

The National Ribat University

Faculty of Graduate Studies & Research



**Risk Factors of Hypertension among Adult Patients
Attending Ibrahim Malik Teaching Hospital, Khartoum
Locality**

**A Thesis Submitted in Partial Fulfillment of the Requirements of the Master Degree in
Human Nutrition and Dietetics**

By: Areej Yousif Izaldin Yousif

Supervisor: prof. Yousif Babiker Yousif

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

" يَرْفَعِ اللَّهُ الَّذِينَ آمَنُوا مِنْكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ دَرَجَاتٍ وَاللَّهُ بِمَا تَعْمَلُونَ خَبِيرٌ "

سورة المجادلة الآية 11

Dedication

This research is dedicated to my parents Yousif Izaldin Yousif and Nawal Mustafa Hilal, who have always loved me unconditionally, the light that brightens my life and guides me through and whose good examples have taught me to work hard for the things that I aspire to achieve.

This research is also dedicate to my Brothers and my friends, the instruments that help me capture life from a joyful zone

Acknowledgment

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prof. Yousif Babiker Yousif

For the continuous support for my research, for his patience, motivation, enthusiasm, and immense knowledge. His guidance helped me in all the time of research and writing of this thesis. I could not have imagined having a better advisor and mentor for my research.

Also I would like to thank the authorities of Ibrahim Malik teaching hospital especially Dr. Mostafa Fahmy for their help and making my work easier there.

Last but not the least I would like to thank my Honest Friend Dietitian Heba Jamal for supporting and encouraging me in this research and also in so many ways in my life.

Abstract

The study was conducted in Ibrahim Malik Teaching Hospital in Khartoum Locality.

The major objective of the study was to determine the risk factors of hypertension among adult patients.

The study was conducted during a period that extended from September 2016 to November 2016. The study sample consisted of 60 patients admitted to hospital in the study duration.

Data were collected using questionnaire, statistically analyzed using (SPSS) program.

The incidence of hypertension was highest in age group of 51- 60 and >60 years, and hypertension was widely common among males 60% than females 40%. Most of patients were primary educated 40%. Family history of hypertension was positive for 70% of patients. Family history of obesity was negative for 60% of patients. Family history of diabetes type2 was 40%. Patients who had hypertension in combination with diabetes were 18.3%. Patients who had no other disease with hypertension were 38.3%. Physical activity was positive for 63.3% of patients. Walking had the highest percent of types of physical activity with 42.1%. Almost all patients didn't consume alcohol. Salt consumption was normal for 61.7% of patients. Sugar consumption was high for 46.7% of patients. Fat consumption was normal for 41.7% of patients. Majority of patients ate two meals and one or two snacks per day. Consumption of herbal medicine to reduce blood pressure was positive for only 11.7% of patients, they consumed Karkade. Body mass index was overweight for 41.7% and obese for 35%. 65% of patients had waist circumference more than 102 cm in males and 88 cm in females.

ملخص الدراسة

أجريت هذه الدراسة في مستشفى إبراهيم مالك التعليمي في الخرطوم. كان الهدف الأساسي من هذه الدراسة هو تحديد عوامل الخطورة المؤدية لإرتفاع ضغط الدم عند البالغين. أجريت هذه الدراسة في الفترة ما بين سبتمبر 2016 إلى نوفمبر 2016. احتوت عينة الدراسة على 60 مريض كانوا داخل المستشفى في فترة الدراسة.

جمعت المعلومات بواسطة الإستبيان ' حللت إحصائياً بواسطة برنامج التحليل الإحصائي. وجدت أعلى نسبة للإصابة بإرتفاع ضغط الدم بين الفترة العمرية من 51-60 و <60 سنة. كانت الإصابة أعلى بين الرجال بنسبة 60% بينما كانت نسبة النساء 40%. كانت نسبة تعليم المرضى 40% مرحلة الأساس.

كانت نسبة التاريخ العائلي لإرتفاع ضغط الدم 70% من المرضى. كانت نسبة التاريخ العائلي للسمنة 40% من المرضى. كانت نسبة التاريخ العائلي للسكري من النوع الثاني 40% من المرضى. المرضى الذين يعانون من ارتفاع ضغط الدم والسكري من النوع الثاني معا كانوا 18.3%. المرضى الذين يعانون من ارتفاع ضغط الدم فقط مع عدم وجود أمراض أخرى كانوا 38.3%.

المرضى الذين يقومون بنشاط يومي كانوا 63.3%. كانت نسبة ممارسة المشي هي الأعلى من بين النشاطات التي يتم ممارستها يوميا بنسبة 42.1%. تقريبا جميع المرضى لم يتناولوا الكحول. نسبة تناول الملح كانت طبيعية لـ 61.7% من المرضى. نسبة تناول السكر كانت عالية لـ 46.7% من المرضى. نسبة تناول الدهون كانت طبيعية لـ 41.7%. أغلبية المرضى كانوا يتناولون وجبتين رئيسيتين و وجبة واحدة أو اثنتين من الأغذية الخفيفة في اليوم. نسبة تناول الأدوية البديلة و الأعشاب كانت 11.7% من المرضى. الكركدي كان من المشروبات المتناولة. نسبة المرضى الذين كان لديهم وزن زائد 41.7% و 35% كانوا يعانون من السمنة. 65% من المرضى كان محيط الخصر لديهم أعلى من 102 سم للرجال و 88 سم للنساء.

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List of Abbreviations

ADA	American Dietetic Association
BP	Blood Pressure
BMI	Body Mass Index
BHS	British Hypertension Society
CHD	Coronary Heart Disease
CVD	Cardiovascular Disease
DBP	Diastolic Blood Pressure
DRI	Dietary reference intakes
DASH	Dietary Approach to Stop Hypertension
DM	Diabetes Mellitus
DVT	Deep Vein Thrombosis
FMoH	Federal Ministry of Health
GABA	Gamma-amino butyric acid
HTN	Hypertension
IHD	Ischemic Heart Disease
LDL	Low Density Lipoprotein
NCDs	Non communicable diseases
NHANES	National Health and Nutrition Examination Survey
NIH	National institute of Health
NICE	National Institute of Health and Clinical Excellence
SBP	Systolic Blood Pressure
SLE	Systemic Lupus erythematosus
SSH	Sudan Society of Hypertension
TH	Thyroid
WHO	World Health Organization
WC	Waist Circumference

CHAPTER

ONE

Chapter one

1-1 Introduction

Hypertension is persistently high arterial blood pressure (BP), the force exerted per unit area on the walls of arteries. To be defined as hypertension, the systolic blood pressure (SBP), the blood pressure during the contraction phase of the cardiac cycle, has to be 120 mm Hg or higher; or the diastolic blood pressure (DBP), the pressure during the relaxation phase of the cardiac cycle, has to be 80 mm Hg or higher; this is reported as more than 120/80 mm Hg.

The normal BP is not higher than 120/80 mmHg. Any BP above 140/90 is considered hypertension (Mahan *et al.*, 2012).

Hypertension is a common health problem in developed countries, it is the third leading killer in the world, there are one billion hypertensive globally, and four million people die annually as a direct result of hypertension. In the Eastern Mediterranean Region, the prevalence of hypertension average 26% and it affects approximately 125 million individuals. In United States one in three adults has high blood pressure (Mahan *et al.*, 2012).

Hypertension has the highest prevalence among non-communicable diseases (NCDs) in Sudan (prevalence of 23.6 in Khartoum State). Hypertension accounts for 1.3% of the outpatient visits; it is represented as one of the 10 leading diseases treated in health facilities (outpatients) and also one of the 10 leading causes of death in Sudan(FMoH/SSH, 2012).

Untreated hypertension leads to many degenerative diseases, including heart failure, end stage renal disease, and peripheral vascular disease. It is often called a "silent killer" because people with hypertension can be asymptomatic for years and then have a fatal stroke or heart attack.

Although no cure is available, hypertension is easily detected and usually controllable (Mahan *et al.*, 2012).

The prevalence of high blood pressure in blacks is one of the highest rates seen anywhere in the world. Because blacks develop hypertension earlier in life and maintain higher blood pressure levels, their risk of fatal stroke, heart disease, or end-stage kidney disease is higher than in whites (Mahan *et al.*, 2012).

A person with any age can have hypertension. Approximately 16% of boys and 9% of girls have elevated blood pressure. With aging, the prevalence of high blood pressure increases. Before the age of 45 more men than women have high blood pressure, and after age 65 the rates of high blood pressure among women in each racial group surpass those of the men in their group. Because the prevalence of hypertension rises with increasing age, more than half the older adult population (>65 years of age) in any racial group has hypertension. Although lifestyle interventions targeted to older persons may reduce the prevalence of hypertension, early intervention programs provide the greatest long-term potential for reducing overall blood pressure-related complications (Mahan *et al.*, 2012).

1-2 Justification:

The incidence of hypertension is increasing rapidly in Sudan. We can help to reduce this high incidence rate by finding the risk factors and reducing their effects.

1-3 Objectives:

1-3-1 General objective:

To determine the risk factors of Hypertension among adult patients attending Ibrahim Malik Teaching hospital in Khartoum Locality.

1-3-2 Specific objectives:

- To assess BMI of hypertension patients.
- To assess waist circumference of hypertension patients
- To evaluate the dietary intake of hypertension patients.

1-4 Hypotheses:

- There is a correlation between hypertension risk factors and the incidence of hypertension.
- Hypertension can be controllable if we manage the modifiable risk factors.

CHAPTER

TWO

Chapter 2

2- Literature Review

2-1 What is hypertension?

Elevated arterial blood pressure is a major cause of premature vascular disease leading to cerebrovascular events, ischemic heart disease and peripheral vascular disease. Blood pressure is characteristic of each individual, like height and weight, with marked inter individual variation, and has continuous (bell-shaped) distribution. The level of blood pressure observed depend on the characteristics of the population studied in particular, the age and ethnic background. Blood pressure rises with age, certainly up to the seventh decade. This rise is more marked for systolic pressure and is more pronounced in men. Hypertension is very common in the developed world. Depending on diagnostic criteria, hypertension is present in 20-30% of the adult population. Hypertension rates are much higher in black Africans 40-50% of adults (Kumar & Clark, 2012).

2-1-1 WHO definition:

Hypertension, also known as high blood pressure, is a condition in which the blood arteries have persistently raised pressure. Blood is carried from the heart to all parts of the body in arteries. Each time the heart beats, it pumps blood into the arteries. Blood pressure is created by the force of blood pushing against the walls of blood arteries as it is pumped by the heart. The higher the pressure the harder the heart has to pump (WHO, 2016 a).

2-2Epidemiology of Hypertension:

Worldwide, raised blood pressure is estimated to cause 7.5 million deaths, about 12.8% of the total of all deaths. This accounts for 57 million disability adjusted life years (DALYs) or 3.7% of disability adjusted life years. Raised blood pressure is a major risk factor for coronary heart disease and ischemic as well as hemorrhagic stroke. Blood pressure levels have been shown to be positively and continuously related to the risk for stroke and coronary heart disease (CHD). In some age groups, the risk of cardiovascular disease doubles for each increment of 20/10 mmHg of blood pressure, starting as low as 115/75 mmHg.

Globally, the overall prevalence of raised blood pressure in adults aged 25 years and over was around 40% in 2008. The proportion of the world's population with high blood pressure, or uncontrolled hypertension, fell modestly between 1980 and 2008. However, because of population growth and aging, the number of people with uncontrolled hypertension rose from 600 million in 1980 to nearly 1 billion in 2008.

Across the WHO regions, the prevalence of raised blood pressure was highest in Africa, where it was 46% for both sexes combined. The lowest prevalence of raised blood pressure was in WHO regions of Americans at 35% for both sexes. Men in this region had higher prevalence than women (39% for men and 32% for women). In all WHO regions, men have slightly higher prevalence of raised blood pressure than women. This difference was only statistically significant in the America and Europe.

Across the income groups of countries, the prevalence of raised blood pressure were consistently high, with low, lower middle and upper middle countries all having rates of around 40%. The prevalence in high income countries was lower at 35% (WHO, 2016 b).

2-3 Classification of Hypertension:

Table (1)

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

(Haslet *et al.*, 1999).

2-4 Types of hypertension:

2-4-1 Essential hypertension:

The great majority of patients with hypertension have primary elevation of blood pressure (Kumar and Clark, 2012).

In the largest group of hypertensive cases (95%), no apparent underlying disease can be discovered these are called "primary or essential hypertension" which can be ameliorated only by life-long pharmacological therapy (Friedberg, 1966).

Essential hypertension has multifactorial risk factors, genetic factors, fetal factors, environmental factors, humoral mechanisms and insulin resistance (Kumar and Clark, 2012).

2-4-2 Secondary hypertension:

Hypertension associated with or due to a variety of conditions notably (renal disease, Endocrine diseases, vascular diseases) (Friedberg, 1966).

Also some drugs have been shown to cause or aggravate hypertension, or interfere with the response to some antihypertensive agents. The oral contraceptive pill, steroids, carbonxolone and vasopressin may all cause hypertension. Patients taking monoamine oxidase inhibitors, who consume tyramine-containing foods, may develop paroxysm of severe hypertension. (Kumar and Clark, 2012).

During pregnancy there is occurrence for secondary hypertension in pre-eclampsia disorder that occurs in or near the third trimester of pregnancy, it is characterized by hypertension which is usually present, oedema, and proteinuria are common in late pregnancy (Haslet *et al.*, 1999).

People whose blood pressure is affected by their salt consumption are called salt-sensitive (Mahan *et al.*, 2012).

Salt sensitivity is a condition in which certain people respond to a high salt intake by experiencing an increase in blood pressure; these people also experience a decrease in blood pressure when salt intake is low. And people who do not experience changes in blood pressure with changes in salt intake are referred to as salt resistant (Thompson *et al.*, 2011)

2-5 Risk Factors of Hypertension:

There are numbers of risk factors associated with hypertension. The first group contains the non modifiable risk factors which cannot be changed. The other group includes the modifiable risk factors which can be changed through medical, dietary, and behavioral changes.

2-5-1 Non-modifiable Risk Factors:

2-5-1-1 Age:

Hypertension is uncommon before the age of 20. Thereafter it is encountered in 15 – 30 % of the general population and in 25 – 40 % of those beyond the age of 50.

Hypertension before the age of 20 occurs chiefly with coarctation of the aorta, acute or chronic glomerulonephritis and rarely with endocrine tumors or unilateral renal vascular disease (Friedberg, 1966).

Hypertension risk increases with age; adults who have normal blood pressure at age 55 still have a 90% risk of developing high blood pressure during their lifetime (Whitney and Rofles, 2008).

2-5-1-2 Gender:

Hypertension is slightly more common in the female, but hypertensive (and atherosclerotic) heart disease is much more frequent in the male. Data on these points are not in agreement. The incidence of hypertension in women increases substantially after the menopause and definitely exceeds that in males in older age groups (Friedberg, 1966).

2-5-1-3 Family history:

Hypertension is usually an inherited disorder; children of hypertensive parents may develop the condition at early ages, often in their adolescent years (Williams, 2011).

2-5-1-4 Race:

Hypertension occurs more frequently in blacks than in whites (Williams, 2011). The prevalence of high blood pressure in blacks is one of the highest rates seen anywhere in the world. Because blacks develop hypertension earlier in life and maintain higher blood pressure levels, their risk of fatal stroke, heart disease, or end-stage kidney disease is higher than in whites (Mahan *et al.*, 2012).

2-5-2 the Modifiable Risk Factors:

2-5-2-1 Obesity and overweight:

Massive or morbid obesity is a health hazard in itself and is a medical problem. It places severe strain on all the body systems. Both extremes of weight, fatness and thinness, pose medical problems.

Studies indicate the direct relationship between obesity and diabetes type 2 and hypertension, which in turn through these risk factors may contribute to cardiovascular disease. Losing excessive weight is associated with improvement of hypertension and diabetes. These improvements in turn reduce risks related to heart disease (Williams, 2011).

2-5-2-2 Excessive salt (sodium chloride) consumption:

Around the world, communities with high intakes of salt experience high rates of hypertension, cardiovascular diseases, cerebral hemorrhage, and hypertension-related stroke. As blood pressure rises, the risk of death from cardiovascular disease climbs steadily (Frances and Eleanor, 2003).

Primitive societies in which the intake of sodium is low (70 mEq/d) experience very little hypertension. Hypertension is prevalent in countries with high consumption of sodium (9 – 12 g/d or 120-150 mEq). Migration from a rural to an urban environment is associated with an increase in blood pressure that is in part related to the amount of salt in the diet (Mahan *et al.*, 2012).

Studies show that there is a beneficial effect of the restriction of salt intake on blood pressure in hypertensive patients (Kumar and Clark, 2012).

2-5-2-3 Diabetes mellitus:

Adults with diabetes have CVD death rates two to four times higher than adults without diabetes. (AHA, 2014)

Consequently, national guidelines have set the target BP goal for antihypertensive therapy for individuals with diabetes mellitus at 130/80 mmHg, lower than that recommended for the general population.

With the increased prevalence of diabetes, this is an important public health problem to address (Mahan *et al.*, 2012).

2-5-2-4 Smoking:

In men, the risk of developing CVD is directly related to the number of cigarettes smoked. This relationship is less certain (but still important) in women and cigar and pipe smokers. The risk from smoking declines to almost normal after 10 years of abstention (Kumar & Clark, 2012).

Cigarette smoking is a strong risk factor for atherosclerosis and hypertension, an interesting study has highlighted unhealthy dietary practices in smokers, which also show decline with discontinuation of smoking (Joshi, 2008).

2-5-2-5 Physical activity:

The higher the blood pressure and the less active a person is, the greater the effect physical activity has in reducing blood pressure. Moderate aerobic activity such as 30-60 minutes of brisk walking most days helps to lower blood pressure directly. Those who engage in regular aerobic activity may not need modification for mild hypertension (Whitney and Rolfes, 2008).

2-5-2-6 Excessive alcohol consumption:

Excess alcohol intake is responsible for about 10% of all cases of hypertension, especially in middle-aged males and among African-American in general, when hypertension is caused by excessive alcohol intake, it is usually reversible. Recommendation of alcohol intake for people with hypertension is two or fewer drinks per day for men and one or no drinks per day for women and all older adults (Wardlaw and Smith, 2009).

2-5-2-7 Hypercholesterolemia:

Elevated serum cholesterol is one of the major risk factors for the disease process, along with hypertension, which is worsened by obesity, lack of exercise, excess food habits, stress, and smoking. Dietary fat can affect serum cholesterol. The National Institute of Health Consensus Group for lowering blood cholesterol has defined serum cholesterol values for persons at risk and emphasized the importance of educating the public about this preventable risk factor (Williams, 2011).

2-5-2-8 Renal diseases:

The association of hypertension with a variety of intrinsic diseases of the kidney has not been known. In these cases the bilateral renal disease precedes the causes of hypertension and is generally regarded as the cause of hypertension, but the mechanisms is uncertain. Intrarenal ischemia may be a causative factor (Friedberg, 1996).

2-5-2-9 Occupation:

Chronic exposure to environmental stressors or increased cardiovascular reactivity can accelerate the development of hypertension. People working in stressful or high strain jobs have higher blood pressure. Another factor that may be associated with increased blood pressure is lifestyle, when aspiration exceeds an individual's occupational resources, based on a match between occupation and income on one hand and possession of material goods on the other. Its effect on blood pressure may be most noticeable (Izzo J. and Black H, 1993).

2-6 Complications of hypertension:

When blood pressure stays high over time, it can damage the body and causes many complications

2-6-1 some complication and their signs and symptoms include:

i) Chronic kidney disease:

When blood vessels narrow in the kidneys, possibly causing kidney failure.

ii) Eye damage:

When blood vessels in the eyes burst or bleed. Signs and symptoms include vision changes or blindness.

iii) Heart attack:

When the flow of oxygen-rich blood to a section of heart muscle suddenly becomes blocked and the heart doesn't get oxygen. The most common warning symptoms of a heart attack are chest pain or discomfort, upper body discomfort, and shortness of breath.

iv) Heart failure:

When the heart cannot pump enough blood to meet the body's needs. Common signs and symptoms of heart failure include shortness of breath; feeling tired; and swelling in the ankles, feet, legs, abdomen, and swollen veins in the neck.

v) Peripheral artery disease:

A disease in which plaque builds up in leg arteries and affects blood flow in the legs. When people have symptoms, the most common are pain, cramping, numbness, aching, or heaviness in the legs, feet, and buttocks after walking or climbing stairs.

vi) Stroke:

When the flow of oxygen-rich blood to a portion of the brains is blocked. The symptoms of a stroke include sudden onset of weakness; paralysis or numbness of the face, arms, or legs; trouble speaking or understanding speech; and trouble seeing (National Heart Lung and Blood Institute 2015).

2-6-2 Complications associated to diabetes and hypertension:

Diabetes has several complications of which one is hypertension or high blood pressure. Data indicate that at least 60-80 % of individuals who develop diabetes will eventually develop high blood pressure. The high blood pressure is gradual at early stages and may take at least 10–15 years to fully develop. Besides diabetes, other factors that may also increase high blood pressure include obesity, insulin resistance and high cholesterol levels. In general, fewer than 25 percent of diabetics have good control of their blood pressure. The presence of high blood pressure in diabetes is associated with a 4 fold increase in death chiefly from heart disease and strokes. Blood pressure readings do vary but experts recommend that blood pressure should not range above 140/80. Secondly, high blood pressure is a silent disease and thus it is vital for all diabetics to regularly check their blood pressure or have it checked at a doctor's office on a regular basis. The American Diabetes Association recommends that all diabetics get their blood pressure measured by a health care professional at least 2-5 times a year (Medical Journal of Australia, 2010).

2-7 Prevention of hypertension:

WHO expert committee on hypertension control has stressed the importance of primary prevention of hypertension by preventing the blood pressure rise, lowering blood pressure levels in the population and addressing modifiable risk factors in order to decrease CVD morbidity and mortality (FMoH and SSH, 2012).

Positive changes in hypertension awareness, treatment, and control have occurred during the last several years. Based on analysis of National Health and Nutrition Examination Survey (NHANNES) data from 2007 - 2008, 81% of

people with hypertension are aware that they have it, up from 72% in 1999 - 2004. Current hypertension treatment and control rates have also increased awareness, treatment and control of hypertension. In 2008 women, younger adults (aged 18-39 years), and Hispanic individuals had lower rates of blood pressure control compared with men, younger individuals, and non-Hispanic whites. Improving hypertension treatment through targeted intervention programs should have a positive effect on CVD outcomes. Blood pressure treatment guidelines highlight the importance of evaluating patients for the presence of multiple CVD risk factors and individualizing lifestyle modification and drug therapies accordingly. Primary prevention can improve quality of life and the associated costs. One strategy is to reduce blood pressure in those with prehypertension (above 120/80) but below cut-off points for stage 1 hypertension. A downward shift of 3 mmHg in SBP would decrease the mortality from stroke by 8% and from CHD by 5%. Persons at highest risk should be strongly encouraged to adopt healthier lifestyle (Mahan *et al.*, 2012).

Changing lifestyle factors have documented efficacy in the primary prevention and control of hypertension, these factors were systematically reviewed and categorized by the American Dietetic Association. A recommendation is made for reducing intake of dietary sodium and increasing intake of fruits and vegetables. The ADA practice Guidelines also recommend weight reduction if overweight; limiting alcohol intake; adopting a dietary pattern that emphasizes fruits, vegetables, and low-fat dairy products; and increasing physical activity. A fair recommendation is made for increasing dietary potassium, magnesium, and calcium to recommended levels based on the dietary reference intakes (DRI). Evidence is not clear for modifications in dietary fats to lower blood pressure (Mahan *et al.*, 2012).

2-8 Treatment of Hypertension:

2-8-1 Pharmacological treatment:

The decision to commence specific drug therapy should usually be made only after a careful period of assessment of up to 6 months, with repeated measurements of blood pressure. The aim of drug treatment to reduce the risk of complications of hypertension should be carefully explained to the patient. All of the drugs used to treat hypertension can be associated with side-effects and since the benefits of drug treatment are not immediately apparent to the patient, compliance is a major problem (Kumar & Clark, 2012).

The standard treatment for hypertension includes diuretics (lower blood pressure by promoting volume depletion and sodium loss, and beta blockers, although other drugs (beta-ACE inhibitors, alpha-receptor blockers, and calcium antagonists) are equally effective. All these drugs can affect nutrition status (Mahan *et al.*, 2012).

2-8-2 Dietary Treatment:

2-8-2-1 The DASH diet:

The DASH diet (Dietary Approach to Stop Hypertension) is a dietary pattern promoted by the U.S.-based National Heart, Lung and Blood Institute [part of National Institute of Health (NIH), an agency of the United states Department of Health and Human Services] to prevent and control hypertension (Vilsack and Sebelius, 2010).

The DASH dietary pattern and several variations have been tested in randomized controlled clinical trials to study the effect of the DASH dietary pattern on CVD risk factors. The original DASH trial demonstrated that the DASH dietary

pattern lowered blood pressure and LDL-cholesterol levels, resulting in reduced CVD risk compared to diets that resembled a typical American diet. The DASH sodium trial conformed the beneficial blood pressure and LDL-cholesterol effects of the DASH eating pattern at three levels of dietary sodium intake and also demonstrated a step-wise lowering of blood pressure as sodium intake was reduced (Burwell and Vilsack , 2015).

The DASH diet has also been shown to lower risk for CHD and stroke among women as well as the risk for metabolic syndrome. DASH diet has been shown to be particularly beneficial in hypertensive African Americans, a population group at very high risk for the disease and its complications (Thompson *et al.*, 2011).

The DASH eating plan is high in vegetables, fruits, low-fat dairy products, whole grains, poultry, fish, beans, and nuts and is low in sweets, sugar-sweetened beverages, and red meats. It is low in saturated fats and rich in potassium, calcium, and magnesium, as well as dietary fiber and protein. It also is lower in sodium than the typical American diet, and includes menus with two levels of sodium 2300 and 1500 mg/d (Burwell and Vilsack , 2015).

National Heart, Lung, and Blood institute suggest a DASH eating plan based on 2000 kcal/day to define the daily and weekly servings for each food from the food groups as, Grains (6-8 servings/day), Meats, poultry and fish (6 or less servings/day), vegetables (4-5 servings/day), fruits (4-5 servings/day), low fat or fat free dairy products(2-3 servings/day), fats and oils (2-3 servings/day), sodium 2300 mg or less servings/day), Nuts, seeds, dry beans, and peas (4-5 servings/week) and sweets (5 or less/week). (National Heart, Lung, and Blood institute, 2015).

2-8-2-2 Sodium intake:

The Dietary Guidelines for Americans recommend that young adults consume less than 2400 mg of sodium/day.

People with hypertension, blacks, and middle-age and elderly people-almost half the population-are advised on consume no more than 1500 mg/day (Mahan *et al.*, 2012).

2-8-2-3 Energy intake:

For each kg of weight lost, reduction in SBP and DBP of approximately 1 mmHg are expected. A modest caloric reduction is associated with a significant lowering of SBP and DBP, and LDL cholesterol levels. Hypocaloric diets that include low-sodium DASH dietary pattern have produced more significant blood pressure reductions than calorie diets emphasizing only low-fat diet (Mahan *et al.*, 2012).

2-8-2-4 Saturated fats, trans fats and cholesterol:

Intake of saturated fat should be limited to less than 10% of total calories of the day by the replacing of saturated fats with monounsaturated fats (olive oil and nuts); this associated with evidence of reduced blood levels of total cholesterol and low density lipoprotein cholesterol (LDL) and also associated with reduced risk for CVD events and attacks.

Peanut oil is vegetable oil that is naturally trans free fat, cholesterol free, low in saturated fats, high in unsaturated fats especially monounsaturated fat like olive

oil, has benefits on blood lipids and heart health, it's available and common to use in Sudan (Peanut institute, 2017).

Sesame oil is rich source of polyunsaturated fats, monounsaturated fats. Has strong role in the prevention and treatment of chronic diseases such as coronary heart disease, hypertension ,diabetes, and arthritis. Has been shown to lower blood pressure, increase good cholesterol and decrease bad cholesterol levels (Khemani L. and Sarivastava M., 2012).

Intake of trans fats should be as low as possible by limiting foods that contain synthetic sources of trans fats (hydrogenated oils and margarines), to reduce the risk for CVD.

Limiting consumption of dietary cholesterol to 300 mg/day is not recommended in dietary guidelines of 2015, just follow a healthy eating pattern and lower intake of dietary cholesterol and this associated with a reduced risk for CVD and Obesity (Burwell and Vilsack, 2015).

2-8-2-5 Potassium intake:

Potassium in the blood helps maintain normal blood pressure. A variety of population studies link high potassium diets with a decreased risk of essential hypertension. Adequate potassium in the diet may reduce the risk of stroke independent of effects on hypertension (Ronzio, 1997).

The recommended intake of potassium for adults is 4.7 g/d (Mahan *et al.*, 2012).

2-8-2-6 Magnesium and calcium intake:

Magnesium is distributed somewhat similarly to potassium; Magnesium can sometimes lower blood pressure. In patients who had received long term

diuretics (mostly for hypertension) and potassium supplements, their blood pressure fell significantly (Truswell and Wall, 2003).

Increased intake of calcium and magnesium may have blood pressure benefits, recommendations suggest that meeting the adequate intake for calcium and recommended dietary allowance for magnesium from food sources rather than supplements (Mahan *et al.*, 2012).

2-8-2-7 Alcohol consumption:

Reduce alcohol consumption, two drinks/day for men and one drink/day for women. An estimated 5-7% of hypertensive cases can be accounted for by excessive drinking (Peckenpaugh , 2010).

2-8-2-8 Physical activity:

Advice adults to engage in aerobic physical activity 3- 4 sessions/week. Each session should be of moderate to vigorous intensity and last an average of 40 minutes. For patients who have been inactive, recommend starting slowly and working up, at a comfortable pace, to at least 30 minutes per day (Cohen and Thayer, 2014).

2-8-2-9 Caffeine consumption:

There are many beverages which contain caffeine such as coffee, cola and black tea.

Moderate coffee drinking(less than six cups a day, according to one study) does not contribute to long term high blood pressure, except in smokers.

Combining caffeine and smoking can significantly drive up the blood pressure of those already suffering from the disease. In others; coffee does not commonly raise normal blood pressure but only temporarily (Carper, 1988).

High intake of coffee has been found to promote aortic stiffness. This effect was noted even after controlling for cigarette smoking (Peckenpaugh, 2010).

2-9 Lifestyle Modification:

The hypertension clinical Guidelines from the National Institute for Health and Clinical Excellence (NICE) usefully recommends regular aerobic exercise and reduction of salt, alcohol, and smoking and advocates healthy, low calorie diets for overweight individuals with raised blood pressure. British Hypertension Society Guidelines (BHS) state that advice should be provided for prevention as well as treatment of hypertension and should be given to prehypertensive and those with a strong family history. Effective lifestyle modification can lower blood pressure by at least as much as a single antihypertensive drug. Even a 2 mmHg decrease in diastolic blood pressure has been found to reduce hypertension prevalence by 17%, risk of coronary heart disease by 6%, and stroke by 15%. In addition to the National Institute for Health and Clinical Excellence (NICE) recommendations, the British Hypertension Society (BHS) also advocates maintenance of normal body weight, consumption of a diet rich in fruit and vegetables, and reduced total and saturated fat. This intervention can reduce the need for drug therapy, enhance the effect of antihypertensive drugs, reduce the need for multiple drug regimens, and favorably influence overall cardiovascular risk (Nicoll and Henein, 2010).

2-10 Herbal Medications and Hypertension:

2-10-1 Definition of herbal medicine:

Herbal medicine, also known as phytomedicine, can be broadly defined as both the science and the art of using botanical medicines to prevent and treat illness, and the study and investigation of these medicines (Braun and Cohen, 2010).

Beside a healthy diet, there is a number of herbs that can help to lower blood pressure, some of them are available and used in Sudan.

- Fennel, black pepper and basil have benefits in lowering blood pressure.
- Garlic :

Garlic helps to normalize blood pressure and also reduce cholesterol, in a scientifically rigorous study; people with high blood pressure were given about one clove of garlic a day for 12 weeks. Afterward they exhibited significantly lower diastolic blood pressure and cholesterol level (Duke, 1997).

- Onion:

In one study, 2 – 3 tablespoons of onion essential oil a day lowered blood pressure in 67% of people with moderate hypertension. Their systolic levels fell an average of 25 points and their diastolic readings fell 15 points. But this oil is not available (Duke, 1997).

- Tomato:

Tomatoes are high in gamma-amino butyric acid (GABA), a compound that can help in reducing blood pressure (Duke, 1997).

- Karkade (Hibiscus):

Karkade has been shown to have an effect on reducing blood pressure, in the original Iranian study, the researchers took blood pressure readings from 54 adults with hypertension, and then had them drink either tea or hibiscus tea daily. After 15 days, the hibiscus group showed significantly lower blood pressure. Since then, several studies by Iranian and Mexican researchers have confirmed this effect (Castleman, 2010).

CHAPTER

THREE

Chapter Three

3- Subjects and Methodology

3-1 Introduction:

This chapter discusses the research methodology and materials including research design, study area, study population, study duration, data collection, data analysis and interpretations. The last section deals with ethical condition.

3-2 Research Design:

This was case finding hospital – based study.

3-3 Study area:

The study was conducted at Ibrahim Malik Teaching Hospital, Khartoum Locality.

3-4 Study population:

Target population included all the patients admitted with hypertension disease at the area of study during the period of the study.

3-5 Sample size:

The sample size was 60 patients.

3-6 Study duration:

The study was carried out during the period from 27 September 2016 to 30 November 2016.

3-7 Data Collection:

3-7-1 Primary Data: were collected by pretested questionnaire from patients who were included in the study.

Questionnaire: was designed according to the objectives of the study.

Questionnaire was divided into five parts, socio-demographic characteristics, lifestyle, history of diseases, anthropometric measurements, and food habits.

Anthropometric measurements:

i) Body Mass Index (BMI) was calculated by body weight (kg)/ height (m²); height measured with shoes removed, and making a mark in the wall by pencil then measure the height with a non elastic tape. Weight was measured with participants wearing light clothing without shoes using weighing balance. Subjects were considered to be normal weight if their BMI was 18.5 - <25 kg/m², overweight if their BMI was 25- 29.5 kg/m², and obese if their BMI was 30 kg/m² or over, very obese if the BMI was more than 40 kg/m².

ii) Waist circumference was measured by a non-elastic tape; waist circumference was measured around the circumference between the end of the ribs and iliac crest. Normal value in women is less than 88 cm and normal value in men is less than 102 cm.

3-7-2 Secondary data: were collected from various types of literature including books, previous studies, web sites, online journals, papers and articles.

3-8 Data analysis:

The collected primary data were analyzed using the statistical package for social science (SPSS) and the results were presented in the form of tables of frequencies and percentage.

3-9 Ethical consideration:

Permission was taken from ethics committee of National Ribat University and from the medical authorities in Ibrahim Malik Teaching Hospital and informed consent was obtained from the patients and confidentiality was secured.

CHAPTER

FOUR

Chapter Four

4- Results and Discussion

4-1 Results:

Table 4-1-1: Socioeconomic- Demographic Characteristics:

Parameter	Description	Percent	Frequency
Age	31- 40	7	11.7
	41- 50	12	20
	51- 60	13	21.7
	>60	28	46.7
Total		60	100
Gender	Female	24	40
	Male	36	60
Total		60	100
Social Status	Single	1	1.7
	Married	58	96.7
	Widow/Widower	1	1.7
Total		60	100
Education	Illiterate	10	16.7
	Low	26	43.3
	High School	16	26.7
	University	8	13.4
Total		60	100
Occupation	Employee/professional	25	42
	Laborer	11	18.3
	Housewife	24	39.7
Total		60	100
Residence	Khartoum State	43	71.6
	States	17	28.3
Total		60	100

Table 4-1-1 Shows that 46.7% Of patients within age group >60 years had hypertension. It's higher among males 60% than female 40%. Majority of patients 96.7% are Married. Education shows that 43.3% of patients had low education, 26.7% were High school. All female patients were housewives 39.7% and 37% of male patients were employees. Majority of patients resided in Khartoum State 71.6%, 28.3% were from States.

Table 4-1-2: Medical background:

Parameter	Description	Frequency	Percent
Duration of hypertension	< 1 year	12	20
	2- 5 years	22	36.7
	6- 9 years	7	11.7
	10 years and above	19	31.7
Total		60	100
Family history of hypertension	Yes	42	70
	No	18	30
Total		60	100
Family history of obesity	Yes	24	40
	No	36	60
Total		60	100
Family history of other disease	Diabetes	24	40
	None	18	30
	DM and CVD	2	3.3
	psychiatric	1	1.7
	CVD	6	10
	DM and TH	1	1.7
	DM and Renal	2	3.3
	Osteoporosis	1	1.7
	Cancer and DM	1	1.7
	DM and asthma	2	3.3
	DM and IHD	1	1.7
	SLE	1	1.7
Total		60	100

Other diseases with hypertension	None	23	38.3
	DVT	1	1.7
	Ischemic stroke	7	11.7
	DM and rheumatism	1	1.7
	DM	11	18.3
	Jaundice	1	1.7
	Asthma	1	1.7
	Hernia	1	1.7
	Osteoporosis and hernia	1	1.7
	Ca colon and DM	1	1.7
	DM, IHD and Gout	2	3.3
	Renal disease	2	3.3
	IHD	5	8.3
	Gout	1	1.7
Liver cirrhosis	2	3.3	
Total	60	100	

Table 4-1-2 shows that duration of hypertension was 36.7% for one group from 2-5 years, 31.7% had it for the duration of 10 years and above. Majority of patients had positive family history of hypertension 70%, 60% had negative family history of obesity, 40% had family history of diabetes, and 30% had no history of other diseases. 38.3% didn't have other disease with hypertension, 18.3% had diabetes with hypertension, 11.7% had ischemic stroke, and 8.3% had ischemic heart disease with hypertension.

Table 4-1-3: Lifestyle activities:

Parameter	Description	Frequency	Percent
Physical activity	Yes	38	63.3
	No	22	36.7
Total		60	100
If yes, which type	Walking	27	70.9
	Household chores	11	28.6
Total		38	100
Duration of activity	30 minutes	10	26.3
	1 hour	6	15.8
	>1 hour	22	57.9
Total		38	100
Times/week	Once	2	5.3
	Three times	6	15.8
	>3 times	30	78.9
Total		38	100
Smoking	Never	45	75
	Current	10	16.7
	Former	5	8.3
Total		60	100

Table 4-1-4 Shows that 63.3% were physically active, majority of them 42.1% were walking, highest duration was more than one hour were the highest 57.9%, and frequency per week was three times for 78.9%. 75% never smoked, 16.7% of men were current smokers, and none of women had smoked.

Table 4-1-4: Dietary habits:

Parameter	Description	Frequency	Percent
Consumption of salt per day	Low	5	8.3
	Normal	37	61.7
	High	18	30
Total		60	100
Consumption of sugar per day	Low	8	13.3
	Normal	24	40
	High	28	46.7
Total		60	100
Consumption of fat per day	Low	12	20
	Normal	25	41.7
	High	23	38.3
Total		60	100
Meals eaten per day	Two meals	45	75
	Three meals	15	25
Total		60	100
Snacks eaten per day	One snack	27	45
	Two snacks	25	41.7
	Three snacks	2	3.3
	None	6	10
Total		60	100
Consumption of alcohol	Yes	1	1.7
	No	59	98.3
Total		60	100

Table 4-1-4 Shows that Consumption of salt was normal for more than half of patients 61.7%. Consumption of sugar was high for 46.7% and normal for 40% of patients. Consumption of fat was normal for 41.7% and high for 38.3% of patients. Majority of patients 75% ate two meals per day, 45% ate one snack per day. Consumption of alcohol was negative for almost all patients 98.3%.

Table 4-1-5: Alternative medicine consumed:

Parameter	Description	Frequency	Percent
Consumption of herbal medicine to reduce Hypertension	Yes	7	11.7
	No	53	88.3
Total		60	100
If yes, which type	Karkade & Garlic	1	14.3
	Karkade	5	71.4
	Karkade & Lemon	1	14.3
Total		7	100

Table 4-1-5 Shows that 11.7% of patients consumed herbal medicine to reduce hypertension. Most of them consumed karkade 71.4%.

Table 4-1-6: Body mass index (BMI) levels and Waist circumference (WC) measures:

Parameter	Description	Frequency	Percent
BMI	Under weight	3	5
	Normal	11	18.3
	Over weight	25	41.7
	Obese	21	35
Total		60	100
Waist circumference	Normal	21	35
	High	39	65
Total		60	100

Table 4-1-6 Shows that 41.7% of patients were overweight, 35% were obese. 65% of patients had high waist circumference.

4-2 Discussion:

The result shows that majority of patients were >60 years old or more, which agree with Osman (2015) that hypertension is most prevalent among >60 years old. But but in contrast Damasceno *et al.* (2009) that most hypertension patients in Mozambique were <45 years old. In this study hypertension increased with age which agreed with Mahan *et al.* (2012). Hypertension was widely common among males 60% than females 40%. This agreed with Osman (2015) result that hypertension was widely common among males 53.1% than females 46.9%. also agreed with Damasceno *et al.* (2009) result that hypertension was lower in women 31.2% than men 35.7%. The rates of high blood pressure increases in men before age of 45 years than women whose rates surpass those of the men after age of 65 years in each racial group (Mahan *et al.*, 2012). Nearly all patients were married. In this study most of patients were primary educated. This is doesn't agree with Osman (2015) result that majority of patients in her study were illiterate. It appears that education has no effect on incidence of hypertension. Majority of males were employees 37% and this is close to Osman (2015) result that 25% of males were employees.

Most of patients resided in Khartoum 45%, which doesn't agree with Osman (2015) result that her participants were from other states.

Highest duration of hypertension was from 2- 5 years (36.7%). Family history of hypertension was positive for 70% of patients. This is higher than Babiker *et al.* (2013) study that 56% of subjects had positive family history of hypertension. Hypertension is usually a genetic disorder; people of hypertensive parents may develop the condition at early ages, often in their adolescent years (Williams, 2011).

Family history of obesity was negative for 60% of patients.

Hypertensive patients with family history of diabetes mellitus type2 were 40%, this is agreed with Babiker *et al.* (2013) result that 42% of hypertensive patients had family history of diabetes type2.

In this study other diseases with hypertension were negative for 38.3% of patients. Patients who had HTN in combination with diabetes were 18.3 %.which is close to the 16.0% reported by Osman (2015) but both were lower than the 24.0% of Babiker *et al.* Hypertension and diabetes are both end results of the metabolic syndrome. They may, therefore, develop one after the other in the same individual (Cheung and Li., 2012).

Physical activity was positive for 63.3% of patients. This doesn't agree with Osman (2015) result that 18.7% of patients in her study frequently exercised. Walking had the higher percent of types of physical activity in this study.

Majority of patients in this study were never smoked 75%. This is lower than Osman (2015) result that 89.1% of patients in her study never smoked. Cigarette smoking is a strong risk factor for atherosclerosis and HTN but there are strong factors rather than smoking that can lead to cardiovascular diseases and hypertension.

Almost all patients 98.3% in this study didn't consume alcohol. This is close to Osman (2015) result that 93.8% of patients in her study didn't consume alcohol. Alcohol consumption is not striking in Sudanese Muslims population especially nowadays.

Salt consumption was normal 61.7%. This is agreed with Osman (2015) result that 59.5% of patients in her study had normal salt intake. But doesn't agree with

Mclachlan *et al.* (2016) study that 65.4% of subjects in his study consumed high salt.

Consumption of sugar was high for 46.7% of patients.

Consumption of fat was normal for 41.7% of the patients. This doesn't agree with Mclachlan *et al.* (2016) result that intake of fat was high by 78.7% of subjects.

Number of meals eaten per day were two meals and one or two snacks; meals were late breakfast and late lunch in the evening. Late breakfast could be due to the Sudanese lifestyle.

Consumption of herbal medicine to reduce blood pressure was positive for only 11.7% of patients; only 5 out of 60 mentioned that they consumed Karkade. In Damasceno *et al.* (2009) result the nonpharmacological management of hypertension and use of herbal/traditional remedies was 1.4% (95% CI: 0.6% to 2.1%).

In this study Body mass index was 41.7% and 35% of patients were overweight and obese. This agrees with Babiker *et al.*, (2013) result that 45% of his patients were overweight, and also close to his result that 29% were obese.

65% of patients in this study had waist circumference more than 102 cm in males and 88 cm in females. Waist circumference and fat where both are high, they are significant predictors of CVD, DM T2 in addition to the hypertension already suffered.

CHAPTER

FIVE

Chapter five

Conclusion and Recommendations

5-1: conclusion:

As previously stated, this case finding hospital based study was carried out with objective of finding the risk factors of hypertension in patients attending Ibrahim Malik teaching hospital in Khartoum.

The following conclusions were reached:

- 68.4% of patients in age groups of 51- 60 and >60 years had Hypertension.
- Hypertension was widely common among males than females.
- Most of patients were primary educated 40%.
- Family history of hypertension was positive for 70% of patients.
- Family history of obesity was negative for 60% of patients.
- Family history of diabetes type2 was 40%.
- Patients who had hypertension in combination with diabetes were 18.3%.
- Patients who had no other disease with hypertension were 38.3%.
- Physical activity was positive for 63.3% of patients.
- Walking had the higher percent of types of physical activity with 42.1%
- Almost all patients didn't consume alcohol.
- Salt consumption was normal for 61.7% of patients.
- Sugar consumption was high for 46.7% of patients.
- Fat consumption was normal for 41.7% of patients.
- Majority of patients ate two meals and one or two snacks per day.
- Consumption of herbal medicine to reduce blood pressure was positive for only 11.7% of patients, they consumed Karkade.
- Body mass index was overweight for 41.7% and obese for 35%.
- 65% of patients had waist circumference more than 102 cm in males and 88 cm in females.

5-2: Recommendations:

To prevent and manage hypertension the following recommendations should be considered:

- The data collected may not represent the entire hypertensive population in Khartoum since it was conducted at only one hospital located in Khartoum locality. It might have limited the generalizability of the results and therefore, a wider study is recommended which will cover majority of hospitals in Khartoum state.
- Appropriate education about health and nutrition should be included in hospitals by the government to increase the knowledge about risk factors of hypertension.
- Hypertensive patients should be encouraged to change their food habits and to follow the DASH diet.
- Hypertensive patients are recommended to increase their physical activity.
- Hypertensive patients who are overweight or obese should be encouraged to weight reduction, because weight loss significantly decreases blood pressure.

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APPENDIX

National Ribat University

Faculty of Graduate Studies & Research

MSc Human Nutrition and Dietetics

Questionnaire about “Risk factors of hypertension among adult patients attending Ibrahim Malik teaching hospital”.

A. Socio-Demographic characteristics:

(1) **Age**.....in years.

(2) **Sex:**

Female () Male ()

(3) **Social status:**

Single (). Married (). Divorced ().
Widow/widower ().

(4) **Education Level:**

Illiterate (). Khalwa (). Primary ().
High school (). University (). University+ ()

(5) **Occupation:**

Employee (). Professional (). Laborer ().
Jobless () others.....

(6) **Residence:**.....

Duration of hypertension:.....

B. lifestyle:

(1) **Do you practice physical activity?** Yes () NO ()

(2) If the answers yes what type of physical activities do you practice?

Walking () household chores () Running ()
others:.....

(3) Duration of the activity?

30 minutes () 1 hour () more than 1 hour ()

(4) How many times per week?

One () three times () more than three ()

(5) Do you smoke?

Never () current () Former ()

(6) Do you consume alcohol?

Yes () No ()

C. Family history of hypertension:

Yes () No ()

D. Family history of Obesity:

Yes () No ()

E. Family history of other

disease:.....

F. Anthropometric indices:

1. Body Mass index

I. Height:..... II. Weight:.....

BMI:.....

2. Waist circumference:

I.cm.

G. other diseases with hypertension:

Disease: Duration:.....

Disease:..... Duration:.....

Disease:..... Duration:.....

Disease:..... Duration:.....

H. Food habit:

1. How many meals do you eat per day?

One meal () Two meals () three meals ()
More than three meals ()

2. How many snacks do you eat per day?

One snack () Two snacks () More than two ()

3. Consumption of salt per day?

Low () Normal () High ()

4. Consumption of Sugar per day?

Low () Normal () High ()

5. Consumption of fat per day?

Low () Normal () High ()

6. Do you consume herbal medication to reduce hypertension?

Yes () No ()

7. If the answer yes, what type of herbal do you consume?

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