentions, attitudes, and thoughts of humans when employing this paradigm because these ideas may not be openly witnessed or quantified with sensory experiences or without evidence (Hammersley, 2012). There is a risk that positivism may ignore people whose comprehension and interpretation of any events, occurrences, or concerns can disclose a lot of truth about reality because its goal is to generalize the results of the study (Pham, 2018).
Postpositivist paradigm	
The paradigm emphasizes the use of both quantitative and qualitative methods (Creswell, 2013). In this paradigm, the weight is placed on quantitative research and is strengthened by qualitative research.	Instead of being governed by general principles, knowledge claims are possibilities concerning human phenomena (Letourneau & Allen, 1999).
Interpretivism paradigm	
Researchers who employ interpretivism can describe things, people, or events as well as fully comprehend them in their social contexts (Pham, 2018). Researchers can elicit an interviewee's opinions by probing their beliefs, values, prejudices, perceptions, attitudes, sentiments, and viewpoints using the crucial interviewing approach known as an interactive interview (Wellington & Szczerbinski, 2007). As a result, the useful information gathered will give researchers good insights for eventual action (Pham, 2018).	Interpretivists aim for a deeper understanding and knowledge of the studied phenomenon inside its complex context rather than extrapolating the results to other people and situations (Cohen, Manion, & Morrison, 2017). The impact of politics and ideology on knowledge and social reality are not considered by interpretivism. This paradigm prioritizes comprehending current events over concerns about society and personal empowerment (Mack, 2010).
Pragmatic paradigm	
Recommended for mixed methods research (Creswell, 2013).	The research may take longer to plan and conduct than that using other paradigms. There could be difficult-to-interpret differences between different sorts of data.

Because of the pluralistic approach, the pragmatic paradigm is considered most appropriate for mixed methods research studies (Tashakkori & Teddlie, 2009). Quantitative research obtains data objectively and deductively, whereas qualitative research does so subjectively and inductively (Teddlie & Tashakkori, 2011). The difference between objectivity and subjectivity is that objectivity leads to empirically verifiable knowledge whereas subjectivity leads to invariable knowledge (Crotty, 1998). However, mixed methods research adopts both objective (no researcher interaction with participants) and subjective (researcher interacts with participants) approaches when collecting data (Biesta, 2010).

4.2.2 Mixed methods and the pragmatic paradigm

Based on the above discussion, this study used a mixed methods deign and followed the principles of the pragmatic paradigm (Creswell & Tashakkori, 2007). Importantly mixed methods can overcome the weaknesses of either quantitative or qualitative approaches, which is a strength of this research design (Creswell & Creswell, 2005; Creswell & Tashakkori, 2007; Goldkuhl, 2012; Hanson et al., 2005). In addition, mixed-methods research enables researchers to understand the entire research problem from meanings obtained via observation or interviews to the prevalence of attributes revealed through surveys, and broadens and deepens the study by allowing the researcher to understand the entire phenomenon (Wasti, Simkhada, van Teijlingen, Sathian, & Banerjee, 2022). Controversial philosophical ideas such as truth and reality are not addressed by the pragmatic research paradigm. Instead, pragmatism acknowledges that there may be a single reality or several realities that are amenable to scientific investigation (Creswell & Clark, 2017), which fit well with a sequential explanatory mixed-methods approach (Creswell, 2013) to explore awareness and individual healthy lifestyle behaviours for the prevention of hypertension.

Ontology is concerned with what is known and the reality of the problem (Hanson et al., 2005). In addition, ontology provides the structure that reflects one's understanding of a certain fact (Creswell & Creswell, 2005). The ontology that relates to pragmatism is pluralism (Ngulube, 2019), as multiple realities exist about a studied phenomenon. This implies that research is not limited to any questions and therefore the researcher can use quantitative or qualitative approaches, or both (Ngulube, 2019). The pluralism ontology was chosen for this study, as there are many risk factors that have been reported as predisposing individuals to hypertension, including smoking, alcohol consumption, poor diet, lack of physical activity, and exposure to stressful events (Defo et al., 2017).

Epistemology refers to how people get to know what exists about a phenomenon (Ngulube, 2019). In this study, there were many epistemological underpinnings about the prevention of hypertension, which included modifiable risk factors, as discussed previously (Zheng et al., 2014). For the purpose of this study, it was considered difficult to explore all these risk factors using a single method to establish the truth. Therefore, applying the pragmatic paradigm was most suitable to find answers to the study questions using a sequential explanatory mixed methods design (Creswell, 2013).

4.2.3 Linking the Theoretical Model and Research Paradigm

As the research paradigm reflects the researcher's thinking or worldview in terms of what is to be studied, how it will be studied, and how the data will be interpreted, it is important to link the paradigm to the underlying theoretical framework. The constructs of the Health Belief Model (Figure 1) (Rosenstock, 1974) suggest that multiple beliefs and perceptions about reality exist concerning the susceptibility, seriousness, benefits, barriers, cues to actions, and self-efficacy to influence behaviour change (Boskey, 2016; Morris et al., 2012; Munro et al., 2007; Rosenstock, 1974; Zare et al., 2016). Similarly, people have different ideas and thoughts about hypertension, which relates to the constructs of the Health Belief Model (Rosenstock, 1990). Akinlua, Meakin, Bashir, and Freemantle (2018) explored beliefs about hypertension among primary healthcare workers and their clients in Nigeria and found that participants had different beliefs about knowledge of hypertension, its cause, and preventive measures. Consistent with the Health Belief Model (Rosenstock, 1974), the pluralist ontology in pragmatism asserts that multiple realities exist (Hanson et al., 2005), which can offer a basis for exploring people's knowledge, healthy lifestyle behaviours and possible explanations of how common hypertension is in their communities.

To explore various realities about people's knowledge, healthy lifestyle behaviours, and the prevalence of hypertension based on the constructs of the Health Belief Model, the present researcher considered it necessary to collect both subjective (qualitative) and objective (quantitative) information from participants. This refers to both subjective and objective epistemology, which calls for a mixed-method approach (Biesta, 2010). Therefore, this research used a sequential explanatory mixed methods design guided by the pragmatist paradigm to answer the research questions.

4.3 Mixed Methods Methodology

There are three major types of mixed methods approaches: concurrent, sequential, and convergent (Tashakkori et al., 2020). Combining the two approaches is based on the idea that there will be more benefit since both types of study designs have merit and are complimentary in some ways. In order to address the same study topic with more assurance and broader implications in the conclusion, the researchers employed both data sets (Morgan, 2013). This study used a sequential explanatory mixed methods design where quantitative data were collected and analysed first, followed by qualitative data collection and analysis (Creswell, 2013; Creswell & Clark, 2017). The quantitative data were used to answer the first three research questions whereas the qualitative data provided an in-depth understanding related to the fourth research question (Creswell, Plano Clark, Gutmann, & Hanson, 2003; Sandelowski, 2000; Tashakkori & Teddlie, 1998). This approach was supported by Creswell and Creswell (2017), who asserted that in a sequential explanatory study, qualitative findings provide explanations for significant findings obtained from the quantitative data analysis, or the quantitative study informs the data collection tool used for the qualitative study. This implies that significant findings regarding prevalence, awareness, and knowledge about hypertension were further explain by the qualitative study to understand why the statistics are either high or low and the possible solutions to the reduction of the high prevalence or increase of the low awareness. However, detailed explanations to specific significant findings may not be achieved by using the concurrent mixed methods design whose intension is to provide insight to all of the quantitative and qualitative questions at the same time with the aim of establishing convergence or similarities (Tashakkori & Creswell, 2007).

Therefore, in this study, qualitatively exploring individuals' experiences of hypertension prevention in rural communities provided an in-depth explanation of the key findings obtained from the quantitative phase of the study. This was consistent with Creswell and Clark (2017), who noted that qualitative data can supplement the quantitative findings. Thereafter, recommendations could be made to inform future interventions for the prevention of hypertension at the community level. However, using a sequential explanatory design has some limitations, such as difficulty in determining the weight or priority to be given to either the quantitative or qualitative data and analysis, and the stage in the process of data collection and analysis at which the two should be mixed or integrated (Creswell et al., 2003; Morgan, 1998).

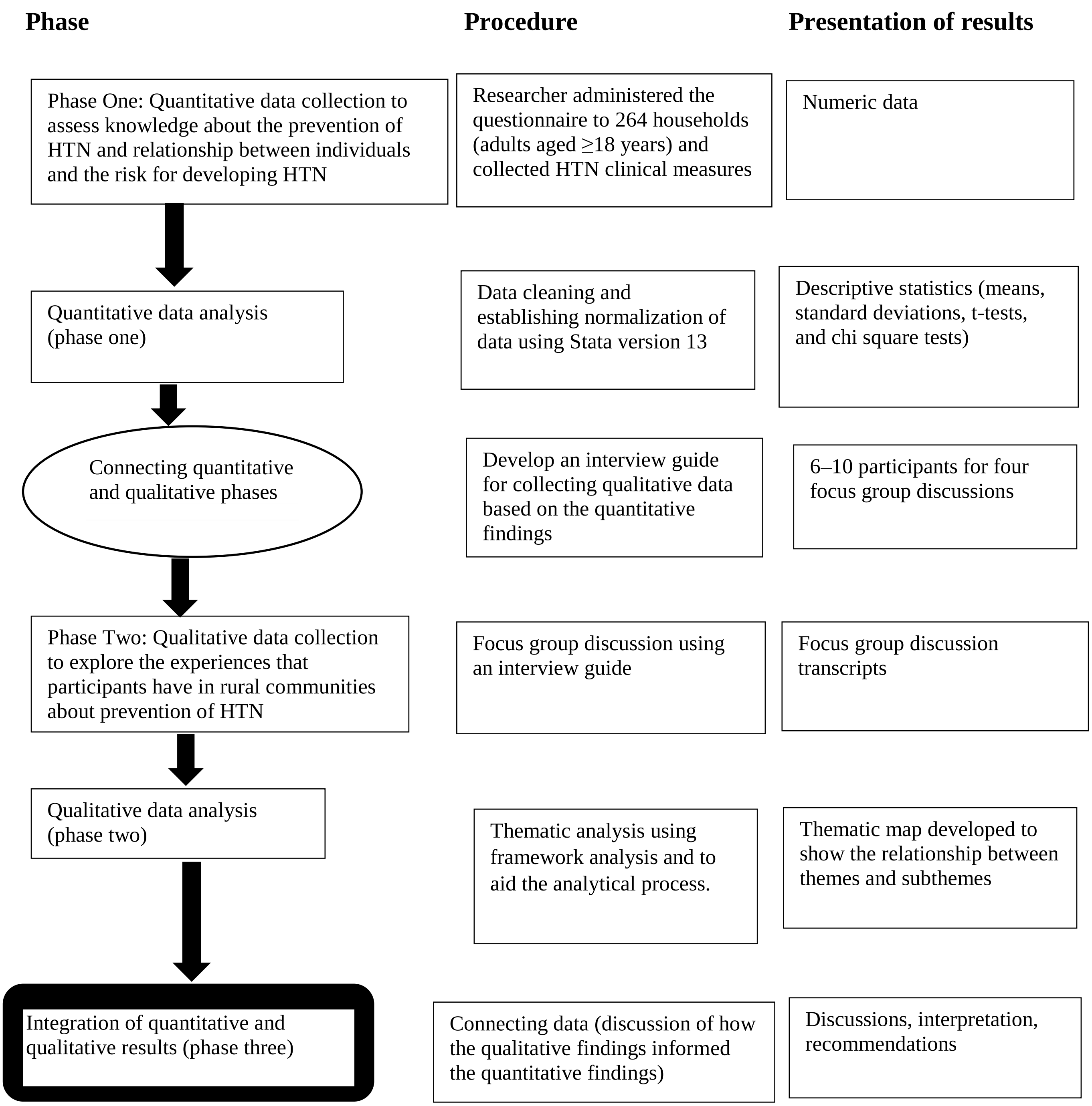
The population and scope of the study can determine where the weight or priority should be placed (Morgan, 1998). Weighting refers to the priority the research attaches to either quantitative or qualitative data to be able to identify which to start with when collecting data. However, it does not mean that the less prominent approach is not important for a study's goals; rather, it means that it is not the study's main dataset and will not play a prominent role in reporting the study findings (Guest & Fleming, 2015). Most sequential explanatory mixed methods research designs give priority to the quantitative method as these data are collected and analysed first to identify concepts that need further explanations, and also represent most parts of the study (Ivankova, Creswell, & Stick, 2006). For this study, priority was placed on the quantitative data collection with the quantitative findings used to develop the qualitative data collection tool through a focus group schedule or interview guide. The results from the quantitative and qualitative aspects of the study were integrated after the qualitative data were analysed using the narrative contiguous approach (Fetters, Curry, & Creswell, 2013).

The scope of this study was the prevention of hypertension in selected rural communities in Central Uganda, with the participants being adults aged 18 years and over. Quantitative research is deductive and quantitative methods are used to enable the researcher to obtain comprehensive and generalizable study findings. Therefore, this study was conducted in two phases. Specifically, quantitative data collection and analysis were completed in the first phase. The findings from the quantitative study informed the development of the semi-structured interview guide that was used during the focus group discussions to explore participants' experiences with hypertension prevention. However, the data analysis was performed in three phases to create an in-depth understanding of the phenomenon under investigation: 1) analysis of quantitative data, 2) qualitative data analysis, and 3) integration of the quantitative and qualitative findings.

Figure 3 shows the visual model for the sequential mixed methods design used in this study. It displays the phases involved in the study, the procedures used, and the presentation of the results.

Figure 3: Visual Model for Mixed Methods Sequential Explanatory Design Procedure for Exploring Awareness and Lifestyle Behaviours in the Prevention of Hypertension (HTN)

(Ivankova et al., 2006)



4.3.1 Sampling for Mixed Methods Research

In mixed methods research, both qualitative and quantitative research techniques are used, which implies the application of probability and purposeful sampling. It is therefore important to acknowledge the difference in these approaches to ensure transparency. Moreover, researchers should show how the sample time orientation and sample relationship were used to determine the sample. Time orientation refers to the sequential and concurrent sampling of the study population, whereas the sample relationship is the association between the quantitative and qualitative samples. Mixed methods sampling techniques include identical, parallel, nested, and multilevel or multistage sampling (Ngulube, 2020). Using the same participants for a study's qualitative and quantitative components is known as identical sampling. The participants in a study are chosen from the same population using parallel sampling, but a separate sample is used for each section of the study. In a nested sampling technique, a subset of the sample used in the first phase of a study is used in the second phase of the study. In multilevel sampling, samples are taken from many strata of the target population (Ngulube & Ukwoma, 2021) and a minimum of two different sets of samples drawn from various research levels are considered (Onwuegbuzie & Collins, 2007).

For this study, a multistage sampling technique was used to reach the sample for the first phase (quantitative) of the study. Thereafter, a nested technique was employed to draw the sample for the second phase (qualitative). Of the 264 households that were included in this study, 562 participants aged ≥18 years were included in the first phase of the study. For the second phase of the study, the nested sampling technique was applied to draw 32 participants from the quantitative sample that was used during the first phase of the study.

4.3.2 Phase One: Quantitative study

4.3.2.1 Study site and sampling technique for the quantitative sample

This study was conducted in Wakiso District, which was randomly selected from the 26 districts in Central Uganda that had previously been determined to have the highest prevalence of hypertension (26.4%), albeit some time ago (Guwatudde et al., 2015). Wakiso District is located in Central Uganda and mostly surrounds Kampala, Uganda's capital city. It had an average estimated population of 2,735,100 people in 2019 (Uganda Bureau of Statistics, 2019). Two out of 146 parishes in the district were randomly selected, and all eight villages within those parishes were included in this study. Next, households were randomly selected; for each household, all potential participants aged 18 years and over were included. This was because previous studies showed that even young people aged 18 years can be hypertensive (Guwatudde et al., 2015; Lunyera et al., 2018; Musinguzi & Nuwaha, 2013). Therefore, all those aged ≥18 years in the selected households were eligible to participate in this study.

The study sites were selected using a multistage sampling technique. A multistage sampling technique is used in large-scale surveys where simple or stratified random sampling may not be effective (Polit & Beck, 2017). In the stratified random sampling technique, the elements that make up the target population are separated into discrete groups or strata; within each stratum, the elements are comparable to one another in terms of a few important criteria (Parsons, 2014). This was not an appropriate sampling technique for this study because there was no need to stratify the study area or participants using specific characteristics. Instead, it was necessary to draw a smaller sample at each stage in the sampling process (Acharya, Prakash, Saxena, & Nigam, 2013). Therefore, multistage sampling was most appropriate to identify the district, communities/parishes, and households for this study. This was because Central Uganda has 26 districts, each district has several parishes or communities, and the individual communities have many villages with several households. Sampling was performed in three stages to identify: (i) one district from Central Uganda; (ii) two rural communities or parishes from the selected district (comprising eight villages); and (iii) households from the two selected rural communities. Importantly, simple random sampling using Stata software was used at all stages to minimize bias (Taherdoost, 2016). Simple random sampling is where everyone in the target population has an equal chance of being included in the study (Taherdoost, 2016).

Stata is a statistical software package used for statistical sample calculations, data analysis, management, and graphics for large and small datasets (Long & Long, 2009). Stata was created for broad analysis of datasets, with the size only constrained by the capabilities of the computer on which it is operating (Banks, 1992). Stata can be used to execute interactively or in batches, with the user having the option of writing new commands or, more easily, batch files of already existing procedures (Banks, 1992).

Drawing a sample from the population at random requires the application of different approaches as all participants must have an equal chance of being included in the study to minimize selection bias. For this study, the samples were identified using Stata version 13 at different stages. For example, to identify the district where the study was conducted, all 26 districts in Central Uganda (Central Region, 2020; Uganda Bureau of Statistics & ICF, 2017) were listed in Stata and a command to randomly select one district was run. Therefore, using the principles of simple random sampling, the first stage of multistage sampling aimed to select broad groups (Appendix D). Wakiso District was randomly selected as the district for conducting this study. Wakiso sub-country was also randomly selected, which has three parishes and 149 villages (LCMT.org, n.d.). From these three parishes, Kasengejje and Mende parishes (communities) were randomly selected. Kasengejje has three villages and Mende has five villages, all of which were included in this study. Next, households from each of the eight villages were randomly selected. This was done by entering the household identification numbers for all households in each village into Stata and running a command to select 33 households per village, which was the sample size calculated for each village. Simple random sampling minimizes bias during the selection process. However, it is time-consuming and the sample size depends on the sampling frame; in addition, it may not be applicable where the samples are scattered (Moule, Aveyard, & Goodman, 2016; Taherdoost, 2016). Standard errors may also be high with simple random sampling (Ghauri, Grønhaug, & Strange, 2020) and generalizations may have some limitations (Malhotra, Nunan, & Birks, 2017). As most Ugandans live in rural communities (over 70%) (Guwatudde et al., 2015), it was considered feasible and cost-effective to sample participants randomly at each stage of the multistage sampling.

The household sample size in each village was obtained using the formula drawn from the United Nations Statistical Division, as set out below. Thereafter, all members of the household aged 18 years and over were invited to participate in this study. In this study, the households had to be selected first before identifying the individual participants in the households. Therefore, this formula (United Nations Statistical Division [UNSD], 2008) was appropriate because it is used for calculating the sample size for household surveys.

$n_h = (z^2)\ (r)\ (1\text{-}r)\ (f)\ (k) /\ (p)\ (n)\ (e^2)$

n_h = sample size of the number of households

z = desired confidence level (1.96)

r = estimate of a key indicator to be measured (prevalence is 0.264) (Guwatudde et al., 2015)

f = sample design effect assumed to be 2.0 (default value)

k = non-response multiplier (0.10)

p = the proportion of the total population accounted for by the target population and upon which the parameter, r, is based [p = proportion accounted for is 47 years (18–64 years) * 0.03 rule of thumb] = 47*0.03 = 1.41 (Guwatudde et al., 2015)

n = the average household size (number of persons per household in Wakiso: 4.7 with at least 2–3 adults) (Uganda Bureau of Statistics [UBOS], 2017)

e^2 = margin of error to be attained (0.1r) = 0.1*0.264 = 0.0264

$$n_h = \frac{(1.96)^2 (0.264) (1-0.264) (2) (0.1)}{(1.41) (4.7) (0.0264)^2}$$

$$n_h = \frac{(3.8416) (0.264) (0.736) (2) (0.1)}{6.627 * 0.00069696}$$

$$n_h = \frac{0.14928764928}{0.00461875392}$$

$n_h =$ 32.2 households per village (this was rounded up to 33 households per village)

As this study was conducted in two different communities (Mende and Kasengejje), which had eight different villages, 2,671 households were given identification numbers; from those households, 264 households were randomly selected according to the calculated household sample size. This was based on the assumption that every household had an average of five family members, of which three would be aged 18 years and older (Uganda National Household Survey, 2019/2020). Approximately 75% of the total population of Uganda lives in rural areas (Central Intellegence Agency, 2020; Guwatudde et al., 2015). Detailed information about households was obtained from national census data, and assistance was sought from the local district leaders and VHTs to obtain the actual numbers that were used in this study.

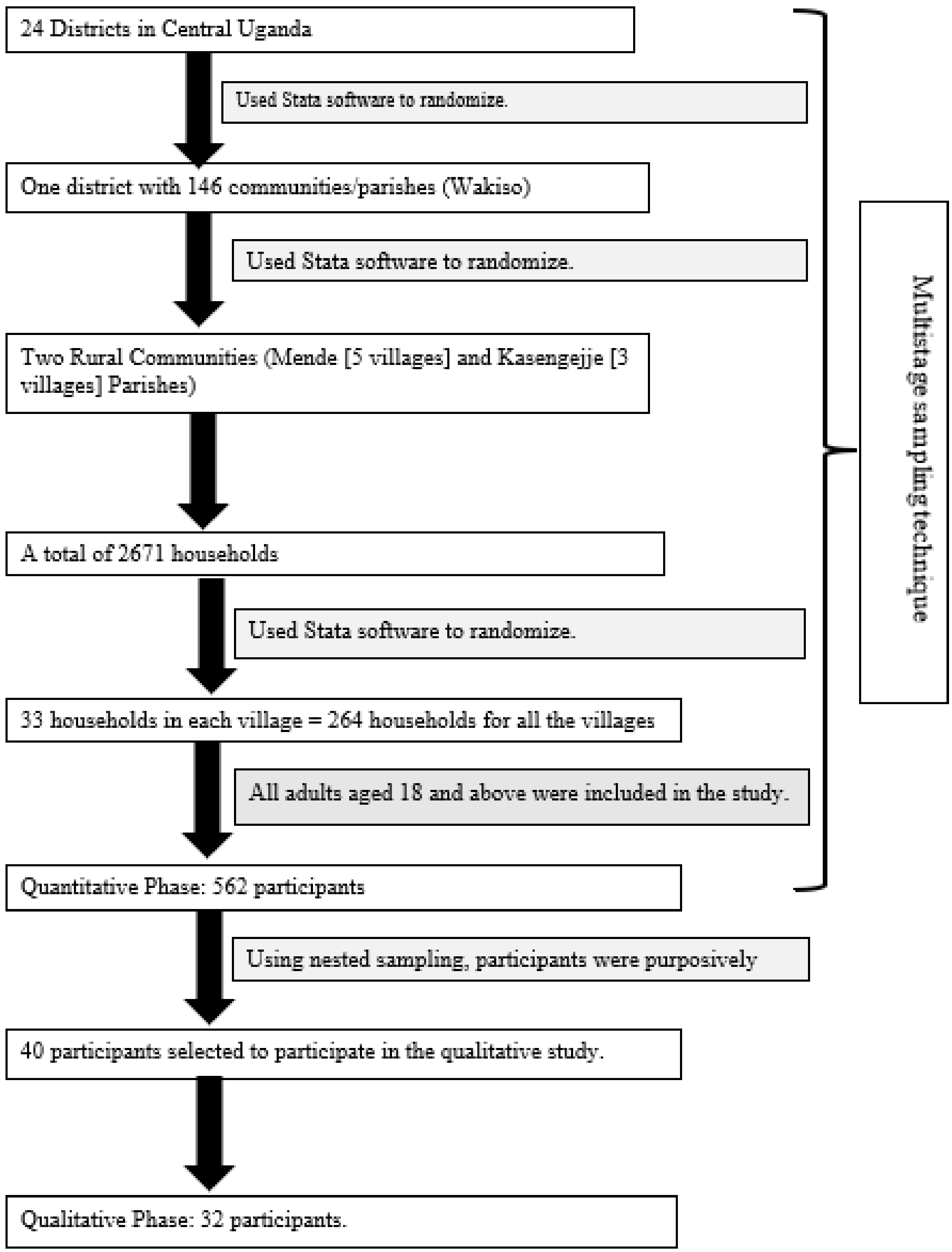


Figure 4: Illustration of the Sampling Procedure used in this Study

4.3.2.2 Data Collection Procedure

Administrative clearance from relevant authorities was obtained, and ethics approval was sought from the University of Salford (HSR1920-034), TASO Research and Ethics Committee (TASOREC/019/2020-UG-REC-009), and Uganda National Council for Science and Technology (UNCST) (HS617ES) before the data collection process started.

Before the start of data collection, five research assistants (with a degree in nursing) with prior experience in data collection for population-based surveys were recruited to support the delivery of this study. Each of these research assistants received two days of training, which included an introduction to this study and a detailed explanation of the data collection methods and data collection tools. Other aspects covered during the training included research ethics using the participant's information sheet, data quality control where they were introduced to Epicollect and how it works to ensure data completeness. Furthermore, the research assistants were trained in communication skills to ensure that they were culturally sensitive as this was a community-based study. During the training, the data collection process was demonstrated, and the research assistants had an opportunity to perform a return demonstration before the pilot study. After the training, a pilot study was conducted in one of the villages with a similar setting as the research study, and the data was analysed to determine validity of the data collection instrument. All necessary amendments were made based on the pilot study before the actual data collection of the study (please Appendix – for the training schedule of the research assistants ZD).

Subsequently, a planning meeting for data collection was held with the research assistants and all materials were prepared. Thereafter, meetings with the local council chairpersons for each village were held to introduce this study and discuss the details of what was required from them. The local council chairpersons are the political leaders of every village and anything that is done in the villages must be authorized by them. The local council chairpersons introduced the researcher and research assistants to the VHTs, which are community members who act as a link between the villages and health facilities. They are known and respected by the community members that they serve. The researcher worked closely with the chairpersons and VHTs to conduct community mapping and allocate identification numbers to each household in the eight villages (Sanda-Nalubi, Sesiriba, Bulondo, Kasengejje, Mende-Central, Najjemba, Mende-Buga, and Nakasugga) in the two selected communities or parishes (Mende and Kasengejje).

4.3.2.3 Inclusion criteria

Participants included in this study were all adults (aged ≥18 years) residing in Kasengejje and Mende parishes in Wakiso District. In Uganda, an adult is defined as anyone aged 18 years and older (United Nations [UN], 1996). In addition, only community members who agreed to sign an informed consent form were included in this study.

4.3.2.4 Exclusion criteria

The exclusion criteria covered all members in the two rural communities who were too unwell to speak, write, or append a thumbprint on the consent form, along with prospective participants who were too busy to spare the time for the entire duration of the survey on two different visits. Participants who were not available in their households on the two different visits were excluded from this study.

4.3.2.5 Participant recruitment

Based on the randomized households, all people aged 18 years and over in each of the selected households were included in this study. By the end of the data collection, a total of 562 participants were included in this study. At the time of data collection, the VHTs worked alongside the research team members. The research team comprised two people per household to ensure that everyone was safe while collecting data in different households in the community. Working in small groups can minimize the risks associated with working alone and improve the individual's safety (Doody & Noonan, 2016). The VHT members led the two research team members to the identified household and introduced them to the family. This aimed to ensure that the study was accepted by the households as the family members knew the VHT; this "gatekeeping" activity was recommended in previous studies (John et al., 2021; Khan et al., 2021). After this introduction, the VHT was requested to leave the research team with the participants to ensure privacy and freedom of speech for participants and minimize the risk of coercion. In Uganda, VHTs comprise respected people from the communities, meaning that community members may easily be influenced or coerced by their presence during consent and data collection. In the absence of the VHT, the two research team members introduced themselves and the aim of this study to each potential participant (members of the household aged ≥18 years). For those who were interested in taking part in the study, a participant information sheet in either the English or Luganda languages (Appendices E and F, respectively) was provided detailing the aims, objectives, and purpose of the study.

The translation from English to Luganda was performed by a professional certified translator from the School Languages at Makerere University (please see the certificate of translation under Appendix G). Participants were given at least 2 hours to make an informed decision as to their participation. During these 2 hours, the researcher went to subsequent participants and repeated this procedure before returning to the original participant to obtain consent before data collection. The participants were given 2 hours because they were farmers who had little time, and besides it was during the rainy season which was time for planting their crops. Therefore, it was challenging to engage them for a longer period as that would mean that I would miss to see them on the following day because many of them used had gardens that were far (3-7 kms away) from their homes. Participants were given time to ask questions, and answers were provided before they signed the consent form. Those who agreed to participate in this study were given two copies of the consent form in either English or Luganda (please see Appendices H and I) to sign or put their thumbprint. One consent form was kept by the researcher and the other was left with the participant. For those who were unable to read, another household member was requested to read the forms for them. For those who did not have anyone in the household to read for them, the researcher or research assistant read the whole participant information sheet in their preferred language, gave them time to ask questions and responded to their questions. One-to-one conversations took place with each member of the household to ensure confidentiality and the freedom of each member of the household to ask their questions without the influence of other household members. This was done in such a way that household members would not hear what was being discussed with the other prospective participants. For those who were unwilling to participate in this study, the researcher thanked them for their time and then spoke with other prospective participants in the household. In cases where people in the selected households were not available on two different visits, they were replaced by members of the immediate neighboring household. Although this was outside the sampling strategy, this decision was made for pragmatic reasons to limit the non-response rate and meet recruitment deadlines because of the academic timeframe that guided this research.

4.3.2.6 Quantitative data collection instrument

Establishing participants' knowledge about hypertension and healthy lifestyle behaviours for the prevention of hypertension was achieved using a structured questionnaire (survey), and the prevalence of hypertension was determined by taking physical measurements (e.g., weight, height, and blood pressure). This demonstrated that deductive and objective approaches were applied to find answers to the research questions by using the structured questionnaire. The research instrument used to collect data for this study was based on a questionnaire adapted from the WHO STEPS instrument, in which the participant selects the most correct answer from among the multiple choice options based on what they know or practice (World Health Organization [WHO], 2005). Three questions were added to the tool covering participants' religion, when they went to sleep, and what time they ate supper. Questions not related to hypertension were removed as they focused on other non-communicable diseases such as diabetes. The STEPS instrument was initiated in 2002 by the WHO because of the need for countries to track risk factors for non-communicable diseases (WHO, 2005). The STEPS approach focuses on monitoring a small number of non-communicable disease risk factors that can inform interventions that may be effective for preventing non-communicable diseases (Riley et al., 2016). Each country can use the generic instrument and contextualize it to their local settings. The research instrument was developed to collect and measure non-communicable disease risk factors and has three steps that guided the process of data collection; questionnaire, physical measurements, and biochemical measurements (Guthold et al., 2011; Riley et al., 2016; WHO, 2023a). For this study, the questionnaire and physical measurement for blood pressure were adapted to answer the research questions that aimed to assess knowledge about the prevention of hypertension, healthy lifestyle behaviours that influenced the prevalence of hypertension, and the prevalence of hypertension in the selected communities. The questionnaire had an English version and a version translated into Luganda, as this study was conducted in Wakiso, which is in Central Buganda where the language predominantly spoken by most people in the communities is Luganda. A translator was available virtually for consultation and was contacted on a few occasions during data collection when participants said something that the researcher did not understand. However, the translated questionnaires were used to ensure that no information was distorted. The questionnaire had both open- and close-ended questions (see Appendix J and K for the English and Luganda versions respectively).

The research instrument was divided into four sections. Section A included sociodemographic characteristics, section B assessed participants' knowledge about the prevention of hypertension, section C assessed individual healthy lifestyle behaviours that influenced the prevalence of hypertension, and section D established the prevalence of hypertension by measuring every participant's blood pressure. Blood pressure measurements were taken three times during the visit (see Section 4.3.2.7) (WHO, 2019). In addition, weight and height were measured to ascertain participants' BMI. Most questions were adopted from the STEPS instrument (WHO, 2005) developed by the WHO but some questions were developed based on the constructs of the Health Belief Model (Morris et al., 2012).

Specific information collected through the four sections (sociodemographic, knowledge about hypertension, individual lifestyle behaviours, and prevalence of hypertension) are detailed below.

- Section A comprised 10 questions focusing on sociodemographic characteristics, including: age, gender, tribe, marital status, level of education, religion, family history of hypertension, number of people in the household, and monthly income.
- Section B assessed knowledge about hypertension and preventive measures and was made up of 12 questions. These questions assessed the seriousness or how dangerous hypertension is, whether participants knew their blood pressure status, causes of hypertension, knowledge as to whether people can do something to prevent hypertension, types of food to eat and those to avoid to in preventing hypertension, risk factors for hypertension, and how participants learned about hypertension.
- Section C assessed individual lifestyle behaviours for the prevention of hypertension (adopted from the WHO STEPS instrument). This section had a total of 40 questions under eight different subsections: physical activity (10 questions); recreational activities (six questions); tobacco use (eight questions); eating fruits (two questions); eating vegetables (two questions); eating meat (four questions); dietary salt (four questions); and alcohol consumption (four questions). When answering questions about physical activity, the participant was asked to consider work (paid or unpaid work), study or training, household duties, food harvesting, food gathering through fishing or hunting, digging, and bricklaying. When responding to the inquiries about activities, those that required a lot of physical effort and resulted in significant increases in breathing or heart rate were referred to as vigorous-intensity activities, whereas activities that required moderate physical effort and resulted in smaller increases in breathing or heart rate were

referred to as moderate-intensity activities. These were adapted from the STEPS tool (WHO, 2005). Some questions were close-ended, and others were open-ended.

- Section D focused on establishing the prevalence of hypertension. It had seven items, which included recording participants' blood pressure, weight, height, and BMI.

The quantitative data collection started in August 2020 and was completed in over one month (30 calendar days). The questionnaire answers were uploaded to Epicollect5 using a computer or mobile phone. Epicollect5 is free and easy-to-use software that was developed to collect epidemiological data in communities. It is linked to both the mobile device and the central database where information is stored. Linking to the central database can be done in real-time with good Internet connectivity. To ensure that Epicollect5 worked effectively, the software was downloaded onto mobile phones that were used for data collection. Power banks were available to ensure that the phones always had power during the process of data collection. The researcher did not anticipate issues with data sharing as all data were stored on secured servers that were password protected. Although Epicollect5 has advantages, the need for Internet access, the related cost, and the often-poor network connectivity in the rural communities could have posed a challenge using the software. However, the issue of poor or absent network connection was resolved by saving the information onto the phone's database and then synchronizing with the server once connectivity was re-established (Aanensen, Huntley, Feil, al-Own, & Spratt, 2009). Therefore, in cases where the Internet connectivity was poor at the time of data collection, the data were stored in the phone's memory; immediately after the Internet connection resumed, the data were uploaded to Epicollect5 and deleted from the phone's memory.

Travel to the research sites in the rural communities by the research team was facilitated with the use of two cars. This was helpful because some households were far apart, and easy transport saved valuable recruitment time.

4.3.2.7 Blood pressure measurement: a clinical procedure

Blood pressure was measured using an "Omron BP786N" machine. This device is easy to read as it uses large font, can detect irregular heartbeats, can read out results loudly (optional), and has Bluetooth functionality (Maloney, 2018). The results for blood pressure measurements were entered directly into Epicollect5, saved on the researcher's phone, and thereafter uploaded to the central database. Participants' awareness of their hypertension status was recorded but whether the individual was on medication or not was not recorded. However, if the individual was found to be hypertensive, they were referred to the counselor (registered nurse) attached to the study for counseling and appropriate referral, as necessary. Importantly, participants' blood pressure was measured by qualified trained and experienced nurses. Survey data were collected before measuring the blood pressure. To take blood pressure measurements, the participant was requested to sit comfortably either on a chair or the floor and relax. The procedure for blood pressure measurement was explained to the participant and they were advised to remove the clothing from both hands before the blood pressure cuff was placed for measurement.

In this study, the first blood pressure measurement was taken from the left arm, followed by the right arm at a 15-minute interval and the third measurement was taken from the arm that had the higher blood pressure after a further 15 minutes (Skirton, Chamberlain, Lawson, Ryan, & Young, 2011). However, for participants whose blood pressure was ≥140/90 mmHg, the three blood pressure measurements were repeated the following day before recording the final reading. Overall, three blood pressure readings were taken per participant at 15-minute intervals and an average of the last two readings was used for analysis. This was consistent with Leung et al. (2016), who recommend that before a diagnosis of hypertension can be made, a person's blood pressure measurement should be taken three times on the same visit and the last two readings averaged. If the blood pressure reading was above 160/100 mmHg, the counselor on the research team was invited to counsel the participant to make an appropriate referral instead of waiting to the repeat blood pressure reading the following day. However, before referring the participant to the hospital, she would repeat the blood pressure measurement using a mercury blood pressure machine. This is because the mercury blood pressure machine is more accurate than the electronic blood pressure machine. However, using a mercury blood pressure machine is time consuming and requires more skilled training of the health care personnel to use it (Srinivasan, Kumar, Saraswathi, Raaju, & Rao, 2018; Unsworth, Tucker, & Hindmarsh, 2015). It is recommended that the blood pressure is taken when an individual is in a sitting position and resting on a chair with un-crossed legs and resting the hand on the table. If there are indications of postural hypotension, especially in the elderly and those with diabetes or neurological diseases like Parkinson's or dementia, individuals with treated hypertension should have their standing blood pressure checked (Stergiou et al., 2021). For this study, all participants' blood pressures were taken in a sitting position apart from those who were referred to the councilor.

4.3.2.8 Validation

The quantitative survey tool was pre-tested in a pilot study conducted in one rural community in Wakiso District that was different from those selected for the main study. The primary goal of the pre-test was to confirm that the target audience could provide meaningful answers and that they comprehend the questions and suggested response options as intended by the researcher (Perneger, Courvoisier, Hudelson, & Gayet-Ageron, 2015). When pre-testing a self-report instrument, the pre-test subject or participant usually completes the questionnaire first, followed by a sequential debriefing for each item. When issues are found, such as unclear questions, strange words, ambiguous grammar, missing timeframes, and absence of relevant answers, the instrument is modified; ideally, further pre-tests are conducted. When no new problems appear, the process is over (Presser et al., 2004). To achieve sufficient power to detect fairly common faults, sample sizes of 30 or more are recommended for pre-tests if possible (prevalence of 10%) (Perneger et al., 2015).

The tool for collection for this study was pre-tested with 30 participants. In addition, the blood pressure readings, weight, and height of these 30 participants were recorded. The tool was then adjusted according to the identified issues. The internal consistency (reliability) of the survey items was assessed using the Cronbach's alpha coefficient (Vaske, Beaman, & Sponarski, 2017). This coefficient was developed by Cronbach (1951) to provide a measure of the internal consistency of a test or scale, and is expressed as a number between 0 and 1. Internal consistency refers to the degree to which each item in a test measures the same notion or construct, and reflects how closely related the items are to one another. Before a test is used for research or examination purposes, the internal consistency should be established to assure the tool's validity (Tavakol & Dennick, 2011). If the items in a test are correlated with each other, the alpha value is increased. However, a high alpha coefficient does not always equate to high internal consistency, because the test length also has an impact on this value. The alpha value decreases if there are few items (Streiner, 2003). The tool (questionnaire) used for data collection in this study was validated. Of the items included in the survey, 54 items were included for validation with a resultant scale reliability coefficient of 0.75, which was within the acceptable range (Cronbach, 1951; Pleasant & Kuruvilla, 2008; Taber, 2018; Tavakol & Dennick, 2011).

4.3.2.9 Quantitative Data Analysis

When analysing data using the WHO STEPS approach, it is important to mention the analytic program that was used and consider the software's ability to handle complex sample data for multiple-stage sampling approaches (WHO, 2023). Moreover, it is necessary to describe how the findings will be displayed (e.g., averages or percentages), with determined CIs weighted to represent the population and associated standard errors. The statistical procedures that were used to check for group differences should also be presented.

In the present study, after data were collected using Epicollect5 software, the survey questions (multiple choice and open-ended questions) were exported to an Excel spreadsheet from which a codebook was developed (see Appendix L). Normally checks should then be performed for missing data (or partially completed surveys) and an appropriate strategy implemented to address missing data. However, for this study, there were no partially completed surveys because Epicollect5 does not accept a new entry or allow the participant to move to the next question before the previous item is completed.

Following the configuration of the codebook, data were imported into Stata version 13 for analysis (Stata, 2013). The data were organized and edited into a format that could be recognized by the Stata software as it is case-sensitive and only recognizes lowercase characters (Kohler & Kreuter, 2005).

4.3.2.10 Hypotheses for this Study

Null Hypothesis

There is no relationship between healthy lifestyle behaviours and hypertension.

In this hypothesis, the healthy lifestyle behaviours included smoking, alcohol consumption, dietary patterns, and physical activity. However, when any of these healthy lifestyle behaviours was statistically significant, the null hypothesis was rejected at a 95% CI.

Descriptive analysis

The baseline characteristics of the study population were explored with the participants stratified by hypertension status (hypertensive or normotensive), irrespective of whether they were hypertensive before the time of data collection (if known). The means for the continuous variables (age, weight, height, and monthly income) were compared using a two-group mean-comparison test (t-test) and SD. Measures of central tendency give a summary or representation of data whereas measures of dispersion (e.g., SD) describe the spread of data from the centre and determine the reliability of the average. Differences in the distribution of categorical variables (gender, location of residence, educational status, wealth status, smoking status, and marital status) were evaluated using Pearson's chi-square tests (Bolboacă, Jäntschi, Sestraş, Sestraş, & Pamfil, 2011). Pearson's chi-square test is employed to determine if two categorical variables are independent of one another or evaluate how well a sample fits the population as a whole (goodness-of-fit) (Franke, Ho, & Christie, 2012). A significant difference was realized at a p-value $\leq\alpha$, where $\alpha=0.05$, which is a basis or cutoff for rejecting the null hypothesis. If the p-value is greater than 0.05, the null hypothesis is not rejected (Rumsey, 2015).

Table 4 shows the layout of the analysis. It displays the variables, type of variable (lineal and categorical), and the approach used to analyse the data. Descriptive statistics and logistic regression were applied in the analysis for the quantitative data.

Table 4: Summary of the analysis process for the study variables

Lay out of the analysis	**Objectives**	**Variables**	**Type of variable and how it was presented for analysis**	**Analysis approach**
	Demographic characteristics	Gender, age, number of adults per household, religion, tribe, marital status, level of education, history of hypertension in the family, occupation, and income	Both linear and categorical variables	Mean and standard deviation (for linear data) and logistic regression for categorical variables
Objective 1	To assess participants' knowledge about the prevention of hypertension in rural communities in Central Uganda	Knowledge about hypertension and its prevention	Categorical variables	Descriptive statistics (frequencies and percentages), and logistic regression analysis (univariate, bivariate and multivariate)
Objective 2	To assess individual lifestyle behaviours that influence the prevalence of hypertension in	Physical activity, diet, alcohol consumption, smoking	Categorical variables	Descriptive statistics (frequencies and percentages), mean, standard deviation, and logistic regression analysis

Lay out of the analysis	Objectives	Variables	Type of variable and how it was presented for analysis	Analysis approach
	rural communities in Central Uganda			(univariate, bivariate and multivariate)
Objective 3	To establish the prevalence of hypertension in the two rural communities (Kasengejje and Mende) in Central Uganda.	Weight, height, and body mass index	Both linear and categorical	Descriptive statistics (frequencies and percentages) and logistic regression analysis (univariate, bivariate and multivariate)

In studies with a large sample size (>30 or >40), it may not be necessary to conduct normality tests because this does not result in serious changes (Pallant, 2020). The central limit theorem is typically considered a catchall term for any theory that provides convergence in distribution, particularly to the normal law, of normed sums of an increasing number of random variables (Heyde, 2006). Such findings are broadly applicable, and have given the normal distribution a prominent position in probability theory and statistics (Heyde, 2006). Moreover, the central limit theorem emphasizes many methods of analysis and asserts that when the means of random samples from any distribution are calculated, they will also have a normal distribution. Furthermore, when the sample involves hundreds of observations, the distribution of the data can be ignored and binary outcomes are treated in the same way (Altman & Bland, 1995). Based on these assumptions, normality tests were not performed in this study because the outcome of the study was binary, and the sample size was in the hundreds (N=562).

4.3.2.11 Regression analysis

Regression analysis seeks to establish relationships between an independent and a dependent variable (Grömping, 2015). It also helps to establish the strength of different independent variables over the dependent variable and predicts a phenomenon (Sarstedt & Mooi, 2014). Standard logistic regression models were used to examine the associations between hypertension and the investigated lifestyle behaviours, controlled for confounders. Both bivariate and multivariate analyses were performed. At the bivariate level of analysis, a variable with a p-value ≤ 0.2 was considered for the multivariate analysis (reporting the aOR). Statistical significance was considered at $\alpha=0.05$.

The influence of lifestyle behaviours on the prevalence of hypertension was analysed using multivariable logistic regression. Multivariate analysis was performed using forward stepwise regression where one variable was added at a time. Statistical significance was considered using the 95% CI and $\alpha=0.05$. Effect modification was assessed using the chunk test (−2 log-likelihood reduced model – 2 log likelihood full model). The corresponding effect was assessed at a 10% cut-off (crude OR [COR]−aOR)/COR*100.

4.3.2.12 Regression Diagnostics

The Hosmer–Lemeshow test was used to assess the goodness-of-fit of the final regression model using the “estat gof” routine in Stata. A p-value <0.05 was used to determine the goodness-of-fit test for the model. These analyses were performed using Stata software version 13. The goodness-of-fit test is a crucial check to determine whether the data observed, and the predictions made matched. In addition, the Hosmer-Lemeshow test is frequently used to assess risk-scoring models that are created using a variety of sample sizes (Paul, Pennell, & Lemeshow, 2013). Making decisions may be based on the outcomes of the hypothesis test. For this study, this test was used to determine the risk factors for the prevention of hypertension. The results are presented in tables and brief descriptions (Chapter Five).

4.3.3 Phase Two: Qualitative Method

The qualitative phase of this study took place in March 2021, and focused on the fourth research question (i.e., how individuals in rural communities in Uganda prevent hypertension). This part of the study was interrupted by COVID-19, but the research team followed the guidelines stipulated by the UNCST to protect participants and the research team from contracting/spreading the virus during data collection (Appendix M).

4.3.3.1 Methodology for Data Collection in the Qualitative Study

Qualitative data can be collected using focus group discussions, individual interviews, and observations as discussed in this section. However, focus group discussions were used in this study. Focus group is referred to as a “non-standard approach” and uses non-standard information-gathering procedures because the text and the questions answered do not, in the moderator’s eyes, follow a predetermined order (Acocella, 2012). In addition, there is no classification system for the potential answer options in the interviewee’s eyes. This approach can be employed to investigate a variety of current viewpoints on a particular subject. As participants in focus group discussions are free to express themselves as they would if speaking to their counterparts, the debate is described as “seemingly informal.” However, focus group debate only partially resembles a regular conversation because it takes place in a location selected by the moderator and is guided by predetermined cognitive goals rather than goals that the group comes up with on its own (Acocella, 2012). Focus groups are set up to encourage participant engagement and maximize the collection of high-quality data in a limited amount of time (Acocella, 2012). Moreover, focus groups have the benefit of being able to include a large number of participants in a single meeting (Wall, 2001). This is a successful method of gathering a lot of information (Barrows, 2000) and certain viewpoints or behaviours (Hines, 2000) quickly, and is a highly useful tool for triangulating data when used with other data collection techniques (Threlfall, 1999). Primarily, focus groups have the advantage of allowing the researcher to "dig" deeply to obtain in-depth insights regarding the researched issue, which other research instruments such as surveys cannot provide (Barrows, 2000).

A focus group has been renowned as an affordable research method in comparison with some other choices (Wall, 2001), and setting up focus groups does not take much time or effort (Threlfall, 1999). However, it is costly when the time and money spent on question development, pre-testing, recruitment, screening procedures, and data collection are considered (Acocella, 2012). In addition, it is relatively expensive because of the cost of the software programs used and the lengthy, labour-intensive analysis process of focus group output (Schmidt, 2001). In addition, the use of focus groups as a sole data collection technique is uncommon, which is another drawback (Ho, 2006; McClelland, 1994). Because of their small sample size, such a group may not be typical of the study population (Gibbs, 1997; Wall, 2001), and its results therefore cannot be applied to the entire population (Barrows, 2000; Gibbs, 1997; Godswill, Amagwula, Igwe, & Gonzaga, 2018; Threlfall, 1999).

In-depth interviews are another method of qualitative data collection. In-depth interviews take a long time as they are conducted using face-to-face interviews to accomplish particular goals (Serry & Liamputtong, 2013). In-depth interviews allow researchers to examine participant behaviour because they are a means of gathering primary data. Moreover, it makes it possible for the researcher to comprehend an idea or theme in detail and is appropriate for participants who choose not to openly voice their opinions (Serry & Liamputtong, 2013). However, in-depth interviews have some limitations, including a small sample size, sample selection may not be made scientifically, and time requirements because of the one-on-one nature of the interviews, which take up a significant amount of the researcher's time for interviewing, transcription, analysis, and reporting (Serry & Liamputtong, 2013). Based on these limitations, the researcher opted to use focus group discussions in this study.

Observations are also used to collect qualitative data. The goal of observational research, a sort of qualitative inquiry, is to better understand a topic of interest by gathering perceptions of the environment using all of one's senses, particularly looking and listening, systematically and deliberately (Benaquisto, 2008). Observations help the researcher find and direct relationships with informants, understand how people interact in an environment, and see how things are set up and given priority (Schensul, Schensul, & LeCompte, 1999). The technique of qualitative observation involves observing the participants in a natural situation to collect data, which is subsequently analysed (Cohen et al., 2017). However, when performing observations, the researcher needs to decide to be either a participant or a non-participant observer in the research environment. Furthermore, the researcher has to decide whether or not to keep the subjects to be observed in the dark about the goals of the study (Jibril, 2018). This was not an appropriate methodology for data collection in the present study as the research aim was to explore participants' experiences of the prevention of hypertension. Therefore, the researcher used focus group discussions to gather participants' experiences.

4.3.3.2 Focus Group Guide

The qualitative data were collected using a semi-structured interview guide that was developed based on the unique results from the quantitative study. A semi-structured interview guide helps the researcher to obtain in-depth information required about the study (Fylan, 2005). The role of the qualitative phase of this study was to gain an in-depth understanding of hypertension prevention experiences among the participants. The qualitative data complemented the quantitative findings by providing the people's voice, thereby giving a more in-depth understanding of the individuals' understanding of hypertension (Almeida, 2018).

The interview guide (Appendix N) was developed for this study once the quantitative data analysis had been completed; this data was needed to inform the development of the focus group interview guide. Unique or significant findings from the quantitative data, such as the relationships between hypertension and gender, age, physical activity, diet, and BMI, were used to develop the interview guide. The data were collected using focus group discussions with participants stratified by gender to enable them to speak freely and share their experiences. This was because traditionally, women in Uganda do not speak freely in the presence of men or husbands as a sign of respect and submissiveness.

Before the actual data collection, a pilot of the focus group interview guide was conducted using two focus group discussions (one for male and the other for female participants) and the tool was modified accordingly. For example, initially, there were many questions but after the pretest, it was evident that some could be combined because responses were almost the same for those questions. In addition, a question related to how the participants thought they could work with healthcare workers or the government to prevent hypertension was added. Participants in the pretest signed an informed consent individually after reading the participant information and asking questions, for which answers were provided. For those who did not know how to read, the researcher read aloud for them.

4.3.3.3 Focus Group Discussions

Focus group discussions were used for qualitative data collection. These are useful in situations where participants have shared experiences and thoughts about a phenomenon of interest (Krueger, 2014). With focus groups, as the participants share their experiences, they also listen to the experiences of other people in the group. The interaction during the focus group discussion gives the researcher a greater insight into the individuals' views, which cannot be achieved without such interaction in a group setting (Ritchie, Lewis, Nicholls, & Ormston, 2013). The focus groups discussions in this study were conducted using face-to-face interactions as they were considered to be more appropriate for the study context than other approaches, such as discussions via telephone and Skype (Ward, Gott, & Hoare, 2015). Moreover, it would have been difficult to use other means of communication because some participants did not have access to the technology to facilitate this. Using video call platforms such as Zoom and Skype would have been difficult because of the poor Internet connectivity in those rural communities.

4.3.3.4 Sampling for the Qualitative Study

Participants for the qualitative phase of this study were sampled using a nested sampling technique. This is where a subset of the sample used in the first phase of a study is used in the second phase of the study. In multilevel sampling, samples are taken from many strata of the target population (Ngulube & Ukwoma, 2021). The first phase of the study comprised 562 participants, and participants for the second phase were obtained from this group (nested sampling technique). During data collection for the first phase of the study, all participants were informed about the second phase and asked if they would be interested in participating. In addition, they were asked if they had been participating in preventive measures for hypertension.

For participants who expressed interest in participating in the second phase (qualitative) of the study, their telephone numbers and household identification numbers were recorded in a notebook for easy identification at the time of sampling. At the time of data collection, 20 men and 20 women were selected based on their experience of participating in measures for hypertension prevention. Selecting the men and women to participate in in separate focus group discussions was because of the culture aspects in Uganda where women may not speak before men with ease.

4.3.3.5 Inclusion criteria for the focus group discussions

The rationale for inclusion in the focus groups was based on whether the participants had expressed interest in taking part in the second phase of the study. During the survey visit, participants were informed about the second phase of the study; for those who were willing to take part, their telephone numbers and household identification numbers were recorded in a notebook for quick reference at the time of the focus group discussions, which took place 4 months after the survey. The 4-month interval enabled the researcher to analyse the quantitative data that were collected during the first phase. Thereafter, the researcher used the results from the quantitative data analysis to develop the questions for the focus group discussion interview guide. At the time of data collection, participants were contacted using the telephone numbers that they had provided. Four focus group discussions comprising six to 10 participants each were held (two groups from each of the two communities). By the time the four focus group discussions were completed, data saturation appeared to have been reached (Morse, Lowery, & Steury, 2014) and the researcher stopped data collection. Saturation refers to the absence of new information that would allow a researcher to further define the category's characteristics (Saunders et al., 2018).

4.3.3.6 Conducting the focus group discussions

The participants were invited to the focus group venue for data collection, which was one of the community centres where people gather. The participants sat on chairs in a circular format at least 2 meters apart as per the guidelines for COVID-19 mitigation set by the UNCST. The researcher and two research assistants distributed participant information sheets to the participants (Appendices O and P in English and Luganda respectively), and then introduced the aim of the research and allowed time for those who could read by themselves to do so; for those who were unable to read, the researcher read the information sheet aloud for them. They were given time to ask questions and the researcher answered each question. Each participant signed two consent forms (Appendices Q and R in English and Luganda respectively), which were also signed by the researcher. One of the consent forms was kept safely in a lockable cupboard in the researcher's office and the other was retained by the participant.

Using the focus group guide, the researcher asked the questions and moderated the subsequent discussions to ensure that all participants were given an equal opportunity to share their views. In cases where something was not clear, the researcher clarified with assistance from one of the research assistants, who also oversaw that the audio recorders were working and moved the recorder closer to the participant as necessary. The other research assistant took notes during the discussion.

During the first focus group discussion, one of the participants emphasized the importance of the VHTs, and after the discussion, the researcher requested her to stay and discuss the VHTs in more detail (please see Appendix S for the memo). In addition, field notes were recorded concerning the observations made, which helped to interpret some of the data (see Appendix T for the field notes). Only one focus group discussion was conducted in a day to ensure proper planning and organization. The focus group discussions lasted for around 60–83 minutes.

4.3.3.7 Rigor and Trustworthiness

Trustworthiness or rigour is the degree to which one becomes confident about data, interpretation, and methods used to ensure the quality of the study (Amankwaa, 2016; Connelly, 2016). It is important to evaluate research studies, and a lack of findings or non-significant results is a waste of time because they lack rigour (Amankwaa, 2016; Long & Johnson, 2000). Therefore, such results should not be recommended for further research (Amankwaa, 2016; Cook, 2012). In qualitative research, a study is considered trustworthy if the reader deems it to be so based on set criteria (Gunawan, 2015). Evaluation for trustworthiness in qualitative research considers credibility, dependability, transferability, and confirmability (Guba & Lincoln, 1981). Credibility is the confidence that the findings are true, transferability is the ability of the findings to be transferred to other contexts, dependability is the consistency in the study findings, and confirmability is where the results are shaped by the respondent to avoid misinterpretation of findings (Guba & Lincoln, 1981)

For this study, credibility was evaluated using member checks (Guba & Lincoln, 1981). After the focus group discussion, the analysis was conducted, and the results were shared with participants (members) who took part in the focus group discussions to check and confirm the findings. This was achieved through interviews. Transferability was evaluated using detailed descriptions (Guba and Lincoln (1981) of the findings following the use of open-ended questions during the focus group discussions. Dependability was evaluated by an auditor, who is defined as an independent person who is an expert in qualitative research (Guba & Lincoln, 1981). For this study, the researcher's supervisors read the research findings and identified any inconsistencies in the findings to confirm the dependability. Confirmability was evaluated using the field notes, memos, probes, and an audit trail developed during the qualitative analysis process.

4.3.3.8 Qualitative data analysis

Framework analysis (Gale, Heath, Cameron, Rashid, & Redwood, 2013) was used to analyse the qualitative data in this study. Details of how the data analysis was performed are presented below under the six framework steps.

2 Framework Analysis for Qualitative Data Analysis

The main goal of framework analysis is to find, explain, and understand significant patterns inside, across, and between cases relating to the phenomenon of interest (Goldsmith, 2021). For the present study, thematic analysis was performed using the framework analysis technique. To conduct a cross-sectional analysis using a combination of data description and abstraction, framework analysis, which is essentially a comparative type of thematic analysis, uses an organized structure of themes generated by both inductive and deductive reasoning.

Framework analysis involves six steps: transcription; familiarization and coding; identifying a thematic framework; indexing; charting and summarizing; and mapping and interpretation (Gale et al., 2013). These steps are discussed in detail in the following sections. Using focus group discussions to obtain qualitative data normally yields a lot of information (Doody, Slevin, & Taggart, 2013). Analysing these data requires refocusing on the purpose of the study to identify pertinent data that helps identify themes. Framework analysis was developed in 1980 by (Ritchie & Spencer, 2002) and has gained popularity in analysing qualitative data in the areas of nursing, psychology, and sociology (Gale et al., 2013). The outstanding feature of framework analysis is the out-output matrix where rows represent cases and columns represent codes, with the cells containing summarized data. This is helpful because it enables the researcher to analyse the data case by case and code by code. Framework analysis is not aligned with any theoretical underpinning but is an important tool used to generate research themes (Gale et al., 2013), as explained in the subsequent sections.

4.3.3.8.1.1 Transcription

For this study, the focus group discussions were recorded using an audio recorder that was stored in a lockable cupboard. The soft copies of the transcripts were stored on a computer protected with a strong password and were only accessible to the researcher. The recorded transcripts were printed out for analysis but did not contain any identifying information to link them to the participants. The themes were identified inductively from these transcripts.

It is important to have a well-written verbatim transcribed copy of the recorded data before analysis. In framework analysis, content is vital and therefore all details of the transcript may be necessary. When writing transcripts, it is important to have large margins that help in the process of coding and writing notes (Gale et al., 2013). In this study, margins of 5 cm on the left and right and 1 cm on the top and bottom of each page were used to enable the researcher to write notes and code the data. The decision to use manual or computer coding depends on the scope of the project, available resources and time, and the researcher's preferences and level of experience (Basit, 2003). The present researcher had little experience in qualitative data analysis but was guided by the supervision team that had a rich experience in the manual coding of data.

To do this successfully, the researcher did the transcription in Luganda language and the translator listened to the audios and made edits and thereafter, the transcripts were translated to English language. The researcher read through the Luganda transcripts and compared them with the translated version to minimise errors. The research supervisors also read through the transcripts as a final check for clarity.

4.3.3.8.1.2 Familiarization and Coding

The process of familiarization and coding involved listening to the audio files and reading and re-reading the transcripts, field notes, and memos. Familiarization is the process of gaining a deeper understanding of the data in the context of the set research objectives (Furber, 2010). This helped the researcher avoid leaving out key information from the focus group discussions, which may otherwise have been lost. The researcher becomes sensitized about the data and this sensitization helps the researcher to identify the differences between participants (Iliffe et al., 2015). For this study, familiarization was undertaken by reading the transcripts and listening to the recordings several times to understand what the participants had said in response to a particular question. In addition, the researcher wrote notes about key themes that arose from the discussions; these were noted in the right-hand margin of the transcripts. This assisted the researcher in identifying any data that could have been left out during the process of transcription. To ensure confidentiality, the notebooks were kept in a lock and key cupboard in the researcher's office, and they could only be accessed by her. These notebooks will be destroyed three years after the time of data collection, in line with University of Salford policy.

After familiarization, reading the transcripts line-by-line allows the researcher to identify codes, which describe the interpretation of a passage of text. The codes can be identified deductively or inductively. Deductive codes are predetermined based on theory, epistemology, and literature, whereas inductive codes are developed from the data through open coding (Gale et al., 2013). During the analysis for this study, an inductive approach was used where the researcher identified the codes after reading the transcripts several times. Coding is helpful in systematically classifying all data so that it can be compared with other datasets. During familiarization in this study, codes were identified and written in the left-hand margin of the transcripts. A sample of the plan for familiarization and coding is shown in Table 5.

4.3.3.8.1.3 Identifying a Thematic Framework

A previous study Gale et al. (2013) recommended that as soon as the initial batch of transcripts has been coded, the research team members should get together to compare their labels and decide on a set of codes that will be used for all future transcripts. The categories that result from grouping several codes can then be readily identified. This forms a working analytical framework, which will likely need to be modified multiple times before new codes appear. The analytical framework is never "complete" until the last transcript has been classified; therefore, it is always worthwhile to include another code under each category to avoid rejecting data that may not appear to fit (Gale et al., 2013). The themes can then be generated to suit their intended meaning consistent with the research questions (Iliffe et al., 2015). In the present analysis, codes were identified based on the questions that were asked during the focus group discussions. At this stage of data analysis, codes were grouped into categories with clear descriptions using a thematic map (for example, please see Figure 6 in the following chapter).

Table 5: Sample for the Plan for Familiarization and Coding Table

Left hand margin (coding labels)	**Focus group discussion**	**Right hand margin (notes and ideas)**
Perceived predisposing factors for HT	**FDG2: P3** For me, what I know is that: getting hypertension or palpitations is most commonly a result of being worried most of the time, in all life situations depending on what challenges we face in our livelihoods. For example, I am a married man; I may be at a risk of getting hypertension because of my family. Because my wife and I may get misunderstandings amongst us, and that can lead to such a situation/condition. Those are my thoughts for now.	Stress Family conflict leads to stress
Perceived causes of HT	**FDG2: P4** For me what I know about hypertension; it comes because of many things. The first could be your life situations; age, the food you eat, the stress or responsibilities you have; generally, things of the kind are the ones which can make a person acquire an ill health status. You could be having a lot of stress due to financial circumstances, family issues, work-related issues, etc. So, because of that, I think hypertension is mainly due to stress. And age too; as your age increases, there are certain things that your body experiences; some ailments just come spontaneously.	Multiple causes Age, food, stress Financial constraints Family issues and work lead to stress Old age
Perceived predisposing factors of HT. Preventive measures for HT	**FDG2: P4** For example, there are some foods we like eating. These days the foods we like eating the most are fast foods. When I talk of "fast foods," it means fried foods [junk food]. We like chips, roasted or fried meat, and other foods of the kind which add a lot fat deposits in our bodies. Those are the things which can lead us to acquiring that disease. Yet there is food which we can eat [and keep healthy]; our natural food, such as cassava, green vegetables, and others for a balanced diet but avoid using the junk foods a lot.	Fast foods Fatty foods Fat depositions Organic food Balanced diet Avoid fast foods

HT, hypertension.

4.3.3.8.1.4 Indexing

The working analytical framework was subsequently used in indexing subsequent transcripts using the preexisting categories and codes. For ease of identification, each code was given a number or abbreviation (Gale et al., 2013; Iliffe et al., 2015). For this study, this varied because different code names were allocated to segments of data and then used throughout the transcripts to match data with similar meanings.

4.3.3.8.1.5 Charting and summarizing

This is the procedure whereby the data are reorganized, and a thematic framework is developed to bring order to the data (Gale et al., 2013; Iliffe et al., 2015). Charting requires grouping the data from each transcript into categories. Good charting involves balancing the reduction of the data with the preservation of the original meanings and "feel" of the interviewees' remarks (Gale et al., 2013). This was achieved by combining several codes to make up categories. In addition, the categories were combined to make up four themes from the data. These themes were sociocultural factors related to hypertension, socioeconomic factors related to hypertension, knowledge and perception about hypertension, and proposed interventions for the prevention of hypertension.

4.3.3.8.1.6 Mapping and interpretation of the themes

This refers to a pictorial representation that displays how the themes interrelate with one another (Iliffe et al., 2015). For this study, the identified themes were linked with one another using illustration diagrams and thematic maps. Thereafter, the linkages were used to explain participants' experiences with hypertension and its prevention. In addition, individual participants' experiences with hypertension prevention were explained, and are discussed in detail under the qualitative findings in the following chapter.

4.3.4 Phase 3: Data Integration Procedure

In this study, data integration was undertaken at different stages; at the design stage, a sequential explanatory mixed methods design was used, where quantitative data were collected and analysed first. Thereafter, the significant quantitative findings were used to develop the focus group discussion guide that was used to collect qualitative data (Chih-Pei & Yan-Yi, 2017). In addition, integration was undertaken at the methods level through connecting. Fetters et al. (2013) asserted that when two different types of data are connected through the sample frame, integration by connecting happens. For example, when conducting a study using a survey and qualitative interviews, participants in the interviews are chosen from the population of survey respondents. Similarly, this was undertaken through the sampling framework in this study, whereby participants who took part in the qualitative study were purposively sampled from those who took part in the first phase of the study (quantitative).

Furthermore, integration at the interpretation stage employed a narrative approach using the contiguous technique (Fetters et al., 2013). With this approach, the quantitative results are presented first, followed by the qualitative findings in a different section (Chih-Pei & Chang, 2017; Fetters et al., 2013; Zhou, 2020). Although the integration of both sets of data may be important for presenting the results, the sequential explanatory mixed methods design facilitated the explanation of the quantitative results through the qualitative findings. For this study, the qualitative findings explained healthy lifestyle behaviours for the prevention of hypertension based on the participants' experiences. Attempting to integrate the data at this point implies that the direct comparison of the two datasets will be affected, which may lead to an inadequate comparison of the two datasets as the qualitative questions narrow the scope of the quantitative questions. Therefore, integration may be performed at the interpretation stage in the discussion section (Chih-Pei & Yan-Yi, 2017). In this study, the quantitative data were presented first, followed by the qualitative data, and the integration of the two datasets was performed in the discussion (Chapter Six). However, a summary of the integrated data is presented in the results (Chapter Five), which maps out important aspects of the quantitative results that matched the qualitative findings. In addition, key findings from the two datasets that did not match were outlined.

Assessment of the "fit" of the data was undertaken. Significant data from the quantitative results were compared with the qualitative data using a table to check for coherency. Furthermore, expansion or divergency was checked during the integration of data to gain a better understanding of healthy lifestyle behaviours for the prevention of hypertension and any other variables that emerged from the data to further explain the studied phenomenon. Moreover, discordance during integration was addressed using evidence from the literature, discussion with the supervisory team, and re-analysing the data to identify the possible cause of the discordance (Fetters et al., 2013). Figure 5 shows the phases that were followed to present the results of this study.

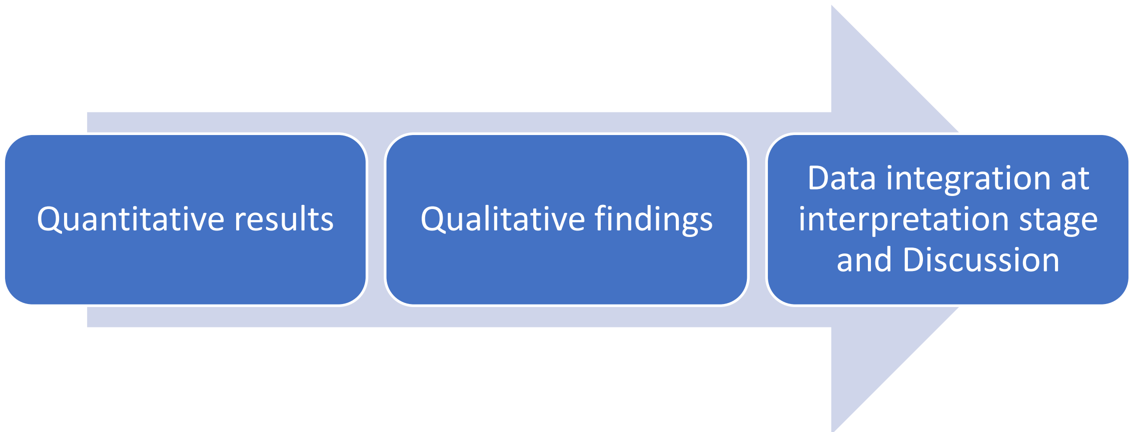


Figure 5: Process of Data Integration Using the Narrative Approach by Applying the Contiguous Technique

4.4 Ethical Issues

Ethical issues were considered in this study, which included administrative clearance from the DHO for Wakiso District (Appendix U). This was followed by seeking ethics approval from the University of Salford (Appendix V). Thereafter, The AIDS Support Organization Research Ethics Committee (TASO REC) reference number TASOREC/019/2020-UG-REC-009 approved this study (Appendix W). In addition, ethical approval was sought from the DHO to the General Secretary of UNCST (Appendix X). The UNCST (reference number HS617ES) provided the final approval to conduct this study (Appendix Y). Participants in both study phases (quantitative and qualitative) were requested to voluntarily sign informed consent forms before participating in this study.

Risks, such as emotional and psychological stress and benefits (e.g., taking participants' blood pressure, weight, and height), were explained to the participants before data collection. Participants were informed that they were free to withdraw from the study at any time, and confidentiality was maintained by answering questionnaires on phones protected with a password as Epicollect5 was used for data entry. In addition, consent forms were kept separately in a locked cupboard in the researcher's office, and there was no identifying information to link a consent form to an answered questionnaire. All participants were assigned codes during data collection to ensure anonymity. The survey/questionnaire was completed while seated outside participants' houses (on the veranda) to ensure the safety of the research team. Blood pressure and weight were measured in a room adjacent to the house or veranda to ensure privacy. In addition, data were always collected by a team of two (i.e., two research assistants or the researcher and a research assistant). The research team also had the telephone contacts of the local council chairpersons for the study sites (communities) for consultation in case the research team needed help. However, no issues arose that posed a risk to the security of either the research team or the participants that required the intervention of the local council chairpersons. However, when a participant was found to have high blood pressure, the nurse counsellor would counsel them and offer referral to the nearest health facility for proper diagnosis and management. This information was clearly written on the consent form and verbally explained to participants before they agreed to take part in this study.

There were minimal risks that were anticipated from the focus group discussions. However, the discussions could have caused emotional and psychological discomfort to the participants, especially those who may have had a bad experience with hypertension. In case such issues occurred, a nurse counsellor from Uganda Heart Institute was available to counsel such participants. The focus group discussions were conducted in designated community meeting places to ensure accessibility for all participants and the safety of the researcher and research assistants.

4.5 Risk Management During Data Collection in the COVID-19 Pandemic Period

Following the guidelines of the UNCST for conducting research during the COVID-19 pandemic period (Appendix L), there was a need to plan for risk management. There was a risk for the researcher, research assistants (research team) and the participants contracting COVID-19 during the process of data collection. However, that risk was managed using the following measures. The research team carried face masks for themselves and participants. During the time they were collecting data, they ensured that all parties always wore masks during their interactions or meetings. The research team ensured a social distance of 2 meters as per the presidential directive. Research team members and participants were asked to use hand sanitizer before and after each meeting. All tabletops and any surfaces the research team used were sanitized; when the team returned home, they ensured that they sanitized and bathed before they interacted with their family members. After signing the consent forms, participants were requested to place the consent forms in a box after showing their signatures to the researcher so that the research team did not touch them. In addition, the research team used Epicollect5 to ensure that there was minimal contact with papers from the participants. At the time of recording blood pressure and height, the research team put on disposable gloves to ensure that they did not touch participants with bare hands. Gloves were removed and changed after taking the blood pressure measurements for each participant.

Furthermore, participants' temperatures were measured before data collection; if temperatures were high, participants would be referred appropriately for further management. Educational materials about COVID-19 prevention in Luganda and English were obtained from the Ministry of Health and provided to every household. Some educational materials were pinned up in the common community meeting centres such as schools and the local leaders' households, with their consent. This action was taken to ensure that people continued to take precautions and appreciate why the research team were undertaking certain measures. To reimburse participants for their time during the focus group discussion, the researcher used mobile money. This was done to ensure no exchange of real money was passed from the researcher to the participants and vice versa. The amount of money that was given was 12,000 Uganda Shillings (UGX; 12,000 UGX = 2.64 GBP); the participant received 10,000 UGX and 2000 UGX covered withdrawal charges.

4.6 Budget for the Research

A research budget was drawn, and funding was sought from Aga Khan University. The budget was partially funded with 4,000 USD from the School of Nursing and Midwifery East Africa Dean's Fund, as per the attached budget, and the remainder was funded by the researcher (Appendix Z).

4.7 Chapter Summary

The chapter presented the methods that were applied to conduct this study. The pragmatic paradigm and pluralist ontology were used to guide the research design and methods for data collection. A sequential explanatory mixed methods design was used to guide the processes of data collection and analysis. In addition, descriptive and logistic regression analyses were used to analyse the quantitative data and framework analysis was used to guide the qualitative data analysis. A narrative contiguous approach was adapted for data integration, where the quantitative findings were presented first, followed by the qualitative findings. However, this was modified by presenting a summary of the integration of key findings with the results before the discussion (Chapter Six). Ethics approval for this study was obtained from the University of Salford, TASO

REC, and UNCST. In addition, COVID-19 mitigation measures, which entailed the use of masks, sanitizer, temperature guns, and social distancing, were adhered to. Furthermore, the proposed budget for the study was highlighted. The next chapter presents the findings from this study.

5 Chapter Five: Findings

This chapter presents the findings from this study. This study used a sequential explanatory mixed methods design, and the findings are presented in three parts: quantitative results, qualitative findings, and the integration of the findings.

5.1 Part I: Quantitative Results

Part I presents the findings from the quantitative phase of this study. As discussed in the previous chapter (see Table 6), the quantitative data collected included both continuous and categorical data. Descriptive statistics and logistic regression modeling were used to analyse these data. Categorical variables were expressed as frequencies and percentages, and the mean, mode, and SD were calculated for continuous variables. Analyses were performed by stratifying participants by their hypertension status and comparing the two groups for the continuous variables using means with corresponding SDs and p-values. Bivariate regression analysis for both communities (Mende and Kasengejje) are presented with CORs and 95% CIs, with aORs and 95% CIs reported for the multivariate regression analysis.

5.1.1 Characteristics of the Study Cohort

The response rate for this study was 71% (the expected number of participants was 792 and the actual number of participants was 562)

In total, 562 people residing in eight villages located in two rural communities (parishes) of Wakiso District participated in this study; of these, 66.7% (n= 375) were female (Table 6). Most participants (183/562, 32.6%) were aged ≥45 years. Most households (457/562, 81.3%) had one to four household members aged ≥18 years that participated in this study, and most participants (391/562, 68.3%) were Christian. Moreover, most participants (467/562, 83.10%) were from the Baganda/Basoga tribe and over half (302/562, 53.7%) were married. Only 7.12% (n= 40) participants had completed a tertiary level of education (diploma or degree). Furthermore, 30.3% (n= 170) participants had at least one family member with a history of hypertension, most commonly a parent (96/262 cases, 36.6%).

Table 6: Demographic Characteristics of the Study Cohort (N=562)

Variable	Frequency (%)
Gender	
Male	187 (33.3)
Female	375 (66.7)
Age group (years)	
18–24	139 (24.7)
25–34	127 (22.6)
35–44	113 (20.1)
≥45	183 (32.6)
Village	
Mende Bbuga	64 (11.4)
Bulondo	73 (13.0)
Mende Central	70 (12.5)
Kasengejje	74 (13.2)
Najemba	74 (13.2)
Nakasugga	64 (11.4)
Sanda Nalubi	75 (13.4)
Sesiriba	68 (12.1)
No. of people per household (≥18 years)	
1–4	457 (81.3)
5–8	105 (18.7)
Religion	
Christian	391 (68.3)
Islam	169 (31.5)
Others	2 (0.4)

Table 6 Continued

Variable	Frequency (%) (n=562)
Tribe	
Baganda/Basoga	467 (83.1)
Others	95 (16.9)
Marital status	
Never married	158 (28.1)
Married	302 (53.7)
Widowed/separated/divorced	102 (18.2)
Highest education level attained	
None	48 (8.5)
Primary	261 (46.4)
Secondary	213 (37.9)
Tertiary	40 (7.1)
Family history of hypertension	
No	247(44.0)
Yes	262 (46.6)
Don’t know	53 (9.4)
If yes in the previous question above, what is the relationship with family members	
Grandmother/father	38 (14.5)
Mother/father	96 (36.6)
Sibling	57 (21.8)
Occupation	
Unemployed (informal employment)	437 (77.8)
Employed (formal employment)	125 (22.2)

5.1.2 Participants' Socioeconomic Characteristics

The majority (78%, n=437/562) of participants were unemployed or had informal employment, as shown in Table 7. Furthermore, 63.9% (n= 359/562) of participants had a monthly income ≤400,000 UGX (approximately 85.6 GBP). Participants were engaged in various employment activities, but the most common group was peasants or farmers (29.2% [n= 164/562]).

Table 7: Participants' Socioeconomic Characteristics (N=562)

Variable	Frequency (%)
Occupation	
Unemployed (informal employment)	437 (77.8)
Employed (formal employment)	125 (22.2)
Monthly income (UGX)	
No earnings	172 (30.6)
<400,000	359 (63.9)
≥400,000	31 (5.5)
Type of employment	
Peasant/farmer	164 (29.2)
Teacher	17 (3.0)
Business	108 (19.2)
No paid employment	133 (23.7)
Any others	140 (24.9)
If you are under any other occupation in the question above, what type of job do you do?	
Motorcycle/bodaboda	5 (3.6)
Brick laying/farming	15 (10.7)
Builder/painter/casual/welder	21 (15.0)
Tailor/hairdresser	37 (26.4)
Nurse/drug dispenser	8 (5.7)
Housewife/maid/waitress	4 (2.9)
Mechanic/factory employee	6 (4.3)
Others	44 (31.4)

400,000 Uganda shillings (UGX) = 85.6 GBP

5.1.3 Knowledge about hypertension prevention

Most participants (93.6% [n= 526]) knew that hypertension was extremely dangerous (Table 8: Chart 3). However, 39.9% of participants did not know their hypertension status. Of the participants who reported that they were hypertensive, approximately 37.3% (n= 22) had been hypertensive for at least 2 years. Almost three-quarters (73.8% [n=413]) of the participants acknowledged that preventative actions could be taken to reduce the likelihood of being hypertensive, but less than 20% (n= 81) were able to correctly mention three to five correct answers for the preventive measures. When asked about the type of foods that helped to prevent hypertension, only 25.3% (n= 142) were able to state two or more correct types of food that supported hypertension prevention. Furthermore, only 23.1% (n= 130) of participants were able to mention two to five correct types of foods to avoid as a preventive measure for hypertension.

Almost one-quarter (22.2% [n= 25]) of the participants did not know any causes of hypertension. Moreover, 49.8% stated that they had learned whatever they knew about hypertension prevention from a single source of information (e.g., radio talk show about hypertension, a workshop about hypertension, health education during a hospital visit, television talk shows about hypertension, formal education in school). However, many participants did not have good knowledge about preventive measures for hypertension (54.9% [n= 227]) or foods that could be eaten to help prevent hypertension (47.3% [n= 226]). Participants also had poor knowledge about the causes of hypertension; only 29% (n= 164) were able to mention two to four causes of hypertension and 58% (n= 325) did not have good knowledge about the types of food to avoid preventing hypertension.

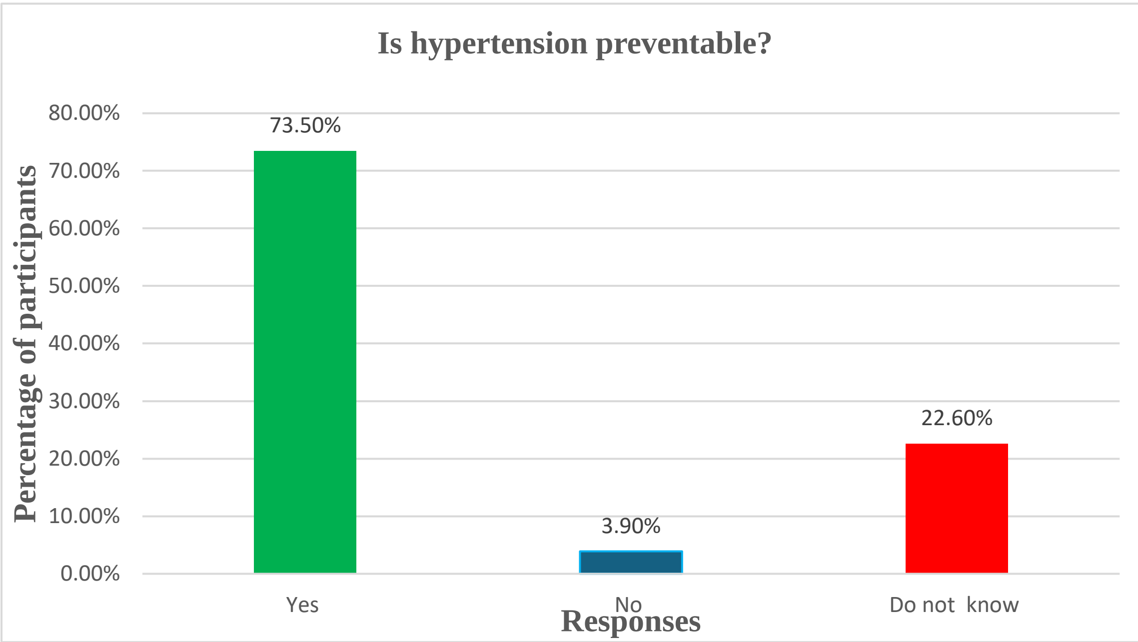
Table 8: Knowledge about Hypertension Prevention

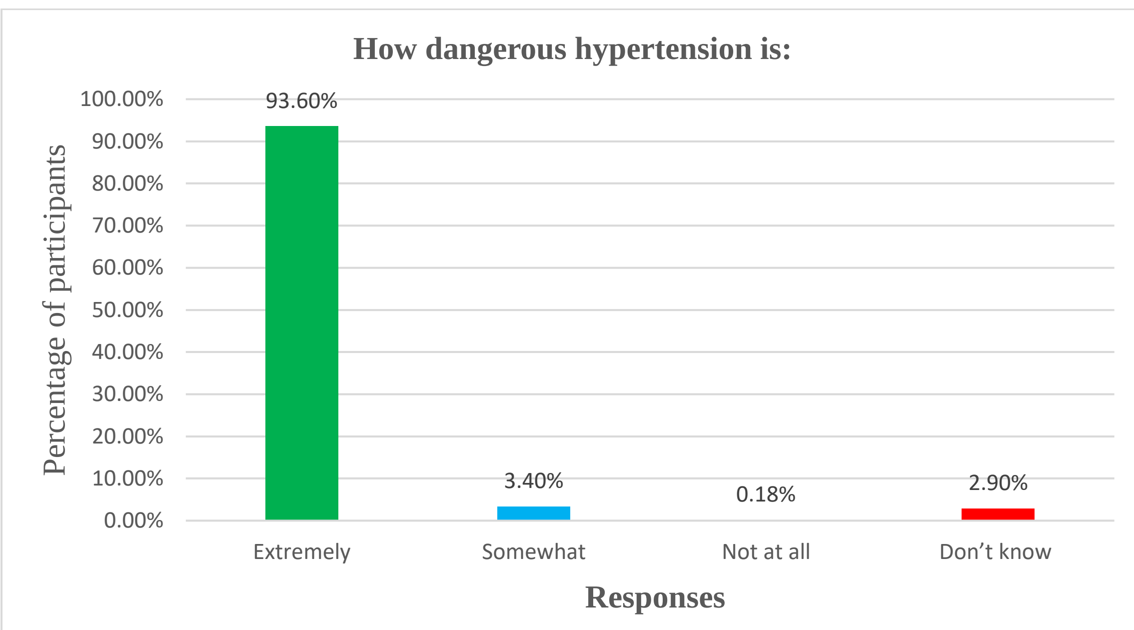
Variable	Frequency (%)
How dangerous hypertension is:	
Extremely	526 (93.6)
Somewhat	19 (3.4)
Not at all	1 (0.18)
Don’t know	16 (2.9)
Do you have hypertension/high blood pressure?	
No	279 (49.6)
Yes	59 (10.5)
Don’t know	224 (39.9)
If you are hypertensive, for how long have you had it (in complete years)	
≤2 years	22 (37.3)
3–4 years	9 (15.3)
5–-6 years	12 (20.3)
≥7 years	16 (27.1)
Can one prevent hypertension?	
No	22 (3.9)
Yes	413 (73.5)
Don’t know	127 (22.6)
If yes in the above question, what are the preventive measures for hypertension?	
No correct answer	91 (22.0)
1 correct answer	136 (32.9)
2 correct answers	105 (25.5)
3–5 correct answers	81 (19.6)
Foods for prevention of hypertension	
No correct type	266 (47.3)
1 correct type	154 (27.4)
≥2 correct types	142 (25.3)

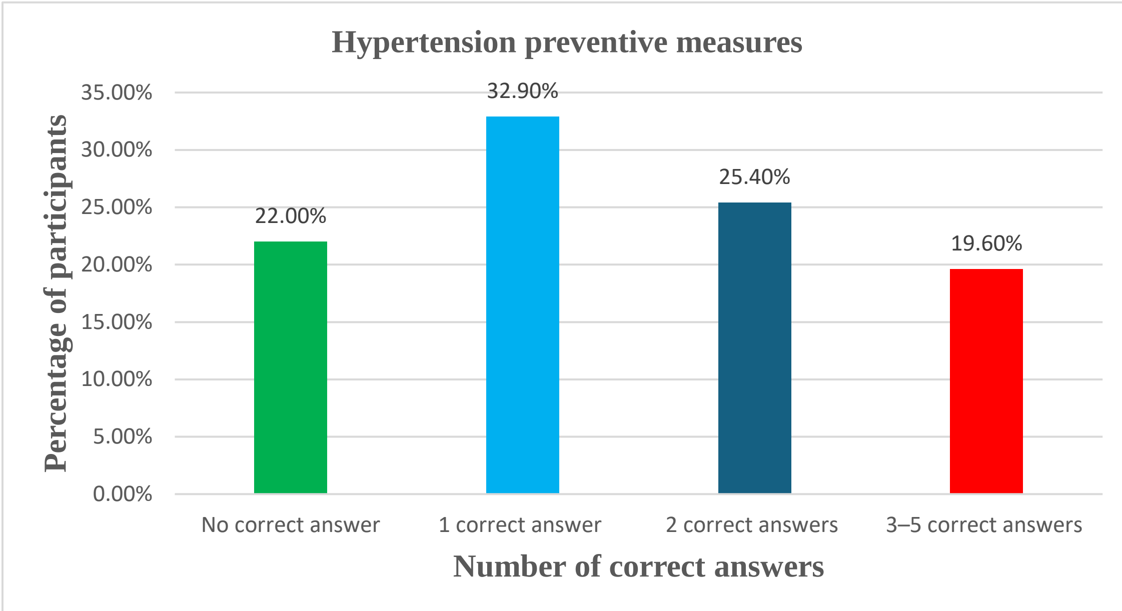
Table 8 Continued

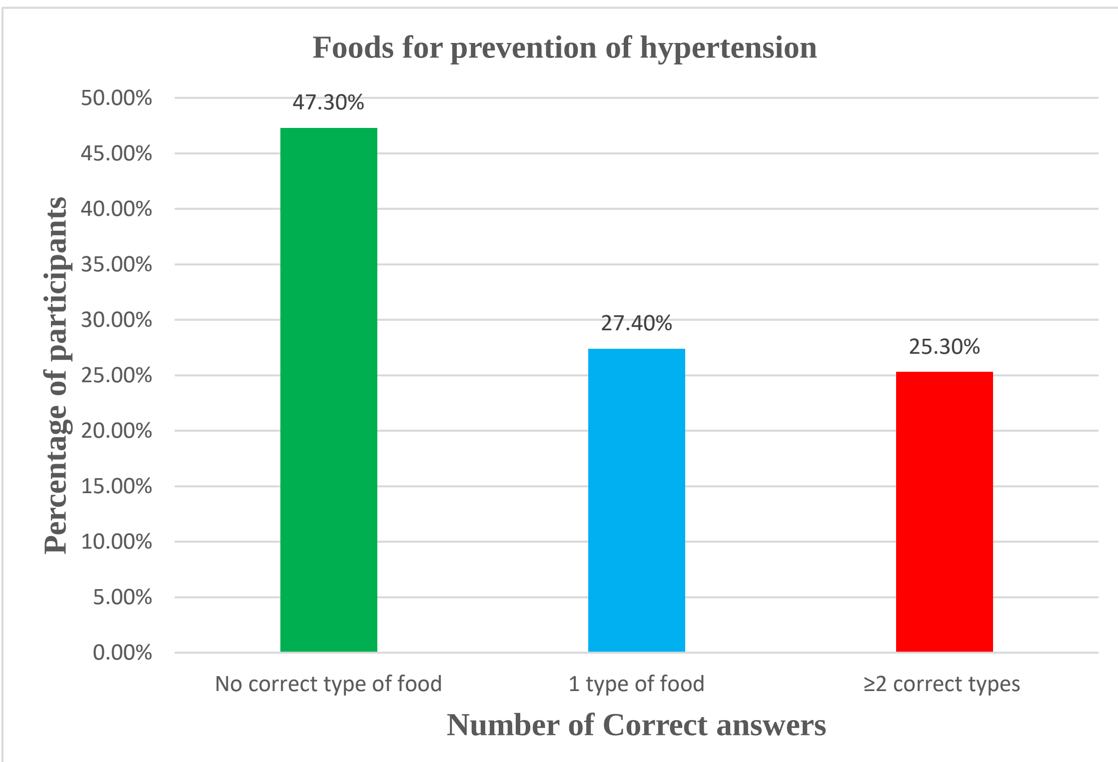
Variables	**Frequency (%)**
Foods to avoid	
No correct type	325 (57.8)
1 correct type	107 (19.0)
2–5 correct types	130 (23.1)
Causes of hypertension	
Don’t know	.25 (22.2)
1 cause	273 (48.6)
2–4 causes	164 (29.2)
Sources of hypertension information	
Never learned from anywhere	17 (3.0)
1 source	280 (49.8)
2 sources	194 (34.5)
3–4 sources	71 (13.0)

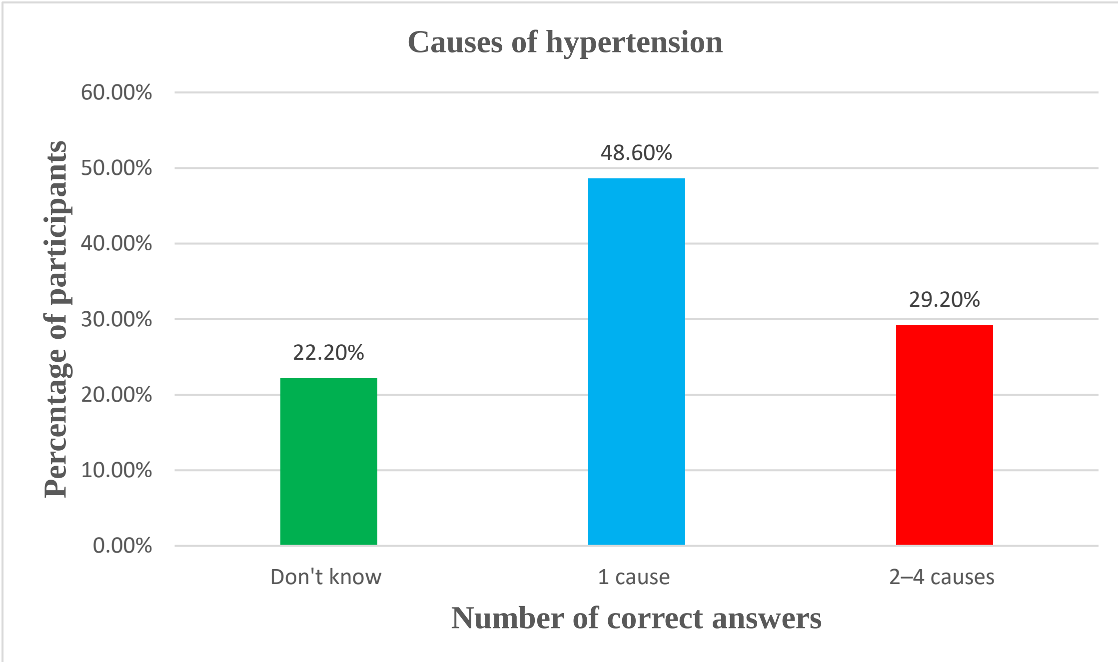
*Chart 3: **Knowledge about the prevention of hypertension***






Hypertension preventive measures
Percentage of participants
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
22.00%
32.90%
25.40%
19.60%
No correct answer
1 correct answer
2 correct answers
3–5 correct answers
Number of correct answers


Foods for prevention of hypertension
Percentage of participants
50.00%
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
47.30%
27.40%
25.30%
No correct type of food
1 type of food
≥2 correct types
Number of Correct answers


Causes of hypertension
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percentage of participants
22.20%
48.60%
29.20%
Don't know
1 cause
2–4 causes
Number of correct answers

5.1.4 Healthy Lifestyle behaviours

Healthy lifestyle behaviours reported by participants that influenced the prevalence of hypertension were analysed and the results are presented in Table 9. This analysis showed that 66.6% (n= 374) of participants said that they performed vigorous-intensity physical activities (e.g., digging, lifting heavy items to earn a living, bricklaying), and the majority (61.8% [n= 231]) performed those activities 6–7 days in a typical week. Moreover, approximately 42% (n= 235) of participants spent ≥3 hours performing vigorous-intensity physical activities in a typical day. In addition, 75% (n= 423) of the participants were engaged in moderate-intensity physical work, with approximately 53% (n= 300) participants performing these activities for ≥3 hours in a typical day and 45% performing these activities ≥3 days in a typical week. Most (88.3% [n=496]) participants walked for 10 minutes continuously, with 78.8% (n= 443) walking for 10 minutes continuously at some point on 3–7 days in a typical week; 45.4% (n= 255) spent ≥3 hours walking to/from their place of work on a typical day. Only 13.7% (n= 77) of participants rode a bicycle, and of those only 13.7% (n= 77) spent 120 minutes cycling in a typical day.

Table 9: Individual Healthy Lifestyle Behaviours that Influence the Prevalence of Hypertension (N=562)

Variable	Frequency (%)
Vigorous-intensity activities (carrying or lifting heavy loads, digging or construction work) for at least 10 minutes continuously	
No	188 (22.5)
Yes	374 (66.6)
If yes in the question above, what is the number of days of doing vigorous activities per week	
2–3 days	71 (19.0)
4–5 days	72 (19.3)
6–7 days	231 (61.8)
Total time spent on vigorous intensity activities on a typical day	
0–2 hours	327 (58.2)
3–4 hours	154 (27.4)
≥5 hours	81 (14.4)
Moderate-intensity work (or carrying light loads) for at least 10 minutes continuously (paid or unpaid or both)	
No	139 (24.7)
Yes	423 (75.3)
Days of moderate intensity work in a week (carrying light loads) for at least 10 minutes continuously	
0–2 days	307 (54.6)
3–4 days	179 (31.9)
7 days	76 (13.5)
Time doing moderate intensity work in a day (in hours)	
0–2 hours	262 (46.6)
3–4 hours	203 (36.1)
5–10 hours	97 (17.3)

Table 9 Continued

Variable	**Frequency (%)**
Walking continuously for 10 minutes from places	
No	66 (11.7)
Yes	496 (88.3)
Days spent walking 10 minutes continuously in a typical week	
0 days	66 (11.7)
1–2 days	53 (9.4)
3–7 days	443 (78.8)
Time spent walking to travel in a typical day	
0–2.5 hours	307 (54.6)
3–5.5 hours	212 (37.7)
6–11.5 hours	43 (7.7)
Use a bicycle for 10 minutes continuously	
No	485 (86.3)
Yes	77 (13.7)
Time spent cycling to travel on a typical day	
Does not ride a bicycle	485 (86.3)
≤120 minutes	77 (13.7)

Most participants (87.7% [n= 485) did not engage in vigorous-intensity sports and only 11.6% (n= 65) participated in such activities for more than 30 minutes on days when they chose to perform these activities (Table 10). Moreover, only 7.8% (n= 44) of the participants said that they participated in moderate-intensity sports, of which 6.6% (n= 37) performed such activity for ≥31 minutes in a typical day.

Table 10: Frequency of Vigorous Sports Activities (N=562)

Variables	Frequency (%)
Do you do vigorous-intensity sports?	
No	485 (86.3)
Yes	77 (13.7)
Time spent on vigorous-intensity sports (minutes)	
None	485 (86.3)
1–30	12 (2.1)
31–60	31 (5.5)
61–90	2 (0.4)
≥91	32 (5.7)
Do moderate-intensity sports	
No	518 (92.2)
Yes	44 (7.8)
Time spent on moderate-intensity sports (minutes)	
None	518 (92.2)
1–30	7 (1.3)
31–60	20 (3.6)
≥61	17 (3.0)
Days doing moderate-intensity sports	
None	518 (92.2)
1–2 days	25 (4.5)
3–4 days	8 (1.4)
≥5 days	11 (2.0)

5.1.4.1 Smoking

Smoking rates were relatively low in the study cohort, with only 10.7% (n= 60) reporting that they were active smokers (Table 11); of these 46.7% (n= 28) had smoked for 1–5 years. Over half (36/60, 60%) of the smoking cohort used other types of tobacco (chewed, sucked, or sniffed), with 61.1% (n=22) using at least two products. Among the participants who smoked, 61.1% used pipes with tobacco and 0.2% (n=1) used piped tobacco and marijuana.

Table 11: Frequency of smoking in the study cohort (N=562)

Variables	Frequency (%)
Do you smoke?	
No	502 (89.3)
Yes	60 (10.7)
If yes in the question above, for how long you have smoked (Years of smoking)	
1–5 years	28 (46.7)
6–10 years	11 (18.3)
11–15 years	2 (3.3)
≥16 years	19 (31.7)
If stated that yes to smoking above, do you use smokeless tobacco (chewed, sucked, or sniffed)	
No	24 (40.0)
Yes	36 (60.0)
If yes in the question above, what is the number of products of smokeless tobacco used daily	
1–2	22 (61.1)
3–4	9 (25.0)
5–6	2 (5.6)
≥7	3 (8.3)
Product used for smokeless tobacco in the above question	
Manufactured cigarettes	9 (25.0)
Hand rolled cigarettes	3 (8.3)
Pipes full of tobacco	22 (61.1)
Others	2 (5.6)
Other tobacco products	
Piped tobacco and marijuana	1 (50.0)
Chewing tobacco	1 (50.0)

5.1.4.2 Frequency of alcohol consumption

Only 28.8% (n= 162) of the participants drank alcohol; of these, 19.8% (n= 32) consumed alcohol one or two times a week with the majority (82.7% [n= 134]) drinking either beer, wine, or waragi (a distilled beverage made in Uganda); 58.6% (n= 95) of these participants drank ≤1000 ml of alcohol in one sitting (Table 12).

Table 12: Frequency of Alcohol Consumption in the Study Cohort (N=562)

Variables	**Frequency (%)**
Do you take alcohol?	
No	400 (71.2)
Yes	162 (28.8)
If yes in the question above, how often do you take alcohol in a week?	
Everyday	29 (18.0)
1–2 times a week	32 (19.8)
Once a month	27 (16.7)
Any other specify	74 (45.7)
If you are under any other duration, which duration do you take?	
3–4 times a week	8 (10.8)
1–4 times a month	8 (10.8)
1–4 times a year	45 (60.8)
Stopped drinking	13 (17.6)
If you take alcohol, which type of alcohol to you consume?	
Beer, wine, or waragi	134 (82.7)
Beer and wine	6 (3.7)
Beer, wine, waragi, and others	22 (13.6)
Quantity of alcohol consumed in one sitting (each time they drink)	
0 liters/no longer drinks	8 (4.9)
≤1000 ml	95 (58.6)
>1000 ml	59 (36.4)

5.1.4.3 Description of Dietary Patterns

Only 10.1% (n= 57) of participants reported not eating any fruit in their usual diet. Most participants (34.9% [n= 196]) ate fruits more than 4 days in a typical week. Most participants (69% [n= 388]) ate vegetables 2–4 days a week with 64.4% (n =362) of these participants eating >2 tablespoons of vegetables per serve. Of the 562 participants, only 32.4% (n= 182) ate red meat 1–2 days a week, with 23.5% (n= 132) of these participants eating around 101–150 g on each of those days or per serve. Approximately 27% (n= 151) of participants ate fish or white meat 1–2 days a week, with most (38.1% [n= 214]) of these participants eating 51–100 g per week. Approximately 70% (n= 392) of participants never added salt to their food, 55.9% (n= 314) never added seasoning to their food, and 50.9% (n= 286) sometimes ate processed food with high salt content. Most (73.9% [n= 415) participants stated that they believed that they ate just the right amount of salt.

Table 13: Frequency of Dietary Patterns

Variables	Frequency (%)
Eating fruit	
No	57 (10.1)
Yes	505 (89.9)
Days eating fruit in a week	
0 days	57 (10.1)
1–2 days	128 (22.8)
3–4 days	181 (32.2)
>4 days	196 (34.9)
Days eating vegetables in a week	
0 days	25 (4.5)
1 day	149 (26.5)
2–4 days	388 (69.0)
Tablespoons of vegetables eaten at one sitting	
0 tablespoons	25 (4.5)
1–2 tablespoons	175 (31.1)
>2 spoons	362 (64.4)
Number of days eating red meat in a typical week	
Once a month or once in 2 months	336 (59.8)
1–2 days	182 (32.4)
3–4 days	29 (5.1)
≥5 days	15 (2.7)
Grams of red meat eaten in a typical week	
0	211 (37.5)
1–50	39 (7.0)
51–100	100 (17.8)
101–150	132 (23.5)
≥151	80 (14.2)

Table 13 Continued

Variable	Frequency (%)
Days eating white meat or fish	
Once a month/twice a month/rarely	216 (38.4)
1–2 days	151 (26.9)
3–4 days	149 (26.5)
≥5 days	46 (8.2)
Grams of white meat eaten in a typical week	
0	130 (23.1)
1–50	97 (17.3)
51–100	214 (38.1)
≥101	121 (21.5)
How often do you add salt to food?	
Never	392 (69.7)
Sometimes	155 (27.6)
Always	15 (2.7)
How often do you add seasoning to food?	
Never	314 (55.9)
Sometimes	155 (27.6)
Always	93 (16.5)
How often do you eat processed food high in salt content?	
Never	155 (27.6)
Sometimes	286 (50.9)
Always	121 (21.5)

Table 13 – Continued

Variable	Frequency (%)
Quantity of salt consumed	
Too much	57 (10.1)
Just the right amount	415 (73.9)
Too little	90 (16.0)

5.1.5 Prevalence of Hypertension

More than half (58.7% [n= 330]) of the participants reported they had previously had their blood pressure measured and 64.5% (n= 213) had their blood pressure measured within the last year (Table 14). Self-reported results for blood pressure showed that the majority (59.7% [n= 197]) were normotensive (normal blood pressure). Further analysis of systolic blood pressure indicated that 24.6% (n= 138) of the participants had raised systolic blood pressure (≥140 mmHg). The diastolic blood pressure readings indicated that approximately 23% (n= 130) of participants had diastolic blood pressure greater than 90 mmHg. Overall, 32.4% (n= 182) of the participants were hypertensive; of these, only 18.5% (n= 61) were aware that they were hypertensive and 21.1% (n= 70) said that they were not aware of their hypertension status.

Table 14: Prevalence of Hypertension (N=562)

Variable	Frequency (%)
Ever had your blood pressure measured	
No	232 (41.3)
Yes	330 (58.7)
If yes above, when was the last time you measured your blood pressure?	
≤12 months	213 (64.5)
13–24 months	39 (11.8)
25–36 months	26 (7.9)
≥37 months	52 (15.8)
If yes, what were the blood pressure results (self-report)	
Don't know	70 (21.2)
High	61 (18.5)
Low	2 (0.6)
Normal	197 (59.7)
Status of systolic blood pressure	
Normal systolic blood pressure (<140 mmHg)	424 (75.4)
Raised systolic blood pressure (≥140 mmHg)	138 (24.6)
Systolic hypertension category	
Optimal (<120 mmHg)	207 (36.8)
Normal (<130 mmHg)	132 (23.5)
High normal (130–139 mmHg)	87 (15.5)
Mild hypertension (140–159 mmHg)	83 (14.8)
Moderate hypertension (160–179 mmHg)	31 (5.5)
Severe hypertension (≥180 mmHg)	22 (3.9)

Table 14 Continued

Variable	Frequency (%)
Diastolic hypertension category	
Optimal (<80 mmHg)	221 (39.3)
Normal (<85 mmHg)	115 (20.5)
High normal (85–89 mmHg)	96 (17.1)
Mild hypertension (90–99 mmHg)	85 (15.1)
Moderate hypertension (100–109 mmHg)	23 (4.1)
Severe hypertension (≥110 mmHg)	22 (3.9)
Isolated systolic hypertension	
≤140 mmHg	424 (75.5)
Level 1 (140–159 mmHg)	81 (14.4)
Level 2 (≥160 mmHg)	57 (10.1)
Isolated diastolic hypertension	
≤90 mmHg	432 (76.9)
>90 mmHg	130 (23.1)
Hypertension category	
Normotensive	380 (67.6)
Hypertensive	182 (32.4)

5.1.5.1 Frequency distribution of BMI of the study cohort

Most of the participants (53.6 [n= 301]) had a normal BMI (18.5–24.5 kg/m^2). Table 15 shows that 16.2% (n= 91) of participants were overweight and 6.2% (n= 35) were obese.

Table 15: Frequency distribution of weight, height, and body mass index of the study cohort (N=562)

Variables	Frequency (%)
Weight, kgs	
31–50	86 (15.3)
51–70	346 (61.6)
71–90	108 (19.2)
>90	22 (3.9)
Height, meters	
0.61–0.80	12 (2.2)
1.41–1.60	334 (59.4)
>1.60	216 (38.4)
Body mass index, kg/m^2	
<18.5 (underweight)	135 (24.0)
18.5–24.5 (normal)	301 (53.6)
25–29.5 (overweight)	91 (16.2)
>29.5 (obese)	35 (6.2)

5.1.5.2 Comparison of BMI by Hypertension Status

The mean age of participants with hypertension was 49.7±17.2 years ($p<0.0001$), which indicated there was a strong relationship between mean age and hypertension status (Table 16). However, weight, height, and BMI did not show statistically significant relationships with hypertension.

Table 16: Comparison of weight, height, and BMI with hypertension status

Variable	Hypertension status		P-value
	Normotensive	Hypertensive	
	(*n*=380)	(*n*=182)	
Age (mean ± SD)	33.3±14.2	49.7±17.2	0.0001
Weight (mean ± SD)	62.6±15.5	65.1±15.0	0.0757
Height (mean ± SD)	1.6±0.1	1.6±0.1	0.1061
BMI (mean ± SD)	30.8±65.6	27.4±12.5	0.4971

BMI, body mass index; SD, standard deviation.

5.1.6 Comparison of Sociodemographic Characteristics by Hypertension Status

The relationships between sociodemographic variables and participants' hypertension status are presented in Table 17. In total, 562 participants from the eight villages (two communities/parishes) were included in this analysis. Although the prevalence of hypertension was higher in women compared with men (65.4% [n=119] vs. 34.6% [n=63], p=0.64) the difference was not significantly different. There was a strong relationship between age and hypertension status (33.3 years vs. 49.7 years, p<0.0001). The number of adults in each household, participants' tribe, and religion did now show significant relationships with hypertension status. However, marital status (p<0.0001) and the highest level of education (p<0.0001) both showed strong associations with hypertension status. Moreover, the relationship with a hypertensive family member had an association with hypertension status (p=0.028). Finally, monthly income showed a significant relationship with hypertension status (p=0.007).

Table 17: Comparison of Sociodemographic Characteristics by Hypertension Status (N=562)

Variable	**Normotensive (n=380)**	**Hypertensive (n=182)**	**p-value**
Gender			
Male	124 (32.6)	63 (34.6)	
Female	256 (67.4)	119 (65.4)	0.640
Age group, years			
18–24	127 (33.4)	12 (6.6)	
25–34	103 (27.1)	24 (13.2)	
35–44	74 (19.5)	39 (21.4)	
≥45	76 (20.0)	107 (58.8)	**0.0001**
Number of adults in the household			
1–2	304 (80.0)	153 (84.1)	
3–4	76 (20.0)	29 (15.9)	0.247
Religion			
Christian	263 (69.2)	129 (70.9)	
Islam	116 (30.5)	53 (29.1)	
Any other	1 (0.3)	0 (0.0)	0.787
Tribe			
Baganda/Basoga	323 (85)	144 (79.1)	
Others	57 (15.0)	38 (20.9)	0.082

Table 17 Continued

Variables	Normotensive (n=380)	Hypertensive (n=182)	p-value
Marital status			
Never married	132 (34.7)	26 (14.3)	
Married	199 (52.4)	103 (56.6)	
Windowed/separated/divorced	49 (12.9)	53 (29.1)	**0.0001**
Highest level of education attained			
None	21 (5.5)	27 (14.8)	
Primary	162 (42.6)	99 (54.4)	
Secondary	169 (44.5)	44 (24.2)	
Tertiary	28 (7.4)	12 (6.6)	**0.0001**
Family history of hypertension			
No	237 (62.5)	102 (56.0)	
Yes	112 (29.5)	58 (31.9)	
Don't know	31 (8.2)	22 (12.1)	0.216
If yes in the question above, what is the relationship with hypertensive person?			
Grandmother/father	19 (16.8)	6 (10.4)	
Mother/father	45 (39.8)	18 (31.0)	
Sibling	18 (16.8)	18 (31.0)	
Other relatives	30 (26.6)	16 (27.6)	**0.028**
Occupation			
Unemployed	291 (76.6)	146 (80.2)	
Employed	89 (23.4)	36 (19.8)	0.331
Monthly income			
Does not earn	120 (31.6)	52 (28.6)	
UGX <400,000	247 (65.0)	112 (61.5)	
UGX 400,000 and above	13 (3.4)	18 (9.9)	0.007

UGX, Uganda shillings.

5.1.7 Comparison of Knowledge about the Prevention of Hypertension-by-Hypertension Status

Table 18 shows the relationship between participants' knowledge about the prevention of hypertension and their hypertension status. The results showed that there was a strong association between hypertension status and a family history of hypertension (self-reported) ($p<0.0001$). None of the other variables exhibited significant associations with hypertension status.

Table 18: Comparison of Knowledge about Hypertension Prevention and Hypertension Status (N=562)

Variable	Normotensive (n=380)	Hypertensive (n=182)	p-value
Perceived severity of hypertension			
Extremely dangerous	358 (94.2)	168 (92.3)	
Somewhat dangerous	10 (2.6)	9 (5.0)	
Not at all dangerous	1 (0.3)	0 (0.0)	
Don't know	11 (2.9)	5 (2.7)	0.478
History of hypertension (self-reported)			
No	221 (58.2)	58 (31.9)	
Yes	16 (4.2)	43 (23.6)	
Don't know	143 (37.6)	81 (44.5)	**0.0001**
Can one prevent hypertension?			
No	14 (3.7)	8 (4.4)	
Yes	274 (72.1)	139 (76.4)	
Don't know	92 (24.2)	35 (19.2)	0.35
If yes in the question above, what are the HT preventive measures?			
No correct answer	61 (22.3)	30 (21.6)	
1 correct answer	93 (33.9)	43 (30.9)	
2 correct answers	63 (23.0)	42 (30.2)	
3–5 correct answers	57 (20.8)	24 (17.3)	0.431
Foods that prevent hypertension			
No correct type	184 (48.4)	82 (45.1)	
1 correct type of food	97 (25.5)	57 (31.3)	
2 correct types	99 (26.1)	43 (23.6)	0.352
Foods to avoid			
No correct type	216 (56.8)	109 (59.9)	
1 correct type	76 (20.0)	35 (19.2)	
2–5 correct types	88 (23.2)	38 (20.9)	0.681
Causes of hypertension			
Don't know	78 (20.5)	47 (25.8)	
One cause	192 (50.5)	81 (44.5)	
2–4 causes	110 (29.0)	54 (29.7)	0.287

5.1.8 Association Between Physical Activity and Hypertension Status

The findings indicated that there was a strong relationship between hypertension status and whether the participant engaged in moderate-intensity physical activity ($p<0.001$) (Table 19). The length of time that participants performed moderate-intensity physical activity showed a strong association with hypertension status ($p<0.001$). Moreover, walking continuously from for 10 minutes showed a significant relationship with hypertension status ($p<0.016$). A strong association was also found between hypertension status and the number of days those participants performed vigorous-intensity sports in a typical week ($p<0.0001$), although the time they spent performing such activity showed a weak relationship with hypertension status ($p=0.041$). Similarly, days spent performing moderate-intensity sports exhibited a weak association with hypertension status ($p=0.044$). The other variables related to physical activity did not have statistically significant relationships with hypertension status.

Table 19: Physical Activity and Hypertension Status (N=562)

Variable	**Normotensive (n=380)**	**Hypertensive (n=182)**	**p-value**
Vigorous-intensity activity work			
No	123 (32.4)	65 (35.7)	
Yes	257 (67.6)	117 (64.3)	
If yes in the question above, how many days do you perform vigorous-intensity work in a typical week?			
2–3 days	56 (21.8)	15 (12.8)	
4–5 days	47 (18.3)	25 (21.4)	
6–7 days	154 (59.9)	77 (65.8)	0.119
Time spent doing vigorous-intensity work			
0–2 hours	153 (59.5)	65 (55.5)	
3–4 hours	64 (25.0)	38 (32.4)	
≥5 hours	40 (15.5)	14 (12.1)	0.148
Moderate-intensity activities			
No	78 (20.5)	61 (33.5)	
Yes	302 (79.5)	121 (66.5)	**0.001**
If yes in the question above, how many days do you spend doing moderate-intensity activities?			
0–2 days	171 (56.6)	61 (50.6)	
3–4 days	94 (31.0)	41 (33.5)	
7 days	37 (12.4)	19 (15.9)	0.331
Time spent doing moderate-intensity activities			
0–2 hours	123 (40.8)	71 (58.8)	
3–4 hours	114 (37.6)	40 (33.0)	
5–10 hours	65 (21.6)	10 (8.2)	**0.001**

Table 19 continued

Variable	Normotensive (n=380)	Hypertensive (n=182)	p-value
Walking continuously for 10 minutes			
No	37 (9.7)	29 (15.9)	
Yes	343 (90.3)	153 (84.1)	**0.016**
If yes, in the question above, how many days do you spend walking for 10 minutes continuously in a typical week?			
0 days	37 (9.7)	29 (15.9)	
1-2 days	34 (9.0)	19 (10.4)	
3-7days	309 (81.3)	134 (73.6)	0.073
Time spent walking 10 minutes continuously in a typical week			
0–2.5 hours	200 (52.6)	107 (58.8)	
3-5.5 hours	147 (38.7)	65 (35.7)	
6–11.5 hours	33 (8.7)	10 (5.5)	0.249
Ride a bicycle for 10 minutes			
No	321 (84.5)	162 (89.0)	
Yes	59 (15.5)	18 (9.9)	0.069
If yes in the question above, what time do you spend cycling?			
Does not ride a bicycle	321 (84.5)	162 (89.0)	
1–120 minutes	47 (12.3)	14 (7.7)	
121–480 minutes	12 (3.2)	6 (3.3)	0.281
Days spent doing vigorous-intensity sports in a typical week			
1–2 days	6 (15.8)	2 (4.4)	
2–4 days	32 (84.2)	37 (95.6)	**0.0001**

Table 19 continued

Variable	Normotensive (n=380)	Hypertensive (n=182)	p-value
Time spent doing vigorous-intensity sports in a typical day			
0 minutes	323 (85.0)	162 (89.0)	
1–30 minutes	11 (2.9)	1 (0.6)	
31–60 minutes	26 (6.8)	5 (2.7)	
61–90 minutes	2 (0.5)	0 (0.0)	
>90 minutes	18 (4.8)	14 (7.7)	**0.041**
Moderate-intensity sports			
No	345 (90.8)	173 (95.1)	
Yes	35 (9.2)	9 (4.9)	0.107
Days spent doing moderate-intensity sports in a week			
Does not do	345 (90.8)	173 (95.1)	
1–2 days	23 (6.0)	2 (1.1)	
3–4 days	6 (1.6)	2 (1.1)	
≥5 days	6 (1.6)	5 (2.7)	**0.044**
Time spent doing moderate-intensity sports in a week			
0 minutes/blank	345 (90.8)	173 (95.10)	
1–30 minutes	4 (1.0)	3 (1.64)	
31–60 minutes	17 (4.5)	3 (1.64)	
≥61 minutes	14 (3.7)	3 (1.64)	0.169

5.1.9 Dietary Behaviours and their Association with Hypertension Status

The number of tablespoons of vegetables a participant consumed in a serve on one day in a week ($p=0.049$) and the amount (g) of white meat consumed ($p=0.036$) in a week showed weak associations with hypertension status (Table 20). Conversely, adding salt or salty sauce to food before or during eating had a strong association with hypertension status ($p<0.0001$). Similarly, how often participants ate processed food (which is known to be high in salt) had a strong association with hypertension status ($p<0.0001$). The perceived amount of salt or salty sauce consumed also had a strong association with hypertension status ($p<0.001$). The other dietary-related variables showed no significant associations with hypertension in this analysis.

Table 20: Dietary Behaviours and their Association with Hypertension Status

Variable	Normotensive (n=380)	Hypertensive (n=182)	p-value
Eats fruit			
No	32 (8.4)	25 (13.7)	
Yes	348 (91.6)	157 (86.3)	0.265
Days eating fruit in a typical week			
0 days	32 (8.4)	25 (13.7)	
1–2 days	91 (24.0)	37 (20.3)	
2–4 days	124 (32.6)	57 (31.3)	
≥5 days	133 (35.0)	63 (34.7)	0.240
Days eating vegetables in a typical week			
Does not take	16 (4.2)	9 (5.0)	
1 day	108 (28.4)	41 (22.5)	
2–4 days	256 (67.4)	132 (72.5)	0.357
Number of tablespoons of vegetables eaten in one serve			
0 tablespoons	16 (4.2)	9 (5.0)	
1–2 tablespoons	132 (34.8)	43 (23.6)	
3–4 days	184 (48.4)	108 (59.3)	
≥5 days	48 (12.6)	22 (12.1)	0.049
Grams of red meat in a typical week			
0	140 (36.8)	71 (39.0)	
1–50	21 (5.6)	18 (9.9)	
51–100	71 (18.7)	29 (15.9)	
101–150	92 (24.2)	40 (22.0)	
≥151	56 (14.7)	24 (13.2)	0.340

Table 20 Continued

Variable	N=562 Normotensive (n=380)	Hypertensive (n=182)	p-value
Days of eating white meat in a week			
Once a month/twice in 2 months	136 (35.8)	80 (44.0)	
1–2 days	110 (28.9)	41 (22.5)	
3–4 days	106 (27.9)	43 (23.6)	
≥5 days	28 (7.4)	18 (9.9)	0.120
Grams of white meat in a week			
0	77 (20.3)	53 (29.1)	
1–50	66 (17.4)	31 (17.0)	
51–100	145 (38.1)	69 (37.9)	
≥101	92 (24.2)	29 (16.0)	**0.036**
Add salt or salty sauce to food before or during eating			
Never	253 (66.6)	139 (76.4)	
Sometimes	114 (30.0)	41 (22.5)	
Always	13 (3.4)	2 (1.1)	**0.0001**
Add salt and salty seasoning while cooking in your household			
Never	231 (60.8)	83 (45.6)	
Sometimes	100 (26.3)	55 (30.2)	
Always	49 (12.9)	44 (24.2)	**0.0001**
Frequency of eating processed food high in salt			
Never	83 (21.8)	72 (39.6)	
Sometimes	216 (56.9)	70 (38.5)	
Always	81 (21.3)	40 (23.0)	**0.0001**
Perceived amount of salt or salty sauce consumed			
Too much	41 (10.8)	16 (8.8)	
Just the right amount	293 (77.1)	122 (67.0)	
Too little	46 (12.1)	44 (24.2)	**0.001**

5.1.10 Relationship Between Tobacco Use and Hypertension Status

The history of smoking had a strong association with hypertension status (p=0.002) and the length of time as a smoker also had a relationship with hypertension status (p=0.054) (Table 21). However, the history of using smokeless tobacco, how long it was used, how often the participant had smoked, the type of product smoked, and the quantity smoked did not show significant associations with hypertension status.

Table 21: Tobacco Use and Hypertension Status (N=562)

Variable	Normotensive (n=380)	Hypertensive (n=182)	p-value
History of smoking			
No	350 (92.1)	152 (83.5)	
Yes	30 (7.9)	30 (16.5)	**0.002**
If yes in the question above, how long have you smoked?			
1–5 years	17 (56.7)	11 (36.7)	
6–10 years	6 (20.0)	5 (16.6)	
11–15 years	2 (6.6)	0 (0.0)	
≥16 years	5 (16.7)	14 (46.7)	**0.054**
History of using smokeless tobacco			
No	12 (40.0)	12 (40.0)	
Yes	18 (60.0)	18 (60.0)	1.000
If yes in the above question, what is the number of products smoked daily?			
1–2	10 (55.6)	12 (66.6)	
3–4	6 (33.3)	3 (16.7)	
≥5	2 (11.1)	3 (16.7)	0.702

5.1.11 Relationship Between Alcohol Consumption and Hypertension Status

The history of alcohol consumption (Table 22) had a significant relationship with hypertension status (p=0.022). However, the other variables related to alcohol did not have statistically significant associations with hypertension status.

Table 22: Relationship Between Alcohol Consumption and Hypertension Status

Variable	**Normotensive (n=380)**	**Hypertensive (n=182)**	**p-value**
Do you take alcohol?			
No	282 (74.2)	118 (64.8)	
Yes	98 (25.8)	64 (35.2)	**0.022**
If yes in the question above, how often do you take alcohol?			
Everyday	19 (19.4)	10 (15.6)	
1–2 times a week	18 (18.4)	14 (21.9)	
Once a month	18 (18.4)	9 (14.1)	
Other duration	43 (43.8)	31 (48.4)	0.764
Type of alcohol consumed			
Beer or wine or waragi	80 (81.6)	54 (84.4)	
Beer and wine	4 (4.1)	2 (3.1)	
Beer, wine and waragi	1 (1.0)	1 (1.6)	
Beer, wine, waragi and others	13 (13.3)	7 (10.9)	0.942
Quantity of alcohol consumed in one sitting			
0 liters/no longer drinks	5 (5.1)	3 (4.7)	
0.1–1 liter	59 (60.2)	36 (56.3)	
≥1.1 liters	34 (34.7)	25 (39.0)	0.852

5.1.12 Crude Estimates from the Bivariate Regression Analysis

Demographic characters and their association with hypertension

The findings from the bivariate regression analysis are presented in this section. Table 23 shows that the demographic characteristics that exhibited significant statistical associations with hypertension status included age group, marital status, highest level of education attained, and monthly income. Concerning age, the risk for being hypertensive increased with increasing age. When compared with those aged 18–24 years, the OR for being hypertensive ranged from 2.47 (95% CI: 1.18–5.17) for those aged 25–34 years to 14.90 (95% CI: 7.69–28.86) for those aged ≥45 years. Those that were married, widowed, or separated/divorced had a higher likelihood of being hypertensive in comparison with the never-married category, with ORs of 2.63 (95 % CI: 1.62–4.26) for the married group and 5.49 (95% CI: 3.10–9.73) for those that were widowed, separated, or divorced.

An educational attainment of at least the primary level was associated with a reduced risk for being hypertensive when compared with having no formal education, with ORs of 0.48 (95% CI: 0.26–0.89) for primary, 0.20 (95% CI: 0.10–0.39) for secondary, and 0.33 (95% CI: 0.14–0.81) for tertiary education. Regarding the relationship with a hypertensive family member, participants who had a sibling with hypertension had an increased likelihood of being hypertensive (OR=3.11, 95% CI: 1.25–7.73). Interestingly, those with a monthly income of UGX >400,000 also had an increased likelihood of being hypertensive (OR=3.75, 95% CI: 1.47–9.59) compared with those who had a lower monthly income. All other demographic characteristics, including the village where participants lived, number of people per household, gender, tribe, religion, family history of hypertension, and occupation, did not exhibit statistically significant associations with hypertension status.

Table 23: Demographic Characteristics and Associations with Hypertension (N=562)

Variable	Crude OR (95% CI)
Village	
Mende Bbuga	**1.00 (Ref)**
Bulondo	1.04 (0.52–2.07)
Mende Central	0.71 (0.35–1.47)
Kasengejje	0.66 (0.32–1.35)
Najemba	0.66 (0.32–1.35)
Nakasugga	0.60 (0.28–1.28)
Sanda Nalubi	1.38 (0.70–2.73)
Sesiriba	0.51 (0.24-1.09)
Number of adults in the household	
1–2	**1.00 (Ref)**
3–4	0.76 (0.47–1.21)
Region	
Christian	**1.00 (Ref)**
Islam	0.98 (0.66–1.444)
Age group, years	
18–24	**1.00 (Ref)**
25–34	2.47 (1.18–5.17) ***
35–44	5.58 (2.75–11.32) ***
≥45	14.90 (7.69–28.86) ***
Gender	
Male	**1.00 (Ref)**
Female	0.91 (0.62–1.33)

Table 23 Continued

Variable	Crude OR (95% CI)
Marital status	
Never married	**1.00 (Ref)**
Married	2.63 (1.62–4.26) ***
Widowed/separated or divorced	5.49 (3.10–9.73) ***
The highest level of education attained	
No education	**1.00 (Ref)**
Primary	0.48 (0.26-0.89) *
Secondary	0.20 (0.10-0.39) ***
Tertiary	0.33 (0.14-0.81) *
Family history of hypertension	
No	**1.00 (Ref)**
Yes	1.20 (0.81–1.78)
Don't know	1.65 (0.91–2.99)
Relationship with a hypertensive family member	
Grandmother/father	**1.00 (Ref)**
Mother/father	1.26 (0.53–3.01)
Sibling	3.11 (1.25–7.73) *
Other relatives	1.75 (0.72–4.27)
Occupation	
Unemployed	**1.00 (Ref)**
Employed	0.81 (0.52-1.24)
Monthly income (Uganda Shillings)	
No earnings	**1.00 (Ref)**
UGX 1-400,000	1.05 (0.71–1.55)
UGX 400,000 and above	3.20 (1.46–7.00) **

Ref = reference group; OR, odds ratio; CI, confidence interval; UGX, Uganda shillings.

* p≤0.01 to ≤0.05 *** p<0.009

** p<0.01 to ≤0.009

1 USD = 3,687.92 Uganda Shillings 1 GBP = 4,545.43 Uganda shillings

5.1.13 Knowledge and awareness of hypertension prevention and its association with hypertension status

Self-reported hypertension was found to be significantly associated with hypertension status (Table 24). Hypertensive individuals were generally aware of their hypertension status, as participants who mentioned that they were hypertensive were more likely to be found to be hypertensive when compared with those who said they were not hypertensive (OR=10.24, 95% CI: 5.39–19.47). However, participants who said that they did not know their hypertension status were less likely to be hypertensive compared with those who said that they were not hypertensive (OR=0.21, 95% CI: 0.11–0.40). The other variables did not show significant associations with hypertension status.

Table 24: Knowledge and awareness of hypertension prevention and its association with hypertension status (N=562)

Variable	Crude OR (95% CI)
Awareness about hypertension as a dangerous disease	
Extremely	1.00 (Ref)
Somewhat	1.92 (0.77–4.81)
Not at all	1.00
Don't know	0.97 (0.33–2.83)
Self-reported hypertension status	
No	1.00 (Ref)
Yes	10.24 (5.39–19.47) ***
Don't know	0.21 (0.11–0.40) ***
Duration with hypertension	
≤2 years	1.00 (Ref)
3–4 years	0.44 (0.08–2.58)
5–6 years	0.44 (0.09–2.24)
≥7 years	0.49 (0.12–2.22)
Awareness about hypertension as a preventive disease	
No	1.00 (Ref)
Yes	0.76 (0.30–1.66)
Don't know	0.57 (0.22–1.51)
Knowledge of hypertension preventive measures	
0 no correct answer	1.00 (Ref)
1 correct answer	0.94 (0.53–1.66)
2 correct answers	1.36 (0.75–2.44)
3–5 correct answers	0.86 (0.45–1.63)
Knowledge of foods for preventing hypertension	
No correct type	1.00 (Ref)
1 correct type	1.32 (0.87–2.00)
≥2 correct types	0.47 (0.18–1.22)

Table 24 Continued

Variable	Crude OR (95% CI)
Causes of hypertension	
Don’t know	**1.00 (Ref)**
1 cause of HT	0.70 (0.45–1.09)
2–4 causes of HT	0.81 (0.50–1.33)
Source of information about HT	
Has never learnt from anywhere	**1.00 (Ref)**
2 sources of information	1.11 (0.75–1.64)
3–4 sources of information	1.08 (0.62–1.89)
Any other source of information about HT	
N/A or never heard about HT	**1.00 (Ref)**
Community	0.87 (0.27–2.85)
Reading books	1
Personal experience/intuitive knowledge	0.63 (0.14–2.71)

5.1.14 Association Between Physical Activity and Hypertension

Participants whose daily work involved vigorous intensity physical activities (i.e., activities requiring a lot of physical effort and leading to significant increases in respiration or heart rate) for 6–7 days/week had an increased likelihood of being hypertensive (OR=1.87; 95% CI: 0.99–0.47) compared with those who performed vigorous activities less often (2–3 days/week) (see Table 25). Conversely, participants whose work involved moderate-intensity activities (i.e., activities involving a minimal amount of physical effort and only slight increases in breathing or heart rate) were found to have a significantly reduced likelihood of being hypertensive (OR=0.51; 95% CI: 0.34–0.76) compared with those whose work did not engage in moderate-intensity activities. In addition, spending 3–4 hours performing moderate-intensity work was associated with a reduced likelihood of being hypertensive and the risk was further reduced with the increase in the number of hours spent doing moderate-intensity activities each day (3–4 hours: OR=0.61, 95% CI: 0.41–0.90; 5–13 hours: OR=0.26, 95% CI: 0.14–0.48). Furthermore, participants who habitually walked continuously for at least 10 minutes had a reduced likelihood of experiencing hypertension (OR=0.53, 95% CI: 0.31–0.94) compared with those who did not. Moreover, participants who walked continuously for 10 minutes for

3–7 days in a typical week were less likely to be hypertensive (OR=0.55, 95% CI: 0.33–0.94) compared with those who did not walk at all in a typical week.

Concerning the number of days spent doing moderate-intensity sports, only those who engaged in moderate-intensity sports on 1–2 days/week were significantly less likely to be hypertensive (OR=0.17, 95% CI: 0.04–0.74) compared with those that did not practice such activity. All other variables under this section did not predict hypertension in the bivariate regression analysis.

Table 25: Physical Activities and their Association with Hypertension (N=562)

Variable	Crude OR (95% CI)
Vigorous activity work	
Yes	**1.00 (Ref)**
No	0.86 (0.59–1.25)
Days doing vigorous-intensity work in a typical week	
2–3 days	**1.00 (Ref)**
4–5 days	1.99 (0.94–4.20)
6–7 days	1.87 (0.99–0.47) *
Time spent doing vigorous-intensity activities	
0–2 hours	**1.00 (Ref)**
3–4 hours	1.39 (0.93–2.07)
≥5 hours	0.83 (0.48–1.44)
Moderate-intensity work	
No	**1.00 (Ref)**
Yes	0.51 (0.34–0.76) **
Days spent on moderate intensity work in a week	
0–2 days	**1.00 (Ref)**
3–4 days	1.20 (0.81–1.79)
7 days	1.44 (0.85–2.43)
Time spent on moderate-intensity work in a typical week	
0–2 hours	**1.00 (Ref)**
3-4 hours	0.61 (0.41–0.90) **
5-10 hours	0.26 (0.14–0.48) ***
Walking continuously for 10 minutes	
No	**1.00 (Ref)**
Yes	0.53 (0.31–0.89) *

Table 25 Continued

Variable	**Crude OR (95% CI) N=562**
Days spent walking 10 minutes continuously in a typical week	
0 days	**1.00 (Ref)**
1-2 days	0.71 (0.34–1.50)
3-7 days	0.55 (0.33–0.94) *
Time spent walking to travel in a typical day	
0-2.5 hours	1.00 (Ref)
3-5.5 hours	0.83 (0.57–1.20)
6-11.5 hours	0.57 (0.27–1.19)
Cycling for 10 minutes continuously	
No	1.00 (Ref)
Yes	0.60 (0.34–1.05)
Time spent cycling to travel on a typical day	
Does not ride a bicycle	1.00 (Ref)
1-120 minutes	0.61 (0.32–1.14)
121-480 minutes	1.09 (0.40–2.99)
Moderate-intensity sports continuous for 10 minutes	
No	1.00 (Ref)
Yes	0.56 (0.27–1.15)
Days doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical week	
0 days	1.00 (Ref)
1–2 days	0.17 (0.04–0.74) *
2–4 days	4.16 (1.95–8.89)
≥5 days	1.66 (0.500–5.52)
Time doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical day	
0 minutes	1.00 (Ref)
1–30 minutes	1.50 (0.33–6.76)
31–60 minutes	0.35 (0.10–1.22)
≥61 minutes	0.43 (0.12–1.51)

5.1.15 Associations between Dietary Factors and Hypertension

The number of days fruits were eaten in a typical week was related to the risk for developing hypertension (Table 26). Participants who ate fruit on 1–2 days/week had a reduced likelihood of developing hypertension (OR=0.52, 95% CI: 0.27–0.99) compared with those who did not eat fruit at all. However, participants who ate red meat 1–2 days in a typical week had an increased likelihood of being hypertensive (OR=1.10, 95% CI: 0.75–1.61) compared with those who ate red meat once or twice a month.

Concerning white meat (chicken and fish) consumption in a typical week, participants who ate white meat on 1–2 days per week were less likely to be hypertensive (OR=0.63, 95% CI: 0.40–1.00) compared with those who rarely ate white meat, although this had borderline statistical significance. The amount (g) of white meat eaten also had a significant association with hypertension, as participants who ate ≥101 g of white meat/week were less likely to be hypertensive (OR=0.47, 95% CI: 0.27–0.81) than those who did not eat white meat. In addition, participants who sometimes added salt or salty sauce to their food had an increased likelihood of being hypertensive (OR=0.65, 95% CI: 0.43–0.99) compared with those who never added salt. The likelihood of being hypertensive among participants who said that they sometimes or always added salt or salty seasoning while cooking in their households was almost two-fold (OR=1.53, 95% CI: 1.01–2.31 and OR=2.45, 95% CI: 1.55–4.03, respectively) compared with those who never added salt or salty seasoning.

However, the likelihood of being hypertensive was reduced among participants who sometimes or always ate processed food high in salt and fat (OR=0.37, 95% CI: 0.25–0.57) compared with those who never ate processed foods high in salt (OR=0.57, 95% CI: 0.35±0.93). Surprisingly, participants who perceived themselves to be eating too little salt were found to have an increased likelihood of being hypertensive compared with those who ate too much salt (OR=2.45, 95% CI: 1.20–4.99).

Table 26: Usual diet and associations with hypertension (N=562)

Variable	Crude OR (95% CI)
Eats fruit	
No	**1.00 (Ref)**
Yes	0.71 (0.39-1.30)
Number of days eating fruit in a typical week	
0 days	**1.00 (Ref)**
1–2 days	0.52 (0.27–0.99) *
2–4 days	0.59 (0.32–1.08)
≥5 days	0.61 (0.33–1.12)
Types of fruit eaten	
No fruit	**1.00 (Ref)**
1–2 types of fruit	1.36 (0.14–13.40)
≥3 types of fruit	1.38 (0.14–13.40)
Days eating vegetables in a typical week	
Does not take	**1.00 (Ref)**
1 Day	0.72 (0.31–1.69)
2–4 days	0.98 (0.44–2.17)
Number of tablespoons of vegetables per serve	
0 tablespoons	**1.00 (Ref)**
1–2 tablespoons	0.58 (0.24–1.40)
3–4 tablespoons	1.04 (0.45–2.44)
≥5 tablespoons	0.81 (0.31–2.13)
Number of days eating red meat in a typical week	
Once in a month/once in 2 months	**1.00 (Ref)**
1–2 days	1.10 (0.75–1.61) *
3–4 days	0.42 (0.16–1.14)
≥5 days	0.31 (0.07–1.41)

Table 26 Continued

Variable	Crude OR (95% CI)
Grams of red meat eaten on one of those days	
0	**1.00 (Ref)**
1–50	1.69 (0.85–3.37)
51–100	0.81 (0.48–1.35)
101–150	0.86 (0.54–1.37)
≥151	0.85 (0.48–1.47)
Number of days of eating white meat in a typical week	
Once a month/twice a month/rarely	**1.00 (Ref)**
1–2 days	0.63 (0.40–1.00) *
3–4 days	0.69 (0.44–1.08)
≥5 days	1.09 (0.57–2.10)
Grams of white meat eaten on one of those days (chicken, fish)	
0	**1.00 (Ref)**
1–50	0.68 (0.39–1.18)
51–100	0.69 (0.43–1.09)
≥101	0.47 (0.27–0.81) **
Add salt/salty sauce to food right before or during eating	
Never	**1.00 (Ref)**
Sometimes	0.65 (0.43–0.99) *
Always	0.28 (0.62–1.26)
Add salt/salty seasoning while cooking in your household	
Never	**1.00 (Ref)**
Sometimes	1.53 (1.01–2.31) *
Always	2.45 (1.55–4.03) ***
Frequency of eating processed food high in salt	
Never	**1.00 (Ref)**
Sometimes	0.37 (0.25–0.57) ***
Always	0.57 (0.35–0.93) *
Perceived amount of salt or salty sauce consumed	
Too much	**1.00 (Ref)**
Just the right amount	1.07 (0.58–1.98)
Too little	2.45 (1.20–4.99) *

5.1.16 Smoking and its association with hypertension

Table 27 shows there was an association between a history of smoking for ≥16 years and hypertension. Participants who had smoked for ≥16 years were over four times more likely to be hypertensive (OR=4.32, 95% CI: 1.21–15.44) than those who had smoked for only 1–5 years. The type of smoking product, being a current smoker, and the number of products smoked daily did not show significant relationships with hypertension.

Table 27: Smoking and its association with hypertension (N=562)

Variable	Crude OR (95% CI)
History of smoking	
No	**1.00 (Ref)**
Yes	2.30 (1.34–3.95)
Complete years of smoking	
1–5	**1.00 (Ref)**
6–10	1.29 (0.31–5.27)
11–15	1
≥16	4.32 (1.21–15.44) *
Product used to smoke	
Manufactured cigarettes	**1.00 (Ref)**
Hand rolled cigarettes	1 (0.06–15.99)
Pipes full of tobacco	2.89 (0.57–14.68)
Others	2 (0.09–44.35)
Currently, use smokeless tobacco	
No	**1.00 (Ref)**
Yes	1.53 (0.36–2.81)
Number of products smoked daily	
1–2	**1.00 (Ref)**
3–4	0.42 (0.08–2.11)
5–6	0.83 (0.46–15.09)
≥7	0.83 (0.46–15.09)

5.1.17 Association between alcohol consumption and hypertension

Participants who had a history of alcohol consumption were more likely to be hypertensive (OR=1.56, 95% CI: 0.07–2.29) compared with their counterparts who said that they did not consume alcohol (Table 28). Furthermore, participants who drank alcohol 1–4 times a month had a reduced likelihood of being hypertensive (OR=0.86, 95% CI: 0.01–1.08) compared with those who drank alcohol 3–4 times a week. This implied that higher frequencies of alcohol consumption increased the chances of acquiring hypertension in this sample.

Table 28: Association of alcohol consumption with hypertension (N=562)

Variable	Crude OR (95% CI)
History of alcohol consumption	
No	1.00 (Ref)
Yes	1.56 (1.07–2.29) *
How often alcohol consumed	
Everyday	1.00 (Ref)
1–2 times a week	1.45 (0.52–4.17)
Once a month	0.95 (0.31–2.88)
Any other duration	1.37 (0.56–3.35)
Any other duration of alcohol consumption	
3–4 times a week	1.00 (Ref)
1–4 times a month	0.86 (0.01–1.08) *
1–4 times a year	0.40 (0.08–1.89)
Stopped drinking	0.70 (0.12–4.23)
Type of alcohol consumed	
All types of local brew	1.00 (Ref)
Local brew	1.00
Stopped taking alcohol	0.33 (0.06–7.14)
Quantity of alcohol consumed in one sitting	
0 liters/no longer drinks	1.00 (Ref)
0.1–1 liter	1.02 (0.23–4.51)
≥1.1 liter	1.22 (0.27–2.51)

5.1.18 Health-seeking behaviour for hypertension and BMI

History of blood pressure measurement, self-reported blood pressure measurement, and BMI had significant associations with hypertension (Table 29). BMI was defined as underweight (15–19.9 kg/m^2), normal (20–24.9 kg/m^2), overweight (25–29.9 kg/m^2), and obese (30–35 kg/m^2) (Weir & Jan, 2019). Participants who had their blood pressure measured before this study were more likely to be found to be hypertensive (OR=1.70, 95% CI: 1.18–2.45) than those who had never had their blood pressure measured. In addition, participants who said that their previous blood pressure measurements were high were six times more likely to be hypertensive (OR=6.04, 95% CI: 2.79–13.07) compared with those who said they did not know their results.

The likelihood of being hypertensive increased with an increase in BMI. When compared with those with a BMI <18.5 kg/m^2, the odds of being hypertensive were almost twice as high among participants who had a BMI of 25–29.9 kg/m^2 (OR=1.91, 95% CI: 1.09–3.35) and close to three times as high among those with a BMI ≥30 kg/m^2 (OR=2.70, 95% CI: 1.26–5.79).

Table 29: Health-seeking behaviour for hypertension and body mass index (N=562)

Variable	Crude OR (95% CI)
History of blood pressure measurement	
No	**1.00 (Ref)**
Yes	1.70 (1.18–2.45) **
When blood pressure was last measured	
≤12 months	**1.00 (Ref)**
13–24 months	1.51 (0.76–3.01)
25–36 months	0.65 (0.26–1.62)
≥37 months	1.40 (0.76–2.59)
Results of blood pressure measurement (self-report)	
Don't know	**1.00 (Ref)**
High	6.04 (2.79–13.07) ***
Low	1.00
Normal	0.66 (0.37–1.19)
BMI (kg/m^2)	
<18.5 (underweight)	**1.00 (Ref)**
18.5–24.9 (normal)	1.04 (0.66–1.62)
25–29.9 (overweight)	1.91 (1.09–3.35) *
≥ 30 (obese)	2.70 (1.26–5.79) *

BMI, body mass index.

5.1.19 Multivariable Regression Analysis

The dependent variable used during multivariable regression analysis was hypertension category and the independent variables were sociodemographic characteristics, physical activity, dietary patterns, smoking, alcohol consumption, and BMI. A forward stepwise approach with a back-and-forth approach was used whereby variables were dropped at some steps and re-introduced when examining the direction of associations between the dependent and independent variables. The findings from the multivariable regression analysis are shown in Table 30. After adjusting for several confounders, the odds of developing hypertension increased significantly with increasing age, particularly for participants aged ≥45 years where the risk was 14 times higher than for those aged 18–24 years. Performing moderate-intensity physical activities for 5–10 hours in a typical week was associated with a reduced likelihood of being hypertensive (p=0.011; OR=0.42, 95% CI: 0.21–0.82) compared with those with at least 2 hours of moderate-intensity physical activity. However, participants who sometimes ate processed food with a high salt content had a reduced likelihood of being hypertensive (p=0.004; OR=0.49, 95% CI: 0.30–0.80) compared with those who never ate processed food high in salt. The odds of developing hypertension increased significantly by 2-fold among participants with a BMI of 25–29.9 kg/m^2 (overweight).

Table 30: Multivariable Regression Analysis

Variable	Odds ratio	p-value	95% Confidence interval
Age group, years			
18–24	**1.00 (Ref)**		
25–34	2.41	0.023	1.13–5.17
35–44	4.58	0.0001	2.19–9.60
≥45	13.94	0.0001	7.05–27.59
Time doing moderate-intensity activities in a typical week			
0–2 hours	**1.00 (Ref)**		
3–4 hours	0.74	0.189	0.47–1.16
5–10 hours	0.42	0.011	0.21–0.82
Frequency of eating processed food high in salt			
Never	**1.00 (Ref)**		
Sometimes	0.49	0.004	0.30–0.80
Always	0.99	0.960	0.55–1.78
BMI, kg/m^2			
<18.5 (underweight)	**1.00 (Ref)**		
18.5–24.9 (normal)	1.11	0.699	0.66–1.86
25–29.9 (overweight)	2.07	0.030	1.07–3.97
≥30 (obese)	2.28	0.064	0.95–5.43

5.1.20 Logistic Regression Model

To determine how well the statistical model fits a group of observed data, a goodness-of-fit test was used. At a 95% CI and an alpha of 0.05, the associations between healthy lifestyle behaviours and hypertension were assessed and a goodness-of-fit test was performed. The p-value of 0.82, which was greater than 0.05, indicated that the null hypothesis was not rejected (Table 31). This implied that the model fit the data well, as expected.

Table 31: Logistic Model for Hypertension Category and Goodness-of-fit Test

Number of observations	**N=562**
Number of covariate patterns	113
Pearson's chi-square (188)	89.03
Prob > chi-square	0.82

5.1.21 Summary of the Key Quantitative Findings

Overall, this study included 562 participants. Of these, almost 74% knew that hypertension was preventable. In addition, most (94%) participants knew that hypertension was extremely dangerous, and about 40% did not know their hypertension status. Almost two-thirds of the participants knew that they could do something to prevent hypertension, although less than one-quarter were able to mention three to five types of preventive measures, and only 5% were able to state three to four types of food that may help to prevent hypertension. More than half of the participants regularly practiced vigorous-intensity physical activities, with approximately 62% conducting these activities on at least 6 days in a typical week. However, less than 15% regularly participated in vigorous-intensity sports.

Approximately half of the participants had previously measured their blood pressure; of those, 64% last had had this measured within the past year. The overall prevalence of hypertension in the two studied communities was 32.4%. This included participants who knew that they were hypertensive at the time of data collection and those who did not know their hypertension status. When participants were stratified by hypertension status, the results showed that the mean age of hypertensive participants was 49.7±7.2 years ($p>0.0001$) (Table 16).

Overall, the risk for being hypertensive increased with participants' age. When compared with the group aged 18–24 years, the odds of being hypertensive ranged from 2.47 (95% CI: 1.18–5.17) for those aged 25–34 years to 14.90 (95% CI: 7.69–28.86) for those aged ≥45 years. In addition, being educated to at least the primary (basic) level was associated with a reduced risk for being hypertensive when compared with having no formal education (primary: OR=0.48, 95% CI: 0.26–0.89; secondary: 0.20, 95% CI: 0.10–0.39; and tertiary: 0.33, 95% CI: 0.14–0.81).

Of those who were hypertensive (32.4% of the total sample), only 23.6%, 43/182) knew that they were hypertensive at the time of data collection (Table 18). In addition, participants whose daily work involved moderate intensity physical activities had a reduced likelihood of being hypertensive compared with those who did not (OR=0.51, 95% CI: 0.34–0.76). Spending more than 2 hours/day engaged in moderate-intensity work was associated with a reduced likelihood of being hypertensive. Participants who stated that they habitually practiced vigorous-intensity sports for 1–2 days a week were also less likely to be hypertensive (OR=0.17, 95% CI: 0.04–0.74) compared with those who did not do any sports activities.

Participants who had no history of smoking were less likely to be hypertensive (OR=0.43, 95% CI: 0.25–0.75) compared with those who had a history of smoking, and those who had smoked for ≥16 years were over four times more likely to be hypertensive (OR=4.32, 95% CI: 1.21–15.44) than those who had smoked for only 1–5 years. Similarly, participants who had a history of alcohol consumption were more likely to be hypertensive (OR=1.56, 95% CI: 1.07–2.29) compared with their counterparts who did not consume alcohol. Furthermore, participants who drank alcohol 1–4 times a month had a reduced likelihood of being hypertensive (OR=0.86, 95% CI: 0.01–1.08) compared with those who drank alcohol 3–4 times/week

The likelihood of being hypertensive increased with participants' BMI. When compared with participants with a BMI less than 18.5 kg/m^2, the odds of being hypertensive were about two times higher among participants who had a BMI of 25–29.9 kg/m^2 (OR=2.07, 95% CI: 1.07–3.97) and close to three times higher among those with a BMI of 30 kg/m^2 and above (OR=2.28, 95% CI: 0.95–5.43).

5.2 Part II: Qualitative Findings

5.2.1 Introduction of the Qualitative Sample

This section presents the qualitative findings from this study. A total of 40 participants from eight different villages in the two selected parishes in Wakiso District were purposively recruited to take part in four focus group discussions. However, during the actual time of data collection, only 32 participants (15 men and 17 women) attended. Two focus group discussions for men, and two for women took place. A brief profile for the different participants in the four focus groups is presented in Tables 32, 33, 34, and 35 below.

Table 32: Participants in Focus Group Discussion 1 (FGD1)

Participant number (P)	Location (village)	Gender	Age (years)
1	Nakasugga	Female	70
2	Nakasugga	Female	62
3	Nakasugga	Female	35
4	Nakasugga	Female	50
5	Najjemba	Female	38
6	Najjemba	Female	31
7	Najjemba	Female	56
8	Kasengejje	Female	43
9	Kasengejje	Female	56
10	Kasengejje	Female	57

Table 33: Participants in Focus Group Discussion 2 (FGD2)

Participant number (P)	Location (village)	Gender	Age (years)
1	Nakasugga	Male	67
2	Nakasugga	Male	46
3	Nakasugga	Male	35
4	Najjemba	Male	20
5	Najjemba	Male	20
6	Kasengejje	Male	54

Table 34: Participants in Focus Group Discussion 3 (FGD3)

Participant number (P)	Location (village)	Gender	Age (years)
1	Bulondo	Female	68
2	Sanda	Female	40
3	Bugga	Female	22
4	Bulondo	Female	31
5	Bulondo	Female	40
6	Mende Central	Female	20
7	Mende Central	Female	20

Table 35: Participants in Focus Group Discussion 4 (FGD4)

Participant number (P)	Location (village)	Gender	Age
1	Bulondo	Male	30
2	Bulondo	Male	35
3	Bulondo	Male	26
4	Mende Central	Male	25
5	Sesiriba	Male	50
6	Bugga	Male	45
7	Bugga	Male	56
8	Sanda	Male	27
9	Mende Central	Male	50

The qualitative findings presented in this section were from the second phase of this sequential explanatory mixed methods study, which aimed to explore individuals' experiences of preventing hypertension. Four themes emerged from the data analysis that covered sociocultural factors, socioeconomic factors, knowledge and perceptions about hypertension, and proposed approaches for the prevention of hypertension. The first three themes focused on factors that may lead to an increased risk for developing hypertension and require interventions for prevention, whereas the fourth theme concerned proposed interventions to prevent hypertension. Thematic maps were developed to illustrate the relationships between themes, categories, codes, and transcripts.

5.2.2 Theme 1: Sociocultural factors related to hypertension

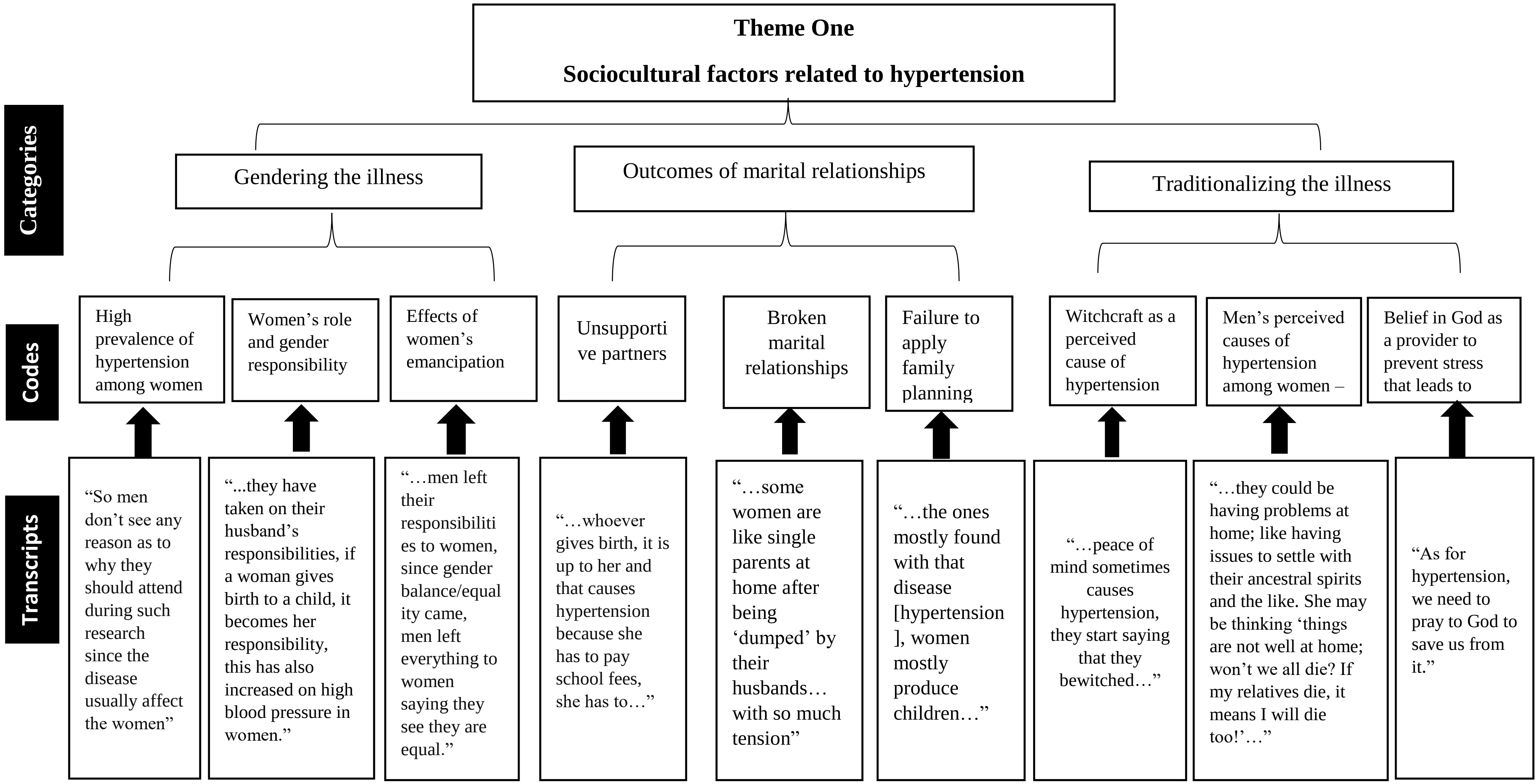
This theme represented the sociocultural factors related to hypertension, as shown in the thematic map (Figure 6). The theme evolved from three categories (gendering the illness, outcomes of marital relationships, and traditionalizing the disease). Sociocultural factors related to hypertension mainly included the social and cultural issues that were thought to predispose individuals to hypertension in the environment in which participants lived. These were considered important because they may also act as barriers to hypertension prevention. However, some of the cultural issues were concerned with individuals' perceptions of hypertension.

Participants strongly perceived hypertension as a disease associated with sociocultural issues or challenges in the community. The social issues included perceptions or experiences derived from the social environment in which the participants lived, whereas the cultural issues were those related to participants' beliefs and norms. The three categories explained how specific sociocultural issues (i.e., gendering the illness, outcomes of marital relationships, and traditionalizing the illness) led to an increased risk for developing hypertension. Figure 6 shows the link between the theme, categories, and outcome (i.e., increased risk for developing hypertension).

5.2.2.1 Gendering hypertension

Participants were asked why they thought the prevalence of hypertension was higher among women than among men, as found in the quantitative arm of the study. Several participants were not surprised by this finding because they said that hypertension was a disease associated with women. Some participants (male and female) said that a potential cause of hypertension was the stressful life events that women experience, such as needing to provide for their children's requirements in situations where men were not supportive of their families. Gendering the illness in this way may have both positive and negative implications for the prevalence of hypertension. Both male and female participants said that participating in research studies and village meetings was helpful for women because they may learn something new that could be used to prevent diseases in the future. However, the researcher's belief was that participants' perception that hypertension was related to the female gender may be a barrier to prevention in the general population, as men may not recognize that it could also affect them and therefore may not seek help. This may also limit them from participating in any initiatives for hypertension prevention. Importantly, men are the decision-makers in most families and therefore need to be involved if the prevention of hypertension is to be successful. In addition, they may also be a contributing factor to the stress that women experienced, which highlighted the need to involve them in hypertension prevention activities or programmes.

Figure 6: Thematic Map for Theme One



3 High prevalence of hypertension among women

The quantitative study revealed that most study participants were female 119 (65.4%). During the focus group discussions, some participants (male: n=7; female: n=5) attributed the large number of women with hypertension to the fact that hypertension was a disease that affected women. Therefore, participants thought that the women's participation in this study would be helpful for them to learn about a disease that impacts their lives.

> *"…So, men don't see any reason as to why they should attend during such research since the disease usually affects the women."* (FGD1, P7, 56 years)
>
> *"For me the very first reason I give as to why women are more vulnerable to hypertension is about their dietary habits. There are some women who say 'for me at my home, I will not feed poorly' without knowing that it's that 'poor feeding' that is of use to her body. She instead decides 'I will eat fried eggs in the morning, chips for lunch' (all are oily foods remember!), 'while in the evening I will eat chapatti or anything tasty for me'. But she doesn't realize that among all these that she likes and thinks she's eating well, none of them has got the nutrients her body…"* (FGD2, P1, 67 years)

It is common in rural communities in Uganda for most social activities or meetings to be attended by women rather than men. Therefore, positive health-seeking behaviour may be more prevalent in women as they are responsible for taking care of the sick people in their households. Therefore, women may want to learn from every available opportunity in their communities.

> *"Women are the most to attend/participate in everything that is brought to the village, we want to know (we like seeking knowledge), how are we benefiting but for a man if they bring anything he says those are things for women. That's why you see women participate in everything, even LC meetings, women are the most that attend so men don't attend! They like their jobs, just tell them there is a job here and there but telling him that there's a workshop/training there, they know those groups/saccos are for women, even research they know it's for women."* (FGD1, P8, 43 years)

A few participants (both men and women) felt that men were only interested in income-generating activities. If something was brought to the community that did not benefit them financially, they may opt not to spend their time on it.

"…they think that they have to be where there is money (in projects where they give out money) where there is no money, they don't come and leave everything to women." (FGD2, P2, 40 years)

"…Others used to walk long distances of about 4 miles in search of food [for their households]. That is the reason why women were the ones mostly found at home." (FGD2, P3, 35 years)

4 Women's role and gender responsibilities

With the advent of gender equality and women's emancipation, women in rural communities have assumed family responsibilities that in the past used to be held by men. Some female participants expressed concern that men believed that women should be able to perform the roles usually held by men as women were equal to men. Nine participants (four males, five females) said that women had a higher prevalence of hypertension in comparison with men because they had to assume so many responsibilities (e.g., paying school fees, buying food, and paying hospital bills when children were sick) that caused them a lot of stress, which eventually led to hypertension. This was evident in various comments concerning men abandoning their responsibilities as husbands or fathers.

"…whether her child will study or not, so you see her heart not settled, going to borrow money, she does everything for her child to study/go to school, this stress has caused us hypertension, because we see it even in our daughters, they have taken on the husband's responsibilities; if a woman gives birth to a child, it becomes her responsibility, this has also increased on the incidence of high blood pressure in women." (FGD3, P4, 31 years)

5 Effects of women's emancipation

Women must play dual roles to cope with the changing situation in rural Uganda, which was not the case before the advent of women's emancipation. Women's emancipation allowed women to compete favorably with men for social, economic, political, and religious opportunities in society. However, the perception of women's emancipation in Uganda is that women can do anything that a man can do. Therefore, men tend to leave their family responsibilities to their wives as they assume that they can perform them. For example, instead of the men sharing roles with their wives, some decided to leave all responsibilities in the home to the woman, which was a factor contributing to stress.

"Most women face domestic violence, men left their responsibilities to women, since gender balance/equality came, men left everything to women saying they see they are

equal, they tell their wives to pay school fees, buy food, clothes; after all, they are equal. I think this gender balance/equality brought domestic violence and it's the major cause why men (these days) are murderers, quarrelsome in homes because men always want to torture women especially when a woman says something, violence starts." (FGD1, P3, 35 years)

5.2.2.2 Outcomes of Marital Relationships

The category "outcomes of marital relationships" was based on the interpretation that problems in marital relationships could prevent individuals from meeting their basic needs, such as clothing, school fees, food, and medical care. This increased stress, which was perceived to pose a risk for developing hypertension. Three codes underpinned this category: unsupportive partners; broken marital relationships; and failure to use contraception.

6 Unsupportive partners

In ideal situations, it is a cultural norm that parenting and providing care to meet the needs of children is undertaken by both parents (Bornstein & Putnick, 2016; Kara & Sümer, 2022). During the focus group discussions, some female participants expressed concerns that they did not receive any support in this regard from their marital partners, which caused them a lot of stress because of financial constraints. With little or no financial resources, women felt they had the responsibility to pay school fees for their children and provide for their other basic needs. When they were unable to do so, they experienced stress; therefore, some participants associated the effects of unsupportive partners with the risk for developing hypertension.

> *"Men just sleep with women, whoever gives birth, it is up to her and that causes hypertension because she has to pay school fees, she has to buy clothes, she is the one to take the child to the hospital and you see a lady not looking good it's because she eats badly/poorly, drinks badly/poorly, and stays awake day and night."* (FGD1, P10, 57 years)

7 Broken marital relationships

In Uganda, it is common practice that care of children is taken over by one parent when there are irreconcilable differences in a marital relationship. In most cases, these childcare responsibilities are taken over by mothers. Therefore, the separation of a couple causes women unexplained tension and stress, which was thought to be a cause of hypertension.

"The truth is if women were the most affected by hypertension, as men (the) majority of us also tend to leave all our own responsibilities unto them. You find a woman is the one to take children to school, some women are like single parents at home after being 'dumped' by their husbands. So, the woman has to live with so much tension, due to lack of support." (FGD2, P3, 35 years)

Overall, the focus group participants demonstrated an awareness of the association between the use of cooking oil (especially reheated oil) with an increased risk for developing hypertension. However, despite this knowledge, participants said that switching to a new approach to cooking would be a challenge and affect martial relationships. They believed that a woman may feel insecure about cooking without using cooking oil for fear that her husband may look for another partner who was a better cook. Similarly, a husband may hesitate to stop buying cooking oil because he feared that his wife may think that he had another woman to whom he took the household money, as cooking oil is expensive. Therefore, participants continued using cooking oil to secure their relationships despite knowing that it may pose a risk for developing hypertension for the entire family.

"Yes, if you cook unfried food like how they have told us to eat 'boil', ground nuts, without frying the tomatoes, he will say as a woman I no longer have market; he will go where they fry with cooking oil." (FGD3, P1, 68 years)

8 Failure to apply family planning

The risk for hypertension was also attributed to the failure to use contraceptives (family planning practice), which leads to increased demands resulting from the number of children delivered with no prior planning for the necessary resources to take care of them. This was thought to cause stress that participants associated with an increased risk for developing hypertension.

"Adding on that Madam, for the women to be the ones mostly found with that disease [hypertension], women mostly produce children without proper planning for them especially girl children or even boys. They go there and separate from the mothers and start producing other children and they bring dump with their mothers at home…" (FGD4, P8, 27 years)

5.2.2.3 Traditionalizing the illness

Surprisingly, participants believed that traditional beliefs in the community were a cause of hypertension. Traditionalizing the illness was linked to the belief that hypertension was the result of traditional beliefs and faith. A few participants believed that hypertension was caused by witchcraft, others thought it might be caused by ancestral spirits, and some believed that God was the only one who could help prevent or cure the illness. Traditionalizing the illness may have negative implications for the prevention and outcomes of hypertension. When people relate hypertension to witchcraft or “God’s will,” it may be difficult for them to take the initiative to prevent hypertension. This may lead to an increased risk for hypertension and its associated complications.

9 Witchcraft as a perceived cause of hypertension

It was noted by participants that when an individual has peace of mind and less stress, they tended to live a sedentary lifestyle, which could predispose them to hypertension. One participant explained that when some people were diagnosed with hypertension, they may think that they are bewitched as they did not have stressors that were perceived to cause hypertension:

> *“…if women get too much peace, get someone to help at home, they say they don’t have time to do exercises; too much peace sometimes causes hypertension, they start saying that they bewitched him/her because of his/her money when he/she fell in the bathroom.”* (FGD1, P1, 70 years)

On a positive note, another participant said that when a person was diagnosed with hypertension, it could help them to dissociate themselves from witchcraft and instead focus on the secondary prevention of hypertension to prevent recurrent complications and attacks.

> *“…I got to know because of too much heart palpitations whether am stressed or not, like when climbing a hill, you feel something in the back, if you are not careful with hypertension, you might think you are bewitched but if you go for medical check-up and you find it’s hypertension, it might not give an attack, sometimes hypertension makes people grow fat and they start lifting you from one place to another…”* (FGD1, P1, 70 years)

10 Men’s perceived causes of hypertension among women: ancestral spirits

Some men perceived that hypertension in women was caused by ancestral spirits from the woman’s family, who were not happy and therefore sent the disease as punishment.

> *“…they could be having problems at home; like having issues to settle with their ancestral spirits and the like. She may be thinking ‘things are not well at home; won’t we all die? If my relatives die, it means I will die too!’. That also may cause her a lot*

of worries because she knows such family issues could cause her death anytime…” (FGD2, P1, 67 years)

11 Belief in God

Regarding the prevention of hypertension, some participants said that it was only God who could help prevent the illness by taking away the problems that caused stress that eventually posed a risk for hypertension.

> *“…find her with a big box of tablets and there is also herbal medicine that she takes but still she gets attacks, and her children take her to hospital, but she comes back with no much change. As for hypertension, we need to pray to God to save us from it!”* (FGD1, P10, 57 years)

Participants described how hypertension was thought by some to come naturally by the will of God. Participants seemed to know that increased physical activity could help in the prevention of hypertension, but their understanding was challenged by very physically active people acquiring hypertension, which some attributed to the will of God:

> *“What I would add on that Madam, is that although hypertension is a serious disease…I have been checked four times so for but that hypertension if you look at how it comes, for it even if you are very active it gets you. Do you see this man? He has said he has hypertension, but nobody digs more than he does. Do you get it Madam? Secondly, this hypertension, we have tried to avoid it, but it comes like an accident. It gets you as long as God wills so.”* (FGD4, P3, 26 years)

Summary of Theme One

This theme illustrated that sociocultural issues may increase the risk for hypertension among people in rural communities in Uganda. Most participants in this study were women and hypertension were associated with the female gender because of the perceived stressful events that some women experienced, including their husbands neglecting family responsibilities and the effects of female emancipation, as perceived by men and women. Hypertension was also perceived to result from stressful events following the breakdown of marital relationships. Furthermore, participants perceived hypertension to be associated with God, witchcraft, and ancestral spirits. Overall, such sociocultural factors may act as perceived barriers that increase the risk for developing hypertension because such beliefs do not motivate people to focus on the prevention of the disease, especially if they believe that they cannot change the risk factors. A focus on prevalence among females may help to reduce the risk for hypertension among women but may increase the risk for hypertension among men over time if hypertension is perceived as a woman's illness.

5.2.3 Theme Two: Socioeconomic Factors Related to Hypertension

Figure 7 represents the connections between this theme and the underlying categories, and codes. This theme indicated that participants perceived that a lack of money to fund basic needs played a role in the predisposition to the risk for developing hypertension. It was evident from the transcripts that participants believed poverty was a risk factor for hypertension because of the increased stress it caused. Moreover, hypertension was also thought to lead to poverty because of the medical cost implications for its management after diagnosis.

The theme covering socioeconomic factors related to hypertension encompassed three categories: financial stressors, expense of healthy food, and the economic impact of hypertension. These were perceived to increase the risk for developing hypertension, as discussed in the following sections.

12 Financial Stressors

Some participants perceived that hypertension was triggered by aggravating factors that were associated with a lack of basic needs (e.g., food, shelter, and clothing) that some individuals encountered in their day-to-day lives. Importantly, this also involved the increasing responsibilities that parents encountered, which may be a result of an imbalance between the demand and supply of basic needs. Stress and anxiety because of reasons such as poverty were considered a predisposing factor for hypertension.

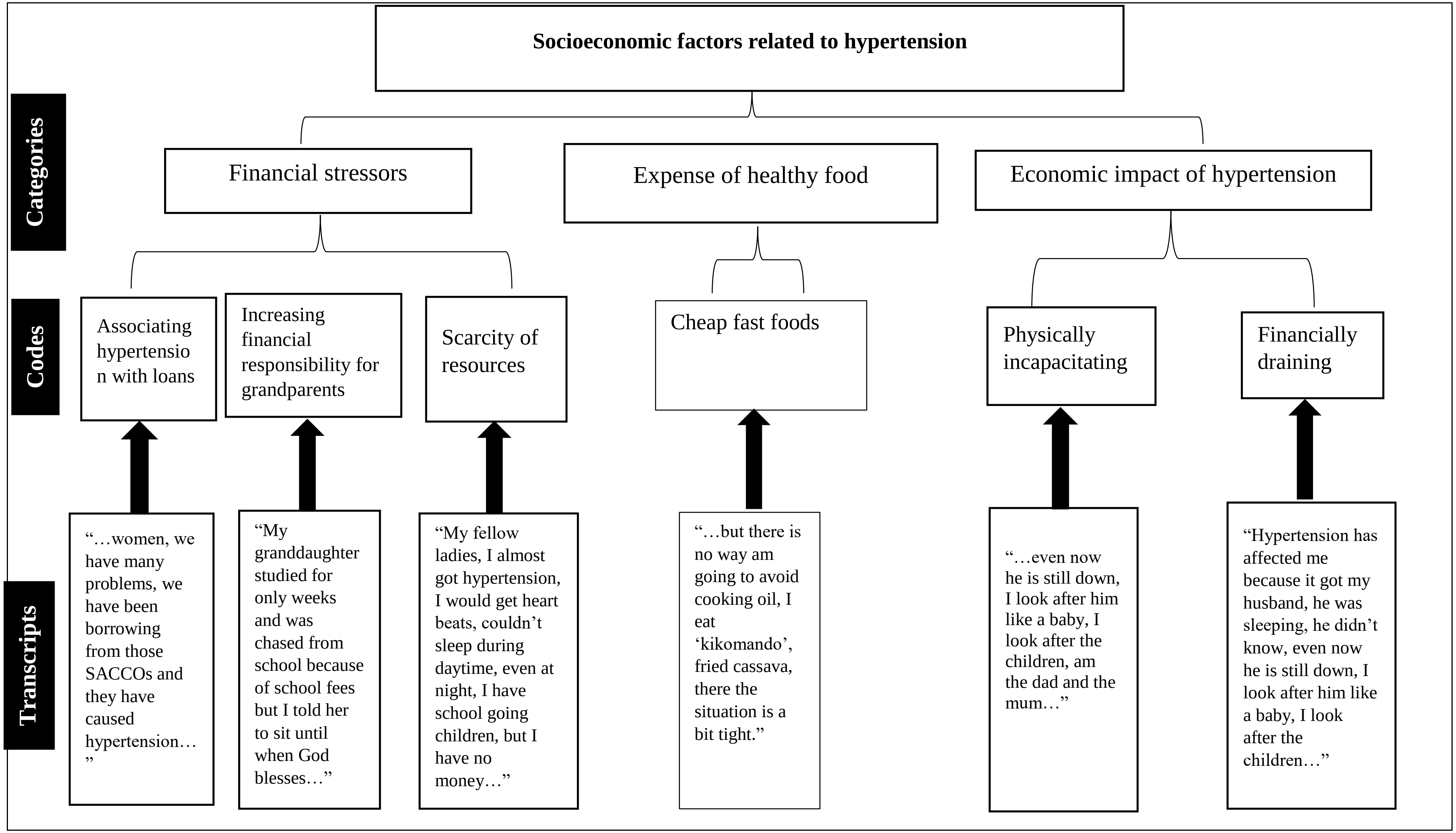
> *"Hypertension is caused by too much stress, like I don't have money, where will I get school fees for my children…"* (FGD1, P2, 62 years)

The category of financial stressors mainly emerged from three codes: associating hypertension with loans; increasing responsibility for grandparents; and scarcity of resources.

5.2.3.1.1.1 Associating Hypertension with Loans

The loan schemes available at different levels in rural communities help support people to acquire basic needs, such as the construction of houses, paying school fees for children, paying medical bills, and even buying food (Vokes & Mills, 2015). However, loan repayments are a challenge for most people because their earnings may not be enough to pay off the loan(s). For example, some women were housewives and others were small-scale farmers who grew food crops that did not earn them enough money to meet their daily family needs. Ideally, husbands would support the family financially, but some do not (intentionally or unintentionally) because they may not have jobs that pay enough money; this led to women acquiring loans to enable them to take care of their children.

Figure 7: Thematic map for theme two



Failure to pay off a loan coupled with frequent demands and reminders from the bank's Credit Cooperative Organizations or Society (SACCOs), or individual money lenders was perceived as major a stressor. These stressors were thought to increase the risk for hypertension. The issue of loans was considered a major predictor of developing hypertension as discussed by some participants.

> *"…when thoughts become too much, women, we have many problems, we have been borrowing from those SACCOs and they have caused us hypertension. You can be there and see them coming and you don't have where to get the money from, stress has been caused by that borrowed money, I have a friend she told me that she got hypertension because of loans, some part of her land was taken by those bank..."* (FGD3, P1, 68 years)

> *"Personally, what I have seen that has affected people regarding hypertension is there are several issues that bring them suffering, without any immediate help. The very first one is the issue of financial challenges one has at hand in their livelihood; plus, the other engagements he/she may as an individual have at home. So, when it comes to be that disease [hypertension] is disturbing him/her, sometimes he/she may resort to borrowing but when inside their heart, that is not possible: with worries that 'how will I face so and so?', and other similar worries."* (FGD2, P2, 46 years)

5.2.3.1.1.2 Increasing financial responsibility for grandparents

Some participants expressed concern that their financial responsibilities had increased because they were helping to take care of their grandchildren. This was because their children had insufficient finances to pay for childcare. To solve the issue of financial stress, parents sent the children to their grandparents who lived in rural communities on the assumption that they had enough food from the garden to feed them. However, this was perceived as a stressor for grandparents that may eventually result in hypertension.

> *"Like how (FGD3, P4, 31 years) said, our children have caused us hypertension, like me they gave me these grandchildren when they had nothing to eat, they were about to die, I told my children to try and bring them to me, there are no jobs like for now they are in COVID-19 times, their company laid them off completely, sometimes they tell me that they didn't have supper for two days, you sell matooke and send them some money, those who were looking after you, asking if you have the medicine but now it's you looking after them, God had given me capacity to look after them but all these cause us hypertension. Another thing, these diseases that kill our children, you nurse your child*

until when he/she dies, a child who is supposed to bury you, that's how I developed hypertension." (FGD3, P1, 68 years)

"...so, they can be there suffering, and the mother stays worried 'my child', and the like. The other thing she worries about her child the other side, while they have dumped for her some grandchildren and she has nothing to feed them, and the other side her daughter is suffering; she hears about her in bars or that she has been arrested, and the like." (FGD4, P8, 27 years)

5.2.3.1.1.3 Scarcity of resources

Many people in rural communities earned very little money and yet demands such as food, school fees, medical care, and clothing were constant. In Uganda, there are hardly any free services. Even the universal primary and secondary education that is said to be "free" requires parents to pay a fee for their children to be allowed to access school. Participants expressed concern about the many things they must pay for, despite the fact that they earned very little or no money. The lack of finances to address these basic needs was perceived as a risk factor for developing hypertension:

"My fellow ladies, I almost got hypertension, I would get heart beats, couldn't sleep during day time, even at night, I have school going children, but I have no money, I don't have a husband (all men left me with their children) so I got stressed…so I would get too much heart beats, when I went to the hospital, I was told my blood pressure is high…" (FGD1, P4, 50 years)

"Women why we worry too much, a child comes and tells you that mum I don't have books, and you see you don't have where to get the money from, when you borrow from the shop keeper, she also demands you so many times, yet you don't have the money." (GFD3, P2, 40 years)

13 Expense of healthy food

The category relating to the expense of healthy food stemmed from participants' experiences, as they believed that eating healthily was good and that it may prevent disease. However, they acknowledged that cost was important for an ordinary person whose income was low or sometimes unpredictable. Therefore, participants resorted to cheap foods that may not be healthy.

5.2.3.1.1.4 Cheap fast foods

In both rural and urban communities in Uganda, many low-income earners tend to eat fast foods, which in most cases are prepared in small hotels or restaurants. It is normally cheaper to eat fast foods than traditional healthy foods, especially for casual labourers who may not have the opportunity to return home for lunch. In some cases, casual workers spend several days without returning home as they may be working a long distance from their homes. Although takeaway food was cheap, it was prepared with a lot of cooking oil and had a high salt content, which participants believed made it a challenge to prevent hypertension.

> *"Madam, preventing hypertension is hard like I have said because cooking oil causes hypertension, that's what I expect, but there is no way am going to avoid cooking oil, I eat 'kikomando', fried cassava, there the situation is a bit tight."* (FGD4, P3, 26 years)

> *"Adding on what (FGD3, P4, 31 years) said, what we eat, stress and things we drink like soda, and eating too much salt more so raw salt, like me with hypertension, I don't eat raw salt, I eat little salt. What causes hypertension most, our eating habits, we eat a lot of fried foods, everything we fry it, and fatty meat."* (FGD3, P1, 68 years)

> *"Among those that bring hypertension, stress, you fail to sleep, eating poorly and eating too much salt especially raw salt."* (FGD3, P5, 40 years)

> *"What I would say on how to prevent hypertension, not to think too much, not to eat too much salt."* (FGD3, P5, 40 years)

14 Economic Impact of Hypertension

Hypertension was described as a disabling illness because of some of its complications hindered an individual from working and earning a living, as well as the financial implications for a family that had a sick relative. One of the complications discussed by participants was stroke, which leads to disability. Disability due to hypertension was understood to affect people in such a way that they may no longer function as they used to. Therefore, their income was affected either directly or indirectly by a sick family member. In most cases, the patient may not be able to work to earn a living, especially if their musculoskeletal system was affected by stroke.

5.2.3.1.1.5 Physically incapacitating

Participants shared their experiences of people who had experienced a stroke as a complication of hypertension. Because of disability resulting from the stroke, the individual could lose their job and income. The long-term nature of the sickness also meant individuals became dependent on others, who eventually felt financially constrained and then struggled to acquire basic needs for themselves as well as the patient.

> *"I have a daughter in Senge, she got a stroke, she just crawls, when she feels weak and can't crawl, she stays there, they bring for her house helps but they leave her because…"* (FGD1, P10, 57 years)
>
> *"Hypertension killed my maternal aunt but she was paralysed for 3 years, she was feeling nothing in the whole body but health workers would come, check her and say that her blood pressure was too high 'till when she died."* (FGD4, P8, 27 years)

5.2.3.1.1.6 Financially draining

During the focus group discussions, participants shared their experiences of people they had observed suffering from hypertension. Some participants said that hypertension made some individuals crippled to the extent that they could not move to the washroom on their own but rather were confined in one place and helpless. This had financial implications for the entire family, and caused a lot of stress for family members, which they believed may also cause them to develop hypertension.

> *"Hypertension has affected me because it got my husband, he was sleeping, he didn't know, and even now he is still down, I look after him like a baby, I look after the children, am the dad and the mum, I have to look for money yet when you came, you told me I have hypertension too so my income was affected, my children no longer go to school because am looking after the person who is not getting better yet I use money all the time, I am affected so much."* (FGD1, P1, 70 years)
>
> *"I was told that what causes hypertension the most is stress. But stress is very dangerous…"* (FGD2, P6, 54 years)

5.2.3.2 Summary of theme two

Participants described how socioeconomic factors such as the lack of money caused stress for individuals, which was associated with the perceived risk for developing hypertension. Hypertension is a chronic illness that causes disability secondary to stroke. A disability meant that the individual was unable to function normally and could not fulfil their financial obligations, leading to a lack of basic life needs. This caused stress for those taking care of the sick, which in turn may increase their own risk for developing hypertension.

5.2.4 Theme Three: Knowledge and Perceptions about Hypertension

The theme covering knowledge and perceptions about hypertension emerged from several categories. These categories included predisposing factors for hypertension, the challenge of preventing hypertension, and anxiety because of the illness. Although healthy lifestyle behaviours were expected to reduce the risk for developing hypertension, participants shared various views about other predisposing factors for hypertension. The thematic map in Figure 8 illustrates the link between the transcripts, codes, and categories in Theme 3.

5.2.4.1 Predisposing factors for hypertension

This category emerged from two codes: dietary patterns and sedentary lifestyle. Focus group participants associated the development of hypertension with an individual's dietary habits, especially if their diet contained a lot of fat or oil. Moreover, other participants said that hypertension was associated with a sedentary lifestyle. These factors are discussed in the following sections.

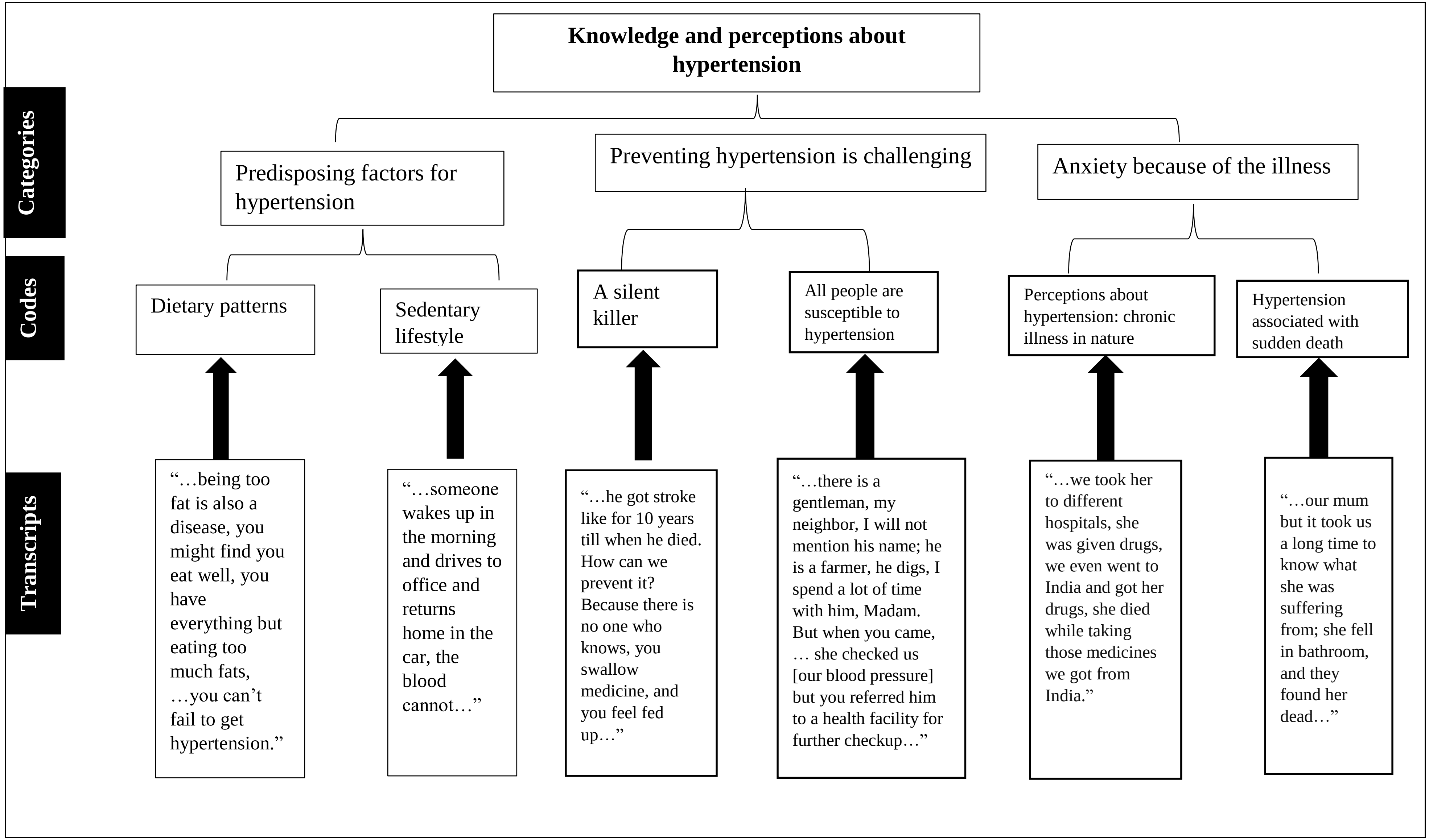
15 Dietary patterns

Participants associated the cause of hypertension with diet. For example, some participants recognised that eating too much fatty or oily food may lead to hypertension. Other participants noted that eating a lot of sugary foods and too much salt could be predisposing factors for hypertension.

> *"I think you may be with hypertension without knowing and being too fat is also a disease, you might find you eat well, you have everything but eating too much fats, having too much peace, you can't fail to get hypertension."* (FGD1, P10, 57 years)

> *"…what we eat, stress and things we drink like soda, and eating too much salt more so raw salt, like me with hypertension, I don't eat raw salt…"* (FGD3, P1, 68 years)

Figure 8: Theme Three: Knowledge and Perceptions about Hypertension



16 Sedentary lifestyle

A sedentary lifestyle was mentioned by participants as one of the causes of hypertension. Participants said that when people were relatively wealthy, they tended to reduce their physical activity as they did not walk but rather used cars for transport. Furthermore, the wealthy may employ people to do physical work (e.g., housework) for them, thereby reducing their physical activity.

> *"I want to add on what (FGD1, P10, 57 years) said, if women get too much peace, get someone to help at home, they say they don't have time to do exercises, too much peace sometimes cause hypertension…"* (FGD1, P1, 70 years)

> *"The wife's duty when she wakes up will be just to clean her face, and then simply relax and enjoy her peace. Personally, I think that too can lead to hypertension, when one lives a too peaceful [sedentary] lifestyle."* (FGD2, P2, 46 years)
> *"…Because when you get fat especially who are financially well off and do not work out; someone wakes up in the morning and drives to office and returns home in the car, the blood cannot flow well, things like that. Me, I think such things are mostly what causes hypertension, when one has no workout or he even takes weeks without jogging around within the compound. Madam, that's my opinion."* (FGD4, P8, 27 years)

5.2.4.2 Preventing Hypertension is Challenging

During the focus group discussions, participants shared their experiences and expressed concern that hypertension was a challenging disease to prevent. Participants perceived hypertension as a disease that was difficult to prevent because even people who were physically active due to the nature of their work still suffered from the disease.

17 A Silent Killer

Concerns were expressed by participants regarding the prevention of hypertension. Participants said that it was challenging to prevent hypertension based on their past experiences and observations that anyone could develop hypertension, irrespective of whether they performed vigorous-intensity activities or not. In addition, participants appeared to be perplexed about what to do to prevent hypertension because often people only became aware of hypertension after they had already developed complications.

> *"I have been checked four times so far but that hypertension if you look at how it comes, for it even if you are very active it gets you. Do you see this man? He has said he has*

hypertension, but nobody digs more than he does. Do you get it Madam? Secondly, this hypertension, we have tried to avoid it but it comes like an accident." (Jackie, 26 years)

"…he got stroke for about 10 years till the time he died. How can we prevent it? Because there is no one who knows, you swallow medicine, and you feel fed up…" (FGD1, P10, 57 years)

Participants in this study described hypertension as being a "silent illness" or "silent killer." During the focus group discussions, participants described hypertension as a silent illness because many people suffered from it but may not know until they went to a hospital with a different complaint. When their blood pressure was taken as part of a physical assessment during their hospital visit, participants discovered that they were hypertensive. In most cases, this was described as daunting for many people as they did not normally expect it. This highlighted the need for regular check-ups by the healthcare providers to allow for early diagnosis and treatment.

"...Because this disease is very dangerous; it does not give you early signs and symptoms that you will feel pain here or there and then know that you have hypertension. You can be living with hypertension without knowing that you have it; but you first get your blood pressure checked and that is when you will know that you are hypertensive. So, I would think that they should be coming around and check people, then one will know that 'I now have this disease'; and either they advise him/her to start on medication or something like that. Personally, I think that is how we should be helped." (FGD2, P4, 20 years)

One participant expressed concern that the only time he was made aware of his hypertension status was after the researcher had visited his household. This occurred during the first phase of this study when participants' blood pressure measurements were checked. If that participant had not had this check, it would have taken longer to be diagnosed.

"Madam, you yourself came and checked me and advised me to go to a health facility. But upon going to the hospital, I have had to be taking medication slowly by slowly like that. Although now I feel unwell, it is not how I was in the past. I didn't know. I used to feel breathless while walking, I could feel unwell while walking and stop, and on walking fast I could hyperventilate." (FGD4, P5, 50 years)

18 All people are susceptible to hypertension

It was known that increased physical activity played a role in hypertension prevention. However, participants' experiences with hypertension showed that it was difficult to prevent because anyone may develop the disease irrespective of their level of physical activity. Some participants had a prior perception that people who do rigorous activities during their daily routine may not suffer from hypertension. However, they later discovered that even with rigorous activities, one can develop hypertension.

> *"…there is a gentleman, my neighbour I will not mention his name; he is a farmer, he digs, I spend a lot of time with him, Madam. But when you came, Madam or your colleague; when she came…she checked us [our blood pressure] but you referred him to a health facility for further checkup. On reaching there, he had hypertension. But he digs, morning and evening every day, is very active, lifts heavy loads…Now there I don't understand in which way he got hypertension!"* (FGD4, P8, 27 years)

> *"All people can get hypertension because they have blood running in their blood vessels, they have life. Now even me where I am I could be having it, however old one is, everybody can get it. In other words, there is nothing like time has passed you that it cannot get you. No, it has no time, it just comes like how malaria comes and becomes a disease."* (FGD4, P1, 30 years)

5.2.4.3 Anxiety because of the Illness

There was a consensus among both male and female participants that hypertension caused anxiety among people as they shared their experiences concerning the seriousness of the disease. Participants said that hypertension was a chronic illness and that when an individual started treatment, they would require medication for life. Furthermore, participants perceived hypertension was a cause of sudden death with no warning signs. These experiences were thought to cause anxiety among people with hypertension and their caregivers as the outcome of the disease was uncertain. This may lead to the risk for developing hypertension for normotensive individuals or worsen the condition of those who already have the disease.

19 Hypertension associated with sudden death

Some participants perceived hypertension as a silent illness as well as a dangerous disease that for some people in the community would result in unexpected and sudden death.

Participants shared their experiences of how hypertension caused the death of their loved ones. One participant explained that they got to know about the cause of death of a loved one after her death.

> *"…she doesn't know what killed her sister, we had our mum, but it took us a long time to know what she was suffering from, she fell in the bathroom, and they found her dead. When they investigated, they told us that it was hypertension…"* (FGD1, P10, 57 years)

20 Perception about hypertension: Chronic illness in nature

Some participants perceived hypertension as a chronic illness because an individual must take medication for the rest of their life after receiving a diagnosis. The perceived chronic nature of the disease caused worries among many participants because its outcomes were uncertain.

> *"I had a sister of mine; she was opening a door and she collapsed and fell down due to hypertension. In fact, by the time this COVID-19 pandemic came, she was already bedridden and that's why she eventually got disabled and died. She spent a complete year bedridden till she died."* (FGD4, P2, 35 years)

> *"I was affected so much, my mum died of hypertension, she had got swollen like a heart patient, and hypertension caused a heart disease…we took her to different hospitals, she was given drugs, we even went to India and got her drugs; she died while taking those medicines we got from India."* (FGD1, P4, 50 years)

5.2.4.4 Summary of Theme Three

Understanding participants' knowledge and perceptions about hypertension is important for the successful development of interventions for the prevention of hypertension. Participants shared what they knew based on their experiences concerning predisposing factors for hypertension such as stress, dietary patterns, and a sedentary lifestyle. Furthermore, they perceived the prevention of hypertension as challenging. Participants also expressed concerns that hypertension could cause anxiety, and when it was left undetected, could result in sudden death.

5.2.5 Theme Four: Proposed Interventions for Hypertension Prevention

The fourth theme was based on participants' experiences and understanding of the prevention of hypertension. This theme emerged from three main categories: lifestyle behaviour change, community-based prevention approach, and government support (Figure 9).

5.2.5.1 Lifestyle Behaviour Change

Lifestyle behaviour change was considered a strategy for the prevention of hypertension as discussed by focus group participants. This category emerged from two codes: a multidimensional approach to preventing hypertension and herbal nutritional supplements.

21 A multidimensional approach to preventing hypertension

During the focus group discussions, participants shared that hypertension may not be prevented by using one approach alone and suggested that multiple approaches may be helpful in the prevention of hypertension. These included managing stress and lowering salt intake.

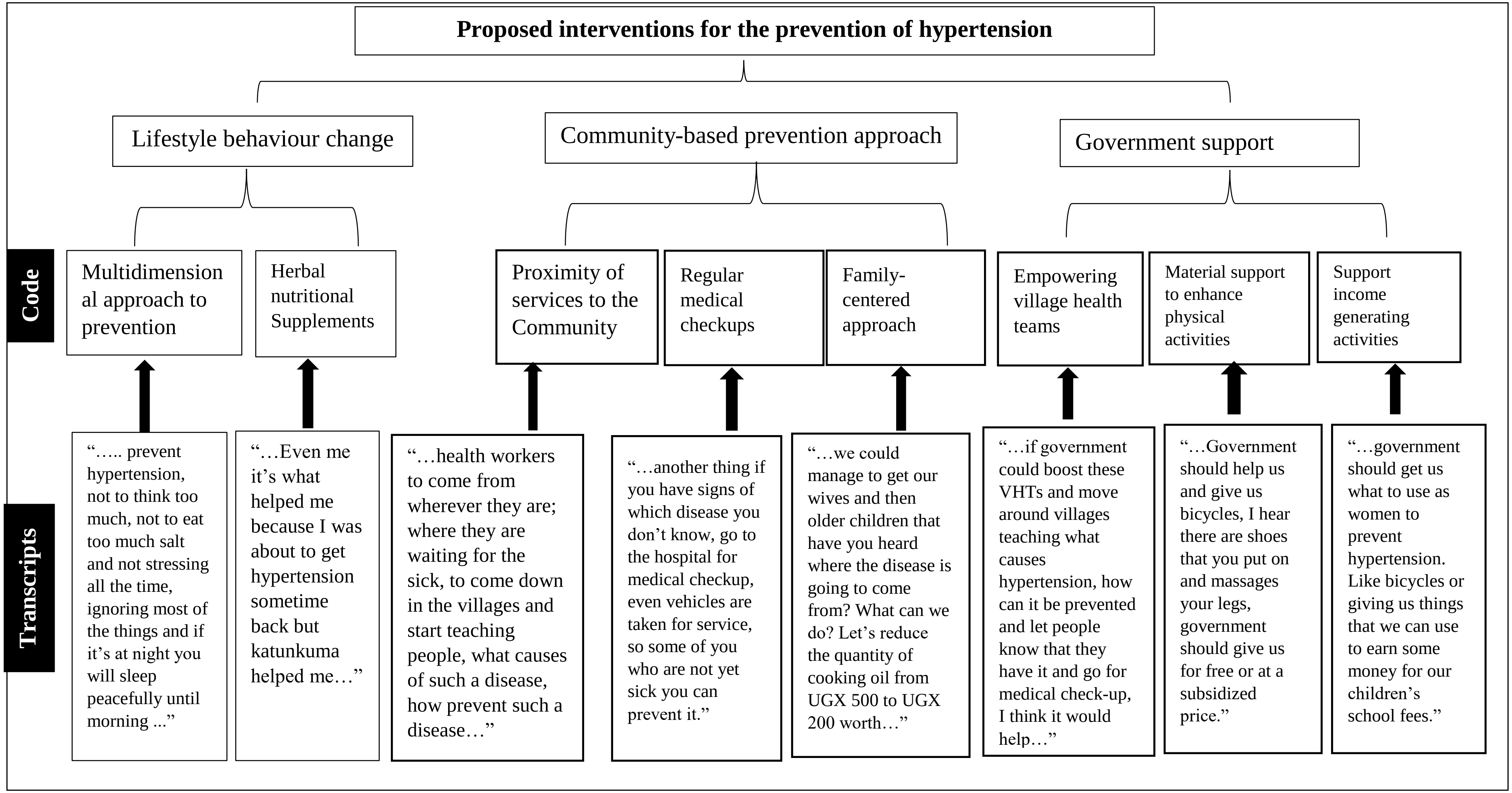
> *"What I would say on how to prevent hypertension, not to think too much, not to eat too much salt and not stressing all the time, ignoring most of the things and if it's at night you will sleep peacefully until morning."* (FGD3, P5, 40 years)

Other participants shared the idea that prevention of hypertension could be achieved by a combination of things ranging from stress management, doing physical activities, and eating selected healthy food.

> *"One thing we need to try in order to prevent that disease is [avoiding] too much stress. We need to get rid of some things which cause us worrying and later on hypertension, and also not allowing our bodies to over relax. We need to be doing some exercises at least. The food we eat we also need to try and be careful with it, not just any food, which may not be useful to our bodies. That is what I think."* (FGD2, P4, 20 years)

> *"…the fried foods that we eat are not good; why can't we eat boil before we fall sick, these fried foods are not healthy, eat silver fish not fried, some drinks we drink without knowing that they are dangerous, exercises are good my friend talked about it…"* (FGD1, P1, 70 years)

Figure 9: Proposed interventions for Hypertension Prevention



Moreover, another participant suggested that eating vegetables, doing exercise, bathing in cold water, and drinking water before meals were helpful strategies to prevent hypertension.

> *"…don't forget to eat greens (vegetables) because they are good, even running is also good like FGD1, P5 said, and bathing cold water in the morning is also good, another thing, take warm water like one cup/glass before eating anything; wait like for 30 minutes then eat your breakfast, do the same at supper time, intestines get clean and warm and fats melt. Whether you have hypertension or not, if you practice it you will see the difference, you feel light. Use warm water not hot water and don't add tea leaves."* (FGD1, P10, 57 years)

22 Herbal Nutritional Supplements

Participants discussed and emphasised the use of herbal remedies as a preventive measure for hypertension. Bitter berries (*katunkuma*) were one of the bitter vegetables that were perceived as an important supplement that many people could use to prevent hypertension. Participants shared their experiences of how this worked in both primary and secondary prevention of hypertension, and strongly recommended it to others.

5.2.5.1.1.1 Bitter berries prevent hypertension

Recurrent views about the use of bitter berries in the prevention of hypertension were evident from the research findings. Participants shared their experiences of eating bitter green vegetables, especially bitter berries (*katunkuma*), as a preventive measure for hypertension.

> *"I heard a lot about katunkuma that it is medicine for hypertension especially the raw one, you pluck from the tree as you eat, helps with heart palpitations. Even me it's what helped me because I was about to get hypertension sometime back but katunkuma helped me, I would eat it every day, now I no longer feel it like I used to before."* (FGD3, P5, 40 years)

> *"Another thing, women please eat 'katunkuma'; katunkuma is very important, like me I have my mother but katukuma must be on every meal, even if it is cold, she eats it because it helps with hypertension." (FGD1, P5, 38 years)*

"We need to take care of our health, like eating katunkuma, avoid too much stress whether you have got the money or not, reduce on too much thinking, eating greens/vegetables help in preventing hypertension." (FGD4, P1, 30 years)

5.2.5.2 Community-Based Prevention Approach

Participants believed that for community interventions to be effective, they needed to be sustainable and accessible so that all members of the community had an opportunity to access and benefit from any services that may be put in place. This category was developed from three codes: proximity of services to the community, regular medical check-ups, and a family-centered approach.

23 Proximity of services to the community

The proximity of services to the community was important so that community members did not have to travel long distances to access any services. This was thought to be a strategy that would help to enhance the uptake of the services for the prevention of hypertension.

"…I think government has the capacity to tell the health workers to come from wherever they are; where they are waiting for the sick, to come down in the villages and start teaching people, what causes such a disease, how to prevent such a disease, I know even this issue of chemicals for spraying what FGD4, P5 was talking will be talked about and that's when these people at village level will also understand it." (FGD4, P1, 30 years)

24 Regular medical check-ups

Participants thought that going for a regular medical check was helpful in the prevention of hypertension. However, it was thought to be unlikely that people would go to the hospital when they were not sick; therefore, a mobile check-up service of visiting the community may increase the uptake of checks.

"…another thing if you have signs of which disease you don't know, go to the hospital for medical check-up, even vehicles are taken for service, so some of you who are not yet sick you can prevent it." (FGD1, P1, 70 years)

25 Family-centered Approach

Participants said that when services were brought to the grassroots or community level, they would be able to access them as a family. Therefore, whatever was taught concerning the prevention of a particular disease, all family members would have the same knowledge and understanding. That would in turn enhance the chances of implementing preventive measures.

"As our entire household we all resolve on what to do after an education talk has come home and everyone is aware that if we use this, we could get a certain disease. But you will not take rules to your home that cooking oil…actually they will say 'where have you got the rules?' Now if that education talk comes to us, we could manage to get our wives and then older children that 'have you heard where the disease is going to come from? What can we do? Let's reduce the quantity of cooking oil from UGX 500 to UGX 200 worth; just to make the food palatable; after the woman and the older children have understood that talk. There we shall manage to fight that thing. But if you go home and want [to] just do it on your own, they will say 'after eating fried food there now you want to feed us with this? You are bringing your poor earning to us!" (FGD4, P4, 25 years)

"…But for me, I am thinking, like how this gentleman has said; education talks, now I join his, education talks are the ones which will address everything when the entire family has understood." (FGD3, P3, 22 years)

5.2.5.3 Government Support

Participants shared their thoughts about the importance of government support to prevent hypertension. This category emerged from three codes; empowering the VHTs, material support to prevent hypertension, and income-generating activities.

26 Empowering VHTs

VHT members are people within the communities who have been trained to assess, identify, educate, and refer people appropriately depending on their needs. However, these VHTs are unpaid volunteers and participants believed that if the government supported them financially, they would do a good job in educating people about the prevention of hypertension.

"About VHTs, I would say as government through Ministry of Health brought VHTs to the village level and they work hard especially in fighting malaria, they should be involved in this too because many people in villages have hypertension but they don't know, if government could boost these VHTs and move around villages teaching what causes hypertension, how can it be prevented and let people know that they have it and go for medical check-up, I think it would help, Or they can train like one or two people

per village to go around the village teaching people about hypertension. Those are the two ways I was talking about." (FGD1, P1, 70 years)

Importantly, the VHTs were considered good mobilisers as they were influential, respected, and experienced in their communities.

"…They (VHTs) could work with us who have participated in the fight against the disease, you approach the responsible persons in the community and make an announcement calling upon the community members that 'on such and such a date, health workers are coming to teach us about such and such a disease'. And the health workers come and administer that education talk." (FGD2, P1, 67 years)

27 Material Support from the Government

Participants appeared to have the motivation to engage in preventive practices. However, they thought that they would do better if the government supported them with some materials that they could use, such as bicycles as an alternative form of transport to cars and blood pressure machines to take their blood pressure:

"…Government should help us and give us bicycles, I hear there are shoes that you put on and massages your legs, government should give us for free or at a subsidised price." (FGD1, P2, 62 years)

"I would say to go for check-up before you get it, government should help us and give us BP machines, health workers should come like every 3 or 4 months to check us up." (FGD3, P5, 40 years)

28 Income-generating activities

Poverty was associated with stress, which was thought to be a predictor of the risk for developing hypertension. Therefore, participants thought that if the government could support them with income-generating activities, their stress would be reduced and therefore their risk for developing hypertension would also be reduced.

"Government should help us, we as women, since it sees that we are the most with hypertension. Even you health workers, go back and lobby for us, help women to prevent hypertension because they think too much, the government should get us what to use as women to prevent hypertension. Like bicycles or giving us things that we can

use to earn some money for our children's school fees and many others." (FGD1, P4, 50 years)

5.2.5.4 Summary of Theme Four

Participants' ideas about interventions for the prevention of hypertension may be instrumental if effective interventions are to be developed. Participants felt that lifestyle behaviour change, community-based interventions, and income-generating activities were key things to consider. They believed that if services were within their reach, community members would be more likely to participate in preventive ventures. They also believed that if they were given support from the government and could obtain income-generating activities, stress may be reduced, which in turn would help in the prevention of hypertension.

5.2.6 Overall summary of the qualitative findings

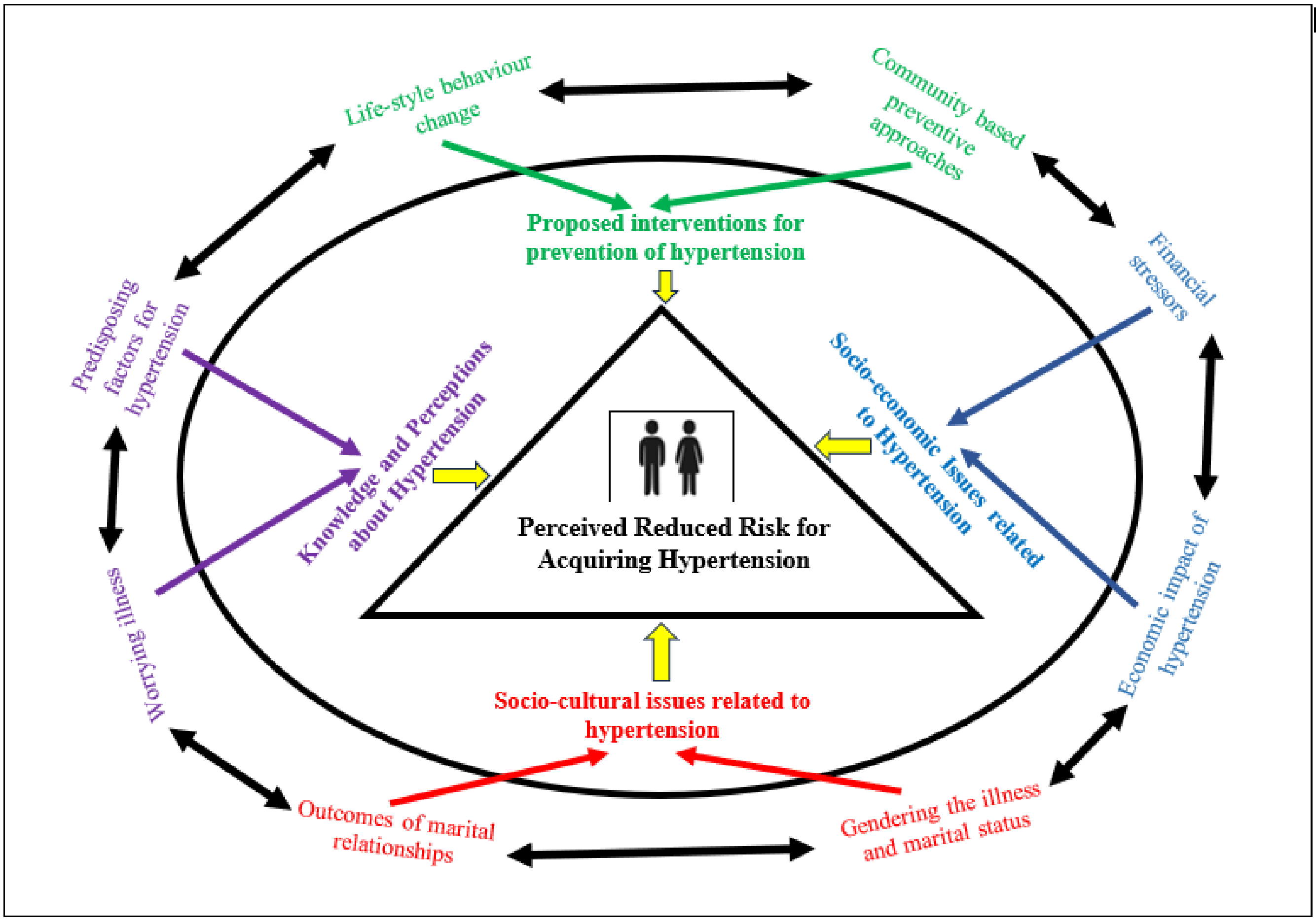
Figure 10 illustrates the four major themes that emerged from the qualitative phase of this study, which covered sociocultural factors, socioeconomic factors, knowledge and perceptions about hypertension, and proposed interventions for the prevention of hypertension.

The findings showed that participants believed in various sociocultural issues, including gendering of the illness and outcomes of marital status, increased the risk for developing hypertension. For example, gender relationships affected women's decisions about healthy foods to be prepared in the home as some women feared losing their marriage if the food they prepared did not "taste nice" without ingredients such as cooking oil, which they considered to be a predisposing factor for developing hypertension. Moreover, socioeconomic issues, including the economic impact of hypertension and financial stressors, may also increase the risk for developing hypertension. In addition, knowledge and perceptions about hypertension held by participants, such as predisposing factors for hypertension and anxiety about developing the illness, were thought to increase the likelihood of developing hypertension.

Participants proposed various interventions to support the prevention of hypertension, such as lifestyle behaviour change and community-based prevention, and strongly believed that these approaches may have the potential to reduce the risk for developing hypertension. However, such sociocultural and socioeconomic factors need to be addressed at the community level for any community-based interventions to be effective in practice. For example, health education may not be effective if people cannot afford to eat the recommended healthy diet. Participants recommended that the government should provide support in the form of physical items (e.g., bicycles and trainers) as well as financial support for families to help alleviate the risk for hypertension.

Overall, sociocultural factors, socioeconomic factors, and the knowledge and perceptions about hypertension that emerged from the data covered factors that increased the risk for developing hypertension. However, the proposed interventions may have potential to reduce the risk for developing the disease if they are developed with due consideration of these risk factors.

Figure 10: Overall summary of the qualitative findings



5.3 Part III: Integration of the Quantitative and Qualitative Findings

This study aimed to explore healthy lifestyle behaviours for the prevention of hypertension in rural communities of Uganda. To achieve the objectives of this study, the data were collected in two phases using a sequential explanatory mixed methods design (Creswell & Clark, 2017; Dawadi, Shrestha, & Giri, 2021). This allowed the qualitative findings to augment the quantitative findings. This study is unique because previous studies that explored lifestyle behaviours for the prevention of hypertension mainly employed either quantitative or qualitative designs and targeted secondary prevention of hypertension. This study combined qualitative and quantitative methods and focused on the primary prevention of hypertension, which enabled the researcher to explore individual healthy lifestyle behaviours for the prevention of hypertension in rural communities in Central Uganda.

Lifestyle behaviours for the prevention of hypertension included diet, physical activity, and addressing the issue of sedentary lifestyles. Although this study aimed to explore healthy lifestyle behaviours, it was important to establish the prevalence of hypertension in these communities to further support the need for prevention. It was also important to explore the demographic characteristics that may influence the prevalence of hypertension and participants' knowledge about hypertension from both quantitative and qualitative perspectives. A narrative contiguous approach was adopted with the premise of integrating the findings in the discussion chapter, whereas this section presents the integration of key findings from the quantitative and qualitative phases.

5.3.1 Healthy Lifestyle Behaviours for Prevention of Hypertension

During the focus group discussions, some participants shared experiences of using bitter berries in the secondary prevention of hypertension and reported improvements among individuals who used them; consequently, they perceived eating bitter berries offered a preventive measure for individuals who did not have hypertension. Moreover, the quantitative findings indicated that participants who consumed preventive food types (e.g., white meat and silverfish or fish) were more likely to be protected from developing the disease. Interestingly, in the qualitative study, participants' explanations about the prevention of hypertension were related to eating different types of food (a balanced diet) with emphasis on the silverfish and consumption of sour or bitter vegetables, with a particular interest in "*katunkuma"* (bitter berries). Although it was not statistically significant that being knowledgeable about the preventive measures for hypertension was protective against developing the disease, the findings from the focus group discussion emphasised the use of multiple approaches to prevent hypertension, such as physical exercise and modifying the diet to reduce fat/oil intake.

The quantitative findings showed that there was an association between marital status and the risk for developing hypertension. Furthermore, a higher prevalence of hypertension was seen among married and widowed or separated/divorced participants compared with those who had never married. The focus group discussion findings from male and female participants suggested that the lack of financial support from women's husbands and being single parents may lead to stress and cause hypertension.

The prevalence of hypertension among women was higher than that of men (66.7% vs. 33.3%). A key finding from the focus group discussions was that participants related the higher prevalence of hypertension among women to the increased stress resulting from the demanding roles of women in their communities. For example, women performed most of the household chores and roles that had been abandoned by their husbands, such as paying school fees for their children. Importantly, single mothers may not have anyone to support them financially or socially, which may lead to stress and thereby predispose them to hypertension. Married participants had the highest prevalence of hypertension, which emerged as “not surprising” during the focus group discussions. Some participants associated hypertension with the female gender because of women’s emancipation. Male participants felt that women should do what men can do because they were emancipated. Women’s emancipation has been interpreted and understood differently in different communities, and this has influenced the roles and responsibilities of women in these communities. Some women must work hard to ensure that they can pay school fees, ensure the family had food to eat, and that their children had clothes. Previously, most of these concerns were men’s roles and for some families, were shared responsibilities. As a result, the family’s expectations may cause stress for women, which can eventually lead to hypertension.

Both male and female participants proposed a family-centered approach for the prevention of hypertension, which should target both parents and the children in the family (household) who are all stakeholders in the effort to prevent hypertension. This could potentially minimise resistance among families to implementing hypertension preventive measures. During the focus group discussions, participants talked about some women fearing to lose their husbands to other women if they cooked without oil, as it might make the food tasteless. This could be attributed to the stress that often comes with being married, especially where relationships involve polygamy, which accounts for 78.3% of marriages in Uganda (Mwanga, Paul, & Lajul, 2021). In a situation where one wife may cook for the husband using cooking oil and yet the other does not, there may be a sense of needing to compete and please the husband, despite the implications of an unhealthy lifestyle. In addition, participants thought that including all family members in health education may improve the acceptance of any interventions implemented, as all family members would be involved in the activities that may help to prevent the disease. During the focus groups, both men and women expressed concern that some men decided to leave family responsibilities (e.g., buying food, paying school fees, and paying medical bills) to their wives. Furthermore, the widowed/separated/divorced participants faced challenges because of the stress that comes with trying to handle family challenges alone with no support from a partner.

Some participants in the focus group discussions expressed concern that prevention of hypertension required eating a healthy diet that contained a range of foods with different nutritional values (carbohydrates, proteins, vitamins) and where possible, with the use of little or no cooking oil. However, for the men who worked far away from their homes and may be required to stay away from home overnight or for longer periods, healthy foods may be difficult to access and expensive, whereas fast foods were cheap and easily available. In addition, such people may not have control over how food is prepared in restaurants or on the streets, and financial constraints mean they may not be able to afford healthy food from a restaurant.

The findings from the quantitative study showed that consumption of white meat or fish was associated with a lower risk for developing hypertension, and participants who frequently consumed white meat (at least 1–2 days/week) had a reduced risk for developing hypertension. During the focus groups, participants gave silverfish (categorized as white meat) as an example of food used in the prevention of hypertension. Given the low economic status of many individuals in these communities, silverfish was a good food choice as it was relatively cheap but categorized as a food recommended for the prevention of hypertension. The qualitative phase of this study indicated participants' knowledge of dietary practices appeared to be good as they suggested that there was a link between the risk for developing hypertension and eating fatty meat and oily foods.

A reduced likelihood of hypertension was also associated with moderate-intensity physical activity. The quantitative study showed that participants who spent more time performing moderate-intensity activities in a day (i.e., 5–10 hours in a typical week) were less likely to develop hypertension compared with those who spent fewer hours (0–2 hours) engaged in such activity. This was supported by the qualitative findings, where participants perceived that performing moderate-intensity exercise based on one's ability was a preventive measure for hypertension. This qualitative finding suggested that participants had a good understanding of the importance of physical activity as a preventive measure for hypertension. This perception was potentially a positive facilitator for the prevention of hypertension because if people know what can be done to prevent hypertension, they may take action to prevent it. Furthermore, the qualitative findings showed that a sedentary lifestyle characterized by minimal exercise increased the risk for developing hypertension.

A BMI greater than 25 kg/m^2 exhibited a positive relationship with the risk for hypertension in the quantitative phase of this study. The focus group findings indicated that participants understood this risk and suggested the need to increase physical activity to help reduce body fat. The quantitative findings also showed that frequent consumption of fruit was associated with a reduced risk for hypertension, with participants who ate fruit 1–2 days per week demonstrating a reduced likelihood of developing hypertension (OR=0.52, 95% CI: 0.27–0.99) compared with those who did not eat fruit. The association between the low risk for hypertension and fruit consumption may be explained by the large proportion (67.1%) of participants who ate fruit at least 3 days a week. Similarly, during the focus group discussions, some participants' experiences indicated that they were aware that eating fruit could reduce the risk for developing hypertension. However, data for this study was collected from rural communities where almost every household had a fruit tree. Therefore, there was a likelihood that some people ate fruit because of their availability and not necessarily because they knew their role in the prevention of hypertension.

Adding salt or salty seasoning while cooking and the frequency of consuming processed foods containing a lot of salt showed an increased risk for developing hypertension in the quantitative findings. Similarly, the qualitative findings showed that participants were aware that the consumption of a low-salt diet was a preventive measure for hypertension.

5.3.2 Knowledge about Hypertension and its Prevention

The findings from the quantitative phase of this study showed that participants who were aware that hypertension was preventable had a reduced risk for developing the disease. This may be related to the high percentage of participants who had completed secondary education, which is thought to be significant in lowering the risk for hypertension (Ostchega, Fryar, Nwankwo, & Nguyen, 2020). However, the findings from the focus group discussions suggested that prior knowledge might have informed or influenced participants' practices regarding preventive behaviours for hypertension.

Genetics is a risk factor for developing hypertension. Having a parent or sibling with hypertension increases the likelihood of developing the disease. In addition, the risk for hypertension increases with the increasing age of the individual. Experiences shared during the focus group discussions suggested that hypertension ran in families, and participants gave examples of parents who had hypertension and subsequently some of their children or siblings were hypertensive.

Both quantitative and qualitative data demonstrated participants’ knowledge concerning the seriousness of hypertension. Participants who were knowledgeable about how dangerous hypertension was had a reduced likelihood of developing the disease. This was highlighted by the 74% of participants that declared hypertension could be prevented. Similarly, findings from the qualitative phase revealed that participants were aware that hypertension was a dangerous disease and could lead to physical and financial problems because of complications such as stroke. Furthermore, the findings from the quantitative phase indicated that participants were knowledgeable about preventative measures, with 45% of participants being able to state at least two to five preventive measures. However, the qualitative findings suggested that knowing how dangerous hypertension was, may not be a guarantee for prevention. Participants noted that it was challenging to prevent hypertension or get an early diagnosis as most people remained asymptomatic and regular blood pressure check-ups were not a common practice in the studied communities.

5.3.3 Sociodemographic Risk Factors that Influenced the Prevalence of Hypertension

Both the quantitative and qualitative phases of this study concurred that genetics played a role in the risk for acquiring hypertension. The quantitative findings showed that first-generation relatives (siblings in particular) were found to have a higher risk for developing hypertension compared with second-generation relatives (grandparents in this case). Similarly, the qualitative findings supported this based on some of the experiences shared by participants concerning the pattern of hypertension in different families. For example, during the first phase of this study, some participants were diagnosed with hypertension for the first time. During the qualitative data collection, they shared their experiences of the history of hypertension in their families, which included their siblings and parents.

The quantitative findings also showed that monthly income was a predictor of the risk for developing hypertension, as the risk increased with the increasing amount of money that a person earned. However, the qualitative findings suggested that poverty and stress among women may lead to an increased risk for developing hypertension. Poverty leads to an inability to purchase equipment (e.g., bicycles), which participants could use to increase their physical activity. Women reported increased stress because of failure to provide basic needs for their families, such as school fees and food for their children. To resolve these issues, participants suggested the need for government support to purchase such items and provide capital to start up income-generating activities. The qualitative findings also suggested that failure to pay bank or microfinance loans caused stress and anxiety among individuals, which could predispose them to hypertension. To mitigate this stress, participants suggested the need for the government to support them with income-generating activities.

5.3.4 Summary of the data integration

The integration of the quantitative and qualitative findings led to the following key findings.

- Dietary modification was considered a key factor in the prevention of hypertension with particular attention to the consumption of bitter berries.
- Moderate intensity activities reduced the risk for developing hypertension.
- Cultural issues related to food cooking practices influenced how women cooked, and this could increase the risk for developing hypertension.
- Access to healthy foods was challenging because of the lack of availability and high cost.
- The prevalence of hypertension was higher among women compared with men.

Other key findings related to healthy lifestyle behaviours for the prevention of hypertension that emerged from the quantitative or qualitative findings (but not both) were as follows.

- The time spent smoking cigarettes was associated with a higher risk for developing hypertension. Participants who had smoked for over 16 years had an increased risk for hypertension.
- Acceptance and adherence to interventions for the prevention of hypertension required a family-centered approach.
- Empowerment of VHTs with help in planning interventions for the prevention of hypertension.
- Regular blood pressure measurements were considered important for hypertension prevention.

- Individuals often experienced complications of hypertension before they were diagnosed.
- Perceived knowledge about hypertension is an enabler of prevention.
- Management of the complications of hypertension (e.g., stroke) was financially draining and stressful for family members.
- Prevention of hypertension required a multidimensional approach.

5.4 Summary of the findings

This chapter presented the integration of the quantitative and qualitative findings and a summary of key findings from this study. In addition, findings that answered the research questions but were only drawn from one phase of the study were presented. Based on evidence that hypertension is a major cause of morbidity and mortality, performing moderate physical activities was found to be significantly associated with reducing the risk for hypertension. Moreover, awareness about hypertension was generally low, but is a fundamental aspect in hypertension prevention. Given that hypertension was perceived as a silent killer and that all individuals are susceptible, prevention using available foods (e.g., bitter berries) and modifying cooking practices is imperative based on participants' experiences. In addition, considering feasible interventions in the local context, such as family-based interventions, were thought to be important from the participants' perspectives. The next chapter presents a discussion of findings based on the researcher's interpretation and evidence from extant literature.

6 Chapter Six: Discussion of the Findings

6.1 Introduction

Hypertension is a major preventable cause of CVDs and continues to be the leading risk factor for mortality and morbidity worldwide (Alpsoy, 2020; Patel, Masi, & Taddei, 2017; Somani, 2017). In the last four decades, low-income nations in South Asia and Sub-Saharan Africa have replaced high-income nations as having the highest burden of hypertension globally (Zhou et al., 2017). This is reflected in Uganda, where a nationwide study conducted across different regions (Central, Western, Eastern, and Northern) revealed an overall prevalence of hypertension of 26.4%. However, the highest prevalence was in Central Uganda and the lowest in the Northern region (28.5% and 23.3%, respectively) (Guwatudde et al., 2015). Although another study found the prevalence of hypertension was comparable in both rural and urban communities of Central Uganda (Lunyera et al., 2018), the high prevalence of hypertension (34.3%) in Eastern Uganda was associated with living in rural communities and being overweight.

The World Bank development indicators showed that 74.5% of the total population in Uganda lived in rural communities in 2021 (World Bank Development Indicators, 2023). Based on Central Uganda having the highest prevalence of hypertension compared with other regions in the country, the difference in the prevalence of hypertension could not be explained by traditional demographic factors (age, gender, educational attainment, occupation, and monthly income) (Lunyera et al., 2018). This indicated that epidemiological factors connected to dietary and lifestyle changes may be contributing to the rising prevalence of hypertension in Uganda as a whole. Based on this premise, it was recommended that further studies were needed to outline epidemiological transition-related factors and their potential significance in increasing the risk for hypertension in Uganda to guide public health interventions aimed at high-risk groups, especially young adults (Lunyera et al., 2018). Correa-Rotter, García-García, Chávez-Iñiguez, and Ramírez-Sandoval (2020) asserted that there may not be significant differences between the risk factors that lead to chronic diseases in low-income countries and those that exist in wealthy nations. Genetics, lifestyle choices, and comorbidities are major factors that influence the epidemiological changes or transitions from infectious to non-communicable diseases. However, there may be additional factors that affect poorer countries (Correa-Rotter et al., 2020). The ability to change lifestyle habits, such as smoking and being sedentary, presents a challenge for the medical profession. The preferred course of action is prevention, and methods include primary care-based patient education, population-based health promotion programs to control otherwise harmful social trends, and political and economic initiatives that go beyond healthcare to emphasize the importance of good behavioural priorities (Feng et al., 2019).

In addition to the high prevalence of hypertension in Central Uganda, rural inhabitants' had lower hypertension awareness (6.0%) compared with urban residents (12.1%) (unadjusted p=0.001) (Guwatudde et al., 2015). However, there remains a gap in evidence related to the causes of hypertension and the low awareness levels in rural communities in Central Uganda (Guwatudde et al., 2015; Lunyera et al., 2018; Musinguzi & Nuwaha, 2013). The main aim of the present study was to address this gap in the literature by exploring healthy lifestyle behaviours for the prevention of hypertension in rural communities in Central Uganda. In this chapter, key findings from the previous chapter are discussed in relation to existing literature to situate the new knowledge gained from this study in the wider context.

6.2 Key Finding 1: Perceived knowledge was associated with a reduced risk for hypertension

The first objective of this study was to assess participants' knowledge regarding hypertension prevention. Assessment of participants' knowledge and awareness of hypertension was pivotal because they play important roles in prevention (Sabouhi, Babaee, Naji, & Zadeh, 2011). Generally, findings from the present study showed that there was good knowledge about the preventive measures for hypertension and its causes (58% of participants had good knowledge about general preventive measures and 40% knew the general causes of hypertension). In addition, 93.6% of participants knew that hypertension was extremely dangerous. Similarly, in Malaysia, participants had moderately good knowledge about hypertension and the severity of hypertension (Tan et al., 2022b). However, findings from a study conducted in Nigeria showed that 51.7% of participants had little understanding of the causes, risk factors, and treatments for hypertension (Gebrihet et al., 2017). In addition, that study showed that the likelihood of being hypertensive was almost four-fold among participants who did not know that physical inactivity was a risk factor for hypertension compared with their counterparts who had this knowledge (Gebrihet et al., 2017).

This implied that knowledge about the health benefits of preventive measures and the complications associated with hypertension may motivate an individual to take preventative actions, such as eating bitter berries, not using cooking oil, increasing exercise performance, and reducing smoking. Similar findings were reported by Chotisiri, Yamarat, and Taneepanichskul (2016) who attributed the high knowledge levels and neutral attitudes toward hypertension in their study to the national public health strategy for the prevention of non-communicable diseases in which people received knowledge through mass media and healthcare workers. They discovered that among patients with hypertension, knowledge or awareness of the condition was a reliable predictor of medication adherence, treatment compliance, and preventative practices.

Similarly, some of the constructs (perceived benefits and cues to action) in the Health Belief Model (Rosenstock, 2000) suggest that perceived knowledge and prior contact with the disease influence a person’s likelihood of taking preventive measures. Furthermore, having seen or heard that some people died because of hypertension (as shared by some participants during the focus group discussions in this study) may act as a cue to action (Glanz et al., 2008). Similarly, previous studies also noted that knowledge about hypertension and its prevention was important for individuals to prevent the illness (Ndejjo, Musinguzi, Nuwaha, Bastiaens, & Wanyenze, 2022; Whelton et al., 2002). Ndejjo, Nuwaha, Bastiaens, Wanyenze, and Musinguzi (2020) also reported that participants in their study had good knowledge about CVD prevention, especially about high-calorie foods. Ndejjo et al. (2022) further emphasised that the uptake of healthy lifestyle behaviour interventions to prevent CVD required an individual to have requisite knowledge and skills.

The present study found that participants lacked knowledge about foods that lowered blood pressure as well as foods to avoid in preventing hypertension, although this was not significantly associated with the risk for developing hypertension. However, Gebrihet et al. (2017) found an association between a lack of knowledge about preventive measures and an increased risk for hypertension. This implied that the lack of knowledge about preventive measures was a barrier to taking preventive actions for hypertension, which is also explained by a construct (i.e., perceived barriers) in the Health Belief Model (Rosenstock, 2000). However, Ozoemena et al. (2019) asserted that knowledge about preventive measures could be improved through health education interventions at the community level.

Knowledge alone is not sufficient for hypertension prevention. It was noted in the qualitative phase of this study that participants believed that the prevention of hypertension could be achieved using multiple approaches, such as good nutrition, exercise, and stress management. This was congruent with a previous study which asserted that a combination of lifestyle modifications, including weight loss (in overweight or obese people), increased physical activity, moderation in alcohol consumption, and a diet high in fruits, vegetables, low-fat dairy products, and low in sodium content, was the most effective strategy for the primary prevention of hypertension (Frisoli, Schmieder, Grodzicki, & Messerli, 2011; Krousel-Wood et al., 2004; Ojangba et al., 2023).

6.3 Key finding 2: Dietary Modification and its Association with Hypertension Prevention

The second objective of this study was to assess the individual healthy lifestyle behaviours that influenced the prevalence of hypertension in rural communities in Central Uganda. An interesting finding from this study was that participants perceived "*katunkuma*" (bitter berries) to be a dietary intervention for preventing and treating hypertension. Many participants described their experiences of treating and preventing the disease with the use of bitter berries. However, there is limited empirical evidence about the effectiveness of bitter berries in preventing hypertension in the general adult population. Nabatanzi et al. (2022) studied the nutraceutical significance (medicinal and nutritional values) of wild edible berries, including bitter berries, among pregnant women and children aged 6–12 years in Uganda. Although the population in the study by Nabatanzi et al. (2022) differed from that in the present study, the findings from that study suggested that bitter berries reduced blood pressure or prevented and treated pregnancy-induced hypertension. Furthermore, that study reported that consumption of bitter berries among children aged 6–12 years prevented obesity, thereby potentially preventing hypertension in later life. In that study, micronutrients (e.g., sodium and potassium) in bitter berries were assessed, and bitter berries had high levels of potassium and lower levels of sodium, both of which are key components in regulating blood volume and osmotic pressure, which ultimately helps in regulating blood pressure. However, the evidence related to sodium and potassium levels in bitter berries and their association with blood pressure regulation was limited to pregnant women and children 6–12 years

(Nabatanzi et al., 2022). As yet, bitter berries have not been tested in the general adult population. In addition, the safety of these berries and the dosage or amount sufficient for hypertension prevention are unknown.

Participants in this study ate bitter berries because they were easily accessible and free, and their elders had suggested that they were nutritionally beneficial. However, the physiological benefits related to the chemical characteristics were unknown to the participants, and it was almost by chance that they were eating something of potential physiological benefit. Similarly, Vendrame et al. (2022) examined the role of different types of berries on blood pressure regulation and hypertension, and reported that reducing blood pressure was not the main reason for recommending the consumption of berries although they had several health benefits. Another study that explored community perceptions of hypertension and its social determinants and community-led interventions in Ddundu parish, Mukono district, Uganda, reported that most individuals indicated they took traditional remedies because they were frequently less expensive and more widely accessible than contemporary treatments (Busulwa, 2022). Community members commonly purchased or produced Vernonia amygdalina (*mululuza*) , Newtonia buchananii (*empewere*), Kigelia africana (*omusa*), Prunus Africana (*entaseesa),* Tithonia diversifolia *(ekimyula),* solanum anguivi *(katunkuma)*, Tamarindus indica *(omukooge)*, and Punica granatum *(enkomamawanga)* as local/traditional remedies and plants (Busulwa, 2022). However, none of the participants in Busulwa's study shared success stories concerning the effectiveness of the remedies in preventing or treating hypertension. Furthermore, there is limited evidence about the efficiency and safety of these traditional remedies. The constructs of the Health Belief Model assert that perceived benefits of preventive measures, such as the suggested importance of bitter berries by community members, may lead to the uptake of recommended health actions (Rosenstock, 2000). Therefore, there is a need to research and determine the safety and efficacy of bitter berries in the general adult population. If there are positive findings regarding safety and efficacy, then public health campaigns could be initiated to promote their use in hypertension prevention.

6.4 Key finding 3: Moderate-Intensity Activities Reduced the Risk for Developing Hypertension

The present study demonstrated an association between moderate-intensity physical activities, such as brisk walking and gardening, and a reduced likelihood of developing hypertension. This was consistent with previous studies conducted in Uganda and Kenya that showed that the mean systolic blood pressure of participants who led sedentary lifestyles was greater than that of the physically active individuals (Twinamasiko et al., 2018; Walekhwa & Kisa, 2021). In addition, existing evidence shows that engaging in moderate- to vigorous-intensity physical activity, particularly aerobic exercise, lowers blood pressure (Bakker, Sui, Brellenthin, & Lee, 2018; Bull et al., 2020). Jogging, running, fast cycling, rapid swimming, and brisk walking up hill are examples of vigorous-intensity activities, whereas brisk walking, dancing, and gardening are examples of moderate-intensity activities (MacIntosh, Murias, Keir, & Weir, 2021). Tan et al. (2022b) also emphasized the need for regular exercise to achieve maximum benefits of blood pressure reduction. The association between performing moderate-intensity activities and the reduced likelihood of developing hypertension could be explained by what occurs in blood vessels after performing moderate-intensity activities (subsequently leading to lower blood pressure). Transmural pressure, the cyclic circumferential strain on the arterial wall, and endothelial shear stress are all modified by exercise as a stimulus (Green & Smith, 2018). Therefore, different exercise types (moderate to vigorous) can result in various patterns of arterial pressure, blood flow, and shear stress, which are linked to various types of beneficial vascular adaptation (Green & Smith, 2018).

In this study, the reduced likelihood of developing hypertension linked to moderate-intensity activity could be explained by the regular brisk walking that some participants performed to reach their gardens/farms. This finding was supported by previous studies where involvement in brisk walking demonstrated a reduction in both systolic and diastolic blood pressure (Whelton et al., 2002; Wijaya, Tahir, Talib, Tasa, & Mulyani, 2022). Furthermore, findings from a meta-analysis of normotensive randomized controlled trial participants reported that involvement in aerobic exercise reduced systolic blood pressure by 4.04 mmHg compared with the control group (Whelton et al., 2002).

The present study found that vigorous-intensity physical activities did not show a significant association with a reduction in the risk for developing hypertension. Previous studies showed that performing vigorous-intensity physical activities had a higher likelihood of reducing the risk for developing hypertension compared with moderate-intensity physical activities (Diaz & Shimbo, 2013; Tian & Zhang, 2022; You et al., 2018) or no activity (Cherfan et al., 2018). In the present study, a significant association was only observed between performing moderate-intensity physical activities and the reduced risk for hypertension. A potential reason for this difference is that most participants in this study were women, who may not engage in as much vigorous-intensity physical activities compared with men; this was also reported in previous studies where vigorous-intensity work was common among men (Joshi et al., 2014)

This study showed that the amount of time spent performing physical activities or exercise played a role in reducing the likelihood of developing hypertension. Performing moderate-intensity physical activities for 5–10 hours in a typical week led to a reduced likelihood of developing hypertension compared with 0–2 hours of such activity. The physical activity standards set out by the WHO and the US government recommend 150 minutes per week of moderate-intensity aerobic activity (e.g., brisk walking, gardening, biking slowly at <2.5 miles per hour) for maintaining and promoting health, which is equivalent to approximately 75 minutes of vigorous-intensity aerobic exercise (e.g., jogging, playing basketball, and riding a bicycle up hill) every week (Bakker et al., 2018). Similarly, the American Heart Association recommended 30 minutes of moderate activity five times per week for people as general exercise to avoid CVD, for which hypertension is a major risk factor (Tian & Meng, 2019). This was also supported by a study conducted in Iran where performing more physical activity was associated with a lower prevalence of hypertension (Mirzaei et al., 2021). Although sustained high levels of exercise (e.g., marathon running) may be detrimental to cardiovascular health, moderate amounts of exercise have consistently been associated with a lower risk for CVD (Nystoriak & Bhatnagar, 2018). However, other researchers reported that both moderate- and vigorous-intensity exercise may yield similar benefits regarding the reduction in the risk for hypertension (Pavey, Peeters, Bauman, & Brown, 2013; Williams & Thompson, 2013). Therefore, there is a need to conduct longitudinal interventional studies comparing moderate- and vigorous-intensity physical activities to ascertain the most effective type of exercise for blood pressure reduction.

Another finding from the qualitative arm of this study was that individuals perceived physical activities to be more useful when they were performed at the rate that individuals could manage so that they did not strain too much. This is supported in a study by Tian and Meng (2019), who asserted that exercise personalization resulted in effective physical activity and positive outcomes. A plausible explanation for this may be that when an individual performs the physical activities or exercises that they can manage, they tend to do them with interest and ease, which implies that goal setting and achievement may be more realistic compared with those that are strenuous and more difficult to achieve.

6.5 Key finding 4: Prevalence of hypertension was higher among women compared with men

The findings from this study confirmed that the prevalence of hypertension was high (32.4%) across the cohort and comparable with previous studies conducted in Uganda (26.4%–31.5%) (Guwatudde et al., 2015; Lunyera et al., 2018; Musinguzi & Nuwaha, 2013). In addition, this study revealed that the hypertension prevalence was almost double among women (66.7%) compared with men (33.7%). In contrast, previous studies conducted in Uganda showed that prevalence was higher in men than women (Guwatudde et al., 2016; Guwatudde et al., 2015; Kotwani et al., 2013). Researchers have associated such gender differences with men being widowed or single (Kavishe et al., 2015; Musinguzi & Nuwaha, 2013). Evidence from the present qualitative study showed that stress among married women because of factors such as lack of financial support from their partners was a risk factor for hypertension. A probable explanation for this is the culture in the study settings. In most Ugandan communities, it is expected that men or husbands provide for their families in terms of food, clothing, and children's school fees (Kansiime, Atwine, Nuwamanya, & Bagenda, 2017; Siu et al., 2017); when they are unable to do so, it can cause stress, as stated by a participant during the focus group discussion.

> *"...I think stress causes hypertension, women, we stress too much about money, you might find a man earns less and it is you (woman) to look after the home, children and your parents so if you stress a lot, you end up getting hypertension…"* (FGD1, P10, 57 years)

Overall, the findings of this study showed that most participants were not employed (77.8%) and those who were earning (63.9%) had a monthly take-home income ≤400,000 UGX (89.57 GBP). Many participants who were employed were engaged in informal (and therefore unreliable) employment such as bricklaying, farming, and small-scale businesses, which sometimes yielded unpredictable monthly incomes. This was partially explained by the fact that most participants had low education attainment, with the majority (46.4%) having a primary (basic) level of education, which has been associated with informal employment (Nkwake, 2009). In addition, there is limited formal employment available in rural communities in Uganda, which limits the nature of work that individuals can engage in. Other participants who were not employed mainly depended on household farming, which also yielded unpredictable income each month. In Uganda, employment frequently refers to self-employment (Lakuma, Marty, & Kuteesa, 2016) because without social safety systems, staying unemployed is not a choice; instead, individuals must find employment, frequently in a casual and informal capacity (Kucera & Roncolato, 2008). For men, this form of employment may not yield enough money to support their family, which over the long term becomes a stressor for women who have a direct role in taking care of the children. Similarly, a qualitative study conducted by Busulwa (2022) in Mukono District, Eastern Uganda, identified that family relationships and having insufficient finances to support the family were the main sources of stress among men and women, and this predisposed individuals to CVD. In addition, a study from Nigeria also related the risk for hypertension to family-related stress and lack of finances because of unemployment (Abdulsalam et al., 2014). Based on the constructs (i.e., perceived barriers) the Health Belief Model (Rosenstock, 1990; Rosenstock, 2000), the cultural perception that men are responsible for providing for their families is a barrier to hypertension prevention, although this can be prevented if measures are implemented to support women in these rural communities.

As the present study was conducted in rural communities, most women were not employed, which suggested that they may not be able to financially support their family by supplementing the family's income if their husband's earnings were insufficient. Financial constraints in the family may cause stress for women given that their children often rely on them rather than their father for provisions. Their limited ability to provide for their children and households may play a part in increased stress, which is a predisposing factor for hypertension, as explained by participants during the focus group discussions in this study. Similarly, a qualitative study conducted in South Africa revealed that the household environment, including family arguments or other stressful or anxiety-provoking situations like being unemployed and the partner being unable to support the family, were perceived as major contributors in the development of hypertension (Jongen et al., 2019). This finding was further emphasized by a quantitative study that reported a significant association (5 [6.0%]; $P < 0.05$) between stress and hypertension (Abdulsalam et al., 2014).

Abrams et al. (2020) conducted in a low-resource setting in the Dominican Republic indicated that hypertension was primarily caused by negative emotions that led to stress, characterized by various daily challenges and the experience of being overwhelmed with life. A female participant reported that the demands from her children led to her experiencing "bad blood," meaning that enduring challenging interpersonal situations can trigger inward anger, stress, or annoyance, and eventually high blood pressure (hypertension) (Abrams et al., 2020).

Childcare in Uganda is assumed to be the mother's responsibility and includes taking charge of the child's health, clothing, food, and education (Guloba et al., 2018). Furthermore, the perceived stress attributed in this study to mothers' inability to provide basic needs for their children, was often explained as a result of unemployment, as noted in previous studies (Carlsson et al., 2014; Jongen et al., 2019). This was also supported by other studies which reported that living under financial stress caused feelings of deprivation, inferiority, loss of status, and self-doubt, which in turn affected cardiovascular health (Carlsson et al., 2014; Georgiades, Janszky, Blom, László, & Ahnve, 2009).

In addition, raised levels of night-time catecholamine (hormones produced by the adrenal glands, brain, and nerve tissues in response to mental and physical stress) have been linked to experiences of low social status and financial hardship (Bergey, Steele, Bereiter, Viali, & Mcgarvey, 2011). These factors have been shown to contribute to ill health, including CVD, for which hypertension is a risk factor (Starrin, Åslund, & Nilsson, 2009). Moreover, empirical evidence shows that stress triggered by financial difficulties is a predictor of hypertension (Al-Bayan, Islam, Edwards, & Duncan, 2016), although other studies reported heart rate had weak correlations with demands, resources, and reactivity (Blascovich & Mendes, 2010; Gordon & Mendes, 2021; Mendes, Major, McCoy, & Blascovich, 2008). In the present study, the association between stress and hypertension was inclined toward the female gender. Although men have their stressors as breadwinners in the home, it was clear during the focus group discussions that women were often stressed when they did not receive sufficient financial support from their husbands to be able to provide for their family's needs. Therefore, there is a need to develop interventions for hypertension prevention that give particular attention to women in rural communities.

Furthermore, when individuals experience high demands (i.e., perceived stress because of demands such as lack of school fees, clothing for children, food, and medical care) compared with the available resources, both systolic and diastolic blood pressure can be affected (Gordon & Mendes, 2021), which is an indicator that persistent stress predisposes individuals to hypertension. Therefore, it is a priority to identify healthy lifestyle behaviours that contribute to the prevention of hypertension. Strong evidence exists to support the notion that stress is preventable through healthy lifestyle modifications (Health & Services, 2018). As stress is a perceived barrier, its presence among individuals can influence adherence to recommended preventive measures, as proposed by the constructs of the Health Belief Model (Glanz et al., 2008; Rosenstock, 2000).

This study suggested that taking care of a patient suffering from the complications of hypertension was stressful and that it exposed caregivers to the risk for developing hypertension (e.g., husbands, wives, children, and other close relatives). This finding was similar to those of previous studies where the management of complications (e.g., stroke) due to hypertension was challenging for caregivers both psychologically and financially (Bhattacharjee, Vairale, Gawali, & Dalal, 2012; Gbiri, Olawale, & Isaac, 2015; Kumar et al., 2022). Similarly, a qualitative study conducted in Uganda found that taking care of a patient with stroke constrained caregivers financially and psychologically and that some caregivers gave up their jobs to care for the patient on a full-time basis (Gertrude et al., 2019). High levels of stress among caregivers have also been shown to lead to difficulty in balancing employment, personal life, and the caretaker role, which may in turn exacerbate stress (Simeone, Savini, Cohen, Alvaro, & Vellone, 2015). Participants in this study perceived this kind of stress to be a contributing factor to the risk for hypertension, as exemplified by the following participant quote.

> *"Hypertension has affected me because it got my husband, he was sleeping, he didn't know, even now he is still down, I look after him like a baby, I look after the children, am the dad and the mum, I have to look for money yet when you came, you told me I have hypertension too so my income was affected, my children no longer go to school because am looking after the person who is not getting better yet I use money all the time, I am affected so much."* (FGD1, P1, 70 years)

This implied that healthcare workers need to apply a family-centered care approach when caring for patients with complications such as stroke, with the aim of providing health education for family members about the disease as well as alleviating the symptoms of stress. This was supported by a previous study that advocated for the need for care for patients with stroke to be extended to their caregivers (Bhattacharjee et al., 2012; Gbiri et al., 2015; Kumar et al., 2022). Currently, healthcare practice focuses on the patient and little attention is paid to the caregiver's health (Menon, Salini, Habeeba, Conjeevaram, & Munisusmitha, 2017).

6.6 Key finding 5: Cultural issues related to cooking practices

An interesting finding from this study was that most women were hesitant to change from unhealthy (e.g., frying food using cooking oil) to healthy cooking practices, such as preparing food without the use of cooking oil (boiled food) for fear that their husbands would abandon them. During the focus group discussions, female participants perceived that food cooked without cooking oil was tasteless and not favourable for their husbands. Therefore, the perception of the change in the food taste instilled fear of broken marital relationships. In Uganda, 78.3% of marriages are polygamous, which may explain feelings of insecurity among women about changing their cooking practices (Mwanga et al., 2021); for example, if they cook without cooking oil and the taste of the food changes, their husband may favour one of their other wives or leave and settle with a different wife who is perceived to cook well (Mwanga et al., 2021). Therefore, women may continue to fry foods using vegetable oil to maintain their relationship with their husbands. It is known that cooking oil increases cholesterol levels in the blood vessels over time, and may eventually predispose individuals to hypertension (Badriyah, 2021).

Based on the constructs of the Health Belief Model (Rosenstock, 2000), in the present study, participants' perceptions regarding the use of vegetable cooking oil act as a potential barrier to the prevention of hypertension. However, this barrier could be addressed through increased public health information and education. If acknowledged, this could help identify appropriate interventions for the prevention of hypertension in this community. Although there is limited empirical evidence in Uganda to explain the association between the use of cooking oil and the risk for hypertension, a study conducted among Filipino women married to Korean men (Provido et al., 2020) revealed that frying food was associated with a two-fold higher prevalence of hypertension compared with people who did not consume fried foods (Provido et al., 2020). Although a South African study did not fully explore the relationship between frying foods and hypertension, participants in that study believed that poor eating habits, such as eating too much red meat, oil, fried food, and starchy and fatty meals, caused obesity, which is a risk factor for hypertension (Okop et al., 2016).

Most participants in the first (quantitative) phase of the present study were women. Focus group participants reasoned that this was because women have good knowledge-seeking behaviours and are always willing to learn about disease prevention and treatment based on available opportunities. A study that examined the impact of age and gender on health-seeking behaviour supported this suggestion, as considerably more men than women were uninterested in learning about illness prevention (Deeks, Lombard, Michelmore, & Teede, 2009). In addition, participants in the present study thought that fewer men took part because they must focus their time and energy on income-generating activities. This finding was also reported by Guloba et al. (2018), who assessed gender roles and the care economy in Uganda with a focus on household decisions. Their findings suggested that husbands or partners avoided getting too involved in things that did not impact their household's wealth as they had many responsibilities that required income generation (Kansiime et al., 2017; Siu et al., 2017). Similar to participating in research, a study that looked at men's health-seeking behaviours among smokers in Malaysia found that their busy schedules, desire to be around other smokers, and belief that they were immune to disease were all deterrents of seeking medical attention and other health-related activities (Tong et al., 2011). When men do not attend certain education programs in the community, it may create a gap in knowledge and practice, which may affect adherence to preventive measures.

In contrast, if the women modify their cooking approach from frying food with cooking oil to steaming and using ingredients such as tomatoes, green peppers, garlic, and onions, the food may taste different, yet remain tasty and nutritious and minimize the risk of predisposing an individual to hypertension. Therefore, when participants acquire knowledge about healthy cooking practices, it is a perceived benefit that may motivate individuals to take preventive actions, as indicated in the "perceived benefit" construct of the Health Belief Model (Glanz et al., 2008).

6.7 Key finding 6: Healthy food is costly for low-income earners

The present study found that some men worked a long distance from their homes for several hours daily or many days. Coupled with financial constraints, this limited the food choices available to them. This increased the frequency that men ate fast foods, which were readily available and cheaper in the communities where they worked than eating healthy food in restaurants. Fast foods are also normally prepared with the repeated use of heated cooking oil. This consumption of fast foods creates a risk for developing hypertension over the long term. This was evident from the study findings where male participants attested that they ate baked pancakes (made using wheat flour and vegetable cooking oil) with beans (commonly referred to as *kikomando*) and chips (French fries) that were normally prepared using heated cooking oil that has been repeatedly used for some days. This was further explained by Godswill et al. (2018), who conducted a study in Uganda (Kampala) to test what happened to vegetable cooking oil after it had been used three times to fry potatoes. Godswill et al. (2018) reported that although repeated use of refined palm oil, sesame oil, and sunflower oil was cheap, reuse caused degradation (increased rancidity) of the oil that made it unsafe for human consumption, meaning this process should be discouraged. Moreover, two reviews revealed that repeated use of heated vegetable oil was a common practice that reduced the cost of food in many communities (Ganesan, Sukalingam, & Xu, 2018; Ng et al., 2014). However, repeated heating of vegetable oil causes lipid oxidation that leads to new functional groups produced by thermal oxidation, which may be risky for cardiovascular health (Ng, Carlberg, Weinehall, & Norberg, 2012). Over time, the repeated use of heated cooking oil to prepare affordable fast foods can lead to an increase in the amount of cholesterol deposited along the blood vessels (Ganesan et al., 2018). Consequently, this leads to the narrowing of the blood vessel lumens and increased pressure with which the blood flows through the blood vessels (Ganesan et al., 2018; Thawornchaisit, de Looze, Reid, Seubsman, & Sleigh, 2013). Long-term ingestion of repeatedly heated oil has been linked to elevated blood pressure and total cholesterol, as well as vascular alterations that predispose the individual to atherosclerosis and vascular inflammation (Ganesan et al., 2018; Ng et al., 2014).

The reuse of oil was reported to be a common practice in Ghana, where out-of-home meals are common (Boakye, Mensah, Sakhuja, Jolly, & Akinyemiju, 2017). In addition to women commonly using vegetable cooking oil to prepare food in their households, men may also be consuming a large amount of unhealthy cooking oil when eating outside the home; this may increase their risk for hypertension. A qualitative study among community healthcare workers in Cape Peninsula, South Africa, reported that consuming a lot of fat was mentioned by many participants as posing a risk for hypertension compared with being overweight (Sengwana & Puoane, 2004). Similarly, a study conducted in a rural Chinese community showed that after controlling for confounders, the risk for hypertension increased steadily with a continuously rising body fat percentage (Lim et al., 2012). However, the practice of using vegetable cooking oil and the reuse of heated cooking oil can be avoided through public health education, which may in turn reduce individuals' likelihood of developing hypertension. Healthy food preparation practices are associated with positive health consequences that result from a lower BMI and body fat (Mills, Brown, Wrieden, White, & Adams, 2017). Healthy food practices may lead to a lowered BMI, which is a perceived benefit as noted by the Health Belief Model (Rosenstock, 2000). Therefore, public health campaigns are required to inform communities about the dangers of reusing heated vegetable cooking oil.

6.8 Men's perception of women's emancipation as a stressor among women

This study found that another perceived stressor among women was that men or husbands had abandoned their responsibilities with the advent of women's emancipation. Men perceived the concept of women's emancipation as an avenue for women to perform all the roles that men could do, meaning that some men felt they no longer had to offer any assistance with household roles. This finding was contrary to Guloba et al. (2018), who conducted a study in some districts in Uganda and found that social norms and perceptions meant completing domestic-related tasks was a "woman's responsibility," and that most women did not accept assistance from their husbands. Therefore, recognising this social norm as a barrier to hypertension prevention is fundamental and will aid in the identification of appropriate interventions to ameliorate the issue. This is further supported by the health belief model construct of perceived barriers to preventive action (Glanz et al., 2008; Rosenstock, 2000).

6.9 Key finding 7: Smoking and BMI are associated with the risk for hypertension

6.9.1 Smoking

The present study showed that the risk for developing hypertension increased with the increasing duration of smoking. Participants who spent ≥16 years smoking had a four-fold higher risk for developing hypertension than those that had not smoked for long. Similar findings were reported in a study from China (Zhang et al., 2021). Moreover, in low- and middle-income countries, smoking is known to be a significant risk factor for hypertension (Cai et al., 2012; Cao et al., 2016; Lin et al., 2012; Ntaganda et al., 2022). Smoking tobacco is preventable but remains one of the most prevalent causes of morbidity, mortality, and disability (Ezzati & Lopez, 2003; Murray et al., 2020; Reitsma et al., 2021; Riala et al., 2007). This was further supported by Dai, Gakidou, and Lopez (2022), who reported that in 2020, 1.18 billion individuals were regular smokers of some form of tobacco, which accounted for 7.0 million deaths globally. The present study reported that 10.7%

of the participants were smokers, which was similar to the findings of earlier research conducted in Uganda and Malaysia (Abdul-Razak et al., 2016; Kabwama et al., 2016). However, this smoking prevalence was lower than many other countries such as India, where one study reported that over 50% of the study population were current smokers (Balsari et al., 2017).

The findings from the present study showed that cigarette smoking was associated with the risk for developing hypertension, which has also been reported globally (Buttar et al., 2005; Centers for Disease Control and Prevention, 2010). Similarly, Mustapha et al. (2022) conducted a study in Uganda and reported that smoking was associated with the risk for hypertension. It is worth noting that although smoking may not be a stand-alone predictor of hypertension, a combination of older age (30 years and above), obesity, and alcohol consumption exacerbates the risk for hypertension (Walekhwa & Kisa, 2021). Moreover, a prior study in Uganda that focused on the association between smoking and pre-hypertension reported that smoking was associated with an increased prevalence of pre-hypertension compared with non-smokers (Nuwaha & Musinguzi, 2013). It is therefore important that further public health interventions regarding smoking cessation target both normotensive and high-risk individuals as continued smoking habits mean they are all at high risk for hypertension.

6.9.2 BMI

The present study revealed that in the multi-variable regression analysis, the risk for being hypertensive was two-fold higher among participants with a BMI ≥ 30 kg/m^2 (obesity) in comparison with those who had a BMI <18.5 kg/m^2 (underweight). This finding was consistent with previous studies conducted in Uganda, although those studies were conducted more than a decade ago (Kotwani et al., 2013; Nuwaha & Musinguzi, 2013; Wamala et al., 2009). Other more recent studies in low- and middle-income countries also aligned with the present findings by reporting a significant association between BMI and an increased risk for being hypertensive (Ali et al., 2022; Awoke et al., 2012; Cherfan et al., 2018; Gebrihet et al., 2017; Helelo et al., 2014; Joshi et al., 2014; Mohamed et al., 2018; Muhihi et al., 2020; Zaki et al., 2021). In addition, other studies from low- and middle-income countries alluded that BMI was an independent risk factor for hypertension (Do et al., 2015; Zhang et al., 2013; Zhao et al., 2018). This study showed that about 22% of the participants were either overweight or obese. This was a large proportion that is at high risk for becoming hypertensive in the future, despite hypertension being preventable through healthy lifestyle behaviour changes, such as engaging in physical exercise. Therefore, there is a need for public health campaigns to educate people on the dangers of obesity and possible interventions for its reduction.

6.10 Key finding 8: Family-centered care approach enhances acceptance and adherence to interventions for the prevention of hypertension

The findings from this study highlighted a need for a family-centered approach to preventing hypertension. This was congruent with a study conducted in South Africa where door-to-door visits by healthcare workers were the most acceptable interventions to create awareness about hypertension (Jongen et al., 2019). A family-centered care approach could have been proposed because of its convenience, as people may not understand the importance of going to hospital when they are not acutely sick. In addition, this approach may be attractive to the public as it saves them time that otherwise they would have spent at a health facility waiting to be seen by a healthcare provider. Similarly, Jongen et al. (2019) found that during hospital visits, knowledge concerning hypertension was provided to clients after they had been diagnosed with the disease. Although there are limited studies that have shown the effectiveness of family-centered care interventions for the prevention of hypertension, this approach has been reported to be effective in the management of hypertensive patients because working with patients in their homes improved a clinician's capacity to comprehend and address the complexity of their dynamic reality as well as that of their families. This approach can therefore be adopted during the development of interventions for hypertension prevention at the community level (Turabian, 2021).

During the focus group discussions in this study, participants identified the empowerment of VHTs as an intervention that may help in the implementation of community preventive measures for hypertension. This could be explained by the fact that VHTs are part of the community as they live in the villages where they work. In addition, they are knowledgeable and influential in their communities. Therefore, if they are empowered and supported financially, they can be instrumental in disseminating knowledge about the prevention of hypertension in their communities.

6.11 Key Finding 9: Age and Genetics are Non-modifiable Risk Factors for Hypertension

The risk for developing hypertension increases with increasing age. The results of this study showed that the risk was almost 14 times higher among people aged ≥45 years compared with those aged 18–24 years. This was consistent with previous studies that showed that the risk for hypertension increased with an increase in age (Wamala et al., 2009). This may be because of the impairment in organ functioning that occurs as individuals grow older; blood pressure increases because the blood vessels become smaller and their walls stiffen (Singh, Nguyen, Kerndt, & Dhamoon, 2022). Although this finding is true across the world, the risk is higher among people aged 40–59 years who live in low-income countries whereas in developed countries it is higher among those aged ≥60 years (Mills et al., 2016). Aging is a long-term non-modifiable risk factor for hypertension; however, it is not an independent risk factor and therefore its effects can be minimized by ensuring good healthy lifestyle behaviours during early and mid-life before an individual ages.

This study confirmed that a family history of hypertension was associated with the risk for developing hypertension which is consistent with previous evidence (Pazoki et al., 2018; Pazoki et al., 2019). A possible explanation for this is that the genetic predisposition of individuals increases their chances of developing the disease (Patel et al., 2017; Pazoki et al., 2019). A healthy lifestyle is associated with genetics and research findings show that people who do not practice healthy lifestyle behaviours and have a genetic predisposition to hypertension have higher blood pressure compared with their counterparts who do not have a genetic predisposition (Abdulsalam et al., 2014; Awoke et al., 2012; Guwatudde et al., 2015).

This study also revealed that the relationship with a hypertensive family member influenced the risk for hypertension. The closer the relationship with the hypertensive person (e.g., sibling or parent) the higher a person's risk of becoming hypertensive. Interestingly, previous studies also associated hypertension with a family and parental history of hypertension (Ibrahim & Damasceno, 2012; Parikh et al., 2008).

6.12 Chapter Summary

This chapter presented a discussion of the key findings regarding healthy lifestyle behaviours for the prevention of hypertension in rural communities in Uganda. Several modifiable risk factors for hypertension were identified, which could be the cornerstone for consideration when developing interventions for hypertension prevention in Central Uganda and other similar settings in low- and middle-income countries. These include the adoption of modifiable risk factors such as performing moderate-intensity physical activities, dietary modifications, and managing the stressors associated with women's responsibilities. It was evident from the discussion that these were major factors to consider. When interventions are developed and tailored to participants' experiences and suggestions coupled with the quantitative evidence, it may yield positive findings and help to reduce the prevalence of hypertension. However, non-modifiable risk factors such as age, gender, and genetic predisposition to hypertension were also identified as fundamental to consider in the prevention of hypertension. Therefore, it is important that further research incorporates these factors when developing appropriate hypertension prevention interventions. Other findings pertinent to the prevention of hypertension were the adoption of a family-centered care approach and empowerment of VHTs to support the implementation of preventive strategies in the communities.

7 Chapter Seven: Conclusions and Implications of the Findings

7.1 Introduction to the chapter

This concluding chapter discusses the reflexivity, strengths and limitations of this study, and the study's contribution to the knowledge base. Next, the chapter presents the implications for further research, implications for practice and policy, and a summary of the conclusions drawn from this study. The chapter also outlines how the findings will be disseminated, offers directions for further research, and presents the researcher's reflections about this PhD journey. This study explored healthy lifestyle behaviours for the prevention of hypertension in rural communities in Central Uganda.

7.2 Reflexivity

Reflexivity is a method by which qualitative researchers guarantee the accuracy and quality of their work and offers a benchmark for assessing credibility (Teh & Lek, 2018). Reflexivity entails paying close attention to the individual, social, methodological, and environmental aspects that potentially affected the study being undertaken (Olmos-Vega, Stalmeijer, Varpio, & Kahlke, 2023). The findings of a study are more credible when a researcher considers the details of participants and themselves contextually regarding the overlapping relationships (Berger, 2015). This process also enriches the knowledge about the work (Dodgson, 2019). Therefore, researchers must place emphasis on self-awareness and sensitivity, seek to better comprehend the role of the "self" in knowledge creation, and carefully self-monitor the influence of their biases, beliefs, and personal experiences on their research (Dodgson, 2019).

When examining the researcher's position as an insider or outsider, it is imperative to consider both the similarities and differences between the researcher and the research participants (Berger, 2015; Teh & Lek, 2018). Finding the positionality was one of the reflexive efforts considered for this study. Being an outsider and not part of the community, the researcher was not known by the participants in the different communities where this study was conducted, and that required reflection on the power differences. For example, some participants may have faced situations where they felt intimidated into disclosing personal information about themselves or otherwise felt hushed, preventing them from sharing the full extent of their experience because of the perceived power relationships between them and the interviewer (Grove, 2017; Olmos-Vega et al., 2023). The present researcher was a professional nurse seeking to conduct a PhD research study, which could have caused bias if participants regarded the researcher as a highly respected person in the community who expected the best from them. However, this was addressed by carefully explaining the aim of the study and research process, which provided a safe and conducive environment where the participants felt free to discuss the correct information in response to the questions asked. Moreover, the researcher drew on the VHTs for an introduction to the participants. Conducting interviews (focus group discussions) in the presence of the VHTs could have potentially introduced bias, but this possibility was identified and mitigated, and the VHTs were asked to leave the focus group venue after introducing the researcher and research assistant to the participants.

The researcher's past experiences and goals should also be described in terms of how they could have influenced the choices taken during the project (Finlay, 2002). As an experienced nurse, the present researcher had prior knowledge about hypertension and its prevention that could have biased the results and interpretation of the study findings. Objectivity was maintained by using the focus group interview guide and an inductive approach to data analysis. In addition, research assistants were present throughout the focus group discussions to assist during the moderation of the discussions as necessary.

Using methodological reflexivity necessitates being aware of the constraints a chosen paradigm places on the research because choosing or acknowledging a paradigm involves opening and closing specific options (Raven, 2007). Researchers must initially reflect on how to match their methodological decisions to their paradigm and theoretical or conceptual framework (Varpio, Paradis, Uijtdehaage, & Young, 2020). Methodological reflexivity was discussed in the methods chapter, with a focus on how credibility, dependability, transferability, and confirmability were addressed during the process of data collection and analysis. Credibility was evaluated using member checks to confirm whether the data that were transcribed correlated with the meanings of the information the participants provided. In addition, transferability was evaluated using detailed descriptions regarding the study, participants, and the methods used. The researcher ensured that the participants understood the aim of this study and the research questions, as well the implications of providing appropriate responses. Dependability was ensured by using an auditor who checked that the findings reflected participants' data. Field notes, memos, probes, and an audit trail created during the qualitative research process were used to evaluate confirmability.

7.3 Strengths and Limitations

An important strength of this study was that it employed a sequential mixed methods design to explore awareness and healthy lifestyle behaviours for the prevention of hypertension. Most previous studies in this area employed quantitative methods and only a few used qualitative methods. However, using a sequential mixed methods design enabled the focus group interview guide to be developed based on the findings of the quantitative phase of this study (Creswell & Creswell, 2017). Consequently, participants provided explanations for some of the quantitative study findings and generated new knowledge regarding hypertension prevention from a rural community perspective.

Although Central Uganda has 26 districts, this study was conducted in one district. This might have introduced bias regarding the generalizability of the findings to other rural communities in Uganda. However, a multistage sampling technique was used and at each stage of sampling, simple random sampling was employed to ensure that the districts, parishes, and participants had an equal chance of participating in this study (Taherdoost, 2016). Simple random sampling was a strength of this study that minimised the bias associated with conducting the study in one district. Therefore, the study findings can be considered generalizable across Central Uganda and other similar settings in low- and middle-income countries.

This study was conducted during the COVID-19 pandemic, which was a stressful period. COVID-19 could have increased the stress levels among participants in this study. It is not clear whether such stress could have influenced participants' blood pressure measurements; if so, this might have affected the overall prevalence of hypertension. In addition, participants' body weight might have been affected during the COVID-19 period; some participants could have lost weight because of challenges obtaining sufficient food, whereas others may have gained weight because of reduced physical activity during the lockdown period. Therefore, participants' BMI might have been affected.

Recall and reporting biases from the participants were other possible limitations of this study. Considering that certain survey questions asked the participants to think back (e.g., when they had last smoked if they had ever smoked), there was a chance that some participants were not able to recall the exact details. Previous research asserted that recall and reporting biases are sometimes inevitable in research (Wu et al., 2017). However, the questionnaire used in this study had subsequent guiding questions that guided the participants to try and recall their history of smoking and minimise recall bias, although the possibility of bias might not have been eliminated.

The design used in this study was cross-sectional and could not reveal the cause-and-effect relationships of certain healthy lifestyle behaviours with the risk for developing hypertension. However, this study provided baseline information to inform the development of further longitudinal studies. Finally, this study did not establish the amount of time the participants slept and whether sleep had an association with the risk for hypertension. If the researcher was to undertake this study again, a convergent mixed methods design would be used to gain a deeper understanding of all the healthy lifestyle behaviours for the prevention of hypertension.

The participants were given two hours from the time the participant information sheets were presented to them to the time of taking a decision to participate in the study. This was a short time for the participants to think about the study, ask questions and take a decision and this could have probably influenced the results. However, this was deemed acceptable in the study setting as it would have been very difficult to find people in their homes on the following day. Many of the participants were farmers and used to go to their gardens and it would have been difficult for them to offer more than that time for study.

7.4 Innovative Mixed Methods

This study is the first of its kind to explore healthy lifestyle behaviours for the prevention of hypertension in Central Uganda using a sequential explanatory mixed methods design. In addition, the process of integration of the findings was modified. A narrative contiguous approach requires that the quantitative and qualitive findings are presented separately and then integrated in the discussion. However, for this study, the researcher was able to map out the key findings and integrate the data in a separate section of the results chapter (Chapter Five) before the discussion (Chapter Six). Consequently, the discussion chapter was arranged based on the key findings.

7.5 Contribution to Knowledge

This study adds to the body of knowledge regarding the primary prevention of hypertension. This study is the first of its kind in Uganda to focus on exploring healthy lifestyle behaviours for the prevention of hypertension using a mixed methods approach. The study identified bitter berries (*katunkuma*) or solanum anguivi as a potential low-cost and accessible preventive measure for hypertension in the general adult population, which has provided a basis for further studies to establish the safety and effectiveness of these berries in preventing hypertension.

This study also adds to knowledge regarding the barriers to the prevention of hypertension. The fear of broken marital relationships was a perceived barrier to the prevention of hypertension among women, which meant that they continued to use cooking oil despite knowing that it was a risk factor for hypertension. The use of cooking oil in food preparation is a dietary practice that predisposes individuals to hypertension, and yet this behaviour can be modified. In addition, eating fast foods poses a risk for hypertension because of the repeated use of heated cooking oil. This risk was identified among men who worked away from their homes for several hours or days. Therefore, there is a need to develop preventive interventions and policy changes that target men in the study areas and other areas with similar settings to provide health education for community members about healthy cooking practices. This will help promote food that is prepared in a healthier way but still taste good to help mitigate the perceived fear of broken marital relationships associated with a change in cooking practices. However, targeted interventions need to be integrated into other community programs that generate income for the community. Furthermore, there is a need to conduct public health campaigns among restaurant or fast-food outlet staff to educate them about healthy cooking practices. There is also a need for policy changes and the government to regulate the use of reheated vegetable cooking oil in restaurants.

This study identified that VHTs may be a key resource for implementing preventive strategies that are family-centered, as they are always in the community and understand the dynamics within their communities. Based on the previous literature that shows VHTs have been important in implementing other services, this approach needs to be explored in the implementation of hypertension prevention strategies. Furthermore, a family-centered care approach was proposed as an intervention that may be effective in hypertension prevention in the context of rural communities in Central Uganda.

7.6 Implications of the Results for Further Research

This research has provided valuable evidence for further research regarding the prevention of hypertension in Central Uganda, where the prevalence of hypertension is highest among the different regions in the country. Although *katunkuma* (bitter berries) were perceived to reduce the risk for developing hypertension in the study population, the safety and effectiveness of *katunkuma* (bitter berries) in preventing hypertension has not been investigated in the general adult population. This is important as this plant is sometimes sprayed with pesticides. Therefore, there is a need to conduct randomized clinical trials to establish the safety, effectiveness, and suitable dosage of bitter berries in the prevention of hypertension. In addition, ethnobotanical studies are recommended to ascertain how *katunkuma* is used and any other species related to *katunkuma* that rural communities perceive to be preventive for hypertension.

There are varying opinions regarding the effectiveness of moderate- and vigorous-intensity physical exercise on the reduction of blood pressure. The present study showed an association between moderate-intensity physical activity and a reduced likelihood of hypertension. However, this reflected the perceived intensity of physical activity as this information was obtained through participant self-report. The actual intensity of physical activity was not measured, which implies that there is a likelihood of obtaining divergent results from different individuals depending on their perceptions. This is a gap in the literature that calls for robust interventional randomized controlled trials to establish the most effective type of physical activity in hypertension prevention.

The present study showed that being female was associated with the risk for developing hypertension. Some inequalities have emerged with the advent of women's emancipation and how it was understood and interpreted by the participants in the study communities. For example, some men believed that with women's emancipation, women could do whatever men do, meaning men no longer need to share household/childcare responsibilities; this placed additional burden on women. This became stressful for women, and stress is known to be associated with the risk for hypertension. It is not clear whether the concept of women's emancipation was well understood in these communities. Therefore, there is a need for further research to establish the relationship between women's emancipation, gender inequality, stress, and the risk for developing hypertension.

Based on the findings from the present study, family-centered interventions may be an effective strategy to address hypertension prevention, as suggested by focus group participants. Although this concept has been used in HIV care in these communities and found to be effective, there is no evidence to support the same effect in the prevention of hypertension. To determine the efficacy of family-centered interventions for hypertension prevention in rural areas, a longitudinal interventional study is required.

This study focused on Central Uganda to explore healthy lifestyle behaviours for the prevention of hypertension. Further research should target exploring awareness of hypertension in all rural communities across the different regions of Uganda to ensure that the results are generalizable to the whole country and identify what people in other regions do to prevent hypertension. In addition, this will give direction as to whether the results resonate with those in other low-income countries with similar settings.

7.7 Implications for Practice and Policy

This study provided evidence that using cooking oil was a perceived predictor of hypertension, yet women continued to use it in their cooking for fear of losing their husbands to other women. Therefore, there is a need to conduct public health awareness campaigns to inform communities about the dangers of using cooking oil and provide information on alternative healthy cooking practices. This needs to be implemented in a sensitive way that recognises the oppression of women within the home and the fear they experience from the possibility of not pleasing their husbands. Moreover, most restaurants reuse heated cooking oil to prepare fast foods, which has been associated with the risk for hypertension in previous studies. Therefore, public health awareness campaigns that target restaurant workers are needed to help prevent hypertension.

In Uganda, most people live in rural communities (Guwatudde et al., 2015). The prevalence of hypertension in these communities is high, which indicates that there is a need for medication among hypertensive individuals. However, the overstretched Ugandan healthcare financing means that individuals must pay for this medication, which they may not be able to afford. With current epidemiological transitions of non-communicable diseases from urban to rural settings (as rural communities have higher populations), the primary prevention of hypertension must be given priority to alleviate the complications and associated cost implications. Therefore, there is an urgent need to conduct clinical trials to establish the safety and efficacy of cost-effective solutions such as bitter berries in hypertension prevention; if found to be effective, they may be recommended as a preventive measure for hypertension in mainstream healthcare settings.

Stress is associated with the risk for developing hypertension, especially among women (Hu et al., 2015). Healthy lifestyle behaviour changes (Al-Maskari, 2010) are instrumental in alleviating the symptoms of stress and reducing the likelihood of becoming hypertensive. Therefore, it is important to target income-generating activities that support women in rural communities. Given that financial constraints aggravate the levels of stress (Guan, Guariglia, Moore, Xu, & Al-Janabi, 2022), such support may help the women to become financially empowered and self-sustaining so they can provide the basic needs for their children, thereby reducing stress. It was also noted that poverty and deprivation because of reduced financial income and low employment levels may be contributing factors to the stress experienced among the study participants. It is therefore important to advocate for people in rural communities to be able to complete basic secondary education, especially female children. This is because after secondary (high school) education, a tertiary institution may be joined or employment obtained, thereby helping to prevent stressors in later life. Similarly, Somani (2017) found that education for girls had a significant impact on society's overall growth. Moreover, educating girls helps to keep hunger away, reduce the number of child marriages and early pregnancies, improve health status and overall socioeconomic circumstances, and create a better and more peaceful society (Bhagavatheeswaran et al., 2016).

This study provided evidence that men's attendance or involvement in community activities that were not income-generating was low. This may imply that men's adherence to healthy lifestyle behaviours for the prevention of hypertension may also be low, as this is seen as women's work; therefore, the prevalence of hypertension has increased. It is important that future interventions are targeted to and motivate men as well as women in rural communities to participate. For example, public health campaign interventions could be integrated with other income-generating programs within the community to attract men to participate.

A family-centered approach was proposed for the prevention of hypertension. Most participants were farmers or farmers' wives and preferred to participate in healthy lifestyle change activities within their communities so that they did not spend a lot of time travelling to and from the health facilities when they were not sick. Therefore, there is a need to develop interventions targeting families in similar settings and communities to those explored in this study. However, these interventions should be holistic and include other hypertension preventive strategies, such as weight loss, increased physical activity, stress management, low fat and salt cooking practices, and including vegetables and fruit in the diet.

Individuals who deliver care to loved ones with physical morbidity and disabilities because of stroke reported experiencing increased stress and were therefore at an increased risk for hypertension. Extended support for such caregivers from mainstream hospitals may help reduce their stress levels and the likelihood of becoming hypertensive. Therefore, primary prevention of hypertension among caregivers of patients with stroke needs to be incorporated into the care of patients in mainstream hospitals.

7.8 Conclusions

This study explored awareness and healthy lifestyle behaviours for the prevention of hypertension in rural communities in Central Uganda using a mixed methods approach and was the first of its kind. One district was randomly selected to be included in the study, from which two parishes with eight villages were selected. A total of 562 participants completed the survey and 32 participants were involved in four focus group discussions. The prevalence of hypertension in these rural communities in Central Uganda is 32.4%. The study findings suggest that the prevalence of hypertension may be influenced by stress, cultural perceptions, and unhealthy cooking practices. These are all lifestyle behaviours that can be modified to prevent hypertension. However, age, gender, and genetics are non-modifiable risk factors that predispose individuals to hypertension. This is consistent with findings from previous studies and highlights the need to blend both modifiable and non-modifiable risk factors when developing interventions for hypertension prevention. Eating bitter berries was one of the dietary health lifestyle behaviours that was perceived as a preventive measure for hypertension in the study communities. Although the safety and effectiveness of bitter berries in preventing hypertension are unknown in the general adult population and will require to be examined for effectiveness in the prevention of hypertension.

In general, participants were well-informed about the different ways to prevent hypertension and its causes based on their knowledge scores. Good knowledge about hypertension is a good predictor of prevention. However, participants had insufficient knowledge of the types of food to eat or avoid help prevent hypertension. Poor knowledge is a barrier to the prevention of hypertension which can be improved through health education interventions.

As the study setting was rural communities, most of the participants were farmers. The suggested family-centered care approach for hypertension prevention was proposed to minimize the time they would have to spend in the hospital waiting to see a doctor for a blood pressure check when they were not sick. In addition, this may lead to increased adherence to preventive measures for hypertension as all family members would be involved.

7.9 Future Research Directions

As this investigation uncovered novel information about healthy lifestyle behaviours for the prevention of hypertension, especially with use of bitter berries (*katunkuma*), there is a plan to conduct a small scale longitudinal randomized controlled trial to establish the safety and effectiveness of bitter berries in the prevention of hypertension. Coupled with this, further studies could involve examining the impact of pesticides on bitter berries and their association with the effectiveness in the prevention of hypertension.

Based on the findings of the present study, hypertension can be prevented using a combination of multiple modifiable risk factor interventions. Therefore, the researcher plans to conduct a study to develop a model for hypertension prevention in rural communities that can be generalizable to other communities with similar settings.

7.10 Dissemination of the Findings

The findings from this research project will serve as a basis to inform the Ugandan Ministry of Health about hypertension prevention in rural communities regarding the practice and policy implementation based on the recommendations from this study. In addition, the Wakiso District Health Research Department will be interested in the research findings. Therefore, the research report will be shared with the Ministry of Health of Uganda and Wakiso District Health Services. The research thesis will also be disseminated via the University of Salford Website. Additional dissemination will be through presentations to the Uganda National Health Research Organization for the attention of policymakers, as well as a relevant international conference and Aga Khan University academic research rounds. Research participants will be offered the opportunity to receive the study results through the DHO’s office. The results will also be published in high-impact international journals (e.g., BMC Medicine and PLoS Global Public Health), including an international open-access journal (e.g., PLoS One). Conference presentations and presentations to healthcare practitioners will be made via different fora.

7.11 Reflection on this PhD Journey

Enrolling for a PhD was one thing I had always considered but had never imagined undertaking. I had just completed a Master's in Nursing Science the previous year and was considering some time out before embarking on other studies. Around the same time, I had just finished a one-year intensive course (Post Graduate Diploma in Medical Education). Before graduation, my employer encouraged me to apply for a PhD in nursing. This was an exciting and brave thing for me to do as a full-time employee as well as a full-time split-site student at the University of Salford, Manchester. The journey was long but rewarding as I learned a lot both from my supervisors and personal reading. Initially, my ideas were broad when considering my research topic but as time went on, I appreciated the need to narrow down and focus on where there was a gap in the knowledge with the guidance of my supervision team. Hypertension has been widely researched in many parts of the world. However, as a community health nurse, I realized that hypertension is prevalent in rural communities and yet people only get to know about the disease after they acquire complications. This observation motivated me to raise awareness and explore healthy lifestyle behaviours for the prevention of hypertension in rural communities.

In the beginning, I was uncertain about which methods to use but after conceptualizing the research idea and reading about the topic in detail, it became evident that a sequential explanatory mixed methods design would be most appropriate. With little knowledge and skills on how to conduct mixed methods, it seemed like a challenge. Today, the knowledge and enthusiasm that I gained about the use of mixed methods has made me appreciate the learning process in the PhD journey. Based on an interest in mixed methods research, a colleague and I published a chapter in a book entitled "Application of Mixed Methods in Information Science Research in Africa: A Methodological Review" (Nakaziba & Namuguzi, 2022). The process of data analysis was challenging but with my wonderful supervision team, I was able to learn and analyse the data. I can now confidently interpret all the data in my work and other research studies. I believe if I had an opportunity to conduct another similar study, I would be able to do so confidently.

This PhD journey seemed to be smooth until I lost two siblings during the COVID-19 period. My sister died in Sweden and was buried five months later because her body could not be repatriated during the lockdown. Seven months after my sister's burial, my brother succumbed to COVID-19. I was very depressed and to some extent discouraged because life seemed to be meaningless at that time. With the lockdown in Uganda being almost two years, it affected the time of data collection for the second phase of this study as we had to conduct focus group discussions physically in the community because online discussions were not feasible. During the lockdown, I continued to work on other chapters as I waited to collect the data. As soon as the COVID-19 restrictions were eased, the data collection was resumed. The process of going into the rural communities to collect data seemed a little daunting, as there was a fear among myself and the research assistants of the possible risk of contracting COVID-19. I made sure that the COVID-19 mitigation plan (wearing masks, social distancing, sanitizing, and avoiding touching surfaces) was implemented. Throughout this time, my supervisors encouraged me and gave me time and space to recover from grieving. Based on this experience I learned that being a PhD supervisor requires one to be patient with the learner and sometimes empathetic but not sympathetic; this is something I would like to emulate when I become a supervisor. In addition, I have learned that resilience and hard work are key to completing a PhD project. It is a long-term project that requires one to continue working despite the challenges that come along the way.

I also learned that being a PhD student does not always follow a straight path but is rather a back-and-forth process. It is therefore important that at every stage during the PhD journey, the student reviews their previous chapters and ensures that they align with the subsequent chapters of the study. I also observed that beginning to write a new chapter is like beginning to write about a new topic that requires reading and understanding of what is appropriate for that chapter. This was time-consuming and sometimes made me feel empty. However, after conceptualizing what was required, the writing became easier and more interesting.

Based on the knowledge I have acquired during this PhD journey; I am confident that I can now manage much bigger research projects. I have also gained knowledge and skills in conducting population-based studies as well as grant writing, which I believe are powerful tools for my future research prospects.

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9 Appendices

9.1 Appendix A: Protocol for the scoping review

Abstract

Objective:

The objective of this scoping review is to establish the existing evidence concerning individual health lifestyle behaviours for the prevention of hypertension in low- and middle-income countries

Introduction:

Hypertension is a major preventable risk factor for cardiovascular morbidity and mortality. The prevalence of hypertension is increasing rapidly in low- and middle-income countries. In Uganda, the prevalence of hypertension is highest in Central Uganda compared to other regions. Over 75% of the population in Uganda lives in rural communities. With the recent epidemiologic transitions where hypertension is on the increase and yet the health care health financing is constrained in the country and the out-of-pocket payment for medical bills is unaffordable for the majority of the people, health lifestyle behaviours for prevention of hypertension must be explored in the rural communities with a higher population.

Inclusion criteria:

This review will include population-based studies conducted in low- and middle-income countries among participants aged 18 and above, focusing on health lifestyle behaviours for the prevention of hypertension. Included studies will be limited to the English language in the last 13 years.

All studies that included adults 18 years and above that were pregnant will be excluded.

Methods

The literature review will be searched using PubMed, CINHAL, Medline EbscoHost, SciELO Citation Index SciELO Citation Index and Open Grey. The search will be conducted in May 2019 and updated on 25th - 30th April 2023 and will be limited to studies published in the English language only ranging from 2010-2023. All identified articles will uploaded into Endnote and duplicates will be removed. A pilot test will be conducted and evaluated by two impartial reviewers using the reviewer's incusion criteria. The selection of the articles will be done by reading the titles and abstracts to ensure that they answer the research objectives. This will be followed by the full

review of the article by at least two impartial reviewers. Data extraction will be done using the Joanna Briggs Institute (JBI charting approach) and the presentation of findings will be guided by the PRISMA Extension for Scoping Reviews (PRISMA-ScR).

Results (For Reviews ONLY):

The PRISMA Extension for Scoping Reviews (PRISMA-ScR) will be used to report the findings of the scoping review.

Conclusions (For Reviews ONLY): The scoping review will identify the gaps regarding health lifestyle behaviours for the prevention of hypertension. In addition, the findings of the scoping review will provide nascent evidence regarding the primary prevention of hypertension in rural communities, further, the evidence would inform future studies that would examine the prevention and management of hypertension particularly in rural populations.

Introduction

Globally, hypertension is the number one risk factor for premature deaths and cardiovascular diseases (Mills et al., 2020; WHO, 2019) and yet it is preventable if efforts are directed to the modifiable risk factors for its cause (Mills et al., 2020). According to estimates, 31.1% of individuals globally (1.39 billion) had hypertension in 2010 and adult hypertension was more common (31.5 percent, 1.04 billion individuals) in Low-Middle-Income Countries (LMICs) than in high-income nations (HICs; 28.5 percent , 349 million people) (Mills et al., 2016). Current evidence shows that the prevalence of hypertension in low- and middle-income countries has increased where approximately a third of the general adult population suffers from it (Schutte, Srinivasapura Venkateshmurthy, Mohan, & Prabhakaran, 2021). In Uganda, the prevalence of hypertension is on the rise with the highest registered in Central Uganda 24.6% (Guwatudde et al., 2015) and 34.3% (Lunyera et al., 2018). Knowledge about hypertension and health lifestyle behaviour interventions are key concepts to promote the primary prevention of hypertension (Ndejjo et al., 2020). In some parts of Europe and Sub-Saharan Africa, it has been noted that knowledge about cardiovascular prevention is low at 17.7% (Ndejjo et al., 2020). In Uganda, knowledge about hypertension status is low (7.7%) which is an indication of the high burden of undiagnosed individuals and the high risk for complications due to hypertension (Guwatudde et al., 2015). It is therefore imperative to assess the current knowledge related to healthy lifestyle behaviours for prevention of hypertension within the geography of low-and-middle income countries and the findings will be used to inform further research and practice.

The objective of the scoping review is to explore the existing literature and identify gaps in knowledge regarding the health lifestyle behaviours for the prevention of hypertension among the general adult population in low- and middle-income countries.

Review question

What knowledge does the general adult population (18 years and above) have about the prevention of hypertension in low-and-middle-income countries?

What health lifestyle behaviours influence the prevalence of hypertension among the general adult (18 years and above) population in low-and-middle-income countries?

What is the prevalence of hypertension among the general adult (18 years and above) population in low-and-middle-income countries?

Keywords

Health Lifestyle behavio*; diet*; salt; alcohol; smok*; and physical activit*; high blood pressure; primary prevention; prevention; preventive measure* aware*

Eligibility criteria

Participants

Participants included in the study will be those aged 18 years and above.

Only papers written in English language will be included.

Only studies published from 2010-2023 will be included.

Pregnant women aged 18 years and above will be excluded.

Concept

Health lifestyle behaviours for the prevention of hypertension including dietary modifications, salt intake, alcohol consumption, smoking, and physical activities focusing on primary prevention will be included.

Studies focusing on the secondary prevention of hypertension will be excluded

Context

The context will include studies conducted in low-and-middle-income countries.

Types of Sources

This scoping review will consider both experimental and quasi-experimental study designs, such as interrupted time-series studies, before and after studies, non-randomized controlled trials, and randomized controlled trials. Additionally, case-control studies, analytical cross-sectional studies, prospective and retrospective cohort studies, and other analytic observational research will be taken into consideration for inclusion. Descriptive cross-sectional studies, case series, individual case reports, and descriptive observational study designs will all be taken into consideration for inclusion in this review.

Studies that concentrate on qualitative data will also be taken into consideration, including but not limited to phenomenology, grounded theory, ethnography, qualitative description, and action research.

Moreover, depending on the study question, systematic reviews that satisfy the inclusion criteria will also be taken into account.

For inclusion in this scoping review, text and opinion articles will also be taken into consideration.

Methods

The proposed scoping review will be conducted in accordance with the JBI methodology for scoping reviews (Peters et al., 2021).

Search strategy

Finding both published and unpublished papers will be the goal of the search approach. An initial limited search of CINHAL and PubMed will be conducted to find articles on the subject. A comprehensive search technique was developed using the text words found in the titles and abstracts of pertinent publications as well as the index terms used to characterize the articles (Appendix W). The search strategy, including all identified keywords and index terms, will be adapted for each included database and/or information source. All included sources of evidence's reference lists will be checked for new studies.

Studies published in English will be included in this scoping review as the research team may have limited access to language translation tools. Studies published in the last 13 years (2010-2023) will be included to have more current literature to inform the current study.

The databases to be searched include PubMed, CINHAL, Medline EbscoHost, SciELO Citation Index SciELO Citation Index and Open Grey. Sources of unpublished studies/ grey literature to be searched include Open Grey.

Study/Source of Evidence Selection

Following the search, all identified citations will be collated and uploaded into Endnote and duplicates removed. After a pilot test, titles and abstracts will be evaluated by two or more impartial reviewers who will compare them to the review's inclusion criteria. Potentially relevant sources will be retrieved in full, and their citation details imported into Endnote. Two or more impartial reviewers will carefully compare the full text of chosen citations to the inclusion and exclusion criteria. In the scoping review, the reasons for excluding full-text sources of evidence that do not fit the eligibility criteria will be noted and documented. At each level of the selection process, any discrepancies that arise between the reviewers will be handled through discussion or with the help of another reviewer or reviewers. A Preferred Reporting Item for Systematic Reviews and Meta-analyses extension for scoping review (PRISMA-ScR) flow diagram will be used to present the search results and the study inclusion process in detail in the final scoping review (Tricco et al., 2018).

Data Extraction

A data extraction tool created by the reviewers following the JBI data extraction guidelines will be used by two or more impartial reviewers to extract data from the publications included in the scoping review. Specific information on the participants, concepts, context, study techniques, and important findings that were pertinent to the review questions will all be included in the data that is extracted.

An extraction form is provided (see Appendix II*)*. The draft data extraction tool will be revised and amended as deemed necessary during the data collection process from each included evidence source. Modifications will be presented in the scoping review. Any disagreements will be discussed or resolved with another reviewer or reviewers if necessary. When necessary, missing, or additional data will be requested from the authors of papers by contacting them if it is appropriate. Disagreements that arise between the reviewers will be resolved through discussion, or with an additional reviewer/s. If appropriate, authors of papers will be contacted to request missing or additional data, where required.

Data Analysis and Presentation

Data will be presented in tabular format and may be modified based on the pilot. The tabulated and/or charted results will be accompanied by a narrative summary that explains how the results relate to the review's purpose and/or question(s).

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Conflicts of interest

There is no conflict of interest in this project.

9.2 Appendix B: Search Strategy

Title: Exploring Awareness and Health Lifestyle Behaviours on Prevention of Hypertension in Low-and Middle-income Countries: A Scoping Review Search Terms

Serial Number	Search Term
1	"Primary prevention" OR prevention OR "preventive measure*"
2	hypertension OR "high blood pressure” OR "raised blood pressure"
3	Diet* OR salt OR alcohol OR smok* OR “physical activit*” OR “Health lifestyle behavio*”
4	Aware*

9.3 Appendix C: Data Extraction Form for the Scoping Review

Serial No.	Title	Author(s)	Origin/country of origin (where the study was published or conducted)	Methodology/methods	Key findings that relate to the scoping review question/s Prevalence of hypertension	Key findings that relate to the scoping review question/s Awareness/knowledge about hypertension	Key findings that relate to the scoping review question/s Health lifestyle behaviours for prevention of hypertension
1	Prevalence, awareness, treatment, control and socio-demographic determinants of hypertension in Malaysian adults	Abdul-Razak, et al. (2016)	Malaysia	Prospective cohort study involving Malaysian adults aged ≥ 30 years from 18 urban and 22 rural communities	The overall prevalence of hypertension was 47.9 % (CI: 47.0–49.0).	Awareness of hypertension” was defined as self-report of any previous diagnosis of hypertension by a healthcare professional among those with hypertension However, a significantly lower prevalence of awareness (49.5 % vs. 56.4 %, p < 0.001) With regards to age, participants aged ≥ 60 years had high- est prevalence of hypertension (68.2 %), awareness (58.1 %) and treatment (44.4 %) compared to the other age groups	Ex- smokers had the highest prevalence of hypertension (58.3 %). In contrast, current smokers had the lowest prevalence of awareness (48.0 %) Obese participants had the highest prevalence of hypertension (60.6 %), and awareness (59.5 %) compared to those in other BMI categories. In a modified Poisson regression model that controlled for location, gender, age, ethnicity, education level, smoking status and BMI, the independent factors associated with hypertension were residing in the rural areas, female, age, Chinese, tertiary education, current smoker and all BMI categories.

						Meanwhile, the factors associated with awareness among the hypertensive participants were female, age, Indigenous groups and being obese. Factors associated with treatment among hypertensive participants were female, age, Indigenous groups and being overweight or obese.	
2	Sociodemographic Correlates of Modifiable Risk Factors for Hypertension in a Rural Local Government Area of Oyo State Southwest Nigeria	Abdulsalam, at al., (2014)	Nigeria	Quantitative Cross-sectional study	The overall prevalence of hypertension was 47.9 % (CI: 47.0–49.0).	The overall awareness of hypertension in the subjects was just 35 (9.5%) with 20 (57.14%) in females and 15 (42.86%) in males. Only 10.71% of the hypertensive subjects had awareness of their status	Current smoking among hypertensive subjects was particularly low in this study; only 4 (4.76) of the smokers were found to be hypertensive, though this finding did not attain statistical significance. On the other hand, a higher proportion, 43 (51.2%), of the hypertensive subjects currently consumed alcohol. This finding was statistically significant, . Current consumption of alcohol was thus significantly associated with hypertension. Furthermore, hypertensive subjects had a higher prevalence of sleep inadequacy 67 (79.76%) than nonhypertensive subjects, 55 (35.10%). It was also observed that sedentary subjects had a slightly higher prevalence 25 (29.76%) of hypertension compared to those with active lifestyle, 66 (23.32%). Concerning stress, it was surprising that only about 5 (6.0%) of the subjects who had significant stress level were disposed to hypertension compared to 79 (94.0%) of those who insignificantly perceived stress. This finding was statistically significant. In this study, it was observed that 25 (29.76%) subjects with abnormal weight had predisposition to hypertension, although 59 (70.23%) of normal weight subjects were also found to be hypertensive. These findings did not attain statistically significant value. In the

							female, only 13 (37.14%) of hypertensive subjects had used hormonal contraceptive compared to 22 (62.86%) of those who denied usage although the finding was not statistically significant. Only four of the independent variables made a unique statistically significant contribution to the model (sex, significant stress perception, inadequate sleep, and overweight). The odds for developing hypertension increased with increasing BMI. The association between BMI and hypertension increased further after adjusting other potential cofounders.
3	Prevalence and risk factors of general and abdominal obesity and hypertension in rural and urban residents in Bangladesh: a cross-sectional study	Ali, et al., 2022)	Bangladesh	Quantitative cross-sectional study	The prevalence was 30.9%,	the overall awareness of all the subjects was 9.5% with 57.14% in females and 42.86% in males. Among those found to be hypertensive, only 10.71% had awareness of their status while 89.29% were unaware. The knowledge about hypertension was higher in males (55.3%) than in women (49.7%) and it was higher among urban residents (61.4%) than rural residents (37.9%)	The prevalence of general obesity was 18.2% and abdominal obesity was 41.9%. Similarly, both types of obesity were higher in urban residents (21.7 and 46.6%, respectively) than in rural residents (13.8 and 35.1%, respectively) ($p < 0.01$ and $p < 0.001$, respectively). In regression analysis, the female sex, increased age, medium socioeconomic status, low physical activity and place of residence (urban area) were independent risk factors for general obesity The risk of general obesity was significantly higher among subjects aged > 30 years groups compared to the subjects aged 18–30 years group ($p < 0.05$ at least for all cases). On the other hand, female sex, increased age and BMI, low physical activity and place of residence (urban area) were the significant risk factors for abdominal obesity

							For hypertension risk factor analysis, we found a significant association for age, high BMI, low physical activity and place of residence (rural area) with increased risk of hypertension among participants
4	Hypertension, pre-hypertension, and associated risk factors in a subsistent farmer community in remote rural central India	Asgary, (2013)	India	Quantitative cross-sectional study of adults in six villages	The prevalence was 30.9%,		Females comprised 57 % of the study population Over 80 % of the participants classified themselves as smokers. Mean annual mean income was 31,217 rupees (SD ±27,303) here was no relationship between alcohol consumption and either high blood pressure readings or pre-HTN.
5	Prevalence and associated factors of hypertension among adults in Gondar, Northwest Ethiopia: a community based cross-sectional study	Awoke et al., (2012)	Ethiopia	A community based cross-sectional study was conducted in April 2012 in Gondar city	28.3 % were hypertensive 28.3 % were hypertensive Rural participants had a higher prevalence of hypertension (35.1%) compared to the urban participants (27.5%). Nearly half (52.3%) were married Non-modifiable factors, age and family history of hypertension were associated with hypertension		Being obese (AOR=5.50 &95%CI: 2.07-14.62) was significantly associated with hypertension compared to having normal BMI not walk at least for 10 minutes continuously on daily basis were about three times (AOR=2.86 & 95%CI 1.15 -7.12) highly likely to be hypertensive. Dietary habits of respondents About two third (67.7%) of respondents reported that

							they usually use vegetable oil for meal preparation while a similar proportion (67.6%) reported eating vegetables at least 1–3 days in a week. Half of the respondents (50.1%) do not eat fruits at all in any days of a week. Hundred and forty three (21.1%) respondents have reported excessive use of salt than other family members
6	A retrospective analysis of hypertension screening at a mass gathering in India: implications for non-communicable disease control strategies	Balsari et al. (2017)	India	Cross sectional quantitative study	Among those aged 45–59, 36.0% had high blood pressure. Among those aged 45–59, 36.0% had high blood pressure. 33.6% of visitors screened for hypertension were found to have high blood pressure. Among those aged 45–59, 36.0% had high blood pressure. This proportion rose to 45.7% among those aged 60–74 age group. 51.5% of those 75 and older were hypertensive 0.7% (2398)		Prevalence of hypertension was 39% among consumed tobacco in some form tobacco users and 29% among non-tobacco users (28%) (P=0.001). A total of 4731 visitors reported their tobacco habits: 50.7% (2398) consumed tobacco in some form. In all, 20.3% reported using cigarettes or bidis exclusively; 24.1% used only gutka or betel nut; and 6.4% reported using both smoking and smokeless tobacco. Among those that reported their tobacco habits, tobacco consumption was 58.7% among those with hypertension, and 46% among those without

					Prevalence of hypertension was 39% among tobacco users and 29% among non-tobacco users (28%) (P0.001)		
7	Socioeconomic Status and Its Relation to Hypertension in Rural Nepal	Bhattarai et al., (2021)	Nepal Kirnetar Health Center in the rural village of Dolakha district in Nepal.	Cross sectional quantitative study	50 (23.9% males and 14.3% females Compared to the low-income group, individuals belonging to middle- and high-income groups had 1.04 (95% CI, 0.54–2.01) and 1.33 (95% CI, 0.68–2.58) times more hypertension prevalence Prevalence was 23.4% Highly educated had a high prevalence of hypertension	60% of hypertensives were aware of their status.	No evidence of mediation by lifestyle factors was observed between socioeconomic status and hypertension. Compared to normotensives, hypertensives were generally elderly, male, employed, a member of other ethnic groups (not Dalit and Brahmin/Chettri), highly educated, less physically active, wealthy, tobacco smokers and alcohol drinkers, and consumed fewer fruits and vegetables.
8	Hypertension Prevalence, Awareness, Treatment, and Control and Sodium Intake in Shandong Province, China: Baseline Results From Shandong–Ministry of Health Action on Salt Reduction and Hypertension	Bi et al., 2014	India	Quantitativ e Cross-sectional survey	weighted prevalence of hypertension was 23.4% (95% CI, 20.9%–26.0%). 50% were men, 50% were women, 31% lived in urban areas, and 69% lived in rural areas. weighted prevalence of hypertension was 23.4% (95% CI, 20.9%–26.0%). Among those classified as having hypertension	significant levels of hypertension in Shandong Province, particularly in rural areas. Control of hypertension has improved but is very low. Sodium intake is high Opportunities have been identified for strategic efforts in targeting hypertension prevention and control and reducing sodium intake	The daily average sodium consumption from processed food was 582 mg (95% CI, 498 mg–666 mg) and accounted for 10.1% (95% CI, 9.0%–11.3%) of the total sodium intake

	(SMASH), 2011				The prevalence of hypertension was not different between rural and urban areas (P = .12). Among those with hypertension, awareness (P = .001) and treatment (P = .002) of hypertension were significantly lower in rural compared with urban Preventing Chronic Disease | Hypertension Prevalence, Awareness, Treatment, and Contr... were significantly lower in rural areas than in urban area	, only one-third (34.5%; 95% CI, 29.8%–39.2%) were aware of their condition; about one-fourth (27.5%; 95% CI, 23.6%–31.4%) reported taking antihypertension medications, and one-seventh (14.9%; 95% CI, 13.0%–16.8%) had their blood pressure controlled	
9	Prevalence, Awareness, Treatment, and Control of Hypertension among Adults in Beijing, China	Cai, et al., 2012	Beijing, China	A cross-sectional survey 18–79 years was conducted in Beijing, in 2008	prevalence of hypertension was 35.5% (41.8% in men, 30.9% in women) and increased with age in both sexes. prevalence of hypertension was 35.5% (41.8% in men, 30.9% in women) and increased with age in both sexes.	Our findings underscore the urgent need to develop a comprehensive health strategy for the prevention, detection, and control of hypertension to avert the cardiovascular disease epidemic in Beijing.	The prevalence of hypertension increased with BMI and waist circumference. Results from logistic regression analyses indicated that higher waist circumference leads to higher odds compared with the lowest waist circumference group (middle: OR = 1.68; high: OR = 2.53, all P < .0001) after adjusted for sex, age, and BMI. The results were unchanged after further adjustment for smoking status, drinking status, and physical activity level

10	High prevalence, low awareness, treatment and control rates of hypertension in Guinea: results from a population-based STEPS survey	Camara, et al., 2015	Guinea	Cross sectional survey	2491 participants (1351 women; 54.2%) age-sex standardized prevalence of hypertension in the general population was 29.9% (95% confidence interval (CI) 29.8–30.0), with the highest prevalence recorded in Rural Lower Guinea area (37.7%) and the lowest in Conakry (23.9%). prevalence steadily increased with age in both sexes 17.8% (single), 35.7% (married) and 49.2% (widowed) for marital status (Po0.001); 38.6% (none), 20.9% (primary-secondary school) and 25.0% (higher education) for education status (Po0.001); 28.9% (no diabetes) and 59.6% (diabetes) for diabetes status (Po0.001); In all, 75.8% of the hypertensive cases were not aware of their condition.		

11	Hypertension unawareness among Chinese patients with first-ever stroke	Cao et al., 2016	China	Cross-sectional study	Based on the results of blood pressure monitoring and a history of antihypertensive medication usage, 3732 (70.3 %) patients were confirmed with hypertension at the time of stroke onset.	(15.9 %) were unaware. hypertension unawareness was more prevalent in young than in elderly patients. Young people may be less vigilant to the hazardous effects of elevated blood pressure to their health.	29.4% (nonsmoking) and 33.6% (smoking) for smoking status (Po0.001); 28.9% (non-obese) and 53.8% (obese) for obesity status (Po0.001) The prevalence of severe hypertension was higher in women than in men (18.3% vs 13.7%, Po0.001). Age–sex standardized prevalence for obesity was 1.9% (95% CI 1.9–2.0) in men and 8.7% (95% CI 8.6–8.8) in women
12	Prevalence and risk factors of hypertension: A nationwide cross-sectional study in Lebanon	Cherfan, et al., 2017	Lebanon	Cross-sectional study	The prevalence of HTN was 31.2% In both sexes, HTN was more common with increasing BMI (P < .001) and in those with a lower range income than 2 000 000 Lebanese pounds In females, HTN was more prevalent in those living in a rural area (P < .01), while it was less prevalent in working individuals (P = .01) and in those with a higher level of education (P = .001). In males, HTN was prevalent in married vs single		Regarding lifestyle behaviors, in both females and males, HTN was less seen in those with "vigorous intensity" physical activities compared to no activity (P trend <.05) and in women who are physically active versus those who are not (ORa 0.412; P < .001) HTN in-creased with increasing age, BMI, and presence of previous CVD in both men and women, and was higher in married men and in women with diabetes.

					individuals (P < .05)		HTN decreased in men with occasional alcohol consumption and in women with higher education and physical activity | 5CHERFAN Et Al . (the total percentage is higher than 100 because a patient may be using one or more drug) with beta-blockers as the most commonly used med- ications (51.4%), followed by angiotensin receptor blockers (33.2%). 3.2 | Nutritional and psychological aspect Components of the LMDS are presented in Table S1 and were com- pared in hypertensive and non-hypertensive individuals. Detrimental components, such as fast food, fried food, meat, and sweets were consumed less frequently in hypertensive individuals than in non- hypertensive. This resulted in a higher mean ± SD detrimental score of 13.4 ± 2.6 compared to 12.1 ± 2.7 in non-hypertensive individuals (P < .001), suggesting that those with hypertension were more adher- ent to the LMD. Beneficial components, such as olive oil, white bread, whole grain bread, cooked vegetables, and fruits were consumed more frequently by those with hypertension (P trend for all, P < .05).

							The beneficial score was similar in both groups (P > .05; data not tab- ulated). The overall LMD score is discussed in the gender-stratified analysis
13	National prevalence and associated risk factors of hypertension and prehypertension among Vietnamese adults	Do, et al., 2014	Vietnam	Cross-sectional study	The prevalence of hypertension was 20.7% (95% CI = 19.4–22.1) and was higher in men vs. women (25.2% vs. 15.9%; P < 0.001) but was similar in urban areas vs. rural The overall prevalence of unknown hyper- tension was 15.4%, highest in rural men (19.4%) and lowest in urban women (7.8%).	Among the group with hypertension, only 25.9% (95% CI = 23.3−28.1) were aware of their condition	The results from multivariable multinomial regression analysis age, educational level, BMI, and physical activity were independent risk factors for hypertension in both men and women.
14	Prevalence, awareness, treatment and control of hypertension among adults in rural north-western China:	Dong, et al 2013	China	Quantitative study Subjects aged 18 – 85 years were sampled from five surveillance areas	The prevalence of hypertension was 36.7% 000 residents were surveyed, including 1355 men (45.2%) and 1645 women (54.8%) educational levels were	(37%) were aware that they had the condition The rates of awareness increased significantly with age, BMI and waist circumference (P < 0.001).	According to multivariate regression analyses, hypertension was independently associated with being overweight, obesity, central obesity

	a cross-sectional population survey				low: 40% (n ¼ 1200) of participants had elementary school or no formal education, 43% (n ¼ 1290) had attended secondary school and 17% (n ¼ 510) had a tertiary education. Prevalence was similar in both male and female	Awareness of hypertension was significantly greater in obese and overweight individuals than in those of normal weight (P < 0.001).	
15	Epidemiological survey of hypertension in Anambra state, Nigeria	Gebrihet, et al., 2017	Nigeria	A sequential quantitative -qualitative study design was employed from October 1 to December 30/2015 among adults living in Aksum town.	crude prevalence of hypertension and prehypertension in the study population were 22.81% and 42.54% respectively. 54.2%) attended at most primary level educa- tion or not at all. Four hundred twenty-eight (82.1%) of the total respondents reported that they eat fruits, but only 89 (17.1%) eats a fruit at least three days per week.	Generally, more than half (51.65%) of the respondents had low knowledge of risk factors and prevention methods of hypertension Knowledge on physical inactivity as a risk factor was also associated with hypertension; respondents who didn't know physical inactivity as a risk factor of hypertension [AOR = 3.57, 95% CI; 1.69, 7.69] were more likely to be hypertensive than their counterparts.	Almost all of the respondents 500 (96%) reported that they eat vegetable in their servings, but only 138 (26.5%) eats three days or more per week. Majority 442 (84.8%) of the respondents reported that they use saturated fat and oil in their diet. Of the total respondents included in this study, 341 (65.5%) were physically active. Regarding to body mass index, 82 (15.7%) of respondents were obese/ 1.3%) were current smokers and 154 (29.6%) were current alcohol users. from the FGD, the participants failed to name clearly the recommended dietary practice or what to avoid and what to consume. a man of 37 years old revealed: "". . . I

					The overall prevalence of hypertension was 16.5% [95% CI: 13.4, 20.0]. Among all hypertensive individuals identified, more than half (57%) were not aware of their hypertension status Moreover, overweight/obese (BMI25 kg/m2) respondents [AOR = 9.2, 95% CI; 4.54, 18.67] were at more than nine times at increased risk of being hypertensive compared to those with normal BMI. Likewise, respondents who did not consume fruit [AOR = 4.31, 95% CI; 1.74, 10.66] were more likely to be hypertensive		believe that hypertension is preventable by improving dietary practice, particularly by avoiding high fat intake just by avoiding consuming oil and sweet foods. Of the total respondents, seven (1.3%) were current smokers and 154 (29.6%) were current alcohol users. Four hundred twenty eight (82.1%) of the total respondents reported that they eat fruits, but only 89 (17.1%) eats a fruit at least three days per week. Almost all of the respon- dents 500 (96%) reported that they eat vegetable in their servings, but only 138 (26.5%) eats three days or more per week. Majority 442 (84.8%) of the respondents reported that they use saturated fat and oil in their diet. Of the total respondents included in this study, 341 (65.5%) were physically active. Regarding to body mass index, 82 (15.7%) of respondents were obese/ overweight (BMI 25 kg/m2). In addition, 41 (7.9%) of the respondents had a family history of hypertension Physically inactive respondents [AOR = 20.11, 95% CI; 8.75, 46.20] were about 20 times more likely to develop hypertension than those who were physically active.

16	The dynamics of hypertension prevalence, awareness, treatment, control and associated factors in Chinese adults: results from CHNS 1991-2011	Guo, et al., 2015	China	Longitudinal survey	From 1991 to 2011, the BP level elevated (SBP 120.0–124.5 mmHg, DBP 76.7–79.3 mmHg) and the prevalence of hypertension increased from 23.4 to 28.6% Factors associated to the risk of hypertension were ever-smokers, were at a higher level of household income, were covered by health insurance schemes, as well as those who were overweight and obese, living in the suburban or urban areas, had greater probability of being hypertensive	Among the hypertensive patients, aware-ness increased from 33.7 to 54.9% (men from 28.7 to 51.7%, women from 38.8 to 58.7%) Compared with being men and illiterate, being women and higher educational attainments were negatively related to hypertension; on the contrary, they were positively related to awareness, treatment and control of hypertension. Alcohol drinking for 1–2 times each week was inversely associated with awareness, treatment and control (vs. never drinking). More alcohol intake at a level of at least 3 drinks/week was related to an elevated risk for hypertension, as well as decreased awareness and treatment.	In the multivariate analysis, we observed that patients who were older which demonstrates the relationship between age and risks of hypertension), were ever-smokers, were at a higher level of household income, were covered by health insurance schemes, as well as those who were overweight and obese, living in the suburban or urban areas, had greater probability of being hypertensive, and at the same time, had higher qualities of awareness, treatment and control among those with hypertension

17	Prevalence and associated factors of hypertension among adults in Durame Town, Southern Ethiopia	Helelo, et al., 2014	Ethiopia	cross sectional study age is >31 years 536 participants	prevalence of hypertension was 22.4% (95% CI: 18.8–26.0) more than one thirds (39.6%) of them were newly screened - who did not know that they had hypertension. 40–50 years category had AOR of 8.88(95% CI: 2.92–27.04) as compared to those 31–40 years old. Participants who had history of hypertension were more likely to be hypertensive		physical inactivity, vegetable eating habit, and use of top added salt on plate were significantly associated with hypertension. If participants of the study use top added salt on plate, then they were [AOR =6.55, 95%CI; 2.31–18.53] more likely to be hypertensive than their counter parts. Whereas, adults who did not eat vegetables for more than three days on their weekly menu were about two times [AOR =2.30, 95% CI; 1.17–4.51] high likely to be hypertensive than those eat daily. Nearly three fourth of participants (72%) had a normal BMI, whereas the rest were either overweight or obese. Overweight/obesity was found to be strong risk factor for hypertension [AOR =15.7, 95% CI; 7.89–31.21]
18	Prevalence, Awareness, Treatment, and Control of Hypertension and Its Risk Factors in (Central) Vietnam	Hien, et al., 2018	Vietnam	A cross-sectional study	Overall, the prevalence of hypertension in the age group of 40–69 years in the Vietnamese population was 44.8%. It was significantly higher in men than in women (51.3% versus 39.7%, p < 0.001). two-thirds of the participants with hypertension were aware of their hypertension.	Overall, two-thirds of the participants with hypertension were aware of their hypertension. This proportion increased with age and ranged from 37.3% at age of 40 to 49 years to 78.3% at age of 60 to 69 years. Gender, age, and excessive alcohol consumption were independently	The prevalence of current smoking and that of excessive alcohol consumption were 33% and 7.6% in the corresponding order. Notwithstanding, the proportions of physical inactivity were similar in both genders. More than half of the participants had excessive abdominal fat and the proportion of overweight, including obesity, was one-third of the participants. These proportions were higher in women than in men.

					The prevalence and awareness of hypertension are similar among participants from urban and rural areas	associated with awareness of hypertension.	The prevalence of hypertension in people with physical inactivity, overweight and obesity, abdominal obesity, and diabetes was higher than that in people without those risk factors.
19	Analysis of the Prevalence and Risk Factors of Hypertension in the She Population in Fujian, China	Huang, et al., 2011	China	A cross-sectional study	prevalence of 36.09%, including 1,374 undiagnosed cases, which was 71.15% of all patients with hypertension prevalence of hypertension gradually decreased while the education levels increased.		The relationship between hypertension and BMI, which demonstrates that the prevalence of hypertension gradually increased with the increase in BMI values the relationship between hypertension and smoking, which demonstrates that the prevalence of hypertension was higher in the smoking group than the non-smoking group. the relationship between hypertension and daily salt intake levels, which demonstrates that the prevalence of hypertension gradually increased with the increase in daily salt intake.

20	Hypertension in a rural community in South Africa: what they know, what they think they know and what they recommend	Jongen, et al., 2019	South Africa	Mixed methods study approach	Slightly more females (n = 229) than males (n = 222) participated, aged on average 40.9, respectively 42.8 years recommendations to raise awareness about hypertension in the community,	The main themes that emerged from analysis of the focus group discussions were: 1. Perceptions and misperceptions of hypertension, describing what the community members know and what they think they know about hypertension. 2. Hypertension prevention and management challenges on community level, describing to which extent the community is informed about hypertension and also describing the difficulties that are faced when looking for help, 3. Rec Stress/anxiety related factors prompting the development of hypertension revolved around the family situation and included fighting with children or spouse or not being able to provide for the family because of unemployment.	Our findings highlight the need for campaigns that focus on ways to create a healthy diet and lifestyle that fits a low income. For instance, campaigns could aim at showing the benefits of reducing salt and fast food and teach people to choose healthier food alter- natives such as vegetable oils (like sunflower oil), fresh fruits and vegetables. Health campaigns could come in a format attracting a younger audience, such as events where the people are educated in a way that is fun to them. Awareness could also be raised through home-based sessions and by collaborating with church leaders.

						Yes, stress also causes high blood pressure especially if you are not working, you have a wife and kids, the kids are crying asking for this and that, and the wife is yelling at you. (isiZulu male FGD discussant) Most woman cause men to have high blood pressure. Communication is fundamental in a relationship, and things like failure to communicate, non-compromising attitude from women and lack of respect results in high blood pressure. (isiZulu mixed FGD discussant) Lastly, genetic predisposition to hypertension was debated. While some participants did not understand what hereditary meant, another group felt that they will become hypertensive despite any preventative efforts if it	

						occurred in their family. The last group felt that a family history of hypertension is not a guarantee that all family members will be hypertensive. It's in our blood, so it's inevitable that I'm going to have it since it's hereditary. (English male FGD discussant) No, high blood pressure is not hereditary. My mother does not have high blood pressure but I have. (isiZulu Female FGD discuss Recommendations for raising awareness in the community about hypertension Door-to-door care vs. visiting the clinic However, not everybody agreed with this, fearing stigmatization as a result of home visits.	

						Coming to my house will make it easy for health workers to discuss my privacy if they discover that I am sick. They would easily talk about me. (isiZulu female FGD discussant) Views on the knowledge of the community members The predominant view was that knowledge about the disease and how to treat it comes with a diagnosis. Those who have been diagnosed with high blood pressure know about it however those who do not have high blood pressure are also not well informed. (isiZulu mixed FGD discussant)	

21	Prevalence of hypertension and associated cardiovascular risk factors in an urban slum in Nairobi, Kenya: a population-based survey	Joshi, et al., 2014	Kenya	Quantitative survey	The age-standardised prevalence of hypertension (95% CI) was 22.8% (20.7, 24.9). 18 to 90 yrs. with a mean age of 33.4 yrs prevalence increased with age and was significantly higher among females in the age strata of 35–44 yrs. (p = 0.008) and 55- 64 yrs (P = 0.001) Correlates of hypertension included advancing age, overweight, general and central obesity which were associated with 2–3 fold increased likelihood of hypertension, affirming that these are risk factors for the development of primary hypertension in this population.	Only 20% (53/258) were aware of their hypertensive status	Vigorous or moderate work-related activity was undertaken by 75.7% (male 78.2%, female 73%), at a median duration of 7 hrs for 6 days per week. vigorous work-related PA was more common in males whereas moderate work related PA was more common in females. Walking or cycling as a mode of transport was undertaken by 77.4% (male 80.3%, female 74.3%) for a median duration of one hour for 6 days per week. Vigorous work-related PA was more common in males whereas moderate work-related PA was more common in females. prevalence of over-weight (BMI >25-29.9) and obesity (BMI ≥30) were significantly higher among women (P = 0.0001 for both BMI categories). Only 5.8% of men and 3.1% of females were underweighting

22	Alcohol use among adults in Uganda: findings from the countrywide non-communicable diseases risk factor cross-sectional survey	Kabwama et al., 2016	Uganda	Cross-sectional study	We also found that older participants were more likely to be medium- to high-end alcohol users than younger participants. This could be attributed to a culture that socially embraces alcohol use (42), as well as stress fac-tors, such as deterioration in health, the experience of traumatic events (44), and high levels of unemployment (27, 45) among older people.		
23	Patterns and determinants of hypertension in Botswana	Keetile, et al., 2015	Botswan	Quantitative study	hypertension has been observed to be more prevalent among females (18.9 %) than males (9.9 %). The results also indicate the prevalence of hypertension increases with age for both genders, although the prevalence is high among female respondents. For instance, among males, the hypertension prevalence in the ages 25–34, 35–44, 45–54 and 55–64 years was 5.3, 6.7, 11.8 and 18.5 % respectively, while among females, the prevalence in ages 25–34, 35–44, 45–54 and 55–64 years was 6.6, 17.3, 28.4 and 41.6 % respectively. For all ages, the prevalence of hypertension is higher among female respondents.		prevalence of hypertension among current smokers was significantly high among females (20.7 %) compared to males (7.9 %). The results also indicate that the proportion of respondents with hypertension was marginally high among both males and females who consume alcohol than those not consuming alcohol. The results also indicate that males who reported that they were not physically active had a higher propensity to have hypertension (11 %) than those who were physically active (7.1 %). The study did not find any significant difference between those who consume vegetables frequently and those who do not in the case of males. On the other hand, for females, the proportion at risk for hypertension was high among those who had not eaten vegetables (21.8 %) on any 1 day of the week compared to those who ate vegetables on 1 or more days of the week (18.6 %). The study found that obesity seems to be an important covariate for hypertension. For males, hypertension was more prevalent among those who were obese (31.1 %) than

					hypertension was significantly high among respondents with tertiary or higher education (12.6 %), followed by those with primary school or less (11.2 %) and secondary education (6.8 %). Interestingly, among females the prevalence of hypertension was significantly high with primary school education or less (23.9 %) compared to respondents with tertiary (16.7 %) and secondary education (12.1 %)		those who were not (8.6 %), and also for females hypertension was more pronounced among those who were obese (29.1 %) than those were not (15.6 %). The results also show that the risk of hypertension is greater among obese men (31.1 %) than obese women (29.1 %).
24	Epidemiology and awareness of hypertension in a rural Ugandan community: a cross-sectional study	Kotwani, et al., 2013	The study was conducted in Kakyerere parish within Mbarara district Uganda	Quantitative Population based survey	The overall unadjusted prevalence of hypertension in this community was 15.7%. Hypertension prevalence was 16.1% among men and 15.4% in women (P = 0.67) Age ≥60 years was associated with a marked elevation in hypertension prevalence compared to age 18–29 years (PR = 12.30; 95% CI 6.59-22.10).	Awareness was higher among women: 50.5% of hyper- tensive women were aware of their diagnosis compared to only 23.5% men (P < 0.0001	Similarly, the prevalence of hypertension increased with BMI: overweight and obese women were more likely to be hypertensive (PR = 1.75; 95% CI 1.28-2.40, and PR = 2.72; 95% CI 1.94-3.83, respectively) An increase in BMI was also associated with a greater hypertension prevalence: PR = 2.12 (95% CI 1.45-3.11) for overweight men and PR = 1.64 (95% CI 0.84-3.22) for obese men.

25	Sex differences in prevalence and risk factors of hypertension in India: Evidence from the National Family Health Survey-4	Kumar & Misra, 2021	India	Cross sectional survey stratified two-stage sample design, the NFHS-4 was administered across Primary Sampling Units (PSU) in rural areas and Census Enumeration Blocks (CEB) in urban areas	Prevalence of hypertension among women and men were 11.56% and 16.32%, respectively. The prevalence was higher among married men than never-married ones and the odds were greater compared to married women (men: AOR, 1.34; 95% CI, 1.27–1.43; P<0.001; women: AOR, 1.27; 95% CI,1.18–1.38; P<0.001). Further, the odds were 1.36 times higher for women and 1.58 times higher for men in the richest wealth quintile Both men and women who consumed alcohol were hypertensive (men: AOR, 1.26; 95% CI, 1.21–1.31; P<0.001; women: AOR, 1.38; 95% CI, 1.23–1.55; P<0.001).		Higher prevalence of hypertension was correlated with a non-vegetarian diet but results were significant only for men (AOR, 1.05; 95% CI, 1.01–1.10; P = 0.02). Both men and women who consumed alcohol were hypertensive (men: AOR, 1.26; 95% CI, 1.21–1.31; P<0.001; women: AOR, 1.38; 95% CI, 1.23–1.55; P<0.001). Higher prevalence of hypertension was correlated with a non-vegetarian diet but results were significant only for men (AOR, 1.05; 95% CI, 1.01–1.10; P = 0.02). We also adjusted estimates for factors like religion and caste but did not find any significant results, except for Muslim women.
26	Prevalence and risk factors associated with prehypertension and hypertension in the Chinese She population	Lin, et al., 2012	China	Quantitative study An interview-based survey of hypertension was performed us-	Only 26.63% of the subjects with hypertension were aware of their hypertension status 38.42% (38.96% in males and 38.01% in females, respectively) Compared to subjects with education status of no	The crude rate of hypertension awareness in the She population was 26.63%, whereas the rate was only 19.16% after age and gender were adjusted, which was significantly lower than that in a Chinese national survey (24%)	Cigarette smoking was not significantly associated with prehypertension but was found to have a significantly negative association with hypertension.

				ing a questionnaire by trained staff.	formal education, those with a higher school education were less likely to have prehypertension and hypertension. A family history of hypertension and hyperuricemia were risk factors for hypertension, but they were not a risk for prehypertension.		
27	Diet And Hypertension: A Comparative Analysis Of Four Diet Groups In South-Western Nigeria	Makinde & Babalola, 2011	Nigeria	Quantitative study Participants were selected using multi-stage random sampling method	Thirteen percent (13%) of the male respondents were hypertensive while 9% of the female were hypertensive	Many respondents were not aware of their hypertension status. However, when assessed across the diet groups, L-O-V had highest awareness level (15%) and vegans were the least aware (7%) of BP status	Reasons for Choice of Dietary Pattern: Economic status, which determines ability to pay for a chosen basket of food items 34% of RME, 25% of WME, 35% of LOV 29% of V engaged in vigorous daily activities. Furthermore, 39% of RME, 37% of WME, 35% of LOV 50% of V engaged in low physical exerting activities daily. 397 respondents interviewed, 253 were red meat eaters, 84 were white meat eaters, 46 were lacto- ovo- vegetarians and 14 were vegans
28	Prevalence of hypertension and related risk factors in central Iran: Results from Yazd Health Study	Mirzaei,et al, 2021	Iran	population-based prospective study conducted in Yazd Greater Area	The prevalence of HTN was 36% [95% CI: (35.1-36.9)] in all the subjects (n = 9975). Its prevalence among women and men was 34.7% [95% CI: 33.4-36.0] and 37.3% [95% CI: 35.9-38.7], respectively.		The prevalence of HTN was lower in people with higher education, more physical activity, lower BMI, and no history of diabetes mellitus (DM) (P < 0.0001). Higher blood pressure is less common in smokers compared to non-smokers (P < 0.0001).

					being female women, younger, and educated were protective factors for HTN.		
29	Prevalence, awareness, treatment and control of hypertension and their determinants: results from a national survey in Kenya	Mohamed, et al., 2018	Kenya	a national cross-sectional household survey targeting randomly selected people aged 18–69 years.	Approximately two-thirds of the respondents were from the rural areas. More than 60% of the respondents had at least completed primary school education and above. The overall age-standardized prevalence of hypertension was estimated at 24.5% [95%CI: 22.6–26.6] Hypertension prevalence increased with increasing wealth status; individuals from the richest households had higher hypertension 29.0% [95%CI: 24.6–33.5] com- pared with those from the poorest households 19.4% [95%CI: 15.4–23.5] and this was statistically significant.	Only 15.5% [95%CI: 12.4–18.9] were aware of their condition, 26.9% [95%CI: 17.3–36.4] of the respondents who were aware of their hypertensive status	Similarly, hypertension prevalence increased with higher BMI; overweight and obese individuals had significantly higher hypertension rates 30.7% [95%CI: 26.2–35.3]

30	Prevalence, Awareness, Treatment, and Control of Hypertension among Young and Middle-Aged Adults: Results from a Community-Based Survey in Rural Tanzania	Muhihi, et al., 2020	Tanzania	Data analyzed for this study were collected as a baseline survey for cluster randomized controlled trial of community health workers (CHWs) interventio ns for reduction of blood pressure	Among 3145 individuals who were approached for participation, 3000 (95.4%) had complete data . About one-third (31.8%) had normal blood pressure, 39.9% had blood pressure in the pre- hypertension range, 16.7% had stage 1 hypertension, and 11.6% had stage 2 hypertension The prevalence of hypertension was 29.3% (Table 2) and increased sharply with age from 12.5% among 25–34 years old age group to 53.2% among 55–64 years groups, respectively ($p < 0.001$) Among 880 participants with hypertension, 302 (34.3%) were aware of their hypertension status, while the remaining 578 (65.7%) were newly diagnosed	Among 880 participants with hypertension, 302 (34.3%) were aware of their hypertension status, while the remaining 578 (65.7%) were newly diagnosed Awareness of hypertension was significantly higher among older compared to young participants (p � 0.016), women compared to men ($p < 0.001$), those with high socioeconomic status ($p < 0.01$), and those with a history of diabetes mellitus ($p < 0.01$). Older participants were more than 2 times likely to be aware of their hypertension compared to younger participants (AOR = 2.05, 95% CI: 1.24–3.39, $p < 0.001$). Similarly, women had more than twice the odds of being aware of hypertension compared	Only 5.9% of the participants was current smokers, and 19.7% was current alcohol drinkers Awareness was low among alcohol drinkers and participants with normal BMI (both $p < 0.01$). Participants who reported using raw table salt had more than twice the odds of being hypertensive (AOR = 2.27, 95% CI: 1.73–2.99, $p < 0.001$). Overweight participants had 53% increased risk (AOR = 1.53, 95% CI: 1.26–1.88, $p < 0.001$), while obese participants had more than double the risk for hypertension (AOR = 2.58, 95% 2.04–3.28, $p < 0.001$) The proportion of participants who consumed vegetables and fruits 5–7 days/week was 63.9% and 7.9%, respectively. Women consumed vegetables more frequent than men ($p < 0.001$)

					Awareness of hypertension was significantly higher among older compared to young participants (p = 0.016), women compared to men (p < 0.001), those with high so- Socioeconomic status (p < 0.01), and those with a history of diabetes mellitus (p < 0.01). Awareness was low among alcohol drinkers and participants with normal BMI (both p < 0.01). Significant predictors of hypertension in multivariate analysis was older age, use of raw table salt, and higher BMI Similarly, women had more than twice the odds of being aware of hypertension compared to men (AOR = 2.47, 95% CI: 1.67–3.66, p < 0.001).	to men (AOR = 2.47, 95% CI: 1.67–3.66, p < 0.001). Other significant predictors of awareness of hypertension were higher socioeconomic status, alcohol drinking, use of raw table salt, history of diabetes mellitus, and higher BMI. Overweight and obese participants were more than 2 times more likely to be aware of their hypertension compared to normal-weight participants. Alcohol drinking was associated with 51% decreased odds of being aware of hypertension status (AOR = 0.49, 95% CI: 0.32–0.74, p = 0.001).	

31	Neglected Cases of Hypertension in Rural Indonesia: A Cross-Sectional Study of Prevalence and Risk Factors on Adult Population	Mulia & Prajitno, 2020	Rural Indonesia	A community-based cross-sectional study	The prevalence of hypertension was 38.8%.		The prevalent risk factors of hypertension in this study were age more than 40 years old (OR=4.1 95%CI:1.8-8.9), abdominal obesity (OR=2.7 95%CI: 1.2-6.01), and smoking (OR=3.2 95%CI: 1.4-7.1).
32	Prevalence, awareness and control of hypertension in Uganda	Musisnguzi & Nuwaha, 2013	Uganda, Buikwe district	a community based cross sectional study where data was collected through interviews and taking of physical measure-ments he tool used for data collection was adapted from the World Health Organisation (WHO) stepwise	Of the 4563 analysed 64.5% where females and 35.5% were males. About two thirds of the participants resided in rural areas and this proportion was the same among females and males majority completed primary education (44.1%) The overall prevalence of hypertension in our sample was 21.8% The prevalence of hypertension increased linearly with age	Awareness increased linearly with age from 1.7% among those aged 15–24 to 38% among those aged more than 65 years (Chi square for linear trend = 68.3, P,0.001).	

				approach to chronic disease risk factors surveillanc e (STEPS)	The prevalence of hypertension was highest among widowed women (49.5%) followed by those who were divorced or separated (30.5%) then by the currently married (18.2%) and finally prevalence of hypertension was lowest among the never married (9.7%) Not attending school was associated with higher prevalence of hypertension in both sex categories. Among those who never attended school, the prevalence was higher (41.8%) among females than men (27.9%) and within the women. Overall, 1268 (36.5%, CI 35.1–37.9%) of the study participants had ever had their blood pressure measured. Females were more likely to have ever had their blood pressure measured compared to			

					males [women 36.5% versus men 12.0%]. At multivariable regression analysis, predictors of being hypertensive were age, residing in an urban area and being overweight or obese		
33	Hypertension and Socioeconomic Status in South Central Uganda: A Population-Based Cohort Study	Mustapha, et al., 2022	South Central Uganda in Rakai District	cross-sectional study	The prevalence of hypertension increased from underweight to obese BMI categories (15% vs. 36%; p < 0.001) 1% of individuals in the highest SES categories were obese compared to 16% in the lowest SES categories (p for trend < 0.001).	The goal to decrease the prevalence of hypertension is a challenging global health priority, and preventive strategies could be tailored to specific populations to attain substantial public health impact in the setting of limited resources. Pragmatic, targeted evidence-based interventions are needed to increase awareness, diagnosis, and treatment of hypertension throughout sub-Saharan Africa.	

34	High rates of undiagnosed and uncontrolled hypertension upon a screening campaign in rural Rwanda: a cross-sectional study	Ntaganda, et al., 2022	8 sectors in the Kirehe District that were systematically selected in Rwanda	cross-sectional study	More than one-third of participants (34%) reported history of smoking; 14.8% (n = 636) were current smokers and 19.2% (n = 821) were former smokers. 21.2% (n = 910) had elevated BP. Also 158 of 910 (17.4%) with elevated BP had a prior diagnosis of HTN and represent 62.2% of all individuals with a prior diagnosis of HTN (158/254). 752 of 910 (82.6%) individuals detected with elevated BP were without a prior diagnosis of HTN and represent 18.7% of all participants without history of HTN. The proportion of new discovery of elevated BP progressively increased with advancing age: 19.1% in 45–54 year old, 27.2% in 55–64 year old, and 33.4% among those with age > 65 years The findings revealed that advanced age was independently associated with progressively increased risk of having elevated BP in all three comparisons (all $p < 0.001$).	Having such high rate of newly discovered abnormal BP from that rural population would imply an epidemiological risk profile transition for hypertension, that needs further studies. Nevertheless, these data support the need to strengthen also in rural areas of Rwanda an adequate strategy for the prevention, early diagnosis and treatment of hypertension. Future longitudinal studies to analyse in more details the specific CVDs risk in that population are needed.	

					The relationship between Elevated BP category with overweight (25 ≤ BMI < 30 kg/m2) and obesity (BMI ≥ 30 kg/m2), weight, waist circumference, and fasting blood glucose were less consistent. Current smoking, alcohol consumption, and fasting blood glucose are significant predictors of Elevated BP in multivariate models		
35	A population-based national estimate of the prevalence and risk factors associated with hypertension in Rwanda: implications for prevention and control	Nahimana, et al., 2017	Rwanda	secondary epidemiological analysis of data collected from a cross-sectional population-based study			
36	Perceptions of body size, obesity threat and the willingness to lose weight among black South African adults: a qualitative study	Okop, et al., 2016	South Africa	Qualitative study Semi-structured focus group discussions	Perceptions about obesity and CVDs *You will have many sicknesses when you are* *overweight (overweight), even those (sicknesses) that* *you were not suffering from—because of the large body* *size. [OO-Man]* *My relative who is very fat like me had serious health* *problems—hypertension, and arthritis. [O-Woman]*	The low perceived threat and severity of obesity particularly among obese women in this community underscores a considerable challenge to obesity prevention and possible resistance to recommended weight loss interventions. Based on these findings, appropriate strategies to improve awareness of the	Perceived causes of overweight Participants were aware of the main causes of obesity and had linked obesity with diet, lifestyle and inactivity. In all the groups, participants believed that overweight can result from unhealthy diet behaviours such as eating too much fatty and starchy food, consuming lots of red meat, oil, and fried or junk food.

						health risk of overweight are critical. Community-based wellness events could be organised around internationally recognised events like obesity, diabetes and hypertension awareness campaign	
37	Association between Adequate Fruit and Vegetable Intake and CVDs-Associated Risk Factors among the Malaysian Adults: Findings from a Nationally Representative Cross-Sectional Study	Tan, et al., 2022	Malaysia	Quantitative We analyzed the data from 11,172 Malaysian adults (i.e., 5554 male and 5618 female), who participated in the population-based National Health and Morbidity Survey 2015.	The age of the participants was between 18 and 114 years old, with a mean age (±SE) of 40.79 (±0.17) years old (data not shown). Of the 11,172 respondents, 51.9% were males and 44.2% were aged between 18 and 29 years old. Concerning the adequacy of fruit and vegetable intake, a remarkably low proportion of the respondents had an adequate intake (2.8%). We further observed that the proportion of respondents with adequate fruit intake alone (9.7%) was lower than the proportion of respondents with adequate vegetable intake alone (10.9%). As for health status, the proportion of undiagnosed hypercholesterolemia was the highest (37.2%), followed by undiagnosed hypertension (12.9%) and undiagnosed diabetes (5.8%).	A holistic public health intervention framework is needed to spread knowledge and improve the attitude and practices on the adequate daily intake of fruit and vegetables among Malaysian adults. This may reinforce public awareness and further aid in the prevention of CVDs-related risk factors, such as hypertension and hypercholesterolemia.	

					Further association analyses between adequate vegetable intake alone and different health status categories demonstrated that only undiagnosed hypertension was significantly associated with adequate vegetable intake (aOR: 0.71, 95% CI: 0.51–0.98), after adjustment for sociodemographic characteristics and lifestyle risk factors We also observed that females, older age, educational level, monthly household income, and obesity were independently associated with undiagnosed hypertension No association was observed between adequate fruit intake alone and undiagnosed diabetes, undiagnosed hypertension, and undiagnosed hypercholesterolemia (		

38	Sedentary Lifestyle and Hypertension in a Periurban Area of Mbarara, South Western Uganda: A Population Based Cross Sectional Survey	Twinamasiko, et al., 2018	cross sectional study in periurban Uganda among adults aged at least 35 years.		Of those with hypertension (n = 76), majority (53) of the 76 participants (69.7%) were not aware they had an elevated blood pressure. The mean systolic blood pressure among those reporting a sedentary work lifestyle was 129.3 compared to 122.6 among those reporting a more active work style. The other categories of physical activity were walking or biking for at least 10 minutes continuously to get to and from places and sedentary recreation. None of these showed significant differences in systolic blood pressure. Older persons were more likely to have a hypertension compared to the younger ones. Compared to respondents in the 35 to 44.9 years' age category, those in the 45 to 55 years' age group had a 2-fold	We recommend that routine measuring of blood pressure should be done to detect hypertension, more vegetables and fruits should be included in the diet, and a more active work and leisure lifestyle might help to protect from hypertension.	

					increase in the odds of hypertension and 4.3-fold increase for those above 55 years. Employment was protective of hypertension, with 70% lower odds of hypertension among those employed compared to those not in any form of employment. Among those who had ever smoked (n = 90), current smoking was protective of hypertension with 80% lower odds of hypertension compared to the former smokers. In the multivariable analysis, our final model comprised age, sedentary work style, and obesity. Older persons and those in a sedentary work style were significantly more likely to have hypertension.		

39	Trends in population blood pressure and prevalence, awareness, treatment, and control of hypertension among middle-aged and older adults in a rural area of Northwest China from 1982 to 2010	Zhao, et al., 2013	China	Quantitative four surveys Data of 8575 participants aged 35–64 years was analyzed. Averages and proportions were adjusted for age and sex.	The prevalence of HTN significantly increased over the 28-year period, both in men and women among all age subgroups (all P,0.001 for trend; And the prevalence rates were higher in men than women before age 45, and were lower in men than women between ages 45 to 64, however, the difference was not significant (all P.0.05). Prevalence of HTN increased with increasing age in both men and women (P,0.001 for trend). Awareness, treatment and control of HTN are presented in Table 4 and Figure 4. There was a significant improvement in awareness, treatment and control of HTN of over time Awareness	The mean population BP and prevalence of HTN among middle-aged and older adults in the rural areas of Hanzhong have increased between 1982 and 2010. However, awareness, treatment and control rates of HTN remain unacceptably low. Public health programs and practical strategies are required to improve prevention, management and control of HTN among the rural population in Northwest China. In particular, attention should be given to the elderly and obese, and to those with a family history of hypertension, while raising awareness and treatment among younger adults.	

					increased significantly with age increasing among men and women in each year (all P,0.05 for trend), but was no difference between men and women (P.0.05). It showed that overweight (25.0 ≤ BMI,30.0), obesity (BMI ≥ 30.0) and having family history of HTN were risk factors for HTN. Family history of HTN gave an approximately two to threefold increase in awareness, treatment and control of HTN.		
40	Association of long-term dynamic change in body weight and incident hypertension: The Rural Chinese Cohort Study	Zhao, et al., 2018	China	Cohort Study, a prospective cohort study based on 20,194101 participants over 18 years old residing in the rural area of Luoyang city in the	The analyses included 10,149 participants (3,978 men and 6,162 women), with a mean190 (SD) age of 48.0 (11.8) years. Body weight at follow-up and its dynamic change were both positively associated with197 blood pressure after adjusting for several confounders	Long-term excessive weight gain is positively associated with increased risk of incident hypertension. Losing weight by lifestyle modification could be helpful for the primary prevention of hypertension in the general rural Chinese population.	

				middle of102 China,	1-kg increase in body weight during follow-up predicted a 0.47 and 0.40 mmHg absolute increase in SBP and DBP For every 1% increase in relative body weight change was associated with a 0.27 and 0.22 mmHg absolute increase in SBP and DBP Risk of hypertension increased significantly with increasing weight gain (p for trend <0.001) The incidence of hypertension was >20% for all participants with overweight or general obesity at baseline The incidence of hypertension was greater for participants who changed to overweight229 and general obesity from non-obesity during the 6-year period regardless of baseline weight230 (all p<0.01) For baseline		

					overweight people, risk of hypertension was significantly reduced for those who changed to a normal weight (aOR 0.67 [0.49-0.92]) but increased for those who changed to general obesity (1.73 [1.35-2.22]) as compared with people who retained their overweight status		
41	Prevalence, awareness, medication, control, and risk factors associated with hypertension in Bai ethnic group in rural China: the Yunnan Minority Eye Study	Zhang, et al., 2013	China	A population-based survey	Overall, 42.1% (899/2133; 95%CI: 40.0, 44.3%) of the adults aged 50 or more among the target population suffered from hypertension, 41.7% (321/769; 95%CI: 38.2, 45.3%) in men and 42.4% (578/1364; 95%CI: 39.7, 45.1%) in women without a statistical difference between them (p.0.05). As a result, the participants with a higher age group level appeared to have a higher risk of developing hypertension (OR.1.0), as is shown in the age group	In conclusion, hypertension was found highly prevalent among Bai ethnic adults aged 50 and above in the rural southwest China (40.0%). The rate of awareness of hypertension was low (28.4%), while the treatment rate was also low (24.6%) with an even lower rate of controlled hypertension (7.5%). These results suggest that effective antihypertension programs be an urgent need for the Bai ethnic communities in terms of health education on hypertension	

					60–69, 70–79, and 80+, compared with the age group 50–59. Overweight and obese participants were more likely to suffer from hypertension than normal-weight ones (OR.1.0), whereas lean people were less likely to have HBP (OR,1.0). In addition, hypertensive patients with a family history of HBP, or those who drank, smoked, had a higher chance of developing hypertension than those without, or those who did not Totally 28.4% (255/899; 95%CI: 25.4, 31.5%) of the participants with hypertension were aware of their condition, 27.4% (88/321; 95%CI: 22.6, 32.6%) in men, and 28.9% (167/578; 95%CI: 25.2, 32.8%) in women. Compared with participants without schooling, those who finished senior high school, junior college or above were less likely to suffer from hypertension (OR,1.0).	management as well as hypertension screening, counselling, and treatment.	
42	Salt intake belief, knowledge,	Zhang, et al., 2016	China	A cross-sectional survey was	Roughly	n summary, our study found that a fairly large proportion of	

	and behavior: a cross-sectional study of older rural Chinese adults			conducted among 4693 older participants (men ≥50 and women ≥60 years old) randomly selected from 120 rural villages in 5 northern provinces in China.	half of the participants were men and half women with an age range from 50 to over 80. A large proportion (32%) of the study population was illiterate and only 17% had more than 9 years of education Healthy salt intake behaviors were reported in 56%, 68%, and 81% of participants for B1, B2, and either B1 or B2, respectively. Unlike knowledge, the percentage of participants with healthy B1 and B2 behaviors increasingly associated with age and decreasingly associated with years of education, and was significantly lower in men than women.	rural older Chinese had a health belief about salt and health, but in contrast, quite a small proportion had knowledge about salt and health. This belief was significantly associated with healthy salt intake behaviors. The study findings have suggested important new knowledge for designing and developing future population salt reduction programs and perhaps also other health education and health promotion programs	
43	The prevalence of hypertension among Malaysian adults and its associated risk factors: data from Malaysian Community Salt Study	Zaki, et al., 2016	Malaysia	cross-sectional study using multi-stage stratified sampling method.	Roughly half of the participants were men and half women with an age range from 50 to over 80. A large proportion (32%) of the study population was illiterate and only 17% had more than 9 years of	These results further under- line the need for routine blood pressure check-up to identify subjects with high-risk of hypertension. Strategies to strengthen the monitoring of modifiable risk	

					education. About 20% had cardiovascular disease, another 49% had hypertension, and more than half were not aware of their health status. A total of 1047 respondents with mean age of 48.80 years (95% CI 47.03–50.61) The prevalence of hypertension in present study was 49.39% (95% CI 44.27–54.51) with no significant difference in gender Higher prevalence of hypertension was shown among those with primary education level (33.77%; 95% CI 27.40–40.78) and secondary education level (48.02%; 95% CI 43.16–52.92) as compared to those with tertiary education (18.20%; 95% CI 12.37–25.96). with hypertension had significantly greater mean BMI	factors including optimal weight control should be advocate for better hypertension control in Malaysia	

					(27.65 kg/m 2 , 95% CI 26.99–28.30, vs 25.68 kg/m 2 , 95% CI 25.08–26.28) and waist circumference index (93.88 cm, 95% CI 92.43–95.32, vs 86.63 cm, 95% CI 85.20–88.06) than those with normal blood pressure. Prevalence of hypertension was higher among married group (79.96%; 95% CI 74.70–84.36) and those in low household income group (50.83%; 95% CI 43.92–57.70 After controlling for other covariates, age was the strongest predictor of hypertension (35–44 years old; OR=2.39, 95% CI=1.39–4.09, 45–54 years old; OR=5.50, 95% CI= 3.23–9.38, 55–64 years old OR=13.56, 95% CI=7.77–23.64 and 65 years old and above; OR=25.28, 95% CI= 13.33–48.66). Overweight or obese respondents were more likely to be hypertensive compared to normal weight (overweight, OR=1.84; 95% CI=1.18–2.86; obese, OR=4.29; 95% CI=2.56–7.29)		

44	Factors associated with prevalence, awareness, treatment and control of hypertension among adults in Southern China: a community-based, cross-sectional survey	Wang, et al., 2013	China	A cross-sectional survey was conducted among 4693 older participants (men ≥50 and women ≥60 years old) randomly selected from 120 rural villages in 5 northern provinces in China.	Of the 17437 respondents (mean 49.30615.10 years old), 5227 subjects (mean 58.09612.51 years old) were diagnosed as hypertension. showed that the prevalence of hypertension increased with increase in age, and this linear trend was statistically significant (x2 for linear trend = 2464.34 P,0.001). old age is associated with higher prevalence of hypertension (OR = 3.37 [age 45–59] and 8.10 Lower education is associated with higher prevalence of hypertension(OR = 1.22 [education: prima- ry] and 1.43 [education: illiterate] vs college or higher. Drinker has a higher risk of having hypertension than nondrinker (OR = 1.20). People with higher BMI are more likely to be hypertensive patients	this study showed an increase in hypertension prevalence among adults in southern China. There was also an increase in hypertension awareness, treatment and control rates. However, hypertension awareness, treatment and control rates were still lower than developed countries. More effort should be targeted to enhance awareness, treatment and control rates, to find hypertensive patients in the early stage, and to strengthen community management of hypertensive patients.	

					(OR = 1.70 [BMI = 23–24.99] and 3.27 [BMI ≥25] vs BMI, 23) of the 5227 hypertensive individuals, 2840 (men 1319 and women 1521) had been aware of their condition prior to the survey. The overall awareness rate of hypertension was 54.33%. There was significant difference between men and women of awareness of hypertension (51.73% vs 56.82%, P,0.001). among those with hypertension, old age (OR = 2.83 [age 45–59] and 5.37[age$60] vs age 18–44), living in the urban (OR = 1.26), low education attainment (OR = 1.72 [education: middle] and 1.69 [education: primary] vs education: college or higher), diabetic hypertensive (OR = 1.86), overweight (OR = 1.28), obese (OR = 1.44), low HDL-C (OR = 1.25) were associated with higher awareness of hypertension. In contrast,		

					male was associated with lower awareness (OR = 0.84). Among those aware of hypertension, old age (OR = 1.59 [age 45–59] and 2.70 [age$60] vs age 18–44), living in the urban (OR = 1.50), diabetic hypertensive (OR = 1.36) were associated with higher treatment of hypertension.		
45	Salt intake belief, knowledge, and behavior: a cross-sectional study of older rural Chinese adults	Zhang, et al., 2016					
46	Tobacco Use and Risk Factors for Hypertensive Individuals in Kenya	Walekhwa & Kisa, 2021	Kenya	Quantitative survey	58.8% of all participants identified as females The prevalence of hypertensive participants was reported as 22%, More people were exposed to alcohol drinking than tobacco use, with a prevalence of 21%. Furthermore, obesity levels were reported as high, based on BMI (obese 10%, overweight 21%) and WHR (obese 25%,	There is a need for greater awareness of hypertension in the general population and among healthcare givers. In addition, within the health system, greater emphasis needs to be placed on the detection, treatment, and control of high blood pressure.	

					overweight 26%). However, the raised blood glucose levels and physical activity levels of less than 30 min were both found to be relatively low compared to all other risk factors, and both were reported as 6%. The highest prevalence was found in fruit and vegetable consumption of less than five servings, which was reported as 95 and 96%, respectively . However, in a multivariate model, tobacco use remained non-significant with less likelihood of 0.12 (0.88–CI: 0.61–1.28) and 0.1 (0.99–0.64–1.53) current and former users, respectively, as observed in the bivariate model. **Awareness** more than 50% had never been tested for their blood pressure. Such a lack of testing makes it even more difficult to control the epidemic if such practices are not reversed		

47	Impact evaluation of a community-based intervention for prevention of cardiovascular diseases in the slums of Nairobi: the SCALE-UP study	van de Vijver, et al., 2017	Kenya	Prospective interventio n study includes awareness campaigns, household visits for screening, and referral and treatment of people with hypertensio n.	We screened 1,531 and 1,233 participants in the intervention and control sites. Comparing the intervention and control group, we found no significant difference in the mean SBP reduction at population level We detected no difference between intervention and control populations in the reduction of hypertension prevalence (OR 1.13, 95% CI 0.84 to 1.52, p-0.421) but did find a significant improvement in the awareness of being hypertensive in the intervention population com- pared with the control population (OR 2.14, 95% CI 1.39 to 3.31, p-0.001) In the control group, we also detected a decrease at population level in smoking (OR 0.73, 95% CI 0.56 to 0.95) and alcohol use (OR 0.71, 95% CI 0.57 to 0.88).	Further research is needed to explore CVD prevention strategies focusing on screening and hypertension treatment adherence to effectively confront the increasing burden of CVD among Africa’s urban poor.	

					Insufficient intake of fruits and vegetables increased significantly at population level both in intervention (OR 1.30, 95% CI 1.08 to 1.56, p -0.006) and control (OR 1.42, 95% CI 1.15 to 1.76, p -0.001) settings		
48	Health motivations and perceived barriers are determinants of self-care behaviour for the prevention of hypertension in a Malaysian community	Tan, et al., 2022	Malaysia	cross-sectional study conducted between 12 June 2020 to 26 July 2021	**Barriers to regular physical activity, moderate alcohol consumption, and regular blood pressure screening.** The lack of time to exercise (72.2%) and laziness (72.2%) were the greatest barrier to regular physical exercise **Barriers to diet-based self-care behaviours.** Common barriers included the lack of time prepare healthy foods due to busy schedule, the lack of healthy food options at workplace or eating out, and to a lesser extent the cost of healthy foods **Motivators for appropriate self-care behaviour** Self-care behaviours pertaining to diet such as reduced salt and calorie intake and consuming more than five servings of fruits and vegetables daily had similar motivators, where	Therefore, hypertension prevention intervention or strategies should focus on targeting barriers and motivations of self-care behaviour, particularly barriers against adopting a healthy diet, regular physical activity and blood pressure screenings.	

					disease prevention (range = 60%–68.8%) was the second highest motivator, followed by intention of weight loss (40%–47.3%), and personal preference (range = 1.8%–8.6%). Participants understood the severity of hypertension (mean = 2.6, SD = 0.5, out of 3), the benefits of controlled blood pressure (mean = 4.7, SD = 0.7, out of 6) and the ability to prevent hypertension, indicated by self-efficacy (mean = 6.6, SD = 0.8, out of 9), and had reasonably good hypertension knowledge (mean = 6.8, SD = 2.2, out of 10),		
49	Drivers of healthy eating in a workplace in Nepal: a qualitative study	Tamrakar, et al., 2020	Nepal	Qualitatative study among 33 partiipants	most participants reported that oily foods or fast foods such as packaged instant noodles, chips and soda (Coke, Pepsi, Fanta or Sprite) were unhealthy. The support staff group especially commented that consumers might not be eat fruits even if they are added to the menu because of their high price. In contrast, most health professionals indicated their willingness to pay more for healthier food.	The availability of affordable healthy foods in the cafeteria, along with increased health awareness, commitment from cafeteria managers, and a regular supply of healthy food from market can result in healthy food choice in the work- place. These factors need to be addressed in order to design cafeteria-based intervention to promote healthy eating in	Physicians, on the other hand, criticised this traditional Nepali diet as unhealthy due to its high carbo- hydrate content, particularly when accompanied by—as it often is—white rice and potatoes Other items including meat, fish, whole grains, yoghurt and so on were also considered healthy by most participants

						Nepal.	
50	Lloyd-Sherlock, et al., 2014	Hypertension among older adults in low-and middle-income countries: prevalence, awareness and control					
51	Omron Health Care Insurance, 2014	10 series Blood Pressure Monitor - Model BP786: Instruction Manual					
Articles from Reference Lists							

52	JNC8 guidelines for the management of hypertension in adults	Armstrong, 2014	Guidelines for management of hypertension	Guidelines about blood pressure measurement	In the general population, pharmacologic treatment should be initiated when blood pressure is 150/90 mm Hg or higher in adults 60 years and older, or 140/90 mm Hg or higher in adults younger than 60 years.		
53	Blood pressure and the new ACC/AHA hypertension guidelines	Flack, J. M., & Adekola, B. (2020)	Blood pressure categories	Guidelines about blood pressure measurement	New BP categories are: 1) normal (<120 systolic and <80 mm Hg diastolic), 2) elevated (120–129 systolic and <80 mm Hg diastolic), 3) stage 1 hypertension (130–139 systolic or 80–89 mm Hg diastolic) and stage 2 hypertension (≥140 systolic or ≥90 mm Hg diastolic). These categories should not be based on BP readings at a single point in time but rather should be confirmed by two or more readings (averaged) made on at least two separate occasions.		
54	The epidemiology of hypertension in Uganda: findings from the national non-communicable diseases risk factor survey	Guwatudde at al., 2015	Uganda	Quantitative study The NCD risk factor survey drew a countrywide sample stratified by the four regions of the country, and with separate estimates for rural	3987 participated in the NCD risk factor survey, giving a response rate of 81.4%. Of the 3906 participants, 1033 were classified as hypertensive, giving an overall prevalence of hypertension was 26.4% The prevalence was highest in the central region at 28.5%, followed by the eastern region at 26.4%, western region at	Of the 1033 participants classified as hypertensive, only 80 (7.7%) reported being aware of their high blood pressure. Bi-variable comparisons showed no significant differences in level of awareness by region ($p = 0.245$), by sex ($p = 0.109$), nor by other population characteristic analyzed; except rural-urban residence. Awareness was significantly lower among rural residents	Hypertension was higher in older age groups, and higher in participants with higher body mass index (BMI). By category of alcohol use, the prevalence of hypertension was highest among high alcohol users at 34.0%, and lowest among participants reporting to have never used alcohol at 24.1% The only modifiable factor found to be associated with hypertension in this analysis was higher body mass index (BMI). Compared to participants with BMI less than 25 kg/m2, the prevalence of hypertension among participants with BMI between 25 to

				and urban areas.	26.3%, and the northern region at 23.3%. The prevalence of hypertension was lower in rural residents at 25.8%, compared to urban residents at 28.2%. The prevalence was higher among men at 28.3% compared to females at 25.2%. The un-modifiable factor found to be associated with hypertension was older age. Compared to participants aged less than 20 years, prevalence of hypertension was higher participants aged 20–29 years with an adjusted PRR of 1.77 [95% CI = 1.19–2.62], and higher among those aged 30–39 years an adjusted PRR of 2.08 [95% CI = 1.40–3.10], even higher among those aged 40–49 years an adjusted PRR of 2.55 [95% CI = 1.71–3.79], and highest among those aged 50 years or older with an adjusted PRR of 3.57 [95% CI = 2.43–5.25].	(44/735 = 6.0%) compared to urban residents (36/298 = 12.1%) (unadjusted p = 0.001).	29.9 kg/m2 was higher with an adjusted PRR = 1.47 [95% CI = 1.29–1.66], and even higher among the obese participants (BMI ≥ 30 kg/m2) with an adjusted PRR = 1.67 [95% CI = 1.41–1.99]. frequency of adding salt to food during meal times was not associated with hypertension
55	Physical Activity Levels Among Adults in Uganda: Findings From a Countrywide Cross-Sectional Survey	Guwatudde, et al., 2016	A cross-sectional study design	A cross-sectional study design	Of the 3987 participants, 2383 (59.8%) were female, 2903 (72.8%) resided in rural areas, 1691 (42.4%) had attained at least secondary school education, 2676 (67.1%) were aged 18 to 39 years, and the overall average age was 35.1 years		The type of intense-specific PAs found to contribute most to partici- pants' overall weekly PA were from work-related PA of moderate intensity contributing 49.6% of participants' overall weekly PA, fol- lowed by travel-related PA contributing 25.2%, and work-related PA

							of vigorous-intensity at 19.8%. The intense-specific PA in which participants reported to engage in most days of a typical week were travel-related PA with an average of 4.5 (SD = 2.6) days per week, and work-related PA of moderate intensity with an average of 4.5 (SD = 3.3) days per week The intense-specific PA in which participants engaged in longest were work-related PA of moderate intensity, with a median weekly duration of 990 (IQR = 150, 1800) minutes, followed by travel-related PA with a median weekly duration of 240 (IQR = 70, 600) minutes.
56	Diagnosis and management of hypertension in adults: NICE guideline update 2019.	Jones, et al., 2020	General	NICE guideline update 2019	The diagnostic threshold for hypertension remains 140/90 mmHg on clinic blood pressure (BP).		
57	Principles and Techniques of Blood Pressure Measurement	Ogedegbe & Pickering, 2010		Guidelines about blood pressure measureme nt	The standard location for blood pressure measurement is the brachial artery Although the auscultatory method using mercury sphygmomanometer is regarded as the gold standard		

					for office blood pressure measurement, widespread implementation of the ban in use of mercury sphygmomanometers continues to diminish the role of this technique. 1 The situation is made worse by the fact that existing aneroid manometers, which use this technique, are less accurate and often need frequent calibration. 1 New devices known as “hybrid” sphygmomanometers have been developed as replacement for mercury devices. Basically these devices combine the features of both electronic and auscultatory devices such that the mercury column is replaced by an electronic pressure gauge		
58	Prevalence, awareness, treatment, and control of hypertension in China: results from a national survey	Wang, et al., 2014	China	Quantitative study	The adjusted prevalence of hypertension was 29.6% (95% CI = 28.9%–30.4%). The prevalence was higher among men compared with women and was higher among those from the north region compared with those from the south region	The awareness, treatment, and control rates among all hypertensive participants and the control rate among treated hypertensive participants were 42.6%, 34.1%, 9.3%, and 27.4%, respectively	The prevalence of hypertension increased among those who were overweight and obese in both men and women and was even higher for those with central obesity compared with those without central obesity in the same BMI category.

					The prevalence of hypertension was similar between those in urban and rural areas, although the prevalence was higher in rural areas among those aged 18–44 years and those aged 45–59 years. The prevalence of hypertension was lowest among urban residents with high income.	Those parameters were higher among women compared with men and were higher in urban areas compared with rural areas. In rural areas, those parameters did not increase with higher tertile of income, which was different from in the urban areas. Participants with higher education tended to have higher control rates, whereas participants with mild occupational physical activities had higher values for all awareness, treatment, and control parameters.	
59	Guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines	Whelton, et al., 2017	General	Guidelines	It is critical that health care providers follow the standards for accurate BP measurement. BP should be categorized as normal, elevated, or stages 1 or 2 hypertension to prevent and treat high BP. Normal BP is defined as <120/<80 mm Hg; elevated BP 120-129/<80 mm Hg; hypertension stage 1 is 130-139 or 80-89 mm Hg, and hypertension stage 2 is ≥140 or ≥90 mm Hg. Prior to labeling a person with hypertension, it is important to use an average based on ≥2 readings obtained on ≥2 occasions to estimate the individual's level of BP.		t is important to screen for and manage other CVD risk factors in adults with hypertension: smoking, diabetes, dyslipidemia, excessive weight, low fitness, unhealthy diet, psychosocial stress, and sleep apnea. Nonpharmacologic interventions to reduce BP include: weight loss for overweight or obese patients with a heart healthy diet, sodium restriction, and potassium supplementation within the diet; and increased physical activity with a structured exercise program. Men should be limited to no more than 2 and women no more than 1 standard alcohol drink(s) per day. The usual impact of each lifestyle change is a 4-5 mm Hg decrease in SBP and 2-4 mm Hg decrease in DBP; but diet low in sodium, saturated fat, and total fat and increase in fruits, vegetables, and grains

					In 2010, hypertension was the leading cause of death and disability-adjusted life-years worldwide, and a greater contributor to events in women and African Americans compared with whites. Often overlooked, the risk for CVD increases in a log-linear fashion; from SBP levels <115 mm Hg to >180 mm Hg, and from DBP levels <75 mm Hg to >105 mm Hg.		may decrease SBP by approximately 11 mm Hg.
60	Harmonization of the American College of Cardiology/American Heart Association and European Society of Cardiology/European Society of Hypertension Blood Pressure/Hypertension Guidelines: Comparisons, Reflections, and Recommendations	Whelton, et al., 2022	General	Guidelines	Categories Systolic blood pressure, mm Hg And/or Diastolic blood pressure, mm Hg **American College of Cardiology/American Heart Association** Normal <120 and <80 Elevated 120–129 and <80 Hypertension, stage 1 130–139 or 80–89 Hypertension, stage 2 ≥140 or ≥90 **European Society of Cardiology/European Society of Hypertension** Optimal <120 and <80		

					Normal 120–129 and/or 80–84 High normal 130–139 and/or 85–89 Hypertension, grade 1 140–159 and/or 90–99 Hypertension, grade 2 160–179 and/or 100–109 Hypertension, grade 3 ≥180 and/or ≥110		
61	Estimation of hypertension risk from lifestyle factors and health profile: a case study	Zheng, et al., 2014	rural areas in Pizhou City, China	Quantitative			In the model built without FPG information, lifestyle factors possess 32% of the prediction weights, which is quite a significant composition even if we neglect the indirect impact of lifestyles through health profiles. Since the extracted factors in the model are mostly long-term stable and directly or indirectly controllable, it is promising that they do comprise relevant features that can be used as preceding warning signals for active prevention of hypertension. As is consistent with previous researches [7–10], age, arterial pulse, FPG, body mass index, sleep quality, intake of salt, oil, liquor, and pickles are the prevailing factors that affect

							the onset of hypertension. In the absence of FPG information, several diet-related factors (e.g., amount, cost of food intake, and type of veg intake) take up the role and yield almost equally good prediction; this illustrates how a surrogate signature can work in risk screening without deep knowledge about the mechanism of the disease. The model indicates that intake of animal oil in a small amount helps reduce the risk of hypertension. This should be interpreted under the background that the vast majority of oil consumption for the investigated group of people is formed up by plant oils. From the model we also see that divorced people are more likely to develop hypertension compared with single or married people; and women bearing children many times are also associated with higher risks. Both phenomena can attribute to the tensions in daily life. As is consistent with previous researches [7–10], age, arterial pulse, FPG, body mass index, sleep quality, intake of

							salt, oil, liquor, and pickles are the prevailing factors that affect the onset of hypertension. In the absence of FPG information, several diet-related factors (e.g., amount, cost of food intake, and type of meat intake) take up the role and yield almost equally good prediction; this illustrates how a surrogate signature can work in risk screening without deep knowledge about the mechanism of the disease.
62	Community perceptions of hypertension and its risk factors and Community-led interventions to address the social Determinants of hypertension in Mukono	Busulwa, 2022	Uganda	Qualitative study Participatory research methods to gather community perspectives on health care quality in Ddundu parish, Mukono district. convenience sampling and purposively selected community members and policymakers for the focus group		Most participants mentioned using local medicines more than western ones. Many participants preferred the local drugs because they were often cheaper than the modern ones and were more readily available. Local/traditional medicines and herbs community members bought or prepared included mululuza, empewere, omusa, entaseesa, ekimyula, katunkuma, omukooge, enkomamawanga, and katunkuma	The next steps now for Ddundu Bumu are to develop an activity plan showing the detailed hypertension prevention and promotion activities, timelines for each proposed activity, the required inputs and expected outputs, and the indicators it will use to measure progress.

				discussions (FGDs) and indepth interviews.			
63	Hegde &- Solomon, 2015	Influence of physical activity on hypertension and cardiac structure and function	Global issue	Secondary analysis of data		According to the Laplace law, the initial adaptive response to hypertension entails increases in wall thickness to reduce wall stress and oxygen. demand. However, persistent pressure overload can occasionally cause a change in response that leads to concentric hypertrophy.	
64	Tong, 2011	Physician's intention to initiate health check-up discussions with men: a qualitative study	Malaysia	Qualitative study			
65	WHO, 2019	Hypertensio n	1	Guidelines			
66	2023	A Community Trial in Coastal Karnataka	Coastal Karnataka found in India	A community trial was conducted in 3			Based on the mean difference between the groups, participants in the physical activity intervention reported a statistically significant drop in systolic blood pressure. Diastolic blood pressure and glycated haemoglobin

		using Life Style Modifications to Assess its Impact on Hypertension and Diabetes		villages in coastal Karnataka			levels significantly decreased in the group that received complete lifestyle modification (21 mmHg and 2.1%; p < 0.001).
67	2023	Self-Assessment of INTERHEART Risk Stratification among the Middle-Aged Community in Malaysia	Malaysia	A cross-sectional survey was carried out using snowball and convenience sampling techniques between November 2022 and January 2023.			Men are more likely than women to acquire cardiovascular disease (CVD), with middle-aged responders in Malaysia at moderate-to-high risk of cardiovascular events (n = 273/602). According to the survey's findings, the most common risk factors among the participants were eating chicken or meat (61%), not exercising (59%), and being around second-hand smoke (SHS) (54%). Just one-third of the respondents ate fruits and vegetables at the suggested amount, while one-third of them ingested deep-fried, high-salted, and fast-food items. The fact that over 25% of the respondents had many recurring or ongoing stressors and even felt down, depressed, or blue for two weeks or more in a succession is concerning. People with lower levels of education, labourers, and men are more prone to experience CVD episodes.
68	Hypertension in urban slums of southern India: Burden, awareness, health seeking, control and risk factor profile	Rakesh, P. S., Renjini, B. A., Mohandas, S., Menon, J., Numpelil, M., Sreedevi, A., & Vasudevan, B. (2023).	India	conducted as part of baseline assessment of a cluster randomized controlled trial on 'Effectiveness of a community based education and peer support led by women	Prevalence of hypertension was found to be 34.8% (95% CI 33.5–34.9)	Of those identified to have hypertension, 33.1% (685/2074) were newly diagnosed during the survey and were unaware of their hypertensive status.	Of them, 53% were obese (BMI>25kg/m2). 80.3% agreed that reducing salt in diet could reduce blood pressure, 40.3% believed that quitting tobacco and 53.1% believed that regular exercise could reduce their blood pressure.

				self-help group members in improving control of hypertension: an implementation research in urban slums of Kochi city			
69	Sex-specific prevalence, awareness, treatment and control of hypertension in adults in India: a study for developing sex-specific public policy from the longitudinal ageing study in India (LASI) data 2017–2018	Ayushi Singh and Priyanka Dixit (2023)	India	cross-sectional research came from the first wave of the LASI.	Overall, 45.1% of the study popu- lation was found to be hypertensive, of which 26.9% self-reported their hypertension and 30% were found to be hypertensive at the time of measurement About 41% of males and 59% of females were found to be hypertensive.		
70	Role of Dietary Management and Physical Activity in Control of Hypertension in Rural Areas of Punjab-A Cross-sectional Study	Singh, H., Devgun, P., Nagpal, M., Bindra, P., Kaur, M., & Mehta, A. (2023).	Rural Areas of Punjab-A	Cross-sectional Study			

71	Association of Dietary and Physical Activity Patterns and Hypertension in Western Rajasthan, 2022	Sinha, et al., 2023	Western Rajasthan	Case-control study.			Overall 'being married' (OR= 3.3), having diabetes/Cardiac disease (OR= 2.6), excessive salt consumption (OR= 2.7), moderate physical exercise less than 30 minutes (OR=1.9), using oil other than vegetable oil (OR=1.8), Age >60 years (OR =1.4) were the key risk factors. It was found that high BMI (BMI>27), consumption of non-vegetable oils (12.7%) was highest in Jodhpur, lack of moderate exercise for at least 30 minutes (81%), lack of sports activity (92%) was highest in Pali, least number of days/week of fruits and vegetables consumption (~1.64 days) was seen in Barmer

9.4 Appendix D: District in Central Uganda

Buikwe, Bukomansimbi, Butambala, Buvuma, Gomba, Kalangala, Kalungu, Kampala, Kasanda, Kayunga, Kiboga, Kyankwanzi, Kyotera, Luweero, Lwengo, Lyantonde, Masaka, Mityana, Mpigi, Mubende, Mukono, Nakaseke, Nakasongola, Rakai, Sembabule and Wakiso (Central Region, 2020).

9.5 Appendix E: Participant Information Sheet for the Survey

Title of study: Exploring health-promoting lifestyle behaviours for prevention of hypertension in rural communities of Uganda

Name of Researcher: X

1. **Invitation to participate in a research study**

I am X, a student at the University of Salford Manchester undertaking a PhD in Nursing.

You are invited to take part in a research project, "Exploring lifestyle promoting behaviours for prevention of hypertension in rural communities of Uganda." Before you decide on whether to take part, you need to understand why the research is being done and what it will involve. Please take time to read the following information carefully before you decide whether or not you wish to take part. In case you are unable to read or you prefer that I read for you, I am happy to do that. You are welcome to discuss this project with others if you wish before you make your decision. Please ask us if there is anything that is not clear or if you would like more information.

2. **What is the purpose of the study?**

The purpose of this study is to explore lifestyle-promoting behaviours (such as activity level, types of food one eats, alcohol intake, and smoking) for the prevention of high blood pressure (hypertension) in rural communities of Uganda. The study is a partial fulfilment of PhD in Nursing.

3. **Why have I been invited to take part?**

You are being asked to participate because you meet the inclusion criteria for the study which are an adult above the age of 18 years and residing in Kasengejje or Mende in Wakiso District.

4. **Do I have to take part?**

No, it is up to you to decide whether or not to join the study. The researcher will describe the study and go through this information sheet. If you agree to take part, the researcher will then ask you to sign a consent form. You are free to withdraw at any time, without giving a reason. This will not affect your relationship and the researcher.

5. **What will happen to me if I take part?**

You will then be given a participant information sheet or the researcher will read it out for you. You will be given time to ask questions and get answers to the questions. You will then be given at least one hour to decide if you would like to participate in the study. After you decide to take part in the study, you will be requested to sign a consent form or if preferred use a thumb print to indicate that you are happy to participate in this study.

The researcher or research assistant will read you the questions on a computer and you will be required to answer the questions. You will at a later time be requested to participate in the focus group discussions.

You will be asked questions about your knowledge about the prevention of hypertension, and lifestyle behaviour that influences the prevalence (occurrence) of hypertension. Your blood pressure, height, and weight will be taken and the measurements will be given to you. The questionnaire should take approximately one hour to complete.

6. Expenses and payments?

There are no payments for participating in the study. Participation in the study will be voluntary and the researcher will find you in your home.

7. What are the possible disadvantages and risks of taking part?

There are minimal risks that may arise from the interviews. During the process of filling out the questionnaire, it may cause you emotional and psychological discomfort and if this does happen, a counsellor will be at hand to support the team and counsel the participant and also refer appropriately when the need arises.

8. What are the possible benefits of taking part?

We cannot promise that the study will help you directly. You will have access to a blood pressure screening which will involve taking your blood pressure, and weight, and measuring your height. In addition, the body mass index will be calculated and you will be informed. The long-term benefit is that the study findings will inform communities and health policy about what needs to be done to prevent hypertension in rural communities.

9. What if there is a problem?

In case an issue occurs, a nurse-counsellor working with the Uganda Heart Institute will be available to provide support. On the other hand, if you are found to have high blood pressure (taken three times at a 10 minutes interval for three days), you will be referred to the nearest health facility for proper management.

If you have a problem or questions about the study, you can contact the researcher by email: X@edu.Salford.ac.uk. If you have any issues or complaints please contact the Chair of the University of Salford Health and Society Ethics Committee, Prof Andrew Clark: a.clark@salford.ac.uk.

10. Will my taking part in the study be kept confidential?

All information will be confidential. The questionnaires will be identified with codes to ensure anonymity. In addition, confidentiality will be maintained by saving the files with a password that will be known by the research team only. In addition, consent forms will be kept separately in a lock and key cupboards. All information will be kept confidential and used for further studies when there is a need. Data will be stored and archived for a minimum of three years, after the graduate award has been made, to allow verification of data from external sources if necessary, or longer if used for further research.

11. What will happen if I don't carry on with the study?

You will be free to withdraw from the study at any time. The established relationship between the researcher and the participant will be maintained throughout the time of data collection. In addition, when you decide to withdraw from the study, you will be requested to consent to allow the researcher to use your data up to the time you withdrew and all your identifying information will be destroyed.

12. What will happen to the results of the research study?

The findings from this research project will serve to inform the Ugandan Ministry of Health on the prevention of hypertension in rural communities. The research thesis will also be disseminated through the University of Salford EBSCO database. Additional dissemination will be through presentations to Uganda National Health Research Organization for the attention of policy makers and an international conference. The results will also be published in an international scholarly journal. The results from the systematic review will be used to develop a model for the prevention of hypertension.

13. Who is organising or sponsoring the research?

The research is sponsored by the University of Salford with financial support from the Aga Khan University.

14. Further information and contact details:

X

X@edu.salford.ac.uk

Principle investigator.

9.6 Appendix F: Olupapula lw'Omwetabi oluliko obubaka obukwata ku Kunoonyereza

Omutwe gw'okunoonyereza: Okwekaliriza embeera z'okutumbula ebyobulamu mu kaweefube w'okutangira entunnunsi mu bitundu by'omu byalo mu Uganda

Amannya g'omunoonyereza: Namuguzi Mary

1. Okusabibwa okwetaba mu kunoonyereza

Nze Namuguzi Mary Ndi muyizi mu Yunivaasite y'e Salford Manchester. Nsoma ddiguli eyookusatu (Phd) mu bujjanjabi.

Osabibwa okwetaba mu kunoonyereza okutuumiddwa "Okwekaliriza embeera z'okutumbula ebyobulamu mu kaweefube w'okutangira entunnunsi mu bitundu by'omu byalo mu Uganda." Nga tonnaba kusalawo oba ng'oneetabamu, kikulu okumanya ensonga ekozesa okunoonyereza kuno n'ebyo ebinaakubeeramu. Tukusaba otwale akaseera okusoma n'obwegendereza obubaka buno wammanga nga tonnaba kusalawo oba ng'oneetabamu oba nedda. Bw'oba nga tosobola kusoma oba ng'oyagala nze mba nkusomera, nsobola okukikola. Oli wa ddembe okwogerako n'abalala ku bikwata ku kunoonyereza kuno, bw'oba ng'okyagala, nga tonnaba kusalawo. Tukusaba otubuuze bwe waba nga waliwo ekintu kyonna ekitategeerekeka oba bw'oba ng'oyagala okumanya ebisingawo.

2. Mugaso ki oguli mu kunoonyereza kuno?

Omugaso gw'okunonoyereza kwe kugezaako okwekaliriza embeera z'okufa ku bulamu (gamba ng'emirimu egikolebwa, ebika by'emmere ebiriibwa, okunywa omwenge, n'okunywa sigala/taaba) olw'okuziyiza obulwadde bw'entunnunsi/puleesa eyawaggulu mu bitundu by'omu byalo mu Uganda. Okunoonyereza kuno kitundu ku bisaanyizo by'okufuna ddiguli eya PhD mu Bujjanjabi (Nursing).

3. **Lwaki nsabiddwa okwetabamu?**

Osabibwa okwetaba mu kunoonyereza kuno kubanga olina ebisaanyizo by'abo be twetaaga okwetaba mu kunoonyereza kuno. Mu byo mulimu okubeera ng'oli muntu mukulu asussa emyaka 18 ate ng'obeera Kasengejje oba mende mu Distrikiti y'e Wakiso.

4. **Nkakibwa okwetabamu?**

Kiri gy'oli okusalawo okwetabamu oba obuteetabaamu. Omunoonyereza ajja kukunnyonnyola okunoonyereza kuno kye kuliko era ayiteeyite mu lupapula oluliko obubaka bw'okunoonyereza. Bw'onokkiriza okwetabamu, omunoonyereza ajja kukusaba okuteeka omukono gwo ku foomu y'okukkiriza. Oli wa ddembe okuvaamu wonna w'oyagalira ne bw'oba nga towadde nsonga. Kino tekijja kukosa nkolagana yo na munoonyereza.

5. Kiki ekinantuukako nga neetabyemu?

Ojja kuweebwa olupapula oluliko obubaka bw'omwetabi oba omunoonyereza ajja kulukusomera. Ojja kuweebwa ekiseera obuuze ebibuuzo era oyanukulwe ku ebyo by'onooba obuuzizza. Oluvannyuma ojja kuweebwa waakiri essaawa emu osalewo oba ng'oyagala okwetaba mu kunoonyereza. Bw'onoomala okusalawo okwetaba mu kunoonyereza, ojja kusabibwa okuteeka omukono ku foomu y'okukkiriza oba bw'onooba ng'oyagala, oteekeko ekinkumu okulaga nti osiimye okwetaba mu kunoonyereza kuno.

Omunoonyereza oba omuyambi we ajja kukusomera ebibuuzo ebinaaba ku kompyuta era kijja kukwetaagisa okwanukula ebibuuzo ebyo. Oluvannyuma ojja kusabibwa okwetaba mu bibinja omunaawanyisiganyirizibwa ebibuuzo.

Ojja kubuuzibwa ebibuuozo ebikwata ku bumanyi bwo obw'okutangira obulwadde bw'entunnunsi, embeera zo ez'okufa ku bulamu bwo n'engeri gye ziyamba okutangira obulwadde bw'entunnunsi. Enkuba yo ey'omusaayi, obuwanvu n'obuzito bijja kupimibwa era ebipimo ebyo bijja kukuweebwa. Ebibuuzo ebyo bijja kutwala essaawa waakiri emu okubijjuza.

6. Ensaasaanya n'okusasulwa?

Tewali kusasulwa olw'okwetaba mu kunoonyereza kuno. Okwetaba mu kunoonyereza kuno kwa kyeyagalire era omunoonyereza ajja kukusanga waka wo.

7. Bibi ki na bulabe ki obuyinza okuva mu kwetabamu?

Waliwo obulabe butono obuyinza okuva mu kubuuzibwa ebibuuzo. Mu kiseera ky'okujjuza ebibuuzo by'oku lupapula, kiyinza okukuleetera okukusumbuyibwa mu ebirowoozo byo era kino bwe kinaabaawo, wajja kubaawo omusomesa (omulyoyi) ng'ali bulindaala okuyambako abanoonyereza okwogerako n'omwetabi ate era bwe kinaaba kyetaagisa, omwetabi ajja kusindikibwa mu kifo ekirala.

8. Miganyulo ki egiyinza okuva mu kwetabamu?

Tetusobola kusuubiza nti okunoonyereza kuno kunaakuyamba butereevu. Ojja kusooka kusunsulibwa era ng'omutendera guno gujja kubaamu okupima enkuba y'omusaayi gwo, obuzito, n'obuwanvu. Mu ngeri y'emu, obuwanvu bwo bujja kugabizibwa mu buzito (BMI) era ojja kutegeezebwa ebinaavaamu. Omuganyulo ogusinga okuba ogw'amanyi guli nti okunoonyereza kuno kujja kutegeeza abantu b'omu bintu ebyenjawulo wamu n'abateeka amateeka ku ebyo ebirina okukolebwa okuziyiza obulwadde bw'entunnunsi mu bantu b'omu byalo.

9. Watya nga waliwo obuzibu?

Bwe wabaawo ensonga yonna, omusomesa (omulyoyi) akola n'Ekitongole kya Uganda Heart Institute ajja kubaawo bulindaala okukuyambako. Mu ngeri endala, bw'onoozuulibwa ng'olina puleesa eyawaggulu (ng'opimiddwa emirundi esatu nga mulundi gwesudde omulala eddakiika 10 okumala ennaku ssatu) ojja kusindikibwa mu ddwaliro eriri okumpi ofune obujjanjabi obwegasa.

Bw'oba ng'olina ekizibu oba ebibuuzo ku kunoonyereza kuno, osobola okutuukirira omunoonyereza ku email: M.Namuguzi@edu.Salford.ac.uk. Bw'oba n'ensonga yonna oba okwemulugunya, tukusaba otuukirire Ssentebe w'Akakiiko Akakola ku Mpisa z'Okunoonyereza (Salford Health and Society Ethics Committee), Prof Andrew Clark: a.clark@salford.ac.uk.

10. Okwetaba mu kunoonyereza kunaakuumibwa nga kwa kyama?

Obubaka bwonna bujja kuba bwa kyama. Ebibuuzo bijja kuteekebwako ennamba ez'ekyama bireme kutegeerekeka nnyini byo. Okwongereza ku ekyo, tujja kukuuma ebikukwatako nga byakyama nga tutereka fayiro nga kuliko ekisumuluzo ekyekyema ekijja okumanyibwa abakola ku kunoonyereza bokka. Mu ngeri y'emu, foomu z'okukkiriza zijja kuterekebwa zokka mu kkabada eziggalwa obudde bwona. Obubaka bwonna bujja kukuumibwa nga bwa kyama era bujja kukozesebwa mu kunoonyereza okujja eyo mu maaso bwe wanaabaawo obwetaavu. Ebinaakuŋŋaanyizibwa bijja kuterekebwa okumala waakiri emyaka esatu, ng'okutikkira kuwedde okusobozesa okwekaliriza obubaka obwaggyibwa mu bitundu ebirala, bwe kinaaba nga kyetaagisa oba okusingawo mu kunoonyereza okusukka ku kuno.

11. Kiki ekinaabaawo singa seeyongerayo na kunoonyereza?

Oli wa ddembe okuva mu kunoonyereza wonna w'oyagalira. Enkolagana eriwo wakati w'omunoonyereza n'omwetabi ejja kukuumibwa mu kiseera kyonna eky'okukuŋŋaanya obubaka mu kunoonyereza kuno. Mu ngeri y'emu, bw'onoosalawo okuva mu kunoonyereza, ojja kusabibwa okukkiriza omunoonyereza okukozesa obubaka bwo okutuusa mu kiseera w'onooviira mu kunoonyereza era obubaka bwonna obukukwatako bujja kusaanyizibwawo.

12. Kiki ekinaakolebwa ku binaava mu kunoonyreza?

Ebinaazuulibwa mu kunoonyereza kuno bijja kukozesebwa okutegeeza Ministule ya Uganda ey'Ebyobulamu ku nsonga z'okutangira obulwadde bw'entunnunsi mu bitundu by'omu byalo. Okunoonyereza kuno era kujja kugabanibwako etterekero ly'ebiwandiiko erya Yunivaasite ya Salford ne EBSCO. Obubaka obulala bujja kugabanibwa mu Kitongole ky'Ebyobulamu mu Uganda abakola ku nteekera za gavumenti babifuneko ate era bigabanibweko ne mu ssemasomo ku ddaala ly'ensi yonna. Ebinaava mu kunoonyereza era bijja kufulumizibwa mu *journal* ku mutendera gw'ensi yonna. Ebinaava mu kwekaliriza bijja kukozesebwa okukolawo omutetenkanyirizo gw'obulwadde bw'entunnunsi.

13. Ani ateekateeka oba asasulira okunoonyereza kuno?

Okunoonyereza kuno kusasulirwa Yunivaasite ya Salford nga bakolera wamu ne Aga Khan University.

14. Obubaka obulala n'endagiriro:

Namuguzi Mary

M.Namuguzi@edu.salford.ac.uk

Omunoonyereza omukulu.

9.7 Appendix G: Certificate of Translation

36 Appendix U: Certificate of Translation

MAKERERE UNIVERSITY
P.O. Box 7062 Kampala Uganda
Tel: +256-414-530106
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COLLEGE OF HUMANITIES AND SOCIAL SCIENCES
SCHOOL OF LANGUAGES, LITERATURE AND COMMUNICATION
DEPARTMENT OF AFRICAN LANGUAGES

The University of Salford
Manchester

28th February 2020

RE: Certificate of Translation of Research Protocol documents

Dear Sir/Madam,
This is to confirm that the undersigned, Medadi Ssentanda, PhD is the lead person of the translation of the above-mentioned documents from English to Luganda. The title of the study is *Exploring health promoting lifestyle behaviours for prevention of hypertension in rural communities of Uganda.* The translated materials included *Participant information sheets, Consent forms* and *Questionnaire.*

The translation was done by me (the undersigned) and I confirm herewith that I am a qualified translator. Translation work involves mainly two stages, Front translation and Editing/proofing. I conform that both stages were done and checked for accuracy.

Should there be any concerns regarding the translations, please contact me at the contact details given below.

Yours faithfully,

SSENTANDA Medadi
(PhD)
Mobile: +256782333669
Email: ssentanda@chuss.mak.ac.ug

9.8 Appendix H: Consent Form for the Survey

Title of study: Exploring Health-promoting lifestyle behaviours for prevention of hypertension in rural communities of Uganda

The aim of the survey is to:

1. To assess the knowledge rural communities have about the prevention of hypertension in rural communities in Uganda.
2. To assess health-promoting lifestyle behaviours for the prevention of hypertension in rural communities of Uganda.
3. To establish the prevalence of hypertension in rural communities of Uganda.

Name of Researcher: X

Please complete and sign this form **after** you have read it or it has been read for you and you understood the study information sheet. Read the following statements or they will be read, and select 'Yes' or 'No' in the box on the right-hand side.

1. I confirm that I have read and understand the study information sheet version ***[Version 1 of X]***, dated ***2nd December 2019***, for the above study. I have had the opportunity to consider the information and ask questions Which have been answered satisfactorily. Yes/No

2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, and without my rights being affected. Yes/No

3. If I do decide to withdraw I understand that the information I have given, up to the point of withdrawal, will be used in the research. The timeframe for withdrawal is before I complete filling out the questionnaire. Yes/No

4. I agree to participate by filling out the questionnaire Yes/No

5. I understand that my personal details will be kept confidential and will not be revealed to people outside the research team. *However, I am aware that if I reveal* anything related to criminal activity and/or something that is harmful to self or other, the researcher will have to share that information with the appropriate authorities**].** Yes/No

6. I understand that my anonymised data will be used in researcher's thesis, academic publications, conferences, and further research. Yes/No

7. I agree to take part in the study: Yes/No

Name of participant	Date	Signature
Name of person taking consent	Date	Signature

9.9 Appendix I: Foomu y'okukkiriza ey'Okunoonyereza

Omutwe gw'okunoonyereza: Okwekaliriza embeera z'okutumbula ebyobulamu mu kaweefube w'okutangira entunnunsi mu bitundu by'omu byalo mu Uganda

Ekigendererwa ky'okunoonyereza kuno kwe:

4. Okwekaliriza amagezi agali mu bitundu by'omu byalo ku kutangira obulwadde bw'entunnunsi mu bitundu by'omu byalo mu Uganda.
5. Okwekaliriza embeera z'obulamu ezitumbula empisa z'okutangira obulwadde bw'entunnunsi mu bitundu by'omu byalo mu Uganda.
6. Okulaba oba nga mu bitundu mu by'omu byalo mu Uganda mulimu okutangira obulwadde bw'entunnunsi.

Amannya g'Omunoonyereza: Namuguzi Mary

Tukusaba ojjuze era oteeke omukono ku foomu eno **oluvannyuma** lw'okugisoma oba okugikusomera era ng'otegedde bulungi ebiri ku lupapula oluliko obubaka. Soma ebigambo bino wammanga oba babiksomere era olondeko 'Yee' oba 'Nedda' mu kabookisi akali ku mukono ogwa ddyo.

1. Nkaksa nti nsomye era ne ntegeera bulungi obubaka obuli ku lupapula lw'obubaka olufulumye ***[Olufulumye olusoka kulusoma luno]***, nga ***26th February 2020***, ebyokunoonyereza okwo waggulu. Nfunye omukisa okutunula mu bubaka obwo era n'okubuuza ebibuuzo. Ebibuuzo byanukuddwa ne mmatira. Yee/Nedda

2. Nkitegeera nti okwetabamu kwange kwa kyeyagalire era nti ndi wa ddembe okukuvaamu ekiseera kyonna nga siwadde nsonga yonna era nga n'eddembe lyange terikosebwa. Yee/Nedda

3. Bwe nnaasalawo okuvaamu, nkitegeera nti obubaka bwe mpaddeyo okutuuka ku kiseera we nviiridde mu kunoonyereza, bujja kukozesebwa mu kunoonyereza. Yee/Nedda

4. Nzikiriza okwetabamu era nkiraga nga nzijuza olukalala lw'ebibuuzo. Yee/Nedda

5. Nkitegeera nti ebinkwatako ng'omuntu bijja kukuumibwa nga byakyama era tebijja kuweebwako bantu batali ku abo abakola ku kunoonyereza kuno. *Wabula, nkimanyi nti singa wabaawo ekintu kyonna kye njasanguza* ekyekwanya n'okuzza emisango/n'ekintu ekikosa nze oba omuntu omulala, omunoonyereza alina okugabana obubaka obwo n'aboobuyinza abakwatibwako ensonga eyo**].** Yee/Nedda

8. Nkimanyia obubaka bwange obuggyiddwako amannya bujja kukozesebwa mu kitabo ky'okunoonyereza eky'omunoonyereza (ekiwakano), mu ssemasomo ne mu kunoonyereza okusukka ku kuno.

9. Nzikiriza okwetaba mu kunoonyereza: Yee/Nedda

____________________	_______________	____________________
Amannya g'omwetabi	Ennaku z'omwezi	Omukono
____________________	_______________	____________________
Amannya g'omuntu asaba okukkiriza	Ennaku z'omwezi	Omukono

9.10 Appendix J: Survey Tool

Exploring Individual Health-Promoting Lifestyle Behaviours for Prevention of Hypertension in Rural Communities of Uganda

Instructions:

i) Fill in the missing gaps

ii) For the multiple choice questions, circle the most correct answer.

Section A: Socio-demographic characters

1. **Age:** …………………………………………………….………...
2. **Sex:** …………………………………………………….………
3. **Tribe**: ………………………………………………………..
4. **Religion:**…………………………………………………….
5. **Marital status**
   a) Single
   b) Married
   c) Widowed
   d) Widower
   e) Divorced
   f) Co-habiting
6. **Level of education**
   a) None
   b) Primary
   c) Secondary
   d) Tertiary
7. **Do you have any family member who suffers from hypertension?**

a) Yes

b) No

8. **If yes in number 6 above, what is your relationship with that person?**

   …………….……………………………………………………………………………

   ……………………………………………………………………………………….....

9. What do you do to earn a living?

a) Peasant/farmer

b) Teacher

c) Business

d) Do not work for payment

e) Any other (specify)……………………………………………………………….

10. Approximately how much money do you earn per month?

…………………………………………………………………………………………………

…………………………………………………………………………………………………

Section B: Knowledge about the prevention of Hypertension

11. How dangerous is hypertension/high blood pressure to your health?

a) Extremely

b) Somewhat

c) Not at all

d) Don't know

12. Do you have hypertension/high blood pressure?

a) Yes

b) No

c) Don't know

13. If Yes in question 11 above, for how long have you been hypertensive?

…………………. Years and ……………………………….. Months

14. What are the causes of hypertension?

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

15. Can people do something to maintain normal blood pressure?

a) Yes

b) No

c) Don't know

16. If Yes in question 14 above, what ways can one use to prevent hypertension (five four answers)?

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………..

17. What time do you normally take dinner?

…………………………………………………………………………………………………........

18. What time do you sleep after dinner?

…………………………………………………………………………………………………..

19. State five foods people can eat to maintain a normal blood pressure

a) ……………………………………………………………………….

b) ……………………………………………………………………….

c) ……………………………………………………………………….

d) ……………………………………………………………………….

e) ……………………………………………………………………….

20. What are some of the foods one should avoid in order to maintain normal blood pressure? (give 5 answers)

a) ……………………………………………………………………….

b) ……………………………………………………………………….

c) ……………………………………………………………………….

d) ……………………………………………………………………….

e) ……………………………………………………………………….

21. State five risk factors that one should take into consideration in order to prevent hypertension.

a) ……………………………………………………………………….

b) ……………………………………………………………………….

c) ……………………………………………………………………….

d) ……………………………………………………………………….

e) ……………………………………………………………………….

22. How did you learn about hypertension? (High blood pressure)?

a) Radio talk shows about hypertension

b) Workshop about hypertension

c) Health education during a hospital visit

d) Television talk shows about hypertension

e) Formally in school

f) Others (specify)

…………………………………………………………………………………………

…………………………………………………………………………………………

Section C: Individual lifestyle behaviour that influence the prevalence of hypertension/ high blood pressure

i. Physical activity

23. Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like [carrying or lifting heavy loads, digging or construction work] for at least 10 minutes continuously?

a) Yes

b) No; (If No, go to question 23)

24. In a typical week, on how many days do you do vigorous-intensity activities as part of your work?

………………………………………….days

25. How much time do you spend doing vigorous-intensity activities at work on a typical day?

Hours……………………………. Minutes…………………………....

26. Does your work involve moderate-intensity activity that causes small increases in breathing or heart rate such as brisk walking [or carrying light loads] for at least 10 minutes continuously?

a) Yes

b) No (If no go to question 25)

27. How much time do you spend doing moderate-intensity activities at work on a typical day?

Hours…………………..…Minutes…………………

28. Do you walk for more than 10 minutes continuously to move to and from places?

a) Yes

b) No

29. Do you use bicycle for more than 10 minutes continuously to move to and from places?

a) Yes

b) No

30. In a typical week how many days do you walk for at least 10 minutes continuous?

Number of Days ……………………………….

31. How much time do you spend walking to travel on a typical day?

Hours…………………..…Minutes…………………

32. How much time do you spend cycling to travel on a typical day?

Hours…………………..…Minutes…………………

ii. Recreational Activities

33. Do you do any vigorous-intensity sports, fitness or recreational (leisure) activities that cause large increases in breathing or heart rate like [running or football] for at least 10 minutes continuously?

a) Yes

b) No (If No go to Question 33)

34. In a typical week, on how many days do you do vigorous intensity sports, fitness or recreational (leisure) activities?

Number of Days……………………………………..

35. How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a typical day?

Hours…………………..…Minutes…………………

36. Do you do any moderate-intensity sports, fitness or recreational (leisure) activities that cause a small increase in breathing or heart rate such as brisk walking, [cycling, swimming, and volleyball] for at least 10 minutes continuously?

a) Yes
b) No (If No go to Question 36)

37. How many days do you spend doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical week?

………………………………………. days

38. How much time do you spend doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical day?

Hours……………………..……Minutes…………………………….…..

iii. Smoking (Tobacco Use)

39. In the past, did you ever smoke any tobacco products?

a) Yes
b) No (If No go to 44)

40. How long did you smoke?

…………………...Years …………………Months…………………….....Weeks

41. Do you currently use tobacco products daily?

a) Yes
b) No (If No go to 44)

42. How long have you used tobacco products?

…………………...Years …………………Months…………………….....Weeks

43. On average, how many of the following products do you smoke daily?

a) Manufactured cigarette ………..
b) Hand-rolled cigarettes………
c) Pipes full of tobacco…………
d) Cigars, cheroots ………….
e) Number of Shisha Sessions……
f) Others ……………………….

44. Do you currently use any smokeless tobacco products?
a) Yes
b) No (if no, go to question 43)

45. Do you currently use smokeless tobacco products daily?
a) Yes
b) No

46. On average, how many times a day do you use:
a) Snuff, by mouth
b) Snuff, by nose
c) Chewing tobacco
d) Other (please specify):

iv. Eating Fruits

47. In a typical week, on how many days do you eat fruit?
a) Number of days …………………………………
b) If Zero days, go to question 46

48. How many fruits do you eat on one of those days?
Name and number of fruits………………………………

v. Eating vegetables

49. In a typical week, on how many days do you eat vegetables?
Number of days…………………………………..

50. How many tablespoons of vegetables do you eat on one of those days?
Number of tablespoons………………………………..

vi. Eating Meat

51. In a typical week, on how many days do you eat red meat (beef, mutton, goat meat etc)?

Number of days…………………………………….

52. Approximately how many grams of red meat do you eat on one of those days?

Grams of red meat………………………………...

53. In a typical week, on how many days do you eat white meat (chicken, fish)?

Number of days……………………………………..

54. Approximately how many grams of white meat do you eat on one of those days?

Number of servings………………………………….

Vii. Dietary Salt (Select the most correct answer)

55. How often do you add salt or a salty sauce such as soya sauce to your food right before you eat it or as you are eating it?

a) Always
b) Often
c) Sometimes
d) Rarely
e) Never
f) Don't know

56. How often is salt, salty seasoning or a salty sauce added in cooking or preparing foods in your household?

a) Always
b) Often
c) Sometimes
d) Rarely
e) Never
f) Don't know

57. How often do you eat processed food high in salt? By processed food high in salt, I mean foods that have been altered from their natural state, such as packaged salty snacks, canned salty food including pickles and preserves, salty food prepared at a fast food restaurant, cheese, bacon and processed meat

a) Always

b) Often

c) Sometimes

d) Rarely

e) Never

f) Don't know

58. How much salt or salty sauce do you think you consume?

a) Far too much

b) Too much

c) Just the right amount

d) Too little

e) Far too little

f) Don't know

Viii. Alcohol consumption

59. Have you ever consumed any alcohol such as beer, wine, waragi?

a) Yes

b) No (If No go to number 5)

57. If yes, in number 56 above, how often do you drink?

a) Everyday

b) Twice a week

c) Once a week

d) Once a month

e) Any other (specify)

59. If yes, in number 56 above, which type of alcohol do you drink?

a) Beer

b) Wine

c) Waragi

d) Any others (specify)

59. If yes in number 56 above, how much alcohol do you take?

-- litres

Section D: Prevalence of hypertension

61. Have you ever measured your blood pressure?

a) Yes

b) No (If No go to number 63)

62. If yes in in question 61 above, when did you last measure it?

…………………………………………………………………………………………………

63. If yes in question 61 above, what were the results of your blood pressure?

a. Normal

b. High

c. I don't know

64. If yes the results were high in question 63, are you on treatment?

a. Yes

b. No

65. Blood pressure reading for today is:

Blood pressure reading 1: ________/________mmHg

Blood pressure reading 2: ________/________mmHg

Blood pressure reading 3: ________/________mmHg

66. **Weight**: ……………………… Kilograms

67. **Height:** ………………………. Centimeters

68. **BMI** …………………………………

9.11 Appendix K: Okunoonyereza kw'Obubaka obw'ebibalo

Ebigobererwa:

i) Jjuza ebibula mu mabanga

ii) Ku bibuuzo ebiriko ebyokulondako teeka enkulungo ku kyokuddamu ekisinga okuba ekituufu.

Ekitundu A: Ebikwata ku muntu

1. Emyaka: ……………………………………………………….………...
2. Ekikula: ………………………………………………………..………
3. Eggwanga: ………………………………………………………..
4. Mufumbo oba nedda

a) Siri mufumo

b) Ndi mufumbo

c) Nnamwandu

d) Ssemwandu

e) Twayawukana

f) Tubeera wamu naye tetuli bafumbo

5. Obuyigirize

a) Saasoma

b) Pulayimale

c) Sekendule

d) Ttendekero eryawaggulu

6. Olina owooluganda yenna eyalwala entunnunsi?

a) Yee

b) Nedda

7. Oba nga Yee mu namba 6 waggulu, olina Luganda ki n'omuntu oyo?

…………….……………………………………………………………………………………

……………………………………………………………………………………………….....

8. Okola mulimu ki?

a) Mulimi

b) Musomesa

c) Bizinensi

d) Sikola mulimu gusasula

e) Ekirala (kirage)………………………………………………………….

9. Ofuna ssente nga mmeka buli mwezi?

……………………………………………………………………………………………………

……………………………………………………………………………………………………

Ekitundu B: obumanyi ku kuziyiza obulwadde bw'entunnunsi

10. Obulwadde bw'entunnunzi bwa bulabe kwenkana ki ku bulamu bwo?

a) Nnyo

b) Kitono

c) Yadde n'akamu

d) Simanyi

11. Olina obulwadde bw'entunnunsi/puleesa eyawaggulu?

a) Yee

b) Nedda

12. Bw'oba nga Yee mu kibuuzo 11 waggulu, omaze bbanga ki ng'olina obulwadde bw'entununsi?

Emyaka …………………n'emyazi ………………………………..

13. Biki ebireeta obulwadde bw'entunnunzi?

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………

14. Abantu balina kye bayinza okukola okwekuuma obutalwala ntunnunsi?

a) Yee

b) Nedda

c) Simanyi

15. Oba nga Yee mu kibuuzo 14 waggulu, biki omuntu by'ayinza okukola okutangira obulwadde bw'entunnunsi?

……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………..

16. Menyayo ebika by'emmere bitaanu abantu bye bayinza okulya okukuuma entunnunsi nga tezikyusekyuse

a) …………………………………………………………………….
b) …………………………………………………………………….
c) …………………………………………………………………….
d) …………………………………………………………………….
e) …………………………………………………………………….

17. Mmere ki omuntu gy'alina okwewala okukuuma entunnunsi nga tezikyusekyuse?

a) …………………………………………………………………….
b) …………………………………………………………………….
c) …………………………………………………………………….
d) …………………………………………………………………….
e) …………………………………………………………………….

18. Menyayo ensonga ttaanu ez'obulabe omuntu z'alina okufaako okusobola okutangira obulwadde bw'entunnunzi.

a) …………………………………………………………………….
b) …………………………………………………………………….
c) …………………………………………………………………….
d) …………………………………………………………………….
e) …………………………………………………………………….

19. Wategeera otya ebikwata ku bulwadde bw'entunnunzi (Puleesa eyawaggulu)?

a) Emboozi z'oku leediyo ezikwata ku bulwadde bw'entunnunsi
b) Omusomo ogukwata ku bulwadde bw'entunnunsi
c) Okusomesebwa ebikwata ku bulamu nga ŋŋenze ku ddwaliro

d) Emboozi z'oku ttivi ezikwata ku bulwadde bw'entunnunsi

e) Nabiyigira mu ssomero

f) Ewalala (kirage)

……………………………………………………………………………………………………

………………………………………………………………………………

Ekitundu C: Embeera z'obulamu bw'omuntu kinnoomu ezireetera okutangira obulwadde bw'entunnunsi/puleesa eyaawaggulu

i. Emirimu egyamaanyi

20. Emirimu gy'okola girimu okukozesa amaanyi amangi nga kikuleetra okussa ennyo oba omutima okweyongera okukubira okumukumu [okwetikka oba okusitula ebintu ebizitowa, okulima oba emirimu gy'okuzimba] okumala waakiri eddakiika 10 ez'omuddiriŋŋanwa?

a) Yee

b) Nedda; (bwe kiba Nedda, genda ku kibuuzo 23)

21. Mu wiiki eya bulijjo, nnaku mmeka z'okolerako emirimu emingi ng'emirimu egyo kitundu ku mirimu gy'okola bulijjo?

Ennaku………………………………………….

22. Budde ki bw'omala ngokola emirimu egy'amaanyi ku mulimu gwo ku lunaku olwa bulijjo?

Essaawa……………………………. Eddakiika…………………………....

23. Omulimu gwo gulimu emirimu emisaamusaamu egireetera okweyongera ku mbiro kw'ossiza oba okweyongera kw'enkuba y'omutima gamba ng'okutambula ng'oyanguyirira [oba ng'osituddde ebintu ebizito] okumala eddakiika waakiri kkumi ez'omuddiriŋŋanwa?

a) Yee

b) Nedda (Bwe kiba nedda, genda ku kibuuzo 25)

24. Budde bwenkana ki bw'omala ng'okola emirimu emisaamusaamu ku mulimu gwo ku lunaku olwa bulijjo?

Essaawa…………………..…Eddakiika …………………

25. Otambulira eddakiika ezisukka 10 nga toyimiriddeemu ng'ova mu kifo ekimu okudda mu kirala?

a) Yee

b) Nedda

26. Ovuga eggaali okumala eddakiika ezisukka mu 10 nga toyimiriddeemu ng'ova mu kifo ekimu okudda mu kirala?

a) Yee

b) Nedda

27. Mu wiiki eya bulijjo emirimu emingi, nnaku mmeka z'otambulirako okumala eddakiika 10 nga toyimiriddeemu?

Omuwendo gw'ennaku ……………………………….

28. Budde bwenkana ki bw'omala ng'otambula olugendo ku lunaku olwa bulijjo?

Essaawa…………………..…Eddakiika…………………

29. Omala budde bwenkana ki ng'osotta akagaali ku lunaku lwo olwa bulijjo?

Essaawa…………………..…Eddakiika…………………

ii. Ebyokwesanyusa

30. Olina emizannyo, dduyiro oba ebyokwesanyusa ebirala eby'amaanyi by'okola ebikuleetera okweyongera mu kussa oba ku mbiro z'enkuba y'omutima nga (okudduka oba okusamba akapiira) okumala eddakiika waakiri 10 nga toyimiriddeemu?

a) Yee

b) Nedda (Bwe kiba Nedda genda ku Kibuuzo 33)

31. Mu wiiki eya bulijjo, nnaku mmeka kw'okolera emizannyo, dduyiro oba ebyokwesanyusa eby'amaanyi?

Omuwendo gw'ennaku……………………………………..

32. Omala budde bwenkana ki ng'okola emizannyo egy'amaanyi, dduyiro oba ebyokwesanyusa eby'amaanyi ku lunaku olwa bulijjo?

Essaawa…………………..…Eddakiika…………………

33. Okola emizannyo, dduyiro oba ebyokwesanyusa ebisaamusaamu ebireetera okweyongera ku ngeri gy'ossaamu oba ku mbiro omutima kwe gukubira gamba ng'okutambulira ku mbiro, [okusotta akagaali, okuwuga, omupiira ogw'ensero] okuamala eddakiika waakiri 10 nga tosirisizzaamu?

a) Yee

b) Nedda (Bwe kiba Nedda genda ku Kizuubo 36)

34. Omala ennaku mmeka ng'okola emizannyo, dduyiro oba ebyokwesanyusa ebisaamusaamu mu wiiki?

Ennaku……………………………………….

35. Omala budde bwenkana ki ng'okola emizannyo, dduyiro oba ebyokwesanyua ku lunaku olwa bulijjo?

Essaawa…………………..……Eddakiika…………………………..…..

iii. Okunywa sigala (Okukozesa taaba)

36. Emabegako eyo walina ekintu ekirimu taaba kye wakozesanga?

a) Yee

b) Nedda (Bwe kiba Nedda genda ku 44)

37. Wamala bbanga ki ng'onywa sigala?

Emyaka…………………... ………Emyezi…………………….....Wiiki……………

38. Mu kiseera kino okozesa ebintu ebirimu taaba buli lunaku?

a) Yee

b) Nedda (Bwe kiba Nedda genda ku 44)

39. Omaze bbanga ki ng'okozesa ebintu ebirimu taaba?

Emyaka…………………... Emyezi………………… Wiiki…………………….....

40. Okutwaliza awamu, bintu bimeka ku bino ebirimu sigala by'okozesa buli lunaku?

a) Sigala ow'omu maduuka ………..

b) Sigala gwe neezingidde………

c) Emmindi erimu sigala…………

d) Cigars, cheroots ………….

e) Emirundi gy'onywa Shisha ……

Ebirala ……………………….

41. Mu kiseera kino olina by'onywa ebirimu taaba naye nga tebivaamu mukka?

a) Yee

b) Nedda (Bwe kiba Nedda genda ku kibuuzo 43)

42. Mu kiseera kino okozesa ekintu kyonna buli lunaku ekirimu taaba naye nga tekivaamu mukka?

a) Yee

b) Nedda

43. Okutwaliza awamu, mirundi emeka gy'okozesa:

a) Okunuusa, ng'okozesa mumwa………………………….

b) Okunuusa, ng'okozesa nnyindo…………………………..

c) Okugaaya taaba………………………………………..

d) Ekirala (kirage):………………………………………

iv. Okulya ebibala

44. Mu wiiki eya bulijjo, nnaku mmeka z'oliirako ebibala?

a) Omuwendo gw'ennaku ………………………………

b) Bwe kiba nga tewali lunaku na lumu, genda ku kibuuzo 46

45. Bibala bimeka by'olya ku lumu ku nnaku ezo?

Erinnya n'omuwendo gw'ebibala………………………………

v. Okulya enva endiirwa/ebivaavava

46. Mu wiiki eya bulijjo, nnaku mmeka z'oliirako enva endiirwa/ebivaavava?

Omuwendo gw'ennaku…………………………………..

47. Bijiiko bimeka ebirya emmere eby'enva endiirwa by'olya ku lunaku olumu ku nnaku ezo?

Omuwendo gw'enva endiirwa………………………………..

vi. Okulya ennyama

48. Mu wiiki eya bulijjo, nnaku mmeka z'oliirako ennyama emmyufu (ennyama y'ente, ey'endiga, ey'embuzi, n'endala)?

Omuwendo gw'ennaku…………………………………….

49. Mu kugeraageranya, bungi ki obw'ennya emmyufu mu kipimo gya grams bw'olya ku lumu ku nnaku ezo?

Grams z'ennyama emmyufu………………………………...

50. Mu wiiki eya bulijjo, nnaku mmeka kw'oliira ennyama enjeru (ennyama y'enkoko, ebyennyanja)?

Omuwendo gw'ennaku……………………………………..

51. Mu kugeraageranya bungi ki obw'ennya enjeru mu kipimo gya grams bw'olya ku lumu ku nnaku ezo?

Omuwendo gw'ebijjuliro…………..

Ekitundu D: Okutangira obulwadde bw'entunnunsi

52. Wali opimye ku nkuba yo ey'omusaayi (puleesa)?

a) Yee

b) Nedda (Bwe kiba Nedda genda ku nnamba 55)

53. Bwe kiba yee mu kibuuzo 52 waggulu, wakoma kupima ddi?

……….………………………………………………………………………………………

54. Bwe kiba yee mu kibuuzo 52 waggulu, ebyava mu kwepima byali bitya?

……………………………………………………………………………………………………

……………………………………………………………………………………………

55. Enkuba y'omusaayi (puleesa) ery'olwaleero:

Enkuba y'omusaayi 1: ________/________mmHg

Enkuba y'omusaayi eya 2: ________/________mmHg

Enkuba y'omusaayi eya 3: ________/________mmHg

56. Obuzito: Kkiro………………………

57. Obuwanvu: Mmita……………………….

58. Obuzito obugabanyiziddwa mu buwanvu (BMI) …………………………………

9.12 Appendix L: Codebook for Prevention of Hypertension Data

Q n.	Variable	Categories	Description
	title		Title of entry
	id		Participant's ID
	hhn		Household number
	village	1. Mende Bbuga 2. Bulondo 3. Mende Central 4. Kasengejje 5. Najemba 6. Nakasugga 7. Sanda Nalubi 8. Sesiriba	Villages in which the participants live
	hhp	1. 1-2 2. 3-4	Number of adults in each household
	religion	1. Christian 2. Islam 3. Any others	Participant's religion
	others	1. Has no religion	Any other religion of the participant not mentioned above
	agegp	1. 18-34 years 2. 35-54 years 3. >54 years	The age group of participants
	gender	1. Male 2. Female	Sex of the participant
	tribe2	1. Muganda/Baganda/Basoga 2. Others	**Tribe of the participant** **Others include:** Aluru Iteso Banyakitara

			Rwandan Burundian Tanzanian Congolese
	mar	1. Married 2. Never married 3. Widowed 4. Separated/divorced	Marital status of the participants **Married:** Formally married and living together (co-habiting) **Never married:** Single **Widowed:** Widow Widower
	education	1. None 2. Primary 3. Secondary 4. Tertiary	The highest level of education attained
	fam_hyp2	1. No 2. Yes 3. Don’t know	**History of HT in the Family**
	rel	1. Grandmother/father 2. Mother/father 3. Sibling 4. Other relatives	**Relationship with hypertensive person** **Other relatives** Aunt/uncle Niece/cousin

			Daughter No one/not applicable **Missing** N/A (No and don’t know on fam_hyp)
	Occup	1. Peasant/farmer 2. Business 3. Formal employment 4. Unemployed 5. others	**Occupation** **Peasant/farmer** Brick laying/digging/farming **Business** Moto cycle/bodaboda Builder/painter/casual laborer/potter/welder Tailor/hair dresser Mechanic/factory employee **Formal employment** Teacher Nurse/drug dispenser **unemployment** Housewife/maid/waitress Others

	income_month	0. 0 1. 1-50,000 2. 50,001-150,000 3. >150,000	Monthly Income
	ht_severity	1. Extremely 2. Somewhat 3. Not at all 4. Don't know	Perceived severity of HT
	ht_self_reporting	1. No 2. Yes 3. Don't know	History of HT diagnosis
	ht_dur	1. ≤ 2 years 2. 3-4 years 3. 5-6 years	Duration of HT diagnosis in complete years
	can_prev_ht	1. No 2. Yes 3. Don't know	Perceived possibility of HT prevention
	ht_prev_meas2	0. 0 no correct answer 1. 1 correct answer 2. 2 correct answers 3. ≥ 3 correct answers	The correct answer to HT prevention
	fds_pre_ht	0. No correct type of food 1. 1 correct type of food 2. ≥ 2 correct types of food	Answers on correct food types for HT prevention
	din_time2	0. Don't eat supper 1. 6.00-8.30 pm 2. 9.00 pm or later	dinner/supper time 0. Don't eat supper +3.00-5.30pm
	bed_time2	0. 7.00-8.30 pm 1. 9.00-10.30 pm 2. 11.00 pm or later	Bedtime

			11.00 pm or later - means 11.00-12.30 am, 1.00-2.30 am, does not sleep
	fds_avoid	0. No correct type of food 1. 1 correct type of food 2. ≥ 2 correct types of food	Answers to Correct foods to avoid
	causes_ht2	0. Don't know 1. 1 cause of HT 2. ≥ 2 causes of HT	Cause of hypertension
	sour_info	0. Has never learnt from anywhere 1. 1 source of information 2. 2 sources of information 3. ≥ 3 sources of information	Source of information about HT
	other_sour2	0. N/A or never heard about HT 1. Community 2. Internet/social media 3. Personal experience/intuitive knowledge	**Any other source of information about HT** Internet/social media also includes books Community includes Relative and friend
	vig_act2	1. No 2. Yes	Whether one does vigorous activity work
	daysvig_act	1. 0-1 day 2. 2-3 days 3. 4-5 days 4. 6-7 days	Days doing vigorous-intensity activities in a typical week as part of one's work

	timevig_act	1. 0-2 hours 2. 3-4 hours 3. 5-6 hours 4. ≥ 7 hours	Time spent doing vigorous-intensity activities
	moderint_work	1. No 2. Yes	Whether one does moderate-intensity work
	daysmod_intwk	1. 0-2 days 2. 3-4 days 3. 5-6 days 4. 7 days	Days one spends on moderate intensity work in a week
	timemod_intwork	1. 0-2 hours 2. 3-4 hours 3. ≥ 5 hours	What time do you spend on moderate-intensity work in a typical week
	walk10_min	1. No 2. Yes	Walking continuously for 10 minutes from places
	timewalk_10min	1. 0-2.5 hours 2. 3-5.5 hours 3. ≥6 hours	Time spent walking to travel in a typical day
	dayswalk_10min	0. 0 days 1. 1-2 days 2. ≥ 3 days	Days spent walking 10 minutes continuously in a typical week
	bicyc10_min	1. No 2. Yes	Cycling for 10 minutes continuously to move to and from places
	time_cycl	0. Does not ride a bicycle 1. 1 minute-120 minutes 2. ≥121 minutes	Time spent cycling to travel on a typical day

	daysvig_intens_sp	0. 0 1. 1-2 days 2. 3-4 days 3. ≥ 5 days	Days doing vigorous-intensity sports in a typical week
	timevig_intenssports	0. 0 or n/a 1. 1-30 minutes 2. 31-60 minutes 3. 61-90 minutes 4. ≥ 91 minutes	Time spent doing vigorous-intensity sports
	modinten_sports	1. No 2. Yes	Moderate-intensity sports continuous for 10 minutes
	daysmod_intensp	0- 0 days/blank 1- 1-2 days 2- 3-4 days 3- ≥ 5	Days doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical week
	timemod_intensp	0. 0 minutes/blank 1. 1-30 minutes 2. 31-60 minutes 3. ≥ 61 minutes	Time doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical day
	eversmok	1. No 2. Yes	History of smoking
	timesmok	1. 1-5 years 2. 6-10 years 3. 11-15 years 4. ≥ 16	Complete years of smoking
	smokelesstob	1. No 2. Yes	Currently, use smokeless tobacco
	prod_for_smok	1. prod_for_smok Hand rolled cigarettes 2. Pipes full of tobacco 3. Others	Type of product used for smoking
	other_tobprod	1. N/A	Any other types of tobacco

		2. Manufactured cigarettes 3. Piped tobacco and marijuana 4. Chewing tobacco	
	smokeless_tob2	1. No 2. Yes	History of smokeless tobacco
	smokelss_prod2	1. No one uses any other products	Use of smokeless products
	Others_spec	0. Blank	Specify others here
	no_of_proddaily	1. 0.1-2 2. 3-4 3. 5-6 4. ≥7	Number of products smoked daily
	snuff	0. N/A	On average, how many times a day do you use: a) Snuff, by mouth b) Snuff, by nose c) Chewing tobacco d) Other (please specify):
	eatfruits	1. No 2. Yes	Whether the participant eats fruits
	dayseat_fruits	0. 0 days 1. 1-2 days 2. 3-4 days 3. ≥ 5 days	Days of eating fruits in a typical week
	fruitstype	0. No fruits 1. 1-2 types of fruits 2. More than 2 types of fruits	Types of fruits one normally eats
	days_veg	0. 0 days 1. 1 day 2. ≥ 2 days	Days taking vegetables in a typical week
	tabsp_veg	0. 0 tablespoons 1. 1-2 tablespoons 2. 3-4 tablespoons	Number of tablespoons of vegetables eaten on one of those days

		3. ≥ 5 tablespoons	
	dayseat_mt	0. once in a month/once in 2 months 1. 1-2 days 2. 3-4 days 3. ≥ 5 days	Number of days eating red meat in a typical week
	gramsof_meat	0. 0 grams 1. 1-50 grams 2. 51-100 grams 3. 101-150 grams 4. ≥ 151 grams	Grams of red meat eaten on one of those days
	dayseat_whitmeat	0. once a month/twice a month/rarely 1. 1-2 days 2. 3-4 days 3. ≥ 5	Days eating white meat in a typical week
	gramswhite_meat	0. 0 grams 1. 1-50 grams 2. 51-100 grams 3. ≥ 101 grams	Grams of white meat eaten on one of those days
	addsalt	0. Always 1. Often 2. Sometimes 3. Rarely 4. Never	Add salt or salty sauce to food right before or during eating
	add_seasoning	1. Always 2. Often 3. Sometimes 4. Rarely 5. Don't know 6. Never	Add salt, salty seasoning in cooking or preparing foods in your household

	proc_food	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never	How often one eats processed food high in salt
	quan_salt	1. Far too much 2. Too much 3. Just the right amount 4. Too little 5. Far too little	The perceived amount of salt or salty sauce consumed
	evercons_alcoh	1. No 2. Yes	History of alcohol consumption
	howoften_consum_alcoh	1. Everyday 2. Twice a week 3. Once a week 4. Once a month 5. Any other specify	How often one consumes alcohol
	other_duration	1. 3-4 times a week 2. 1-4 times a month 3. 1-4 times a year 4. Stopped drinking	If yes in the above, Specify here
	typ_of_alcoh	1. Beer 2. Beer and wine 3. Beer, wine and waragi 4. Beer, wine, and waragi and any others 5. Beer and waragi 6. Beer, waragi and any others 7. Wine 8. Waragi 9. Any others	If yes, which type of alcohol do you consume?
	others_alcoh_typ	1. All types of local brew 2. Local brew 3. Stopped taking alcohol	Any others specify here

	quant_of_alcoh	0. 0 liters/no longer drinks 1. 0.1-1 liter 2. ≥ 1.1 liters	Quantity of alcohol consumed in one sitting
	evermeas_bp	1. No 2. Yes	History of blood pressure measurement
	whenlast_meas	1. 1 day – 12 months ago 2. 13- 24 months 3. 25-36 months 4. ≥ 37 months 5. Can't remember	If yes, when did you last measure it?
	resultsof_bp	1. Don't know 2. High 3. Low 4. Normal	Results of blood pressure measurement
	statusof_syst_bp	1. Normal systolic blood pressure (<140 mmHg) 2. Raised systolic blood pressure (≥140 mmHg)	Average of 2nd and 3rd systolic BP
	ht_cat_syst	1. Optimal(<120mm Hg) 2. Normal (<130 mmHg) 3. High normal (130-139 mmHg) 4. Mild hypertensive (140-159 mmHg) 5. Moderate HT (160-179 mmHg) 6. Severe HT (≥180 mmHg)	Hypertension category for Systolic BP
	ht_cat_diast	1. Optimal (<80 mmHg) 2. Normal (<85 mmHg) 3. High normal (85-89 mmHg)	Hypertension category for diastolic blood pressure

		4. Mild HT (90-99 mmHg) 5. Moderate HT (100-109 mmHg) 6. Severe HT (greater than 110 mmHg)	
	isol_syst_ht	0. (<140 mmHg) 1. Level 1 (140-159 mmHg) 2. Level 2 (≥160 mmHg)	Isolated systolic blood pressure
	isol_dias_ht	1. <90 mmHg 2. N/A	Isolated diastolic blood pressure
	isol_ht_category	0. n/a 1. Level 1 (syst - (≥160 and dist – less than 90) 2. Level 2 (syst - 140-159 and dist – less than 90)	Isolated HT category
	ave_diastolic	0. <90 mmHg 1. ≥90 mmHg	Diastolic blood pressure
	ave_systolic	0. >140 mmHg 1. ≥140 mmHg	Systolic blood pressure
	ht_cat	0. Normotensive 1. Hypertensive	Hypertension category
	Weight_kgs	1. 31-50 2. 51-70 3. 71-90 4. 91-110 5. >110	Weight in kgs
	weightinkgs		Weight in kgs as a continuous variable
	height_m	1. 0.61-1.4 2. 1.41-1.60 3. ≥ 1.61	Height in meters
	heightinmeters		Height in meters as a continuous variable

	bmi	1. <18.5 (underweight) 2. 18.5–24.9 (normal) 3. 25–29.9 (overweight) 4. ≥ 30 (obesity)	BMI
	Completebmi		Complete BMI as a continuous variable

9.13 Appendix M: Resumption of Research Activities During the Covid-19 Pandemic

UNCST

Uganda National Council for Science and Technology

(Established by Act of Parliament of the Republic of Uganda)

4th June 2020

Research Ethics Chairpersons
Researchers

RESUMPTION OF RESEARCH ACTIVITIES DURING THE COVID-19 PANDEMIC

Uganda National Council for Science and Technology (UNCST) on 27th March 2020 provided guidance on procedures for conduct of research during the Corona Virus Disease 2019 (COVID-19) Pandemic. In the notice researchers were discouraged from recruitment of new study participants because of the additional risk the clinical teams and patients at the recruitment sites would have while conducting their activities. Researchers were also encouraged not to invite the already recruited participants that required follow up to hospitals or recruitment sites.

UNCST held a stakeholders consultative meeting on 1st June 2020 that provided advice on how best research can be conducted in the country in line with the Ministry of Health guidelines for prevention of COVID-19, without compromising the rights, welfare and safety for both the research participants and research teams.

It is against this background and the need to support research activities in the country that the moratorium that UNCST had put has now been lifted, but we would like to encourage the research fraternity to observe the following guidelines as they conduct their research:

1. Screening of research teams and participants with a temperature monitor at research institutions or recruitment entry points. The main purpose of screening is to identify, isolate and refer suspected cases with Corona Virus infection to prevent transmission and optimise case management.
2. Research teams should be familiar with the common signs and symptoms of Corona Virus infection so as to immediately identify, isolate and refer suspected cases to the Ministry of Health or District COVID-19 Taskforce teams.
3. Key preventive measures such as use of Personal Protective Equipment (PPE), mandatory wearing of face masks, washing hands with soap and water or hand sanitizer and physical distancing must be adhered to throughout the implementation of research activities. Research teams should avoid hand-shakes and hugging at all times.
4. A distance of at least two metres should be ensured during research procedures and activities such as consenting, focus Group discussions and trainings to

LOCATION/CORRESPONDENCE

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P. O. Box 6884
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COMMUNICATION

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EMAIL: info@uncst.go.ug
WEBSITE: http://www.uncst.go.ug

prevent person- to- person spread of the Corona Virus while conducting research activities.

5. Research projects that involve community engagement must carry with them educational materials on prevention of COVID-19 in a language understood by the community as guided by the Ministry of Health. The materials should be displayed in places that are easily visible such as notice boards and doors, etc.

6. Administrative measures to minimise risk of Corona Virus infection such as surface disinfection at least once a day with sodium hypochlorite, alcohol based disinfect or other WHO recommended disinfectants should be done in addition to daily cleaning of research institution and recruitment site surfaces. Research institutions should provide enough PPEs and adequate waste management facilities.

In addition to the above guidance, you are required to develop Risk Management Plans (RMPs) to ensure that research teams and study participants' safety as you implement your activities. The RMPs should be submitted to the Research Ethics Committee (REC) and National Drug Authority (NDA) where applicable for advice and approval, and to UNCST for acknowledgment. We also encouraged you to observe the already existing Ministry of Health guidelines on prevention of COVID-19 in order to stay safe.

For any further assistance or clarification, please contact us on telephone: +256 414 705 513/ +256 414 705 525, mobile: +256 788 744 067/+256 755 423 321/ +256 772 620 279 or send an email to info@uncst.go.ug or research@uncst.go.ug.

We look forward to your continued collaboration as we promote ethical research in the country.

Dr. Peter Ndemere
EXECUTIVE SECRETARY

9.14 Appendix N: Focus Group Discussion Interview Guide

Thank you for agreeing to take part in this focus group discussion. The objective of this focus group discussion is to explore lifestyle behaviours for prevention of hypertension in Kasengejje and Mende communities. Your participation in this focus group discussion is very important because the information you will give us will be used to develop effective interventions for prevention of hypertension at community level.

Please note that the answers you give during this interview will be recorded using an audio recorder. The recording will be kept confidential and no one outside your group will know what you discussed. There are no wrong or right answers but we request that you answer the questions based on what you know or your experience.

Ground Rules:

i. The interviewer will moderate the interview from beginning to the end.
ii. A set of questions will be asked by the moderator and each participant will be given adequate time to answer the question asked by the moderator.
iii. No interruption is allowed when one of the group members is responding to a question.
iv. If you feel upset or distressed by a question, please inform the moderator immediately.
v. Completing the interview is voluntary, and you are free to withdraw at any point in time during the interview. However, your answers up to the point of withdrawal may be included in the overall data generated.

Research question:

How do individuals in rural communities of Central Uganda prevent hypertension?

Focus Group Guide Questions

1. What is your experience with high blood pressure?
2. Tell how high blood pressure affected you or your relative or a friend.
3. What type of things can one do to prevent high blood pressure?

Probing questions: Tell me examples of what people do to prevent hypertension.
*Use the quantitative to probe

4. What do you think is needed to help in the prevention of high blood pressure in the community?

9.15 Appendix O: Participant Information Sheet for the Focus Group Discussion

Title of study: Exploring health-promoting lifestyle behaviours for prevention of hypertension in rural communities of Uganda

Name of Researcher: X

1. Invitation to participate in a research study

I am X, a student at the University of Salford, Manchester undertaking a PhD in Nursing.

"You are being invited to take part in a research project, "Exploring lifestyle promoting behaviours for prevention of hypertension in rural communities of Uganda." Before you decide whether to take part, you need to understand why the research is being done and what it will involve. Please take time to read the following information carefully before you decide whether or not you wish to take part. In case you are unable to read or you prefer that I read for you, I am happy to do that. You are welcome to discuss this project with others if you wish before you make your decision. Please ask us if there is anything that is not clear or if you would like more information.

2. What is the purpose of the study?

The purpose of this study is to explore lifestyle-promoting behaviours (such as activity level, types of food one eats, alcohol intake, and smoking) for the prevention of hypertension in rural communities of Uganda. The study is a partial fulfilment of PhD in Nursing.

3. Why have I been invited to take part?

You are being asked to participate because you meet the inclusion criteria for the study which are an adult above the age of 18 years and residing in Kasengejje or Mende in Wakiso District. I am requesting your consent to take part in the study and this consent is important because it protects you as a research participant. You have been invited to take part in the focus group discussion to explore the experiences individuals have about the prevention of hypertension in rural communities of Uganda.

A total number of approximately 50 participants will be selected to take part in the study from Kasengejje and Mende communities. Two to seven focus group discussions will be held in each community with approximately eight (8) participants in each group.

4. Do I have to take part?

No, it is up to you to decide whether or not to join the study. The researcher will describe the study and go through this information sheet. If you agree to take part, the researcher will then ask you to sign a consent form. You are free to withdraw at any time, without giving a reason. This will not affect your relationship and the researcher.

5. What will happen to me if I take part?

You will then be given a participant information sheet or the researcher will read it out for you. You will be given time to ask questions and get answers to the questions. You will then be given at least two hours to decide if you would like to participate in the study. During that two-hour interval, the researcher will go to the next participant's home to enable him to take an informed decision. When the two hours elapse, the researcher will return to you. When you decide to take part in the study, you will be requested to sign a consent form or if preferred use a thumb print to indicate that you are happy to participate in this study. Then, the researcher will inform you about the venue and time of the focus group since you will be expected to be in one community gathering place as a group of 6-8 people. The focus group discussions will take a maximum of one hour.

The questions you will be asked may require you to provide an in-depth explanation to each of the questions during the focus group discussion. As you do that, a tape recorder will be used to record the information during the focus group discussions.

6. Expenses and payments?

There are no payments for participating in this study. Participation in this study will be voluntary. However, you will be given a transport refund of 10,000 Uganda Shillings. Snacks and a drink will be offered during the focus group discussion as they focus group discussions will be conducted in one central place away from your home.

7. What are the possible disadvantages and risks of taking part?

There are minimal risks that may arise from the interviews. The individual interviews and focus group discussions may cause you emotional and psychological discomfort and if this does happen then a counsellor will be at hand to support the team and counsel the participant.

There are minimal risks that may arise from the interviews. The focus group discussions may cause you emotional and psychological discomfort and if this does happen, a counsellor will be at hand to support the team and counsel the participant and also refer appropriately when the need arises.

8. What are the possible benefits of taking part?

We cannot promise that the study will help you directly. You will have access to a blood pressure screening which will involve taking your blood pressure, and weight, and measuring your height. In addition, the body mass index will be calculated and you will be informed. The long-term benefit is that the study findings will inform communities and health policy on what needs to be done to prevent hypertension in rural communities.

9. What if there is a problem?

In case an issue occurs, a nurse-counsellor working with the Uganda Heart will be available to provide support.

If you have a problem or questions about the study, you can contact the researcher by email: X@edu.Salford.ac.uk. If you have any issues or complaints please contact the Chair of the University of Salford Health and Society Ethics Committee, Prof Andrew Clark: a.clark@salford.ac.uk

10. Will my taking part in the study be kept confidential?

All information will be confidential. The questionnaires will be identified with codes to ensure anonymity. In addition, confidentiality will be maintained by keeping all hard copy transcripts under a lock and key cupboard and only the researcher will have access to the keys. After entering data into a computer, information will be protected using a password. In addition, consent forms will be kept separately from the questionnaires using different locks and key cupboards. All information will be kept confidential and used for further studies when there is a need. Data will be stored and archived for a minimum of three years, after the graduate award has been made, to allow verification of data from external sources if necessary, or longer if used for further research.

11. What will happen if I don't carry on with the study?

You will be free to withdraw from the study at any time. The established relationship between the researcher and the participant will be maintained throughout the time of data collection. In addition, when you decide to withdraw from the study, you will be requested to consent to allow the researcher to use your data up to the time you withdrew and all your identifying information will be destroyed.

12. What will happen to the results of the research study?

The findings from this research project will serve to inform the Ugandan Ministry of Health on the prevention of hypertension in rural communities. The research will also be disseminated by the University of Salford EBSCO database. Additional dissemination will be through presentations to Uganda National Health Research Organization for the attention of policymakers and an international conference. The results will also be published in an international journal. In future, the results from the systematic review will be used to develop a model for the prevention of hypertension.

13. Who is organising or sponsoring the research?

The research is sponsored by the University of Salford along with financial support from the Aga Khan University.

14. Further information and contact details:

X

X@edu.salford.ac.uk

Principle investigator.

9.16 Appendix P: Olupapula lw'Omwetabi olw'okukubanyirizaako ebirowoozo mu Bibinja

Omutwe gw'okunoonyereza: Okwekaliriza embeera z'okutumbula ebyobulamu mu kaweefube w'okutangira entunnunsi mu bitundu by'omu byalo mu Uganda

Amannya g'omunoonyereza: Namuguzi Mary

1. Okusabibwa okwetaba mu kunoonyereza

Nze Namuguzi Ndi muyizi mu Yunivaasite y'e Salford Manchester. Nsoma ddiguli eyookusatu (Phd) mu bujjanjabi.

"Osabibwa okwetaba mu kunoonyereza okutuumiddwa "Okwekaliriza embeera z'okutumbula ebyobulamu mu kaweefube w'okutangira entunnunsi mu bitundu by'omu byalo mu Uganda." Nga tonnaba kusalawo oba ng'oneetabamu, kikulu okumanya ensonga ekozesa okunoonyereza kuno n'ebyo ebinaakubeeramu. Tukusaba otwale akaseera okusoma n'obwegendereza obubaka buno wammanga nga tonnaba kusalawo oba ng'oneetabamu oba nedda. Bw'oba nga tosobola kusoma oba ng'oyagala nze mba nkusomera, nsobola okukikola. Oli wa ddembe okwogerako n'abalala ku bikwata ku kunoonyereza kuno, bw'oba ng'okyagala, nga tonnaba kusalawo. Tukusaba otubuuze obwe waba nga waliwo ekintu kyonna ekitategeerekeka oba bw'oba ng'oyagala okumanya ebisingawo.

2. Mugaso ki oguli mu kunoonyereza kuno?

Omugaso gw'okunonoyereza kwe kugezaako okwekaliriza embeera z'okufa ku bulamu (gamba ng'emirimu egikolebwa, ebika by'emmere ebiriibwa, okunywa omwenge, n'okunywa sigala/taaba) olw'okuziyiza obulwadde bw'entunnunsi/puleesa eyawaggulu mu bitundu by'omu byalo mu Uganda. Okunoonyereza kuno kitundu ku bisaanyizo by'okufuna ddiguli eya PhD mu Bujjanjabi (Nursing).

3. Lwaki nsabiddwa okwetabamu?

Osabibwa okwetaba mu kunoonyereza kuno kubanga olina ebisaanyizo by'okwetaba mu kunoonyereza kuno. Mu byo mulimu okubeera ng'oli muntu mukulu asussa emyaka 18 ate ng'obeera Kasengejje oba Mende mu Distrikiti y'e Wakiso.

Nkusaba okkirize okwetaba mu kunoonyereza kuno era okukkiriza kuno kukulu nnyo kubanga kukukuuma ggwe ng'omwetabi. Osabibwa okwetaba mu kukubaganya ebirowoozo okw'omu bibinja okuluubirira okwekenneenya abantu bye bayitamu mu kutangira obulwadde bw'entunnunsi mu bitundu by'omu byalo mu Uganda.

Abeetabi nga 50 bajja kulondebwa okwetaba mu kunoonyereza kuno nga bava mu kitundu ky'e Kasengejje ne Mmende. Ebibinja eby'okukubaganyirizaamu ebirowoozo ebiri wakati w'ebibiri n'omusanvu bye bijja okukolebwako mu buli kitundu era nga mu buli kibinja mulimu abeetabi nga munaana (8).

4. Nkakibwa okwetabamu?

Nedda, kiri gy'oli okusalawo okwetabamu oba obuteetabaamu.

Omunoonyereza ajja kukunnyonnyola okunoonyereza kuno kye kuliko era ayiteeyite mu lupapula oluliko obubaka bw'okunoonyereza. Bw'onokkiriza okwetabamu, omunoonyereza ajja kukusaba okuteeka omukono gwo ku foomu y'okukkiriza. Oli wa ddembe okuvaamu wonna w'oyagalira ne bw'oba nga towadde nsonga. Kino tekijja kukosa nkolagana yo na munoonyereza.

5. Kiki ekinantuukako nga neetabyemu?

Ojja kuweebwa olupapula oluliko obubaka bw'omwetabi oba omunoonyereza ajja kulukusomera. Ojja kuweebwa ekiseera obuuze ebibuuzo era oyanukulwe ku ebyo by'onooba obuuzizza. Oluvannyuma ojja kuweebwa waakiri essaawa bbiri osalewo oba ng'oyagala okwetaba mu kunoonyereza. Mu kiseera ekyo eky'essaawa ebbiri, omunoonyereza ajja kugenda mu maka g'omwetabi anaaba addako kikusobozese okukola okusalawo okutuufu. Essaawa ebbiri bwe zinaggwaako, omunoonyereza ajja kukomawo gy'oli. Bw'onoosalawo okwetaba mu kunoonyereza, ojja kusabibwa okussa omukono ku foomu y'okukkiriza oba bw'onooba ng'oyagala oteekeko ekinkumu okulaga nti osiimye okwetaba mu kunoonyereza kuno. Oluvannyuma, omunoonyereza ajja kukutegeeza ku kifo n'obudde ekibinja ky'okukubaganya ebirowoozo we kinaatuulira olw'okuba nti ojja kuba osuubirwa okubeera mu kitundu kye kimu mu kibinja ky'abantu abali wakati wa 6-8. Ekibinja ky'okukubaganyirizaamu ebirowoozo kijja kutuula obutasussa ssaawa emu.

Ebibuuzo ebinaakubuuzibwa biyinza okukwetaagisa okuwa okunnyonnyola okugenda ewala mu kiseera ky'okukubaganya ebirowoozo mu kibinja. Ekyo bw'onooba ng'okikola, akuuma akakwata amaloboozi kajja kukozesebwa okukwata obubaka obwo mu kiseera ky'okukubaganya ebirowoozo mu kibinja.

6. Ensaasaanya n'okusasulwa?

Tewali kusasulwa olw'okwetaba mu kunoonyereza kuno. Okwetaba mu kunoonyereza kuno kwa kyeyagalire. Wabula, ojja kuddizibwa ssente z'entambula Shs 10,000. Obumpwakimpwaki n'ekyokunywa bijja kukuweebwa mu kiseera ky'okukubaganya ebirowoozo ebirowoozo mu kibinja kubanga okukubaganya ebirowoozo okwo kujja kukolerwa mu kifo kimu ekitali mu maka go.

7. Bibi ki na bulabe ki obuyinza okuva mu kwetabamu?

Waliwo obulabe butono obuyinza okuva mu kubuuzibwa ebibuuzo. Okubuuza ebibuuzo ebya kinnoomu n'okukubaganya ebirowoozo okw'omu kibinja kuyinza okukuleeta okusumbuyibwa mu birowoozo era kino bwe kinaabaawo, omusomesa (omulyoyi) ajja kubaawo bulindaala okuyambako abanoonyereza okwogerako n'omwetabi ate era bwe kinaaba kyetaagisa, omwetabi ajja kusindikibwa mu kifo ekirala.

8. Miganyulo ki egiyinza okuva mu kwetabamu?

Tetusobola kusuubiza nti okunoonyereza kuno kunaakuyamba butereevu. Ojja kusooka kusunsulibwa era ng'omutendera guno gujja kubaamu okupima enkuba y'omusaayi gwo, obuzito, n'obuwanvu. Mu ngeri y'emu, obuwanvu bwo bujja kugabizibwa mu buzito (BMI) era ojja kutegeezebwa ebinaavaamu. Omuganyulo ogusinga okuba ogw'amanyi guli nti okunoonyereza kuno kujja kutegeeza abantu b'omu bintu ebyenjawulo wamu n'abateeka amateeka ku ebyo ebirina okukolebwa okuziyiza obulwadde bw'entunnunsi mu bantu b'omu byalo.

9. Watya nga waliwo obuzibu?

Bwe wabaawo ensonga yonna, omusomesa (omulyoyi) akola n'Ekitongole kya Uganda Heart Institute ajja kubaawo bulindaala okukuyambako.

Bw'oba ng'olina ekizibu oba ebibuuzo ku kunoonyereza kuno, osobola okutuukirira omunoonyereza ku email: M.Namuguzi@edu.Salford.ac.uk. Bw'oba n'ensonga yonna oba okwemulugunya, tukusaba otuukirire Ssentebe w'Akakiiko Akakola ku Mpisa z'Okunoonyereza (Salford Health and Society Ethics Committee), Prof Andrew Clark a.clark@salford.ac.uk

10. Okwetaba mu kunoonyereza kunaakuumibwa nga kwa kyama?

Obubaka bwonna bujja kuba bwa kyama. Ebibuuzo bijja kuteekebwako ennamba ez'ekyama bireme kutegeerekeka nnyini byo. Mu ngeri y'emu tujja kukuuma ebikukwatako nga bya kyama nga tutereka ebiwandiiko byonna ku mpapula nga biri mu kabada ekuumibwa nga nzigale era omunoonyereza yekka y'ajja okuba n'ebisumuluzo. Obubaka bwe bunaamala okuyingizibwa mu kompyuta, obubaka bujja kukuumibwa ekisumuluzo ky'ekigambo ekyekyama. Mu ngeri y'emu, foomu z'okukkiriza zijja kuterekebwa zokka okuva ku bibuuzo nga tukozesa kabada n'ebisumuluzo ebyenjawulo. Obubaka bwonna bujja kukuumibwa nga bwa kyama era bukozesebwa mu kunoonyereza okulala ng'obwetaavu buzze. Ebinaakuŋŋaanyizibwa bijja kuterekebwa okumala waakiri emyaka esatu, ng'okutikkira kuwedde okusobozesa okwekaliriza obubaka obwaggyibwa mu bitundu ebirala, bwe kinaaba nga kyetaagisa oba okusingawo mu kunoonyereza okusukka ku kuno.

11. Kiki ekinaabaawo singa seeyongerayo na kunoonyereza?

Oli wa ddembe okuva mu kunoonyereza wonna w'oyagalira. Enkolagana eriwo wakati w'omunoonyereza n'omwetabi ejja kukuumibwa mu kiseera kyonna eky'okukuŋŋaanya obubaka mu kunoonyereza kuno. Mu ngeri y'emu, bw'onoosalawo okuva mu kunoonyereza, ojja kusabibwa okukkiriza omunoonyereza okukozesa obubaka bwo okutuusa mu kiseera w'onooviira mu kunoonyereza era obubaka bwonna obukukwatako bujja kusaanyizibwawo.

12. Kiki ekinaakolebwa ku binaava mu kunoonyreza?

Ebinaazuulibwa mu kunoonyereza kuno bijja kukozesebwa okutegeeza Ministule ya Uganda ey'Ebyobulamu ku nsonga z'okutangira obulwadde bw'entunnunsi mu bitundu by'omu byalo. Okunoonyereza kuno era kujja kugabanibwako etterekero ly'ebiwandiiko erya Yunivaasite ya Salford ne EBSCO. Obubaka obulala bujja kugabanibwa mu Kitongole ky'Ebyobulamu mu Uganda abakola ku nteekera za gavumenti babifuneko ate era bigabanibweko ne mu ssemasomo ku ddaala ly'ensi yonna. Ebinaava mu kunoonyereza era bijja kufulumizibwa mu *journal* ku mutendera gw'ensi yonna Ebinaava mu kwekaliriza bijja kukozesebwa okukolawo omutetenkanyirizo gw'obulwadde bw'entunnunsi.

13. Ani ateekateeka oba asasulira okunoonyereza kuno?

Okunoonyereza kuno kusasulirwa Yunivaasite ya Salford nga bakolera wamu ne Aga Khan University

14. Obubaka obulala n'endagiriro:

Namuguzi Mary

M.Namuguzi@edu.salford.ac.uk

Omunoonyereza omukulu.

9.17 Appendix Q: Consent Form for the Focus Group Discussion

Title of study: Exploring health-promoting lifestyle behaviours for prevention of hypertension in rural communities of Uganda

The aim of the focus group discussion will be to the explore experiences individuals have about the prevention of hypertension in rural communities of Uganda.

Name of Researcher: X

Please complete and sign this form **after** you have read it or it has been read for you and you understood the study information sheet. Read the following statements or they will be read, and select 'Yes' or 'No' in the box on the right-hand side.

1. I confirm that I have read and understand the study information Sheet _______________ version ***[version 1 of X]***, dated ***[2nd December 2019]***, for the above study. I have had the opportunity to consider the information and to ask questions which have been answered satisfactorily. — Yes/No

2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, and without my rights being affected. — Yes/No

3. If I do decide to withdraw I understand that the information I have given, up to the point of withdrawal, will be used in the research. — Yes/No

4. I agree to participate in the focus group discussions — Yes/No

5. I understand that my personal details will be kept confidential and will not be revealed to people outside the research team. *However, I am aware that if I reveal* anything related to criminal activity and/or something that is harmful to self or other, the researcher will have to share that information with the appropriate authorities**.** — Yes/No

6. I understand that my anonymised data will be used in researcher's thesis, academic publications, conferences, and further research. — Yes/No

7. I agree to take part in the study: Yes/No

8. I agree to the use of audio/video-taping, with possible use of verbatim quotation or use of photographs. Yes/No

9. I consent to keep the discussion information confidential and will not discuss anything with other people after this. Yes/No

Name of participant	Date	Signature
Name of person taking consent	Date	Signature

9.18 Appendix R: Foomu y'Okukkiriza ey'okukubaganya ebirowoozo mu bibinja

Omutwe gw'okunoonyereza: Okwekaliriza embeera z'okutumbula ebyobulamu mu kaweefube w'okutangira entunnunsi mu bitundu by'omu byalo mu Uganda

Ekigendererwa ky'okukubaganya ebirowoozo mu bibinja kwekwo okutunuulira abantu kinnoomu bye bayiseemu ku kutangira obulwadde bw'entunnunsi mu bitundu by'omu byalo mu Uganda.

Amannya g'Omunoonyereza: Namuguzi Mary

Tukusaba ojjuze era oteeke omukono ku foomu eno **oluvannyuma** lw'okugisoma oba okugikusomera era ng'otegedde bulungi ebiri ku lupapula oluliko obubaka. Soma ebigambo bino wammanga oba babikusomere era olondeko 'Yee' oba 'Nedda' mu kabookisi akali ku mukono ogwa ddyo.

3. Nkakasa nti nsomye era ne ntegeera bulungi obubaka obuli ku lupapula lw'obubaka olufulumye ***[Olufulumye olusoka kulusoma luno]***, nga ***26th February 2020***, ebyokunoonyereza okwo waggulu. Nfunye omukisa okutunula mu bubaka obwo era n'okubuuza ebibuuzo era n'ebibuuzo byanukuddwa ne mmatira. Yee/Nedda

4. Nkitegeera nti okwetabamu kwange kwa kyeyagalire era nti ndi wa ddembe okukuvaamu ekiseera kyonna nga siwadde nsonga yonna era nga n'eddembe lyange terikosebwa Yee/Nedda

5. Bwe nnaasalawo okuvaamu, nkitegeera nti obubaka bwe mpaddeyo okutuuka ku kiseera we nviiridde mu kunoonyereza, bujja kukozesebwa mu kunoonyereza. Yee/Nedda

6. Nkiriza okwetaba mu kukubaganya ebirowoozo mu kibinja. Yee/Nedda
7. Nkitegeera nti ebinkwatako ng'omuntu bijja kukuumibwa nga byakyama era tebijja kuweebwako bantu batali ku abo abakola ku kunoonyereza kuno. *Wabula, nkimanyi nti singa wabaawo ekintu kyonna kye njasanguza* ekyekwanya Yes/No

n’okuzza emisango/n’ekintu ekikosa nze oba omuntu omulala, omunoonyereza alina okugabana obubaka obwo n’aboobuyinza abakwatibwako ensonga eyo**.**

10. Nkimanyia obubaka bwange obuggyiddwako amannya bujja kukozesebwa mu kitabo ky’okunoonyereza eky’omunoonyereza (ekiwakano), mu ssemasomo ne mu kunoonyereza okusukka ku kuno. Yee/Nedda

11. Nzikiriza okwetaba mu kunoonyereza: Yee/Nedda

12. Nzikiriza okukwata amaloboozi/vidiyo omwo nga mulimu n’obusobozi bw'okukozesa ebigambo byange byennyini oba okukozesa ebifaananyi byange. Yee/Nedda

13. Nzikiriza okukuuma ebinaayogerwako nga byakyama era sijja kwogera ku kintu kyonna na bantu balala nga tumaze okukubaganya ebirowoozo. Yee/Nedda

______________________ ________________ ______________________

Amannya g’omwetabi Ennaku z’omwezi Omukono

______________________ ________________ ______________________

Amannya g’omuntu asaba okukkiriza Ennaku z’omwezi Omukono

9.19 Appendix S: Memo during the focus group discussion

M: Mbadde mbuza maama nti obade oyegera kusonga ya ba VHT nengeri ki jebayiza okutuyamba mu kawefube wo kulwanisa ekilwadde kya pressure, obadde okigamba ko ki, kyetwagala okumanya.

M: I was asking that you talked about the issue of VHTs and how they can help in preventing hypertension, what do you say about?

P1: Ekya VHT mbadde nkyogerako bweti, nti government okuva mu minisitule ye byobulamu neleeta ba VHT wansi bakola bulungi ku dwadde ya malaria nakiino ndaba nsonga nenne nnyoo kuba abasiinga wansi balina obulwadde bunno naye tebakimanyi singa government ebadde esoobola okwongela amanyi mu ba VHT baano nebabela nga basoboola okuka ddala wansi nga basomesa, nga bogera kubulwadde buno bujja butya, obutangira otya katti nebasobola okumanya nti obulwadde babuyina olusi nebagenda nebekebeza, oba enkola ya mirundi ebiri jjembadde nyogelako oba newabawo abantu ku ground bebatendeeka kko oba nga omu LC omuntu 1 oba 2 nebabatendeeka bbo nebaba nga basomesa kwobo obulwadde, katti zezo ensoga ebbiri zempadde njogerako.

P1: About VHTs, I would say as government through Ministry of Health brought VHTs to the village level and they work hard especially in fighting malaria, they should be involved in this too because many people in villages have hypertension but they don’t know, if government could boost these VHTs and move around villages teaching what causes hypertension, how can it be prevented and let people know that they have it and go for medical check up, I think it would help, Or they can train like 1 or 2 people per village to go around the village teaching people about hypertension. Those are the two ways I was talking about.

M: Tweyanziza nnyoo

M: Thank you so much.

Key

M- moderator

P- Participant

9.20 Appendix T: Field Notes

Transcript	Reflections
FDG2: P5 My reason is one, the reason women are the most affected by that disease. Sometimes it is about the life situation. That [*difficult*] situation becomes a torture to women; you find she is the one responsible as a mother and responsible as a father at the same time. The poor lady sometimes you find her working as a casual laborer. She has spent the whole day there [at the site/field] while at the same time thinking about the children she left at home. The children's father is sometimes out there having fun, he is enjoying his alcohol; and when he returns home sometimes he even beats [the woman/wife]. That is why most women live on tension like that. That is my personal view. **FDG2: P5** Casual labour …. [laughs]; like digging in people's fields, moving around asking 'my neighbor, do you have job [for me]? My children are in a difficult situation'. The person may say 'I want someone who can dig for me in my plantation' for example. Doing laundry for people in the communities, things of the kind; fetching water for people in the village, and the like. Most women live in that kind of situation.	This implies women go through stressful events to provide for the children's needs in case the men are no able
FGD 4: P3 …… I have someone whom I owe money, so to avoid getting hypertension, I have to go there and I tell him, sir, my lord, am asking you to be patient with me for sometime, I will come there on Tuesday. By doing that one may not put you on too much pressure like hiding from someone you owe money or like me P3, P4 builds a good house, I might be on too much pressure, I say he has bought that kind of roofing, I even fail to do something at home, the pressure am on is to buy a roofing type like for P4, you understand? I spend my thoughts on that, this world you are seeing, long time ago there was no hypertension like these days, I think am older than you all here but when I was still young, I didn't hear of anyone suffering from hypertension but now days, the world changed, we have to work hard, we think too much, we have debts, we borrow from the banks and you be on tension/pressure, who am I not to get hypertension as Participant #3? **All participants:** *Laugh!*	Thinking too much about how one will survive triggers stress which individuals perceive to predispose to hypertension

Transcript	Reflections
FGD 4: P3 ….. My view goes to the government or anyone else it concerns. HIV/AIDS came and they got a solution for it, TB they got a solution for it, and other diseases too. Now this disease here, the government should bring a vaccine and they simply vaccinate us, injection, *[laughter from other participants]* there is nothing that will be greater than that. I am telling you the truth, there is nothing greater. Simply vaccination. Just like the way they have done, because diseases are many, the government has tried, you the health workers too have tried, but there is nothing that will be done as long as the foods manufactured by the companies from which the government gets taxes and cannot ban them…..	When the participants laughed, to me it meant that they did not believe that a vaccine for prevention of hypertension can be manufactured.
FGD 4: P3 Let me end with this: that gentleman Madam the herbal medicine he is talking about I personally may not be able to afford its cost. Herbal medicine innovators make money – they innovate those medicines. But I wish to request the government if it can afford to support them such that their medicine costs reduce and become affordable for me as participant #3 to look after my life but what that gentleman said is right, herbal medicine is there, it works! But Madam, if it wasn't for this and that, we would call them on phone and ask them how much it costs; you would hear tens of thousands. Now for me I can repair a TV set for UGX 20,000, do you hear that? As my labour cost. So when I take off the cost for charcoal and what I am going to leave on the stool [meant for other needs at home]….; It will be finished! *[some laughter among other participants]* So I request the government to help us on that herbal medicine. If it can handle them well it will get best out of them, and the world will be well. But the medicine is expensive, it is expensive, it is there but very expensive…..	The laughter to the participants meant that that most likely they all earn little money that is not sufficient to buy what the family requires. Participants perceive herbal medicine to be effective in preventing hypertension, but it is rather costly and believe that if the government supports the herbalists to process the herbs, it may be affordable for them.
FGD 4: P1 ….. One may like cooking oil while the other one may not. The man likes cooking oil, the woman does not. It is very rare to find a woman with whom you have the same likes and dislikes. You see even when you naturally enjoy meat and she enjoys groundnuts it may annoy her, and she says 'yet me I enjoy meat but you stopped buying it, you only buy groundnuts'. That also may annoy her. But when you tell her prepare for me only boiled food (not fried), she may say 'how come you pretend to know it all? Prepare it yourself". *[laughters]* Actually, you may also fail; you may fail. When she cooks it poorly and it doesn't taste good, you then become the one to cook it. And if you cook it today and eat it, she will say 'so it means I came to marry two men! I cook and you also cook?'. From	The laughter from the participants indicates that it is difficult to implement something new in the home if others have not studies about the same.

Transcript	Reflections
there you may get some disagreements. May be if you are single, you can live the way you want	
FGD 4: P4 Those things that limit us from implementing them, it needs when a health education talk has come to the village; you bring the family, and you know that the disease we are going to study about comes from this. As our entire household we all resolve on what to do after an education talk has come home and everyone is aware that if we use this we could get a certain disease. But you will not take rules to your home that cooking oil… actually they will say 'where have you got the rules?'. Now if that education talk comes to us, we could manage to get our wives and then older children that 'have you heard where the disease is going to come from? What can we do? Let's reduce the quantity of cooking oil from UGX 500 to UGX 200 worth; just to make the food palatable; after the woman and the older children have understood that talk. There we shall manage to fight that thing. But if you go home and want just do it on your own, they will say 'after eating fried food there now you want to feed us with this? You are bringing your poor earning to us! *[laughters]* That is my opinion. *[laughters continued*	When the participants laughed to me this meant that when one member of the family learns about the preventive measures for hypertension and tries to implement them, it becomes challenging and to avoid that it requires a family centered based strategy which members later mentioned.
FGD 4: P8 Let me give my opinion Madam. Those physical exercises would be good Madam. But like the way you see our lifestyle here in the village; a person wakes up early and digs, in the evening he must go back and dig again. Now after doing that, again he starts on exercises! *[sustained laughters….]* I really see it challenging Madam *[as laughters continue... one participant adds:* such a person would be already tired*]*. Those are my views Madam.	The participants reactions meant that what some participants do is enough exercise to help them prevent hypertension

9.21 Appendix U: Administrative Clearance from Wakiso District

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REPUBLIC OF UGANDA

WAKISO DISTRICT LOCAL GOVERNMENT

Office of the District Health Officer
P.O. Box 7218, Kampala Uganda,
Email: wakisodlc@yahoo.co.uk /

Ref: Med 218/09/2019

26th September, 2019

To Mary Namuguzi
University of Salford, Manchester.

Re: Clearance for a Research Study in Kasengejje and Mende Communities:

Reference is made to your letter dated 24th September, 2019 in which you requested to be given clearance to conduct your PhD study: **Exploring individual health promoting lifestyle behaviours for prevention of hypertension in rural communities of Uganda.**
Permission has been granted to you to conduct your research in the above communities.
However, you will work with in- charges of Wakiso Health Centre IV and Mende Health Centre III, who will attach you to the respective villages to ease your study.

Thank you.

Nabuganda Betty
FOR: DISTRICT HEALTH OFFICER.

c.c. Town Clerk, Wakiso Town Council
c.c. SAS, Mende Sub county.
c.c In charge, Wakiso Health Centre IV.
c.c In charge, Mende Health Centre III.

THE AIDS SUPPORT ORGANISATION
28 MAY 2021
Approved, Valid Until:
RESEARCH ETHICS COMMITTEE

9.22 Appendix V: Ethics Approval from the University of Salford

versity of
alford
NCHESTER

19 February 2020

Dear Mary,

RE: ETHICS APPLICATION–HSR1920-034 – Exploring individual health promoting lifestyle behaviours for prevention of hypertension in rural communities of Uganda.

Based on the information that you have provided, I am pleased to inform you that application HSR1920-034 has been approved.

If there are any changes to the project and/or its methodology, then please inform the Panel as soon as possible by contacting Health-ResearchEthics@salford.ac.uk

Yours sincerely,

Professor Andrew Clark

Chair of the Research Ethics Panel

9.23 Appendix W: Ethics Approval from TASO Research and Ethics Committee

THE AIDS SUPPORT ORGANISATION
TASO
LIVING POSITIVELY WITH HIV

The AIDS Support Organisation (TASO) Uganda Ltd.

TASO Headquarters
Mulago Hospital Complex
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Fax: +256 414 541 288
Email: mail@tasouganda.org
Website: www.tasouganda.org

TASO COLLEGE OF HEALTH SCIENCES (TACHS)
Kanyanya Off Gayaza-Road,
After Mpererwe
P.O. Box 10443, Kampala
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Fax: +256 414 566 704
Email: training@tasouganda.org

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TASO ENTEBBE
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Tel: 0414 320 030/0752 774 135
Email: entebbe@tasouganda.org

TASO GULU
Plot 4 Mathew Lukwiya Road
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TASO JINJA
Jinja Referral Hospital
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Fax: 0434 120382
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TASO MASAKA
Masaka Hospital
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TASO MASINDI
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TASO MBALE
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TASO MBARARA
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TASO MULAGO
Mulago Hospital
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Email: mulago@tasouganda.org

TASO RUKUNGIRI
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TASO SOROTI
Soroti Hospital
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TASO TORORO
Plot 30, Cox Road
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Tel: 0454 442 009/0752 774 140
Fax: 0454 445 334
Email: tororo@tasouganda.org

DISCRETE PROJECTS

GRANTS MANAGEMENT UNIT / GLOBAL FUND
House of Hope, Plot 10
Windor Loop
P.O. Box 10443, Kampala
Tel: 0414 259 555/ 0752 774 109
Email: mail@tasouganda.org

TASO-KARAMOJA PROJECT
Plot 10, Independence Avenue
P.O. Box 131, Moroto
Tel: 0752 744 792
Fax: 0454 445 334
Email: mail@tasouganda.org

TORORO LABORATORY HUB
P.O. Box 777, Tororo
Tel: 0454 442 009/ 0752 774 723
Fax: 0454 445 334
Email: hub@tasouganda.org

29th May, 2020

Our Ref: TASOREC/019/2020-UG-REC-009

Ms. Mary Namuguzi,
University of Salford, Manchester
M.Namuguzi@edu.salford.ack.uk

Dear Mary,

RE: RESEARCH APPROVAL **"EXPLORING INDIVIDUAL HEALTH PROMOTING LIFESTYLE BEHAVIOURS FOR PREVENTION OF HYPERTENSION IN RURAL COMMUNITIES OF UGANDA."**

Thank you for responding to the committee's request for further information.

On behalf of the committee, I am pleased to confirm that your correspondence bearing the revised documentation on **30th March 2020** with responses to initial review comments of **28th February 2020**, met the requirements for approval.

TASO REC, through its full meeting gave a favorable ethical opinion of the research, annual approval has been granted, effective **29th May 2020**, valid until **28th May 2021**.

Final list of documents reviewed and approved:

Document Type	Date	Version
1. The Study Protocol.	29/05/2020	2.0
2. Informed Consent Forms with Translations.	29/05/2020	2.0
3. Data Collection Tools with Translations.	19/02/2020	1.0
4. TASO REC Research Review Application and DOC of Interest.	21/02/2020	1.0
5. IRB approval, University of Salford, Manchester-HSR1920-034.	19/02/2020	
6. Clearance Letter, Office of the DHO, Wakiso District.	26/09/2019	

After ethical review:

Amendments: All proposed amendments to the study (including personnel, procedures, or documents) must be approved by the REC in advance before the study commences.

Adverse Events/Unanticipated Problems: It is your responsibility to inform the REC of any adverse consequences to participants that occur in the course of the study.

Site Monitoring Visits: shall be undertaken to verify that only approved procedures are being implemented, to ensure that the rights and welfare of participants are being protected.

Study Reports: It is a requirement by the REC that you submit timely progress reports.

Renewal of the study approval: This should be through submission of the Annual Report and a Continuing Review Application, at least 60 days prior to expiration date.

Protocol documents which contain the REC-stamp (if applicable), must be utilized during recruitment of participants, obtaining informed consent and data collection processes.

We recommend that you proceed with the registration and final clearance of your study by the Uganda National Council of Science and Technology (UNCST) before commencement.

THE AIDS SUPPORT ORGANISATION
29 MAY 2021
Approved, Valid Until:..........
RESEARCH ETHICS COMMITTEE

Yours sincerely,

Dr. Adrian Jjuuko,
Chairperson, TASO RESEARCH ETHICS COMMITTEE (REC)

CC: Executive Director, TASO (U) Limited
CC: Uganda National Council for Science & Technology (UNCST)

9.24 Appendix X: Administrative Clearance from DHO to the General Secretary Uganda National Council for Science and Technology

THE REPUBLIC OF UGANDA

WAKISO DISTRICT LOCAL GOVERNMENT

OFFICE OF THE DISTRICT HEALTH OFFICER
P.O. Box 7218, Kampala Uganda,
Email: wakisodlc@yahoo.co.uk / Website:www.wakiso.go.ug

TOGETHER WE WIN

15th June 2020

Executive Secretary,
Uganda National Council for Science and Technology (UNCST)

Dear Sir/Madam,

RE: ADMINISTRATIVE CLEARANCE FOR NAMUGUZI MARY TO COLLECT DATA IN KASENGEJJE AND MENDE COMMUNITIES

In reference to the above subject matter, l am writing to inform you that Namuguzi Mary will be allowed to collect data in Kasengejje and Mende Communities.

Namuguzi Mary is a PHD student at the University of Salford, Manchester. The topic for study is **"Exploring individual health promoting lifestyle behaviors for prevention of Hypertension in Rural Communities in Uganda**." The study will use a sequential explanatory mixed methods approach and will have two phases of data collection starting in July to December 2020. My hope is that this study will contribute to identifying effective interventions for prevention of hypertension in rural communities. Hence, that will be good information to inform practice.

However, l expect Mary to follow all the guidelines sent out by UNCST regarding prevention of COVID-19 to both the research team and the participants as stipulated in her protocol. Mary will also follow all the ethical issues to safeguard the rights of participants.
I anticipate that she will share a final report of her study findings.
Your assistance in this regard will be appreciated.

Yours sincerely

Kasumba

Sr. Sylivia Kasumba
FOR: DISTRICT HEALTH OFFICER

9.25 Appendix X: Ethics Approval from UNCST

Uganda National Council for Science and Technology

(Established by Act of Parliament of the Republic of Uganda)

Our Ref: HS617ES

Namuguzi Namuguzi

Agan Khan University, Uganda

Kampala

27 October 2020

Re: Research Approval: Exploring Individual Health-Promoting Lifestyle Behaviours for Prevention of Hypertension in Rural Communities of Uganda

I am pleased to inform you that on **27/10/2020**, the Uganda National Council for Science and Technology (UNCST) approved

the above referenced research project. The Approval of the research project is for the period of **27/10/2020** to **27/10/2021**.

Your research registration number with the UNCST is **HS617ES**. Please, cite this number in all your future correspondences

with UNCST in respect of the above research project. As the Principal Investigator of the research project, you are responsible for fulfilling the following requirements of approval:

1. Keeping all co-investigators informed of the status of the research.

2. Submitting all changes, amendments, and addenda to the research protocol or the consent form (where applicable) to the designated Research Ethics Committee (REC) or Lead Agency for re-review and approval **prior** to the activation of the changes. UNCST must be notified of the approved changes within five working days.

3. For clinical trials, all serious adverse events must be reported promptly to the designated local REC for review with copies to the National Drug Authority and a notification to the UNCST.

4. Unanticipated problems involving risks to research participants or other must be reported promptly to the UNCST. New information that becomes available which could change the risk/benefit ratio must be submitted promptly for UNCST notification after review by the REC.

5. Only approved study procedures are to be implemented. The UNCST may conduct impromptu audits of all study records.

6. An annual progress report and approval letter of continuation from the REC must be submitted electronically to UNCST. Failure to do so may result in termination of the research project.

Please note that this approval includes all study related tools submitted as part of the application as shown below:

No. Document Title Language Version Number Version Date

Project Proposal English 2

1 Approval Letter English 2 2020-05-29

2 Administrative Clearance English 2 2020-05-29

2 Dr. Karen Higginbotham - RS6 Form English 1 21 July 2020

3 Formal Response Letter for the comments English 1 21 July 2020

4 Dr. Joy Probyn - RS 6 Form English 1 21 July 2020

5 Mary Namuguzi - RS 6 Form English 1 20 July 2020

6 Dr. Ahmed Sarki. RS6 Form English 1 20 July 2020

7 Dr. Joy - CV English 1 21 July 2020

8 Dr. Karen - CV English 1 21 July 2020

9 Dr. Ahmed - CV English 1 21 July 2020

10 Mary - CV English 1 21 July 2020

11 Dr. Joy - Recommendation Letter English 1 21 July 2020

12 Dr. Karen - Recommendation Letter English 1 21 July 2020

13 Dr. Ahmed - Recommendation Letter English 1 21 July 2020

Yours Sincerely

Hellen Opolot

For: Executive Secretary

UGANDA NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

9.26 Appendix Z: Budget

Budget for PhD Research

Student's Name: Mary Namuguzi

School: University of Salford

Year of Study: 2nd Year

Year of Data Collection: 2020

Title: Exploring Individual Health Promoting Lifestyle Behaviours for Prevention of Hypertension in Rural Communities of Uganda

Item Name	Nos. Required	Unit Cost (Ug. Shs.)	Total Amount (Ug. Shs.)	Amount in US Dollars
Research Assistants (for the survey)	2 research assistants for a period of 1 month	115,833.33 per day	6,950,000	1868.21
Transcriber	1	1,000,000	1,000,000	268.81
Biostatistian	1	1,200,000	1,200,000	322.57
Power Bank for the phones	3	100,000	300,000	80.62
Stadiometer	3	150,000	450,000	120.96
Facilatation for VHTs and Local leaders	12	100,000	1,000,000	268.81
Transport to Study Sites by the researcher for 1 month			1,270,000	341.37
Telephone calls	4 people	25,000	100,000	26.88
Transport refund for Research assistants		20,000	120,000	32.25
Ethics application fees for UNCST	1	190,000	190,000	51.06
Tranport refund for Participants during the FDGs	50	10,000	500,000	134.36
Refreshments during the FDGs	60	5,000	300,000	80.62
Transport refund for the research assistants after training	3 people	50,000	150,000	40.32
Refreshments for research assistants during the training	4 people		80,000	21.504
Masks			200,000	53.76

Gloves			100,000	26.94
Sanitizer			200,000	53.76
Temperature Guns	3	257,004.02	771,012	207.23
Total			**14,881,012**	**4000.034**

9.27 Appendix ZA: Gantt Chart

	2019				2020				2021				2022	
Research Activity	Jan-Mar	Apr-June	July-Sept	Oct-Dec	Jan-Mar	Apr - June	July - Sept	Oct-Dec	Jan-Mar	Apr - June	July - Sept	Oct-Dec	Jan - Mar	Apr-June
Proposal development														
Literature review														
IA (Internal Assessment)														
Ethical approval UoS														
Ethical approval in Uganda														
Systematic Review														
Data collection and analysis Phase one (Survey														
IE (Internal Evaluation)														
Data collection and analysis Phase two (Focus Group discussions)														
Interpreting and integrating results														
Final write up and submission														
Corrections and Defense														

9.28 Appendix ZB: List of Training Undertaken

Date	Training undertaken	Course description	Appraisal of the learning outcomes	Relevance to the progression of the study.
29th October 2018	Literature review	- Literature should identify gaps in research - Literature identifies similarities and differences in literature - Informs policy and practice	Important in identifying the implication of literate to the current study.	This helped to identify relevant literature and I was able to identify similarities and differences between the different studies I read.
30th October 2018	Referencing and information - Ethics for research	The PGR environment - Originality: the contribution that tests or examines a hypothesis - Viva voice (live voice) to externally assess quality through: • Spoken defence • A public document - Types of plagiarism • Academic collusion • Copying and pasting • Word switching or blurring • Recycling ideas • Metaphors reused • Misrepresentation • Multiple submissions • Selective omission • Self-plagiarism • No or poor referencing	Based on this knowledge I was able to develop the endnote library for this study based on the primary sources of information found in the literature to avoid errors in referencing secondary sources.	This guided me in identifying primary sources of information relevant to this study and also being able to reference the all-academic materials with their rightful owners

1st November 2018	The ABC of the PhD journey	- The PhD journey is not straight. It has a lot of challenges that I as PhD student has to learn to overcome.	Although not directly related to the study, it gave me an insight into what I should expect during the PhD journey.	This was an eye-opener for the PhD journey for me to remain focused.
1st November 2018	Research Methods: Qualitative research methods	Different qualitative research methods use different data collection instruments and are used to collect different types of data sets	The training was important because it helped me to understand the different types of mixed methods approaches and their application.	Identification of an appropriate mixed method approach based on evidence to support its application to the study.
1st November 2018	Celebrating PGR research day	Students presented their research work and I learnt that they had SMART objectives. Their research topics seemed achievable, the literature review was well described and students were confident.	This was a great opportunity to learn how other students present their work and how feasible it is to conduct PhD research when other people share their experiences	Helped me to gain momentum and encouragement. Some of the fears I had about a PhD relied on after the research day.
5th November 2018	Critical writing and thinking	Every Academic paper must have a beginning, middle and end (introduction, body and conclusion)	Critical writing and review were important because it helps in shaping how one writes and what to include in every section.	This training has helped me to critically appraise the literature and write critically.
6th November 2018	Guided literature searching or reviewing	Literature must be searched systemically and when writing the chapter for literature there will be a need to describe the section for the literature review	Gained a clear understanding of how to search and save literature from different databases.	This helped me in searching for literature in a systematic manner

		I have learnt how to search for literature using the PICO approach and key search terms. I have also learnt how to save the literature search		
20th December 2018	Choosing Mixed methods	**Mixed methods is about:** • Collecting and analysing quantitative and qualitative data • Using rigorous qualitative and quantitative methods • Combing or mixing quantitative and qualitative data using a specific type of mixed methods design • Framing the mixed methods design within a broader framework **Important things to consider when using mixed methods research:** • One's philosophy and comfort level with quantitative and qualitative approaches. • Resources, including time, skills and funding. • List the goals/aims and determine whether these portions of the study will require quantitative or qualitative methods. • What type of data will be collected under each approach?	This training provided a detailed understanding of the differences between mixed methods designs and the basis for choosing an appropriate design for the study.	Guided the methods chapter to identify an appropriate mixed method for the study and also develop a plan of how it would be conducted.
24th January 2019	When to use mixed methods	For a researcher to determine whether using a mixed methods approach is appropriate, there is a need to understand the strengths and weaknesses of a mixed methods approach.	This training gave me an insight into the different types of mixed methods and their research application.	Evidence to support the selected mixed methods was guided by this training.

24th January 2019	Analysing mixed methods	• The strategy for data analysis and the timing of the analysis may be driven by the overall rationale or purpose for using mixed methods such as triangulation, complementarity, development, initiation, and expansion. • Data is normally analysed sequentially or concurrently • After analysis, data has to be integrated to draw conclusions	The training clearly described the process of analysis undertaken for different mixed methods studies.	This guided me to develop a plan of how the qualitative and quantitative data will be integrated after the analysis of data.
29th January 2019	Systematic Review and meta-analysis training	• Before conducting a systematic review, one must set a clear research question, use a systematic and explicit method to identify, select and critically appraise relevant primary research • I also learnt that a systematic review is done step by step	The training was very helpful in providing a clear understanding of how to conduct a systematic review.	Guided the development of the systematic protocol and thereafter the systematic review search process for the study.

13th February 2019	Training on behavioural change	• Every research study requires a behavioural change to a great extent • For one to change behaviour, it is influenced by his or her perception and willingness to change	Although not directly related to the study, it gave me an insight into how behaviour changes following the research findings.	Appreciated to be applicable to inform practice based on research findings from the study.
26th March 2019	Characteristics of strong Mixed methods research	Mixed methods research should: • Demonstrate the need for mixed methods to answer the research questions and should have the qualitative and quantitative components • Should have distinctly qualitative and quantitative data • Make identifiable inferences • Integrate results of the two (qualitative and quantitative)	After the training, I was able to understand and identify the differences in the different types of mixed methods.	This guided the methods chapter to identify an appropriate mixed method to guide the study and be able to answer the research questions.
26th March 2019	The sample size for qualitative studies	• Saturation must be reached • For ethnographic studies, the sample size is 30-50 participants • Grounded theory – 30-50 participants (Morse, 1994) and Creswell (1998) recommends 20-30 participants • Phenomenology – 5-25 participants	This helped to have a clear understanding of the samples to expect in qualitative research studies.	This guided the methods chapter to predict the expected sample size for the qualitative study.

		• Case studies – 10-35 participants		
5th September 2019	Writing for Publication training	Writing for publication has five major sections: • Decide on what you want to write • Choose your journal • Consider novelty or originality • Consider common reasons for failure • Begin to write	This training helped to identify key parts to put in a manuscript and how to avoid failure or rejection	This was an eye-opener for me in case I want to publish my work in future.
15th December 2019	Research Philosophy	There are different philosophical approaches employed by different researchers and they include: • Ontology • Epistemology • Constructivism • Naturalism and positivism • Pragmatism	Helped to understand the different world views and how they inform research studies	This guided me in identifying the relevant philosophical underpinnings that guided my work
20th December 2019	Epicollect5	• This was developed by researchers at Imperial College London and funded by Wellcome Trust. • It is a mobile data-gathering tool that can be very helpful during the process of data collection and ensure quality since it saves the time and place where the data was gathered from. • Epicollect5 is free to all users	I learnt how to use Epicollect 4 as a tool for data collection. I can now use it to develop a questionnaire, edit and even administer it.	Epicollect helped me to collect data in real-time and reduce the issues to do with missing data and also having to go back to the participants several times to pick the filled questionnaires.
4th January 2020	Ethics training	Application of the principles of ethics in research.	Well appreciated the lecture which a detailed understanding of research ethics for humans involved in different research studies.	Application of the principles of ethics in research especially human protection

13th February 2020	Ontology and Epistemology	Ontology is concerned with what is true and real and the nature of reality Epistemology is concerned with the nature of knowledge and different methods of gaining it	Provided an understanding of the application of epistemology in research.	Explanation of the ontology and epistemology related to this study
19th March 2020	Sampling techniques Steps in calculating sample size	When constructing a sample, the following are important: i. Consistency ii. Diversity iii. Transparency Probability sampling includes i. Random sampling ii. Systematic sampling iii. Stratified sampling Non-probability sampling includes i. Convenience sampling ii. Snowball sampling iii. Quota sampling Steps for sample size calculation include: I. Decide on the key indicator II. Estimate the prevalence of the key indicator III. Decide on the precision required IV. Calculate the initial sample size using the formula V. Adjust for individual non-response	Gained a deeper understanding of how different sampling techniques apply and how they are applied.	Identification of an appropriate sampling technique and being able to use it rigorously in the field during the time of data collection.

		VI. Adjust for eligible members VII. Adjust for household non-response rate VIII. Final sample size		
6th April 2020	Search Engines and databases	It is important to understand how to navigate the different search engines	This training helped to learn where to find the different data sources and how to search them to get the appropriate literature required.	Identification of appropriate search engines and navigation to identify appropriate literature to inform the study.
23rd April 2020	Steps for Conducting a Systematic Review	There are 8 steps 1. Identify a research question 2. Define the inclusion and exclusion criteria 3. Run the search for the selected databases 4. Export results to endnote 5. Extract data using a review matrix 6. Evaluate the risk of bias in the included studies 7. Draw a prism flow diagram: Assess the quality of findings including detailed methodology (such as strategies used and selection criteria) 8. Identify a journal to publish the systematic review	This training was appropriate because it helped to develop the research question for the systematic review and identify the data sources and relevant literature. I was also able to use the same knowledge to export all the relevant literature to the endnote and begin extracting data from it.	Conduct a systematic review search and refine the search to identify literature relevant to this study.
15th May 2020	Conducting a systematic search	It is important to include mesh terms and free text when conducting a systematic search so that we do not miss out on any of the articles	A systematic review is helpful because it guides the literature review search process not to leave out any relevant literature on the required field of study.	Use of mesh terms to search for literature which guided the way I searched for literature

10th July 2020	Action Research Workshop (by Prof. Loise Arkers)	Action research is done after identifying a gap, then one works with the healthcare worker to bridge the gap. Regular reports are required and also evaluation of interventions is done regularly	This was informative and gave a clear understanding of how Action research is conducted.	This training gave insight into the importance of reporting the report findings at each step of the research process.
3rd September 2020	IE Training by Prof. O. Paula	• She explained to us what to expect in IE and emphasized that IE determines whether the study will culminate into a PhD or not. • She gave us sample questions concerning what to expect during IE and what the report should look like.	This is an insight into what to expect during IE and work towards achieving what is expected.	this has guided me on how to write the report in preparation for the IE.
14th September 2020	PhD seminar series specifically discussing measuring research impact and publication journals	The ranking of journals is based on: • Impact factor • Immediacy index • Citation analysis	Knowledge was gained on identifying relevant journals for research.	This will be applied during the time of publication of the research findings
17th November 2020	Training about Stata	Stata can be used for regression analysis and inferential statistics	This training provided foundation knowledge about the use of Stata	This training was very important as it helped me in conducting descriptive and inferential analysis for this study
4th December 2020	Training about Stata specifically on regression analysis	Regression analysis is important in predicting variables that might be a cause of something or identifying relationships between different variables with the main outcome variable	Developed a deeper understanding of the application of different commands in Stata training	Data analysis for this study has been guided by knowledge acquired during this training.

				The regression analysis has been conducted in detail after acquiring this knowledge to answer the research questions. Ability to interpret findings after analysis has been gained.
29th -31st January 2021	NVivo Training	NVivo is an important software that helps to organize qualitative data so that it can be analysed by the researcher.	NVivo helps to organize the sources of information into internal, external and other. When nodes and classification are done, it helps the researcher to explore different ways in which the data can be visualized. After the visuals are obtained, the researcher can then identify themes and subthemes which will be helpful in the analysis of the data	After collecting data from the focus group discussion, I will be able to use NVivo to help in the data organization of the research projection.
22nd February 2021	Systematic review risk of bias assessment	Systematic reviews help to identify effective interventions for the prevention of hypertension	This is important to ensure the articles added are free of bias	Cochrane collaboration tool has 5 major parts: • Selection bias • Perforamance bias • Detection bias • Attrition bias

				• Reporting bias
2nd March 2021	What to expect in IE	Discussed through mock and I was aksed some of the questions that I should expect	I was to understand and know what to expect during IE	It is important to undertake this course before the IE.
15th March 2021	How to conduct focus group discussions	This course introduces the research to focus group discussion.	Focus Groups require 6-12 participants The Modurator must be a good listener	This is important im preparation for data collection
5th August 2021	Framework analysis	This course introduces the researcher to the process of framework analysis • Framework analysis for qualitative data analysis mainly has five steps: i. Familiarisation ii. Identifying a thematic framework iii. Indexing (coding) iv. Charting and summarizing v. Mapping and interpretation	Helps the researcher to remain focused in the process of data analysis	This course was helpful in guiding me on how to analyse the qualitative data
10th December 2021	Process of writing the findings for qualitative data	This outlines and guides the research on how to write the qualitative results	Different people and schools write differently byt what was common was a) Introducing the theme. b) Describing the categories or subthemes and linking them with the	This was helpful because it guided the way I presented the results for the qualitative study

			trancripts by giving an example	
10th June 2022	Data integration for mixed methods	The course introduces the researcher to the the different types of integration	a) Integration at design level occurs at three basic designs of mixed methods - Sequential explanatory mixed methods design - Sequential exploratory mixed methods - Convergent b) Integration at methods level occurs through four approaches - In connecting, one database links with another through sampling - With building, one database informs the data collection of another - When merging, the two databases are brought together for analysis - With embedding, data collection and analysis link up at multiple points - Integration at interpretation and reporting	This was important and guided the way the data was integrated and presented.

			levels occurs through narrative data transformation and transformative and joint display. - Connecting occur in sequesntial designs - Merging occur in any design - Embedding occur in interventional designs Integration at interpretation level and reporting level - Integration through narrative, researchers describe qualitative and quantitative findings in a single or series of reports. i. Weaving approach involves writing both qualitative and quantitative y findings together on a theme by theme or concept by concet basis ii. The staged approach often occurs in multi-phased studies iii. Integration through data transformation	

			(qualitative has to be transformed into qualitative and visevasa) then the	
7th September 2022	How to identify your unique contribution in research	This course helps the researcher to identify the norvelty of the research	New contributions can be found in the application of theory, results, and the methods	Helped in the identifying the new knowledge from the research
5th -7th October 2022	Discussion of missed methods' results in a thesis	This provides a guide on how to discuss the findings in an integrated approach	This was helpful because it helped me appreciate the integration of findings	This is a guide on how to present the integrated findings.
10th April 2023	Scoping review	This course introduces the researcher to the JBI scoping review guide	JBI scoping review guide involves developing a protocol, searching for the relevant studies,, study selection, charting of evidence and data synthesis	This was very helpful when I was conducting the scoping review.

9.29 Appendix ZC: Research Supervision Record

Number	Date	Mode of supervision
1	30th October 2018	Face to face
2	6th October 2018	Face to face
3	30th October 2018	Face to face
4	1st November 2018	Face to face
5	6th November 2018	Via zoom
6	18th December 2018	Via zoom
7	4th January 2019	Via zoom
8	18th January 2019	Via zoom
9	6th March 2019	Via zoom
10	1st July 2019	Face to face
11	7th July 2019	Face to face
12	22nd July 2019	Face to face
13	2nd April 2019	Via zoom
14	15th January 2020	Via zoom
15	29th January 2020	Via zoom
16	25th March 2020	Via zoom
17	1st June 2020	Via zoom
18	29th June 2020	Via zoom
19	16th July 2020	Via zoom
20	18th August 2020	Via zoom
21	16th September 2020	Via zoom

Number	**Date**	**Mode of supervision**
22	19th November 2020	Via zoom
23	19th November 2020	Via zoom
24	17th December 2020	Via zoom
25	21st January 2021	Via zoom
26	29th January 2021	Via zoom
27	25th February 2021	Via zoom
28	12th March 2021	Via zoom
29	19th March 2021	Via zoom
30	21st April 2021	Via zoom
39	3rd August 2021	Via zoom
40	14th September 2021	Via zoom
41	21st October 2021	Via zoom
42	18th November 2021	Via zoom
43	2nd December 2021	Via zoom
44	21st December 2021	Via zoom
45	21st March 2022	Via zoom
46	21st June 2022	Via zoom
47	5th August 2022	Face to face
48	23rd August 2022	Face to face
49	5th September 2022	Face to face
50	9th September 2022	Face to face
51	11th September 2022	Via zoom

Number	**Date**	**Mode of supervision**
52	30th September 2022	Via zoom
53	1st February 2023	Via zoom
54	17th March 2023	Via zoom
55	18th April 2023	Via zoom
56	14th June 2023	Via zoom

9.30 Appendix ZC: English Editor's Confirmation

Audrey Holmes
English Language Editing
Phone: +64 6 322 9852
Email: audsholmes@gmail.com
LinkedIn: www.linkedin.com/in/audrey-holmes-4b168534

Confirmation of English language editing

This document confirms that a draft of the below manuscript has been edited for proper English language, grammar, punctuation, spelling, and overall style by Audrey Holmes, MA, an expert English language editor.

Title: Exploring Awareness and Healthy Lifestyle Behaviors for the Prevention of Hypertension in Rural Communities in Central Uganda

Author: Mary Namuguzi

Date language editing completed: 27 October 2023

Editor: Audrey Holmes

If further confirmation or information is required please contact Audrey Holmes (audsholmes@gmail.com). This document confirms that a draft of the manuscript listed above was edited for proper English language, grammar, punctuation, spelling, and style by an expert native English-speaking editor. Editing did not alter the research content or authors' intentions.

9.31 Appendix ZD: Training Schedule for Research Assistants

Day One	
Time	**Activity**
9:00-10:00am	Introduction to the study (objectives, research design, and methodology)
10:00-10:30am	Tea Break
10:30-11:30am	Research ethics (participant information sheet and consent forms)
11.30-11.45am	Break
11:45-1:00pm	Data collection technique (Epicollect was used to introduce the data collection instrument)
1:00-2:00pm	Lunch break
2:00-3:00pm	Communication skills and fieldwork preparation
Day Two	
9:00-10:00am	Recap of the previous day's activities
10:00-10:30am	Tea Break
10:30-1:00pm	Demonstration and return demonstration of the data collection using Epicollect
1:00-2:00pm	Lunch break
2:00-3:00pm	Brainstorming of any possible challenges based on the demonstration and the possible solutions