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DEPARTMENT OF FOOD TECHNOLOGY AND NUTRITION

PREVALENCE AND RISK FACTORS OF HYPERTENSION AMONG PREGNANT MOTHERS ATTENDING ANTENATAL CLINIC IN FORT PORTAL REGIONAL REFERRAL HOSPITAL

BY

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A RESEARCH REPORT SUBMITTED TO THE SCHOOL OF FOOD TECHNOLOGY NUTRITION AND BIO ENGINEERING IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A DEGREE OF BACHELOR OF SCIENCE IN HUMAN NUTRITION
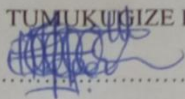
AUGUST, 2019

DECLARATION

I TUMUKUGIZE HILDA, hereby declare that all the information in this report is my original work and has never been presented or submitted to any university or institution for academic purposes for the reward of a degree.

Student's Name: TUMUKUGIZE HILDA

Signature:-.. Date:-......9th August 2019.............

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APPROVAL

APPROVAL

This is to certify that this research titled "PREVALENCE AND RISK FACTORS OF HYPERTENSION AMONG PREGNANT MOTHERS ATTENDING ANTENATAL CLINIC IN FORT PORTAL REGIONAL REFERRAL HOSPITAL" was carried out under my supervision.

Supervisor's name: DR. ABEL ATUKWASE, (PhD)

Signature: ……………………………… Date: ……12/08/2019……………………

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DEDICATION

This special project report is dedicated to the almighty God for the gift of life He has given me, the guidance, love and blessings during the journey of my studies.

I also dedicate this report to my late mother Kugonza Aida and my late father Talemwa Daniel (RIP).

ACKNOWLEDGEMENT

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ACRONYMS

ACE	Angiotensin Converting Enzyme
ANC	Antenatal Care
ARB	Angiotensin Receptor Blockers
BP	Blood Pressure
DDS	Dietary Diversity Score
FAO	Food And Agriculture Organization
FHI	Family Health International
FPRRH	Fort Portal Regional Referral hospital
GH	Gestational Hypertension
HDP	Hypertensive Disorders in pregnancy
HTN	Hypertension
IDDS	Individual Dietary Diversity Score
IUGR	Intra Uterine Growth Retardation
JNC	Joint National Committee
MDDS	Minimum Dietary Diversity Score
MDDW	Minimum Dietary Diversity for Women
MoH	Ministry of Health
MUAC	Mid Upper Arm Circumference
PIH	Pregnancy Induced Hypertension
UBOS	Uganda Bureau of Statistics
UDHS	Uganda demographic and health survey
UN	United Nations
WHO	World Health Organization

ABSTRACT

Around 15% of pregnant women are expected to develop life-threatening complications during pregnancy, at delivery or post-partum. In Asia and Africa, nearly one tenth of all maternal deaths are associated with hypertensive disorders of pregnancy, whereas one quarter of all maternal deaths in Latin America have been associated with those complications. In Uganda, it was found out that 13% of women with severe obstetric complications had hypertensive disorders, pre-eclampsia (54.1%), eclampsia (42.7%) and chronic hypertension (13%). Therefore, the prevalence of hypertensive disorders during pregnancy was estimated to be 13%.

This study aimed at establishing the prevalence of hypertension in pregnant women aged 15 to 49 years attending antenatal clinic at Fort Portal Regional Referral Hospital.

A cross-sectional descriptive study design using semi-structured questionnaire guided interviews was used to collect information from 110 pregnant mothers aged between 15-49 years attending antenatal clinic at Fort Portal Regional Referral Hospital during the study period and consented to participate in the study. The obtained data was interpreted, analyzed and presented using Statistical Package for Social Sciences software (SPSS).

Majority (34.5%) of the pregnant mothers were between 15-24 years of age, only 1.8% were married, 39.1% had stopped schooling in lower primary, 63.6% were unemployed and 60.9% had an average monthly income between Ug shs. 60,000-200,000. Almost all (92.7%) of the pregnant women had an optimal nutrition status, 6.4% were moderately malnourished and only 0.9% were severely malnourished. The overall prevalence of hypertension during pregnancy was 5.5% and 39.1% of the mothers being pre-hypertensive. Majority (70%) of the women complained of lower back ache and only 9.1% presented with edema. Over half (62.7%) of the mothers met the minimum requirements of consuming at least 5 food groups out of 10 recommended food groups. The study showed evidence of association between family history of hypertension (p=0.000) and hypertension during pregnancy, nutrition knowledge (p= 0.038) and antenatal care attendance.

Hypertension is no health problem among the pregnant women in Fort Portal. Majority of the mothers had positive attitudes towards the management of hypertension, however they did not put into practice the nutritional knowledge they had. Family history of hypertension showed sufficient evidence as a risk factor for hypertension during pregnancy.

CHAPTER ONE: INTRODUCTION

1.1 Background

Around 15% of pregnant women are expected to develop life-threatening complications during pregnancy, at delivery or post-partum. Hypertensive disorders of pregnancy (HDP) are significant contributors to these complications and sufferings (WHO, 2017 and Chen et al., 2006). This group of diseases and conditions includes pre-eclampsia, eclampsia, gestational hypertension and chronic hypertension (Duley, 2009). Hypertension may be pre-existent, may be induced by the pregnancy or both types may co-occur, and its influence on the outcome of the pregnancy is different depending on the type of disorder concerned (Swati et al., 2014).

A pregnant woman is considered hypertensive if her blood pressure is greater than or equal to 140/90 mmHg on two consecutive measurements (Yigzaw et al., 2015). Hypertensive disorders of pregnancy are a general term for increased blood pressure during pregnancy. It includes pregnancy-induced hypertension (PIH) (without proteinuria), pre-eclampsia (with proteinuria) and eclampsia (pre-eclampsia with convulsions), gestational hypertension and chronic hypertension (USAID, 2012).

Hypertensive disorders of pregnancy are the major cause of severe acute morbidity, long-term disability and death among mothers and babies (WHO, 2011). In Asia and Africa, nearly one tenth of all maternal deaths are associated with hypertensive disorders of pregnancy, whereas one quarter of all maternal deaths in Latin America have been associated with those complications (Khan et al., 2006). The majority of deaths related to hypertensive disorders can be avoided by providing timely and effective care to women presenting with such complications.

There are several explanations for the high morbidity burden of severe pre-eclampsia and other hypertensive disorders in pregnancy. Pre-eclampsia is a disorder characterized by abnormal placentation with subsequent maternal inflammatory and vascular response. It manifests as a systemic inflammatory disease that may lead to multiple maternal organ damage including the liver, kidneys, lungs and central nervous system. The placenta-related complications of the disorders include placental insufficiency, placental abruption, intrauterine growth restriction, preterm birth and intrauterine fetal death (Eastabrook et al., 2011).

In 2013, the maternal mortality rate in Uganda was 360 per 100 000 live births compared with 210 per 100 000 live births globally (WHO, 2016). In Mulago Referral Hospital, hypertension contributed 17.6% to maternal morbidity and 21.4% to maternal mortality (Kaye et al., 2003). Nakimuli et al, 2014 found out that the case fatality rate from eclampsia was 2.3%.

In Uganda, (Nakimuli et al., 2016) carried out a prospective cohort study in Jinja and Mulago and found out that 13% of women with severe obstetric complications had hypertensive disorders, pre-eclampsia (54.1%), eclampsia (42.7%) and chronic hypertension (13%). Women with chronic or preexisting hypertension have been shown to have a markedly increased risk of severe adverse outcomes, such as maternal cerebrovascular accidents and placental abruption compared to normotensive women. In a study carried out in Mukono district, (Naggayi et al., 2013) found out that chronic hypertension accounted for 10.2%, gestational hypertension (3.4%), pre-eclampsia (3%) of the hypertensive disorders of pregnancy (HDP) and all of these present differently among different women.

The above mentioned studies highlight the challenges associated with pre-eclampsia in Uganda. However, there is limited information on the extent of the problem in Uganda. This study was conducted to explore the prevalence and risk factors of hypertensive disorders among pregnant women in Fort Portal District, western Uganda.

1.2 Problem statement

Hypertension among pregnant women is regarded as a major cause of morbidity and mortality for both mothers and fetus accounting for 4.5% of all maternal deaths globally and 10 to 15% in developing countries (Whitworth et al., 2003). Global studies showed that pre-eclampsia and eclampsia were associated with higher rates of prenatal, maternal mortality and morbidity, preterm and small for gestational age deliveries (WHO, 2011). Women with HDP are five times more likely to have perinatal death compared with women who have no hypertensive disorders of pregnancy (Duley et al., 2009).

The prevalence of pre-eclampsia in developing countries ranges from 1.8% to 16.7% (Lakew et al., 2013). Pregnancy-induced hypertension complicates 10% of all pregnancies. Around 40,000 women, mostly from developing countries, die each year due to pre-eclampsia or eclampsia. Pre-eclampsia alone is estimated to account for about 40% to 60% of maternal deaths in developing countries. A hospital-based study conducted in South Africa showed that HDP contributed for 20.7% of maternal deaths in the country (Moodel, 2004).

In Uganda, HDP are still a public health concern contributing 17.6% to maternal morbidity and 21.4% to maternal mortality (Kaye et al., 2003). The specific cause of hypertension in pregnancy is not well defined, though the existing literature indicates that the risk factors associated with HDP include overweight and obesity (Kumar et al., 2010), and diets high in salt sugar and fat. Wandabwa et al., 2010 found out that the predictors of severe pre-eclampsia were chronic hypertension, family history of hypertension, low socio-economic status, nullparity and delivering male babies.

There are a few studies and limited data documenting the risk factors of HDP and their prevalence reported in poor resource settings. Fort Portal Regional Referral Hospital (FPRRH) is one of the health facilities with high maternal mortality ratio in Uganda. HDP could be among the causes of high maternal mortality rates in Fort Portal District. This study was carried out to establish the prevalence and risk factors associated with HDP among women attending antenatal clinics at FPRRH.

1.3 Objectives of the study

1.3.1 Overall objective

To establish the prevalence of hypertension in pregnant women aged 15 to 49 years attending antenatal clinic at Fort Portal Regional Referral Hospital.

1.3.2 Specific objectives

1. To determine the prevalence of hypertension among pregnant mothers attending antenatal care in Fort Portal Regional Hospital.
2. To assess the risk factors associated with hypertensive disorders among pregnant mothers attending antenatal care in Fort Portal Regional Hospital.

1.4 Research questions

1. What is the prevalence of hypertension among pregnant mothers attending antenatal care (ANC) in FPRRH?

2. What are the risk factors associated with hypertensive disorders among pregnant mothers attending ANC in FPRRH?

1.5 Significance of the study

Hypertension is an adverse problem worldwide affecting both the developed and under developed countries including Uganda. This problem has been linked to various risk factors which among include family history of hypertension, lack of proper nutritional knowledge towards hypertension, poor attitude and poor nutritional practices of the affected people. The findings from this study provided more information for policy and health practitioners in designing interventions to reduce hypertension among pregnant women in Uganda. The findings from this study provided a basis for further research about hypertension globally and Uganda in particular.

CHAPTER TWO: LITERATURE REVIEW

2.1 Hypertension definition

Motha et al., (2016) defined hypertension as a systolic blood (SBP) ≥140mm Hg and /or diastolic blood pressure (DBP) ≥ 90 mmHg. Hypertension is the commonest medical disorder encountered during pregnancy. It includes women with chronic hypertension (hypertension prior to 20 weeks of pregnancy or present at the booking visit including pre-existing hypertension), gestational hypertension (hypertension presenting after 20 weeks without proteinuria) and pre-eclampsia (hypertension presenting after 20 weeks with significant proteinuria).

According to the criteria, it is recommended that gestational blood pressure elevation is defined on the basis of at least two measurements. Certainty regarding pre-eclampsia diagnoses is indicated when blood pressure is ≥160/110 mmHg with proteinuria. However, differentiating between mild and severe disease is the subject of debate (Steegers et al., 2010). Blood pressure is most often measured with a device called sphygmomanometer which consists of a stethoscope, arm, dial, pump and a valve. The measured blood pressure is recorded as systolic over diastolic in mmHg.

2.2 Classification of hypertension

The Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure classified blood pressure based on the average of 2 or more properly measured, seated BP readings on each of 2 or more visits (Table 1).

Table 1. Classification of blood pressure

BP Classification	SBP mmHg	DBP mmHg
Normal	<120	and<80
Prehypertension	120-139	or 80-89
Stage 1 hypertension	140-159	or 90-99
Stage 2 hypertension	≥160	or≥100

(Adopted from JNC-7, 2003)

2.3 Hypertension and pregnancy

Hypertensive disorders represent one of the most common problems of pregnancy and lead to increased maternal and perinatal morbidity and mortality. Hypertension may be pre-existent, may be induced by the pregnancy or both types may co-occur, and their influence on the outcome of the pregnancy is different depending on the type of disorder concerned. Further, hypertension in the presence of proteinuria indicates more severe maternal and fetal consequences (Swati et al., 2014).

2.3.1 Hypertensive disorders of pregnancy

Globally, hypertensive pregnancy disorders complicate approximately 6–16% of all pregnancies, with pre-eclampsia accounting for 3–7% (National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy, 2000). In high-income countries, the rates are around 10%, with pre-eclampsia accounting for ~4% (C. L. Roberts et al., 2011). These disorders are the leading causes of maternal, fetal and neonatal morbidity and mortality. Overall, 10–15% of maternal deaths from pregnancy-related causes are associated with pre-eclampsia and eclampsia (Duley, 2009).

While most of these deaths occur in low- and middle-income countries, the proportion associated with pre-eclampsia and eclampsia is similar between countries (Duley, 2009). Pre-eclampsia and eclampsia also drastically increase the risk of maternal morbidity as well as the risks to the infant (Carty et al., 2010). Immediate risks to the infant include perinatal death, poor growth and prematurity. Less information is available on the long-term implications of these disorders. As well as pre-eclampsia, gestational hypertension may increase the risk of adverse perinatal and long-term outcomes (Villar et al., 2006).

2.3.2 Classification of hypertensive disorders

Hypertensive pregnancy disorders are characterized by elevated blood pressure where proteinuria is an additional characteristic in pre-eclampsia. Table 2 describes the diagnostic criteria according to the National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy (Table 2).

Table 2: Classification of hypertensive pregnancy disorders

Category	Definition
Chronic hypertension	HT $\geq$ 140/90 mmHg present before pregnancy or diagnosed before 20th week of gestation or does not resolve post-partum
Gestational hypertension	HT $\geq$ 140/90 mmHg on $\geq$2 occasions at least 4h apart in a women who was normotensive before 20th week of gestation and whose blood pressure returns to normal post-partum
Pre-eclampsia-eclampsia	HT $\geq$140/90 mmHg on $\geq$2 occasions at least 4h apart in a women who was normotensive before 20th week of gestation with proteinuria $\geq$300 mg/ 24 h
Pre-eclampsia superimposed on chronic hypertension	HT $\geq$140/90 mmHg present before pregnancy or diagnosed before 20th week of gestation with (new-onset) proteinuria $\geq$300 mg/ 24 h

(American College of Obstetricians and Gynecologists & Task Force on Hypertension in Pregnancy, 2013; National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy, 2000)

2.4 Pathophysiology

The underlying causes of pre-eclampsia and gestational hypertension remain unknown. Inadequate placentation due to deficient trophoblastic invasion of the uterine spiral arteries is one probable underlying cause. This may result in the release of a variety of factors into the circulatory system that alter endothelial function (Taylor et al., 2009). While the factors may differ between individuals, they may include angiogenic factors, metabolic factors and inflammatory mediators.

It is possible that these give rise to oxidative stress and endothelial dysfunction, culminating in pre-eclampsia (Taylor et al., 2009). Clinical manifestations result from systemic endothelial dysfunction, in which the target organ may be the brain, the liver and/or the kidney. It is of note that at least some forms of gestational hypertension may share certain pathophysiologic and pathogenic mechanisms with pre-eclampsia (Levine et al., 2006 and Strevens et al., 2003).

2.5 Diagnosis

The diagnosis of pre-eclampsia is largely based upon meeting the characteristic clinical features which define pre-eclampsia. These features can be identified by either carrying out clinical assessment or laboratory tests.

The hallmark features in pre-eclampsia include developing systolic blood pressure (SBP) $\geq$140, or diastolic blood pressure (DBP) $\geq$90, and proteinuria of 0.3 grams or greater in a 24-hour urine specimen after 20 weeks of gestation in a woman who was previously normotensive. Hypertension is generally the earliest physical abnormality seen in pre-eclampsia and is the most important clinical clue to the presence of the disease. Since SBP and DBP readings are an essential part of the diagnosis of pre-eclampsia, ensuring that the optimal and appropriate ways are employed to measure BP cannot be overemphasized.

Using different indices of BP to predict pre-eclampsia has been comprehensively evaluated in a meta-analysis published by (Cnossen et al., 2008). This meta-analysis included 34 studies and evaluated using SBP, DBP, mean arterial pressure, and the increase over time in BP. The data from this meta-analysis supports the conclusion that BP measurements in the first and second trimesters have only a modest ability to predict pre-eclampsia (Cnossen et al., 2008).

Although proteinuria is generally considered an essential characteristic of pre-eclampsia, pre-eclampsia should be suspected in any pregnant woman with hypertension and characteristic signs or symptoms, even if proteinuria is absent. Twenty percent of women who develop eclampsia have no proteinuria and 10 percent of women with other clinical and/or histological manifestations of pre-eclampsia have no proteinuria (Mustafa et al., 2012). Women with proteinuria detected by urine dipstick should undergo quantitative measurement of protein excretion. Use of the urine protein: creatinine (P: C) ratio to estimate 24 h protein excretion for the diagnosis of pre-eclampsia has been controversial. The P: C ratio has been compared with 24 h urine collection in pregnant women with discordant conclusions.

2.6 Cardiovascular physiological changes during pregnancy

Pregnancy is a dynamic process associated with significant physiological changes in the cardiovascular system. These changes are mechanisms that the body has adapted to meet the increased metabolic demands of the mother and fetus and to ensure adequate utero placental circulation for fetal growth and development.

Significant cardiovascular and haemodynamic changes occur early in pregnancy in order to provide enough blood for the embryo and maintain normal fetal intrauterine growth. Such changes include increased maternal plasma volume, cardiac output and heart rate, decreased maternal systemic vascular resistance and arterial blood pressure (Ouzounian and Elkayam, 2012).Insufficient hemodynamic changes can result in maternal and fetal morbidity, as seen in pre-eclampsia and intrauterine growth retardation. In addition, maternal inability to adapt to these physiological changes can expose underlying, previously silent, cardiac pathology, which is why some call pregnancy nature's stress test (Monika et al., 2014). Indeed, cardiovascular disease in pregnancy is the leading cause of maternal mortality in North America (Berg et al., 2005).

2.7 Risk factors for hypertensive disorders during pregnancy

The risk factors for hypertensive pregnancy disorders have been well documented and can be divided into factors associated with a maternal predisposition to cardiovascular disease and factors that represent the placental or pregnancy-related component of pre-eclampsia and hypertension without proteinuria. In addition, it is possible that psychological risk factors such as job stress, depression and anxiety have a positive association (Paarlberg et al., 2009).

While poor placentation is commonly associated with disease, this is not always the case. Maternal constitutional susceptibility may be a determining factor. This assumption is consistent with the shared risk factors associated with both pre-eclampsia and gestational hypertension and cardiovascular disease. In addition, although pre-eclampsia is associated with intrauterine growth restriction (IUGR), most infants born to pre-eclamptic women have a normal birth weight for gestational age. This may be explained by factors such as diabetes and obesity, which are risk factors for pre-eclampsia and gestational hypertension, yet are often associated with larger babies (King, 2006).

2.8 Effects of hypertension during pregnancy

Past studies have attempted to quantify the effect of hypertensive pregnancy disorders on adverse perinatal outcomes. Pregnancies complicated by hypertension with or without proteinuria are characterized by an increased rate of preterm delivery (Steegers et al., 2011) but the rates vary considerably across studies. The higher rate is at least partly due to delivery being the only curative treatment for pre-eclampsia. Indeed, due to medically indicated preterm births, pre-eclampsia is implicated in 10–15% of all preterm births (Ananth & Vintzileos, 2006).

Compared to children born after normotensive pregnancies, children born after hypertensive pregnancy disorders often also have lower birth weights and a higher risk of being born with a birth weight of less than 2500g (Bakker et al., 2011). Naturally, this may in part be explained by their increased risk of preterm birth or a shorter length of gestation. In addition, it is intuitive that if placental blood flow is reduced with pre-eclampsia and hypertension, it should result in decreased fetal growth. This should not only increase the risk of low birth weight, but also intrauterine growth restriction. Poor fetal growth is, indeed, often considered a characteristic of pregnancies complicated by hypertension and supported by many studies (Bakker et al., 2011 and Ferrazzani et al., 2011).

The reported rates of IUGR reach up to 50% in hypertensive pregnancy disorders. It has been suggested that approximately 10% of all cases of IUGR are secondary to pre-eclampsia or gestational hypertension (Villar et al., 2006). A few studies have reported an association between pre-eclampsia and/or gestational hypertension and with large-for-gestational age births (Eskild, Romundstad, & Vatten, 2009). A recent meta-analytic review revealed that pre-eclampsia was associated with a 60% increase in the odds of a stillbirth in high-income countries over the past

two decades (Flenady et al., 2011). Gestational hypertension was associated with a 30% increase in the odds. The risk associated with pre-existing hypertension was even higher than that for pre-eclampsia or gestational hypertension.

2.9 Treatment of hypertension

Management of hypertension can be achieved through both pharmacological and non-pharmacological treatments. And the main goals of treatment is to regularly maintain the blood pressure levels within the normal ranges and also minimize fetal risks attributable to hypertension, development of vascular disease and possible harmful effects of the antihypertensive medications causing decreased utero-placental perfusion or potential harmful fetal effects (Moussa et al., 2015).

2.9.1 Non-pharmacological and pharmacological treatment

Non-pharmacological management refers to interventions that do not involve medications. The American College of Obstetricians and Gynecologists, 2013 suggested that weight loss and extremely low sodium diets of less than 100 mEq daily should not be used for the management of chronic hypertension in pregnancy. It is also suggested that moderate exercise should be continued during pregnancy for women who are accustomed to exercising (Moussa et al., 2015). The major non-pharmacological interventions include the close monitoring of the most risk factors of hypertension and are the following;

a) **Salt reduction:** High salt diets consumption has drastically increased especially the processed foods. The reduction of salt intake is highly recommended for blood pressure reduction and it can be achieved through eating healthy snacks like fruits and vegetables in their raw state, avoid adding raw salt in already cooked food, reduce on the consumption of processed foods. Franco et al., 2006, reported that dietary salt intake has a linear association with blood pressure and reduced sodium intake to approximately 100mmol/day can prevent hypertension and can facilitate blood pressure control in elderly patients on medication.

b) **Weight loss management:** Being overweight and obese is among the risk factors of hypertension. Weight loss reduction reduces on the fats in the adipose tissues and hence reducing the free fatty acids circulating and blocking the blood vessels. Reduced consumption on fatty deep fried foods eg. Chips, chicken and replacing them with fresh

healthy fruits and vegetables can be helpful in weight reduction. Overweight (body mass index $\geq 25kg/m^2$) has been evidenced in epidemiological studies to be an important risk factor for higher blood pressure and there seems to be a linear relation between body weight and blood pressure (Doll et al., 2002). Weight loss studies show that clinically significant blood pressure reductions can be achieved by modest weight loss in people with and without hypertension and that blood pressure reduction is proportional to weight loss (Monica et al., 2018).

c) **Cigarette smoking cessation:** Stopping smoking will not directly reduce the blood pressure, but it is a major cardiovascular risk factor. Therefore, patients should be educated on the disadvantages of smoking and their counselled and guided to cease. Cigarette smoking is a major independent risk factor for cardiovascular disease and the association between chronic smoking and cardiovascular disease is well established (Talukder et al., 2011).

d) **Exercise:** Regular but moderate exercise helps in the reduction of blood pressure. It improves the flow of blood through the blood vessels, improves insulin sensitivity, and reduces circulating levels of triglycerides and low-density lipoproteins.

e) **Alcohol consumption:** Excess alcohol consumption which is above the recommend consumption for women of 1 drink per day increases the blood pressure levels therefore alcohol reduction encouraged for the management and monitoring of high blood pressure. In cross-sectional and prospective epidemiological studies, high blood pressure has consistently been found among persons reporting usual daily intake of three standard-sized drinks or more (Pajak, 2013).

2.9.2. Pharmacological management of hypertension

Centrally acting agents

Methyldopa is one of the most widely used drugs and was the first- line agent for the treatment of hypertension in pregnancy. It is a pro-drug metabolized to alpha methyl-norepinephrine, which then replaces norepinephrine in the neuro-secretory vesicles of adrenergic nerve terminals. It is not thought to be tera-togenic and has been reported to prevent subsequent progression to severe hypertension in pregnancy and does not seem to have adverse effects on utero placental or fetal hemodynamics (Magee et al., 2008).

Calcium channel blockers

These drugs have been used to manage chronic hypertension, mild pre-eclampsia presenting late in gestation and urgent hypertension associated with pre-eclampsia. Both nifedipine a non dihydropyridine calcium channel blocker and verapamil are not associated with teratogenic risks to fetus exposed in first trimester. Maternal adverse effects with nifedipine include tachycardia, palpitations, peripheral edema, headaches, and facial flushing. Nifedipine does not seem to cause a detectable decrease in uterine blood flow. Short-acting dihydropyridine calcium antagonists, particularly when administered (Podymown et al., 2008).

Diuretics

Diuretics are first-line agents to be used in management of essential hypertension prior to conception and, based on their apparent safety, they may be continued during pregnancy alone or in combination with other agents especially in women more likely to have salt-responsive hypertension (Rocella E.J, 2000). Concerns regarding volume contraction leading to limited fetal growth have not been supported in studies. Mild volume contraction, however, may lead to hyper-uricemia and in doing so invalidate serum uric acid levels as a laboratory marker that may assist in the diagnosis of superimposed pre-eclampsia.

Direct vasodilators

Hydralazine selectively relaxes arteriolar smooth muscle by an as yet unknown mechanism. The most important indication is severe hypertension or a third-line agent in control of refractory hypertension. It can be used orally, intravenously, or intramuscularly. Adverse effects are due to excessive vasodilation or sympathetic activation (headache, nausea, flushing, or palpitations). Chronic use can lead to (in rare cases) a pyridoxine- responsive polyneuropathy or to immunologic reactions, including a drug-induced lupus syndrome.

Angiotensin-Converting Enzyme Inhibitors (ACE-I) and Angiotensin Receptor Blockers (ARB). ACE-I and ARB are contraindicated in 2nd and 3rd trimesters because of severe toxicity secondary to reduced renal perfusion of the fetal kidneys. Their use has been associated with renal dysgenesis, oligohydramnios as a result of fetal oliguria, calvarial and pulmonary hypoplasia, intrauterine growth restriction, and neonatal anuric renal failure, leading to death of the fetus. ARBs have also been associated with fetal demise and same concerns are applicable to

the use of direct renin inhibitors. ACE inhibitors and ARBs, may cause fetal anomalties, such as fetal renal insufficiency, oligohydramnios, growth restriction, pulmonary hypoplasia, cranial anomalies and severe fetal hypotension especially in the second and third trimesters and therefore should be avoided in pregnancy (Laube et al., 2007).Health providers caring for women in the reproductive age group should be cautious about the use of these medications, patient's reproductive plans and potential risks including awareness of potential side effects and teratogenesis (Moussa and Sibai, 2015).

2.10 Nutrition during pregnancy

Adequate nutrition before, during and after pregnancy has greater potential for a long term health of both mother and child (Singh et al., 2009). Good nutrition is highly important during pregnancy whereby healthy eating is needed to meet the added demands on the maternal body as well as that of the growing fetus. Maternal intake of carbohydrates, proteins, fatty acids and micronutrients such as zinc, iron, magnesium, calcium, riboflavin and vitamin c have important effects on growth of the fetus and perinatal outcomes. For maternal stores not to get depleted, the mother's diet should provide adequate nutrients (Khoushabi and Saraswathi, 2010).

2.10.1 Nutrition status during pregnancy

A pregnant woman's nutritional status has important implications for her health as well as the health of her children. It has been established that sufficient nutrition before and during pregnancy has the potential for the promotion of a long term health of the mother and her child (Khoushabi and Saraswathi, 2010).Assessment of maternal nutritional status relies on measure of MUAC, pre-pregnancy weight and weight gain during pregnancy. MUAC has been recommended as it has been found as a potential indicator of nutritional status. A study done in Ethiopia, found that women with low MUAC, were more likely to give birth to low birth weight infants (Assefa et al., 2012).

2.10.2 Dietary diversity

Dietary diversity which is defined as the consumption of an adequate variety of food groups has been accepted as an aspect of dietary quality and can indicate nutritional adequacy (Becquey, Capon and Martin-Prével, 2009; Mpontshane et al.,2008; FAO, 2007). It postulates the concept

that increasing the variety of foods and food groups in the diet helps to ensure adequate intake of essential nutrients and promotes good health (Becquey, Capon and Martin-Prével, 2009; Mirmiran, Azadbakht and Azizi, 2006).

Dietary diversity can be measured by using several methods such as a household or individual dietary diversity questionnaire in which dietary diversity score is used (FAO, 2007). Dietary diversity scores are created by adding either the number of individual food items that have been consumed over a reference period or the various food groups. Individual Dietary Diversity Score (IDDS) uses 16 food groups which include. Cereals; Vitamin A rich vegetables and tubers; White roots and tubers; Dark green leafy vegetables; Other vegetables; Vitamin A rich fruits; Other fruits; Organ meat; Flesh meat; Eggs; Fish; Pulses/Legumes, nuts and seeds; Milk and milk products; Oils and fats; Sweets and sugar and condiments and spices. The IDDS aims to capture nutrient adequacy and studies have shown that an increase in individual dietary diversity score is related to increased nutrient adequacy (Foote et al., 2004).

Maternal intake of carbohydrates, proteins, fatty acids and micronutrients such as zinc, iron, magnesium, calcium, riboflavin and vitamin c have important effects on the growth of the fetus and perinatal outcomes (Baer et al, 2005). Adequate maternal nutrient intake was found to reduce the risk for low birth weight (19%), small for gestational-age births (8%), preterm birth by 16%, and infant mortality by 15% (Abu-Saad & Fraser, 2010).Pregnant women need additional protein for initial deposition of pregnancy- related tissue and to maintain new tissue (Kathleen and Dora, 2010).A number of studies have been able to link dietary diversity to the intake of nutrients specifically among adults in the developing countries of which Kenya is one of them (Thorne-Lyman et al.,2009; Arimond and Ruel, 2004).

CHAPTER THREE: METHODOLOGY

3.1 Study area and location

This study was conducted in Fort Portal Regional Referral Hospital also commonly known as Buhinga Hospital. Fort Portal Regional Referral Hospital lies within in the municipality of Fort portal, in Kabarole district. Fort Portal is located approximately 180 kilometers, north-west of Mbarara and 297 kilometers West of Kampala, the coordinates of the town are 0°39'16.0"N, 30°16'28.0"E. Kabarole district covers a total area of 1,814 sq.km. Fort Portal Regional Referral Hospitalis a public hospital which started in 1920 as a dispensary and upgraded to a regional referral hospital in 1994. The hospital is funded by the Government of Uganda through the Ministry of Health.

3.2 Study design

A cross-sectional descriptive study design using semi-structured questionnaire guided interviews was used to collect information from the pregnant mothers who attended antenatal clinic at Fort Portal Regional Referral Hospital during the study period and consented to participate in the study.

3.3 Study population and respondents

The study population included pregnant mothers who were aged 15 to 49 years attending antenatal clinic at Fort Portal Regional Referral Hospital. The respondents were pregnant mothers who attended antenatal clinic during the study period and consented to take part in the study.

3.4 Selection criteria

3.4.1 Inclusion criteria

Pregnant mothers aged between 15 to 49 years who attended antenatal clinic during the study period and consented to take part in the study.

3.4.2 Exclusion criteria

- Pregnant mothers who did not attend antenatal clinic
- Mothers who did not consent to take part in the study
- Mothers who were below 15 years of age and above 49 years of age
- Non-pregnant patients

3.5 Sampling method

Simple random sampling was used. This method eliminates bias because it gives all individuals an equal chance to be chosen to take part in the study. In terms of sampling, numbers 1 to 100 were written down on small pieces of paper. These papers were folded and put in a basket and picked at random until half of them were picked. The subjects were selected through a proportionate random sampling by either choosing the even or odd numbers. This process was repeated until the target number of respondents was captured. This sampling technique ensured the inclusion of greater number of respondents, representative of the whole population.

3.5.1 Sample size determination

The sample size was determined using the Cochran's formula;

$$n = \frac{Z^2 pq}{d^2}$$

Where;

n= the required sample size

z= the test statistics at the desired level of significance. From the normal distribution curve, the confidence interval is 95%, corresponding to 1.96.

p= is the proportion of the interest in the population, which is hypertension in this study. The expected proportion of HDP in Uganda approximates to 13% as reported by (Nakimuli et al, 2016) in a prospective cohort study conducted at Jinja and Mulago hospitals.

q= 1-p

d= accepted error to be committed in the study (5%)

$$n = \frac{(1.96)^2(0.13)(1 - 0.13)}{0.05^2}$$

$$n = \underline{174}$$

However, a sample of 110 respondents was used due to financial constraints.

3.6 Data collection

3.6.1 Questionnaire

Semi structured questionnaires were administered by the researcher to gather data on the respondent's socio-demographic characteristics (Age, occupation, education level, marital status), obstetric history (Mode of delivery and gravidity). The questionnaires were first pretested on a selected number of pregnant mothers outside the sample area and necessary adjustments and corrections were made. The pretest was basically to help determine how much time was required to complete the questionnaire.

3.6.2 MUAC measurement

Standard Mid Upper Arm Circumference (MUAC) tapes were used to take the measurements to determine the nutritional status of the participants. MUAC of a less active arm was taken to the nearest 0.1 cm with no clothing on. The measurement was done twice for each respondent to ensure accuracy.

3.6.3 Blood pressure measurement

Blood pressure was measured using a blood pressure machine. The participant was given five minutes to rest before measurement of her blood pressure and a one-minute resting interval as the participant was seated before another measurement was taken.

3.6.4 Dietary diversity

The participant was requested to describe the foods (meals and snacks) that she ate or drank in the past 24 hours whether at home or outside the home. When the respondent 24hour recall was complete, 10 food groups based on Minimum Dietary Diversity for reproductive women was filled.

3.7 Data analysis

The raw data obtained was checked and edited thoroughly to eliminate all the possible errors which might have resulted from the misinterpretation of the asked questions by the respondents in the questionnaire. Statistical codes were assigned to the various responses for easy analysis and these included numbers and letters among others. The data was entered into a software the Statistical Package for Social Sciences (SPSS), interpreted, analyzed and presented in the frequency tables, and chi square tests of significance to show how the variables were related. The $p < 0.05$ was used to measure the level of statistical significance.

3.8 Ethical consideration

An introductory letter from Makerere University, Department of Food Technology and Nutrition was used to introduce the researcher to the office of the Hospital director. The study was approved by the Research Committee of Fort Portal Regional Referral Hospital. Written informed consent was obtained from the mothers after explaining the purpose and benefits of the study. Participation was voluntary and confidentiality of participant's information was highly observed.

CHAPTER FOUR: RESULTS

4.1 Socio-demographic characteristics of the pregnant mothers.

The social-demographic characteristics of the study population are summarized in Table 3.The results indicate that majority (34.5%) of the pregnant mothers were between 15-24 years of age, while 32.7% were between 25-34 years and only 3.6% were aged 45-49 years. Majority (90.9%) of the mothers were cohabiting while 6.4% were single mothers and only 1.8% were married.

The results indicate that majority (39.1%) of the pregnant women stopped schooling in lower primary, while 1.8% attained advanced secondary level and only 0.9% had no formal education. Majority (63.6%) of the mothers were unemployed and only 36.4%were employed. Majority (60.9%) of the pregnant women reported that their average monthly income was between Ug shs. 60,000 -200,000 and only 39.1% was below Ug shs 50,000.

Table 3: Social-demographic information of the mothers.

Variable	Categories	Frequency (n=110)	Percentage (%)
Age (years)	15-24	38	34.5
	25-34	36	32.7
	35-44	32	29.1
	45-49	4	3.6
Marital status	Single	7	6.4
	Married	2	1.8
	Divorced/separated	1	0.9
	Co-habiting	100	90.9
Religion	Christian	84	76.4
	Muslim	26	23.6
	Atheist	0	0
Level of education	Lower primary (up to P4)	43	39.1
	Upper primary (P5-P7)	38	34.5
	Ordinary secondary level	25	22.7
	Advanced secondary level	2	1.8
	Degree or diploma holder	1	0.9
	No formal training	1	0.9
Employment status	Employed	40	36.4
	Unemployed	70	63.6
Average monthly income	Below Ug shs. 50,000	43	39.1
	Between 50,000- 59,999	0	0
	Between 60,000- 20,0000	67	60.9
	Between 300,000-1,000,000	0	0
	Above 1,000,000	0	0

4.2 Nutrition status of pregnant mothers attending antenatal care.

The results summarized in Figure 3, indicate that majority (92.7%) of the mothers had optimal or normal nutrition status (MUAC between 23.0 cm and above) while 6.4% were at risk of malnutrition or moderately malnourished (MUAC between $\geq$ 21.0 and < 23.0 cm). Only 0.9% of the respondents were severely malnourished (MUAC less than 21.0cm).
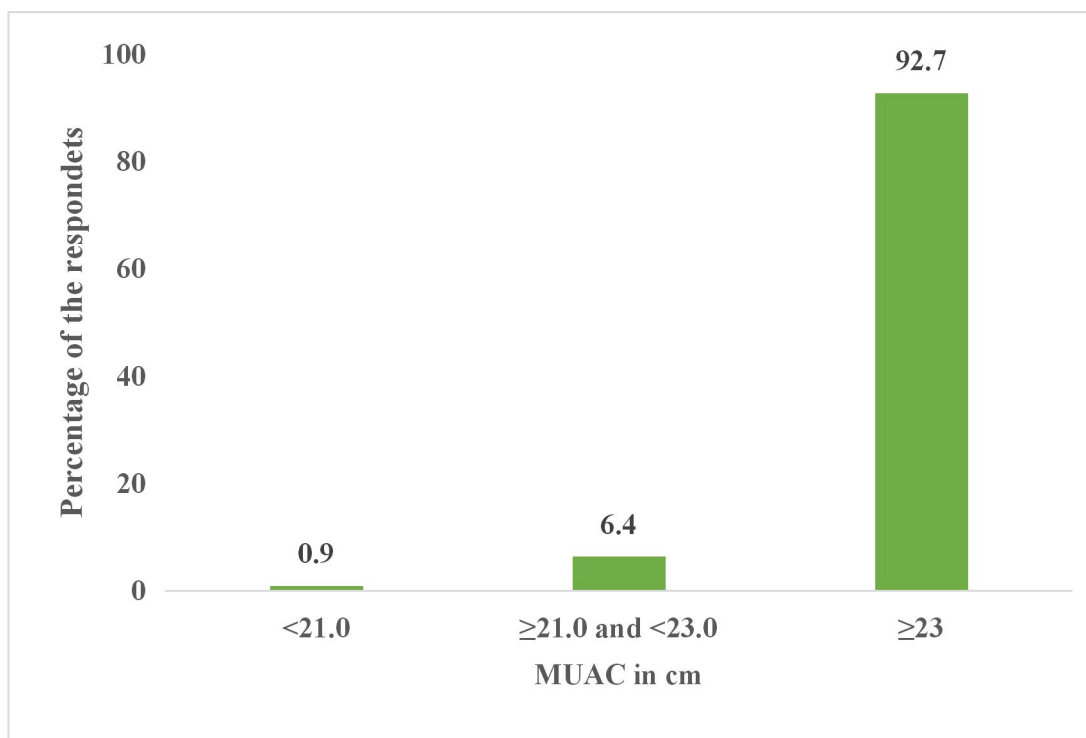
Figure 1: Nutrition status of pregnant women

4.3 Average blood pressure of the pregnant mothers attending ANC.

Majority (55.5%) of the pregnant mothers had normal blood pressure, while 39.1% were pre-hypertensive and only 5.5% had stage 1 hypertension (Figure 2).
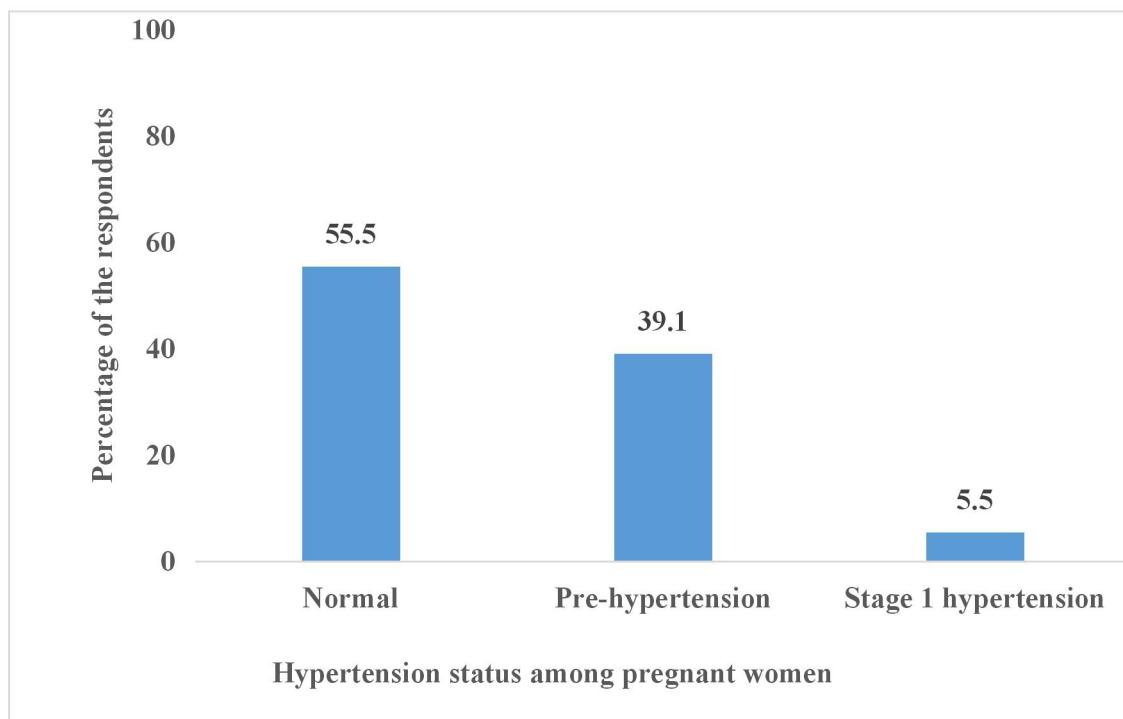
Figure 2: The prevalence of hypertensive disorders among pregnant women

4.4 Antenatal care characteristics of the pregnant mothers.

The results indicate that majority (54.5%) of the pregnant mothers were in their second trimester of pregnancy while 42.7% were in the third trimester. The results further indicate that only 2.7% of the mothers were in the first trimester.

Majority (44.5%) of the mothers reported to have attended antenatal clinic twice and only 4.5% of the women had attended antenatal clinic once. The results indicate that 40.9% of the pregnant women reported their current gravida to be between 1and 2 while only 0.9% of these women reported their current gravida to be between 7 and above. Majority (40.0%) of the mothers had between 1 and 2 children while 3.6% reported to have 5 and above children. Although 18.2 % of the pregnant mothers in the study had never delivered before, 47.3% had previously delivered by vaginal (natural birth) while 34.5% had delivered by caesarean section (Table 4).

Table 4: Antenatal care characteristics of the pregnant women.

Characteristic	Frequency (n)	Percentage (%)
Months of the pregnancy		
0-3	3	2.7
4-6	60	54.5
7-9	47	42.7
Antenatal attendance		
Once	5	4.5
Twice	49	44.5
Thrice	23	20.9
Forth time	33	30.0
Current gravida		
1-2	45	40.9
3-4	33	30.0
5-6	31	28.2
7 and above	1	0.9
Number of children		
No child	24	21.8
1-2	44	40.0
3-4	38	34.5
5 and above children	4	3.6
Ever produced twins		
Yes	0	0
No	110	100
Ever lost any pregnancy		
Yes	30	27.3
No	80	72.7
Mode of delivery of the last pregnancy		
Never delivered before	20	18.2
Vaginal (natural birth)	52	47.3
Caesarean section	38	34.5
Vacuum(assisted)	0	0

4.5 Level of physical activity among the pregnant mothers attending antenatal clinic.

Majority (58.2%) of the mothers often carried out moderate type of physical activity while 41.8% reported to carry out light type of physical activity. The study results also indicate that 41.8% of the pregnant women reported that walking short distances as the most carried out physical exercise while 11.8% reported digging. Only 4.5% of the mothers did not carry out any of the physical exercises. Majority (54.5%) of the women reported that they often do exercise between 1-3 times while 29.1% reported 3-5times (Table 5).

Table 5: Level of physical activity among the mothers attending antenatal clinic.

Characteristic	Frequency (n)	Percentage (%)
Physical activity level		
Light	46	41.8
Moderate	64	58.2
Heavy	0	0
Most carried out physical exercise		
Walking short distances	46	41.8
Digging	13	11.8
Running / jogging	0	0
Walking long distances	46	41.8
None	5	4.5
Frequency of exercise		
1-3	60	54.5
3-5	32	29.1
5-7	10	9.1
Inconsistently	4	3.6
None	4	3.6

4.6 The possible risk factors of hypertension during pregnancy among the pregnant women

Among the mothers, 55.5% had a family history of hypertension and 38.2% of these mothers had maternal history of hypertension. Majority (91.8%) of the pregnant women reported never to have been told by a doctor that they have diabetes while 8.2% reported to have diabetes. The study results also indicated that 19.1% of the women had ever been told by a health professional in the past months to have elevated blood pressure. Only 9.1% of the mothers had been diagnosed with hypertension during pregnancy (Table 6).

Table 6: Risk factors of hypertension among the pregnant mothers

Characteristic	Frequency (n)	Percentage (%)
Ever smoked		
Yes	0	0
No	110	100.0
Anyone in your household who smokes		
Yes	50	45.5
No	60	54.5
Currently taking alcohol		
Yes	15	13.6
No	95	86.4
Told by any health professional that you have diabetes		
Yes	9	8.2
No	101	91.8
History of hypertension in your family		
Yes	61	55.5
No	49	44.5
If yes, from which side of your family		
No history of hypertension	49	44.5
Fathers	20	18.2
Mothers	39	35.5
Both	2	1.8
Last blood pressure measurement by a health professional		
Within the past 5 months	102	92.7
6-12 months ago	7	6.4
Above 1 year	1	0.9

Told by a health professional in the past months that you have elevated blood pressure		
Yes	21	19.1
No	89	80.9
Diagnosed with hypertension during any of your pregnancy		
Yes	10	9.1
No	100	90.9

4.7 Nutritional knowledge of the pregnant women attending antenatal clinic.

The results indicate that, only 11.8% of the pregnant mothers had never heard of the term balanced diet. Majority (70.9%) of the women identified starchy foods mainly, millet, posho and rice as energy giving foods while 72.7% knew the importance of fruits and vegetables to their bodies. Among the pregnant women, 62.7% identified fruits and vegetables as healthy snacks recommended for people with hypertension.

Majority (73.6%) of the mothers said modifying a diet is essential for managing high blood pressure while 60.0% of the women recommended low fatty foods with more vegetables, good proteins and low in salt diets for hypertensive patients (Table 7).

Table 7: Nutrition knowledge of the pregnant mothers attending antenatal clinic.

Characteristic	Frequency (n)	Percentage (%)
Heard of the term balanced diet		
Yes	97	88.2
No	13	11.8
A balanced diet is		
1. Diet which contains all the necessary nutrients	32	29.1
2. Diet with appropriate amount of each nutrient	45	40.9
3. Diet that contains the same quantities of all food groups	20	18.2
4. I don't know	13	11.8
Energy giving foods		
1. Starchy foods eg posho, rice, millet	78	70.9
2. Fruits and vegetables eg mangoes, dodo	6	5.5
3. Legumes eg beans, peas	23	20.9
4. I don't know	3	2.7
Fruits and vegetables give our bodies		
1. Energy	18	16.4
2. Oils	0	0
3. Vitamins, minerals and fiber	80	72.7
4. I don't know	12	10.9
Healthy snacks recommended for people with hypertension		
1. Carbonated soft drinks (soda, processed drinks)	39	35.5
2. Chips, deep fried fatty foods (beef, mandazi, cassava)	2	1.8
3. Fruits and vegetables(doddo, cabbage, mangoes)	69	62.7
4. Baked products(bread, biscuits, cakes)	0	0
Diet modification is essential in managing high blood pressure		
1. Yes	81	73.6
2. No	23	20.9
3. I don't know	6	5.5

Diets recommended for a person with hypertension

	Frequency	Percentage
1. High fatty foods with little vegetable, no fruits and too much water	0	0
2. Low fatty foods with more vegetables, good proteins and low in salt	66	60.0
3. Deep fried foods, soda, beer, enough water, and too much salt	0	0
4. None of the above	13	11.8
5. I don't know	31	28.2

4.8 Attitudes of the pregnant mothers towards the management of hypertension.

The study results indicate that majority (97.3%) of the pregnant mothers highly disagreed with adding extra salt to already cooked food.

Majority (100%) of the mothers agreed with advising a hypertensive patient to avoid or stop smoking. The results also indicated that 89.1% of the pregnant women agreed that a diet high in fat, refined sugar and salt cannot be tolerated by a hypertensive patient while 71.8% agreed that being overweight or obese is a risk factor for hypertension.

Among the mothers, 61.8% agreed that attending ANC can reduce chances of one becoming hypertensive during pregnancy. Majority (82.7%) of the pregnant women disagreed with a balanced diet being time consuming and tiresome to prepare while 89.1% agreed that eating plenty of fruits and vegetables is healthier. Only 62.7% of the mothers agreed that a pregnant woman needs to check her blood pressure regularly (Table 8).

Table 8: Attitudes of the pregnant mothers towards the management of hypertension.

Characteristic	Frequency (n)	Percentage (%)
Adding extra salt to already cooked food is advisable for a hypertensive patient		
Agree	3	2.7
Disagree	107	97.3
I would advise a hypertensive patient to avoid or stop smoking		
Agree	110	100
Disagree	0	0
A diet high in fat, refined sugar, and salt cannot be tolerated by a patient with hypertension		
Agree	98	89.1

Disagree	12	10.9
Being overweight or obese is a risk factor for hypertension		
Agree	79	71.8
Disagree	31	28.2
Attending ANC can reduce chances of you becoming hypertensive during pregnancy		
Agree	68	61.8
Disagree	42	38.2
Doing light daily exercise plays a good role in hypertension management		
Agree	70	63.6
Disagree	40	36.4
Preparing a balanced diet is tiresome and time consuming		
Agree	19	17.3
Disagree	91	82.7
Eating a balanced diet is costly		
Agree	16	14.5
Disagree	94	85.5
Eating plenty fruits and vegetables is healthy for hypertensive and normotensive people		
Agree	98	89.1
Disagree	12	10.9
Avoiding alcohol among people with hypertension is good		
Agree	106	96.4
Disagree	4	3.6
Patients with hypertension need to be careful with whatever they eat		
Agree	101	91.8
Disagree	9	8.2
A pregnant woman needs to check her blood pressure regularly		
Agree	69	62.7
Disagree	41	37.3
Over consumption of fluids during pregnancy causes complications during labor		
Agree	87	79.1
Disagree	23	20.9

4.9 Signs and symptoms of hypertension among the pregnant women

Majority (70.0%) of the pregnant women experienced lower back pain, 60% experienced severe headache while only 9.1% of the women presented with edema (Table 9).

Table 9: Signs and symptoms of hypertension during pregnancy

Characteristic	Frequency (n)	Percentage (%)
Edema		
Yes	10	9.1
No	100	90.9
Severe headache		
Yes	66	60.0
No	44	40.0
Blurred vision		
Yes	6	5.5
No	104	94.5
Dizziness		
Yes	3	2.7
No	107	97.3
Shortness of breath		
Yes	21	19.1
No	89	80.9
Sudden weight gain		
Yes	3	2.7
No	107	97.3
Lower backache		
Yes	77	70.0
No	33	30.0

4.10 Consumption of foods from various food groups by the pregnant mothers.

The 24-hour recall interviews of the women revealed that the most consumed food groups were grains (100%), pulses (84%) and other vegetables (99.1%). The moderately consumed food groups were nuts (69%) and diary (57%) while the least consumed food groups were meat (37%), eggs (1%), dark green vegetables (8%) and other fruits (29%) (Table 10).

Table 10: Percentage consumption of foods from each food group

No.	Food group(s)	Examples	Frequency(n)	Percentage (%)
1	Grains, plantains, white roots and tubers,	Bread, biscuits, cookies or any other foods made from millet, sorghum, maize, spaghetti, pasta, rice, wheat, porridge or pastes or other locally available grains, white potatoes, white yams, cassava, green bananas	Yes 110 No 0	100 0
2	Pulses	Beans, peas and lentils	Yes 84 No 26	76.4 23.6
3	Nuts and seeds	Peanut/groundnut, chia seed, hibiscus seed, pumpkin seed	Yes 69 No 41	62.7 37.3
4	Dairy	Milk, cheese, yoghurt, other milk products	Yes 57 No 53	51.8 48.2
5	Meat, poultry and fish	Beef, pork, lamb, goat, rabbit, wild game, chicken, duck, doves or other birds Liver, kidney, heart or other organ meats, Nile perch, tilapia, fresh or dried fish	Yes 37 No 73	33.6 66.4
6	Eggs	Eggs	Yes 1 No 109	0.9 99.1
7	Dark green leafy vegetables	Sukuma wiki, spinach, cabbages, cassava leaves, pumpkin leaves, cowpea leaves, indigenous green vegetables	Yes 8 No 102	7.3 92.7
8	Other vitamin A-rich roots and tubers, fruits and vegetables	Ripe mangoes, pawpaw, pumpkin, carrots, yellow fleshed sweet potatoes	Yes 52 No 58	47.3 52.7
9	Other vegetables	Tomato, onion, eggplant, green pepper	Yes 109 No 1	99.1 0.9
10	Other fruits	Passion fruit, banana, oranges, avocado	Yes 23 No 87	20.9 79.1
Individual level	Ate anything (meal or snack) outside the home yesterday		Yes 13 No 97	11.8 88.2

4.11 Dietary diversity score of the pregnant women

Majority (62.7%) of the pregnant mothers consumed foods from greater than 5 food groups while 37.3% of the mothers consumed foods from less than 5 food groups (Figure 3).
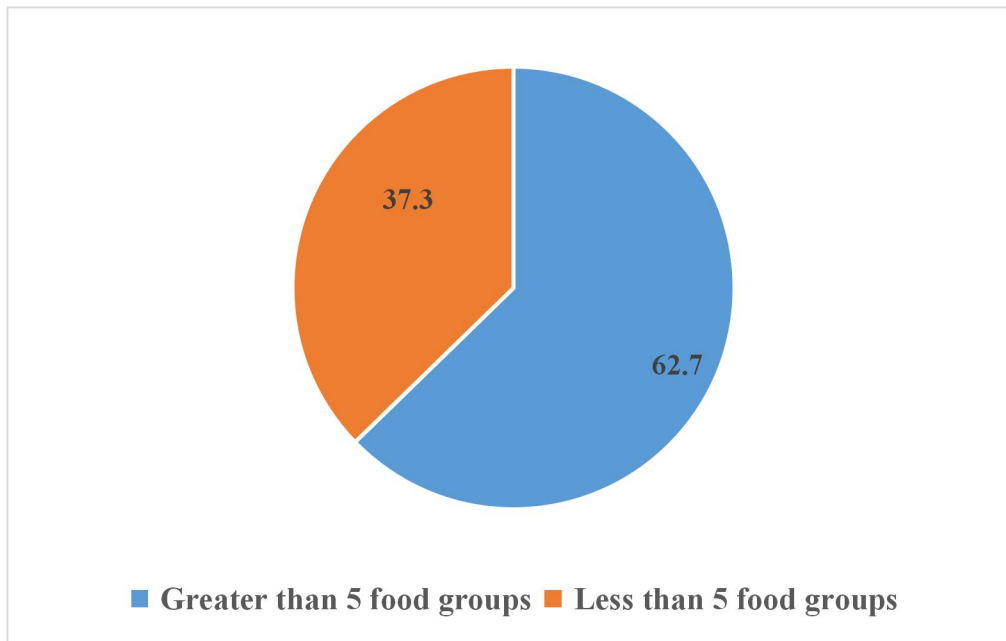
Figure 3: Dietary diversity score of respondents

4.12 Risk factors for hypertensive disorders during pregnancy among the women.

The study results indicate that alcohol consumption increases the risk of hypertension during pregnancy. Majority (53.3%) of the pregnant mothers who were taking alcohol, were reported to be prehypertensive. Among the pregnant women who had stage 1 hypertension (11.1%) were reported to have diabetes. The study only showed strong statistical evidence **(p=0.000)** of an association between family history of hypertension and hypertension during pregnancy, while other risk factors had no sufficient evidence for any statistical relationship (Table 11).

Table 11: Risk factors for hypertension during pregnancy

Factor		Ratio of respondents to blood pressure {n (%)}			P value
		Normal Blood pressure	**Prehypertension**	**Stage 1 hypertension**	
Nutrition status	Below 21 cm	0(0)	1(100)	0(0)	
	Between 21 and <23cm	4(57.1)	3(42.9)	0(0)	0.731
	≥23cm and above	57(55.9)	39(38.2)	6(5.9)	
Alcohol consumption	Yes	7(46.7)	8(53.3)	0(0)	
	No	54(56.8)	35(36.8)	6(6.3)	0.352
Diabetes	Yes	3(33.3)	5(55.6)	1(11.1)	
	No	58(57.4)	38(37.6)	5(4.9)	0.347
Family history of hypertension	No history of hypertension	28(57.1)	21(42.9)	0(0)	
	Paternal side	8(40.0)	9(45.0)	3(15.0)	**0.000***
	Maternal side	25(64.1)	13(33.3)	1(2.6)	
	Both	0(0)	0(0)	2(100)	

4.13 Association between blood pressure and the age of the pregnant mothers.

The results of the study indicate that the percentage of pregnant women with prehypertension increased as their age increased. Among the pregnant mothers who were aged between 45-49 years, 75% were reported to be prehypertensive while 25% had stage 1 hypertension. The mothers who were aged between 45-49 years reported that their pregnancies were in the third trimester (Table 12).

Table 12: Association between maternal age and blood pressure of the pregnant mothers

Maternal age (years)	Ratio of respondents to blood pressure {n (%)}		
	Normal Blood pressure	**Prehypertension**	**Stage 1 hypertension**
15-24	26(68.4)	10(26.3)	2(5.3)
25-24	19(52.8)	16(44.4)	1(2.8)
35-44	16(50.0)	14(43.8)	2(6.3)
45-49	0(0)	3(75)	1(25)

4.14 Association between physical activity and blood pressure of the pregnant women.

Majority (55.5%) of the pregnant women in the study had normal blood pressure. Among the women, 60% carried out light physical activity while 51.6% carried out moderate physical activity. The chi- square tests showed no evidence of a statistical relationship between physical activity and blood pressure (Table 13).

Table 13: Physical activity association with blood pressure among the pregnant women

Physical activity factor		Ratio of respondents to blood pressure {n (%)}			P value
		Normal Blood pressure	Prehypertension	Stage 1 hypertension	
Type of physical activity	Light	28(60.9)	15(32.6)	3(6.5)	
	Moderate	33(51.6)	28(43.8)	3(4.7)	0.488
	Heavy	0(0)	0(0)	0(0)	
Physical exercise	Walking short distances	28(60.9)	14(30.4)	4(8.7)	
	Digging	7(53.8)	6(46.2)	0(0)	0.628
	Running	0(0)	0(0)	0(0)	
	Walking long distances	24(52.2)	20(43.5)	2(4.3)	
	None	2(40)	3(60)	0(0)	
Frequency of exercise	1-3	36(60)	21(35)	3(5)	
	3-5	16(50)	16(50)	0(0)	
	5-7	5(50)	3(30)	2(20)	0.206
	Inconsistently	2(50)	1(25)	1(25)	
	None	2(50)	2(50)	0(0)	

4.15 Association between antenatal care attendance and blood pressure among pregnant mothers.

Majority (66.7%) of the mothers that were found to be prehypertensive had attended antenatal clinic four times. These women reported that their pregnancies were in the third trimester. Also the majority (100%) of the women who had normal blood pressure had attended antenatal clinic only once. Majority (60%) of these mothers reported that their pregnancies were in the first trimester while the 40% reported second trimester (Table 14).

Table 14: Antenatal care attendance association with blood pressure

Antenatal attendance	Ratio of respondents to blood pressure {n (%)}		
	Normal Blood pressure	**Prehypertension**	**Stage 1 hypertension**
Once	5(100)	0(0)	0(0)
Twice	31(63.3)	16(32.7)	2(4.1)
Thrice	16(69.6)	5(21.7)	2(8.7)
Forth time	9(27.2)	22(66.7)	2(6.1)

4.16 Association between dietary diversity score and blood pressure among the women.

The study results indicated that majority (7.3%) of the mothers who had stage 1 hypertension had a poor dietary diversity of consuming foods from < 5 food groups. Majority (66.7%) of the women who had a poor dietary diversity score of < 5 food groups reported that their pregnancies were in the third trimester while 33.3% were in the second trimester. The results also revealed that 66.6% and 33.3% of these women had attended antenatal care thrice and four times respectively (Table 15).

Table 15: Dietary diversity association with blood pressure

Dietary diversity score	Ratio of respondents with blood pressure {n (%)}		
	Normal Blood pressure	**Prehypertension**	**Stage1 hypertension**
Good diversity > 5 food groups	37(53.6)	28(40.6)	3(4.3)
Poor diversity <5 food groups	24(58.5)	15(36.6)	3(7.3)

4.17 Nutrition knowledge association with blood pressure among the pregnant mothers

The results indicate that 45.0% of the mothers who had knowledge on fruits and vegetables were prehypertensive and only 7.5% had stage 1 hypertension. There was a statistical evidence **(p=0.016)** of an association between the knowledge of fruits and vegetables and hypertension during pregnancy while other nutrition knowledge factors did not show any evidence of association as obtained from the chi- square tests (Table 16).

Table 16: Association of nutritional knowledge and blood pressure among the mothers

Nutrition factor		Ratio of respondents to blood pressure {n (%)}			P value
		Normal Blood pressure	**Prehypertension**	**Stage 1 hypertension**	
Ability to define a	Yes	44(57.1)	29(36.7)	4(5.2)	
balanced diet	No	17(51.5)	14(42.4)	2(6.1)	0.862
Knowledge on energy	Yes	39(50.0)	34(43.6)	5(6.4)	
giving foods	No	22(68.8)	9(28.1)	1(3.1)	0.194
Knowledge on fruits and	Yes	38(47.5)	36(45.0)	6(7.5)	
vegetables	No	23(76.7)	7(23.3)	0(0)	**0.016***

4.18 Nutritional knowledge association with antenatal care attendance of the mothers.

Among the pregnant women, majority (46.7%) had no knowledge on fruits and vegetables. These mothers had attended antenatal care twice while 20.0% had attended ANC four times. In this study, **(p=0.038)** showed sufficient evidence of association between antenatal care attendance and nutritional knowledge (Table 17).

Table 17: Association of nutrition knowledge with antenatal care of the mothers.

Nutrition factor		Ratio of respondents to antenatal attendance {n (%)}				P value
		Once	**Twice**	**Thrice**	**Forth time**	
Ability to define a	Yes	2(2.6)	30(39.0)	19(24.6)	26(33.8)	
balanced diet	No	3(9.1)	19(57.6)	4(12.1)	7(21.2)	0.075
Knowledge on fruits and	Yes	1(1.3)	35(43.8)	17(21.2)	27(33.7)	
vegetables	No	4(13.3)	14(46.7)	6(20.0)	6(20.0)	**0.038***

CHAPTER FIVE: DISCUSSION

The results indicate that majority of the mothers were adolescents. Complications from pregnancy and child birth are the leading cause of death among adolescent mothers. This finding is similar to the findings from a study in Nigeria where majority of the mothers were adolescents and they showed poor maternal and perinatal health outcomes (Qazi, 2011). Sedgh et al., 2015 reported that pregnancy during adolescence is commonly associated with adverse psychological, socio economic and health outcomes. The infants of adolescent mothers are also more likely to have low birth weight which can have a long term impact on their health and development (WHO, 2014). Teenage mothers are more likely to experience adverse pregnancy outcome and are more constrained in their ability to pursue educational opportunities than young women who delay child bearing.

In the study, it was reported that majority of the mothers were cohabiting while some were married. This proportion is lower than that reported by Gudeta et al., (2019). Luo et al., (2004) reported that the rates of fetal and neonatal death of children of unmarried women have been reported to be high.

Majority of the mothers had attained primary level of education. This can be attributed to the Government of Uganda program of Universal Primary Education. This finding is consistent with that of Gudeta et al., (2019), were majority of the mothers were reported to have attained up to primary level of education. The mother's educational level is important because it enables her to acquire knowledge about the nutritional requirements needed before, during and after pregnancy. It also improves the household food consumption and food security level of the families. Lunde et al., 2007 reported that fetal growth is determined by a complex interplay of genetic and environmental factors and one important environmental factor is socio-economic status as indicated by educational level which has an influence on the income level and occupation.

The results indicate that majority of the mothers were reported to be unemployed. This finding is consistent with the findings from a case-control study done in Tigray region, Ethiopia were majority of the pregnant mothers were reported to be unemployed (Kahsay et al., 2018). This could be attributed to the fact that majority of the mothers had attained just primary level of education and these had not attained any formal education and thus could not compete for formal employment. Compared with women of high socioeconomic status, those of low socioeconomic

status often give birth to babies with a lower birth weight (Jansen et al., 2009). This is because mothers who are employed are well educated and earn enough money to take care of themselves ie regular checkups while the unemployed mothers are basically uneducated and they do not take care of themselves like they miss regular checkups as they do not have enough money. The proportion of teenagers who have started child bearing decreases with increasing level of education (UDHS, 2016).

The study results indicated that majority of the mothers had an optimal nutritional status. This is similar to the findings obtained from a study done in the Kumasi Metropolis of Ghana, where majority of women were reported to have a normal nutrition status (Sackey et al., 2018). Nutritional status of the expectant mother is one of the most important determinant affecting pregnancy outcomes (Ramakrishnan, 2004). According to the WHO, (2013), a higher percentage of the pregnant women in Sri Lanka had normal nutritional status and this might have been due to regular attendance at Maternal and Child health clinics. A study done by (Mora and Nestel, 2000) showed that out of 200 million pregnant women each year, those in developing countries suffer from nutritional deficiencies. And these nutritional problems affect the health of a woman and her unborn child. The finding of the nutrition and food security survey showed that underweight among pregnant women was 13.4% (Jayatissa and Hossaine, 2010). In this study, there was no evidence of a statistical relationship between nutrition status and hypertension.

The study revealed that there was a low prevalence of hypertension among the pregnant mothers. This finding is slightly lower than that reported from a cohort study done in Mulago and Jinja Referral Hospitals by Nakimuli et al., (2016). Some of the mothers were prehypertensive which indicates that these women are at risk or susceptible to hypertension if no corrective measures are applied to monitor and control their blood pressure. From a one community based study in Chiri, Mehta et al. (2015) reported that nearly one in 14 pregnant women in rural areas of Haryana suffers from a hypertensive disorder of pregnancy. In contrary, Berhe et al., (2018) reported that the overall pooled prevalence of hypertensive disorders among pregnant women in Ethipoia was 6.07% and this was concluded to be high and common among pregnant mothers who are >35 years of age. Igbokwe and Ukwuma, (2013), reported that hypertension was statistically higher for women who come from rural setting than for women from urban settings.

In this study, majority of the pregnant mothers reported to have attended antenatal clinic more than once. These results are inconsistent with what was reported by Teka, (2018) in Southwest Ethiopia where the rate of ANC attendance by the pregnant mothers was very low i.e. the mothers attended ANC less than three times during the course of their pregnancy. A study conducted in Malaysia also demonstrated that antenatal mothers with higher education level learned more and had a better understanding when exposed to nutrition education (Zahara et al., 2014). Globally, developing countries still face a challenge of poorly implemented ANC programs with unskilled ANC providers, irregular clinical visits and long waiting hours of the pregnant mothers (Villar et al, 2002). According to Ensor et al., (2013), many respondents blamed their refusal of ANC as a result of unsatisfactory services at the health facility, unfriendly attitude of staff at the health facility, unavailability of staff at the health facility, long waiting time. UBOS (2014) reported that the overall one-time antenatal attendance in Uganda was found at 94% with women in rural areas being twice less likely to attend ANC than the urban women. According to the UBOS (2007) report, women in Uganda tend to seek antenatal care very late, 37% attending for the first time at 6 months of pregnancy or more.

In relation to physical activity, it was found that majority of the pregnant mothers reported to carry out light to moderate physical activity. Mudd et al., (2009) found out that women in the first trimester of pregnancy were almost twice as likely to participate in any exercise compared to women in their second or third trimester. He also reported that women who stayed active throughout the pregnancy experienced improved fetal growth. Pereira et al., (2007) concluded that women decrease physical activity intensity and duration as pregnancy progresses and shift toward performing less intense, more comfortable modes of activity with lower risks of maternal and fetal injury. According to Chasan et al., (2007), women with more than one child have less time to participate in recreational activities but greater overall energy expenditure due to increased activities of daily living (e.g., housework, playing with older children). In this study, the chi- square tests showed no evidence of a statistical relationship between physical activity and blood pressure.

In this study majority of the women met the minimum requirements of consuming foods from at least 5 food groups. This finding is almost consistent with the findings of other studies done in Kenya (Kiboi et al, 2017) and Tanzania (Ochieng et al, 2017). According to the MDD-W (FAO and FHI 360,2016), women who have consumed at least 5 of the 10 possible food groups over 24 hour recall period were classified as having minimally adequate diet diversity and micronutrient adequacy. A study on dietary intake of expectant mother revealed that proper dietary balance of mother's diet is necessary to ensure sufficient energy and nutrient intake for adequate growth of the fetus without depleting maternal stores and damaging mothers own tissues to maintain her pregnancy (Mridula et al., 2003). Another study done among women in Malaysia affirmed that after adjusting for other variables, diet diversity score has remained a significant protective factor against health risks where women with a higher dietary diversity score were more likely to have <3 health risks (Mohamadpour, Sharif and Keysami, 2012).

Many studies have described maternal age, nutritional status, level of education and diabetes as risk factors of hypertension during pregnancy. In this particular study, majority of the respondents who had stage 1 hypertension were aged between 45-49 years (Table 12).Koffi (2011), reported in his study that mothers >35 years of age and maternal diabetes as risk factors for hypertensive disorders of pregnancy. The increase in blood pressure with increase in age is mostly associated with structural changes in the arteries and especially with large artery stiffness. In the elderly, the most powerful predictor of risk is increased pulse pressure due to decreased diastolic and increased systolic blood pressure (Elisabete Pinto, 2007). In a study conducted from Maroua Regional Hospital in Cameroon, Tebeu et al., (2011) reported that early teenage status, illiteracy, housewife status, nulliparity and family or personal histories of hypertension.

The findings of this study indicated that there was a strong relationship between family history of hypertension and hypertension during pregnancy. In a cohort study done by Priyanga et al., (2015), those with family history of hypertension are nearly 1.4 times more likely to develop hypertension than those without a family history. Unlikely in this same study, there is no evidence of significant relationships through the chi-square tests between the risk factors maternal age, nutritional status, level of education, diabetes and hypertension during pregnancy

There was a statistical evidence of a significant relationship between nutritional knowledge and hypertension during pregnancy. Majority of the pregnant mothers had positive attitudes towards management of hypertension. Mothers had sufficient nutritional knowledge, however they did not put the knowledge they had into practice. This finding is consistent with that of Fasola et al., (2018) where mothers did not translate to a good dietary practice for about half of the respondents. There was also a statistical evidence of a significant relationship between ANC attendance and nutritional knowledge of fruits and vegetables.

Shortness of breath, severe headache were clear signs and symptoms of hypertension among pregnant women as reported by Kumar et al, (2010). The presence of these signs present differently among different people and therefore the need for thorough observation during the clinical assessment and identification of these signs. Van et al., (2010) reported that, the early recognition of these signs and symptoms may prevent further complications.

CHAPTER SIX: CONCLUSION AND RECOMMENDATION

6.1 Conclusion

i. Hypertension was not widespread among pregnant women in Fort Portal. Family history was the major risk factor associated with hypertension during pregnancy.

ii. Majority of the mothers had an optimal nutritional status and were moderately active. However, some of the mothers did not meet their minimum dietary diversity requirements of consuming foods from at least 5 food groups.

iii. Mothers had positive attitudes towards the management of hypertension, however they did not put into practice the nutritional knowledge they had.

6.2 Recommendation

Pregnant mothers should be sensitized on the preventive measures for managing high blood pressure and these would include,

- Encouraging mothers with family history of hypertension to always and regularly check their blood pressure levels by a health professional.
- Promotion of dietary diversity and diet modification through practical food demonstrations.
- Encouraging pregnant mothers to put into practice their nutritional knowledge.
- Providing pregnant mothers with adequate nutrition education and counselling.
- Encouraging pregnant mothers to always attend antenatal care sessions as scheduled by the ANC health providers.

REFERENCES

Abu-Saad, K., Fraser, D. (2010). Maternal nutrition and birth outcomes. *Epidemiologic Reviews*, 32(1), 5-25.

American College of Obstetricians and Gynecologists, Task Force on Hypertensionin Pregnancy (2013). Hypertension in pregnancy. *Report of the American College of Obstetricians and Gynecologists' Task Force on Hypertension in Pregnancy. Obstetrics and Gynecology,* 122.

Arimond, M., Ruel, M.T. (2004). Dietary diversity is associated with child nutritional status: Evidence from 11 Demographic and Health Surveys. *The Journal of Nutrition*, 134, 2579-2585.

Becquey, E., Capon, G., Martin-Prével, Y. (2009). Dietary Diversity as a Measure of the Micronutrient Adequacy of Women's Diets: Results from Ouagadougou, Burkina Faso Site. Washington, DC: *Food and Nutrition Technical Assistance II Project, Academy for Educational Development.*

Berg, C.J., Callaghan, W.M., Syverson, C., Henderson, Z. (2010). *Pregnancy Related Mortality in the United StatesObstetrics and Gynecology,* 116, 1302–1309.

Berhe, K.A., Kassa, G.M., Fekadu, G.A., Muche, A.A. (2018). Prevalence of hypertensive disorders of pregnancy in Ethiopia: a systemic review and meta-analysis, *BioMed Central Pregnancy and Childbirth*, 18, 34

Bharti Mehta, B., Vijay, K., Sumit, C., Sandeep, S., Debjyoti, M. (2015). Hypertension in Pregnancy: A Community-Based Study*, Indian Journal of Community Medicine*, 40(4), 273–278.

Bilenko, N., Rachel, H., Ilana, B. (2007). Utilization of antenatal care services by a semi-nomadic Bedouin Arab population: evaluation of the impact of a local maternal and child health clinic. *Maternal and Child Health Journal,* 11, (5), 425-430.

Bourne, P.A. (2010). Self-reported health and medical care-seeking behavior of uninsured Jamaicans. *American Journal of Medical Science*, 2, 71-80.

Carty, D. M., Delles, C., Dominiczak, A. F. (2010). Pre-eclampsia and future maternal health. *Journal of Hypertension,* 28, 1349–1355.

Case, A. P., Hoyt, A. T., Canfield, M. A., Wilkinson, V. (2015). Periconceptional Risk Factors for Birth Defects among younger and older teen mothers. *Journal of Pediatric and Adolescent Gynecology*, 28, 263-279

Chasan, T.L., Schmidt, M., Pekow, P. (2007). Correlates of exercise in pregnancy among Latina women, *Maternal Child Health Journal*, 11, 353–63

Chen, X., Wens, W.M., Fleming, N., Demissie, K., Rhoads, G.G., Walker, M. (2007). Teenage pregnancy and adverse birth outcomes: A large population based retrospective cohort study. *International Journal of epidemiology,* 36, 368-373.

Chen, X.K., Wenn, S.W., Smith, G., Yang, Q., Walker, M. (2006). Pregnancy-induced Hypertension is associated with lower infant mortality in preterm singletons.*An International Journal of Obstetrics and Gynecology*, 113(5), 544–551

Cnossen, J. S, Vollebregt K. C., De Vrieze N. (2008). Accuracy of mean arterial pressure and blood pressure measurements in predicting pre-eclampsia: systematic review and meta-analysis, *BioMed Journal*, 336(7653),1117–1120

Doll, S., Paccaud, F., Bovet, P., Burnier, M., Wietlisbach, V. (2002). Body mass index, abdominal adiposity and blood pressure: Consistency of their association across developing and developed countries. *International Journal Obesity Related Metabolism,* 26, 48-57

Duley, L. (2009).The Global impact of pre-eclampsia and eclampsia. *Seminars in Perinatology*, 33(3), 130-137.

Eastabrook, G., Brown, M., Sargent, I. (2011). The origins and end-organ consequence of pre-eclampsia.*Best Practice and Research Clinical Obstetrics and Gynaecology*, 25(4), 435-447

Elisabete, P. (2007). Blood pressure and ageing. *Postgraduate Medical Journal*, 83,109-114

Fasola, O., Abosede, O., Foluke, A. (2018). Knowledge, attitude and practice of good nutrition among women of childbearing age in Somolu Local Government, Lagos State, *Journal of Public Health,* 21,9(1), 793.

Franco, V., Oparil, Suzanne. (2006). Salt Sensitivity, a Determinant of Blood Pressure, Cardiovascular Disease and Survival. *Journal of the American College of Nutrition*, 25(3), 247-255

Foote, J., Murphy, S., Wilkens, L., Basiotis, P., Carlson, A. (2004). Dietary variety increases the probability of nutrient adequacy among adults. *The Journal of Nutrition*, 134, 1779-1785.

Ghulmiyyah, L., Sibai, B. (2012). Maternal mortality from pre-eclampsia/ eclampsia. *Seminar in Perinatology*, 36, 56-59

Gudeta, T.A., Regassa, T.M. (2019). Pregnancy Induced Hypertension and Associated Factors among Women Attending Delivery Service at Mizan-Tepi University Teaching Hospital, Tepi General Hospital and Gebretsadik Shawo Hospital, Southwest, Ethiopia: *Ethiopian Journal of Health Science*, 29(1), 831-840

Igbokwe, C.C., Ukwuma, M.C. (2013). Incidence of Hypertension among Pregnant Women in Enugu East Local Government Area of Enugu State, *International Journal of Research in Arts and Social Sciences*, 6

Jane, M., Hagger, M., Foster, J., Ho, S., Pal, S. (2018). Social media for health promotion and weight management. *BioMed Central of Public Health,* 18, 932

Jansen, P.W., Tiemeier, H., Looman, C.W. (2009). Explaining educational inequalities in birthweight. The Generation. R study. *Pediatrician Perinatology Epidemiology,* 23, 216-228

Jayatissa, R., Hosssaine, S.M. (2010). Nutrition and Food Security Assessment in Sri Lanka, *Medical Research Institute* in collaboration with UNICEF.

Kashay, H.B., Gashe, F.E., Ayele, W.M. (2018). Risk factors for hypertensive disorders of pregnancy among mothers in Tigray region, Ethiopia: matched case-control study: *BioMed Central Pregnancy Childbirth*, 18,482

Kathleen, A., Dora, F. (2010). Maternal Nutrition and Birth Outcomes. *Epidemiologic Reviews*, 32, 5-25

Kawakita, T., Wilson, K., Grantz, K.L., Landy, H. J., Huang, C., Gomes-Lobo, V. (2016). Adverse Maternal and Neonatal outcomes in Adolescent Pregnancy. *Journal of Pediatric and Adolescent Gynecology,* 29, 130-136.

Kaye, D., Mirembe, F., Aziga, F., Namulema, B. (2003). Maternal mortality and associated near-misses among emergency intrapartum obstetric referrals in Mulago Hospital, Kampala, Uganda. *East African Medical Journal*, 80, 144–149.

Kennedy, G., Ballard, T., Dop, M. (2007). Guidelines for measuring household and individual dietary diversity. Food and Agriculture Organization of the United Nations.

Khoushabi, F., and Saraswathi, G. (2010). Impact of nutritional status on birth weight of neonates in Zahedan City, Iran. *Nutrition Research and Practice*, 4, 339.

Kiboi, W., Kiminywe, J., Chege, P. (2017). Determinants of Dietary Diversity among Pregnant Women in Laikipa County, Kenya: A Cross sectional study *BioMed Central Nutrition*, 3(1), 12

Lakew, Y., Reda, A.A., Tamene, H., Benedict, S., Deribe, K. (2013). Geographical variation and factors influencing modern contraceptive use among married women in Ethiopia: evidence from a national population based survey. *Reproductive Health*, 10(1), 1742-4755

Lunde, A., Melve, K.K., Gjessing, H.K., Skjaerven, R., Irgnes, L.M. (2007). Genetic and environmental influences on birthweight, birth length, head circumference, and gestational age by use of population- based parent- offspring data. *American Journal epidemiology*, 165, 734-741

Luo, Z.C., Wilkins, R., Kramer, M.S. (2004). Fetal and Infant health study Group of the Canadian Perinatal Surveillance System Disparities in pregnancy outcomes according to marital and cohabitation status. *Obstetrician Gynecology,* 103(6), 1300-1307

Magee, L. A. (2008). Diagnosis, evaluation and management of the hypertensive disorders of pregnancy,*American Journal of Obstetrics & Gynecology*, 30, 1–48.

Manu, R., Kumar, K. (2010). Obesity in children and adolescents. *Indian Journal of Medical Research*, 132(5), 598-607

Mirmiran, P., Azadbakht, L., Azizi, F. (2006).Dietary diversity within food groups: An indicator of specific nutrient adequacy in Tehranian women. *Journal of the American College of Nutrition,* 25(4), 354–361.

Mohamadpour, M., Sharif, Z. M., Keysami, M. A. (2012). Food Insecurity, Health and Nutritional Status among Sample of Palm-plantation Households in Malaysia. *Journal of Health, Population and Nutrition,* 30(3), 291–302.

Monika, S., John, D.R. (2014).Cardiovascular physiology of pregnancy. *Circulation,*130, 1003-1007

Mora, J.O., Nestel, P.S. (2000). Improving prenatal nutritional in developing countries: strategies, prospects and challenge. *American Journal of Clinical Nutrition,* 71, 1353-63

Motha, M.B., Jayasundara, C. (2016). Hypertension in Pregnancy. *Sri Lanka Journal of Obstetrics and gynecology.*

Moodley, J. (2004). Maternal deaths associated with hypertensive disorders of pregnancy: a population-based study. *Hypertension in pregnancy*, 23(3), 247–256.

Mpontshane, N., den Broeck, J. V., Chagan, M., Luabeya, K. K. A., Johnson, A., Bennish, M. L. (2008). HIV Infection is associated with decreased dietary diversity in South African children. *The Journal of Nutrition*, 138(9), 1705–1711.

Mridula, D., Mishra, C.P., Chakraverty, A. (2003). Dietary intake of expectant mothers. *IndianJournal of Nutrition and Dietetics*, 40, 24-30

Mudd, L., Nechuta, S., Pivarnik, J. (2009). Factors associated with women's perceptions of exercise safety during pregnancy. *Preventive Medical Journal,* 49, 194–199.

Muthayya, S. (2009). Maternal nutrition and low birth weight -what is really important? *IndianJournal of Medical Research*, 130, 600-608.

Naggayi, G., Bagonza, J., Mayega, R., Kiwanuka, N. (2014). Hypertensive disorders of Pregnancy among pregnant women in Mukono district- Uganda.

Nakimuli, A., Nakubulwa, S., Kakaire, O., Odongo, M., Mbalinda, S., Kakande, N., Nabirye, R., Kaye, D. (2016). The burden of maternal morbidity and mortality attributable to hypertensive disorders in pregnancy: a prospective cohort study from Uganda.

Nakimuli, A., Elliott, A.M., Kaleebu, P., Moffett, A., Mirembe, F. (2013). Hypertension Persisting after Pre-Eclampsia: A Prospective Cohort Study at Mulago Hospital, Uganda. *PLoS ONE,*8(12),5273

National High BloodPressure Education ProgramWorking Group on High BloodPressure in Pregnancy. (2000). Report of the National High BloodPressure Education Program Working Group on HighBlood Pressure in Pregnancy. *American Journal of Obstetrics and Gynecology, task Force on Hypertension in Pregnancy,*183, 1–22.

Neal, S.E., Chandra-Mouli, V., Chou, D. (2015). Adolescent first births in east Africa: Disaggregating characteristics, trends and determinants. *Reproductive health*, 12, (13), 1742-4755

Ness, R. B., Roberts, J. M. (2009). Epidemiology of pregnancy-related hypertension. Hypertensive disorders inpregnancy (3rd ed.). USA: Academic Press.

Ochieng, J., Victor, A. S., Lukumany, P.J., Dubois,T. (2017). Determinants of Dietary Diversity and potential role of men in improving household nutrition in Tanzania. *PLoS One,* 12, 12.

Pajak, A., Szafraniec, K., Bobak, M. (2013). Binge Drinking and Blood Pressure: Cross-Sectional Results of the HAPIEE study. *PLoS ONE*, 8, 6

Pereira, M.A., Rifas, S.L., Kleinman, K.P. (2007).Predictors of change in physical activity during and after pregnancy: Project Viva. *American Journal of Preventive Medicine*, 32, 312-319

Podymow, T., August, P. (2008). Update on the use of anti-hypertensive drugs in pregnancy. *Hypertension*, 51(4), 960–969.

Priyanga, R., Dilin,i N.C., Prasad, K. (2015). The influence of family history hypertension on disease prevalence and associated metabolic risk factors among Sri Lankan adults. *BioMed Central Public Health,* 15, 576

Qazi, G. (2011). Obstetric characteristics and complications of teenage pregnancy: Journal of *Postgraduate Medical Institute*, 25(2), 134-138

Ramakrishnan, U. (2004). Nutrition and Low birth weight: From research to practices. American *Journal of Clinical Nutrition,* 79(1), 17-21

Roberts, C.L., Ford, J.B., Algert, C.S., Antonsen, S., Chalmers, J., Cnattingius, S., Weir, C.J. (2011). Population-based trends inpregnancy hypertension and pre-eclampsia: An international comparative study. *British Medical Journal* Open, 1, e000101.

Roccella E. J. (2000). Report of the National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy. *American Journal of Obstetrics & Gynecology,* 183(1), 1–22.

Sackey, D.S., Christopher, L., Faustina, O.M. (2018). Geophagia, nutrition and health of women with pregnancy-induced hypertension, *African Health Science,* 18(4), 1243–1254.

Sedgh, G., Finer, L.B., Bankole, A., Eilers, M.A., Singhs, S. (2015). Adolescent pregnancy, birth, and abortion rates across countries: Levels and recent trends. *Journal of adolescent health*, 56, 223-230.

Steegers, E.A., Von, D. P., Duvekot, J. J., Pijnenborg, R. (2010). Pre-eclampsia. *Lancet*, 376, 631–644.

Swati, S., Ekele, B.A., Shehu, C. E., Nwobodo, E. I. (2014). *Niger Medical Journal*, 55(5), 384–388.

Thorne-Lyman, A. L., Valpiani, N., Sun, K., Semba, R. D., Klotz, C. L., Kraemer, K., Akhter, N., De Pee, S., Moench-Pfanner, R., Sari, M., Bloem, M.W. (2009). Household dietary diversity and food expenditures are closely linked in rural Bangladesh, increasing the risk of malnutrition due to the financial crisis. *The Journal of Nutrition*, 182-188

Tim, E., Paula, Q., Cathy, G., Abdul, R.B., Dynes, K., Seter, S. (2013). Knowledgeable antenatal care as a pathway to skilled delivery: modeling the interactions between use of services and knowledge in Zambia. *Health Policy and Planning*, 29, (5), 580-588.

Uganda Bureau of Statistics. (2014). National Population and Housing Census 2014, Provisional results.

Uganda Bureau of Statistics & ICF International. (2012). Uganda Demographic and Health Survey 2011.

Uganda Demographic and Health Survey 2016.

Uganda Population Secretariat. (2013). State of Uganda Population Report 2013.

USAID (2012). Africa Bureau. Three successful sub-Saharan Africa family planning programs: Ethiopia, Malawi, Rwanda. Washington, DC.

Van, D.J., Mesman, J.A., Zwart, J.J., Bloemenkamp, K.W., Van, R.J. (2010). Introducing maternal morbidity audit in the Netherlands.*An International Journal of Obstetrics and Gynecology*, 4, 416-421

Villar,J., Bakketeiig, L., Donner, A. (2002). The WHO Antenatal Care Randomized Controlled Trial: *Manual for Implementation of New Model*, 6, 28.

Villar, J., Carroli, G., Wojdyla, D., Abalos, E., Giordano, D., Ba'aqeel, H., World Health Organization Antenatal Care TrialResearch Group. (2006). Pre-eclampsia, gestational hypertension and intrauterine growth restriction, relatedor independent conditions. *American Journal of Obstetrics and Gynecology*, 194, 921–931.

Wandabwa, J., Doyle, P., Kiondo, P., Campbell, O., Maconichie, N., Welishe, G. (2010). Rick Factors for Severe Pre-eclampsiaand Eclampsia in Mulago Hospital, Kampala, Uganda: *East African Medical Journal*,87, 10.

Wen, M.L., Flood, V.M., Baur, L.A. (2010). Dietary behaviors during pregnancy: findings from first-time mothers in Southwest Sydney, Australia. *International Journal of Behavioral Nutrition and Physical Activity,* 7, 13.

WHO. (2011). *Recommendations for Prevention and Treatment of Pre-eclampsia and Eclampsia. Department of Maternal and Child Health*. Geneva: WHO.

WHO. (2013). *Trends in maternal mortality* 1990 to 2013. WHO, UNICEF, UNFPA. Geneva: WHO.

WHO. (2018). *Uganda maternal and perinatal health profile.* Geneva: WHO.

WHO. (2014).*Trends in maternal mortality*: 1990 to 2013. Geneva: WHO.

WHO. (2018).*Health topics. Maternal Health*. Geneva: WHO.

WHO /UNICEF. (2017). *Managingcomplications in pregnancy and childbirth: a guide for midwives and doctors*. Geneva: WHO.

World Health Organization. (2014). *Adolescent pregnancy fact sheet*. Geneva: WHO

Yanit, K.E., Snowden, J.M., Cheng, Y.W., Caughey, A.B. (2012). The Impact of Chronic hypertension and pre-gestational diabetes on pregnancy outcomes. *American Journal of Obstetrics and Gynecology*, 207, 331-336

Zahara, A.M., Nuruljannah, J., Lee, Y.M., Chua, K.Y., Loke, W.T. (2014). Nutritional status and nutritional knowledge of Malay pregnant women in selected private hospitals in Klang Valley. *International Electronic Journal of Health Education*, 11, 119-132.

A RESEARCH QUESTIONNAIRE OF THE STUDY ON THE PREVALENCE AND RISK FACTORS OF HYPERTENSION AMONG PREGNANT WOMEN AGED 15-49 YEARS ATTENDING ANTENATAL CLINIC IN FORT PORTAL REGIONAL REFERRAL HOSPITAL.

Hello my name is **TUMUKUGIZE HILDA** and I am a student at Makerere University pursuing a Bachelor of Science degree in Human Nutrition. I am conducting a study on the prevalence and risk factors of hypertension among pregnant women aged 15-49 years attending antenatal clinic in Fort Portal regional referral hospital. The questionnaire will take only a few minutes. Whatever information you shall provide will be kept strictly confidential and will not be shown to any other person. Participation in this study is voluntary and you can choose not to answer any individual question or all the questions.

Do you accept to participate in the interview?   Yes……..   No ………

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS

For the following questions below respond with an appropriate answer when needed.

    A. How old are you?
1. 15-24years   _____
2. 25-34 years   _____
3. 35-44 years   _____
4. 45-49 years   _____

    B. What is your marital status
1. Single   _____
2. Married   _____
3. Divorced/ separated   _____
4. Co-habiting   _____
5. Others (Specify) ……………………..

    C. What is your religion?
1. Christian
2. Muslim
3. Atheist
4. Others (Specify)……………………….

D. What is your highest level of education?
1. Lower primary (up to P4)   _____
2. Upper primary (up to P5)   _____
3. Ordinary secondary level   _____
4. Advanced secondary level   _____
5. Degree or diploma holder   _____
6. No formal training   _____

E. What is your current employment status?
1. Employed   _____
2. Unemployed   _____

F. What is your average monthly income (UG shs)?
1. Below Ug Shs. 50,000_____
2. Between 50,000-59,999 _____
3. Between 60,000-200,000_____
4. Between 300,000-1,000,000_____
5. Above 1,000000_____

SECTION B: MEASUREMENTS

a) Take MUAC measurements of the respondent and record them in the table below.

Measurement	1st reading	2nd reading	Average
MUAC(cm)			

b) Take blood pressure measurements when the participant has settled for about 5 minutes with a 1 minute interval between the measurements.

Measurement	1st reading	2nd reading	Average
Blood pressure (mmHg)			

SECTION C: ANTENATAL DATA

Please give appropriate answers for the following questions regarding your pregnancy.

a) How many months is your pregnancy?
   1. 0-3 months _____
   2. 4-6 months _____
   3. 7-9 months _____

b) How many times have you attended antenatal clinic?
   1. Once _____   3. Thrice _____
   2. Twice _____   4. Forth time _____

c) What is your current gravida?
   1. 1-2 _____   3. 5-6 _____
   2. 3-4 _____   4. 7 and above _____

d) How many children do you currently have?
   1. No child _____
   2. 1-2 children _____
   3. 3-4 children _____
   4. 5 and above children _____

e) Have you ever produced twins?
   1. Yes _____   2. No _____

f) Have you ever lost any pregnancy?
   1. Yes _____   2. No _____

g) Which type of delivery did you have for your previous pregnancy?
   1. Vaginal (natural birth) _____
   2. Caesarean section _____
   3. Vacuum (assisted) _____
   4. Never delivered before _____

SECTION D: RISK FACTOR ASSESSMENT

Please give an appropriate response for the asked questions below.

1) What type of physical activity do you often carry out?
1. Light _____
2. Moderate _____
3. Heavy _____

2) Choose among the following your most carried out physical exercise?
1. Walking short distances _____   2. Digging _____
3. Running/ Jogging _____   4. Walking long distances_____
5. None _____

3) How often do you do physical exercise?
1. 1-3 times a week _____
2. 3-5 times a week _____
3. 5-7 times a week _____
4. Inconsistently _____
5. None _____

No.	Questions	1=Yes	2=No
1	Have you ever smoked cigarettes?		
2	Does anyone in your household smoke?		
3	Do you take alcohol?		
4	Have you ever been told by a doctor that you have diabetes?		
5a)	Do you have history of hypertension in your family?		
b)	If yes, from which side? 1. Fathers 2. Mothers		
c)	When was your blood pressure last measured by a health professional? 1. Within the past 5months 2. 6-12 months ago 3. Above 1 year		
d)	Have you been told by a health professional in the past months that you have elevated blood pressure or hypertension?		
e)	Have you ever been diagnosed with hypertension during any of your pregnancy?		

d

SECTION E: NUTRITIONAL KNOWLEDGE

For the following statements respond with an answer that applies to you.

1. Have you ever heard of the term balanced diet?
   a) Yes
   b) No

2. What do you understand by a balanced diet?
   a) A diet which contains all the necessary nutrients
   b) A diet with appropriate amount of each nutrient
   c) A diet that contains the same quantities of all food groups
   d) I don't know

3. What are the energy giving foods among the following?

   a) Starchy foods eg. Posho, rice, millet
   b) Fruits and vegetables
   c) Legumes eg beans, peas
   d) I don't know

4. What do fruits and vegetables give to our bodies?

   a) Energy
   b) Oils
   c) Vitamins, minerals and fiber
   d) I don't know

5. Which of the following are healthy snacks recommended for people with hypertension?

   a) Carbonated soft drinks (soda, processed drinks)
   b) Chips, deep fried fatty foods (beef, cassava, bans)
   c) Fruits and vegetables (kale, cabbage)
   d) Baked products (bread, biscuits, cakes)

6. Is modifying a diet essential in managing high blood pressure?

   a) Yes
   b) No
   c) I don't know

7. Which of the following diets would you recommend for a person with hypertension?

   a) High fatty foods with little vegetables, no fruits, too much water
   b) Low fatty foods with more vegetables, good proteins and low in salt
   c) Deep fried foods, soda, beer, enough water and too much salt
   d) None of the above

e) I don't know

SECTION F: ATTITUDE

For each statement below respond with an appropriate answer.

	Statement	1= Agree	2= Disagree
A.	Adding extra salt to already cooked food can cause or worsen hypertension		
B.	I would advise a hypertensive patient to avoid or stop smoking		
C.	A diet high in fat, refined sugar, and salt cannot be tolerated by a patient with hypertension		
D.	Being overweight or obese is a risk factor for hypertension		
E.	Attending ANC can reduce chances of you becoming hypertensive during pregnancy		
F.	Doing light daily exercise plays a good role in hypertension management		
G.	Preparing a balanced diet is tiresome and time consuming		
H.	Eating a balanced diets is costly		
I.	Eating plenty of fruits and vegetables is healthy for hypertensive and normotensive people		
J.	Avoiding alcohol among people with hypertension is good		
K.	Patients with hypertension need to be careful with whatever they eat		
L.	A pregnant woman needs to check her blood pressure regularly		
M.	Over consumption of fluids during pregnancy causes complications during labor.		

SECTION G

SIGNS AND SYMPTOMS OF HYPERTENSION DURING PREGNANCY

1. Are you experiencing any of the following during this pregnancy? Respond with appropriate answers.

Characteristics	Yes	No
• Edema (swelling of legs and other parts of the body)		
• Severe headache		
• Blurred vision		
• Dizziness		
• Shortness of breath		
• Sudden weight gain		
• Low back ache		

SECTION F

DIETARY DIVERSITY ASSESSMENT USING THE 24 HOUR RECALL METHOD

1. Ask the respondent to describe the foods (meal and snacks) that they ate or drank yesterday during the day and night, whether at home or outside the home. Start with the first food or drink of the morning.

- *The interviewer writes down all the foods and drinks mentioned. When composite dishes are mentioned, ask for the list of ingredients.*
- *When the respondent has finished, continue probing for other extra meals and snacks not mentioned.*

Time	Place	List of foods	Food preparation ie boiled, fried, steamed, eaten raw	Quantity / portion sizes(estimated portion sizes eg using home utensils, palms and food pictures)

h

2. *When the respondent 24-hour recall is complete, the researcher will fill in the food groups based on the information recorded above. For any food group not mentioned, the interviewer should ask the respondent if a food item from that group was consumed.*

No.	Food group(s)	Examples	Yes=1 No=0
1	Grains, plantains, white roots and tubers,	Bread, biscuits, cookies or any other foods made from millet, sorghum, maize, spaghetti, pasta, rice, wheat, porridge or pastes or other locally available grains, white potatoes, white yams, cassava, green bananas	
2	Pulses	Beans, peas and lentils	
3	Nuts and seeds	Peanut/groundnut, chia seed, hibiscus seed, pumpkin seed	
4	Dairy	Milk, cheese, yoghurt, other milk products	
5	Meat, poultry and fish	Beef, pork, lamb, goat, rabbit,, wild game, chicken, duck, doves or other birds Liver, kidney, heart or other organ meats, Nile perch, tilapia, fresh or dried fish	
6	Eggs	Eggs	
7	Dark green leafy vegetables	Sukuma wiki, spinach, cabbages, cassava leaves, pumpkin leaves, cowpea leaves, indigenous green vegetables	
8	Other vitamin A-rich roots and tubers, fruits and vegetables	Ripe mangoes, pawpaw, pumpkin, carrots, yellow fleshed sweet potatoes	
9	Other vegetables	Tomato, onion, eggplant, green pepper	
10	Other fruits	Passion fruit, banana, oranges, avocado	
Individual level	Did you eat anything (meal or snack) outside the home yesterday? (Snacks eg fast foods like potato chips, samosas, chapattis or a fruit like mango, banana)		

Is there any question you would like to ask me before we end our session?

Thank you so much for your great cooperation and participation have a great day

Title of the proposed study: Prevalence and risk factors of hypertension among pregnant mothers attending antenatal clinic in Fort Portal Regional referral Hospital.

Purpose of the study: The study intends to determine the risk factors of hypertension among pregnant mothers and can help reduce on the high morbidity and mortality rates and mothers and their children.

Risks/ discomforts.

The study is harmless to the participants.

Statement of voluntariness.

Participation in this interview is completely voluntary. You may stop me at any time to ask questions about your participation or stop your participation completely.

Confidentiality.

Your responses will be kept private and used only for the purposes of this study. Information will not bear your name, contact or address. After analysis of results, this questionnaire will be completely destroyed.

For any questions concerning this study please contact the following people.

Investigator: Tumukugize Hilda

Tel: 0704835049 / 0772418760

Email: tumukugizehilda@gmail.com

My Academic supervisor: Dr. Abel Atukwase, (PhD)

Dean School of Food Technology, Nutrition and Bioengineering, Makerere University.

Tel: 0774468261

Email: abelatukwase@gmail.com

STATEMENT OF INFORMED CONSENT

The above information has been clearly read and explained to me and I have understood it. I do here by voluntarily agree to participate in this study.

Respondents' signature/thumb print.................................

THANK YOU

APPENDIX III: INTRODUCTORY LETTER FROM UNIVERSITY

MAKERERE

P.O. Box 7062,
Kampala-UGANDA

E-mail: foodtech@agric.mak.ac.ug

UNIVERSITY

Phone: 256-414-533865
Fax: 256-414-533676

WE BUILD FOR THE FUTURE

COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES
SCHOOL OF FOOD TECHNOLOGY, NUTRITION & BIO-ENGINEERING
DEPARTMENT OF FOOD TECHNOLOGY AND NUTRITION

OFFICE OF THE HOSPITAL DIRECTOR
1 0 JUN 2019
RECEIVED
FORT PORTAL HOSPITAL

25th May 2019

The Hospital Director,
Fort Portal Regional Referral Hospital,
Kabarole.

Dear Sir/Madam,

RE: INTRODUCTION LETTER FOR Ms HILDA TUMUKUGIZE

This to introduce to you Ms Hilda Tumukugize who is a Third Year Student of BSc. Human Nutrition at the Department of Food Technology and Nutrition, Makerere University.

As a third year student, Hilda is required to undertake a special research project to fulfill the requirements for the award of BSc degree in Human Nutrition. She has developed a research proposal titled *"Prevalence and risk factors of hypertension among pregnant mothers attending antenatal care in Fort portal Regional Referral Hospital."*

This is therefore to request you to allow her conduct the research Fort Portal Regional Referral Hospital. She will be using a questionnaire to collect data from the respondents. The research is scheduled to be completed in a period of 2 weeks and will only target pregnant mothers attending antenatal care and will thus not interfere with the daily activities of the hospital. All the data collected will be kept confidential and will only be used for academic purposes.

Any assistance rendered to her will be highly appreciated. In case you need any further information, please do not hesitate to contact me on 0774468261.

Thank you.

Yours sincerely,

Dr. Abel Atukwase
Senior Lecturer and Supervisor

APPENDIX IV: APPROVAL FOR THE STUDY

FORT PORTAL REGIONAL REFERRAL HOSPITAL
P.O.BOX 10
FORT PORTAL
Uganda

THE REPUBLIC OF UGANDA

MINISTRY OF HEALTH

For any correspondence on this Subject, please quote: Date: June 13, 2019

Ms.HILDA TUMUKUGIZE.

MAKERERE UNIVERSITY – DEPARTMENT OF FOOD TECHNOLOGY AND NUTRITION.

Subject: REQUEST TO CONDUCT RESEARCH TITLED *"PREVALENCE AND RISK FACTORS OF HYPERTENSION AMONG PREGNANT MOTHERS ATTENDING ANTENATAL CARE IN FORT REGIONAL REFERRAL HOSPITAL"*.

Reference is made to a request dated 25th April, 2019, requesting for permission to collect data for a research titled *"PREVALENCE AND RISK FACTORS OF HYPERTENSION AMONG PREGNANT MOTHERS ATTENDING ANTENATAL CARE IN FORT REGIONAL REFERRAL HOSPITAL"*.

The hospital hereby grants you **administrative permission** to collect data using the methods and tools as presented in your research protocol.

Dr. Tugumisirize Florence

HOSPITAL DIRECTOR

Mission statement: To increase access of all people in Rwenzori region to quality, general &specialized services health services