Risk factors for poor blood pressure control in hypertensive patients on treatment in Manzini, Eswatini

By

Dr Millicent Phumzile Bubu Buckham

Student number: 4002733

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Supervisor: Dr Lungiswa Tsolekile

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KEYWORDS

Risk factors

Hypertension

Poor blood pressure control

Blood pressure

Patients on treatment

Manzini

Eswatini.

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ABSTRACT

Background: There is an alarming number of uncontrolled hypertensive patients on treatment seen daily in out-patient clinics across Eswatini. Many have the avoidable complications of uncontrolled hypertension, such as renal failure and strokes. However, the health system is ill-equipped to manage all of these. Eswatini already has an enormous burden of non-communicable diseases (NCDs) and rising related morbidity and mortality, with complications of hypertension among the top five causes of death. The factors associated with poor blood pressure (BP) control in these hypertensive patients in Eswatini are poorly understood as not many studies have looked into this problem. This research assessed the prevalence of uncontrolled hypertension and identified factors associated with poor control in hypertensive patients aged 40 years and older on treatment at Raleigh Fitkin Memorial (RFM) hospital in the Manzini region, Eswatini.

Methods: A quantitative observational cross-sectional descriptive study was carried out among adult participants 40 years and older on treatment for hypertension at RFM Hospital, who met the inclusion criteria. Systematic sampling was used to select 324 participants for the study. Data were collected through face-to-face interviews using previously validated questionnaires. Anthropometric measurements, namely weight and height were taken and used to calculate participants' body mass index (BMI). In addition, blood pressure was also measured. Data were cleaned, coded and entered into an excel spreadsheet. Stata 13.1. was the statistical software used to analyze the data. A Chi-squared test was used to conduct a bivariate analysis to determine associations between outcome and exposure variables. A T-test was utilized to compare averages between the two groups.

Results: The prevalence of poorly controlled hypertension in patients on anti-hypertensive treatment in Manzini Eswatini was 56.17 %. The male gender was found to be an essential risk factor for poor BP control in hypertensive patients on treatment in Manzini, Eswatini (OR 1.76; CI: 1.01: 3.04; p =0.04). The socio-demographic characteristics significantly associated with poor BP control status were level of education (p = 0.00) and gender (p = 0.04). Other factors that were significantly associated with poor BP control status were physical activity levels (p = 0.03) and adherence score (p = 0.005). Adherence to BP medication was found to be very good, with 98.15% of the participants falling into the good adherence category (score > 75%).

Conclusions: The prevalence of uncontrolled BP in patients on anti-hypertensive treatment in Manzini, Eswatini was high, with the odds of uncontrolled hypertension being 76% higher in males. The study findings highlight the urgent need to prioritize interventions to improve BP control in Eswatini. It will be helpful to customize interventions to target males with hypertension, improve physical activity levels and enhance awareness of the dangers of poorly controlled BP. Moreover, improving adherence to pharmacological and non-pharmacological BP-lowering measures is critical in this setting.

DECLARATION

I declare that "*Risk factors for poor blood pressure control in Hypertensive patients on treatment in Manzini, Eswatini"* is my own work, that it has not been submitted for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Dr Millicent Phumzile Bubu Buckham.

Date: 30 November 2022

Signed……

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LIST OF ABBREVIATIONS

Abbreviation	*Description*
BP	Blood pressure
CO	Cardiac output
CVD	Cardiovascular disease
DM	Diabetes Mellitus
HCW	Health care workers
HICs	High-income countries
HL	Health literacy
HTN	Hypertension
IHD	Ischemic Heart Disease
LMICs	Low and middle-income countries
MoH	Ministry of Health
NCD	Non-Communicable Disease
OR	Odds ratio
PA	Physical activity
PR	Peripheral resistance
RFM	Raleigh Fitkin Memorial
SDG	Sustainable Development Goal
SES	Socioeconomic status
SSA	sub-Saharan Africa
UN	United Nations
WHO	World Health Organization

OPERATIONAL TERMS

Hypertension: Blood pressure of more than or equal to 140/90 mmHg (Campbell *et al*., 2017).

Poor control: Blood pressure above or equal to 140/90 for non-diabetic patients. (Upoyo, Setyopranoto and Pangastuti, 2021).

Risk factors: Factors that indicate a greater likelihood of developing the outcome. (Bonita, Beaglehole and Kjellstrom, 2006).

Adherence: How well a patient cooperates with taking treatment the way they are supposed to and following the appropriate management interventions (Sarkodie *et al.*, 2020).

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CHAPTER 1. INTRODUCTION

1.1 BACKGROUND

Hypertension (HTN) is an epidemic and impending public health disaster whose prevalence is estimated by the World Health Organization (WHO) to be the highest in Africa, where blood pressure control rates are also sub-optimal (Ferdinand, 2020). The WHO reported that only one in every five hypertensive adults globally has their BP controlled (WHO, 2021a). Jafar *et al.* (2018) reported that internationally an estimated one-third of hypertensive patients on treatment had controlled BPs. Even with the intensified public health strategies and efforts to upscale treatment, prevention and awareness of HT, BP control remains low, with a 93% prevalence of poor BP control reported in sub-Saharan Africa (SSA) (Mohhamed *et al*., 2021).

Hypertension or raised BP is defined as BP above or equal to 140/90 mm Hg (Campbell *et al*., 2017). However, the American Heart Association describes it as a systolic BP of 130 mm Hg or more or a diastolic BP of 80 mm Hg or more (Taler, 2018). The recommendation is that hypertensive patients maintain a BP under 130/80 mm Hg to reduce cardiovascular events (Lee *et al.*, 2018). BP is uncontrolled when systolic blood pressure is greater than or equal to 140 mm Hg and/or diastolic BP is greater than or equal to 90 mm Hg (Upoyo, Setyopranoto & Pangastuti, 2021). The WHO (2021) states this BP greater than 140/90 mm Hg should occur on two separate days to diagnose HTN.

Guidelines from the European Society of Cardiologists grade hypertension as follows; Grade 1 being diastolic BP 90-99 mm Hg and systolic BP 140-159 mm Hg, Grade 2 being diastolic BP 100-109 mm Hg and systolic BP 160-179 mm Hg and Grade 3 being diastolic BP 110 mm Hg and above and systolic BP 180 mm Hg and above (Antignac *et al.*, 2018). An increase in the BP grade is associated with an increased risk of cardiovascular disease (CVD) (Mancia *et al.*, 2013).

The prevalence of hypertension is higher in low and middle-income countries (LMICs) compared to high-income countries (HICS) (Palafox *et al.*, 2016). Poorly controlled BP is also seen more in LMICs like Eswatini, where up to three-quarters of deaths are due to CVD (WHO, 2020a). Hypertension is the leading cause of premature death, even more so in LMICs, where the lowest BP control rates are reported (Nugroho *et al.*, 2022). Annually, HTN kills approximately 17.9

million people (WHO, 2020c). According to Sharp *et al.* (2020), 85% of all untimely deaths (for ages 30 to 69) due to NCDs, including HTN, occurred in LMICs.

The modifiable risk factors for HTN included high alcohol and sodium intake, weight gain, smoking, a sedentary lifestyle and medications such as nonsteroidal anti-inflammatory Drugs (NSAIDs), stimulants and illicit drugs (Diancu, Dediu & Lancu, 2018). There are also secondary causes, such as endocrine disease and a genetic predisposition to HTN (Taler, 2018).

Hypertension is the most common chronic NCD globally (Umemura *et al.*, 2019). It is the largest contributor to the global disease burden (The Lancet, 2018a). More than being the biggest cause of untimely death, HTN worldwide also leads as the cause of disability and CVD (Boima *et al.*, 2020; Mohamed *et al.*, 2021). BP control is, therefore, a priority for public health globally (Tisdale *et al.*, 2021).

Uncontrolled HTN causes damage to the brain resulting in strokes and dementia, and to the eye, where it causes retinopathy (Nadar *et al.*, 2006). Moreover, it results in myocardial infarction and cardiomyopathy and in the kidneys and blood vessels; HTN causes kidney failure and atherosclerotic occlusive disease, respectively (Taler, 2018). These complications are avoidable through optimal BP control (Nadar *et al.*, 2006). Reducing the prevalence of uncontrolled BP by 25% by 2025 is one of the 2011 sustainable development goals (SDGs) (Sacco *et al.*, 2016). Eswatini is moving in the opposite direction, with NCDs not receiving adequate attention in the country in previous years (WHO, 2020b).

Reducing systolic BP by just 10 mm Hg is associated with a 13% drop in mortality, a 17% drop in coronary heart disease, a 27% drop in strokes and a 28% drop in heart failure (Sarfo *et al.*, 2018). Hypertension and its poor control have significant social and fiscal consequences globally (Mills, Stefanescu & He, 2016). It leads to the loss of life, disabilities and reduced quality of life from cardiovascular disease (Jafar *et al.*, 2018). According to WHO (2020c), NCDs in LMICs spike household costs and drain incomes, thus contributing to poverty and repression of development. They also impede advancement towards sustainable development, which aims to decrease premature NCDS deaths by a third by 2030 (The Lancet, 2020).

1.2 PROBLEM STATEMENT

Despite the availability of local treatment guidelines for managing HTN and other NCDs, Eswatini has a dramatically growing NCDs burden with increasing related deaths and disabilities (MSF, 2017; Sharp *et al.*, 2020). NCDs caused 37% of Eswatini's mortalities in 2017, according to the World Bank (2019). Approximately 22% of adults in Eswatini were reported to be hypertensive (Sharp *et al.*,2020). Cardiovascular disease, a complication of HTN, was among the top five reasons for mortality in the country (WHO, 2018). Hypertension was classified as the number one disease among the top ten outpatient department (OPD) cases nationally in 2016 (Gbadamosi & Tlou, 2020).

Despite being on treatment, several hypertensive patients, presented at RFM hospital daily with uncontrolled BP, and many already had the avoidable complications of HTN. In 2000, the prevalence of uncontrolled HTN in adults was about 30% in Eswatini (WHO, 2014). The burden of uncontrolled HTN negatively impacts the inadequate national healthcare budget (Tesfaye *et al.*, 2017). This poor BP control could be due, among other reasons, to the misalignment between the population's healthcare needs and the available resources identified by the World Bank (2019). This misalignment causes a constant shortage of anti-hypertensive drugs in public hospitals and peripheral clinics (Shabangu & Suleman, 2015). Poor BP control could also be due to the failure to decentralize NCDs care to more accessible peripheral clinics despite the national adoption of a CVD/ Diabetes care package managing NCDSs in community clinics in Eswatini (WHO, 2013). Disordered delivery of drugs from transportation challenges, inconsistent supervision from large hospitals and overwhelmed peripheral clinics impede this decentralization (Sharp *et al.*, 2020). Little is known about the current prevalence of uncontrolled HT and the risk factors for poor BP control in Eswatini, as research on this problem appears scanty (WHO,2013).

It is imperative, therefore, to determine the risk factors for poor BP control in hypertensive patients on treatment in Eswatini. Determining the critical individual, health system and socio-economic factors associated with poor BP control in our setting will address this knowledge gap. It will further provide information that will support healthcare workers and the Health Ministry in Eswatini to plan improved, targeted and effective interventions to tackle the risk factors for poor BP control. Outcomes in our local hypertensive population will thus improve (Degli Esposti *et al.*, 2004).

Improved BP control significantly decreases the complications of HTN, which place a massive burden on the health system and diminish patients' quality of life (Jafar *et al.*, 2018). Measuring the proportion of hypertensive patients on treatment with uncontrolled BP and assessing the associations between individual factors, HTN treatment adherence, comorbid conditions, socio-demographic characteristics, and other variables of uncontrolled BP will aid in understanding the contributors to poor BP control.

1.3 RATIONALE

This study will provide new awareness and knowledge to empower and influence the practices of healthcare workers and the national NCDs committee managing HTN in Eswatini. This knowledge will assist in planning improved, tailored local strategies to improve BP control. The findings could inform policy and the allocation of resources to tackle the identified risk factors of poor BP control, thereby improving patient outcomes and reducing the prevalence of poor BP control in line with the 2011 Sustainable Development Goals (SDGs).

1.4 AIMS AND OBJECTIVES.

This study aimed to determine the prevalence of uncontrolled hypertension and the risk factors associated with poor BP control in hypertensive patients on treatment in Manzini, Eswatini.

The objectives of the study were:

- To determine the prevalence of uncontrolled BP in hypertensive patients on treatment in Manzini, Eswatini
- To describe the sociodemographic characteristics of hypertensive patients with uncontrolled BP on treatment in Manzini, Eswatini.
- To determine the risk factors associated with poor BP control in hypertensive patients on treatment in Manzini, Eswatini.

1.5 RESEARCH QUESTION

What are the risk factors for poor BP control in hypertensive patients on treatment in Manzini, Eswatini?

1.6 HYPOTHESIS OF THE STUDY

Factors including physical activity, compliance to BP treatment and gender are not associated with BP control.

1.7 OUTLINE OF THE MINI THESIS

This thesis contains six chapters.

In Chapter 1, HTN is introduced and defined. Its trends globally and public health consequences, especially in LMICs like Eswatini, are outlined as well as the study's aim and objectives.

In Chapter 2, the literature on the burden of HTN internationally, in sub-Saharan Africa and locally is discussed. The causes of poorly controlled BP are focused on, as well as some of the risk factors in the literature and the consequences of poor BP control. Lastly, interventions globally, in SSA and locally to control HTN are discussed, and the chapter is summarized.

Chapter 3 outlines the methodology of the study. This section includes the study design, population, sampling methods and data collection process: data analysis, validity and reliability of the study instruments and techniques. The ethics considerations of the study conclude this chapter.

In Chapter 4, the study results are presented, including the prevalence of uncontrolled HTN, the sociodemographic characteristics of participants and the factors found to be associated with uncontrolled BP.

Chapter 5 discusses these results in relation to the available literature.

Chapter 6 presents the conclusion and recommendations.

1.8 SUMMARY

Hypertension is an increasingly important public health problem. Globally HT leads as a cause of disability and CVD, more so in LMICs like Eswatini, where BP control is the worst (WHO, 2020a). Understanding the risk factors of poor BP control is imperative to achieving SDG 3.4 (The Lancet, 2020).

CHAPTER 2. LITERATURE REVIEW

2.1 INTRODUCTION

The research aims to determine the prevalence of poorly controlled BP and determine the risk factors associated with poor BP control. This literature review will thus discuss the global, regional and local epidemiology and prevalence of HTN and poor BP control. It will further look at the risk factors for HTN and poor BP control reported in the literature and possible reasons for the problem of poor BP control in Eswatini. Patient-related sociodemographic, clinical and lifestyle risk factors for poorly controlled BP will be discussed. Moreover, this chapter will focus on health system-related risk factors. Furthermore, it will look at the consequences of this epidemic and the interventions globally, regionally and locally aimed at controlling HTN.

Hypertension, the most critical risk factor for CVD, is a complex and multifactorial disease that usually does not cause noticeable symptoms (Sawicka *et al.*, 2011). This allows it to go undetected for extended periods (Masilela *et al.*, 2020; Cappuccio and Miller, 2016).

2.2 THE BURDEN OF HYPERTENSION GLOBALLY, IN AFRICA AND LOCALLY

Hypertension is a global health crisis (The Lancet, 2018a). Due to the demographic transition occurring globally, the elderly population has increased (The Lancet, 2016). This increase comes with an increase in the prevalence of NCDs (Oktaviyani *et al.*, 2022). There are regional variances in the prevalence of raised BP (Mills, Stefanescu & He, 2016). A decrease in uncontrolled BP was noted HICs from 1975 to 2015, whereas LMICs such as SSA saw an increase in BP (Zhou *et al.*, 2021).

2.2.1 HYPERTENSION GLOBALLY

In 2000, 972 million people worldwide had HTN, with the most considerable burden carried by LMICs (Masilela *et al.*, 2020). In 2008, nearly 1 billion people had uncontrolled hypertension

globally, with the highest prevalence of 46% in Africa (Cappuccio & Miller, 2016). In 2015 it was reported that one in five people aged 18 years and over globally had HTN comprising 25% of men and 20% of women (Gbadamosi & Tlou, 2020). It is projected that in the year 2025, up to 1.5 billion people worldwide will be living with HTN (Du *et al.*, 2018). LMICs carry two-thirds of the burden of CVD, which is a consequence of poorly controlled HTN and two-thirds of CVD mortality (WHO, 2020a). Cardiovascular diseases, a complication of uncontrolled HTN, are a principal cause of mortality in LMICs (McKenzie *et al.*, 2020). CVD also occurs at younger ages in LMICs (Berra *et al.*, 2011). This is not in line with attaining SDG 3.4 of decreasing premature deaths from NCD by a third by 2030 (Salinas and Kones, 2018).

Literature from varying studies in differing settings, using different designs, methods and sample sizes, demonstrates high levels of poor BP control that vary within regions, countries and socio-economic statuses. Besides the different methodologies, settings and populations, the variations can be attributed to the differing and evolving risk factor characteristics in the different regions over time (Mills, Stefanescu & He, 2016). However, BP control is still noted to be worse in LMICs (Zhou *et al.*, 2021).

An earlier systematic review of the differences in BP control between developing and developed countries reported no significant differences in BP control (Pereira *et al.*, 2009). On the other hand, a more recent systematic review of 33 studies on the disparities in the prevalence of hypertension control globally, reported a prevalence of poor BP control ranging from 73.7% to 30.4% in HICs and 49.6% to 94.2% in LMICs (Elnaem *et al.*, 2022). Similarly, a larger cross-sectional study on 163 397 hypertensive adults across low-, middle-, and high-income countries including South Africa, reported the worst BP control in the poorest countries, with up to 90% of hypertensive patients in some LMICs uncontrolled (Palafox *et al.*, 2016).

In a cross-sectional study on 999 hypertensive patients from four primary care centers in Chile, a LMIC, a 46.9% prevalence of poor BP control was reported, which was higher than a previous similar study reported in Chile. This study reported the low 38.5% adherence of the study participants to BP treatment as a significant risk factor for poor BP control. Researchers acknowledged however, that the tool used to measure adherence may have under estimated the actual adherence to BP treatment (Sandoval, Nazzal and Romero, 2018). A similar cross-sectional study in Botswana on 280 hypertensive patients from ambulatory care clinics in rural and semi-

urban communities reported a 55% prevalence of poor BP control and cited medication errors as a significant risk factor for poor BP control (Gala *et al.*, 2020).

2.2.2 HYPERTENSION IN AFRICA

Hypertension was identified as the biggest priority to reduce stroke and heart disease in the African continent by the Pan African Society of Cardiology (PASCAR), as the WHO projected that Africa has the largest number of individuals affected by HTN (WHO, 2015). An estimated 46% HTN prevalence was reported in Africa, which is the highest globally (Dzudie *et al.*, 2018). A study on HTN prevalence in Sub-Saharan Africa in 2017 showed low levels of well-controlled BP across the region and differing burdens between and within countries of this massive public health problem, the highest prevalence of poor BP control being in South Africa. The same study further reported that many countries lack data on HTN prevalence and the prevalence of poor BP control, which this study aimed to measure in Eswatini (Gómez-Olivé *et al.*, 2017).

This high and rising uncontrolled BP prevalence is credited partly to demographic transitions such as the increasing ageing population (Wirtz *et al.*, 2016). Urbanization associated with unhealthy diets and reduced physical activity potentially fuels poor BP control in SSA (Mills, Stefanescu & He, 2016). The suboptimal and disorganized control rates in SSA are attributed to an amalgamation of factors such as poor healthcare systems that are short of resources, including maintainable drug treatment and non-existent population-level strategies to improve BP control (The Lancet, 2012). These are barriers to treatment compliance (Husain *et al.*, 2020). It is estimated that 250 000 annual mortalities could be prevented in SSA if the BP was adequately controlled; therefore, BP control should be prioritized (Cappuccio & Miller, 2016).

2.2.3 HYPERTENSION IN ESWATINI

Eswatini, formerly called Swaziland, is a LMIC in southern Africa with a high and rising CVD risk factors and burden (Sharp *et al.*, 2020). CVD accounts for 11% of the annual mortality (Palma *et al.*, 2018). CVD and chronic kidney disease, both complications of poor BP control, are among the top five causes of death in Eswatini (WHO, 2018; World Bank, 2019). In 2000, a 30% uncontrolled BP prevalence was recorded in Eswatini (WHO, 2014). However, the current situation is unknown due to a dearth of data.

Hypertensive patients frequently present late and with complications of elevated BP, and thus attempts have been made to decentralize HTN care for accessibility to remote rural communities, improve health-care worker expertise and develop treatment guidelines (Sharp *et al.*, 2020).

2.3 RISK FACTORS FOR HYPERTENSION

Hypertension is a progressing heterogeneous CVD caused by different but interrelated pathophysiological pathways as illustrated in Figure 1 (Vikrant & Tiwari, 2001). Hereditary factors and environmental factors such as unhealthy diets, smoking, obesity and excessive intake of alcohol play various roles in the pathophysiology of HTN (Tasnim *et al.*, 2020). BP is the pressure required to move blood through the circulatory system and is the result of peripheral resistance in the vascular system (PR) or the tone in the arteries, and the amount of pump action of the heart called the cardiac output (Jhanji, Dawson & Pearse, 2008). Cardiac output and PR are, in turn, influenced by various factors such as sodium retention in the kidneys and stressors, which cause sympathetic over-activity and changes in cell membranes of blood vessels which cause vascular contraction or cardiac hypertrophy (Vikrant & Tiwari, 2001).

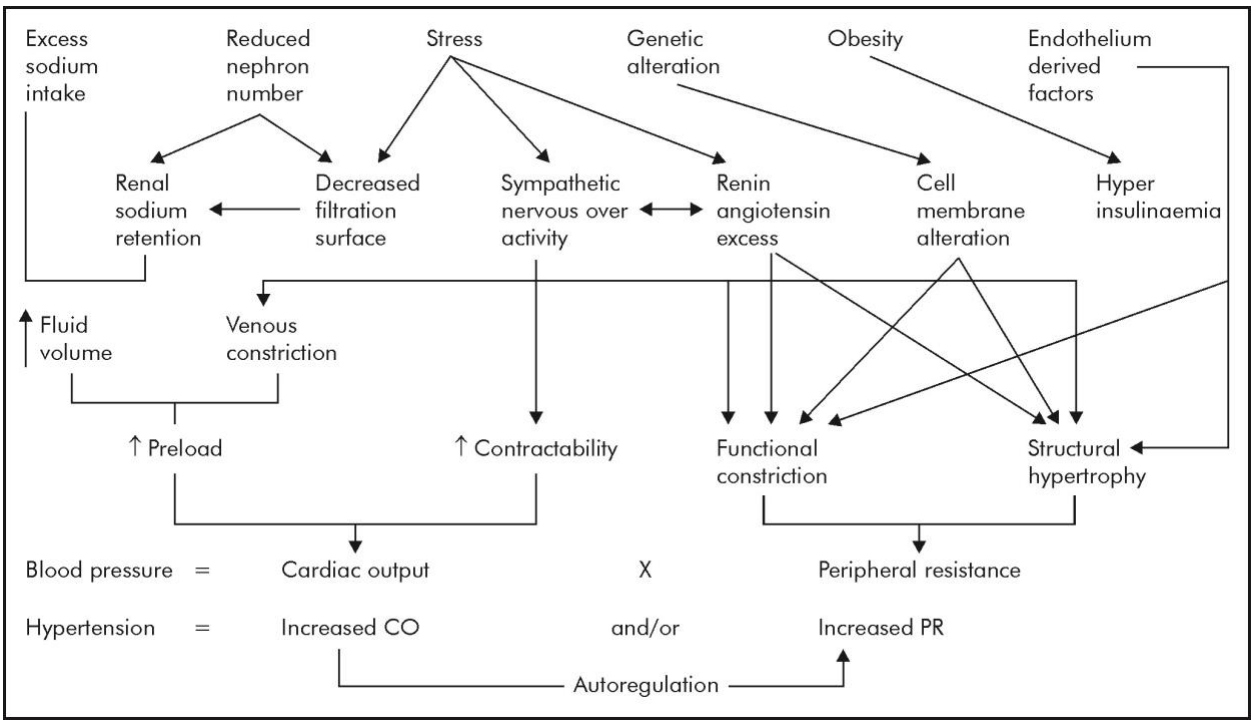


FIGURE1: THE PATHOPHYSIOLOGY OF HT

*Adopted from Vikrant & Tiwari (2001).

2.4 RISK FACTORS FOR POOR BP CONTROL

Denison *et al.* (2007) grouped barriers to BP control in a conceptual framework into 1) predisposing factors (knowledge and attitude about HTN and its causes and complications; quality of life; perceived life threat and health as well as priorities), 2) enabling factors (healthcare resources such as medication shortages, health behaviour inadequacies and lack of patient involvement and participation in their management) and 3) reinforcing factors (lack of social support, which compounds stress and satisfaction with care). Dzudie *et al.* (2018), in developing a roadmap to control HTN in Africa by 2025, also grouped barriers to BP control as government or health system-related, health care professional related and patient-related.

2.4.1 PATIENT-RELATED FACTORS

2.4.1.1 PATIENT SOCIO-DEMOGRAPHIC FACTORS

GENDER

Literature reveals gender disparities in BP control across countries and studies for varying reasons. An American cross sectional survey on gender differences in BP control in hypertensive adults aged 18 and older, found that although women were more likely to adhere to treatment than men, men were significantly more likely to achieve BP control even when differences in age were adjusted for (Gu *et al.*, 2008). This was not consistent with findings from a systematic review of the gender differences in mid-life HTN in the Arab region however, which showed that more middle-aged rather than younger women compared to men, had uncontrolled BP, possibly due to the associated menopause, decreasing physical activity and obesity (Akl *et al.*, 2017). These findings could reflect the effect of age-associated changes on BP control noted in some studies (Mohamed *et al.*, 2021). Consistently, an international survey conducted in 26 countries, looking at BP control in males and females, Caucasian, Asian and Hispanic 18 years and older, reported poorer systolic BP control in women and that BP in women increased with advancing age which was not noted in males (Thoenes *et al.*, 2010).

South African and Zimbabwean cross-sectional studies looking at determinants of uncontrolled HTN found no significant differences in BP control between the sexes (Masilela *et al.*, 2020; Goverwa *et al.*, 2014). Conversely, another African study in Botswana revealed better BP control in females than males attributing this to better awareness of the disease and treatment and healthier lifestyle choices in females (Tapela *et al.*, 2020). Similarly, a 2017 survey in Jordan looking at HT prevalence and control among women and men aged 18 to 90 years showed that 30.7% of hypertensive males on treatment were controlled compared to 35% of hypertensive females (Khader *et al.*, 2019). These findings in literature also highlight the possibility that different cultural and behavioral roles played by the different genders in the various countries at varying ages, influence activity levels, lifestyle and dietary patterns (Dressler, Bindon & Neggers, 1998). Furthermore, different findings may mirror differing health-seeking behavior between males and females in different nations (Gu *et al.*, 2008).

ADVANCED AGE

Advanced age is consistently reported in the literature to be associated with other comorbidities, such as diabetes and obesity, due to reduced activity, which are important risk factors of poor BP control (Mohamed *et al.*, 2021). Older age is also associated with forgetfulness and cognitive impairment, which impair treatment adherence and consequently lead to poor BP control (Goverwa *et al.*, 2014b). A Korean study on elderly hypertensive patients confirmed this and found poor cognitive functioning in the elderly to be associated with unsatisfactory medication adherence levels (Cho *et al.*, 2018). A study done in the USA assessing the patterns of hypertension across different ages similarly reported that more older hypertensive patients on treatment were uncontrolled than the patients younger than sixty years on treatment (Franklin *et al.*, 2001).

In A Zimbabwean analytical cross-sectional study on uncontrolled HTN among hypertensive patients on anti-hypertensive treatment aged eighteen and above, the older age groups were found to have a higher prevalence of uncontrolled HT. This was attributed to the differing National hypertension treatment guidelines in Zimbabwe, where the systolic BP at which treatment is initiated in the elderly is 160mmHg. (Goverwa *et al.*, 2014b). In a similar South African study in the Mkhondvo Region, on patients aged eighteen and older, however, older age was not associated with uncontrolled BP (Masilela *et al.*, 2020). This dissimilarity in findings could possibly reflect more effective, accessible and sustained HTN care being available to the elderly in the Mkhondvo region, with sufficient availability of anti-hypertensive hypertensive drugs.

HEALTH LITERACY (HL)

Du *et al.* (2018) define health literacy as the level reached by an individual to be aware of, understand, acquire and practice basic health care information necessary for healthy decision-making. Studies reported varying effects of good health literacy on BP control, as notably, various other complex factors influence disease outcomes even with good health literacy (Isa *et al.*, 2021; Willens *et al.*, 2013). Gomez-Olive *et al.* (2017), in a cross-sectional study conducted in four African countries, stated that low awareness levels of HTN and its consequences negatively impact BP control. This was also reported in a cross-sectional survey of HTN care in South Africa

(Dennison *et al.*, 2007). Jongen *et al.* (2019), in a mixed methods cohort and qualitative study to understand the knowledge and perception of HTN in a rural South African community, also highlighted the importance of increasing HTN knowledge in improving BP control.

However, an integrative review of articles to gain an understanding of the effect of HL on health outcomes in HTN showed higher HL scores to be associated with a higher BP control rate in some studies and that some did not find an association between higher HL and achievement of improved BP control(Du *et al.*, 2018). Although low HL may cause poor knowledge of HTN, there is not enough evidence in literature to associate poor health literacy with inadequate BP control (Willens *et al.*, 2013).

SOCIO-ECONOMIC STATUS (SES)

Contrary to the historical belief of lower CVD risk factors in poorer settings due to heavy manual labor and largely plant-based diets, literature reports similar differing findings on the effects of SES on BP control as a consequence of caloric intake and lifestyle behavior (Shariq &Mckenzie, 2020; Sung *et al.*, 2018). An analysis of data from 105 household surveys, on CVD and thus elevated BP risk factors among 78 LMICs reported that higher levels of overweight and obesity, behavioral risk factors and a lesser likelihood of appropriate BP treatment were notable in low SES settings (Geldsetzer *et al.*, 2022). This can be attributed to the increasing consumption of more affordable high-calorie foods and more sedentary lifestyles associated with industrialization in LMICs (Mills, Stefanescu & He, 2016).

In a 2016 cross-sectional survey examining wealth-related inequalities in BP control in HICs and LICs, BP control was observed to be pro-rich and socio-economic status was reported to impact access to health care services and treatment and thus BP control (Palafox *et al.*, 2016). Jongen *et al.* (2019), further pointed to poverty as a barrier to healthy lifestyle choices and access to health care, which both influence BP control.

In SSA, poverty is notably a major hindrance to hypertensive patient care and a driver of the poor control of this disease with fatal consequences (Ferdinand, 2020). A meta-analysis assessing access to CVD medicines in LMICs, reported that the effect of the poor economic level of a country on patients taking appropriate BP medicines surpassed that of factors such as age and gender

(Wirtz *et al.*, 2016). The Multination EIGHT study conducted by Antignac *et al.* (2018) in 12 countries to measure the association between BP control and SES in SSA revealed a progressive rise in poor BP control with declining levels of individual affluence in LMICs. This study also reported a rising grade of HT with declining levels of hypertensive patients' wealth.

2.4.1.2 CLINICAL PATIENT FACTORS

CO-MORBIDITIES

In an American study assessing the role of co-morbidities in the management of HTN, Kressin *et al*. (2014) reported poor BP control in up to 70% of patients with co-morbidities, stating that polypharmacy and confusion regarding the information about the different illnesses led to an interruption in the proper adherence, management and control of HTN resulting in HTN not being prioritized. This is supported by other studies citing the complexity of medicines as a contributor to poor adherence (Benner et al.,2009). In contrast, Cho *et al.* (2018), in a Korean study, showed good BP medicine adherence in diabetic, stroke and dyslipidemia patients yet showed poor adherence to BP medicine in cancer patients. These findings raise the question of whether adherence to BP treatment could depend on the type of and possibly on the prognosis of the existing co-morbidities in hypertensive patients from different regions (Shin *et al.*, 2010).

Mohamed *et al.* (2021), in a systematic review and meta-analysis looking at the prevalence of poorly controlled BP in people with co-morbidities in SSA, reported an alarming prevalence of 78.6% of poorly controlled HTN in Sub-Saharan Africa (SSA) in people with co-morbidities. Of note, however, was that most of the studies analyzed by this review were hospital-based and did not use random sampling methods. A study in Indonesia on the risk factors of HTN found a significant association between a diabetes mellitus (DM) diagnosis and having a raised BP (Oktaviyani *et al.*, 2022). It is estimated that up to 74% of adult diabetic patients have uncontrolled BP (Passarella *et al.*, 2018). Literature shows that DM and other comorbidities contribute to the pathophysiology of elevated BP (Gu *et al.*, 2022).

OBESITY

Obesity, defined as a BMI of 30 kg per square meter and above, is a global public health problem whose prevalence is escalating at pandemic rates in developing countries due to factors such as urbanization, sedentary lifestyles and unhealthy diets rich in calories (Boachie *et al.*, 2022). Obesity accounts for up to 78% of HT cases (Shariq & Mckenzie, 2020). Obesity is reported to cause HT through multifaceted mechanisms, including quickening the heart rate, increasing the cardiac output and water retention (Vikrant & Tiwari, 2001). Increases in BMI are therefore linked to increased BP (Chu & Singh, 2021). The obesity prevalence is nearly double what it was 30 years ago, and due to its reported expedition of the sequelae causing raised BP, improving its avoidance and control is considered critical in BP control (Leggio *et al.*, 2017). A cross-sectional analytical study conducted in Zimbabwe on hypertensive patients on treatment found obesity to be an independent risk factor for poor BP control (Goverwa *et al.*, 2014**).** In a similar cross-sectional study on hypertensive patients on treatment in Mkhondo, South Africa, obesity was also significantly associated with uncontrolled BP (Masilela *et al.*, 2020).

However, other literature reports what is called "The obesity paradox", where being obese is unexpectedly protective and obese patients have superior prognosis in certain scenarios in HT and CVD patients (Hainer & Aldhoon-Hainerová, 2013). Examples include hypertensive patients with obesity having lower mortality rates and lower incidences of myocardial infarction when compared to hypertensive patients with normal weights (Banack & Kaufman, 2013). A further example is the lower CVD deaths in the obese elderly than in the elderly with normal weight, which could be due to the possibility of a raised BMI, meaning better nutritional standing because BMI does not distinguish lean mass from fat mass (Elagizi *et al.*, 2018).

2.4.1.3 PATIENT LIFESTYLE FACTORS

ALCOHOL USE

Tasnim *et al.* (2020) report that consuming more than the maximum amount of three alcoholic drinks for women and four drinks for men daily escalates the CVD risk. Consuming 3-4 alcoholic drinks a day was similarly reported to be associated with raised BP in a worldwide epidemiological study done in 32 countries on males and females of ages 20 to 59 looking at salt and various factors influencing BP control (Stambler *et al.*, 1997). Alcohol has both acute and chronic effects on BP. It increases plasma rennin which initiates a cascade culminating in sodium and water retention (Kawano *et al.*, 2004). It also leads to increased PR and stimulates the sympathetic nervous system culminating in responses such as increased heart rate (Tasnim *et al.*, 2020).

In a systematic review and meta-analysis looking at the effects of reducing alcohol consumption on BP, a dose-dependent BP reduction in BP was reported in individuals who had more than two alcoholic drinks a day. However, the decrease in BP was noted to be larger in the individuals who had over six alcoholic beverages per day, with a 50% reduced alcohol intake resulting in a mean difference in systolic BP of -5 mm Hg (The Lancet, 2017). In another systematic review of the effects of alcohol on BP, it was reported that large doses of alcohol resulted in up to a 3.77 mm Hg rise in BP twelve hours after consumption compared to a placebo (Tasnim *et al.*, 2020).

Another systematic review and meta-analysis reported a protective effect of consuming moderate to low amounts of alcohol for CV; however, this study also reported lower mortality in middle-aged males and females who consume low to moderate amounts of alcohol (Yoon *et al.*, 2020).

SMOKING

The chemicals, including nicotine in smoke, are reported to cause an increase in BP by a myriad of mechanisms, including vasoconstriction and hindering the neurotransmitters involved in maintaining normal blood pressure, thus impairing BP control (Landini & Leone, 2011; Park *et al.*, 2018). An experimental study on the effects of smoking on HTN reported that oxidative stress from smoking causes damage to the vasculature and consequently weakens vascular function, further raising blood pressure (Dikalov *et al.*, 2019). The chemicals in smoke metabolically interfere with the body's response to BP medicines which worsens BP control (Cohen &

Townsend, 2009). Results from a cross-sectional survey of participants in over 100 countries worldwide supported these findings and reported a significantly raised BP in smokers (The Lancet, 2018a). Other studies, however reported no significant BP elevation in smokers and attributed this to the vasodilator effect of nicotine metabolites (Cohen & Townsend, 2009).

PHYSICAL ACTIVITY (PA)

Studies report a positive effect of sufficient PA on BP control (Schroeder *et al.*, 2019; Ng & Popkin, 2013; Kokkinos *et al.*, 2009). PA was defined as skeletal muscle contraction associated with body movement that raises energy usage beyond normal levels (Physical Activity Guidelines Advisory Committee, 2008). A systematic review of the effect of exercise on CVD risk factors reported that BP decrease due to exercise was greater in hypertensive patients than in normotensive patients (Wasfy & Baggish, 2016). The Physical Activity Guidelines for Americans from the United States Health Department recommended a minimum of 150 to 300 minutes of moderate-intensity PA a week or 75 to 150 minutes of vigorous-intensity PA per week to reduce BP and slow down CVD progression (Piercy & Troiano, 2018). A systematic review examining the relationship between PA and BP also reported that PA reduces BP in hypertensive patients (Pescatello *et al.*, 2019).

A study analyzing global survey data reporting the prevalence of insufficient PA (less than 150 minutes per week of moderate-intensity PA or 75 minutes per week of vigorous-intensity PA) reported that SSA was among the three regions with the lowest levels of insufficient PA. Furthermore, this study reported a 16.2% prevalence of inadequate PA in LICs compared to a 36.8% prevalence in HICs (The Lancet, 2018b). The poor activity levels in HICs could be a consequence of the increasingly deskbound occupations in urbanized, first-world settings and the greater availability of motor-powered transportation (Ng & Popkin, 2013).

Exercise is a critical non-pharmacological method of reducing BP as well as the risk of other factors that impair BP control, such as obesity and diabetes, by different mechanisms (Kokkinos *et al.*, 2009; Pescatello *et al.*, 2019). It is affordable in relation to drug treatment and has no adverse effects, yet it is reported to lower BP by up to 12 mm Hg (Awotidebe *et al.*, 2014).

DIETARY INTAKE

Including vegetables and fruit in the diet and restricting salt intake are two major dietary measures consistently found to be associated with a reduction in BP (Filippou *et al.*, 2021; Savica, Bellinghieri & Kopple, 2010; Taler, 2018). The WHO recommended daily salt intake is less than 5 grams (Ghimire *et al.*, 2021). This amount is supported by The International Society of Hypertension and The World Hypertension League (Campbell *et al.*, 2015). The average salt intake in most countries is, however, reported to be 10 grams daily (Feng *et al.,* 2020).

The intake of salt in excess leads to increases in fluid volume via its effect on the homeostasis of fluid, thus causing an increased cardiac output. It also increases PR as it affects vasculature reactivity through inflammatory and hormonal pathways (Feng *et al.*, 2020). The INTERSALT worldwide study looking at the effect of sodium excretion on BP showed that reducing daily salt intake by just 100 mg could lower systolic BP by up to 3.4 mm Hg (Stambler, 1997). Goverwa *et al.* (2014)**,** in their Zimbabwean analytical cross-sectional study on 354 hypertensive patients, reported that adding salt to prepared food was an independent risk factor for poor BP control.

Five portions of fruit and vegetables a day, or 400 grams a day, is recommended by the WHO to prevent CVD (Frank *et al.*, 2019). These foods have a large potassium content which has a BP-lowering effect (Stamler *et al.*, 1989). Results from a meta-analysis of prospective cohorts looking at the relationship between CVD risk and fruit and vegetable intake showed improved fruit and vegetable intake to have an inverse association with CVD risk (Zurbau *et al.*, 2020). A nutritional transition has followed the urbanization in LMICs, where consumption of processed and high-calorie foods has surpassed that of fruits, vegetables, whole grains and legumes, leading to an alarming rise in HTN and other NCDs (Frank *et al.*, 2019).

2.4.2 HEALTH-SYSTEM RELATED FACTORS

2.4.2.1 ACCESS TO MEDICINE TREATMENT

Appropriate HTN medications are critical in BP control and CVD prevention (Wirtz *et al.*, 2016). A meta-analysis assessing access to CVD medicines in LMICs found that essential BP medicines were only available in 26% of public hospitals (Wirtz *et al.*, 2016). This finding highlights the

scarcity of BP medicines in LMICs (Shabangu & Suleman,2015), and the inequalities in access to appropriate healthcare across socio-economic groups (Jongen *et al.*, 9019). A study by Husain *et al.* (2020), also assessing the accessibility of anti-hypertensive medicines in LMICs reported 30% of hypertensive adults had access to treatment, and only 10% attained BP control. These findings were in keeping with literature that reported inadequate availability and unaffordability of anti-hypertensive medication as a barrier to treatment adherence and BP control (Elnaem *et al.*, 2022). One of the nine global targets towards attaining the 25% reduction in untimely CVD deaths by 2025 is reaching 80% availability of essential NCDs medicines (Salinas & Kones, 2018). The poor access to antihypertensive medicines hinders the achievement of this 25% reduction in mortality (Kishore *et al.*, 2015).

2.5 CONSEQUENCES OF POOR BLOOD PRESSURE CONTROL

CVD, stroke and heart disease and premature death are major, preventable health consequences of uncontrolled HTN globally (Jafar *et al.*, 2018; Dzudie *et al.*, 2018). Uncontrolled HTN also results in chronic kidney disease, according to Tesfaye *et al.* (2017). Heart disease and cerebrovascular disease are the number 1 and 3 causes of death globally (WHO, 2020c). Approximately 49% of ischemic heart disease cases and 62% of cerebrovascular disease cases are attributed to uncontrolled BP (Wirtz *et al.*, 2016). HTN is also one of the leading risk factors for dementia (Zhou *et al.*, 2021).

Strokes and kidney failure require expensive extended treatment and may result in loss of jobs and income due to disability and absenteeism (Xiao *et al.*, 2019). The effect of uncontrolled HTN and CVD on socio-economic development is massive (Skeete *et al.*, 2020). Productive and fruitful years of life are lost due to disability (Cappuccio & Miller, 2016b). The limited health resources in LMICs are usually diverted to tertiary care for the complications of HT, such as kidney failure (Schutte *et al.*, 2021). This additionally worsens the economic impact (Cappuccio & Miller, 2016). Millions are driven into poverty annually as healthcare costs of uncontrolled BP and its complications raise living expenses and drain resources in households, thus impairing poverty reduction (Sorato, Davari & Kebriaeezadeh, 2022; Wang & Zhou, 2020). The impact of

uncontrolled HTN is also more pronounced in disadvantaged groups with further restricted access to adequate healthcare and further worsening health inequalities (WHO, 2021b). Uncontrolled BP thus places a massive strain on the health system and diminishes patients' quality of life and economic status (Skeete *et al.*, 2020).

2.6 INTERVENTIONS TO CONTROL HTN GLOBALLY AND LOCALLY

The World Health Organization supports countries in strengthening the control and prevention of CVD and HTN reduction (Husain *et al.*, 2020). In 2013, the NCDs Global Action Plan 2013-2020 was released for NCD prevention and control to lower the global high BP prevalence by 25% (WHO, 2013). The UN SDG 3.4, aiming at reducing CVD-related mortality by a third, is being supported by The World Heart Federation and The Lancet Commission, which delivered a roadmap to achieving this goal (Gupta & Xavier, 2018). The WHO created guidelines for managing BP specifically for LMICs use (WHO, 2021a). These target the unique problems faced by these LMICs, which include high rates of complications of HTN and scarce resources such as medicines (Nugroho *et al.*, 2022).

The Global Hearts Initiative launched by the United States Centers for Disease Control and Prevention (U.S CDC), WHO and other partners in 2016 includes a package with six modules with approaches to cardiovascular health improvement globally. Since this initiative's inception in 2017, three million hypertensive patients in LMICs have been started on treatment based on standardized HTN control protocols (WHO, 2021a).

Dzudie *et al.* (2018) reported that to lower the HTN burden in Africa, the Pan African Society of Cardiology implemented valuable and simple evidence-based clinical management guidelines and allocated resources for timely HTN detection and effectual treatment. In Eswatini, the government attempted a national approach to lower mortality from NCDs, which includes implementing a combined and comprehensive NCDs service in all community clinics and decentralizing NCDs care to clinics to improve access to care and facilitate the early presentation and management of NCDs patients (Sharp *et al.*, 2020). Interventions targeting the risk factors of poor BP control are critical in Eswatini to improve BP control (Ministry of Health Swaziland Government, 2014).

2.7 SUMMARY

HTN is the biggest risk factor for CVD, leading to mortality and morbidity globally (Boima *et al*., 2020). Literature from different studies worldwide reports that the largest burden of HTN rests on LMICs such as Eswatini, which also have the most suboptimal levels of control (WHO, 2020a). Both innate and environmental factors cause HTN (Vikrant & Tiwari, 2001). Some risk factors for poor control include excessive salt consumption, older age, obesity, a sedentary lifestyle, smoking and excessive alcohol use (Tasnim *et al.*, 2020). BP control is crucial in preventing the alarming number of premature deaths caused by uncontrolled BP (Dzudie *et al.*, 2018). To achieve the SDG of Reducing the prevalence of uncontrolled BP by 25% by 2025 and decreasing the premature deaths from NCDs by a third by 2030, the WHO supports countries by strengthening control and prevention strategies for HTN (Husain *et al.*, 2020; The Lancet, 2020). Health systems orientation as well as public health and clinic-based interventions are necessary to increase HTN control and prevent the abysmal consequences of this epidemic (Masilela *et al.*, 2020).

CHAPTER 3. METHODOLOGY

3.1 INTRODUCTION

This chapter outlines the study design used in the research and describes the study's setting and the study population. The sample size calculation is described, as well as the sampling method used. The data collection and analysis is then outlined, followed by a description of how validity, reliability and generalizability were ensured. The ethical considerations conclude the chapter**.**

3.2 STUDY DESIGN

An observational cross-sectional descriptive survey study was used for this research because this study design observes and describes the state of things at a definite point in time (Zheng, 2015). The study aimed to determine the current prevalence of uncontrolled BP in hypertensive patients on treatment in Manzini, Eswatini. This design allowed the assessment of the prevalence of uncontrolled HTN and simultaneously assessed many exposures and the outcome of the study participants; the researcher did not follow up with participants. The cross-sectional study also allowed the researcher to calculate the odds ratios. Limited time was available to do the research, and cross-sectional studies can be done in a short time (Setia, 2016).

The study's objectives included the description of the demographic characteristics of hypertensive patients with uncontrolled BP on treatment and the determination of risk factors associated with poor BP control in hypertensive patients on treatment in Manzini, Eswatini. This design allowed the researcher to answer the research question and meet the study objectives by observing a population of hypertensive patients on treatment, comparing the controlled and uncontrolled patient groups and identifying statistically significant exposure variables in the analysis that were associated with the outcome of poor control in the uncontrolled BP patients (Hennekens & Buring, 1987). Cross-sectional studies are also very low-cost, making them ideal for the researcher's resource-limited situation (Levin, 2006).

3.3 STUDY SETTING

The study was set at RFM hospital, the only regional and referral hospital in the Manzini region of Eswatini (formerly Swaziland). The hospital manages roughly 200 000 patients yearly, and 40% of patients seen are NCDS patients (Shabangu & Suleman, 2015). Manzini is the most populous of the four regions in the country, with 31% of the country's population (WHO, 2019b). Eswatini has a population of about 1.4 million (Dlamini *et al.*, 2019) and is a LMIC in southern Africa, where high BP cases and the factors contributing to HTN and other NCDs are steadily rising (Tisdale *et al.*, 2021; Sharp *et al.*, 2020). An estimated 42.5% of the Eswatini population has raised BP (Ministry of Health Swaziland Government, 2014). The majority of the country's hypertensive patients are managed in hospitals like RFM rather than in primary health care clinics (Sharp *et al.*, 2020).

3.4 STUDY POPULATION

The study population included hypertensive patients aged 40 years and older living in Manzini. These were patients on anti-hypertensive drug treatment at the hospital for at least six months prior to data collection. This limited age range was influenced by the observation that the vast majority of hypertensive patients on treatment in the study setting were aged 40 and above. The exclusion criteria were patients presenting for the first time, pregnant women, severely ill patients, mentally disabled patients, patients with secondary HTN and patients who have not given informed consent.

3.5 SAMPLING AND SAMPLE SIZE

A probability sample was used to achieve representativeness, make all study population members equally likely to be in the sample and allow the results to be generalized. The sampling method was systematic. Patients were assigned numbers in order of arrival. Sampling started with every third patient coming into the clinic that day. Every third patient afterwards was invited to participate, was told the purpose of the study, and provided informed consent. When a chosen patient declined to participate, the next one in line was requested to participate. The sample size was calculated using this sample size formula for a descriptive study $\underline{\boldsymbol{n = Z^2pq/e^2}}$ (Kasiulevičius,

Šapoka & Filipavičiūtė, 2006). In the formula, *n* is the minimum number of participants, Z is the test statistic, the level of significance corresponding to the 95% confidence interval =1.96, *p* is the assumed population with the desired attribute, and according to literature, only a third of HT patients are controlled so 33% (0.33) are uncontrolled (Kumara *et al.*, 2013; Jafar *et al.*, 2018). The *q* is 1-p (=67% or 0.67), and *e* is the desired level of precision or sampling error which is the range where the true population value is estimated to lie at = 0.05 (5%). Therefore, n = ((1.96) (1.96) (0.67) (0.33))/ ((0.05) (0.05)) =339.8 (Naing, 2003).

3.6 DATA COLLECTION

Randomly selected participants meeting the inclusion criteria were requested to participate in the study after their informed consent was obtained. Participants were ensured confidentiality, and the purpose of the study was explained to them. Questions were asked of participants in a face-to-face interview, and the researcher administered the questionnaire. This made the data collection process quicker and reduced errors and incomplete data. All data were collected in the same way and in the same confidential quiet room to maintain consistency.

COVID-19 prevention regulations were adhered to by firstly screening all participants for symptoms and taking participants' temperatures to identify possibly infected patients and refer them for testing and treatment. Data was collected in a well-ventilated room with only one participant and the researcher inside at a time, and both wore protective masks. The hands of both participant and researcher were sanitized before data collection, and the equipment for measuring BP, weight and height were sanitized after each participant. The researcher washed hands with soap and water after each participant and disinfected all surfaces. A social distance of 1.5 meters was maintained during interviews (Ağalar & Öztürk Engin, 2020).

A printed, interviewer-administered questionnaire (Appendix 1), was adapted from the Eswatini WHO and Ministry of Health 2014 Stepwise approach to surveillance survey (STEPS) and translated to SiSwati. The questionnaire was organized into sections collecting data on sociodemographic variables, treatment and medication adherence variables, clinical variables, lifestyle and behavioural variables, psychosocial variables, health literacy variables, provider-

related variables and health system-related variables, with a total of 23 variables (Ministry of Health Swaziland Government, 2014).

To quantify physical activity, the International Physical Activity Questionnaire (IPAQ), was used. This allowed the classification of participants into 1) inactive (less than 30 minutes per week of moderate physical activity (MVPA) such as carrying a bucket of water and walking for recreation or vigorous physical activity such as digging or lifting heavy weights), 2) insufficiently active (30 to149 minutes per week of MVPA) and 3) sufficiently active (150 or more minutes per week MVPA) (Stelmach, 2018). The CAGE questionnaire was utilized to measure alcohol abuse. This tool consists of four questions where two or more positive answers suggest alcoholism (CAGE positive) (Pang *et al.*, 2020). The Hill-bone compliance scale, adopted from neighboring South Africa, measuring treatment compliance was also used (Faulkner, Cohn & Remington, 2006). This consists of 10 questions with 6 Likert scale answers, giving a total score of 60. A score of 75% and above was classified as good compliance, and a score below 75% was classified as poor compliance (Lambert *et al.*, 2006).

Health literacy on HTN was measured by asking participants two multiple-choice questions to assess their knowledge of the risk factors for BP control and the complications of HTN adapted from the literature reviewed. A score of 0 was graded poor, a score of one was graded average, and a score of two graded as good. Household wealth was measured by the amount of Emalangeni earned in the household last year (1 Swazi Lilangeni equals 0.058 United States Dollars). Participants were categorized into six groups according to yearly household earnings.

The questionnaire was pre-tested for improved fluency, feasibility and for error identification and correction. The questionnaire had clearly worded, pre-determined, closed-ended, fixed-response questions, multiple-choice questions and categories of answers for scoring so that responses could be grouped for ease of coding and data analysis in numerical form (Kabir, 2016).

Blood pressures in mm Hg were measured using a manual mercury sphygmomanometer (checked daily) in a standardized way for all participants. For 30 minutes before measurement, participants were asked not to have tea, coffee or smoke and to sit still for an accurate reading. The average of three BP measurements taken 3 minutes apart was used (Jafar *et al.*, 2018). One stadiometer was used to measure all participants' heights to the nearest 0.1 cm from the heel to the highest point of the head. The participants were positioned to stand upright, barefoot, with their feet parallel and

facing forward. The same weighing scale was used to measure all participants' body weight to the nearest 0.1kg; then, their BMIs were calculated using the formula weight in kilograms divided by height in meters squared. The scale was pre-calibrated daily. All collected data was written on each participant's questionnaire for later transfer to an excel spreadsheet.

3.7 DATA ANALYSIS

Data were checked for soundness and completeness, coded and entered into a Microsoft Excel spreadsheet. Data were then exported to Stata 13.1. software package for analysis. Participants were described by sociodemographic characteristics. The univariate analysis described the distribution of categorical variables such as sex using percentages and frequencies. The primary outcome or dependent variable was categorized into controlled and uncontrolled BP (WHO, 2019). Continuous variables such as age were summarized using descriptive statistics mean (standard deviation) and median (interquartile range) with a 95% confidence interval (Bonita, Beaglehole & Kjellstrom, 2006). To test the strength of the association between the outcome and exposure variables, bivariate analysis was conducted using the Chi-square test. A T-test was utilized to compare averages between the two groups (Anderson & Wilfert, 1999). Logistic regression was performed to identify significant variables associated with poor blood pressure control. Odds ratios with a 95% confidence interval were used to show associations between the dependent and independent variables. A p-value less than 0.05 was considered statistically significant (Degli Esposti *et al.*, 2004).

3.8 VALIDITY

Random sampling was used, and only participants meeting the inclusion criteria were selected to participate in the study. In data collection, the same standardized questionnaire was used and it contained previously validated tools used in previous surveys. The researcher used a standard working procedure to collect data from all the participants to minimize measurement bias (Baigent *et al.*, 2008). An appropriately large sample size was used, and the questionnaire was translated into the local SiSwati language (Collins, 2003). The questionnaire was straightforward in wording for ease of understanding and limited ambiguity (Del Greco, Walop & McCarthy, 1987).

The questionnaire approved by the Eswatini National Health and Human Research Review Board (NHHRRB) for ease of understanding in the local Siswati language, lack of ambiguity and for complete coverage of all the risk factors that should be measured without lacking important questions. The assessor was trained and tested on the data collection tool, on the standard procedure and on remaining neutral (Filip, 2003). Characteristics of a cross-sectional study design were followed strictly, and the correct methodology and data analysis were used to ensure validity scientifically (Bonita, Beaglehole and Kjellstrom, 2006). Errors in collected data and missing data were minimized by only the researcher filling in all data into the questionnaire and Excel (Baigent *et al.*, 2008).

3.9 RELIABILITY OF THE STUDY

A medical practitioner trained in the data collection tool and methods verified the data and did daily quality checks for consistency (Del Greco, Walop & McCarthy, 1987). Data were collected in the same calm, private environment (room) for all participants in the mornings (Appelbaum *et al.*, 2019). The same questionnaire was used to interview participants who took part in a pilot study twice over three months. This was done to ensure there were no deviations from the initial responses.

3.10 GENERALIZABILITY OF THE STUDY

Random sampling was used to provide a representative sample. The results obtained can therefore be generalized to the Eswatini population.

3.11 ETHICAL CONSIDERATIONS

The research proposal was submitted to The Higher Degrees Committee of the University of the Western Cape (UWC). Ethical clearance was obtained from the Biomedical Research Committee (Reference number: BM21/10/33) (Appendix 4). The Ministry of Health Eswatini's National Health and Human Research Review Board (NHHRRB) granted clearance to conduct the research in the country. (Reference number: EHHRRB112/2021) (Appendix 6)

Written permission to conduct research at the RFM hospital was granted by the hospital administrator (Appendix 5). Although the researcher was previously an employee at the institution where the research was conducted, the researcher declares that there is no conflict of interest. The importance, benefits and contributions of the study were discussed with participants, and an information sheet was provided (Appendix 3).

Written informed consent (Appendix 2) was obtained from each study participant after their participation in the study was requested. The study purpose, aims and objectives were clearly explained, and the confidentiality of participants' personal information was guaranteed. Instead of using their names, participants were all assigned a number. Questionnaires were securely transported by the researcher from the study site and kept locked up in the researcher's office for the duration of the research process. They will be destroyed after five years. Electronic data was password protected on the researcher's computer. Participants were told that they could refuse to participate or withdraw at any time as participation was strictly voluntary and that they would not be victimized or disadvantaged in any way if they did refuse. Questions on factors such as alcohol use may have caused some psychological discomfort in some participants. Access to emotional support was ensured by the researcher, who made arrangements to refer participants who required support to the psychologist in the hospital.

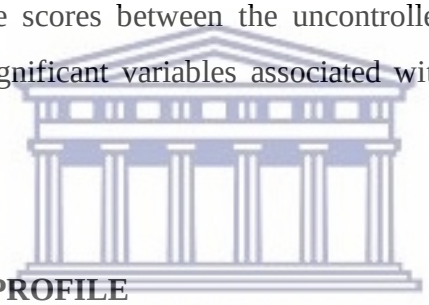
3.12 SUMMARY

The study was a cross-sectional descriptive survey conducted in the only referral hospital in the most populous region of Eswatini, on hypertensive patients on treatment meeting the inclusion criteria. A probability sample was used after obtaining informed consent from participants, and a questionnaire adopted from previously validated measurement tools was used to conduct face-to-face interviews to collect data. BP, weight and height were also measured. Stata 13.1 was used for data analysis. Approval to conduct research was obtained from the relevant bodies.

CHAPTER 4. RESULTS

4.1 INTRODUCTION

This chapter reports the results of the study. The descriptive socio-demographic characteristics and lifestyle habits of the participants are described. Shapiro–Wilk test of normality is used to test continuous data. Continuous data are described using means (standard deviation) and median (interquartile range). Categorical data are presented using frequencies (percentages). The prevalence of uncontrolled BP in hypertensive patients on treatment in Manzini, Eswatini, is presented. A chi-squared test analysis was used to identify statistically significant associations between the uncontrolled BP and the controlled BP groups for each of the variables assessed. Mann-Whitney test is used for continuous variables. T-test compared the average age, BMI, number of drugs and adherence scores between the uncontrolled and controlled BP groups. Logistic regression identified significant variables associated with poor BP control. Statistical significance was at $p < 0.05$.



4.2 SOCIODEMOGRAPHIC PROFILE

A total of 324 (95.3% response rate) hypertensive patients agreed to participate in the study against a target of 340 participants. Participants who could not answer all the questions in the questionnaire were excluded from the study. Socio-demographic characteristics assessed were age, age groups, the distance of residence to the hospital, gender, education, household wealth and marital status. The majority of participants were females, 252 (77.78%), and the median (IQR) age of the participants was 62 (53; 68) years. More than half of the participants, 171 (52.78%), lived more than 10kilometers from the hospital. Only 30 (9.26%) participants had no formal education, and 13 (4.01%) had a household income of less than E500 a year.

Table 1 is a summary of the sociodemographic findings.

TABLE 1: SOCIODEMOGRAPHIC PROFILE OF PARTICIPANTS

Demographic Variable	Frequency (%)
Gender	
Female	252 (77.78)
Male	72 (22.22)
Age	
40-59 years	143 (44.1)
60 and above years	189 (55.9)
Level of education	
No education	30 (9.26)
Primary school	106 (32.72)
High school	145 (44.75)
College/University	43 (13.27)
Marital status	
Never married	55 (16.98)
Married	137 (42.28)
Separated	18 (5.56)
Divorced	5 (1.54)
Widowed	97 (29.94)
Cohabiting	12 (3.70)
Household wealth (Earnings in the last year)	
≤E 500	13 (4.01)
>E 500 - ≤ E1000	9 (2.78)
>E1000 - ≤E2000	18 (5.56)
>E2000 - ≤E3000	16 (4.94)
>E3000	197 (60.80)
Unsure	71 (21.91)
Residence/Distance to hospital	
Within 10km of the hospital	153 (47.22)
Beyond 10km of the hospital	171 (52.78)

4.3 ANTHROPOMETRIC PROFILE

Participants' weight and height were used to calculate their Body Mass Index (BMI). The median (IQR) BMI was 31.45(27.70; 36.35) kg/m^2. Only 32 (9.88%) participants had normal BMI. The majority, 290 (89.51%) participants, were either overweight, obese or morbidly obese. These findings are presented in table 2 below.

TABLE 2: PARTICIPANT'S BODY MASS INDEX

BMI categories (BMI)	Frequency (%)
Underweight (<18.5)	2 (0.62)
Normal weight (18.5-24.9)	32 (9.88)
Overweight (25-29.9)	97 (29.94)
Obese (30-34.9)	94 (29.01)
Morbidly obese (35 and above)	99 (30.56)

4.4 CLINICAL PROFILE OF PARTICIPANTS

The clinical characteristics assessed were the presence of DM, the presence of other illnesses or comorbidities besides DM and HTN, and the patient's literacy on the risk factors of poor BP control and the complications of HTN. Diabetes mellitus was a common co-morbid condition among the study participants, with 131 (40.43%) participants confirming that they had DM. Overall, 218 (67.28%) participants had good literacy on risk factors of poor BP control and its complications. These findings are summarized in table 3 below.

TABLE 3: CLINICAL PROFILE OF PARTICIPANTS

Clinical variable	Frequency (%)
DM	
Yes	131 (40.43)
No	193 (59.57)
On treatment for other illnesses besides DM and HTN	
Yes	109 (33.64)
No	215 (66.36)
Literacy on risk factors of poor BP control and complications	
Poor (0/2)	32 (9.88)
Average (1/2)	74 (22.84
Good (2/2)	218 (67.28)

4.5 LIFESTYLE PROFILE OF PARTICIPANTS

Participants' lifestyle characteristics assessed were the presence of daily social support in their lives, whether or not they were smokers, physical activity levels, alcohol dependency/CAGE status and whether or not they add additional salt to prepared food. More than half, 220 (67.90%), reported sufficient physical activity levels equivalent to doing 150 or more minutes per week of moderate or vigorous-intensity physical activity (MVPA). Only 24 (7.41%) participants were CAGE positive, and 80 (24.69%) put additional salt into prepared food. These findings are summarized in table 4 below.

TABLE 4: LIFESTYLE PROFILE OF PARTICIPANTS

Variable	Frequency (%)
Social support	
Yes	318 (98.15)
No	6 (1.85)
Smoker	
No	310 (95.68)
Yes	14 (4.32)
Physical activity levels	
Unsure	3 (0.93)
Inactive	38 (11.73)
Insufficient	63 (19.44)
Sufficient	220 (67.90)
CAGE/ alcohol dependency	
Negative	300 (92.59)
Positive	24 (7.41)
Adding additional salt to prepared food	
Never	244 (75.31)
Yes	80 (24.69)

4.6 HEALTH SYSTEM-RELATED FACTORS

Health system-related factors assessed were the availability of all participants' HTN medicines at the hospital, whether participants had received advice on smoking, alcohol use, diet and exercise

from their health care provider in the hospital in the last year, and whether or not they are satisfied with the care they received at the hospital when they come for BP management. The availability of BP medicines was mainly erratic, with 216 (66.67%) participants reporting that they sometimes received all their BP medicines. More than half of the participants, 193 (59.57%), reported receiving advice from their health care provider on smoking, alcohol use, diet and exercise in the last year. The majority, 307 (94.75%), were satisfied with the care received from their nurse/doctor at the facility when they attended BP management. Findings are summarized in table 5 below

TABLE 5: HEALTH SYSTEM-RELATED FACTORS

Variable	Frequency (%)
Availability of HTN medicines at the hospital	
All the time	43 (13.27)
Sometimes	216 (66.67)
Never	65 (20.06)
Advice on smoking, alcohol use, diet and exercise from a healthcare provider in the last year	
Yes	193 (59.57)
No	131 (40.43)
Satisfaction with care received from doctor/nurse providing BP care at the hospital	
Yes	307 (94.75)
No	17 (5.25)

4.7 BP TREATMENT AND ADHERENCE TO BP MANAGEMENT

With respect to BP medication, the median [IQR] number of drugs taken was 2 [1; 3]. Slightly more than half of the participants, 166 (51.23%), were on a once daily medication regimen. Adherence to BP medication was also assessed, and a large proportion of participants reported that they never forget to take their BP medication and never choose to skip their medication 212 (65.43%) and 288 (88.89%), respectively. The total adherence was calculated by taking the sum

of the scores for each of the ten adherence questions. The median (IQR) score was 56 (54; 58). A percentage score was calculated to determine overall adherence and a cut-off value of 75% was used to signify good adherence, and less than 75% was poor adherence. Adherence was very good, with 318 (98.15%) participants falling into the good adherence category. Table 6 is a summary of these findings.

TABLE 6: BP TREATMENT AND ADHERENCE TO BP MANAGEMENT

Variable	Frequency (%)
Drug dosing	
Once daily	166 (51.23)
More than once daily	158 (48.77)
Adherence	
Good (>75%)	318 (98.15)
Poor (< 75%)	6 (1.85)
Forgetting to take BP medicine	
None of the time	212 (65.43)
Some of the time	107 (33.02)
Most of the time	1 (0.31)
Don't know	4 (1.23)
Deciding not to take BP medicine	
None of the time	288 (88.89)
Some of the time	22 (6.79)
Most of the time	1 (0.31)
All the time	2 (0.62)
None Applicable (N/A)	1 (0.31)

Don’t know	10 (3.09)

Variable	**Frequency (%)**
Frequency of eating salty food	
None of the time	46 (14.20)
Some of the time	135 (41.67)
Most of the time	23 (7.10)
All the time	108 (33.33)
None Applicable (N/A)	2 (0.62)
Don’t know	10 (3.09)
Missing scheduled appointments for BP management	
None of the time	195 (60.19)
Some of the time	119 (36.73)
Most of the time	5 (1.54)
All the time	2 (0.62)
None Applicable (N/A)	1 (0.31)
Don’t know	2 (0.62)
Running out of BP medicine	
None of the time	194 (59.88)
Some of the time	93 (28.70)
Most of the time	20 (6.17)
All the time	14 (4.32)
None Applicable (N/A)	2 (0.62)

Don’t know	1 (0.31)

Variable	**Frequency (%)**
Skipping BP medicine 1-3 days before attending the clinic	
None of the time	265 (81.79)
Some of the time	47 (14.51)
Most of the time	4 (1.23)
All the time	3 (0.93)
None Applicable (N/A)	1 (0.31)
Don’t know	4 (1.23)
Skipping BP medicine when feeling better	
None of the time	302 (93.21)
Some of the time	16 (4.94)
Most of the time	1 (0.31)
All the time	3 (0.93)
Don’t know	2 (0.62)
Skipping BP medicine when feeling ill	
None of the time	307 (94.75)
Some of the time	12 (3.70)
All the time	2 (0.62)
Don’t know	3 (0.93)

Variable	**Frequency (%)**
Taking other people’s BP medicine	

None of the time	313 (96.60)
Some of the time	8 (2.475)
None Applicable (N/A)	1 (0.31)
Don't know	2(0.62)
Skipping BP medicine when pre occupied	
None of the time	261 (80.56)
Some of the time	45 (13.89)
Most of the time	4 (1.23)
All the time	2 (0.62)
None Applicable (N/A)	2 (0.62)
Don't know	10 (3.09)

4.8 PREVALENCE OF UNCONTROLLED BP

Objective 1 is to determine the prevalence of uncontrolled BP in hypertensive patients on treatment in Manzini, Eswatini. More than half of the participants182 (56.17%) had uncontrolled HTN. Only 142 (43.83%) of the participants had controlled BP.

4. 9 RELATIONSHIP BETWEEN BP CONTROL AND EXPOSURE VARIABLES.

4.9.1 SOCIODEMOGRAPHIC CHARACTERISTICS OF UNCONTROLLED HYPERTENSIVE PATIENTS ON TREATMENT IN MANZINI, ESWATINI.

Objective 2 is to describe the sociodemographic characteristics of hypertensive patients with uncontrolled BP on treatment in Manzini, Eswatini. In order to achieve this objective, a specific analysis targeting 182 (56.17%) participants with poorly controlled BP was conducted, and this was compared to the 142 patients who had controlled HTN. The median age of participants with uncontrolled BP was 62.6 years (IQR 54;70), and 104 (57.14%) participants with uncontrolled

BP were 60 and above. More than half of the participants, 94 (51.65%), of the uncontrolled BP participants resided beyond 10 kilometers from the hospital, and 134 (73.63%) were female. Regarding education, only 20 (10.99%) had no formal education. Only 7 (3.85%) reported earning less than E500 ($29) in the last year, while 118 (64.84%) reported earning more than E3000 ($174).

A chi-square test was performed to test for significant associations between BP control and the demographic variables. The Wilcoxon rank-sum (Mann-Whitney) test was used for continuous variables. In most of the variables, there were no significant relationships with BP control. Significant relationships to BP control were noted between the participant's gender, with a larger proportion of males being uncontrolled (Chi-square = 4.14; p = 0.04) and level of education, with a larger proportion of the college educated participants and the participants with no formal education being in the uncontrolled BP group (Chi-square =18.33; p = 0.00). A summary of these findings is presented in table 7 below.

TABLE 7: SOCIODEMOGRAPHIC CHARACTERISTICS OF CONTROLLED AND UNCONTROLLED HYPERTENSIVE PATIENTS ON TREATMENT

Variable	Uncontrolled HT (n =182) Frequency (%)	Controlled HT (n = 142) Frequency (%)	Chi-square	p-value
Gender				
Female	134 (73.63)	118 (83.10)	4.14	0.04
Male	48 (26.37)	24 (16.90)		
Age(Median [IQR])years	62.5 [54; 70]	61.0 [53, 67]	*z= -1.39	0.17
Age range				
40 – 59 years	78 (42.86)	65 (45.77)	0.28	0.6
60 years and above	104 (57.14)	77 (54.23)		
Level of Education				
No education	20 (10.99)	10 (7.04)	18.33	0.00
Primary school	52 (28.57)	54 (38.03)		
High school	74 (40.66)	71 (50.00)		

College/University	36 (19.78)	7 (4.93)		

Variable	**Uncontrolled HT (n=182) Frequency (%)**	**Controlled HT (n=142) Frequency (%)**	**Chi-square**	**p-value**
Marital status				
Never married	33 (18.13)	22 (15.49)	7.17	0.21
Married	85 (46.70)	52 (36.62)		
Separated	10 (5.49)	8 (5.63)		
Divorced	3 (1.65)	2 (1.41)		
Widowed	47 (25.82)	50 (35.21)		
Cohabiting	4 (2.20)	8 (5.63)		
Household wealth (Earnings in the last year)			4.19	0.52
≤E 500	7 (3.85)	6 (4.23)		
>E 500 - ≤ E1000	5 (2.75)	4 (2.82)		
>E1000 - ≤E2000	7 (3.85)	11 (7.75)		
>E2000 - ≤E3000	9 (4.95)	7 (4.93)		
>E3000	118 (64.84)	79 (55.63)		
Unsure	36 (19.78)	35 (24.65)		
Residence/ Distance to hospital			0.21	0.65
Within 10km	88 (48.35)	65 (45.77)		
Beyond 10km	94 (51.65)	77 (54.23)		

*z is reported for continuous variables in place of chi-square

4.9.2 ASSOCIATION BETWEEN BP CONTROL AND BMI OF HYPERTENSIVE PATIENTS ON TREATMENT IN MANZINI, ESWATINI.

There was no significant association between BMI and BP control. Table 8 below is a summary of these findings.

TABLE 8: RELATIONSHIP BETWEEN BMI AND BP CONTROL

Variable	Uncontrolled HT (n = 182) Frequency (%)	Controlled HT (n = 142) Frequency (%)	Chi-square	p-value
BMI (Median [IQR]) kg/m^2	31.40 (28.30; 37.60)	31.50 (26.90;35.80)	Z= -0.96	0.36
BMI categories				
Normal weight (18.5-24.9)	15 (8.24)	17 (11.97)	2.22	0.69
Overweight (25-29.9)	57 (31.32)	40 (28.17)		
Obese (30-34.9)	50 (27.47)	44 (30.99)		
Morbid obesity (35 and above)	59 (32.42)	40 (28.17)		
Underweight (<18.5)	1 (0.55)	1 (0.70)		

4.9.3 ASSOCIATION BETWEEN BP CONTROL AND CLINICAL CHARACTERISTICS OF HYPERTENSIVE PATIENTS ON TREATMENT IN MANZINI, ESWATINI.

There was no significant association between being diabetic, being on treatment for other illnesses and literacy on the risk factors of poor BP control and complications of HTN and BP control. Table 9 below is a summary of these findings.

TABLE 9: RELATIONSHIP BETWEEN CLINICAL VARIABLES AND BP CONTROL

Variable		Uncontrolled HT (n=182) frequency (%)	Controlled HT (n=142) Frequency (%)	Chi-square	p-value
Diabetes	**Yes**	81(44.51%)	50 (35.21%)	2.86	0.09
	No	101 (55.49%)	92 (64.79%)		
On treatment for other illnesses besides DM and HT				0.03	0.86
Yes		62 (34.07%)	47 (33.10%)		
No		120 (65.93%)	95 (66.90%)		
Literacy on risk factors of poor BP control and complications				2.76	0.25
Poor		22 (12.09%)	10 (7.04%)		
Average		38 (20.88%)	36 (25.35%)		
Good		122 (67.03%)	96 (67.61%)		

4.9.4 ASSOCIATION BETWEEN BP CONTROL AND LIFESTYLE CHARACTERISTICS OF HYPERTENSIVE PATIENTS ON TREATMENT IN MANZINI, ESWATINI

A significant association was identified between activity levels and BP control (p = 0.03). Table 10 below is a summary of these findings.

TABLE 10: RELATIONSHIP BETWEEN LIFESTYLE VARIABLES AND BP CONTROL

Variable	Uncontrolled HT (n=182) frequency (%)	Controlled HT (n=142) Frequency (%)	Chi-square	p-value
Smoker			0.23	0.63
No	175 (96.15)	135 (95.07)		
Yes	7 (3.85)	7 (4.93)		
Physical activity levels			9.26	0.03
Unsure	2 (1.10)	1 (0.70)		
Inactive	25 (13.74)	13 (9.15)		
Insufficient	44 (24.18)	19 (13.38)		
Sufficient	111 (60.99)	109 (76.76)		
CAGE/ alcohol dependency			0.42	0.52
Negative	167 (91.76)	133 (93.66)		
Positive	15 (8.24)	9 (6.34)		
Adding additional salt to prepared food			0.06	0.81
Never	138 (75.82)	106 (74.65)		
Yes	44 (24.18)	36 (25.35)		

4.9.5 AN ASSOCIATION BETWEEN BP CONTROL AND HEALTH SYSTEM RELATED FACTORS

There was no significant association between reported BP medicine availability and receiving advice from a health care provider in the last year on smoking, alcohol use, diet and exercise and BP control. No significant relationship was noted in satisfaction with care received from the doctor/nurse at the hospital providing BP care and BP control. Table 11 below is a summary of these findings.

TABLE 11: RELATIONSHIP BETWEEN BP CONTROL AND HEALTH SYSTEM VARIABLES

Variable	Uncontrolled HT (n=182) Frequency (%)	Controlled HT (n=142) Frequency (%)	Chi-square	p-value
Availability of HT medicines at the hospital			1.26	0.53
All the time	27 (14.84)	16 (11.27)		
Sometimes	117 (64.29)	99 (69.72)		
Never	38 (20.88)	27 (19.01)		
Health education on smoking, alcohol use, diet and exercise from health care providers in the last year			1.10	0.30
Yes	113 (62.09)	80 (56.34)		
No	69 (37.91)	62 (43.66)		
Satisfaction with care from				

doctor/nurse providing BP care at the hospital				
Yes	172 (94.51)	135 (95.07)	0.05	0.82
No	10 (5.49)	7 (4.93)		

4.9.6 ASSOCIATION BETWEEN BP CONTROL AND BP TREATMENT AND ADHERENCE VARIABLES

With respect to adherence measures, significant relationships were noted between forgetting to take BP medicines (p=0.04) and skipping BP medicines 1-3 days before attending clinic (p = 0.01) and BP control. A statistically significant relationship was also found between adherence scores and BP control. (chi-square = 7.84, p = 0.005). These findings are summarized in table 12 below.

TABLE 12: AN ASSOCIATION BETWEEN BP CONTROL AND BP TREATMENT AND ADHERENCE VARIABLES.

Variable	Uncontrolled HT (n = 182) Frequency (%)	Controlled HT (n= 142) Frequency (%)	Chi-square	p-value
Number of drugs taken for BP (Median [IQR])	2 (2; 3)	2 (1; 3)	Z= -0.71	0.48
Adherence score Median (IQR)	56 (54; 58)	57 (55; 58)	7.84	0.05
Drug dosing			0.53	0.47
Once daily	90 (49.45)	76 (53.52)		
More than once daily	92 (50.55)	66 (46.48)		
Forgetting to take BP medicine			8.21	0.04
None of the time	114 (62.64%)	98 (69.01%)		
Some of the time	67 (36.81)	40 (28.17%)		
Most of the time	1 (0.55%)	0 (0.00%)		
Don't know	0 (0.0%)	4 (2.82%)		

Deciding not to take BP medicine			6.21	0.29
None of the time	163 (89.56%)	125 (88.03%)		
Some of the time	14 (7.69%)	8 (5.63%)		
Most of the time	1 (0.55%)	0 (0.00%)		
All the time	0 (0.00%)	2 (1.41%)		
Not applicable (N/A)	0(0.00%)	1 (0.70%)		
Don't know	4 (2.20%)	6(4.23%)		
Variable	**Uncontrolled HT (n=182) Frequency (%)**	**Controlled HT (n=142) Frequency (%)**	**Chi-square**	**p-value**
Frequency of eating salty food			6.01	0.31
None of the time	22 (12.09%)	24 (16.90%)		
Some of the time	79 (43.41%)	56 (39.44%)		
Most of the time	16 (8.79%)	7 (4.935)		
All the time	60 (32.97%)	48 (33.80%)		
Not applicable (N/A)	0 (0.00%)	2 (1.41%)		
Don't know	5 (2.75%)	5 (3.52%)		
Missing scheduled appointments for BP management			4.55	0.47
None of the time	110(60.44%)	85 (59.86%)		
Some of the time	65 (35.71%)	54 (38.03%)		
Most of the time	2 (1.10%)	3 (2.11%)		
All the time	2 (1.10%)	0 (0.00%)		

Not applicable (N/A)	1 (0.55%)	0 (0.00%)		
Don't know	2 (1.10%)	0 (0.00%)		
Running out of BP medicines			6.07	0.30
None of the time	105 57.69%)	89 (62.68%)		
Some of the time	55 (30.22%)	38 (62.68)		
Most of the time	14 (7.69)	6 (4.23)		
All the time	8 (4.40%)	6 (4.23)		
Not applicable (N/A)	0 (0.00%)	2 (1.41%)		
Don't know	0 (0.00%)	1 (0.70%)		
Skipping of BP medicines 1-3 days before attending clinic			15.97	0.01
None of the time	142 (78.02%)	123 (86.62%)		
Some of the time	36 (19.78%)	11 (7.75%)		
Most of the time	3 (1.65%)	1 (0.70%)		
All the time	0 (0.00%)	3 (2.11%)		
Not applicable (N/A)	0 (0.00%)	1 (0.70%)		
Don't know	1 (0.55%)	3 (2.11%)		
Skipping BP medicines when feeling better			2.51	0.64
None of the time	168 (92.31)	134 (94.73%)		
Some of the time	11 (6.04%)	5 (3.525)		
Most of the time	4 (0.55%)	0 (0.00%)		
All the time	1 (0.55%)	2 (1.41%)		
Don't know	1 (0.55%)	1 (0.70%)		

Variable	Uncontrolled HT (n=182) Frequency (%)	Controlled HT (n=142) Frequency (%)	Chi-square	p-value
Skipping medicines when feeling sick			3.47	0.33
None of the time	175 (96.15%)	6 (1.32%)		
Some of the time	6 (3.30%)	6 (4.23%)		
All the time	0 (0.00%)	2 (1.41%)		
Don't know	1 (0.55%)	2 (1.41%)		
Taking someone else's BP medicine			0.95	0.81
None of the time	175 (96.15%)	138 (97.18%)		
Some of the time	5 (2.75%)	3 (2.11%)		
Not applicable (N/A)	1 (0.55%)	0 (0.00%)		
Don't know	1 (0.55%)	1(0.70%)		
Skipping BP medicines when pre occupied			4.03	0.54
None of the time	145 (79.67%)	116 (81.69%)		
Some of the time	28 (15.38%)	17 (11.97%)		
Most of the time	3 (1.65%)	1 (0.70%)		
All the time	0 (0.00%)	2 (1.41%)		
Not applicable (N/A)	1 (0.55%)	1 (0.70%)		
Don't know	5 (2.75%)	5 (3.52%)		

4.10 RISK FACTORS ASSOCIATED WITH POOR BP CONTROL IN HYPERTENSIVE PATIENTS ON TREATMENT IN MANZINI, ESWATINI

Objective three determined the risk factors associated with poor BP control in hypertensive patients on treatment in Manzini, Eswatini. Logistic regression was used to identify risk factors associated with poor BP control in hypertensive patients on treatment in Manzini, Eswatini. The outcome variable was controlled BP which was coded as 0 (zero) when controlled and 1 (one) when uncontrolled. A univariate analysis was run with all the sociodemographic and clinical variables.

The odds of uncontrolled HTN were increased by 1% for a year increase in age (not statistically significant, p = 0.23). After categorizing age, the odds of uncontrolled HTN were found to be 13% higher amongst those patients aged 60 and above as compared to those patients in the 40 to 59 age group (not statistically significant, p = 0.60). The odds of uncontrolled HTN were 76% higher in males than females, and this finding was statistically significant (p = 0.04). Results from the univariate analysis are presented in table 13 below.

TABLE 13: UNIVARIATE LOGISTIC REGRESSION ANALYSIS OF FACTORS ASSOCIATED WITH POOR BP CONTROL IN HYPERTENSIVE PATIENTS ON TREATMENT

Variable	Odds Ratio	95% CI	p-value
Gender			
Female (Ref)	1.00	-	-
Male	1.76	1.02; 3.05	*0.04
Age	1.01	0.99; 1.03	0.23
Age range			
40-59yrs(Ref)	1.00	-	-
≥60yrs	1.13	0.72; 1.75	0.60
Level of education			
No education (Ref)	1.00	-	-
Primary school	0.48	0.21; 1.13	0.09
High school	0.52	0.23; 1.19	0.12

College/University	2.57	0.85; 7.80	0.10
Variable	**Odds Ratio**	**95% CI**	**p-value**
Marital status			
Never married (Ref)	1.00	-	-
Married	1.09	0.57; 2.07	0.79
Separated	0.83	0.28; 2.44	0.74
Divorced	1.00	0.15; 6.48	1.00
Widowed	0.63	0.32; 1.23	0.17
Cohabiting	0.33	0.09; 1.24	0.10
Household wealth (Earnings in the last year)			
≤E 500 (Ref)	1.00	-	-
>E 500 - ≤ E1000	1.07	0.19; 5.91	0.94
>E1000 - ≤E2000	0.55	0.13; 2.31	0.41
>E2000 - ≤E3000	1.10	0.25; 4.80	0.90
>E3000	1.28	0.41; 3.95	0.67
Unsure	0.88	0.27; 2.89	0.84
Distance to hospital/ Residence			
Within 10km (Ref)	1.00	-	-
Beyond 10km	0.90	0.58; 1.40	0.65
BMI categories			
Normal (18.5-24.9) (Ref)	1.00	-	-
Overweight (25-29.9)	1.62	0.72; 3.60	0.24
Obese (30-34.9)	1.29	0.58; 2.88	0.54
Morbid obesity (35 and above)	1.67	0.75; 3.73	0.21
Underweight (<18.5)	1.13	0.07; 19.74	0.93
BMI	1.02	0.98; 1.05	0.32

4.11 t-TEST COMPARING AVERAGES BETWEEN THE CONTROLLED AND UNCONTROLLED BP GROUPS

An independent sample t-test was conducted to compare the mean ages, BMI and number of drugs taken and the adherence scores between the controlled and uncontrolled BP groups. There was no statistically significant difference in the mean age, BMI, number of drugs taken and adherence scores between the participants with uncontrolled BP and those with controlled BP on the T-test analysis. Findings are summarized in table 14 below.

TABLE 14: AVERAGES BETWEEN THE CONTROLLED AND UNCONTROLLED BP GROUPS. t-TEST ANALYSIS

Variable	Mean in PB uncontrolled	Mean in BP controlled	Mean difference	t-statistic	p
Age	61.33 (SD 10.938)	59.87 (SD 10.839).	-1.456 95% (CI -3.856 to 0.943)	-1.194	0.233
BMI	32.609 (SD 6.584),	31.866 (SD 6.714).	– 0.742 CI -2.205 - 0.721)	-0.998	0.322
Number of drugs	2.35 (SD1.180)	2.25 (SD 1.164)	-0.100, CI-0.388-0.158	- 0.760	0.224
Adherence scores	55. 753/ 60 (SD 2.939)	55.507/60 (SD 4.392)	- 0.246, CI -1.089-0.598	- 0.58	0.56

4.12 SUMMARY

The prevalence of uncontrolled BP in hypertensive patients on treatment in Manzini Eswatini was 56.17% (n=182). The odds of uncontrolled HTN were 76% higher in males than females, and this finding was statistically significant (p = 0.04). In most of the variables, there was no significant

difference in results between the controlled HTN group and the uncontrolled HTN group. Significant differences were noted in gender (p = 0.04) and level of education (p = 0.00). A large proportion of 290 (89.51%) of study participants were overweight 97 (29.94%), obese 94 (29.01%) and morbidly obese 99 (30.56%). Only 32 (9.88%) of the study participants had normal BMIs. With respect to adherence measures, significant differences were noted in forgetting BP medicines (p=0.04) and skipping BP medicines 1-3 days before attending clinic (p = 0.01) between the BP controlled and uncontrolled groups. A significant difference was also noted in the adherence score between the two groups (p= 0.005). A significant difference was also identified in physical activity levels between the two groups (p = 0.03). A total of 65 (20.06%) participants reported never receiving all their BP medicines at the hospital, and 216 (66.67%) reported only receiving all their BP medicines sometimes.

CHAPTER 5. DISCUSSION

5.1 INTRODUCTION

This chapter discusses the study findings based on the study objectives. Firstly, it examines the prevalence of poor BP control in hypertensive patients on treatment in Manzini, Eswatini. Secondly, the socio-demographic characteristics of hypertensive patients with uncontrolled BP on anti-hypertensive treatment are discussed. Lastly, it deliberates on the risk factors associated with poor BP control in hypertensive patients on treatment and discusses some notable findings from the research.

5.2 PREVALENCE OF POOR BP CONTROL IN HYPERTENSIVE PATIENTS ON TREATMENT

The study sought to determine the prevalence of poorly controlled HTN in hypertensive patients on treatment in Manzini, Eswatini. Results showed a high prevalence of 56.17% of uncontrolled BP. These findings on the prevalence of poor BP control are comparable with other findings in the southern African region, and this may be explained by similar cultural, lifestyle and behavioral risk factors for poor BP control (Folb *et al.*, 2016; Mills, Stefanescu & He, 2016; The Lancet, 2019). Masilela *et al.* (2020) in a cross-sectional study done in the Mkhondvo region in the neighbouring Mpumalanga Province, South Africa, reported a 56% prevalence of poor BP control among hypertensive patients on treatment. Similarly, Gala *et al.* (2020) in Kweneng, Botswana reported a 55% prevalence of poor BP control. According to Sharp et al. (2020), Eswatini's primary healthcare system is inadequate for managing NCDs, which hinders efforts to control BP among hypertensive patients. This significant prevalence of poor BP control in this study could further be explained by ongoing shortages of BP medications, which show a lack of governmental commitment to achieving BP control and SDG 3.4 (Sorato et al., 2021; Shabangu & Suleman, 2015). Additionally, the clients who are mostly obese and overweight in this study travel long distances to the hospital, which may affect access to health services for BP control, thus possibly contributing to the high prevalence of poor BP control.

Higher prevalences of poorly controlled HTN were reported by other similar cross-sectional studies in the region conversely as noted in a study in Ghana, where a 76.2% prevalence was attributed to similar problems noted in this study including continuous drug shortages, long distances travelled by hypertensive patients for hypertensive care, but was additionally attributed to substandard counselling of patients by health care workers (Sanuade, Boatema and Kushitor, 2018). In Zimbabwe, Goverwa *et al*. (2014) ascribed a high 67% prevalence to less stringent national hypertensive treatment guidelines.

Differing findings have been reported in the literature on the prevalence of poor BP control in HICs compared to LMICs. In an earlier Systematic review of differences in PB control, no significant differences in BP control were reported (Pereira *et al.*,2009). In contrast, Campbel et al. (2019), later reported a higher control rate of 28.4 % in HICs compared to 7.7% in LMICs, and Gala *et al*. (2020) also reported worse BP control in LMICs than HICs. This observation supports literature reporting on the rising effects of urbanization linked to rising risk factors of poor BP control in LMICs added to the predominant low SES in LMICs being a barrier to healthy lifestyle choices and access to medical treatment (Kandala *et al*., 2021; Jongen *et al*.,2019; Campbel *et al*., 2019). The differences in uncontrolled BP prevalence can also be explained by the lower capacity of health systems in LICs to handle the HTN and other NCDS compared to that of health systems in HICs (Mills, Stefanescu & He, 2016).

5.3 SOCIODEMOGRAPHIC CHARACTERISTICS OF HYPERTENSIVE PATIENTS WITH UNCONTROLLED BP ON TREATMENT

More than half of the uncontrolled BP study participants were 60 years and above 104 (57.14%). A similar cross-sectional study in neighboring South Africa on the determinants of uncontrolled BP, which included hypertensive patients aged 18 and above, reported the majority, 116 (62.05%), of the uncontrolled BP participants were aged 55 years and above (Masilela *et al*., 2020). This supports the literature arguing that older hypertensive patients on treatment achieve less BP control (Franklin *et al*., 2001; *Cho et al.*,2018*;* Goverwa *et al.*,2014).

The study results indicate that most participants (73.63%) with uncontrolled BP were female. Due to the nature of the sample, more females appear to be suffering from uncontrolled HTN than males, and at the same time, more females appear to have their HTN under control. Noteworthy is that the high number of uncontrolled BP participants being females was due to the majority, 252 (77.78%) of participants in this study being females. Furthermore, most clinic attendants were also noted to be females, thus explaining a higher proportion of females sampled. Correspondingly, a cross-sectional survey of the risk factors of poor BP control in Morocco found the male-to-female ratio in sampled participants to be 1: 3 (Essayagh *et al.*, 2019). This was also noted in a study in Botswana (Tapela *et al.*, 2020). The higher numbers of sampled females could also reflect that the population in Eswatini is composed of more females than males (UN, 2021). Fewer males were sampled, possibly due to their poor health-seeking behaviour and lesser likelihood of visiting health-care facilities (Tapela *et al.*, 2020).

More than half (51.65%) of the uncontrolled BP participants resided beyond 10 kilometers from the hospital. It may be expected that patients in low socio-economic settings who live further from their health-care facility may face challenges with the scarcity of transportation and costs of travelling to receive anti-hypertensive treatment, which may impair their adherence to treatment and, consequently, their BP control. Distance to the hospital was, however, not found to be significantly associated with uncontrolled BP in this study. This absence of a significant association between distance to the hospital and BP control could be because most of the Eswatini population resides in more rural areas as they rely on subsistence farming as a source of revenue (The Worldbank, 2022). On the contrary, in Ghana and Botswana, the participants' residence was significantly associated with BP control (Sanuade, Boatemaa & Kushitor, 2018; Tapela *et al.*, 2020).

The majority of the study participants were educated, with only 30 (9.26%) having no formal education; these findings are in keeping with those reported in the 2014 Eswatini NCDs risk factor surveillance report (Ministry of Health Swaziland Government, 2014). In the region, similar studies in Mutare, Zimbabwe and Mwanza, Tanzania, 35 (10%) of the participants and 28 (9.3%) of its hypertensive participants, respectively, never attained formal education (Maginga *et al.*, 2016; Tozivepi *et al.*, 2021). This reflects similar poor uptake of primary school education in this

region. In Eswatini, early childhood education was previously accessed by only 30% of Eswatini's children (UNICEF, 2018).

Of note was that the poorly controlled BP group contained 20 (66%) of the study participants with no formal education, similar to the Zimbabwe study where more than half of the uneducated participants, 18 (51.43%), were in the uncontrolled BP group (Tozivepi *et al.*, 2021). Remarkable, however, is that in the poorly controlled BP group, 36 (19.78%) participants were college/university educated compared to 7 (4.93%) in the controlled BP group. This may be explained by tertiary education increasing rates of employment which is linked with a better income. This may increase risky behaviours such as buying and consuming more salty and processed fast foods and exercising less (Yosef, 2020). This is in agreement with the argument that higher educational status, although found in some studies to be associated with better outcomes in hypertensive patients, does not always mean better health literacy on HT or better BP control (Willens *et al.*, 2013; Tavakoly Sany *et al.*, 2020). Significant differences were noted in this study in the level of education between the controlled and uncontrolled BP groups. Education level was, however, not found to be a significant risk factor for poor BP control in the regression analysis.

In this study, more than half the uncontrolled BP participants, 118 (64.84%), reported household earnings of E3000 ($174) and above in the last year compared to 79 (55.63%) in the controlled BP group. Only 7 (3.85%) participants in the uncontrolled BP group reported earnings of less than E500 ($29) in the last year, and 36 (19.78%) were unsure of how much they had earned in the previous year. There we no significant differences in earnings between the controlled and uncontrolled groups and household earnings in the last year were not a significant risk factor of poor BP control. This absence of a significant relationship could be due to the method used to classify participants in terms of their wealth (Egbujie, Igumbor & Puoane, 2016).

More uncontrolled BP participants, 85 (46.70%), reported being married compared to 52 (36.62%) in the controlled BP group. About a quarter, 47 (25.83%) of the uncontrolled BP participants were widowed compared to 50 (35.21%) in the controlled BP group. This study found non-significant associations between marital status and BP control. Studies report varying results on the effect of marital status, especially being married and being widowed, on BP control. Wilcox *et al.* (2003) and Trivedi *et al.* (2013) reported that being married positively impacts lifestyle risk factors such

as adherence to BP medication, smoking cessation, vegetable and fruit consumption and may have a negative impact on alcohol use and physical activity level.

5. 4 RISK FACTORS ASSOCIATED WITH POOR BP CONTROL

GENDER

The male gender was the strongest risk factor for poor BP control in hypertensive patients on treatment in Manzini, Eswatini. The higher proportion of female attendance at the clinic where the study was conducted suggests that females attend HTN care more than males and have better health-seeking behaviour (Gu *et al.*, 2008). These findings correspond with results in a study in Botswana by Tapela *et al.* (2020) and India by Prenissl *et al.* (2019), where males were less likely to have controlled BP. The greater levels of awareness of BP and treatment of BP in women reported in studies could be another reason females are more BP-controlled (Mills, Stefanescu & He, 2016). The notable differences in gender as a risk factor for poor BP control could be further attributed to differing cultural and behavioural roles played by males and females in the various countries, which impact their respective activity levels, lifestyle and dietary patterns (Dressler, Bindon & Neggers, 1998).

EDUCATION

Significant differences were noted in the level of education between the BP-controlled and uncontrolled groups. Nevertheless, it was not found to be a significant risk factor of poor control in the regression analysis of this study. Correspondingly, education did not significantly impact BP control in similar African cross-sectional studies in Cameroon and Tanzania (Menanga *et al.*, 2016; Maginga *et al.*, 2016). Interestingly, the literature reports differing effects of being educated on BP control. Tavakoly *et al.* (2020) in Iran related that higher educational levels were linked to improved adherence to BP medication and better control of BP because being educated led to better awareness of HT and its complications. Many other studies report similar findings (Willens *et al.*, 2013; Cappuccio & Miller, 2016).

ADHERENCE TO BP TREATMENT

Adherence to BP medication is critical in controlling BP. Adherence to BP medication was found to be very good, with 98.15% of the participants falling into the good adherence category (score > 75%). These high adherence level scores could be due to the fact that patients were reporting their adherence levels to the researcher with the possibility of recall bias and social desirability (Wang & Vasan, 2005). Studies report that hypertensive patients generally have poorer medication adherence than noted in this study (Sarkodie *et al.*, 2020; Cho *et al.*, 2018). In contrast to the findings in this study, a cross-sectional survey in urban clinics assessing medication adherence in 12 SSA countries found that only 782 (35,6%) participants had good adherence (Kramoh *et al.*, 2019).

A statistically significant relationship was found to exist between adherence score and BP control status of patients. With respect to the individual adherence measures, significant differences were also noted between the two groups in this study in forgetting to take BP medication and skipping medication 1-3 days before attending clinic. These were similarly found to be associated with reduced BP control in a Tanzanian study (Maginga *et al.*, 2016). Good adherence to treatment is clearly documented to be associated with better BP control in many studies. Goverwa *et al.* (2014), in a similar cross-sectional Zimbabwean study on HTN in patients on treatment, found adherence to drug treatment protective against poor BP control.

ACTIVITY LEVELS

The study documented significant differences in activity levels between the BP-controlled and BP-uncontrolled groups. A greater percentage of the BP-controlled participants, 109 (76.76%) reported being sufficiently active compared to the BP-uncontrolled participants 111 (60.99%). This is congruent with studies that have reported an inverse relationship between elevated BP and adequate intensity, duration and amounts of PA (Kokkinos *et al.*, 2009; Pascatello *et al.*,2019).

In a similar South African cross sectional study, where 231 (70.21%) of the participants reported to be sedentary, physical activity was found to be a determinant of BP control and paradoxically the physically active participants were nearly five times more likely to have poor BP control than the physically inactive participants (Masilela *et al.*, 2020). Likewise, in this study, despite the high prevalence of poorly controlled BP, an impressive proportion of 67.9% of the participants reported

being sufficiently active, which equates to doing 150 minutes or more per week of moderate to vigorous physical activity (Faulkner, Cohn & Remington, 2006). A similar cross sectional Zimbabwean study reported a comparable proportion (62%), of participants reporting moderate to vigorous physical activity to this study (Goverwa *et al.*, 2014a). This demonstrates the possibility of social desirability in these self-reported PA levels, with participants presenting themselves to be more active than they are. It is a possibility that if the levels of PA were based on observations, findings would likely differ (Chung & Monroe, 2007). It is also worth considering that other influences such as the high prevalence of overweight and obesity and unhealthy diets in the study participants may diminish the effects of the reported PA on BP control (Masilela *et al.*, 2020).

A randomized control study comparing the effects of different exercise regimens on CVD risk factors including HTN, found that combined resistance and aerobic exercises had better BP lowering effects than a single type of activity. The reported PA levels by participants in this study may only include only a single activity such as gardening or walking (Schroeder *et al.*, 2019). Another study on the other hand reported that moderate rather than vigorous intensity physical activity produces an antihypertensive effect (Kokkinos *et al.*, 2009). These different findings raise the idea that the BP lowering effects of physical activity may differ with the type of physical activity.

5.5 BODY MASS INDEX

Noteworthy in the study findings was the high prevalence of obesity and overweight among hypertensive patients on treatment in Manzini, Eswatini. In this study, 290 (89.51%) of study participants were either overweight 97 (29.94%), obese 94 (29.01%) or morbidly obese 99 (30.56%). Only 32 (9.88%) of the study participants had normal BMI. BMI was not found to be associated with BP control in this study, although literature has widely reported the rising public health problem of obesity and overweight causing poor BP control (Fantin *et al.*, 2019; Tanaka, 2020; Hamid, Groot & Pavlova, 2019). In Eswatini, similar to other African countries, having a heavy body weight is not seen as being unhealthy and is even desired, which is possibly a further contributing factor to the high prevalence of overweight and obesity found in this study (Maginga *et al.*, 2016).

The prevalence of overweight and obesity in patients in this study is significantly higher than reported previously in a similar 2014 South African study by Duncan *et al.* (2014), where 140

(28%) hypertensive patients were overweight, and 171 (34%) were obese. Study findings support literature reporting that overweight and obesity is no longer just a public health problem in the affluent nations but it is a rising public health problem even in SSA (Boachie *et al.*, 2022; Shariq & Mckenzie, 2020). Urbanization and advances in technology in LMICs with associated lifestyle changes including inactivity and greater access to diets high in saturated fats can further explain these study findings (Sung *et al.*, 2018; Berra *et al*., 2011). Public health preventative and management strategies to address this pandemic are critical to reducing overweight and obesity in Eswatini especially with its link to raised BP.

5.6 SUMMARY

The high prevalence of poor BP control in this study is comparable to findings from other studies in the region and attributed to similar risk factor characteristics (Masilela *et al*., l 2020. The prevalence of poor BP control in LMICs is rising and surpassing that in HICs and this was similarly noted with the prevalence of overweight and obesity (Gala *et al*., 2020; Shariq & Mckenzie, 2020). The male gender was the strongest risk factor for poor BP control and this could be attributed to poor health seeking behavior and the different cultural roles males have which impact their behavioral and lifestyle risk factors for BP control (Gu *et al.,* 2008; Tapela *et al.*, 2020; Prenissl *et al*., 2019). Other risk factors associated with BP control were education level, compliance to treatment and level of physical activity.

CHAPTER 6. CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION

This study aimed to determine the prevalence of uncontrolled HTN and the risk factors associated with poor BP control in hypertensive patients on treatment in Manzini, Eswatini. This chapter concludes the study and suggests recommendations based on the study findings.

6.2 CONCLUSION

The odds of uncontrolled HTN were 76% higher in males than females; therefore, being male was a significant risk factor for poor BP control. This study found that 56.17% of the hypertensive patients on treatment in Manzini, Eswatini, had poorly controlled BP. Of the participants with poorly controlled BP, more than half were above the age of sixty, and nearly three quarters of them were female, as mainly female patients attended the clinic. More than half of the participants with uncontrolled BP resided beyond ten kilometers from the hospital where they were managed for BP. Of the participants with no formal education, 66% had poorly controlled BP.

Significant differences were noted in the level of education and physical activity levels between the BP-controlled and uncontrolled participants. A significant difference was also noted in the adherence score between the two groups. With respect to adherence measures, significant differences were noted in forgetting to take BP medicines and skipping medicines 1-3 days before attending clinic between the BP controlled and uncontrolled groups.

The findings from this study add to the evidence in the literature on the current magnitude of the problem of poor BP control in patients on hypertensive treatment in the Manzini region and point out the significant risk factors associated with poor BP control. Study results point to the unmet needs in the practice of caring for hypertensive patients that health care workers and the health care facility should improve on. It directs the planning of locally sensitive, evidence-based intervention aimed at improving BP control specifically targeting male hypertensive patients and

providing education on HTN to accommodate the many poorly controlled patients without education.

Furthermore, study findings can be used to inform policy-makers on the adequate allocation of resources for medicines and health promotion activities necessary to improve hypertensive patients' outcomes and prevent avoidable complications in the Manzini region.

6.3 RECOMMENDATIONS

The following recommendations are made based on the study findings that underlined areas requiring intervention to improve BP control and reduce CVD risk and, ultimately CVD related deaths in Manzini, Eswatini.

6.3.1 THE PREVALENCE OF POORLY CONTROLLED BP

This study found that more than half (56.17%, n=182) of hypertensive patients on treatment in Manzini, Eswatini, had poorly controlled BP. Interventions are necessary to educate the whole population of Eswatini on HTN and its dangers and how they can improve BP control. Interventions creating and promoting environments that support physical activity, healthy diets rich in fruit and vegetables and low in sodium and lower the harmful use of alcohol and tobacco need to be policy-driven and effected in multiple sectors nationally. Interventions need to be affordable, sustainable and encourage self-management by lifestyle actions such as growing and consuming more fruits and vegetables, reducing salt intake, increasing exercise levels as well as adhering to the prescribed BP medicines

6.3.2 SOCIODEMOGRAPHIC CHARACTERISTICS OF PARTICIPANTS

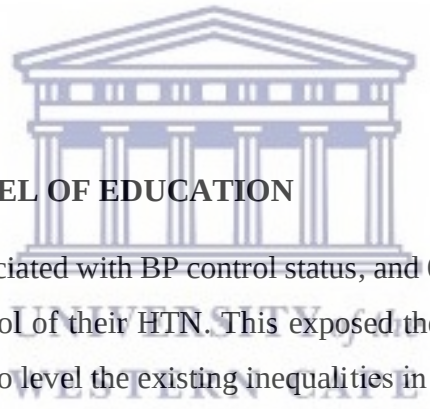
More than half the uncontrolled BP participants resided beyond ten kilometers from the hospital, and more than half were 60 years old and above. This points to the need to capacitate primary health care clinics in rural communities with sufficient BP medicines and health-care workers to manage hypertensive patients in their communities. Capacitating primary health care clinics will reduce the costs and strain of travelling long distances for HTN care, especially for elderly patients.

6.3.3 RISK FACTORS OF POOR BP CONTROL

MALE GENDER

The odds of poorly controlled HTN were 76% higher in males than in females. Beyond the health education and medicine treatment from the hospital, culturally sensitive health promotion intervention strategies are necessary. These interventions should be aimed at raising awareness among the male hypertensive population on the dangers of uncontrolled BP. Furthermore, interventions should positively influence the risk factors of poor BP control that are modifiable.

Interventions may involve coaching, empowering and educational sessions for males in their communities. These sessions must be conducted by other male health care workers and non-physician providers such as community health workers and peer educators. Sessions should highlight the importance of BP self-management and improving health-seeking behaviour.



DIFFERENCES IN THE LEVEL OF EDUCATION

Education was significantly associated with BP control status, and 66% of the participants with no formal education had poor control of their HTN. This exposed the need for health care workers managing hypertensive patients to level the existing inequalities in patient's health literacy during their management of hypertensive patients by:

- Providing daily health talks and clear and comprehensible information and advice that is acceptable and practical to all hypertensive patients despite their educational level.
- Using every patient encounter as an opportunity to educate all patients on the risk factors and complications of poor BP control. Self-management using lifestyle and behavioural measures and how to improve adherence to BP treatment should also be taught to patients.

ADHERENCE TO HYPERTENSIVE MANAGEMENT

Study findings showed that adherence to BP management was associated with BP control; forgetting to take BP medicines and skipping BP medicines 1 to 3 days before attending the clinic were particularly associated with BP control status.

- Health-care workers managing BP must encourage patients on the importance of reminders to take their BP medication, including their relatives and alarm clocks. Health-care workers must advise patients to come to the clinic earlier if they notice their medication running out before the given appointment date.
- Hospital pharmacists need to ensure an adequate supply of drugs is packaged for patients to last until the next review date written on the chronic care card.

PHYSICAL ACTIVITY LEVELS, OVERWEIGHT AND OBESITY

Physical activity was significantly associated with BP control status, and an alarmingly high proportion of study participants were overweight and obese. The finding from this study underlines the urgent necessity to implement sustainable, cost-effective and culturally-acceptable population level interventions to increase physical activity levels and prevent and control overweight and obesity in Manzini, Eswatini.

- Interventions must be supported by the policy in line with SDG 3 (Safeguarding healthy lives and supporting wellbeing for everyone) and involve commitment and collaboration with the health sector from different sectors, including education, agriculture, sports and culture, the national media, and economic planning. Interventions must promote and enable healthier diets lower in cholesterol and sodium and rich in complex carbohydrates, fruits and vegetables. Furthermore, interventions must facilitate and encourage physical activity in the entire population.
- BMIs must be calculated at every clinic visit and discussed with patients to encourage commitment to controlling body weight.

- Primary health care centers in communities should conduct exercise sessions on certain days of the week for all community members and give health talks on maintaining a healthy BMI.

6.3.4 FUTURE STUDY

- Study findings point to the need for a qualitative study focusing on the perspectives of male hypertensive patients in Eswatini. Understanding the following matters is critical in designing specific and suitable interventions aimed at improving male patients' treatment outcomes.
    - What influences male hypertensive patients' health-seeking behaviour?
    - What challenges are met by male hypertensive patients in Eswatini in adhering to BP treatment and lifestyle measures?
    - What is male patients' understanding of and attitude towards HTN and its complications?
- There is a need for larger studies examining a wider range of risk factors for poor BP control, such as different treatment regimens being managed in the private sector compared to the public sector, therapeutic inertia and health care worker related factors. Clinical variables such as cholesterol levels may also be examined. This study must be conducted in settings across the whole country to give a more holistic picture nationally of the risk factors for poor BP control.
- A more recent survey is needed to determine the proportion of the population with HTN in Eswatini, aware and unaware of their hypertensive status. This will present an opportunity to address the prevention of CVD, even in the population that is unaware of their hypertensive status.

6.3.5 UNAVAILABILITY OF DRUGS

The high proportion of participants that reported never receiving all their BP medicines or only receiving them sometimes highlights the need for interventions addressing the severe gaps in the hospital pharmacy's readiness to provide the necessary BP medication for all hypertensive patients

consistently. Interventions must evaluate drug procurement and inventory management practices with the aim of improving them.

6.4 STRENGTHS AND LIMITATIONS

This study provided important information on the current prevalence of uncontrolled BP in patients on treatment in Manzini, Eswatini and the risk factors associated with poor BP control in Manzini, Eswatini. However, it has some limitations. This was a cross-sectional study which does not allow the determination of causal links from the risk factors, and the measurement of BP, weight and height only once off by the researcher.

Furthermore, there are several other possible health systems, provider-related and clinical risk factors for poor BP control, which were not covered and assessed by this study as data was collected from patient interviews and measurements. Questions quantifying the level of physical activity, alcohol use and smoking were subject to recall bias, social desirability bias and under-reporting. This is especially so because the researcher was a health-care worker in the facility where the study was conducted. The target sample size was not reached as only one researcher was doing interviews and some patients declined to participate in the study as they were reluctant to wait to be interviewed. Some participants did not answer all the questions and had to be excluded from the study. Having an assistant during data collection would have assisted in achieving the desired sample size more quickly.

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APPENDICES

APPENDIX 1: QUESTIONNAIRE

QUESTIONNAIRE ON THE RISK FACTORS FOR POOR BP CONTROL IN HYPERTENSIVE PATIENTS ON TREATMENT IN MANZINI, ESWATINI.

A

PATIENT FACTORS

DEMOGRAPHIC VARIABLES

1. ***Age (****Iminyaka yakho)*

40-59 years	***60 years and above*** *(Nasetulu)*

2. ***Address*** *(uhlala kuphi)*

Within 10km to the hospital	***Beyond 10km to the hospital***

3. ***Gender*** *(Ungumfati noma uyindvodza?)*

Male *(indvodza)*	***Female*** *(umfati)*

4. ***Level of education- How many years of school did you have? (excluding pre-school)***

Mingakhi iminyaka lowayifundza eskolweni? (ngaphandle kwenkhulisa)

No formal education *(Angifundzanga nhlobo)*	***Primary school 1-7 YEARS*** ***(****Ngagcina eskolweni lesincane()*	***High school 8-12 YEARS*** *(ngagcina eskolweni lesikhulu)*	***College/ university >12 YEARS*** ***(****ngafundzela ekolishi/enyuvesi)*

5. ***HOUSEHOLD WEALTH***

In the last year can you give an estimate your household earnings? *(Kulomunyaka lowengcile ungangibekisela kutsi imali lengene ekhaya nguyiphi kuleti?)*

Less than *(ngephasi kwa****)E500***	***More than****(ngenhla kwa****) E500***	***More than*** *(ngenhla kwa)* ***E1000***	***More than*** *(ngenhla kwa)* ***E2000***	***More than****(ngenhla kwa)* ***E3000***	***Unsure****(ngite siciniseko****)***

ANTHROPOMETRIC VARIABLES *(TIKALO TAKHO)*

1. ***weight: (****sisindvo)*

2. ***height:*** *(budze)*

3. ***BMI:*** *(Sisindvo nge budze bakho****)***

Categories *(Luhla lwetisindvo nge budzebemuntfu)*

Normal weight (BMI 18.5 less than 25) *(sisindvo ngebudze lesifanele)*	***Overweight (BMI 25 to less than 30) (****sisindvo lesikhulu kunebudze)*	***Obese (BMI 30 and above)*** *(Sisindvo lesikhulu kakhulu kunebudze)*

BP TREATMENT VARIABLES *(KULAPHA KWAKHO I BP)*

1. ***BP:***

2. ***Is the BP controlled?*** *(Ikahle yini I BP yakho)?*
   (less than 140/80)

YES	***NO***

1. ***Number of drugs taken for BP*** *(Unatsa mangakhi emaphilisi e BP)*

2. ***Dosing of BP medication*** *(Uwanatsa kanjani emaphilisi e BP?)*

Daily *(Kanye ngelilanga)*	***More than once daily****(kwencga Kanye ngelilanga)*

3. ***Adherence to BP treatment*** *(Sibuka kunatseka kwemaphilisi e BP ngendlela lengiyo)*

Question	***None of the time 1*** *(akwenteki)*	***Some of the time 2*** *(ngalamanye emahlandla)*	***Most of the time 3*** *(esikhatsini lesinyenti)*	***All the time 4*** *(sonkhe sikhatsi)*	***Not Applicable 8*** *(angifisi kuphendvula)*	***Don't know 9*** *(ngite siciniseko)*

How often do you forget to take your BP medicine *(Uyakhohlwa yini kunatsa emitsi yakho?)*						
How often do you decide not to take your BP medicine? *(Utitjela kangakhi kutsi angeke unatse imitsi yakho?)*						
How often do you eat salty food?*(Luswayi uludla kangakanani?)*						
How often do you miss scheduled appointments? *(kuvame kanganani kutsi ungayi emtfolamphilo ngelilanga lobekelwe lona?)*						
how often do you run out of BP medicine? *(Uvame kanganani kuphelelwa yimitsi?)*						
How often do you skip your medicine 1-3 days before attending clinic? *(Uvame kanganani kunganatsi imitsi yakho 1-3*						

wemalanga ungaketi emtfolamphilo?)						
How often do you miss taking your pills when you're feeling better? *(Nawutiva uphilile, uvame kanganani kunganatsi imitsi yakho?)*						
How often do your miss taking your pills when you're feeling sick? *(Nawuphatsekile uvame kanganani kunganatsi imitsi yakho?)*						
How often do you take someone else's BP pills? (*kuvame kanganani kutsi unatse imitsi yalomunye umuntfu?)*						
How often do you miss taking your BP pills when you care less? *(nawungacabangi ngekugula kwakho uvame kanganani kukhohlwa imitsi)*						
Total Score *(emaphoyinti akho****)***						
GOOD AHDERENCE				POOR ADHERENCE		

CLINICAL VARIABLES *(IMPHILO NALOKUNYE KUGULA LONAKO)*

Have you ever been told by a health care provider that you have Diabetes? *(Wake watjelwa ngulosebenta ngetemphilo kutsi unesifo sashukela na)?*

Yes *(yebo)*	***No*** *(cha)*

Are you on medical treatment for any other illness? *(Kukhona lokunye kugula lowelashelwa kona betemphilo?)*

Yes *(yebo)*	***No*** *(cha)*

PSYCHOSOCIAL VARIABLES *(KUPHATSEKA KWAKHO EMOYENI NASEKHAYA)*

Do you have present social support daily? *(Kukhona yini lophilanaye onkhe malanga)?*

Yes *(yebo)*	***No****(cha)*

Marital status *(simo semshado)*

Never married *(zange sengishade)*	***Married*** *(ngishadile)*	***Separated*** *(ngehlukene nalebengishade naye)*	***Divorced*** *(sehlukene ngekwemtsetfo)*	***Widowed*** *(washona lebengishadenaye)*	***Cohabitating*** *(kukhona lengihlala naye)*

HEALTH LITERACY VARIABLE ON BP *(LWATI LWAKHO NGE BP)*

1. ***Which of the following make BP poorly controlled? (chose the best answer)***

1.(Khetsa kunye kuloku lokulandzelako lokubanga I BP ibesetulu)

a) salt in the diet, not exercising, drinking alcohol, smoking

(luswayi, kungashukumisi umtimbha, kunatsa tjwala, kubhema)

b) ***working hard, sleeping late, drinking coke***

(kusebenta kakhulu, kulala selishone kakhulu, kunatsa icoca cola)

2. ***Which one of the following are complications of hypertension? (chose the best answer)***

(Khetsa kunye kuloku lokulandzelako lokuyingoti levela ngenca ye BP)

a) stroke, kidney failure, heart failure
(Sifo senhlitiyo, kulimala kwetinso, kufa luhlangotsi)
b) weight gain, joint pain, loss of hearing
(kukhuluphala, buhlungu bematsambo, kungeva emadlebeni)

Poor (0/2)	***Partial(1/2)***	***Good (2/2)***

LIFESTYLE HABITS VARIABLES ***(****INDLELA YEKUPHILA)*

Are you currently a smoker? (*Uyabhema noma cha****)***

Yes *(yebo)*	***No*** *(cha)*

Physical activity levels *(Lizinga lakho lekushukumisa umtimba)*

VIGOROUS ACTIVITY *(KUSHUKUMA KAMATIMA)*	
1. ***In the last week, on how many days did you do activities like digging or lifting heavy weights?*** *(kuleliviki lesisuka kilo kushukuma kamatima lokufana nekuhlakula nekwetfwala lokusindzako ukwente kumangakhi emalanga?)*	……***days(****Emalanga)*
2. ***How much time did you spend doing vigorous activity on one of those days?*** *(lokushukuma loku ukwente sikhatsi lesinganani?)*	……***hours*** *(emahora)* ……***minutes*** *(imizuzu)*
MODERATE PHYSICAL ACTIVITY *(KUSHUKUMA LOKUNGAMATIMA KAKHULU)*	
3. ***In the last week, how many days did you do moderate physical activity like carrying a water bucket or walking for recreation?*** *(kuleliviki lesisuka kilo mangakhi emalanga lawu shukume khona ngekuhamba ulule tinyawo noma wetfwala libhakede lemanti?)*	……..***days*** *(emalanga)*
4. ***How much time did you spend doing this activity in one of those days?*** *(lokushukuma loku ukwente sikhatsi lesinganani?)*	……. ***Hours****(emahora)* ……***minutes*** *(imizuzu****)***
SEDENTARY TIME*(KUHLALA NEKUPHUMULA)*	
5. ***In the last week, how much time did you usually spend sitting, reading or watching TV?*** *(kuleliviki lesisuka kilo ucitse lesinganani sikhatsi u hleli, ufundza incwadzi noma ubukela mabonakudze?)*	……. ***Hours*** *(emahora)* ……***minutes*** *(imizuzu****)***

TOTAL Moderate and vigorous- intensity physical activity (MVPA)	***……..***
SCORES	
1. INACTIVE (less than 30min/week MVPA)	
2. INSUFFICIENTLY ACTIVE(30-149 min/week MVPA)	
3. SUFFICIENTLY ACTIVE(150 or more min/week MVPA)	

Alcohol dependence *(lizinga lekusebentisa tjwala)*

1. ***Have you ever been told by a health care professional that you need to reduce the amount of alcohol you consume?*** *(Wake wecwayiswa ngulosebenta ngetemphilo kutsi yehlisa lizinga lakho lekunatsa tjwala?**)***

Yes *(yebo)**=1***	***No*** *(cha)=**0***

2. ***Has anyone expressed concern about your drinking?*** *(Kukhona yini lowake wakhombisa kukhatsateka ngelizinga lekunatsa kwakho tjwala**)***

Yes(*yebo)=**1***	***No*** *(cha)=**0***

3. ***Has your drinking caused you any bad feelings?*** *(kunatsa kwakho tjwala kuke kwakuphatsa kabi yini)*

Yes *(Yebo**)=1***	***No*** *(cha**)=0***

4. ***Have you ever had to get a drink in order to function in the morning or heal a hangover? (****kuyenteka yini udzinge kunatsa tjwala nawuvuka ekuseni kute utive sowukahle noma kute utawukhokha linyeva?)*

Yes (*yebo**)=1***	***No*** *(cha)=**0***

APPENDIX 2: CONSENT FORMS (ENGLISH AND SISWATI)

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa
Tel : +27 21-959 2809, Fax : 27 21-959 2872
E-mail: soph-comm@uwc.ac.za

CONSENT FORM

Title of Research Project: **Risk factors for poor blood pressure control in Hypertensive patients on treatment in Manzini, Eswatini.**

The study has been described to me in language that I understand. My questions about the study have been answered. I understand what my participation will involve and I agree to participate of my own choice and free will. I understand that my identity will not be disclosed to anyone. I understand that I may withdraw from the study at any time without giving a reason and without fear of negative consequences or loss of benefits.

___ I agree to be audiotaped during my participation in this study.
___ I do not agree to be audiotaped during my participation in this study.

Participant's name……...

Participant's signature…….

Date……

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel : +27 21-959 2809, Fax : 27 21-959 2872

E-mail: soph-comm@uwc.ac.za

LIPHEPHA LELIKHOMBA KUVUMA KUNGENELA LOLUCWANINGO

Libito lwalolucwaningo: **Tintfo letibanga iBP ihlale isetulu kubantfu labalashelwa l BP kaManzini, Eswatini.**

Ngichazelekile ngalolucwaningo ngelulwimi lwami lengiluvako. Imibuto yami mayelana nalolucwaningo iphendvulekile. Ngiyati kutsi kungenela kwami lolucwaningo kushokutsini futsi ngiyavuma kulungenela ngoba ngitikhetsele mine. Ngiyacondza kutsi libito lami ngeke litjelwe lomunye umuntfu litawhlala liyimfihlo. Ngiyacondza kutsi ngingayekela noma ngabe kunini kungenela lolucwaningo futsi akudzingeki ngibeke

sizatfu sekuyekela. Futsi nangiyekela kute lokubi lokutawenteka kimi noma lengitakweswela.

___ Ngiyavuma ku rekhodiwa ekungeneleni kwami lolucwaningo.
___ Angivumi ku rekhodiwa ekungeneleni kwami lolucwaningo.

Libito lalongenela lolucwaningo……...

Kusayina kwalongenela lolucwaningo …….

Lusuku……

APPENDIX3: INFORMATION SHEETS (ENGLISH AND SISWATI)

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa
Tel : +27 21-959 2809, Fax : 27 21-959 2872
E-mail: soph-comm@uwc.ac.za

Project Title: Risk factors for poor blood pressure control in Hypertensive patients on treatment in Manzini, Eswatini

What is this study about?

This study is being carried out by Dr Millicent Buckham, a student at the University of the Western Cape in Cape Town, South Africa, as part of her studies. It aims to measure how many hypertensive patients in Manzini, Eswatini, on drug treatment, have high BPs despite treatment. It also aims to find out the factors associated with BPs being high in these uncontrolled patients. We are inviting you to take part in this study because you are a patient with hypertension, and we want to learn from the information we get from you so that we improve our management of hypertensive patients and improve the number of controlled patients, thereby decreasing complications such as strokes and heart attacks. The findings from this research can be used to

make recommendations to the Ministry of health on what resources should be allocated to improve the management of hypertension.

What will I be asked to do if I agree to participate?

You will be asked to answer some questions for a few minutes and then have your blood pressure, weight and height measured. The interview will be audio recorded.

Examples of the types of questions you will be asked are:

1. How old are you and where do you live?
2. Have you ever been told by a health care worker that you are Diabetic?
3. How many types of BP pills do you take, and how many times do you take them a day?
4. Do you put salt in your food?
5. Do you smoke?
6. Are you satisfied with the treatment and care you receive at the clinic?

Would my participation in this study be kept confidential?

The researchers assure they will safeguard confidential information and identity.

For anonymity, participant names will not be involved in collected data, only assigned numbers and codes will be used.

To ensure confidentiality:

(1) All data collected will be locked up and transported by only the researcher. Electronic data retrieved from questionnaires will be saved on the researcher's password-locked laptop with only the researcher having access to it.

(2) Participants' data obtained from this study will be used to complete the researcher's mini-thesis and if an article or report is written about this research project, your identity will be protected.

What are the risks of this research?

Some of the discussed topics may make the participant feel uncomfortable. Each patient will be assigned a number for anonymity. If any participant experiences psychological discomfort during participation in this study, the researcher has arranged for referral to the hospital psychologist and will assist the participant in reaching it. If during the study any participant needs medical attention, the researcher will ensure they receive it at the NCD clinic or hospital emergency room.

What are the benefits of this research?

The results of this research will inform the investigator and health care workers and improve understanding about the factors that cause BP to be uncontrolled despite treatment so that they can work on ways to address these in their treatment of BP. This will lead to better outcomes and quality of life in hypertensive patients and fewer deaths and complications. Knowing how many people have uncontrolled and why BP may assist with motivating for resources to ensure medicines and other resources used in managing BP are more available.

Do I have to be in this research and may I stop participating at any time?

Your participation in this study is completely voluntary; you can refuse to participate if you decide to. You are also free to decide to stop participating at any time if you want to or not to answer, and you do not have to explain why. To withdraw from the study, you can simply tell the researcher you are no longer participating, and any data we get from you will not be used in the study. Refusing to participate or deciding to withdraw will not cause you to be disadvantaged in any way. Before starting with the interview, I will require you to sign the included consent form to participate in this study. Please look at it and decide if you would want to be part of the research or not, and then sign it if you want to participate.

What if I have questions?

This research is being conducted Dr Millicent Buckham from the School of Public Health at the University of the Western Cape (UWC). If you have further questions or about the research study itself, please contact:

Student Name: Millicent Buckham

Student Number: 4002733

Mobile Number: 00268 7607 4772

Work Number: 00268 2508 4000

Email: 4002733@myuwc.ac.za

I am accountable to my supervisor: Dr Lungiswa Tsolekile

School of Public Health, UWC.

Tel:+27 82 3995428

Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study please contact:

Prof Uta Lehmann

Head of Department: School of Public Health

University of the Western Cape

Private Bag X17

Bellville 7535

ulehmann@uwc.ac.za

Prof Anthea Rhoda

Dean: Faculty of Community and Health Sciences

University of the Western Cape

Private Bag X17

Bellville 7535

chs-deansoffice@uwc.ac.za

This research has been approved by the University of the Western Cape's Biomedical Research Ethics Committee.

Biomedical Research Ethics Committee

University of the Western Cape

Private Bag X17

Bellville

7535

Tel: 021 959 4111

e-mail: research-ethics@uwc.ac.za

UNIVERSITY OF THE WESTERN CAPE

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Tel : +27 21-959 2809, Fax : 27 21-959 2872
E-mail: soph-comm@uwc.ac.za

Libito lwalolucwaningo: Tintfo letibanga iBP ihlale isetulu kubantfu labalashelwa I BP kaManzini, Eswatini.

Lungani lolucwaningo?

Lolucwaningo lolwentiwa ngu Dr Mlillicent Buckham lofundza enyuvesi yase Western Cape, eCape Town, South Africa, lufuna kubuka kutsi bangakhi bantfu labalashelwa iBP labachubeka kuba ne BP lesetulu noma banikiwe emaphilisisi alesifo. Lifuna nekubuka kutsi yini timbangela

talokuchubeka kukhuphuke iBP nomangabe ulashelwa yona ngemaphilisi kulabantfu labakhandzakala bane BP lesetulu

Siyakumema kutsi ubesekhatsi kulelucwaningo njengoba nawe ulashelwa i BP. Siyafisa kutfola lwati kuwe khona sitawkhona kunyusa lizinga letfo lekulapha bantfu labaphila ne BP khona sitawehlisa tinombolo tebantfu labane BP lesetulu. Loku kutawusita kuts kwehle lizinga lebantfu labagcina baphetfwe sifo senhlitiyo netiTrokhi ngenca ye BP lehlala isetulu. Lwati lolutfolakala kulolucwaningo lutawusita nekutsi sikhone kucela etikweni lwetemphilo kutsi basite ngetintfo lesitawkhandza tidzingeka noma tishoda kulolucwaningo letitawusita ekulapheni kancono bantfu labane BP.

Yini letawdzingeka kimi uma ngivuma kuba kulelucwaningo?

Utawcelwa kutsi usiphendvulele imibuto letsite bese sikukala ne BP, sisindvo Kanye nebudze. Kutawurekhodiwa lelesitabesikhuluma ngako.

Imibuto lotawubutwa yona ifana nanayi:

7. Uhlalaphi futsi iminyaka yakho mingakhi?
8. Sifo sashukela unaso yini?
9. Tingakhi tinhlobo temaphilisi e BP lotinatsako futsi uninatsa kangkakhi ngelilanga?
10. Luswayi uyaludla yini ekudleni?
11. Uyabhema yini?
12. Uyanetiseka yini ngelusito lolutfola lamtfolamphilo nawutile?

Imininingwane yami lenginitjela yona kulocwaningo itawgcineka iyimfihlo yini?

Lowenta lolucwaningo uyatsembisa kugcina yonkhe imininingwane yalabalungenelako iyimfihlo. Angeke kwateke kubantfu kutsi ngubani losinike lwati.

Kugcina imininingwane ifihlekile:

(3) Emagama alabangenela lolucwaningo ngeke asetjentiswe, batawuniketwa tinombolo kuphela kuze kungatawateka kutsi babobani.

(4) Onkhe lamaphepha lesitawbhalela kuwo timphendvulo talabangenela lolocwaningo atawukhiyelwa ahanjiswe ngulolowenta lolucwaningo kuphela. Timphendvulo Titawufakwa kungcondvomshina titawgcineka tiyimfihlo tikhiyelwe kungcondvomshina. Titawubonwa ngulowenta lolucwaningo kuphela.

(5) Timphendvulo letitfolakala kulolocwaningo titawsebenta etifundvweni talowenta lolucwaningo kuphela.

Kukhona yini lokubi lokungangivelela nangingenela lolucwaningo?

Kungenteka kutsi mhlawumbe imibuto letsite kulolucwaningo ingabi ngulemunandzi kuyiphendvula kulabanye. Wonkhe lolungenelako utawunikwa inombolo, angasebentisi libito lakhe kute timphendvulo takhe titawugcineka tiyimfihlo. Lowenta lolocwaningo ulungisile nalowelulekanako khona lasbhedlela kutsi asite labo lekungenteka badzinge kwelulekwa. Uma kukhona lodzinga lusito lwadokotela noma lwemhlengikati kulabo labatabe bangenele lolwaningo, lusito lutawutfolakala khona lana emtfolamhilo kulosebenta ngekwelulekana.

Yini lokuhle lokutawuletfwa ngulolucwaningo?

Lwati lolutfolakala kulolucwaningo lutawatisa labalapha lesifo kutsi yini tintfo letibanga iBP ingehli noma seyilashwa ngemaphilisi. Loku kutawenta bakhone kwenta tindlela tekulungisa leto tintfo. Kulungisa letintfo letenta iBP ingehli kutawsita ekuyehliseni kute labaphila nalesifo bangatawuvelelwa tifo letibangwa kwenyuka kweBP. Futsi kutawunciphisa lizinga lekushona

kwebantfu ngenca ye BP. Kwati kutsi bangakhi labaneBP lehlala iphakeme kungasita nekutsi kugcugcuteleke litiko letemphilo kutsi lungete imitsi nalokunye kwekwelapha I BP lamitfolamphilo kute kutawuhlala kukhona.

Ngiphocelelekile yini kungenela lolucwaningo, futsi ngingaphuma yini kilo nangifisa?

Lolucwaningo ulingenela nawufisa kuphela, awukaphoceleleki. Futsi nasewulingenele unelilungelo lekuphuma kilo nawufisa. Nekungaphendvuli imibuto tsite uvumelelekile. Angeke ubutwe nekutsi sewuphumelani. Uma sewufuna kuphuma, utawvele usho bese uyaphuma. Timphendvulo takho ngeke sitisebentise nasewuphumile. Kungalungeneli lolucwaningo nekuphuma kilo kute lapho kutakulimata khona. Utawuchubeka usitakale lamtfolamphilo njengabo bonkhe bantfu ngoba kulilungelo lakho. Ngitakucela ungisayinele kutsi uyavuma kungenela lolucwaningo singakacali. Ngitawcela ubuke leliphepha lelishoko kutsi uyavuma kungenela lolocwaningo bese uyakhetsa kutsi uyalisayina noma cha.

Uma nginemibuto ngentanjani?

Uma unaleminye imibuto noma ufuna kwati kabanti ngalolucwaningo, ngiyatfolakala kunatimbolo:

Ligama lemfundzi: Millicent Buckham

Inombolo yemfundzi yasenyuvesi: 4002733

Inombolo yamahlalekhukhwini: 00268 7607 4772

Inombolo yasesmsebentini: 00268 2508 4000

Likheli le email: 4002733@myuwc.ac.za

Longelusako nalongiphetse kulolucwaningo: Dr Lungiswa Tsolekile

School of Public Health UWC:

Tel: +27-21 - 959 2809

Fax: +27- 21 - 959 2872

Umangabe unemibuto mayelana nalolucwaningo nemalungelo akho mayelana nekulingenela, noma umangabe uhlangana netinkinga usangenele lolucwaningo lofisa kutibika, ngicela utsintse naba baphatsi benyuvesi labalandzelako:

Prof Uta Lehmann

Head of Department: School of Public Health

University of the Western Cape

Private Bag X17

Bellville 7535

ulehmann@uwc.ac.za

Prof Anthea Rhoda

Dean: Faculty of Community and Health Sciences

University of the Western Cape

Private Bag X17

Bellville 7535

chs-deansoffice@uwc.ac.za

Lolucwaningo luvunyelwe li komidi le University of the Western Cape's Biomedical Research Ethics.

Biomedical Research Ethics Committee

University of the Western Cape

Private Bag X17

Bellville

7535

Tel: 021 959 4111

e-mail: research-ethics@uwc.ac.za

APPENDIX 4 UNIVERSITY OF THE WESTERN CAPE ETHICAL CLEARANCE

UNIVERSITY *of the* WESTERN CAPE

60 YEARS *of hope, action & knowledge*

03 December 2021

Dr M Buckham
School of Public Health
Faculty of Community and Health Sciences

Ethics Reference Number:	BM21/10/33
Project Title:	Risk factors for poor blood pressure control in Hypertensive patients on treatment in Manzini, Eswatini.
Approval Period:	**03 December 2021 – 03 December 2024**

I hereby certify that the Biomedical Science Research Ethics Committee of the University of the Western Cape approved the scientific methodology and ethics of the above mentioned research project and the requested amendment to the project.

Any further amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

Please remember to submit a progress report annually by 30 November for the duration of the project.

For permission to conduct research using student and/or staff data or to distribute research surveys/questionnaires please apply via:
https://sites.google.com/uwc.ac.za/permissionresearch/home

The permission letter must then be submitted to BMREC for record keeping purposes.

The Committee must be informed of any serious adverse event and/or termination of the study.

Ms Patricia Josias
Research Ethics Committee Officer
University of the Western Cape

NHREC Registration Number: BMREC-130416-050

FROM HOPE TO ACTION THROUGH KNOWLEDGE.

APPENDIX 5: PERMISSION TO CONDUCT RESEARCH AT RALEIGH FITKIN MEMORIAL HOSPITAL

Eswatini Nazarene Health Institution (ENHI)
Raleigh Fitkin Memorial (RFM) Hospital
& the Community Health Clinics

17 November 2021

Dr. Millicent P Buckham
P O BOX 1277
Manzini, M200

Dear Doctor

RE: AUTHORIZATION TO DO RESEARCH IN THE HOSPITAL

Your request on the fore mentioned endeavors has been duly considered and permission granted on the following conditions please:

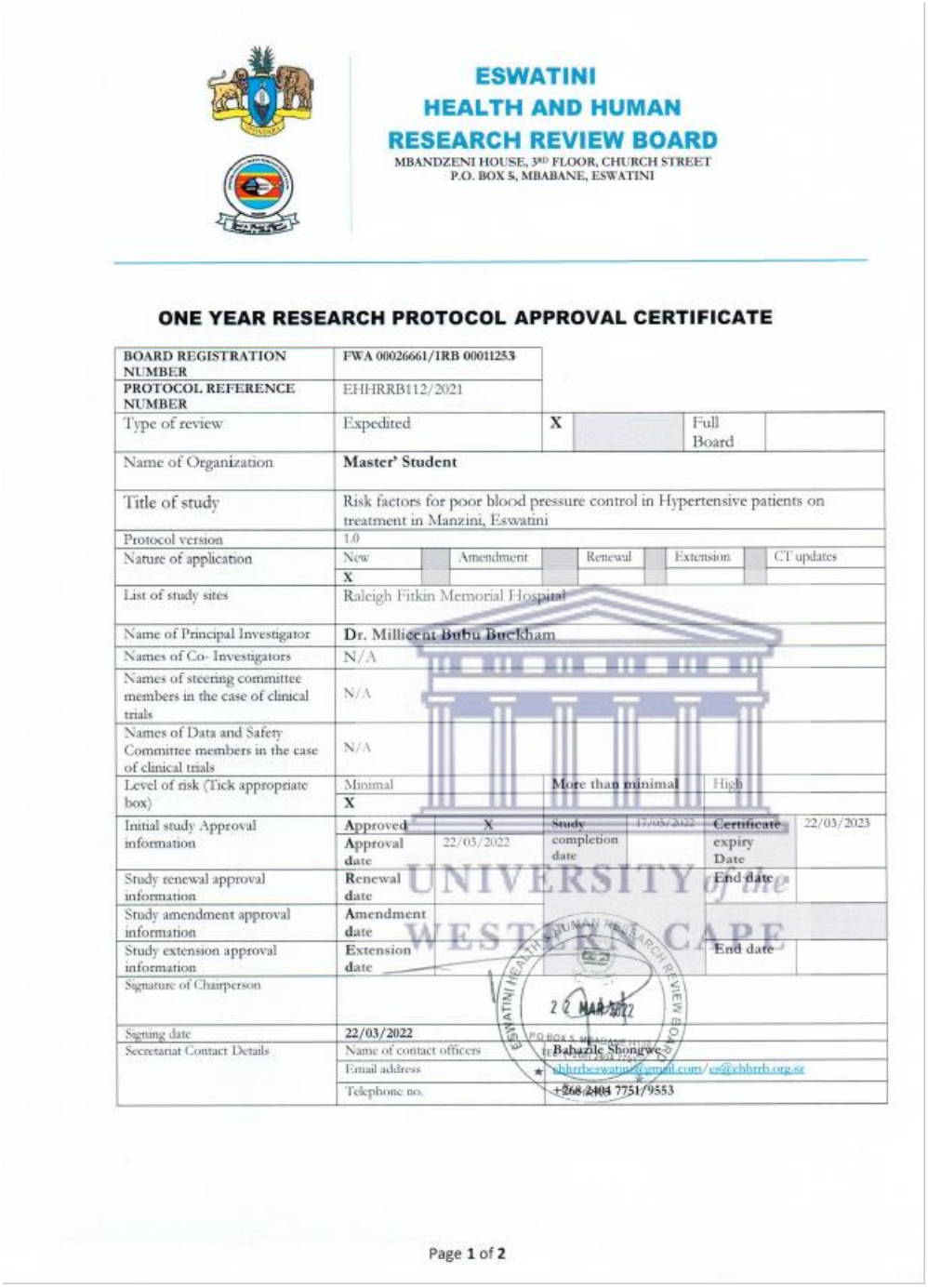
a). That confidentiality is strictly observed
b). That the hospital receives a copy of the report on the proposed research.

Yours Sincerely

Leonard S. Dlamini (Mr.)
HOSPITAL ADMINISTRATOR

CC: Matron 1
SMO

APPENDIX 6: ETHICAL CLEARANCE FROM THE ESWATINI HEALTH AND HUMAN RESEARCH REVIEW BOARD.



ESWATINI HEALTH AND HUMAN RESEARCH REVIEW BOARD
MBANDZENI HOUSE, 3RD FLOOR, CHURCH STREET
P.O. BOX 5, MBABANE, ESWATINI

ONE YEAR RESEARCH PROTOCOL APPROVAL CERTIFICATE

BOARD REGISTRATION NUMBER	FWA 00026661/IRB 00011253								
PROTOCOL REFERENCE NUMBER	EHHRRB112/2021								
Type of review	Expedited	X		Full Board					
Name of Organization	**Master' Student**								
Title of study	Risk factors for poor blood pressure control in Hypertensive patients on treatment in Manzini, Eswatini								
Protocol version	1.0								
Nature of application	New		Amendment		Renewal		Extension		CT updates
	X								
List of study sites	Raleigh Fitkin Memorial Hospital								
Name of Principal Investigator	**Dr. Millicent Bubu Buckham**								
Names of Co- Investigators	N/A								
Names of steering committee members in the case of clinical trials	N/A								
Names of Data and Safety Committee members in the case of clinical trials	N/A								
Level of risk (Tick appropriate box)	Minimal			More than minimal			High		
	X								
Initial study Approval information	Approved	X		Study completion date	17/03/2022		Certificate expiry Date		22/03/2023
	Approval date	22/03/2022							
Study renewal approval information	Renewal date						End date		
Study amendment approval information	Amendment date								
Study extension approval information	Extension date						End date		
Signature of Chairperson									
Signing date	**22/03/2022**								
Secretariat Contact Details	Name of contact officers			Bahazile Shongwe					
	Email address			ehhrrbeswatini@gmail.com/es@ehhrrb.org.sz					
	Telephone no.			+268 2404 7751/9553					

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APPROVAL CONDITIONS

Ref.	Conditions	Indication of conditions (tick appropriate box)				
1	Implementation of approved version of protocol					
2	Submission of progress reporting for multi-year studies	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
3	Submission of end of project report (Hard copy)	✓				
4	Submission of end of project report (Soft copy)	✓				
5	Submission of data sets	✓				

List of reviewed documents

Ref.	Documents	Reviewed documents (tick appropriate box)
1	Completed application form	✓
2	Cover letters	✓
3	Evidence of administrative permission to conduct the research by involved institutions/sites (where applicable)	
4	Detailed current resume or curriculum vitae of Principal Investigator/s including Principal investigators declaration	✓
5	Summary resume or biography for other investigator(s)	✓
6	Evidence of approval/rejection by other Ethics Committees, including comments and requested alterations to the protocol, where appropriate.	✓
7	Research protocol (see outline in Annex 1)	✓
8	Questionnaires and interview guides (with back-translated versions where applicable)	✓
9	Case report forms (CRFs), abstraction forms and other data collection tools	
10	Participant/subjects Information Statement(s) (where applicable)	✓
11	Informed consent form(s) including photographic and electronic media consent statements.	✓
12	Advertisements relevant to the study (where applicable)	
13	Source of funding and detailed budget breakdown including material and incentives to participants if applicable	✓
14	Notification form for adverse effects/events.	
15	Proof of payment	✓
16	Proof of insurance cover for research subjects in clinical trials or where applicable	N/A
17	Any other special requirements should be stated, if applicable	N/A