THE NUTRITIONAL KNOWLEDGE AND CONSUMPTION OF BLACKJACK BY HYPERTENSIVE PATIENTS IN VHEMBE DISTRICT, LIMPOPO PROVINCE, SOUTH AFRICA

By

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The dissertation is submitted in fulfilment of the requirements for the degree of Master of Science in Public Nutrition in the Department of Nutrition, School of Health Sciences, at the University of Venda

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DECLARATION

I, Fhatuwani Gavhi, declare that the dissertation for the Master of Science in Public Nutrition degree (MScPN) at the University of Venda, hereby submitted by me, has not been submitted previously for a degree at this or any other university, that it is my own work in design and execution, and that all reference material contained therein have been duly acknowledged.

…… ……

Signature Date

DEDICATION

- To my dearest mother, Vho-Mutshekwa, this degree is yours mommy! As old as you are, you never ceased to support my dreams. You allowed me to spend most of the time indoors working on this degree, the time that I was supposed to spend with you. You are God's gift in my life. Words are not enough to describe how grateful I am for your love and support.

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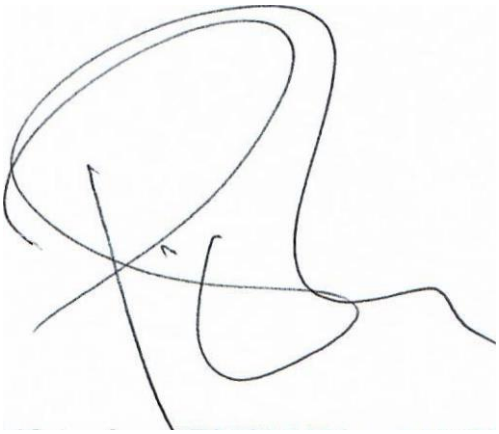
EDITORIAL LETTER

30th April, 2019

This is to certify that I, **Dr P Kaburise,** of the English Department, University of Venda, have proofread the research report entitled - **THE NUTRITIONAL KNOWLEDGE AND CONSUMPTION OF BLACKJACK BY HYPERTENSIVE PATIENTS IN VHEMBE DISTRICT, LIMPOPO PROVINCE, SOUTH AFRICA -** by Gavhi F. I have indicated some amendments which the student has undertaken to effect, before the final report is submitted.



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ABBREVIATIONS

ARB	Alpha Receptor Block
BMI	Body Mass Index
CVD	Cardio Vascular Disease
DBP	Diastolic Blood Pressure
DHB	District Health Barometer
DoH	Department of Health
g/ml	Gramme/ millilitre
HC	Health Centre
HCTZ	Hydrochlorothiazide
HHs	Households
mmHg	millimetre per mercury
NDoH	National Department of Health
QFFQ	Quantitative Food Frequency Questionnaire
RDA	Recommended Dietary Allowance
SADHS	South African Demographic Health Survey
SANHANES	South African National Health and Nutrition Examination Survey
SBP	Systolic Blood Pressure
SPSS	Statistical Package for Social Sciences
WHO	World Health Organisation

DEFINITION OF TERMS

Blackjack is an annual widely available indigenous leafy vegetable that has medicinal properties and is known to prevent diseases (Bartolome, *et al.,* 2013). In this study, Blackjack refers to an indigenous vegetable of interest.

Blackjack availability around the households in this study refers to the presence of Blackjack in the household, fields and/or gardens.

Blackjack consumption in this study refers to its availability around the households, preparation methods and consumption patterns.

Blackjack consumption patterns in this study refers to the way hypertensive participants consume Blackjack; this includes, place of consumption, people whom participants consume Blackjack with, quantity of Blackjack and frequency with which the participants consume Blackjack.

Blackjack nutritional knowledge in this study refers to the knowledge that the study participants have regarding nutritional content and health benefits of Blackjack.

Blood pressure refers to the measure of the force of blood pushing against blood vessels walls (McManus, *et al*., 2011).

Dietary intake refers to the daily eating patterns of an individual, including specific foods and nutrients consumed and their relative quantities (WHO, 2015a).

Dietary intake in this study refers to the broader picture of food and nutrient consumption of participants.

Hypertension refers to a chronic condition in which the blood pressure in the arteries is elevated (McManus, *et al*., 2011).

Hypertensive patients in this study refer to hypertensive individuals who participated in the study.

Indigenous vegetables refers to plant species that have either evolved in the area or migrated there by natural means and that are consumed as part of traditional diet (Hughes & Keatinge 2012). In this study, **indigenous vegetables** will refer to any plant consumed as part of a traditional diet.

Large family size in this study refers to a family with seven to ten members.

Medium family size in this study refers to a family with four to six members.

Nutritional knowledge refers to knowledge of concepts and processes related to nutrition and health aspects, including knowledge of diet and health, diet and disease, foods representing major sources of nutrients, and dietary guidelines and recommendations (Axelson & Brinberg 1992). In this study, nutritional knowledge encompassed the nutritional importance of consuming Blackjack and the Blackjack health benefits.

Nutritional status refers to the state of the body in relation to the consumption and utilisation of nutrients (WHO, 2015a). Nutritional status is usually measured with two to four methods that include anthropometric, biochemical, clinical and dietary intake measurements (WHO, 2015a). In this study, nutritional status of the hypertensive patients was measured by anthropometric and dietary intake assessments.

Small family size in this study refers to a family with one to three members.

ABSTRACT

Hypertension remains a major public health problem that needs different comprehensive health strategies to deal with it. Indigenous vegetables, Blackjack in particular, have been shown to possess anti-hypertensive properties that are attributed to bioactive chemical substances such as phytochemicals, fiber, antioxidants as well as micronutrients that include potassium, magnesium, calcium, vitamin C, zinc, iron and copper. The use of indigenous vegetables in combination with the conventional hypertension treatment may reduce hypertensive conditions; hence, the purpose of this study was to determine Blackjack nutritional knowledge and consumption by hypertensive patients. A cross-sectional study employing both quantitative and qualitative methods was conducted on 275 hypertensive participants at Mphambo and Mutale Health Centers, Vhembe District of Limpopo Province, South Africa. A questionnaire was used to collect data on participants' Blackjack nutritional knowledge, Blackjack availability around their households as well as their Blackjack consumption patterns and nutritional status. The Blackjack nutritional knowledge data was triangulated with focus group discussions and participants' nutritional status was assessed by anthropometric and dietary intake methods. The body mass index (BMI) was calculated and dietary intake frequency from selected foods was determined. Blood pressure was measured using Microlife automatic blood pressure monitor. The findings indicated that most hypertensive participants had poor knowledge of the nutritional importance of Blackjack and its associated medicinal contribution on hypertension management. Participants were unable to mention different diseases that can be prevented or managed by Blackjack, which was mostly consumed once a week with porridge during the summer season. Hypertensive patients were consuming high amounts of sodium and less amounts of minerals that are known to regulate blood pressure, such as potassium and magnesium. Hypertensive patients had high prevalence of overweight and obesity and most were either in hypertension stage 1 or stage 2. Lack of Blackjack nutritional knowledge may have contributed to a decreased consumption of Blackjack by hypertensive patients. The health professionals should promote the nutritional benefits of Blackjack in rural areas, particularly to hypertensive patients to raise awareness of Blackjack's benefits in disease prevention and management.

Keywords: *Blackjack, Blackjack consumption, blood pressure, hypertension, indigenous vegetables, nutritional knowledge, phytochemicals.*

CHAPTER 1: INTRODUCTION

1.1 Background of the study

Hypertension is documented as a common cause of cardiovascular diseases (CVD) and a leading non-communicable disease, globally (Forouzanfar, *et al*., 2017; World Health Organisation (WHO), 2015b). Approximately one billion people worldwide have hypertension with two thirds of them in developing countries (Sumeet, *et al*., 2014). As hypertension prevalence continues to increase across the world, the medical intervention seems to be failing to meet the goal of curbing it (Sumeet, *et al*., 2014; Hatano & Strasser, 2018). Sumeet, *et al*. (2014) predict that 1.56 billion adults in the world will be suffering from hypertension by 2025. Developing countries are expected to have a high burden of hypertensive population (80%) compared to developed countries (20%) due to several factors that include transition, lifestyle factors, poor health-care systems and other unmodifiable factors (WHO, 2015b). Approximately 75 million people in the United States of America were reported as suffering from hypertension in 2016 (Claudia, *et al*., 2016). An estimated one billion people live with hypertension in Sub-Saharan Africa and of these people, more than nine million die from the condition each year (Kaze, *et al*., 2017).

South Africa reportedly also have a high prevalence of hypertension. The District Health Barometer (DHB) 2016/17 reported increased hypertension incidences in South Africa with 18.9% cases per 1 000 persons of the population (Massyn *et al*., 2017). Shisana, *et al*. (2013) and the South African Demographic Health Survey (SADHS, 2016) state that approximately 46% of women and 44% of men aged 15 years and older have hypertension in South Africa. In addition, it is estimated that, 53 men and 78 women die daily due to hypertension in South Africa (Hughes, *et al*., 2013). High prevalence of hypertension has also been reported in rural areas of Limpopo Province. A study conducted with 1281 participants in Limpopo Province reported 41.4% prevalence of hypertension (Ntuli, *et al*., 2015). In Vhembe District, DHB 2016/2017 affirmed 11.4% hypertension incidence per 1000 population in individuals aged 18 years and above (Massyn *et al*., 2017).

There are several factors that can be contributing to the high prevalence of hypertension in South Africa. The major risk factors for hypertension are high fat diets, lack of exercise and cultural habits (Ntuli, *et al.,* 2015; SADHS, 2016). Sumeet, *et al*. (2014) note that South African diets are not only high in fats but also in sugar while being low in vegetables and fruits, thereby, contributing

to excess weight gain and a risk of hypertension. Low intake of vegetables and fruit is among the top 10 risk factors contributing to hypertension in South Africa (Faber, *et al*., 2010).

Health complications of non-communicable diseases such as hypertension are a clear indication of inadequate intake of vegetables and fruits (WHO, 2015b). WHO (2006) recommends a daily intake of more than 400 g of vegetables and fruit to protect against dietary-related chronic diseases, rather, South Africans consumes half (200 g) of the recommended amount (Faber, *et al*., 2010). In a study done in the Eastern Cape Province, Taleni, *et al*. (2012) indicated that consumption of indigenous vegetables had declined even in rural areas. Additionally, while it is well established that high salt (sodium) intake can raise blood pressure, salt intake of South Africans ranges between 6 g to 11 g/day, double the recommended amount of 5 g (1 teaspoon) of salt a day (Hughes, *et al*., 2013; Wentzel-Viljoen, *et al*., 2013). High salt consumption causes retention of fluid in the body, which can increase blood pressure. Wentzel-Viljoen, *et al*. (2013) and Sumeet, *et al.* (2014) add that poor access to adequate health services also imposes risk from an increased rate of hypertension.

There are foods that can protect our bodies against hypertension. Indigenous vegetables consumption has been identified as a good strategy to increase vegetable and fruit consumption (Faber, *et al*., 2010). Indigenous vegetables have been proven to have more nutritive value in terms of protein, carbohydrates, vitamins and minerals than some western vegetables (Mensah, *et al*., 2008). Indigenous vegetables, like *Amaranthus* spp., *Galinsoga parviflora*, *Tulbaghia violacea* have been evaluated at the University of KwaZulu Natal and have shown potential in the management of hypertension (Lewu & Mavengahama, 2011). Leaves of most indigenous vegetables contain potassium and magnesium which are minerals known to decrease blood pressure (Mensah, *et al*., 2008). In addition, indigenous vegetables have non-nutrient but beneficial healthy compounds such as fiber, phytochemicals and antioxidants that can reduce hypertension (Mensah, *et al*., 2008). Fiber provides bulk in diets and helps to reduce the excessive intake of starchy food. Starchy food may contribute to excessive weight gain and lead to hypertension (Mensah, *et al*, 2008; Lewu & Mavengahama, 2011).

Blackjack (*Bidens pilosa*) has been studied before and was found to have micronutrients that include high levels of copper, zinc, magnesium, calcium, potassium and iron (Mensah, *et al.,* 2008; Mavengahama, *et al*., 2013; Sanoussi, *et al.,* 2015). Roots, leaves and seeds of Blackjack are reportedly rich in anti-inflammatory, diuretic and hepato-protective measures (Mavengahama,

et al., 2013). Sanoussi, *et al.* (2015) indicated that Blackjack contains high amounts of fiber, antioxidants and phytochemicals and has been used as medicinal plant for dietary anemia, blood flow and lowering of blood pressure (Mavengahama, *et al*., 2013). Although there is information about the nutritional benefits of Blackjack, Mensah, *et al*. (2008) and Mavengahama, *et al*. (2013) indicate that the available information is scanty and suggested that further research needs to be done.

1.2 Problem statement

There is a major concern about high hypertension prevalence in rural areas of Vhembe District (DoH, 2015). High prevalence of hypertension requires high medical (treatment) costs in its management. This high hypertension prevalence can be reduced with the usage of locally available indigenous vegetables. Some medicinal properties identified in indigenous vegetables are commended for their ability to manage hypertension (Mavengahama, *et al*., 2013). Blackjack, one of the widely available vegetable in Vhembe District, is among those indigenous vegetables that have been previously studied for medicinal properties. Although Blackjack has been found to have medicinal properties, its consumption pattern within the rural communities is not yet documented (Lewu & Mavengahama, 2011). Furthermore, there are no studies that have been done in Vhembe District to document Blackjack nutritional knowledge among hypertensive patients nor if people consume Blackjack for health benefits reasons.

1.3 Research questions

1.3.1 What is the nutritional knowledge status on Blackjack among hypertensive patients?

1.3.2 What are the consumption patterns of Blackjack by hypertensive patients?

1.4 Aim of the study

The aim of the study was to determine Blackjack nutritional knowledge and consumption among hypertensive patients.

1.5 Objectives of the study

1.5.1 To assess Blackjack nutritional knowledge of the hypertensive patients in Vhembe District

1.5.2 To determine availability of Blackjack around the households of hypertensive patients.

1.5.3 To determine consumption pattern of Blackjack among hypertensive patients.

1.5.4 To determine the nutritional status of hypertensive patients.

1.5.5 To measure the blood pressure of hypertensive patients.

1.6 Significance of the study

The findings of this study will set baseline information on nutritional knowledge, consumption and dietary intake patterns of Blackjack by hypertensive patients. Policy makers may, use the findings of this study to formulate policies and subsequent intervention strategies to ensure that hypertensive patients have information on Blackjack's nutritional value. Findings may also inform relevant stakeholders, such as Department of Health to include education on Blackjack's nutritional importance in health promotion programmes. Including such information in health-promotion initiatives will assist to raise awareness of Blackjack's nutritional importance and result in an increased consumption by hypertensive patients, hence, may assist in the prevention and management of the hypertension burden within the communities.

CHAPTER 2: LITERATURE REVIEW

2.1 Overview

This section introduces literature used to support the discussion in the study about Blackjack's nutritional knowledge and consumption among hypertensive patients. Description and composition of indigenous vegetables and their health benefits, particularly of Blackjack, in relation to hypertension, will be reviewed. In addition, the nutritional status of hypertensive patients, different stages of hypertension and factors that influence hypertension will be reviewed. Lastly, the review will include hypertensive patients' knowledge on nutrition regarding indigenous vegetables.

2.2 Consumption of indigenous vegetables

There are different indigenous vegetables that are consumed particularly in rural areas. Indigenous vegetables refer to any plant consumed as part of a traditional diet (Hughes & Keatinge 2013). Indigenous vegetable consumption is acknowledged as a good intervention for the prevention and reduction of micronutrient deficiencies as well as non-communicable diseases such as hypertension and diabetes (Hughes & Keatinge 2013; Kamga *et al*., 2013; Birol *et al*., 2015). Although indigenous vegetables are recommended by studies to be beneficial in human health, their consumption levels and frequencies are still too low to guarantee much benefit (Birol *et al*., 2015). The promotion and consumption of indigenous vegetables can help to mitigate food insecurity and alleviate malnutrition in developing countries (Kamga *et al*., 2013; Birol *et al*., 2015), hence, it is advisable to use indigenous vegetables and fruits that were consumed in the past as they have proven health benefits.

Indigenous vegetables have long been considered as an important part in a balanced diet, and their increased consumption has been a central objective of many health promotion programmes (Mensah, *et al*., 2008; Van der Hoeven, *et al*., 2013). Despite the evidence of the benefits of consuming indigenous vegetables, most Americans consume less than the recommended amounts (Van der Hoeven, *et al*., 2013). It has been established that population groups, including children and adolescents in most Western, Asian, Costa Rica and African countries, consume far less than the recommended amount of indigenous vegetables (Birol *et al*., 2015; Van der Hoeven, *et al*., 2013).

Gido, *et al*. (2017) note that rural dwellers consume more indigenous vegetables when compared to urban dwellers in Kenya. South Africans of lower socio-economic status have been shown to

be those most likely to consume indigenous vegetables, in line with health-professionals' recommendations (Mensah, *et al*., 2008; Lewu & Mavengahama, 2011). Lewu & Mavengahama (2011) argue that South African rural residents have more access to indigenous vegetables compared to urban dwellers. Consumption status of indigenous vegetables, however, has been declining over the years even in rural areas. The decline might be due to lack of knowledge regarding the health importance of consuming these indigenous vegetables. Transition in diets might also be contributing to the decline of indigenous vegetables consumption as most people are currently depending on western diets. This decline in indigenous vegetable consumption can result in poor diets and increased risk of chronic diseases such as hypertension (Mensah, *et al*., 2008; Lewu & Mavengahama, 2011).

Consumption of indigenous vegetables is also affected by seasonal changes, however, some individuals preserve these vegetable and use them during dry seasons such as winter. Preserving indigenous vegetables is essential to ensure their availability and consumption all year round. Indigenous vegetables are abundantly available during summer and there is a decrease, even no-availability during dry season making vulnerable people who rely solely on them (Lewu & Mavengahama, 2011; Taruvinga & Nengovhela, 2015).

Indigenous vegetables, particularly, Blackjack grows naturally around homestead gardens in the KwaZulu-Natal and Limpopo Provinces (Lewu & Mavengahama, 2011), although, they are also commercialised due to developments and seasonal changes (Mensah, *et al*., 2008; Lewu & Mavengahama, 2011). With the current state of the economy, it could be difficult for low-income people to access these indigenous vegtables.

A study done in Kenya revealed that cowpea leaves and jute mallow were still the most popular indigenous vegetables among the nine varieties that were consumed by 60% of the 120 households surveyed (Ekesa, *et al*., 2009). Faber, *et al*. (2010) highlighs the dominant indigenous vegetables in rural areas of Kwa-Zulu Natal as amaranth (*Amaranthusspp)* and Blackjack whilst in rural Limpopo, spider plant (*Cleomegynandra)*, amaranth (*Amaranthusspp)* and wild watermelon leaves (*Citrulluslanatus)* were most frequently consumed. The study done in Blouberg area, Limpopo Province by Mathibela & Potgieter (2017) indicated that *Amaranthus thunbergii* Moq. *Cleome gynandra* L., *Corchorus tridens* L., and *Vigna unguiculata (*L.) Walp were the most consumed indigenous vegetables by the community members.

2.3 Nutritional knowledge on indigenous vegetables

Nutritional knowledge plays an important role in promoting food-habit changes among the public. For instance, Taruvinga & Nengovhela (2015) found that 84% of the participants in a study that was done in Eastern Cape, South Africa, responded that they eat indigenous vegetables, as they know these have nutritional value critical for balanced diet and disease prevention. A study done amongst Malaysian adults revealed that females have poorer nutritional knowledge as compared to their male counterparts (Mensah, *et al*., 2008). Females' poor nutritional knowledge might be due to a general lack of knowledge, as females are usually less educated as compared to males as a result of social disparities. On the contrary, Karim, *et al*. (2008) state that adult females were more knowledgeable of Blackjack compared to males in Taiwan and Australia. Females reported using Blackjack for wounds, colds, flu, fever, hepatitis, jaundice, glandular sclerosis, rheumatic conditions, neuralgia, smallpox, colic, diarrhea, diuretic, pain, snake bite, conjunctivitis and anemia (Karim, *et al*., 2008).

Mushaphi, *et al*. (2015) claim that most caregivers know indigenous vegetables, such as *Spider wisp* (*murudi)*, *Elephant ear (mufungwi)*, indigenous mixed dishes such as *dovhi* and fruits in rural areas of Limpopo Province. Gido, *et al*. (2017) assert that rural dwellers were more knowledgeable about the medicinal benefits associated with indigenous vegetables than urban dwellers in Kenya. Sigh, *et al.* (2013) also argue that rural dwellers in India used indigenous vegetables for health problems such as anemia, poor vision, skin problems, digestive irregularities, scurvy, wound healing and intestinal worms.

2.4 Indigenous vegetables and health benefits

Indigenous vegetables are wild species that have either evolved in the area or migrated there by natural means (Hughes & Keatinge 2013). Most rural areas have both indigenous vegetables and naturalised vegetables. Naturalised plants are wild plants that have not evolved in the area but were introduced intentionally or accidentally (Moteetee, 2016). Some indigenous and naturalised leafy vegetables have been shown to have the potential synergetic effect, as they are high in micronutrients and can be used as traditional medicine or substitute (Dlamini, *et al*., 2010; Hughes & Keatinge, 2013; Kamga, *et al*., 2013; Birol, *et al*., 2015). Dlamini, *et al*. (2010) attest that the contribution of local indigenous foods in reducing health risks have been recognized.

The fresh leaves of indigenous vegetables usually contain about 21.6% water and this may be responsible for their use as diuretics in traditional herbal preparations (Lewu & Mavengahama,

2011; Ayua, 2016). Birol, *et al*. (2015) explain that the high content of calcium in *Gryllotalpa Africana* (4.13 mg/100 g), *T. triangulare* (7.44 mg/100 g), *A.cruentus* (2.05 mg/100 g), *Celosia* sp. (2.66 mg/100 g) and *V. amygdalina* (2.25 mg/100 g) suggest that they may be of therapeutic value in hypocalcemia states like osteoporosis but will be risky in hypercalcemia.

Indigenous vegetables have also been identified as being high in potassium and magnesium (Faber, *et al*., 2010). Potassium and magnesium are known to decrease blood pressure (Faber, *et al*., 2010; Birol, *et al*., 2015) and also plays a role in controlling skeletal muscle contraction and nerve impulse transmission (Birol, *et al*., 2015). High magnesium content in *A. cruentus* (2.53 mg/100 g), *T. triangulare* (2.22 mg/100 g), *Celosia* (1.41mg/100 g) and *G. latifolium* (1.32 mg/100 g) explains their blood pressure-lowering properties (Faber, *et al*., 2010; Ayua, 2016; Buhroy, *et al.,* 2017). Kamga, *et al*. (2013) and Birol, *et al*. (2015) further indicate that *T. triangulare, A. cruentus and Psidiumguineense* have high iron content and are recommended for iron deficiency anemia. Iron is needed in haemoglobin formation and recommended for anemic convalescence (Faber 2010; Ali. *et al.,* 2017). Kamga, *et al*. (2013) and Birol, *et al*. (2015), however, argue that even though some indigenous vegetables have high iron contents, plants usually have non-heame iron that is less readily absorbed than heame iron that is found from animal sources.

Indigenous vegetables are also high in fiber, which is essential in cleansing of digestive system (Krause, *et al*., 2011; Kenning, *et al*., 2014). In addition, indigenous vegetables are significant sources of alkaloids with medicinal properties and are used in the management of cold, persistent headaches and migraine (Lewu & Mavengahama, 2011; Kamga, *et al*., 2013). The use of C*elosia* which contains high levels of alkaloids, sodium and potassium ions, in the treatment of diarrhea has been well documented (Kamga, *et al*., 2013; Birol, *et al*., 2015). *Vemonia (*bitter leaf) is high in ascorbic acid (345 mg/100 g), dry matter (47.9 g/100 g), carbohydrate (47.9 g/100 g), potassium (38.7 mg/100 g) and contains alkaloid, saponnin and insulin (Mensah, *et al*., 2008). Hypertensive patients are usually placed on diet containing large quantities of *Vernonia* as it is capable of reducing headaches associated with hypertension (Mensah, *et al*., 2008; Faber, *et al*., 2010).

2.5 Blackjack description and composition

Blackjack (*Bidens Pilosa*) is a plant from South America and it is now found in almost all tropical and subtropical countries around the world (Lee, *et al*., 2013). It is a cosmopolitan herb considered hostile to annual and persistent crops and widely seen in disturbed areas (Silva, *et al*., 2011). The whole plant, including the root, stem, leaf and flower is used in various medicines and as a popular

herbal tea ingredient (Lee, *et al*., 2013; Falowo, *et al*., 2017). Approximately 200 different compounds have been discovered in Blackjack (Lee, *et al*., 2013; Mavengahama, *et al*., 2013). Among the discovered compounds, flavonoids and polyacetylenes have been recognized as the major ones (Lee, *et al*., 2013).

2.6 Health benefits of Blackjack

The proven biological activities of Blackjack have led countries like Brazil to include it in the official list of medicinal plants with the potential for its development for herbal use by the public health system (Lee, *et al*., 2013). Mavengahama, *et al*. (2013) state that Blackjack is commonly used in traditional medicine around the world. Solutions made from Blackjack roots are regarded as useful in the treatment of malaria and tumors (Lee, *et al*., 2013; Sannuoi, *et al*., 2015). Studies of Blackjack plant extracts have shown that it has an anti-hyperglycemic, antihypertensive, antiulcerogenic, hepatoprotective, antipyretic, immunosuppressive and anti-inflammatory, anti-leukemic, anti-malarial, anti-bacterial, antiparasitic, anti-angiogenic, antioxidant, antitumor effects and cercaricidal constituents (Silva, *et al*., 2011; Lee, *et al*., 2013; Falowo, *et al*., 2017). Flavonoids and polyacetylenes have been identified as preventing chronic diseases such as hypertension and diabetes mellitus (Lee, *et al*., 2013). There are other two active polyacetylenes, namely, ethyl acetate and tetrayne that have been reported in Blackjack (Lee, et al., 2013; Falowo, *et al.,* 2017). Ethyl acetate and tetrayne exhibit significant ability to block endothelial cell proliferation, migration and tube formation of cancer (Lee, et al., 2013; Falowo, *et al.,* 2017).

Blackjack is widely used as a folk medicine, by indigenous people to treat a variety of illnesses including pain, fever, angina, diabetes, edema, infections and inflammation in Brazil (Lee, *et al*., 2013). In China, Blackjack has been popularly used as herbal tea ingredient or in traditional medicine for treating various disorders, such as diabetes, inflammation, enteritis, bacillary dysentery and pharyngitis (Silva, *et al*., 2011). Aqueous preparations of the leaves are used in both China and Brazil for the treatment of dysentery, diarrhea and colic (Silva, *et al*., 2011; Lee, *et al*., 2013).

2.7 Hypertension

Hypertension is a medical term used for high blood pressure (Saklayen & Deshpande, 2016). High blood pressure is measured in millimeters (mm) of mercury (HG) (Saklayen & Deshpande, 2016). It is known as a “silent killer” because it can strike without any signs or symptoms (Kronish, *et al*., 2016). Hypertension readings are summarised by two numbers, which are Systolic Blood

Pressure (SBP) and Diastolic Blood Pressure (DBP) (Kronish, *et al*., 2016; Saklayen & Deshpande, 2016). SBP is when the heart is contracting and DBP is when the heart muscle is relaxing. The WHO recommended normal blood pressure range is 120/80mmHg (WHO, 2013), while hypertension is demonstrated as an SBP of greater than 140mm/HG and DBP of more than 90mm/HG (Saklayen & Deshpande, 2016).

Hypertension is categorised in three different stages and each stage depends on the average of two or more blood pressure readings recorded in more than one clinic visit (Seedat & Rayner, 2014). These stages differ with SBP and DBP values as well as recommended management measures. These stages include prehypertension, hypertension stage 1 and hypertension stage 2 (Seedat & Rayner, 2014).

2.7.1 Prehypertension

Prehypertension is the initial stage of hypertension that is described as SBP between 120-139mm/HG or DBP between 80-89mm/HG (Seedat & Rayner, 2014; Mills, *et al*., 2016). This is the critical stage for identification of individuals who are at risk of developing hypertension (Mills, *et al*., 2016). It is advisable for people who have this stage of hypertension to practice lifestyle changes that include, eating healthy diets and engaging in physical activities to control their blood pressure as medication is not recommended at this stage, except for individuals with other chronic conditions such as diabetes and kidney failure (Seedat & Rayner, 2014; Stergiou, *et al*., 2018). Stergiou, *et al*. (2018) add most people who are at this stage of hypertension remain undiagnosed until they reach hypertension stage 1.

2.7.2 Hypertension stage 1

Hypertension stage 1 is the second stage of hypertension that is defined by SBP between 140mmHg and 159 mmHg or DBP between 90 mmHg and 99 mmHg (Gebreselassie & Padyab, 2015). Although it is the second stage, most South Africans are only diagnosed with hypertension at this stage (Seedat & Rayner, 2014; Stergiou, *et al*., 2018). Lifestyle measures in combination with medication are recommended at this stage (Stergiou, *et al*., 2018). As it is the stage where medication management is recommended, thiadize-type diuretic is the first recommended medication (Gebreselassie & Padyab, 2015). A diuretic is a hypertension medication that decreases blood pressure by helping a body to remove extra fluid and sodium (Gebreselassie & Padyab, 2015).

2.7.3 Hypertension stage 2

Hypertension stage 2 is the third and last stage that has been documented so far and it is defined by SBP of 160 mm/HG and above or DBP of 100 mm/HG and more (Gebreselassie & Padyab, 2015; Stergiou, *et al*., 2018). Individuals with hypertension stage 2 are more likely to also have other medical complications such as diabetes and coronary heart diseases (Gebreselassie & Padyab, 2015). Recommended measures for this stage include lifestyle modification in combination with medication (Gebreselassie & Padyab, 2015; Stergiou, *et al*., 2018). Most hypertensive patients at this stage are required to have two or more medications (Seedat & Rayner, 2014; Mills, *et al*., 2016).

2.8 Risk factors of hypertension

There are various risk factors of hypertension. Hypertension risk factors can be categorised into two classes, namely, unmodifiable and modifiable factors.

2.8.1 Unmodifiable risk factors of hypertension

Unmodifiable factors are those that come naturally and cannot be prevented (Rahimi, *et al*., 2015). Unmodifiable factors include age, gender, ethnicity and family history (Bosu, 2016).

2.8.1.1 Age and gender

Hypertension may occur in anyone regardless of age; however, the risk increases with age as the blood vessels become less flexible when a person gets older (Keetile, *et al*., 2015). This can also be influenced by the fact that elderly people mostly live sedentary lifestyles (Ranasinghe, *et al*., 2015). With regard to gender, both men and women have equal risks of developing hypertension, however, the risk differs with age (Keetile, et al., 2015; Ranasinghe, *et al*., 2015). Men under the age of 45 years are more likely to have hypertension than women, however, by the age of 60 years, women are more likely to have the condition than men (Shisana, *et al.,* 2013; McGoon & Humbert, 2014). Age and gender are biologically made-up factors that cannot be changed, however lifestyle modification can help to reduce these risk factors (McGoon & Humbert, 2014).

2.8.1.2 Ethnicity

Most chronic diseases affect people according to their ethnicity groups, mainly because lifestyle practices differ among people and hypertension is not an exception (Ranasinghe, *et al*., 2016). African Americans have been reported to be developing hypertension more than their White counterparts (WHO, 2015b). Similarly, the National Department of Health (NDoH, 2016) reported

that more Blacks have hypertension than their White counterparts in South Africa. Shisana, *et al*. (2013) and Ranasinghe, *et al*. (2016) continue that Blacks are more likely to die pre-maturely from hypertension and its attributable diseases, due to its late diagnosis and lack of access to proper health-care service.

2.8.1.3 Family history

Hereditary characteristics are also positive risk factors for hypertension (Ranasinghe, *et al*., 2016). Individuals with family members who have hypertension have about 35% more chance of developing the diseases than those who do not have such a family history (Ranasinghe, *et al*., 2016). It is advisable, therefore, for individuals who have family history of hypertension to reduce the risk by living healthy lifestyles (Shisana, *et al.,* 2013; McGoon & Humbert, 2013; Ranasinghe, *et al*., 2016).

2.8.2 Modifiable risk factors of hypertension

Modifiable factors of hypertension are those that can be prevented (Rahimi, *et al*., 2015). Modifiable factors include diabetes, stress, alcohol drinking, smoking, overweight, obesity, medication, physical inactivity and unhealthy diet (Kayima, *et al*., 2015; Bosu, 2016). Modifiable risk factors like physical inactivity, smoking and diet are the most common causes of hypertension in South Africa (Kayima, *et al*., 2015). Physical activity, medication and diet are the mostly studied factors that influence hypertension (Krause, *et al*., 2011; Kenning, *et al*., 2014).

2.8.2.1 Diabetes

Shisana, *et al*. (2013) reported that 1 in 10 adults in South Africa has diebetes. Having diabetes doubles the risk of developing hypertension and people with both these conditions have increased risk of having heart diseases than people without either condition (McGoon & Humbert, 2013; Howitt, *et al.,* 2015). Howitt, *et al*. (2015) contend that approximately 40% of people with diabetes are more likely to develop hypertension when they reach 45 years old and the rate increases to 60% at the age of 75.

2.8.2.2 Stress

Acute stress can cause temporary increase in blood pressure (Forouzanfar, *et al*., 2017). Stress may contribute to hypertension, although, there are no studies that have been done to prove this association (Forouzanfar, *et al*., 2017, Ziegle & Milic, 2017). In addition, most people tend to

overeat, drink and smoke as a way of dealing with stress and all of these are risk factors that contribute to hypertension (Forouzanfar, *et al*., 2017).

2.8.2.3 Drinking alcohol and smoking

Smoking and excessive alcohol intake are among the major causes of hypertension. Smoking is one of the major contributors of preventable deaths globally and it increases the risk of having cardiovascular diseases (Howitt, *et al*., 2015). Blood pressure can increase to more than 10 times and stays high with each single cigarette (Howitt, *et al*., 2015). About 20% of the adult population reported a history of smoking and 17.7% reported being exposed to passive smoking in South Africa (Shisana, *et al*., 2013). The Blood pressure of those who smoke frequently can be elevated for a long time (Howitt, *et al*., 2015) and high amount of passive smoking can also cause hypertension (Shisana, *et al*., 2013; Howitt, *et al*., 2015). Passive smoking is the involuntary inhalation of smoke from cigarettes that are being smoked by other people (Howitt, *et al*., 2015).

Excessive drinking can cause abnormal heart functioning and lead to cardiovascular diseases (Ranasinghe, *et al*., 2016). More alcohol in the body stimulate the release of hormones that increase blood flow and heartbeat (WHO, 2013). Increased blood flow and heartbeat can increase blood pressure and hinder the effectiveness of the medication used for the treatment of high blood pressure (Shisana, *et al*., 2013; Ranasinghe, *et al*., 2016).

2.8.2.4 Lack of physical activity

Lack of physical activity is also one of the major risk factors of hypertension. Sedentary lifestyle does not only increase the risk of hypertension but also of heart diseases and stroke (Shisana, *et al*., 2013; Howitt *et al*., 2015). Shisana, *et al*. (2013) reveals in their study that approximately 45% women and 27.9% men are physically inactive in South Africa. Lack of physical activity makes it easier to put on unwanted weight that puts more pressure on heart to pump normally. Moreover, increased force exerted on the arteries can lead to high blood pressure (Gebreselassie & Padyab, 2015).

Being physically active is one of the most crucial things that can be done to prevent or control high blood pressure. Hypertensive patients should be advised to participate in at least 30 minutes of moderate-intensity dynamic aerobic exercises, such as walking, jogging, cycling or swimming 6 days per week (Krause, *et al*., 2011; Filipovsky, *et al*., 2012; Kenning, *et al*., 2014; Rodriguez, 2014). Aerobic training has also been shown to reduce blood pressure (Filipovsky, *et al*., 2012).

The impact of other forms of exercise, such as isometric resistance training (muscular force development without movement) and dynamic reassure on blood pressure is to reduce the risk of heart disease (Kenning, *et al*., 2014).

2.8.2.5 Weight

Nuttall (2015) explains that anthropometry encompasses a variety of human body measurements such as weight, height and size including skinfold thicknesses and circumferences. Anthropometric data are used to evaluate health, dietary status, disease risk and body composition changes that occur in human life (Nuttall, 2015). In addition, anthropometry reflects both health and nutritional status and predicts performance, health and survival (Miravitlles, *et al*., 2014).

Weight with height data is used in combination in the determination of the Body Mass Index (BMI), a useful indicator of nutritional status (Nuttall 2015; Miravittles, *et al.,* 2014). BMI provides an acceptable approximation for assessment of total body fat and is a reliable indicator of body fat for adults with the exception of athletes and the elderly (Miravitlles, *et al*., 2014). The BMI has been considered the most useful indicator in which weight-for-height can be related to health outcomes (Miravitlles, *et al*., 2014). It is widely acknowledged that the risk of developing hypertension increases with increase in weight, starting from a BMI of 25 kg/m2 (Shisana, *et al.,* 2013).

Currently, South Africa is experiencing demographic and epidemiological transition (NDoH, 2016). Studies have noted that South Africa is currently experiencing increased prevalence of obesity (Shisana, *et al*., 2013; NDoH, 2016). Obesity leads to chronic conditions such as hypertension and diabetes. South African females who reside in urban areas are said to be more obese than their rural counterparts (Shisana, *et al*., 2013; NDoH, 2016). Obesity is among the major risk factors of hypertension in South Africa (NDoH, 2016). Excess weight strains heart functioning and increases cholesterol and triglyceride levels (McGoon & Humbert, 2014; Howitt, *et al*., 2015). Howitt, *et al*. (2015) explains that more weight requires more blood to provide oxygen and nutrients to the body therefore increasing pressure on the artery walls.

2.8.2.6 Diet

Poor diet is also a causal factor in the development of hypertension (Shisana, *et al*., 2013). WHO recommends daily intake of more than 400 g of vegetables and fruit per day to protect against

non-communicable diseases, which include hypertension (Mchiza, *et al*., 2015). Most people, however, often consume unhealthy diets that comprises of excess energy, fat, salt and sugar but low in vitamins and minerals (Qaseem, *et al*., 2017). Such diets are also a major cause of overweight and tend to increase the risk of developing chronic diseases (Mchiza, *et al*., 2015). Salt consumption of South Africans is more than double the recommended amount of 6 g per day (Wentzel-Viljoen, *et al*., 2013).

High salt consumption causes retention of fluid in the body that leads to increased blood pressure (Wentzel-Viljoen, *et al*., 2013). Insufficient potassium, an important mineral that balances the amount of sodium in cells, can also increases the risk of having hypertension (Weber, *et al*., 2014). Potassium intake is associated with lowering blood pressure (Kenning, *et al*., 2014), however, supplementation of potassium, calcium and magnesium is not recommended for the prevention or treatment of hypertension (Kenning, *et al*., 2014). High potassium intake can be achieved through diet, hence, consumption of potassium-rich foods such as green leafy vegetables rather than pills is the preferred strategy to increase potassium intake; potassium derived from diet has the additional advantage that it is accompanied by other nutrients, particularly bicarbonate precursors (Kenning, *et al*., 2014; Weber, *et al*., 2014). The extent of blood pressure reduction from potassium depends on the concurrent levels of salt intake and vice versa (Kenning, *et al*., 2014).

Different diet approaches are recommended for hypertension management. These diet approaches include Dietary Approach to Stop Hypertension and vegetarian diet (Kenning, *et al*., 2014; Weber, *et al*., 2014). Increased potassium, magnesium and calcium in the diet is recommended for hypertension management. Potassium lowers blood pressure particularyly when there is a high salt intake compared to low salt intake (Kenning, *et al*., 2014). A reduced salt intake lowers blood pressure when potassium intake is low (Wentzel-Viljoen, *et al*., 2013; Kenning, *et al*., 2014; Weber, *et al*., 2014). Calcium and magnesium have also shown significant impact on lowering of blood pressure (Kenning, *et al*., 2014; Weber, *et al*., 2014).

Health professionals advises hypertensive patients to eat vegetables, low-fat dairy products, dietary fiber, whole grains and protein from plant sources that are low in saturated fat and cholesterol (Kenning, *et al*., 2014). Hypertensive patients are also advised to eat fish at least twice a week and 400 g/day of fruit and vegetables (Kenning, *et al*., 2014). Diet adjustment should be

accompanied by other lifestyle changes such as physical activities (Kenning, *et al*., 2014; Weber, *et al*., 2014).

2.9 Hypertension medication

Hypertension treatment guidelines recommend that diuretics are suitable for the initiation and maintenance of antihypertensive treatment, either as monotherapy or in combinations (Jennings, 2013; Wiysonge, *et al*., 2017). Recommended diuretics for hypertension include thiazides, chlorthalidone and indapamide, beta-blockers, calcium antagonists, inhibitors and Alpha Receptor Blockers (ARBs) (Jennings, 2013; Wiysonge, *et al*., 2017). Other antihypertensive agents such as ascentrally active drugs are also effective and they are mostly used in multiple drug combinations (Jardim, *et al*., 2017). Jennings (2013) suggests that the advantage of initiating monotherapy treatment is the use of a single agent, thus being able to describe effectiveness and adverse effects to that agent, however, the advantage of initiating combination therapy is potentially beneficial in high-risk patients with higher blood pressure values (Filipovsky, *et al*., 2012; Wiysonge, *et al*., 2017). Jennings (2013) has indicated that combining two agents from two classes of antihypertensive drugs increases the blood pressure reduction more than increasing the dose of one agent.

According to Jennings (2013) and Wiysonge, *et al*. (2017), further advantage of combination therapy is that there are physiological and pharmacological synergies between different classes of agents; this may not only justify a greater blood pressure reduction but also cause fewer side effects and may provide larger benefits than those offered by a single agent. In addition, the use of combinations of two antihypertensive drugs at fixed doses, in a single tablet is encouraged, because reducing the number of pills to be taken daily improves adherence (Filipovsky, *et al*., 2012; Wiysonge, *et al*., 2017).

2.10 Conclusion

Several indigenous vegetables have been studied and recorded as medicinal plants because of their health benefits (Hughes & Keatinge 2013; Kamga *et al*., 2013; Birol *et al*., 2015). Blackjack has also been studied and has shown potential in hypertension management. The literature indicates that although indigenous vegetables are still consumed, sometimes they are not available due to seasonal changes. Blackjack has antihypertensive properties and its consumption is important for prevention and management of hypertension (Silva, *et al*., 2011; Lee, *et al*., 2013). Hypertension is associated with overweight and obesity, conditions prevalent

amongst rural women in South Africa. Diet and lifestyle are therefore significant elements in the prevention and management of hypertension. Knowledge about Blackjack's nutritional value may influence its consumption within communities and that may result in optimum nutrients' intake by hypertensive patients (Karim, *et al*., 2008). The elderly females are the most knowledgeable but they mainly know the health benefits rather than the nutritional benefits.

2.11 Knowledge gaps identified after literature review

1. It is not known whether hypertensive patients in Vhembe District have nutritional knowledge of Blackjack.
2. The consumption pattern of Blackjack by hypertensive patients in Vhembe District is also not known.

CHAPTER 3: METHODOLOGY

3.1 Study design

The study design was cross-sectional, aimed at determining Blackjack's nutritional knowledge and consumption among hypertensive participants. Mixed methods approach was used where both quantitative and qualitative research methods were used to collect and analyse data.

3.2 Population and study area

The study population was hypertensive patients who consulted at Mphambo and Mutale Health Centres (HCs) in the Vhembe District of Limpopo Province. Vhembe District covers 21 407 square km of land with approximately 382 346 households (Stats SA, 2016). Mphambo HC is situated 37 km South West of Thohoyandou town next to Malamulele town in Collins Chabane Municipality (Figure 3.1). Mutale HC is situated 35 km north of Thohoyandou town in Thulamela Municipality (Figure 3.2). Both HCs are situated in rural, open, dry and flat areas with large free open sites where people cultivate crops like maize, pumpkin leaves *(Cucurbita Melo L)* and cowpeas (*Vigna Unguiculata*). Blackjack grows in both areas naturally in the wild and in the homestead gardens. Xitsonga and Tshivenda are the predominant languages at Mphambo and Mutale areas respectively.

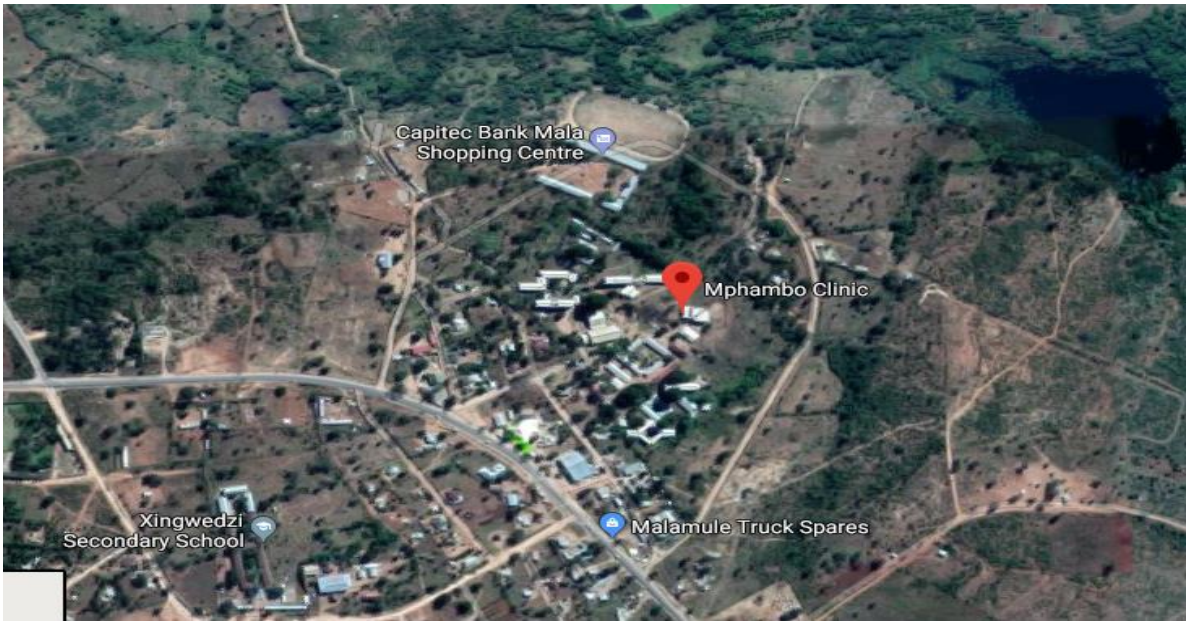

Figure 3.1 Satellite map showing Mphambo Health Centre

Figure 3.2 Satellite map showing Mutale Health Centre

3.3 Inclusion criteria

All hypertensive patients (male and female) aged 18 years and above who consulted at Mphambo and Mutale HCs from June 2014-June 2016 were considered for the study.

3.4 Exclusion criteria

Pregnant and mentally-ill hypertensive patients were excluded from the study. These individuals were excluded to ensure that the study relied on individuals who were capable of adhering to the study's procedures until the end.

3.5 Sampling

Mphambo and Mutale HCs were conveniently selected. According to DoH (2015), Mphambo and Mutale HCs are the top two HCs that have a high rate of hypertensive patients in the Vhembe District. The total number of hypertensive patients in the patients' record books from Mphambo and Mutale HCs within the period of interest (June 2014-June 2016) was 300 and 250 respectively. The formula ($n=N /(1+ (Ne^2)$ was used to calculate the total sample size where n=sample size, N=total number of hypertensive patients and e=the accepted margin of error, an additional 10% (which is a given number of 0.05 of the accepted attrition rate for sample size). The following calculations were done to get the total sample size:

Mphambo HC

$n = N / (1 + (Ne^2)$

Mutale HC

$n = 300/1 + [300 \times (0.05)^2]$

$= 300/ 1.75 \sim 2$

$= 300/2$

$=150$

$n = 250/1 + [250 \times (0.05)^2]$

$= 250/1.62 \sim 2$

$= 250/2$

$=125$

Figure 3.3 illustrates the sampling process that was followed. Overall, the sample size was 275, 150 at Mphambo HC and 125 at Mutale HC. A systematic random sampling procedure was done where a k^{th} value was determined from the list of hypertensive patients who were obtained from each HC. Every k^{th} patient was included in the study. The k^{th} value of Mphambo HC was 300/150=2. The k^{th} value for Mutale HC was 250/125=2. For a 24-hour recall interview and focus groups, 20% of the participants from each HC were selected using a simple random sampling procedure. Small pieces of paper that were written 'yes' or 'no' were folded by the researcher and placed in a container. Each participants picked up one piece of paper and those who picked up papers with 'yes' were included in the 24-hour recall interviews. The procedure was repeated for all the participants who were included in the focus-group sessions. Simple random sampling was also done to assign focus-group members into three different groups for Mphambo HC and into two different groups for Mutale HC. At Mphambo HC, each group was comprised of 10 participants. At Mutale HC, one group had 13 participants and the other had 12.

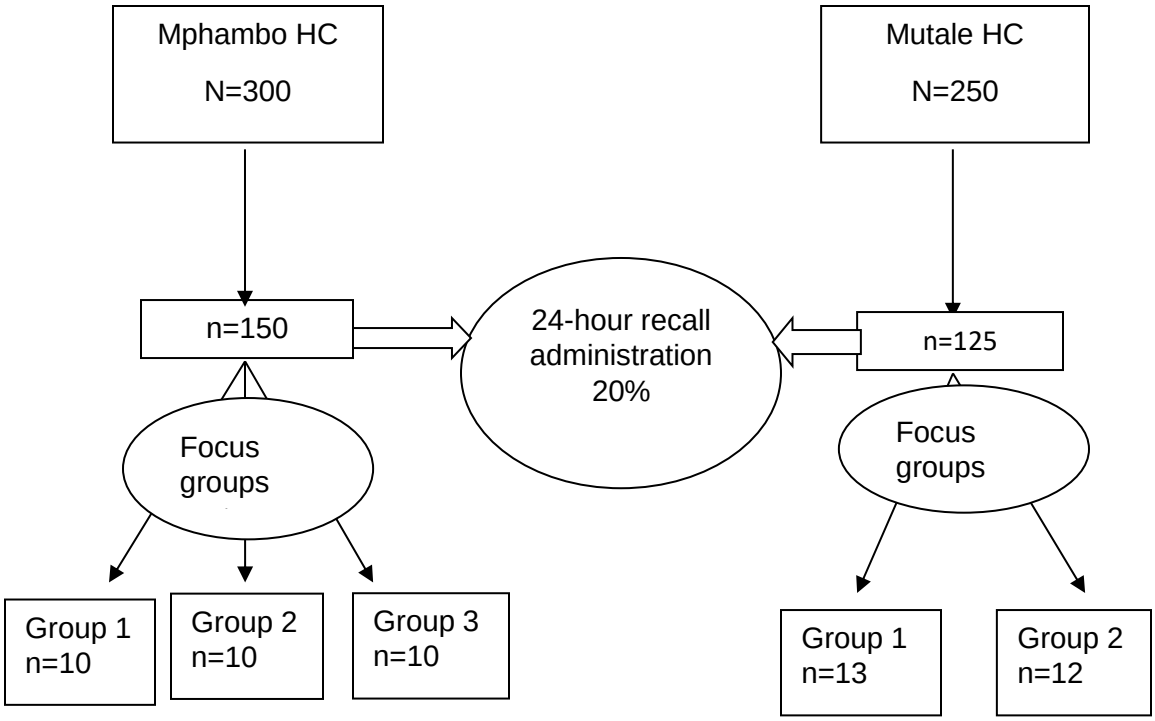

Figure 3.3 The sampling plan

3.6 Subject recruitment

Mphambo and Mutale HCs were visited to request permission to conduct the study and to make arrangements to meet hypertensive patients. There were two visits made as explained below.

3.6.1 First visit

Mphambo and Mutale HCs were visited to seek permission from the managers to get a list of hypertensive patients for selection purposes. Selection of patients for participation in the study was done as explained above. Contact numbers of those selected were obtained from the HCs' record books. The contact numbers were used by the researcher to communicate with the selected patients to set up appointments for meeting them on their next visit to the HCs. A room for meetings with the participants was also requested from the managers of the HCs during this visit. Dates for the hypertensive participants' next consultation were also obtained from the managers the same day.

3.6.2 Second visit

The researcher visited the HCs on the dates that the hypertensive participants were consulting and met with them as pre-arranged. The researcher and a field worker (professional nurse) introduced themselves and the study, particularly, the aim, objectives and procedures that would

be carried out as illustrated in the information letter (Appendix 1a). The patients who agreed to be part of the study were requested to sign a consent form (Appendix 1b). The process of selecting participants to be included in the 24 hour-recall interviews and focus-group sessions was done during this visit. The 24-hour recall (Appendix 2) was then administered to participants who were selected in both HCs to ascertain food items that would be included in the Quantitative Food Frequency Questionnaire (QFFQ). The researcher agreed with the participants on the dates of the next meeting for interviews and focus-group sessions.

3.7 Instrument development and measurements

The sections below will present the instruments that were used to collect data and the variables that were measured in the study.

3.7.1 Instrument development

The questionnaire (Appendix 3) and the unstructured focus-group interview's schedule (Appendix 4) were developed following the objectives of the study and relevant literature. Both instruments were developed in English and translated into Xitsonga and Tshivenda. Back translations were done to ensure that the meaning is not lost through the translation. All translations were done in the Department of Linguistics at the University of Venda. The instruments were also improved from the inputs offered by experts and peers in the field of nutrition.

3.7.1.1 Questionnaire

The questionnaire consisted of six sections, namely, section A (socio-demographic information), section B (Blackjack consumption information), section C (Blackjack nutritional knowledge test), section D (QFFQ), section E (Anthropometric measurements recording sheet) and section F (Hypertensive related information). Both closed and open-ended questions were used.

3.7.1.2 Interview schedule

The interview schedule consisted of only two broad open-ended questions to determine participants' Blackjack's nutritional knowledge. Questions were:

1. *Explain the nutritional importance of consuming Blackjack.*
2. *Explain the health benefits of Blackjack.*

3.7.2 Measurements

The variables that were measured in this study included Blackjack consumption, Blackjack nutritional knowledge, dietary intake, anthropometric measurements and blood pressure of the participants.

3.7.2.1 Blackjack consumption

The required information on Blackjack consumption included its availability in the households, preparation methods and consumption patterns.

3.7.2.1.1 Blackjack availability in the households

Blackjack availability in the households was measured using both closed and open-ended questions. Participants had to indicate whether they had Blackjack in their households and the form (fresh, dried or frozen) in which the vegetable was available.

3.7.2.1.2 Blackjack preparation methods

Blackjack preparation methods were measured using both closed and open-ended questions. Participants had to indicate ingredients that they added and amount of time they spent when cooking Blackjack.

3.7.2.1.3 Blackjack consumption patterns

Questions that measured Blackjack's consumption patterns included the place where the participants obtained the vegetable, people with whom Blackjack was consumed, time/ season of consumption, the frequency of consumption and other food items including their consumption quantities with which participants consumed Blackjack.

3.7.2.2 Blackjack nutritional knowledge

Blackjack nutritional knowledge was assessed quantitatively and qualitatively. The quantitative data was collected through test questions on the questionnaire (Appendix 3 section C). A memorandum for the test questions (Appendix 5) was used to determine the knowledge of participants. Participants' answers for the questions on the questionnaire were marked according to the memorandum and each correct answer was allocated 2 points. The points were calculated into percentages and interpreted as indicated on Table 3.1.

Table 3.1 Interpretation of knowledge scores (Mc Donnell, *et al*., 2003)

Scores	Level of knowledge
0 – 39 %	Poor
40 – 59 %	Fair
60 – 69 %	Good
70 – 79	Very good
80% and above	Excellent

For the qualitative approach, an interview schedule (Appendix 4) was used to collect data from the focus-groups.

3.7.2.3 Nutritional status

This section explains how the nutritional status of the participants was measured. The nutritional status was measured by dietary intake and anthropometric status.

3.7.2.3.1 Dietary intake

Dietary intake was measured using QFFQ. Food items, number of days that the food items were consumed in a week, number of times that the participants consumed a food item per day and approximate portion size of the food items were included in the QFFQ. Quantities of food items on the QFFQ were measured in either grams (g), milligrams (mg) or micrograms (mcg) per day. The researcher verified quantities reportedly consumed with food measuring utensils, such as cups and spoons. The utensils also assisted participants to recall the amount of foods consumed. Participants' average daily energy and nutrients' intake were compared with the standardised Recommended Dietary Allowance (RDA) amounts. Food items such as pumpkin leaves (*Cucurbiter Pepo)*, cowpeas (*Vigna Unguiculata*) and Chinese spinach *(Ipomoea aquatic)* were not available on the Food Finder analysis programme. Therefore, spinach (*Spinacia oleracea*) was alternately used in the analysis of these food items as it was commonly used in a similar manner.

3.7.2.3.2 Anthropometric measurements

Anthropometric measurements that were taken included weight and height which were taken using procedures adopted from Nuttall (2015). Measurements were taken as described in the next sections.

a. Weight measurement

A Seca 875 electronic Class III scale was used to measure weight. The scale was put on a flat floor, checked and adjusted for zero balance before each measurement. The participants wore minimal clothes, stood unassisted at the centre of the scale and looked straight ahead. The body weight was observed and recorded to the nearest 0.1 kg. To ensure that the weight measured was reliable, measurements were repeated after five minutes and recorded in section E of the questionnaire. The average weight measurement was then calculated and recorded in kg.

b. Height measurement

A portable Seca stadiometer was used to measure participants' height. The scale was put on a flat floor. Participants were bare footed and wearing minimal clothes. They were then asked to stand straight with feet together, knees straight and heels, buttocks and shoulder blades in contact with the vertical side of the stadiometer. Arms were hanging loosely at the sides with the palms facing the thighs. The participants were asked to take a deep breath, stand tall with relaxed shoulders, to aid the straightening of the spine. Finally, the movable board was gently lowered until it touched the crown of the head and then the body height was observed and recorded. To ensure that the measured height was reliable, measurements were repeated after five minutes and the average height measurement was calculated and recorded in squared metres (m^2).

Weight and height measurements were used to calculate BMI of the participants. The formula, BMI= weight (kg)/height (m^2) was used and the values were recorded in kg/m^2. BMI classification was done as shown in Table 3.2.

Table 3.2 BMI classification (WHO, 2006)

Classification	BMI (kg/m^2)
Underweight	<18.5
Normal	18.5 – 24.9
Overweight	25.0 – 29.9
Obesity class I	30.0 – 34.9
Obesity class II	35.0 – 39.9
Obesity class III	≥40

3.7.2.4 Hypertensive related information

Hypertensive related information was measured using questions and blood pressure measurements. Hypertensive questions included last consultation period and medication taken. The professional nurse measured blood pressure using an automatic Microlife blood pressure

measuring machine. The professional nurse used procedures adopted from Seedat, *et al*. (2014) and Galiè, *et al.* (2015). Participants were wearing minimal clothes or clothes without any sleeves to prevent blood flow constriction. Proper blood pressure cuff size was chosen. Participants were required to sit in an upright position with their feet flat on the floor where possible and upper arm positioned on the table so that it was level with their heart. The blood pressure cuff was placed and wrapped on a participant's arm, making sure that the cuff was a couple of centimeters above the elbow crease and was not in contact with any clothing. Participants were relaxed for at least five minutes before readings were taken. They were instructed not to talk when the readings were being taken as talking may increase the blood pressure. The monitor was then pressed for readings and then the systolic and diastolic readings were observed and recorded. To ensure accuracy of the blood pressure readings, measurements were repeated after five minutes and recorded on the appropriate space on section F of the questionnaire, then, the average was calculated and recorded. Table 3.3 below was used to classify the blood pressure of the participants.

Table 3.3 Blood pressure classifications (WHO, 2006)

Blood pressure classification	Systolic blood pressure (mmHg)	Diastolic blood pressure (mmHg)
Normal	< 120	< 80
Prehypertension	120 – 139	80 – 89
Stage 1 hypertension	140 – 159	90 – 99
Stage 2 hypertension	≥ 160	≥ 100

3.8 Training of field worker

The field worker in this study was a professional nurse who was mainly recruited as an expert in the measurement of blood pressure readings. As she also had some experience in data collection of health survey studies, she also assisted with other data collection. The professional nurse was trained by the researcher on the standardised data collection procedures. Trainings included questionnaire administration, establishing common understanding on what needed to be done on the blood pressure measurements and recording of the participants' response during focus-group sessions. The researcher and the professional nurse had a series of sessions interchangeably playing different roles during the questionnaire administration, focus-group interview and taking of anthropometric and blood pressure measurements to ensure consistency in data collection.

3.9 Role of researcher and field worker

The researcher supervised the data collection process by setting up dates for the participants' questionnaire administration, focus-group sessions and the measuring of the weight and height of the participants. The researcher and the professional nurse assisted each other during consent form administration, questionnaire administration and in conducting focus-group sessions. The professional nurse further measured blood pressure of the participants and recorded readings on the questionnaire.

3.10 Pre-testing of instruments

Pre-testing of the instruments was done at Tiyani HC to assess if the instruments were understandable to the participants. Tiyani HC was selected, as it was the third facility in Vhembe District with high hypertension rate (DoH, 2015). Questionnaire administration and focus group sessions were conducted on 28 patients (~10% of the sample size) who consulted at the HC for hypertension during the period of interest (June 2014-June 2016). The researcher made minor changes on the questionnaire after the pre-testing. Changes made included, omitting questions that were being repeated. There were no changes made on the focus-group interview schedule.

3.11 Data collection

Questionnaire administration was done before conducting the focus-group sessions. Different dates were scheduled for these activities.

3.11.1 Questionnaire administration

The questionnaire was administered by the researcher and the professional nurse using local languages (Tshivenda and Xitsonga according to the most preferred language by the participant) to accommodate the participants who were illiterate. The venues provided by HCs were used and the questionnaire was administered per individual participant. Each participant was asked the questions as they appeared on the questionnaire and the administrator filled in participants' response accordingly. Questionnaire administration with one participant lasted about 45 minutes. After the questionnaire administration, the researcher measured weight and height of the participants. Body mass index of the participants was then calculated and recorded on the questionnaire using weight and height values. Participants' blood pressure was then measured by the professional nurse after the weight and height measurements. Weight, height and blood pressure measurements lasted about 20 minutes. Seven to eight participants were done in a day.

3.11.2 Focus-group sessions

The researcher and the field worker met the participants at the HCs as scheduled. Three focus-groups sessions were conducted at Mphambo HC and two at Mutale HC. Focus-group sessions lasted for more than 45 minutes and were conducted using local languages (Tshivenda and Xitsonga). The researcher, field worker and participants gathered in one room. The researcher led the discussions and probed for more information whenever necessary. Participants' responses were captured in the form of writing notes and video recording. Both the researcher and the field worker took notes of the participants' responses, independently, while the field worker was also video recording all responses that participants gave.

3.12 Validity and reliability

This section discusses the quality control measurements that were enforced during the study. All procedures undertaken to ensure validity and reliability are explained.

3.12.1 Validity

According to Strydom, *et al.* (2007), validity is described as the extent to which a concept, conclusion or measurement is well-founded and corresponds accurately to the real world. The questionnaire development was informed by the objectives of the study and the literature. The questionnaire was scrutinised by peers and experts in the field of Nutrition. The final version of questionnaire was approved by two experts in the field of Nutrition. Participants' Blackjack nutritional knowledge was obtained by both quantitative and qualitative methods. Pre-testing of the instruments assisted in ensuring that information obtained was what was intended. The use of local languages also served as a measure to ensure validity as the participants were able to understand questions well and responded accordingly and the training of the field worker increased the validity of the study.

3.12.2 Reliability

Reliability is the quality of a measurement method that suggests that the same data would be collected each time there is a repeated observation of the same phenomenon (Strydom, *et al.,* 2007). The sample size reliably represented the population of the study because it was derived from the standard formula for calculating sample size. The sampling method ensured an equal chance of participation for every patient from the accessible population who meet the inclusion criterion. Questionnaire was appropriate as it was developed following relevant literature and objectives of the study. The researcher trained field worker on the standardised data collection

procedures and questions were asked as they appear on the questionnaire. Weight, height and blood pressure measurements of the participants were measured twice and averages were recorded.

3.13 Accuracy and truthfulness of scientific findings from focus groups

Accuracy and truthfulness of the findings from the focus-groups sessions was ensured through the criteria of trustworthiness that included credibility, transferability, dependability and conformability as presented below.

3.13.1 Credibility

To ensure credibility of the study, data triangulation was done. Participants' Blackjack nutritional knowledge was determined qualitatively (focus groups) and quantitatively (questionnaire administration). Feedback on the study's processes and findings was received from the supervisors. Focus-group sessions were conducted for a prolonged time to ensure that participants gained trust in the researcher enough for them to provide their understanding regarding Blackjack's nutritional and health importance. In certain cases, engagement with participants was prolonged up to 2 hours instead of the scheduled 45 minutes. This assisted the researcher to gain extensive insight into the participants' knowledge on Blackjack. Data was also collected with a video recording to ensure that precise information was captured. The researcher and the professional nurse were taking notes independently during the focus-group sessions to reduce any bias or misunderstanding of the data.

3.13.2 Transferability

The study included only hypertensive participants in two different HCs who had similar characteristics (for example, they were all aged 18 years and above). This was done in order to ensure generalisability of the findings to other hypertensive population. Demographic descriptions of participants in the focus-group sessions were also provided in the study, while a full description of how the focus-groups sessions were conducted was done. In addition, the findings of the study were discussed and compared to those of other studies.

3.13.3 Dependability

The code-recode strategy was used to ensure dependability of the study. Data that was collected during the focus-group sessions was coded twice and compared in order to check if the results were the same or different on these separate occasions. The coding was done one week apart

by the researcher and the coding results were in agreement; an expert in nutrition served as an external auditor. The expert examined the data collection process and the findings from the focus-group sessions; after this, the expert gave feedback to the researcher to ensure that quality data were obtained from the sessions and that the findings are well articulated. The audit was done to evaluate the accuracy, hence, the quality of the findings.

3.13.4 Conformability

Focus-group schedule and questions were inclusive as they were developed following relevant literature and objectives of the study. The researcher recorded information that was brought by the participants without any additional information. The process of conducting the focus-group sessions was fully described in the proposal and the researcher kept referring to the detailed process throughout the data collection process. The researcher reflected on the notes that were compiled during the focus-group sessions and interviews to compile the findings on the participants' knowledge on Blackjack.

3.14 Data management and analysis

Microsoft Excel 2010 was used to enter, clean, protect, store, and process data from the questionnaires. The dataset was checked for typing errors and verified to ensure that the data were within the allowable ranges (examples, sex was either 'male' or 'female'). Checks were also done to ensure that the data were consistent from one question to another and errors were corrected. The dataset was exported to the Statistical Package for Social Sciences (SPSS) version 24 for analysis.

Descriptive statistics was used to summarize characteristics of the study participants. Numerical data, such as age was described by median and range. Categorical data, such as sex was described using absolute numbers and percentages. Frequency tables and bar charts were used to display data visually.

Statistical analysis for nutritional knowledge was done after grading the knowledge test answers from questionnaires into scores. Qualitative data from focus-group sessions were analysed using thematic analysis approach. Structural coding of the raw data was done followed by assignment of labels. Grouped labels were then categorised into themes.

The QFFQ was analyzed using computer programme Food Finder III. Anthropometric measurements of the participants were analyzed using WHO BMI classification table (Table 3.2) and blood pressure of the participants was analysed using WHO blood pressure classification table (Table 3.3).

3.15 Institutional approval

The research proposal was submitted and presented to the Higher Degrees and Ethics Committee of the University of Venda for ethical approval before the commencement of the data collection. Ethical clearance certificate (SHS/16/NUT/02/0505) (Appendix 6) was obtained from the University Research Ethics Committee. The ethical approval, permission request letter (Appendix 7) and the research proposal were submitted to the Provincial Department of Health for further approval before data collection. The approval letter (Appendix 8) obtained from the Department of Health was submitted to Mphambo and Mutale HCs to request permission to conduct the study and the access to the participants and venues.

3.16 Ethical consideration

The researcher offered an oral and written explanation of the study, including - the aim and objectives of the study, information that was needed from the participants, procedures that will be performed during data collection, possible risks and the withdrawal rights of the participants (Appendix 1a). Nobody participated in the study without signing informed consent (Appendix 1b). Data generated from the study was stored and password-protected in a computer database to maintain participants' confidentially. Unique identifiers were assigned to personal data of participants to ensure privacy. For data verification and quality control purposes, regulatory authorities or members of the Ethics Committee of the University of Venda were allowed to access data obtained from the participants.

3.17 Dissemination of results

The results of the study will be disseminated through a dissertation, seminars, conferences and publications. The report will be submitted and presented to Mphambo and Mutale HCs as well as Limpopo Provincial Department of Health. The results of the study will be presented during research days at University of Venda and at different congresses or forums of the Department of Health.

CHAPTER 4: RESULTS

4.1 Overview

The results of the study will be presented in this chapter. Presentation will include demographic information, household land availability and food production, socio-economic status, knowledge on Blackjack's nutritional properties, its consumption, participants' nutritional status and hypertension-related information. A total of 275 hypertensive patients participated in this study.

4.2 Demographic information of the study participants

Table 4.1 shows the demographic characteristics of the participants. The median age of the participants was 69 (range 37 to 94) years. The majority of the participants (91.6%) were 50 years old and above and were females (83.3%). About 39% of the participants had never attended school followed by 32% who had primary education. Almost half (49.5%) of the participants were married and 36.7% were widowed.

Nearly two thirds of the participants' households (62.2%) had medium-sized families (4-6 members) with 21.1% who had small family size (1-3 members). About two thirds of the households (65.5%) depended only on firewood as the source of fuel for cooking while 25.5% depended on both firewood and electricity. More than half of the participants (53.1%) were using community taps with 42.2% who had household taps as source of water for drinking and cooking.

Table 4.1 Demographic information of the study participants

Demographic characteristics	n=275	%
Age in years		
Median age (range)	69 (37-94)	
< 50	23	8.4
50 years and above	252	91.6
Gender		
Female	229	83.3
Male	46	16.7
Level of education		
Never attended school	108	39.3
Primary	88	32.0
Secondary	67	24.4
Tertiary	12	4.3
Marital status		
Single	12	4.4
Married	136	49.5
Living with a partner	12	4.4
Divorced	14	5.1
Widowed	101	36.7
Family size		
Small (1-3 members)	58	21.1
Medium (4-6 members)	171	62.2
Large (7-10 members)	46	16.7
Sources of fuel for cooking		
Electricity	25	9.0
Firewood	180	65.5
Electricity and firewood	70	25.5
Sources of water for drinking and cooking		
Tap at home	116	42.2
Community tap	146	53.1
Borehole	10	3.6
Community tap and borehole	2	0.7
Both home and community tap	1	0.4

4.4 Socio-economic status of the study participants

Table 4.2 shows that the majority of the participants (81.5%) were unemployed. Just above half of the participants (50.2%) reported having at least one employed family member. About 4.7% of the households had monthly income of less than R1000.00 per month. About 40% of the households had a monthly income range of R3500.00 to R5000.00. Monthly household income of above R5000.00 was reported by 22.2% of the participants.

Table 4.2 Socio-economic status of the study participants

Employment	**n=275**	**%**
Employed	51	18.5
Unemployed	224	81.5
Employment status in HH		
HHs with no employed family member	137	49.8
HHs with employed family member(s)	138	50.2
HHs income per month		
< R 1000.00	13	4.7
≥ R1000.00 – R3500.00	89	32.4
> R3500.00 – R5000.00	112	40.7
> R5000.00	61	22.2

***percentages do not amount to 100% because some households received money from more than one sources of income.

Figure 4.1 shows that the national social development grant was the source of income for less than one third of the households (31.6%). National social development grants include old age, child support and disability grants. Both national social development grant and employment were the sources of income for 20.4% of the household. Employment also included self-employment. The pension fund was the only source of income for about 6.2% of the households.

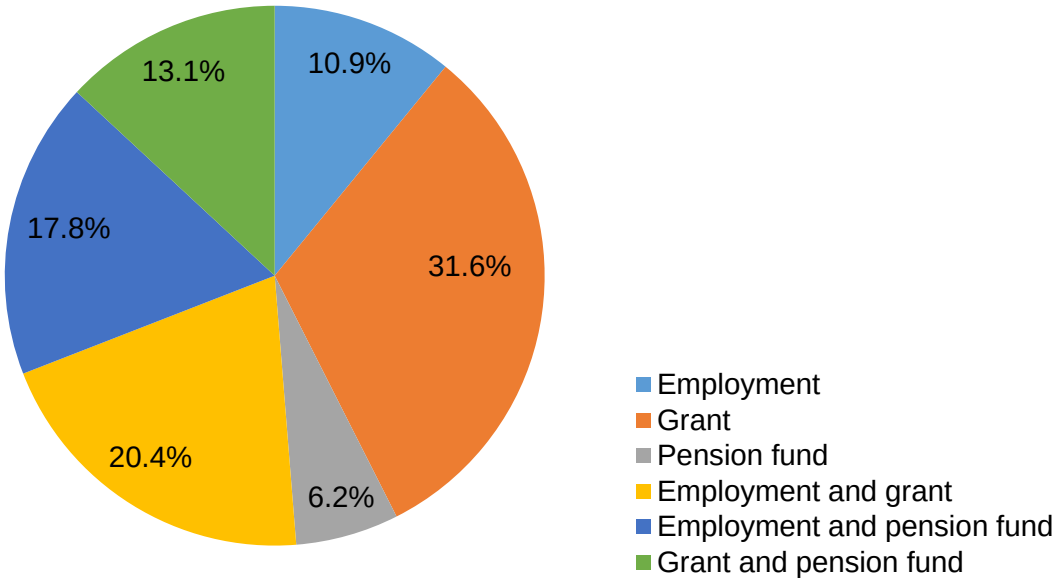

Figure 4.1 Sources of participants' households income (n=275)

4.3 Land availability and food production of the study participants

Table 4.3 indicates that 65.8% of the participants' households had land for food production. From the 181 households that had land for food production, 16% had home gardens and 36.53% had fields. Less than half of the households (45.3%) owned both home gardens and fields. Only 1.7% of the households had home gardens and orchards. Few participants (0.5%) had all three entities, home garden, field and orchard. About 58.6% of the households were producing vegetables, fruits, as well as starch and protein food on their land. Few households (9.9%) were producing starch and protein food only on their land.

Table 4.3 also shows that all households with land (100%, n=181) were planting pumpkins, which will be consumed with leaves and flowers as vegetable followed by 71.3% that were planting Chinese spinach. Cabbage and spinach were planted by 40.3% and 48.1% of the participants respectively. Few households (14.9%) were planting green pepper followed by beetroot by 17% of the households. Most households (76.2%) had mango trees followed by 42% that had oranges. Few households (8.3%) and (8.8%) had peach and guava fruit trees respectively. The starchy foods produced by households were reportedly maize and sweet potatoes while plant protein-rich foods indicated were legumes and nuts. All households (100%) were planting maize with very few (2.1%) planting sweet potatoes. More than half (54.1%) of the households were producing nuts with 36.5% produced cowpeas.

Table 4.3 Land availability and food production of the study participants

Characteristic	n=275	%
Presence of HH land for food production		
Yes	181	65.8
No	94	34.2
Production use of HH land	**n=181**	
Home garden	29	16.0
Field	66	36.5
Home garden and field	82	45.3
Home garden and orchard	3	1.7
Home garden, orchard and field	1	0.5
HHs produce	**n=181**	
Vegetables, fruits, starchy$^{\beta}$ and protein-rich$^{\mu}$ foods	106	58.6
Vegetables, starchy$^{\beta}$ and protein-rich$^{\mu}$ foods	57	31.5
Starchy$^{\beta}$ and protein-rich$^{\mu}$ foods	18	9.9

$^{\beta}$starchy food refers to maize and sweet potatoes. $^{\mu}$protein-rich food refers to legumes and nuts.

Table 4.3 Land availability and food production of the study participants (continues)

Vegetables produced	**n=181**	**%***
Pumpkin* varieties (e.g. *Cucurbita ficifolia, C maxima and C Moschata*)	181	100
Chinese spinach *(Ipomoea aquatic)*	129	71.3
Tomato	87	48.1
Cabbage	73	40.3
Cowpeas leaves (*Vigna Unguiculata*)	97	36.5
Spinach	87	48.1
Okra (*Hibiscus Esculenta*)	61	33.7
Night shade (*Solanum Nigram*)	57	31.5
Beetroot	31	17.1
Green pepper	27	14.9
Fruits produced		
Mango	138	76.2
Orange	76	42.0
Pawpaw	71	39.2
Naartjie	65	35.9
Avocado	49	27.1
Lemon	38	21.0
Banana	37	20.4
Watermelon	28	15.5
Litchi	21	11.6
Peach	16	8.8
Guava	15	8.3
Protein$^{\mu}$ and starchy$^{\beta}$ food produces in HHs*		
Maize	181	100
Sweet potatoes	37	2.4
Nuts	98	54.1
Legumes- cow peas (*Vigna Unguiculata*)	66	36.5

***percentages do not amount to 100% because of multiple responses. $^{\beta}$starch food included maize and potatoes. $^{\mu}$protein food include legumes and nuts.

4.5 Blackjack nutritional knowledge

This section will present two sets of results on the participants' Blackjack nutritional knowledge. The first section will present individual reporting results and second section will present focus-group meetings results.

4.5.1 Individual reporting

Table 4.4 presents the results on the participants' Blackjack nutritional knowledge. Almost two thirds of the participants (66.2%) did not know the importance of consuming Blackjack. From the 93 participants who reported that they knew the importance of consuming Blackjack, 76.3% had poor knowledge on this. Only 23.7% of the participants had fair knowledge on the importance of Blackjack consumption. More than half of the participants (54.5%) did not believe that Blackjack could help with certain diseases and health conditions. Of the participants who indicated that Blackjack can help with certain diseases or conditions, 40.8% and 28.8% reported that Blackjack can help with hypertension and diabetes respectively. Of those participants that mentioned more than one disease or condition, 9.6% reported that Blackjack can help with both hypertension and diabetes with 6.4% that reported that Blackjack can help with hypertension and constipation respectively, while 34.9% did not know the amount of Blackjack a person should consume in a day, 46.5% said 1 cup per day.

Table 4.4 Blackjack nutritional knowledge

Knowledge on the importance of consuming Blackjack	**n=275**	**%**
Yes	93	33.8
No	182	66.2
Level of the Blackjack nutritional knowledge	**n=93**	
Poor	71	76.3
Fair	22	23.7
Blackjack help in certain diseases and health conditions	**n=275**	
Yes	125	45.5
No	150	54.5
Diseases that can be managed by Blackjack	**n=(125)**	
Hypertension	51	40.8
Diabetes	36	28.8
Constipation	18	14.4
Hypertension and diabetes	12	9.6
Hypertension and constipation	8	6.4
Amount of Blackjack that an adult person should consume in a day	**n=275**	
½ cup	16	5.8
1 cup	128	46.5
2 cups	7	9.8
3 cups	1	0.4
1 ½ cup	2	0.7
¼ cup	5	1.8
Do not know	96	34.9

4.5.2 Focus-groups results

This section will present findings from focus group sessions that were conducted in Mphambo and Mutale HCs.

All focus groups from both HCs reported that it was a common practice for them to consume Blackjack with both males and females expressing their views about Blackjack consumption and health. There was no notable difference in the information given from both HCs; however, participants from Mutale HC had more ideas regarding Blackjack importance in health as compared to participants from Mphambo HC. Further findings will be presented under four themes that emerged from the discussions, including, Blackjack's health benefits, disease prevention and management, nutritional content of Blackjack and reasons for consuming Blackjack.

4.5.2.1 Blackjack health benefits

Most participants indicated that they had never heard about the health benefits of Blackjack when they were growing up. They, however, later heard people talking about its benefit on health. Although some of the participants indicated that they had heard people talking about the benefits of consuming Blackjack, they were unable to explain its benefits in detail. Participants who had ideas about the health benefits of Blackjack were not certain if Blackjack was classified as a vegetable that is known to be important to human health. Participant 1 in group 1 of Mutale HC said "*I heard that vegetables are good for health, however*, "*I am not sure if Blackjack is also one of those vegetables that are good for health*". When asked further, why they were not sure if Blackjack had health benefits, they responded to say, "Blackjack is just a vegetable mostly found in the bushes and mountains, we do not come across it in our daily activities".

4.5.2.2 Disease prevention and management

Participants seemed not sure of the disease prevention and management by Blackjack, although, some had ideas that Blackjack can prevent or manage diseases. They even shared experiences they had had after consuming Blackjack. Participant 1 in group 3 of Mphambo HC said "*I once ate Blackjack when I was constipated and had good bowel functioning after consumption".* Participants were unable to explain in detail or give specific names of the diseases, although, some indicated that they had heard that the bitter taste of Blackjack can prevent diseases. It also emerged during the discussions that some participants drink the bitter water of Blackjack, which they drain during the vegetable's preparation. This was reported by a few participants who said

they heard that the bitter taste of Blackjack could prevent or manage diseases. However, participants were not sure of the specific diseases that can be prevented or managed by Blackjack. Participant 2 in group 1 of Mutale HC said *"Back in the days people were just eating Blackjack, and did not have any diseases, maybe it was Blackjack that was preventing diseases".* Participant 1 in group 2 of Mutale HC said *"I do not know the diseases that can be prevented or managed by Blackjack, maybe hypertension and diabetes can be prevented or healed by Blackjack*".

4.5.2.3 Nutritional content of Blackjack

Most participants did not know the nutritional content of Blackjack, however, a few assumed that Blackjack has nutrients as it is a vegetable. Participant 1 in group 1 of Mphambo HC said "*I think Blackjack has nutrients because it is a vegetable. I heard that vegetables have nutrients*". None of the participants was able to name specific nutrients that are found in Blackjack.

4.5.2.4 Reasons for consuming Blackjack

There was a perception that Blackjack consumption is associated with poverty. The focus-group members in both HCs supported this as they indicated that they used to consume Blackjack in olden days when they did not have any means to access fancy food. Most focus group members indicated that the reason they consume Blackjack is that it is easily accessible especially in its season; however, some participants indicated that they consume Blackjack because health professionals in the HCs encouraged them to do so.

4.6 Blackjack consumption

Figure 4.2 illustrate results on the participants' Blackjack consumption and their reasons of not consuming it. The majority of the participants (98.5%) were consuming Blackjack. Of the few participants, (1.5%) who did not consume Blackjack, about 75% indicated that they do not consume because it causes heartburn while 25% indicated that they had never tasted it before.

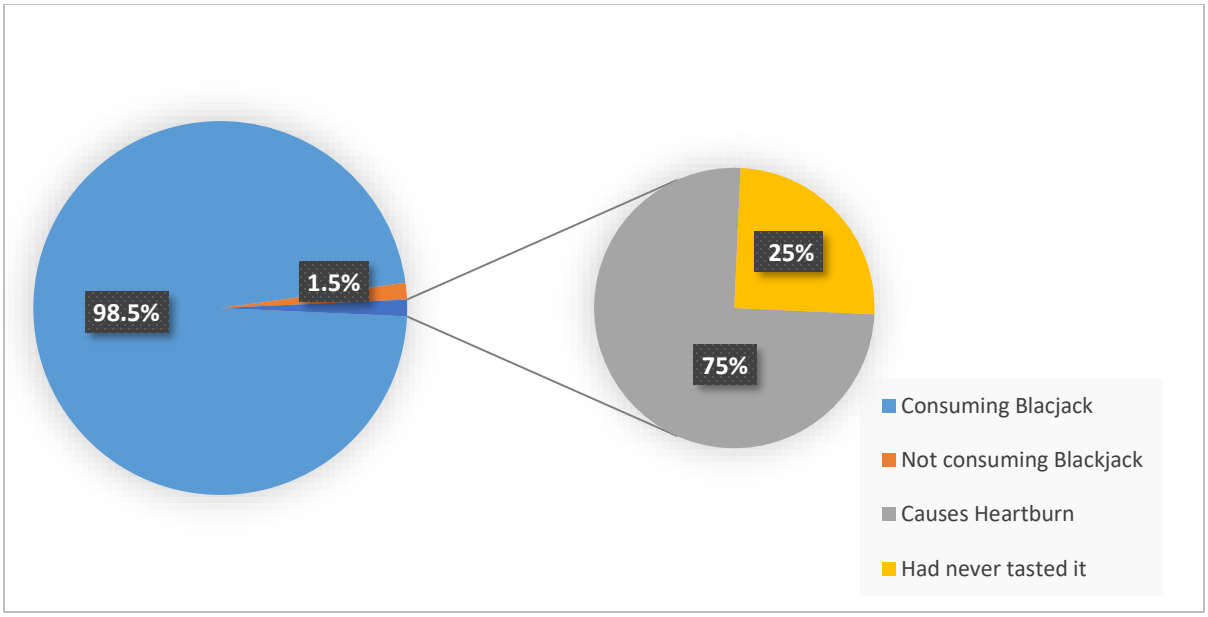

Figure 4.2 Blackjack consumption by participants (n=275)

4.6.1 Blackjack availability

Table 4.5 indicates that the majority of the households (87.6%) did not have Blackjack during the period of data collection. Of the 34 households with Blackjack available at the time, below half (47.1%) had it in their home gardens while 29% had it in their fields. However, Blackjack was reportedly found in the fields most of the time by the majority of participants (58.9%) while 33.8% said they normally got it from their home gardens. Some households (38.2%) normally bought Blackjack from hawkers (33.1%) and local supermarkets (5.1%).

Table 4.5 Blackjack availability in the HHs of the study participants

Current availability of Blackjack in the HHs	**n=275**	**%**
Yes	34	12.4
No	241	87.6
Place where Blackjack was currently available in HHs	n=34	
Home garden	16	47.1
Kitchen storage	6	17.6
Fields	10	29.0
Kitchen storage and home garden	1	2.9
Kitchen storage and fields	1	2.9
Place HHs normally got Blackjack *	**n=275**	
Fields	162	58.9
Home garden	93	33.8
Hawkers	91	33.1
Local supermarket	14	5.1

*percentages do not amount to 100% because of multiple responses.

Figure 4.3 illustrates that from the households that had Blackjack (n=34), the majority (88.2%) had fresh Blackjack while few (5.9%) had it in a frozen form. Only a few (5.9%) households had both fresh and frozen Blackjack.

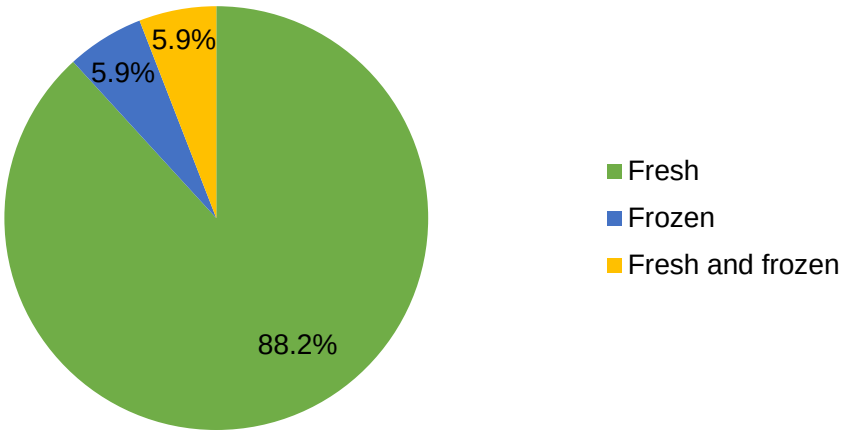

Figure 4.3 Form of Blackjack availability in the households (n=34)

4.6.2 Blackjack consumption patterns

Table 4.6 shows that from 271 participants who consumed Blackjack, most of them (94.8%) consumed it in their homes, with (82.7%) mainly with their family members. The most popular season for Blackjack consumption was reportedly, summer (80.4%). The majority of the participants (87.5%) consumed fresh Blackjack. Only 7% of the participants were consuming preserved (dried) Blackjack.

Less than half of the participants (40.9%) consumed Blackjack once in a week while 21.4% consumed Blackjack twice weekly when in season. The majority of the participants (89.7%) did not consume Blackjack out of its season. Of those participants who consumed Blackjack out of its season (28/271), less than half (46.4%) consumed once in a month and 21.4% consumed it once in a week. All participants consumed Blackjack with porridge but 33.6% would add either chicken or meat. Most participants (73.8%) consumed 1 cup of Blackjack per meal. Participants had different reasons for consuming Blackjack. Some of the participants (43.5%) consumed Blackjack because it was a conveniently available vegetable. Above one third of the participants

(34.7%) consumed Blackjack for health purposes. About 15.9% of the participants consumed Blackjack because it is a culturally acceptable vegetable that participants grew up eating.

Table 4.6 Consumption of Blackjack

Place participants normally consume Blackjack	**n=271**	**%**
Home	257	94.8
Events/functions	14	5.2
People whom participants consume Blackjack with		
Alone	44	16.2
Family	224	82.7
Friends	3	1.1
Season participants normally consume Blackjack		
Summer	218	80.4
Winter	12	4.4
Autumn	1	0.4
Spring	1	0.4
Summer and winter	39	14.4
Form of Blackjack consumed by participants		
Fresh	237	87.5
Dried	2	0.7
Fresh and frozen	15	5.5
Fresh and dried	17	6.3
Consumption of Blackjack in season		
Yes	271	100
Blackjack consumption pattern in season		
Once in a week	111	40.9
Twice in a week	54	19.9
Three times in a week	17	6.3
Once in 2 weeks	58	21.4
Once in 3 weeks	4	1.5
Once in a month	20	7.4
Twice in a month	7	2.6
Consumption of Blackjack out of season		
Yes	28	10.3
No	243	89.7

Table 4.6 Consumption of Blackjack (continues)

Blackjack consumption pattern when out of season	n=28	%
Once in a week	6	21.4
Once in 2 weeks	5	17.9
Once in 3 weeks	2	7.1
Once in a month	13	46.4
Twice in a month	2	7.1
Food that participants normally consume Blackjack with	**n=271**	
Porridge	180	66.4
Porridge and chicken	26	9.6
Porridge, chicken and meat	59	21.8
Porridge and meat	6	2.2
Amount of Blackjack that participants consume at a time	**n=271**	
½ cup	19	7
1 cup	200	73.8
2 cups	48	17.7
3 cups	3	1.1
¼ cup	1	0.4
Participants' reasons of consuming Blackjack	**n=271**	
Conveniently available vegetable	118	43.5
Health purposes	94	34.7
Culturally acceptable vegetable that people grow up eating	43	15.9
Just because it is a vegetable	13	4.8
Just liking it	3	1.1

4.6.3 Blackjack preparation

This section will present Blackjack preparation method and ingredients that were used by participants as shown in Table 4.7. The majority of the participants (80.1%) cooked Blackjack themselves in their households.

4.6.3.1 Preparation method

More than half of the participants (57.2%) did not measure the time it took to cook Blackjack. Participants indicated that they cooked Blackjack for a long time until its texture was soft, color changes and the bitter taste faded away or reduced. About 18% of the participants reported cooking Blackjack for more than 30 minutes to an hour while 12.5% were cooking between one hour and one hour 30 minutes. Very few participants (3.3%) cooked Blackjack for less than 30 minutes. The majority of the participants (96.3%) covered the pot with a lid and about 62% did not drain the water after cooking Blackjack.

Table 4.7 Blackjack preparation

Person cooking Blackjack	n=271	%
Self-preparation	217	80.1
Other family members cook Blackjack	54	19.9
Length/ time of cooking Blackjack		
< 30 minutes	9	3.3
>30 minutes – 1hr	39	18.1
>1hr – 1hr30 minutes	44	12.5
>1hr30 minutes – 2hrs	24	8.5
Long until texture is soft, color changes, bitter taste fade or reduced	155	57.2
Draining of water during Blackjack preparation		
Yes	103	38
No	168	62
Cooking of Blackjack with the pot closed		
Yes	261	96.3
No	10	3.7

4.6.3.2 Ingredients added when participants cook Blackjack

Table 4.8 indicates the added ingredients to Blackjack during preparation. About 45% of the participants reported that they added cooking oil and either salt, tomato, onion or their combination when they prepared Blackjack. In addition, 35.4% of the participants reported the addition of nuts with either tomato, onion or salt. About 44% of the participants reported addition of other vegetables. Of the 117 participants who reported the addition of other vegetables during Blackjack preparation, below two-thirds (63.2%), cooked Blackjack with spindle pigweed while 15.4% cooked with spinach.

Table 4.8 Ingredients participants add when cooking Blackjack

Ingredients participants add when cooking Blackjack *	n=271	%
Cooking oil, salt	22	8.1
Cooking oil, tomato, onion, salt	53	19.6
Cooking oil, tomato, onion	48	17.7
Nuts, salt	15	5.5
Nuts, tomato, onion, salt	43	15.9
Nuts, tomato, onion	38	14.0
Salt	18	6.6
Tomato, onion	34	12.6
Cooking Blackjack with other vegetable		
Yes	117	43.2
No	154	56.8
Other vegetables that participants cook Blackjack with *	**n=117**	
Small pigweed (*Amaranthus hybridus L*)	74	63.2
Spinach (*Spinacia oleracea)*	18	15.4
Spider wisp (*Cleome gynadra*)	11	9.4
Chinese spinach (*Ipomoea aquatic*)	6	5
Pumpkin leaves (*Cucurbiter Pepo)*	3	2.6
Annual sow thistle (*Sonchus asper*)	2	1.7
Night shade (*Solanum Nigram*)	1	0.9
Cowpeas (*Vigna Unguiculata*)	1	0.9
Elephant ear (*Colocasia esulenta*)	1	0.9

*percentages do not amount to 100% because of multiple responses

4.6.4 Other Indigenous vegetables that hypertensive participants consume

Table 4.9 presents other indigenous vegetables that participants were consuming. These indigenous vegetables included naturalized vegetables. All participants (100%) were consuming pumpkin leaves and pumpkins flowers. Okra, Chinese spinach and cowpeas were consumed by 93.1%, 94.2% and 97.5% of the participants, respectively. About 81.1% and 89.1% of the participants consumed wild jute and stinging nettle respectively. Some of the common indigenous vegetables like jelly melon, African cucumber, elephant ear, small pigweed; annual sow thistle and night shade were consumed by 64.7% to 77.8% of the participants. Spider wisp was consumed by almost half (49.8%) of the participants. *Tshinzie* was the least consumed indigenous vegetables with only 8.6%.

Table 4.9 Other indigenous vegetables consumed by the participants

Other indigenous vegetables that participants consumed	n=275	%*
Pumpkins, pumpkin leaves and flowers (*Cucurbiter Pepo, Cucurbiter and Cucurbiter F*)	275	100
Cowpeas (*Vigna Unguiculata*)	268	97.5
Chinese spinach (*Ipomoea aquatic*)	259	94.2
Okra (*Hibiscus Esculenta*)	256	93.2
Stinging nettle (*Lapritea paduncularis*)	245	89.1
Nngu∞ (*Mordica foetida*)	233	84.7
Spindle pod (*Cleome monophylla*)	223	81.8
Wild jute (*Corchus hirstirus/ tridens*)	223	81.1
Night shade (*Solanum Nigram*)	214	77.8
Annual sow thistle (*Sonchus asper*)	213	77.5
Small pigweed (*Amaranthus hybridus L*)	201	73.1
Elephant ear (*Colocasia esulenta*)	198	72
African cucumber (*Momordica balsamina L*)	187	68
Jelly Mellon (*Cucumis Africanus*)	178	64.7
Spider wisp (*Cleome gynadra*)	137	49.8
Mutshatsha (Citrullus lanatus)	65	23.6
Tshinzie∞	23	8.6

*percentages do not amount to 100% because of multiple responses. ∞I*Nngu* and *Tshinzie only have* local Venda name, English names not available.

4.7 Nutritional status of hypertensive participants

Nutritional status will encompass dietary intake and anthropometric status of hypertensive participants.

4.7.1 Dietary intake

Table 4.10 presents mean daily dietary intake of participants. The average dietary fiber intake of participants was 1.95 g/day; average hypertensive participants' iron intake was 0.6 mg/day with only 0.1 mg/day of heame iron. Average daily consumption of copper and magnesium was 0.1 mg to 25.6 mg, respectively. Daily sodium intake of the participants was 7.1 g/day and antioxidants consumed included Vitamin A, C, and E. Phytochemicals take in included lycopene and lutein and on the average hypertensive participants' antioxidants intake was 0.3 mg/day.

Table 4.10 Dietary intake of hypertensive participants

Energy and nutrients	Standards RDAs	Average daily intake
Energy (kJ)	2000 - 3200	630.6
Total protein (g)	46-56	8
Total fat (g)	44-77	5.2
Total dietary fiber (g)	18-38	1.95
Total iron (mg)	17-20.5	0.6
Heame iron (mg)	-	0.1
Non-heame iron (mg)	-	0.5
Calcium (mg)	1000	43
Magnesium (mg)	310-420	25.6
Potassium (mg)	4700	292.4
Sodium (g)	1.5-6	7.1
Zinc (mg)	8-11	1.1
Copper (mg)	0.9	0.1
Vitamin A (RE) (mg)	0.7-0.9	0.1
Total carotenoids (mg)	-	0.3
B-Carotene (mg)	0.5-0.6	0.2
A-Carotene (mg)	-	0.1
Vitamin C (mg)	0.8-0.9	0.1
Vitamin E (mg)	1.5	0.1
Lycopene (mg)	-	0.01
Lutein (mg)	-	0.2
Vitamin K (mg)	0.1-0.12	0.02
Saturated FA (g)	20-30	1.6
Mono-unsaturated FA (g)	5-6	2.3
Polyunsaturated FA (g)	5-6	1
Cholesterol (mg)	300	25.6

-Recommended dietary allowance not available

4.7.2 Anthropometric status of participants

Figure 4.4 illustrates the results of anthropometric status assessment of the participants. Only 20.4% of the participants had normal BMI, many (45.8%) were overweight and one-third (33.1%) were obese with 24.4% having class I obesity.

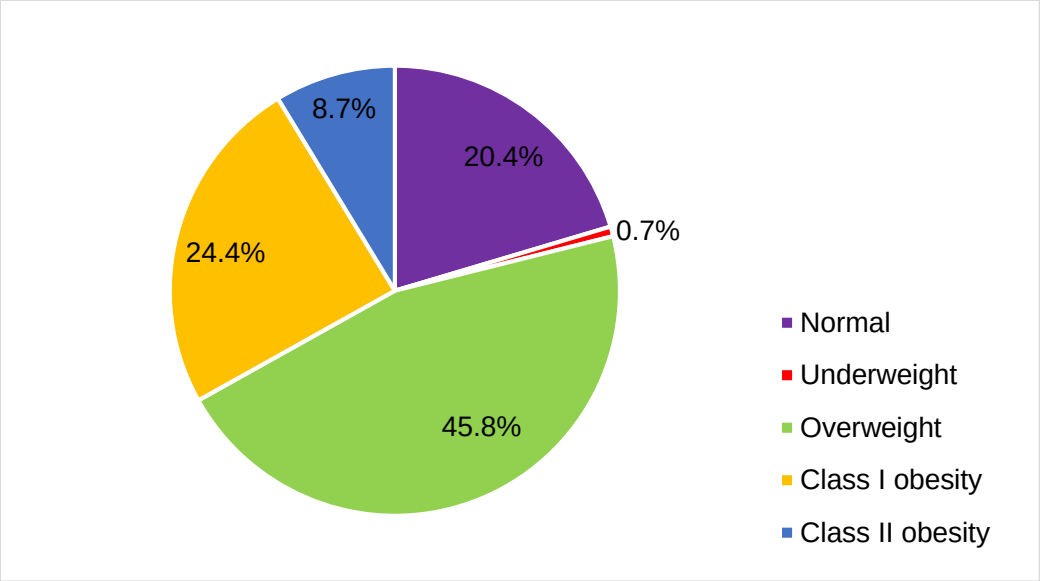

Figure 4.4 Nutritional status of the study participants (n=275)

4.8 Hypertension-related information

Table 4.11 shows that just above one-third (34.5%) of the participants reported to have last come for consultation at the clinic in the past three weeks from the period of data collection. Only 5.8% of the participants had spent over a month without consulting at the clinic about their hypertension.

There were eight hypertension medications that participants were using, namely, Hydrochlorothiazide (HCTZ), Amlodipine, Asiprin, Amittas, Enalapril, Captopril, Smoastatin and Atenolol. All participants (100%) were using HCTZ; more than half of the participants (54.2%) were using Amlodipine. About 43% of the participants had hypertension stage 1 whereas 22.2% had hypertension stage 2 while only 7.3% of the participants had normal blood pressure. Just below two third (63.3%) of the participants had changed their hypertension medication since they started with the treatment. About 27.3% of the participants were using one medication at a time with 24% of the participants using three different hypertension medications. Few participants (9.8%) were using four different hypertension medications.

Table 4.11 Hypertension related information of the study participants

Hypertension related information	n=275	%
Last consultation at the clinic		
≤ three days	53	19.3
A week ago – 2 weeks ago	58	21.1
Three weeks ago	95	34.5
A month ago	53	19.3
>month	16	5.8
Change of hypertension medication at some point		
Yes	101	36.7
No	174	63.3
Names of hypertension medications *		
Hydrochlorothiazide (HCTZ)	275	100
Amlodipine	149	54.2
Aspirin	47	17.1
Amittas	29	10.5
Enalapril	84	30.5
Captopril	2	0.7
Smoastatin	2	0.7
Atenolol	2	0.7
Number of hypertension medication used by hypertensive patients		
One	75	27.3
Two	107	38.9
Three	66	24.0
Four	27	9.8
Blood pressure stages		
Normal	20	7.3
Prehypertension	74	26.9
Stage 1 hypertension	120	43.6
Stage 2 hypertension	61	22.2

*percentages do not amount to 100% because of multiple responses

CHAPTER 5: DISCUSSION

This section will discuss the findings regarding Blackjack nutritional knowledge and consumption by hypertensive participants. In addition, nutritional status and blood pressure of the hypertensive participants in Mphambo and Mutale HCs will be discussed.

5.1 Introduction

Mphambo and Mutale HCs are in the rural areas of Vhembe District and, although, rural areas have been reported to have less prevalence of hypertension, these areas are faced with challenges, such as lack of advanced health-care system as compared to urban settings (Li, *et al*., 2017; Dastan, *et al*., 2017). Dastan, *et al*. (2017) reveal that poor health-care services in rural areas can increase the risk of developing hypertension as individuals are more likely to be diagnosed late and struggle to get proper treatment. Most hypertensive patients in both HCs were above 50 years old. Keetile, *et al*. (2015) note that the risk of developing hypertension increases with age as the blood vessels become less flexible with aging. In addition, developing hypertension in elderly people may be influenced by a sedentary life style (Keetile, *et al*., 2015). Most of the participants in this study were females. Although both females and males have equal risk of developing hypertension, females are reported to have an increased risk of developing hypertension by the age of 50 as compared to males who are likely to develop hypertension under the age of 45 (Shisana, *et al*., 2013; McGoon & Humbert, 2014). The increased risk of developing hypertension in females may be attributed to menopause as blood pressure generally increases after menopause due to hormonal changes (McGoon & Humbert, 2014). Although age and gender are non-modifiable factors, knowledge and consumption of indigenous vegetables that include Blackjack are crucial in reduction of the risk of developing hypertension.

5.2 Blackjack nutritional knowledge

Blackjack is one of the traditional vegetables that have been empirically proven to possess medicinal properties and is regarded as important in the prevention and management of diseases such as hypertension (Lewu & Mavengahama, 2011). Blackjack nutritional knowledge makes an important contribution to its consumption. It is envisaged that the higher the knowledge on Blackjack, the higher the consumption. Blackjack nutritional knowledge may motivate hypertensive patients to participate in lifestyle modifications such as weight loss and consumption of fruit and vegetables that include indigenous vegetables.

Information on Blackjack nutritional knowledge that was obtained during the individual interviews in this study was not different from the information from the focus-group sessions, however, during the focus-group sessions, hypertensive participants were able to share their experiences and practices with Blackjack. Some hypertensive participants indicated that they drink Blackjack bitter water that they drain when cooking it. The bitter taste of indigenous vegetables, particularly Blackjack has been proven to contain antihypertensive properties, such as alkaloid, saponnin and inulin that are able to reduce headache associated with hypertension (Mensah, *et al*., 2008; Faber, *et al*., 2010).

Generally, the participants had poor nutritional knowledge on the benefits of Blackjack. Different findings were reported by Taruvinga & Nengovhela (2015) and Gido, *et al*. (2017) where rural dwellers in Eastern Cape, South Africa and Kenya respectively, were knowledgeable on the health importance of indigenous vegetables including Blackjack. Elderly people are known to possess indigenous knowledge; however, participants in this study were not knowledgeable about Blackjack and its associated health benefits. Lack of Blackjack nutritional knowledge by participants in this study may be due to developments and stigma associated with the use of indigenous foods. Over the years, Blackjack has been associated with poverty; hence, people have a low tendency to use it. People have been using exotic vegetables instead of indigenous vegetables that include Blackjack. In addition, lack of awareness of the importance of Blackjack to health around Vhembe District may have led to participants' poor knowledge on Blackjack's nutritional importance.

Participants in this study did not know many diseases that can be prevented or managed by Blackjack. Participants were only able to mention constipation, diabetes and hypertension as the only diseases or conditions that can be prevented and managed by Blackjack. Participants may have been able to mention hypertension as one of the diseases that can be prevented by Blackjack as they knew it was the disease of interest in the study. Findings of this study are consistent with those obtained in China by Silva, *et al.* (2011), where participants reported diabetes and hypertension as diseases that can be managed by Blackjack. Although in this study and that of Silva, *et al*. (2011), few health indications were raised, the studies by Sanoussi, *et al.* (2015) and Subhuti (2013) showed participants' full awareness of Blackjack health benefits, as there were many reported health conditions by the participants. Health conditions that were reported by Sanoussi, *et al.* (2015) and Subhuti (2013) include indigestion, aphrodisiac, wounds, sore throats and abscess, headaches, ear infections, kidney problems, flatulence, malaria,

stomach and mouth ulcers, diarrhea and hangover. In addition, a study conducted by Lee, *et al*. (2013) reported that participants were using Blackjack for inflammation, enteritis, bacillary, edema, fever, dysentery and pharyngitis in Brazil. Results of these studies suggest that there is a range of diseases or health conditions that can be prevented or managed by Blackjack. Several scientific studies investigating the potential medicinal uses of Blackjack have been done and they have documented a range of diseases (Oliveira, *et al*., 2004; Sundararajan, *et al*., 2006; Bartolome, *et al*., 2013). Findings of this study show a gap in the knowledge on the health benefits of Blackjack, as participants did not know many diseases that can be prevented or managed by Blackjack. This lack of knowledge could be a hindrance in the use of Blackjack for hypertension management.

5.3 Participants' reasons for consuming Blackjack

Participants' main reasons for consuming Blackjack in this study were that, it is a convenient vegetable that is culturally acceptable and easily accessible in Vhembe District. Conversely, Sanoussi, *et al.* (2015) indicated that all participants who were included in their study that investigated three indigenous vegetables in Bennin, reported that they consumed Blackjack for health purposes. Differences in the findings of this study and that of Sanuossi, *et al*. (2015) may be due to lack of awareness of Blackjack consumption by hypertensive patients in Vhembe district, South Africa. Benin has a strategic plan for food and nutrition development where a multi-sectoral approach is used to raise awareness in consumption of indigenous food that include Blackjack, within the communities (World Food Programme, 2015). Educating hypertensive patients on the importance of Blackjack may improve its consumption. With better Blackjack nutritional knowledge and improved consumption, blood pressure may be modified towards normal level. This is in accordance with the notion that the level of one's health can be determined by the level of knowledge of a person (Yuliyana, *et al*., 2018), hence, the better the level of one's knowledge, the better the health level.

5.4 Blackjack preparation methods

Participants in this study were cooking Blackjack for a long time as most of them indicated that they cooked it for more than an hour. Cooking Blackjack for a long time may reduce the amount of nutrients and other essential substances such as phytochemicals due to thermal degradation (Pérez-Burillo, *et al*., 2018). Minerals bioavailability may decrease as overcooking can promote complexation reactions (Pérez-Burillo, *et al*., 2018). Therefore, overcooking Blackjack may reduce the amount of potassium, magnesium and calcium, which are important minerals in the

regulation of blood pressure (Weber, *et al*., 2014). Participants in this study were draining the water when cooking Blackjack. Draining cooking water also reduces the nutrient content of the Blackjack as the leached nutrients are washed and thrown away with the drained water. A study that was conducted by Chirango and Senga, in 2004, in Malawi reported that cooking Blackjack for more than 20 minutes diminishes nutrients content, particularly water-soluble vitamins. Findings of this study show that information on nutritive value and methods of preparation that minimize nutrient leaching was limited among the participants. Hypertensive patients need to be educated about proper cooking methods that include cooking Blackjack for short period and to prevent the draining of cooking water by avoiding adding large amounts of water. Hypertensive participants were adding other ingredients, such as nuts and were also cooking Blackjack with other indigenous vegetables. Adding nuts and other indigenous vegetables when cooking Blackjack is of health benefit as participants are attaining different nutrients from these other ingredients (Chirambo & Senga, 2004). Different nutrients are needed within the body to maintain good health (Eastwood, 2013).

5.5 Blackjack consumption pattern of hypertensive patients

Blackjack was scarce in the participants homestead gardens during the data collection period. This might have been due to the seasonal changes as data was collected in winter. Participants indicated that Blackjack normally grows during summer season in the Vhembe District. Tarivunga and Nengovhela (2015) also indicated that rural dwellers had low access to indigenous vegetables in the Eastern Cape during winter season. Scarcity of Blackjack due to seasonal change can reduce its consumption as hypertensive patients may not have money to purchase it or may not be able to get it from the markets. In addition, scarcity of Blackjack can have impact on its consumption, as hypertensive participants will not be able to consume the recommended amount. Irregular consumption of Blackjack may reduce its ability to manage hypertension, as participants may not be able to get enough of the medicinal properties that are found in Blackjack. Although rural dwellers in South Africa have been shown to be more likely to consume indigenous vegetables, consumption is decreasing due to its unavailability (Lewu & Mavengahama, 2011; Thamaga- Chitja *et al*., 2011). Unavailability may be influenced by the massive development taking place around the country both in rural and urban areas.

Small proportion of hypertensive participants who were consuming preserved Blackjack was noted in this study. This may be due to the perception that Blackjack or dried vegetables are associated with poverty. However, consumption of both dried vegetables is beneficial as they lack

preservatives that may have negative impact on health. Hypertensive participants were consuming Blackjack with their family members. Consumption of Blackjack by all family members can encourage hypertensive participants to consume more, which will result in achieving optimum health benefit compounds, which is required in the prevention of health conditions, such as hypertension.

In this study, there was a noteworthy practice of the consumption of Blackjack by participants, once in a week during its season. Findings of this study are consistent with those of Duncan (2014) and Thamaga-Chitja, *et al*. (2011) that rural dwellers in the Eastern Cape and Kwazulu Natal Provinces were consuming indigenous vegetables such as Blackjack 1-2 times in a week, during summer season. Consumption of Blackjack once in a week might be due to the limited availability of Blackjack within the households or the availability of various other indigenous vegetables. Consuming other indigenous vegetables such as *Amaranthus hybridus* by hypertensive participants is important as these other indigenous vegetables also have antihypertensive properties (Sigh, *et al.*, 2013).

5.6 Nutritional and blood pressure status of hypertensive participants

Findings of this study showed high amount (7.1 g/day) of daily sodium intake by hypertensive participants. High sodium consumption is one of the major risk factors for hypertension, as sodium is known to cause retention of fluid in the body that can lead to increased blood pressure (Weber, *et al*., 2014). Siliva, *et al*. (2014) reported two times the amount (15 g/day) of hypertensive patients' sodium daily intake in Brazil. Although the daily sodium intake of hypertensive participants in the findings of this study and that of Siliva, *et al*. (2014) was high, Ijarotimi, *et al*. (2013) reported an average of 18.37 g/day sodium intake of hypertensive patients in a study that was done in Nigeria. Dietary sodium intake reduction to less than 6g/day is recommended and has the potential to reduce systolic blood pressure by 8 mmHg (WHO, 2013).

The present study and that of Ijarotimi, *et al*. (2013) indicate similar low amount of potassium intake (292.4 mg/day) by hypertensive patients. This amount is 16 times lower than the recommended amount of 4700 mg/day (WHO, 2013). In addition, Siliva, *et al*. (2014) and Suliburska, *et al*. (2012) note an average of 2000 mg/day potassium intake by hypertensive patients in Southern Brazil. Consumption of low amounts of potassium increases the risk of developing hypertension due to imbalance of sodium in the body (Weber, *et al*., 2014). Hypertensive participants in this study were consuming 14 times less the amount of magnesium

compared to the recommended amount of 310-420 mg/day. Findings of this study differ with the findings of Suliburska, *et al*. (2012) that reported 287.6 mg/day average amount of magnesium intake by hypertensive patients in a study that was done in Poland. Magnesium is an important mineral that regulates blood pressure as it helps blood vessels relax and assist in transportation of calcium and potassium in the body (Weber, *et al*., 2014). Furthermore, this study reported low fiber intake of hypertensive participants, which differs from the findings of Suliburska, *et al*. (2012) in Poland that reported an average of 18.8 g/day fiber intake. Fiber is important in the prevention of constipation and cleansing of the digestive system (Kenning, *et al*., 2014). Moreover, soluble fiber may contribute to the reduction of the risk of hypertension. Consumption of low amounts of potassium, magnesium and fiber suggest that it is necessary for hypertensive participants to consume Blackjack as it has high amount of these antihypertensive properties. Hypertensive patients need to be equipped with Blackjack nutritional knowledge so that they know the importance of Blackjack consumption. Knowing the importance of Blackjack in regulation of blood pressure may encourage hypertensive participants to consume it in order to get enough amount of its antihypertensive properties.

In this study, the prevalence of overweight and obesity were 45.8% and 33.1% respectively. Findings of this study are consistent with the NDoH (2016) report which indicated that South Africa is currently experiencing high prevalence of overweight and obesity. In addition, the study that was conducted with 500 hypertensive patients in rural primary health care facilities of Kwazulu Natal Province indicated that almost two thirds of the participants were overweight and obese (Duncan, *et al*., 2014). Both in this study and that of Cheah, *et al.* (2018) that was done in Malaysia, overweight and obesity prevalence was high by above 40% in hypertensive patients. Findings of the current study suggest that there is still a major challenge in overcoming hypertension in South Africa. High weight requires more blood to provide oxygen and nutrients to the body therefore increasing pressure on the artery walls that can lead to hypertension (Howitt, *et al*., 2015). In order to prevent hypertension's severe complications, interventions to reduce overweight and obesity prevalence may be necessary for hypertensive patients in Vhembe District.

With the reported high prevalence of overweight and obesity, most hypertensive participants are also at hypertension stage 1 and stage 2, in this study. Excess weight in hypertensive patients may pressurize heart functioning and increases cholesterol levels, which can result in complications of the hypertension (Howitt, *et al*., 2015). Hypertensive participants were at stage

1 and stage 2, although they were under treatment. This might be an indication that treatment alone is not enough for the management of hypertension; hence, increased consumption of Blackjack by hypertensive patients might be a solution as Blackjack has the ability to manage blood pressure.

5.7 Limitation of the study

The study was conducted when Blackjack was off-season, therefore, the consumption patterns obtained may not be a true reflection of maximal consumption levels and patterns by hypertensive patients in Vhembe District. Some commonly consumed food items that were included in the QFFQ were not available on the Food Finder analysis programme. There is possibility that those food items were analysed inaccurately as the analyses were done based on the alternate food items that were available on the Food Finder programme

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The aim of the study was to determine Blackjack nutritional knowledge and its consumption among hypertensive patients. Findings of this study could be considered as a baseline information for an improvement on the paucity of data on the Blackjack nutritional knowledge and consumption by hypertensive patients in Vhembe District. This study revealed that hypertensive participants have poor nutritional knowledge on Blackjack and its associated medicinal benefit on hypertension management. The nutritional knowledge among hypertensive patients was not sufficient for Blackjack consumption to be regarded as a potential component of hypertension management. Hypertensive participants were consuming Blackjack mainly during the summer season; however, they were taking in high amounts of sodium and less amount of minerals known to regulate blood pressure, such as magnesium and potassium. Hypertensive participants had a high prevalence of overweight and obesity, and stage 1 and 2 hypertension. The high prevalence of hypertension stage 1 and 2 among participants could be an indication that medical treatment alone is not adequate to control the disease.

6.2 Recommendations

Increasing hypertensive patients' Blackjack nutritional knowledge and its consumption should be enhanced through education. Health professionals should consider raising awareness about the nutritional benefits of Blackjack in rural areas, particularly to vulnerable groups such as hypertensive patients, as the initiative could significantly contribute to an increased consumption. Increased Blackjack consumption would result in prevention and management of diseases such as hypertension. Education should include proper preparation methods to ensure conservation of hypertensive compounds as well as the nutritive value of the plants when cooking. Authorities such as Department of Health and Department of Agriculture and Rural Development may need to collaborate and initiate programs to plant Blackjack in rural areas so that hypertensive patients would always have access to it. Weight management programs need to be strengthened within the health facilities and communities to ensure that hypertensive patients maintain normal body weight. Future studies should be done in the similar settings in order to explore the nutritional knowledge and consumption of Blackjack by hypertensive patients. It is recommendable that future studies should be done during Blackjack on-season in order to get true reflection of the consumption pattern by hypertensive patients.

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8. APPENDICES

APPENDIX 1a: Information letter

Research project: **The nutritional knowledge and consumption of Blackjack by hypertensive patients in Vhembe District, Limpopo Province**

Researchers
Ms Gavhi F MSCPNUT Student at the University of Venda.
Dr CN Nesamvuni, Department of Nutrition, School of Health Sciences, University of Venda
Ms HV Mbhatsani, Department of Nutrition, School of Health Sciences, University of Venda

Dear Sir/ Madam

You are invited to participate in our study. This study intends to contribute towards the health and nutritional knowledge of hypertensive patients. The information that you will provide us with will be used solely for the purpose of this study. Your participation is invaluable because you will be helping towards getting quality data. The results of this study may be used in formulating strategies to solve burden of hypertension and that may not be only in Vhembe District but in our country and other countries as well. This means that you would have contributed to the well-being of the nations. The proposal of this study was evaluated by a panel of experts at the University of Venda. Permission to conduct this study was granted by ethical committee, University of Venda, Department of Health, Limpopo Province Department of Health, Vhembe District Department of Health and by the chief of your village.

What will happen to the findings: The findings of this study will be made public for other professionals and researchers to know and use them for the improvement of human life but you will not be identified.

Introduction: We are conducting this study to learn about the nutritional knowledge and consumption of Blackjack by hypertensive patients. This study will determine the hypertensive patients' Blackjack nutritional knowledge in Vhembe District. Blackjack availability around the households and its consumption patterns by the hypertensive patients will also be determined. Dietary intake and blood pressure of hypertensive patients will be assessed.

What the study involves: We will make an appointment with you to come to the HCs for the interviews and focus group sessions. Apart from asking few questions about your background information you will be asked questions about food that you eat including type and amount that

you eat at time. There will be questions particularly about Blackjack. We will also measure your blood pressure, weight and height. During the focus group discussions, we will take notes and record your response with video.

Risks of being involved in this study: There are no foreseen risks associated with this study.

Voluntary participation: Your participation in this study is voluntary, meaning that if you choose to withdraw from the study, you may do so without any judgment or penalty. We would however be grateful if you participate in the study until to the end as your withdrawal may disadvantage the study by reducing the chances of meeting the goals of this study.

Benefits of being in the study: You will not benefit directly from this study; however, the findings of this study may be used to plant strategies that can be used on hypertensive patients' care within our country.

Remuneration: Your contribution to this study is very important and will help in solving hypertension burden within our country but you will not be paid for participating in this study.

Anonymity: Your personal information will be kept confidential. Your name will not be used in connection with the information that you will provide. Codes will be used instead of names to keep anonymity.

Confidentiality: Confidentiality will be kept and reporting will be on findings of the study not on individual information.

Should you have any questions related to this study or worried about the way the study is done or the way you are treated, you can call the supervisors of this study Dr CN Nesamvuni on 015 962 8653, Ms V Mbhatsani on 015 962 8685 or member of ethics committee UNIVEN Prof GE Ekosse *on 015 962 8313.*

APPENDIX 1b: Consent form

Please fill in the space provided below if you agree to be part of the study.

I …….…… …… (Name and Surname) confirm that I have read and understood information on this document. I agree to participate in the study. I made this decision willingly.

Signature ……

Date…… Place.....

I declare that I did not coerce the participant to agree to be part of this study. I have fully outlined the aims and procedures of the study on the information letter.

....

Signature of the researcher Date

APPENDIX 2

24 Hour Recall

1. Please indicate all the food items including drinks you ate since the time you woke up yesterday until you went to bed.

Food item	Portion size (g/ml)	Place of consumption
Morning: a. b. c. d. e. f.		
Mid-morning snack: a. b. c. d.		
Lunch: a. b. c. d. e. f.		
Afternoon snack: a. b. c. d.		
Supper/Dinner: a. b. c. d. e. f.		
Night snack: a. b. c. d. e.		

APPENDIX 3: Questionnaire

University of Venda

QUESTIONNAIRE

The nutritional knowledge and consumption of Blackjack by hypertensive patients in Vhembe District, Limpopo Province

CODE

Date.....
Good day

My name is …….....

I am quite happy that you agreed to participate in this study. Your time, information and co-operation are very important this study. Please feel free to share your information with me. There is no right or wrong answer. I will appreciate your honesty in your responses. Thank you.

SECTION A: Demographic information

1. Gender

1.	Male	
2.	Female	

2. Date of birth

D	D	M	M	Y	Y

3. Age in years …….

4. Level of education

1.	Never attended school	
2.	Primary	
3.	Secondary	
4.	Tertiary	
5.		

4. Marital status

1.	Single	
2.	Married	
3.	Living with a partner	
4.	Divorced	
5.	Widowed	

5. Indicate the number of people staying in your household **including** yourself ……
6. Do you have employment/self-employment?

1.	Yes	
2.	No	

7. Indicate the number of people who have employment in your household **excluding** yourself. ……..
8. Indicate the sources of household income

1.	Old aged grant	
2.	Child support grant	
3.	Pension fund	
4.	Disability grant	
5.	Self-employment	
6.	Employment	
7.	Other, specify…….	

9. Indicate the total household monthly income.……
10. What is your source of fuel for cooking?

1.	Electricity	
2.	Firewood	
3.	Gas	
4.	Paraffin	
5.	Other, specify……..	

11. What is your source of water for cooking and drinking?

1.	Tap at home	
2.	Community tap	
3.	Boreholes	
4.	River	
5.	Other, specify…….	

12. Do you have land for food production in your household?

1.	Yes	
2.	No	

If the answer for question 13 is no, skip to question 16.

13. What is the land used for?

1.	Vegetables garden	
2.	Orchard	
3.	Fields	
4.	Other specify…….....	

14. What kind of produce do you normally have from this land?

1.	Vegetables Specify……	
2.	Fruits, Specify……	
3.	Other Specify……	

SECTION B: Blackjack availability, consumption patterns and cooking method

15. Do you consume Blackjack?

1.	Yes	
2.	No	

If the answer for question 16 is yes, skip to question 18.

16. State the reason why you do not consume Blackjack

……

17. Do you currently have Blackjack in your household?

1.	Yes	
2.	No	

If the answer for question 18 is no, skip to question 21.

18. Where do you currently have Blackjack?

1.	Kitchen storage	
2.	Vegetables garden	
3.	Fields	
4.	Other Specify	

19. What is the form in which Blackjack is currently available in the household?

1.	Fresh	
2.	Frozen	
3.	Dried	
4.	Other, specify……	

20. Where does your household normally get Blackjack from?

1.	Household garden	
2.	Fields	
3.	Local supermarkets	
4.	Hawkers	
5.	Other, specify……..	

If the answer for question 16 is no, skip to question 42

21. Where do you normally consume Blackjack?

1.	Home	
2.	Restaurants	
3.	Events	
4.	Other, specify ……	

22. With whom do you normally consume Blackjack with?

1.	Alone	
2.	Family	
3.	Friends	
4.	Other, specify ……...	

23. When do you consume Blackjack?

1.	Summer	
2.	Winter	
3.	Autumn	
4.	Spring	

24. How do you consume Blackjack?

1.	Fresh	
2.	Frozen	
3.	Dried	
4.	Other, specify ……	

25. Do you consume Blackjack in season?

1.	Yes	
2.	No	

If the answer for question 26 is no, skip to question 28.

26. How often do you consume Blackjack when in season?

……

27. Do you consume Blackjack out of season?

1.	Yes	
2.	No	

If the answer for question 28 is no, skip to question 30.

28. How often do you consume Blackjack out of season?

……

29. Do you consume Blackjack in and out of season?

1.	Yes	
2.	No	

30. With what other food do you normally consume Blackjack with?

……..

31. How much Blackjack do you consume at a time?

……..

32. Why do you consume Blackjack?

……

33. Are you the one who cook Blackjack in the household?

1.	Yes	
2.	No	

If the answer to question 34 is no, please provide a contact number of person who cook Blackjack in the household and skip to question 42.

Contact number **……**

34. How long do you cook Blackjack?

……

35. How much water do you add when you cook Blackjack? ……
36. With what do you cook Blackjack with? …….
37. Do you drain water when you cook Blackjack?

1.	Yes	
2.	No	

38. Do you cook Blackjack with the pot closed?

1.	Yes	
2.	No	

39. Do you cook Blackjack with other vegetables?

1.	Yes	
2.	No	

If the answer for question 40 is no, skip to question 42.

40. If you cook Blackjack with other vegetables, which other vegetables do you usually cook it with? ……
41. Name other indigenous vegetables that you consume……

SECTION C: Blackjack nutrition knowledge

42. Do you know the importance of consuming Blackjack?

1.	Yes	
2.	No	

If the answer to question 42 is no, skip to question 44.

43. Explain the importance of consuming Blackjack? .....
44. Do you think Blackjack can help with certain diseases or health conditions?

1.	Yes	
2.	No	

If the answer to question 44 is no, skip to question 46.

45. Name at least three diseases or conditions that are known to be managed by Blackjack.

……

46. In your knowledge how much Blackjack should a person consume in a day?

.....

SECTION D: QFFQ

47. Please indicate how you frequently eat the following food items. Also, provide the amount you usually eaten at a time.

FOOD ITEMS	Description	NO OF DAYS PER WEEK			TIMES PER DAY			PORTION SIZE (g/ml)	Total portion size (g/ml)
		1-2	3-4	5-7	1	2	3		
Starchy foods	*Circle where appropriate*								
a. Porridge	Maize meal Sorghum Other, specify…….. Thin consistency (e.g. *Mukapu*) Medium. consistency (e.g. *Vhutete/ Xibasa/ Mutuku/Dini)* Thick consistency (e.g. *Mugayo* Other, specify …….								
b. Rice	White Brown								
c. Samp	With beans With nuts With vegetables, specify …….. Other, specify …….								
d. Bread	Brown White Whole wheat Other, specify …….								
e. Breakfast cereal	Oats Maltabella/Mabele Maize meal Morvite								

	Corn flakes All Bran Other, specify……..								
f. Other, specify ……....									
Protein Foods									
g. Beef	Boiled Fried Grilled, Stewed, specify vegetables added ……. Other specify …….....								
h. Beef offal	Boiled Fried Stewed, specify vegetables added ……. Other specify …….....								
i. Mutton/Lamb	Boiled Fried Grilled, Stewed, specify vegetables added ……. Other specify …….....								
j. Mutton offal	Boiled								

	Fried Stewed, specify vegetables added …… Other specify …….....								
k. Pork	Boiled Fried Grilled, Stewed, specify vegetables added …… Other specify …….....								
l. Chicken	Boiled Fried Grilled, Stewed, specify vegetables added …… Other specify …….....								
m. Chicken offal	Boiled Fried Stewed, specify vegetables added…… Other specify ……..								
n. Chicken feet	Boiled Fried Other specify								

	……..								
o. Canned fish	Boiled Stewed, specify vegetables …….								
p. Fresh fish	Baked Grilled Poached Deep fried Boiled Other specify ……								
q. Eggs	Boiled Fried Scrambled Poached Other specify ……..								
r. Other specify ……..									
Vegetables									
s. Red cabbage	Boiled Steamed In salad Other specify …….								
t. Green cabbage	Boiled Steamed In salad Other specify …….								
u. Spinach	Boiled, steamed Other specify …….								

v. Chinese Spinach/ *Mutshaina*	Boiled fresh Boiled dried Other specify ……..								
w. Pumpkin leaves (*Thanga/ Xiphaswe*)	Boiled fresh Boiled dried Other specify …….								
x. Carrots	Raw In salad Other specify ……..								
y. Beetroot	In salad Other specify ……..								
z. Beetroot leaves	Boiled Other specify …….								
aa. Cowpeas/ Munawa/ Tinawa	Boiled fresh Boiled dried Other specify …….								
bb. Other specify ……..									
Fruits									
cc. Apple	Small Medium Large								
dd. Orange	Small Medium Large								
ee. Banana	Small Medium Large								
ff. Paw-paw	Small Medium								

	Large								
gg. Avocado	Small Medium Large								
hh. Other specify ……..									
Dairy food									
ii. Milk	Fresh milk Fermented full cream milk Condensed milk Skimmed milk Other specify …… Low fat Fat free Full cream Other specify ……								
jj. Other specify ……..									
kk. Yoghurt	Fat free Low fat Plain Other specify ……								
ll. Other specify ……..									
Legumes									
mm. Beans	Dry beans Lentils Peas Other specify……								
nn. Nuts	Ground nuts								

	Other specify ……								
oo. Other specify ……									
Beverages									
pp. Tea	Nothing added With sugar With fresh milk With tea creamer With sugar and fresh milk With sugar and tea creamer								
qq. Juice	100% fruit juice Fruit concentrate Squash Other specify ……								
rr. Coffee	Nothing added With sugar With fresh milk With coffee creamer With sugar and fresh milk With sugar and coffee creamer								
ss. Soft drink									
tt. Water	Tap water Sparkling water Still water Other specify ……								
uu. Other specify									

SECTION E: Anthropometric measurements and assessment

48. Weight

Readings	Weight (kg)
First reading	
Second reading	
Average	

49. Height

Readings	Height (m)
First reading	
Second reading	
Average	

SECTION F: Hypertension related information

50. When was the hypertension diagnosed?

1.	<6 months ago	
2.	≥6 -12 months ago	
3.	>12-18 months ago	
4.	>18-24 months ago	
5.	Other, specify…	

51. When last did you consult at the clinic or health centre with regards to hypertension?

1.	≤ three days	
2.	A week ago – 2 weeks ago	
3.	Three weeks ago	
4.	A month ago	
5.	>month	
6.	Other, specify……	

52. Has your hypertensive medication been changed in the past 2 years?

1.	Yes	
2.	No	

53. How many hypertension medications are you using? .....

54. What are the names or description of the medication you are currently taking?

……

55. Blood pressure (systolic/diastolic) readings

Readings	mmHg
First reading	
Second reading	
Average	

APPENDIX 4

Focus group interview schedule

a. Explain the nutritional importance of consuming Blackjack.

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b. Explain the health benefits of Blackjack.

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APPENDIX 5: Memorandum for knowledge test questions

1. Explain nutritional importance of consuming Blackjack.

- Blackjack have nutrients such as iron, copper, zinc, magnesium, potassium as well as non-nutrients properties such as fibre, phytochemicals and antioxidants that helps to prevent, manage, treat diseases and nourish bodies.

2.Explain the health benefits of Blackjack

44. Explain the importance of consuming Blackjack?

- Blackjack has essential nutrients that can prevent, reduce and treat diseases.
- Blackjack helps to prevent and reduces chronic diseases through its essential nutrients and properties.
- Blackjack has non-nutrients properties that are for health benefits. Those properties include fibre, phytochemicals and antioxidants.
- Blackjack helps to manage diseases such as hypertension and diabetes.

46. Name at least three diseases or conditions that are known to be prevented or managed by Blackjack.

- Wounds, colds and flu, fever, constipation, malaria, hepatitis, jaundice, glandular sclerosis, rheumatic conditions, neuralgia, smallpox, colic, diarrhea, diuretic, pain, snake bite, conjunctivitis, anemia, hemorrhage, rectal prolapsed, cancer, allergies, hypertension and diabetes.

APPENDIX: 6 UHDC approval and ethics clearance certificate

UNIVERSITY OF VENDA

OFFICE OF THE DEPUTY VICE-CHANCELLOR: ACADEMIC

TO : MR/MS F GAVHI
SCHOOL OF HEALTH SCIENCE

FROM: PROF J.E. CRAFFORD
DEPUTY VICE-CHANCELLOR: ACADEMIC

DATE : 01 SEPTEMBER 2016

DECISIONS TAKEN BY UHDC OF 25 AUGUST 2016

Application for approval of Master's research proposal in Health Sciences: **F. Gavhi (11572208)**

Topic: "The nutritional Knowlwdge and consumption of blackjack by hypertensive patients in Vhembe District, Limpopo Province, South Africa."

Supervisor	UNIVEN	Dr. C.N Nesamvuni
Co-supervisor	UNIVEN	Ms. H.V Mbhatsani

UHDC approved Master's proposal

Prof J.E. CRAFFORD
DEPUTY VICE-CHANCELLOR: ACADEMIC

RESEARCH AND INNOVATION
OFFICE OF THE DIRECTOR

NAME OF RESEARCHER/INVESTIGATOR:
Ms F Gavhi

Student No:
11572208

PROJECT TITLE: **The nutritional knowledge and consumption of Blackjack by hypertensive patients in Vhembe District, Limpopo Province, South Africa.**

PROJECT NO: SHS/16/NUT/02/0505

SUPERVISORS/ CO-RESEARCHERS/ CO-INVESTIGATORS

NAME	INSTITUTION & DEPARTMENT	ROLE
Dr CN Nesamvuni	University of Venda	Supervisor
Ms HV Mbhatsani	University of Venda	Co- Supervisor
Ms F Gavhi	University of Venda	Investigator – Student

ISSUED BY:
UNIVERSITY OF VENDA, RESEARCH ETHICS COMMITTEE

Date Considered: May 2017
Decision by Ethical Clearance Committee Granted
Signature of Chairperson of the Committee: .....
Name of the Chairperson of the Committee: Prof. G.E. Ekosse

UNIVERSITY OF VENDA
DIRECTOR
RESEARCH AND INNOVATION
2017 -05- 10
Private Bag X5050
Thohoyandou 0950

University of Venda
PRIVATE BAG X5050, THOHOYANDOU, 0950, LIMPOPO PROVINCE, SOUTH AFRICA
TELEPHONE (015) 962 8504/8313 FAX (015) 962 9060
"A quality driven financially sustainable, rural-based Comprehensive University"

APPENDIX :7 Permission request letter

University of Venda

School of Health Sciences
Department of Nutrition
Private Bag X5050
Thohoyandou, 0950

The Department of Health
Limpopo Provincial Office
P/bag X9302, Polokwane
0700
15 May 2017

Dear Sir/Madam

RE: A REQUEST TO RECRUIT HYPERTENSIVE PATIENTS OF MPHAMBO AND MUTALE HEALTH CENTERS IN VHEMBE DISTRICT FOR RESEARCH

Ms Fhatuwani Gavhi (Student No. 11572208) is currently registered for MSc in Public Nutrition with the University of Venda. The title of the research is "The nutritional knowledge and consumption of Blackjack by hypertensive patients in Vhembe District, Limpopo Province, South Africa".

This communication serves as a request for permission to recruit 275 hypertensive patients from Mphambo and Mutale Health Centers in Vhembe District for research (see attached proposal). The ethical approval for this study has been already obtained from University of Venda Research Ethics Committee (see enclosed approval certificate).

The study aims to determine Blackjack nutritional knowledge and consumption by hypertensive patients. The study objectives are as follows:

- To determine Blackjack nutritional knowledge of hypertensive patients in Vhembe district
- To determine Blackjack availability around the households.
- To determine Blackjack consumption patterns of hypertensive patients.
- To assess dietary intake of hypertensive participants.
- To determine nutritional status of hypertensive patients using anthropometric measurements.
- To measure the blood pressure of hypertensive patients.

We intend to randomly select 150 and 125 hypertensive patients in Mphambo and Mutale health centers respectively. Permission will also be sought from the health centers and patients. Proper ethical procedures will be highly considered.

There are no foreseen risks associated with this study. Special care will be taken to keep confidentiality of the participants. There will be no reward to participating individuals, however the results of this study may in future contribute towards strategies that can be successful in relieving hypertension burden.

Your positive response will be highly appreciated.

Yours sincerely,

Researcher: F Gavhi
Contact: 073 926 9586/ 083 283 4640
Email: fhatuwanigavhi@yahoo.com

Co- Supervisor: Ms HV Mbhatsani

Supervisor: Dr CN Nesamvuni

APPENDIX 8: Approval letters: Provincial and District Department of Health

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF HEALTH

Enquiries: Stols M.L (015 293 6169) Ref:4/2/2

Gavhi F
University of Venda

Greetings,

RE: The Nutritional knowledge and consumption of Blackjack by hypertensive patients in Vhembe District, Limpopo Province, South Africa

The above matter refers.

1. Permission to conduct the above mentioned study is hereby granted.
2. Kindly be informed that:-
   - Research must be loaded on the NHRD site (http://nhrd.hst.org.za) by the researcher.
   - Further arrangement should be made with the targeted institutions, after consultation with the District Executive Manager.
   - In the course of your study there should be no action that disrupts the services.
   - After completion of the study, it is mandatory that the findings should be submitted to the Department to serve as a resource.
   - The researcher should be prepared to assist in the interpretation and implementation of the study recommendation where possible.
   - The above approval is valid for a 3 year period.
   - If the proposal has been amended, a new approval should be sought from the Department of Health.
   - Kindly note, that the Department can withdraw the approval at any time.

Your cooperation will be highly appreciated.

Head of Department

12/06/2017
Date

18 College Street, Polokwane, 0700, Private Bag x9302, POLOKWANE, 0700
Tel: (015) 293 6000, Fax: (015) 293 6211/20 Website: http/www.limpopo.gov.za

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LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF HEALTH
VHEMBE DISTRICT

Ref: S5/4/2/3
Enq: Ms Gertrude Baloyi
Date: 22 June 2017
TO: University Of Venda
Attention: Gavhi F

SUBJECT: REQUEST TO CONDUCT RESEARCH STUDY AT VHEMBE DISTRICT HOSPITALS AND PRIMARY HEALTH CARE CENTRES.

1. The above matter has reference
2. The Department of Health has acknowledged your communiqué received on the 21 June 2017 for the above mentioned.
3. Kindly be informed that permission has been granted to conduct Research Study at **Vhembe District Hospitals and Health Care Centers from 04 July 2017– 04 July 2020.**
4. You are also advised to comply or adhere with the Departmental Policies, rules and regulations during your operations.

LIMPOPO PROVINCE
VHEMBE DISTRICT
22 JUN 2017
P/BAG X5009 THOHOYANDOU 0950
DEPARTMENT OF HEALTH

Hoping that you will find this in order

.....
CHIEF DIRECTOR: HEALTH SERVICES

22/06/2017
.....
Date

Private Bag X5009 THOHOYANDOU 0950
OLD parliamentary Building Tel (015) 962 1000 (Health) (015) 962 4958 (Social Dev) Fax (015) 962 2274/4623

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