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Dietary patterns and the risk of metabolic syndrome among HIV positive individuals from selected health facilities in Lusaka District, Zambia

By

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A research dissertation submitted in partial fulfilment of the requirements for the award of the Degree of Master of Science in Human Nutrition

October, 2021

DECLARATION

I Peryson Kekelwa Kalaluka, declare that this dissertation is a result of my own original effort and work, and that to the best of my knowledge, the findings have never been previously presented to the University of Zambia or any other university for the award of any academic qualification. Where assistant was sought, it has been accordingly acknowledged.

Signed …….

Date ……

Peryson Kekelwa Kalaluka (Candidate)

I, Dr Chiza Kumwenda, have read this research document and approved it for submission.

Signed ……

Date……

Chiza Kumwenda, PhD (Principal supervisor)

I, Dr. Phoebe Bwembya have read this research document and approved it for submission.

Signed …….

Date…….

Phoebe Bwembya, PhD (Co- supervisor)

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Therefore this dissertation of Peryson Kekelwa Kalaluka has been approved as fulfilling the requirements for award of Master`s Degree in Human Nutrition by the University of Zambia.

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ABSTRACT

The relationship between diet and the risk of metabolic syndrome has not yet been established among HIV positive individuals in Zambia. Around 37.9 million people globally are believed to be living with HIV infection and in Zambia 1.2 million people are living with the same infection. HIV infection and antiretroviral therapy use are associated with disturbance in glucose and lipid metabolism. It is estimated that approximately 25% of the world's population has metabolic syndrome. The prevalence of metabolic syndrome among HIV positive individuals in Zambia is not known. In the Sub-Saharan Africa population, including Zambia, the prevalence of metabolic syndrome and its differential contribution by HIV status is not yet established. However, the rapid urbanization, demographic and epidemiological transitions and as well as changes in lifestyle that have been observed in SSA have been associated with the emergency of cardiovascular diseases which are metabolic syndrome components. The main objective of this study was to determine the dietary patterns and the risk of metabolic syndrome among HIV positive individuals. A cross-sectional study was conducted among the 180 subjects from April to July 2020 in the three sampled health facilities that offer antiretroviral services from the twenty six health facilities in Lusaka District. Participants completed a structured questionnaire on socio-demographic characteristics and a 53-item food frequency questionnaire. Anthropometric measurements (weight, height and waist circumference) were also obtained and analysed. Blood pressure was also analysed by the use of the sygmomanometre. Blood metabolites for cholesterol, triglycerides and glucose were analysed at the laboratory. Dietary patterns from food frequent questionnaire were identified using Principal Component Analysis (PCA). Binary logistic regression analysis was performed to evaluate the association of extracted dietary patterns as well as other lifestyles patterns with metabolic syndrome and its metabolic abnormalities. Out of the 180 participants, 53% (n=96) of them were women. Physical measurements indicated that 39% (n=70) of the respondents had high waist to hip ratio, high waist circumference was observed among females 21% (n=38) than among males 4% (n=7). Respondents with elevated blood pressure were 33% (n=60), elevated total cholesterol levels were 52% (n=93) and elevated triglycerides levels were 46% (n=83). Through PCA analysis, three dietary clusters were identified which included omnivorous; "staples, animal products and

fruits", vegetarian; "legumes and nuts" and the other one, unclassified; "fats and oils, other foods and beverages and vegetables". None of the food clusters showed significant association with metabolic syndrome or its components. The findings of this study showed that metabolic syndrome among HIV positive individuals is zero. However, raised blood pressure, 33% (n=60) was the only metabolic syndrome predictor with the rest of the parameters being predictors of non-communicable disease. Therefore interventions such as consumption of low energy yielding foods during group and community health messaging sessions could be implemented so as to keep the zero prevalence levels of metabolic syndrome in Zambia at bay.

DEDICATION

I dedicate my academic effort to my mother, Stella Mweetwa and my three children: Stella, Chisola and Kennedy for their ultimate patience and prayers to our Almighty God for my good health during this academic work.

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ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
ART	Anti-Retroviral Therapy
BMI	Body Mass Index
CSO	Central Statistical Office
CVD	Cardiovascular Disease
FAO	Food and Agriculture Organization
FFQ	Food Frequency Questionnaire
HAART	Highly Active ART
HDL	High Density Lipoprotein
HIV	Human Immune deficiency Virus
IDF	International Diabetes Foundation
LDL	Low Density Lipoprotein
MetS	Metabolic Syndrome
mmHg	Millimetre of Mercury
MoH	Ministry of Health
NCD	Non-Communicable Diseases
NCEP	National Cholesterol Education Program
NFNC	National Food and Nutrition Commission
PDP	Prudent Dietary Pattern
PLHA	People Living with HIV/AIDS
SSA	Sub- Saharan Africa
TG	Triglyceride
TDRC	Tropical Disease Research Control
UNZA	University of Zambia
WDP	Western Dietary Pattern
WHO	World Health Organisation
ZDHS	Zambia Demographic Health Survey
ZAMPHIA	Zambia Population Based HIV Impact Assessment

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Metabolic syndrome (MetS) refers to a co-occurrence of numerous known cardiovascular and diabetic risk factors like insulin resistance, abdominal obesity, atherogenic dyslipidaemia, elevated serum triglycerides levels, hypertension and low high- density lipoprotein cholesterol levels (Naja et al, 2019). The global health burden of metabolic syndrome approximately stands at 25% of the world's population and has increased over the past few years (Mohammad, 2018). Also, according to the global HIV statistics of 2017, about 37.9 million people were reported to be living with HIV (UNAIDS, 2019).

Globally, the burden of chronic diseases is expected to increase by 60% in most developing countries like sub-Sahara African countries in which cardiovascular disease is already the leading cause of mortality among adults in these countries (Naja et al, 2013). Another study conducted by Yaya and colleagues in 2020 suggested that NCDs are responsible for about 80% of most deaths among adults in low and middle income countries especially in Sub Saharan Africa.

In the Sub-Saharan Africa population, the prevalence of metabolic syndrome and its differential contribution by HIV status is not yet established. However, the rapid urbanization, demographic and epidemiological transitions and even aging population as well as changes in lifestyle that have been observed have been associated with the emergency of cardiovascular diseases which are metabolic syndrome components (Olamide et.al, 2019).

In Zambia, the prevalence of HIV infection among adults 15 to 59 years of age stands at 14.5% for women and 9.5% for males (ZAMPHIA, 2015-2016). HIV positive individuals take antiretroviral drugs that may increase their lipid profiles in the body which consequently put them at high risk of having metabolic syndrome predictors like hypertension, diabetes mellitus and insulin resistance (Olamide, et.al, 2019). This understanding together with the associated effects of urbanization, demographic and epidemiological transitions on changes in dietary lifestyles also puts the already

predisposed HIV infected individuals at greater risk of having metabolic syndrome (Besa et al. (2013).

Considerable differences in the prevalence of metabolic syndrome among HIV positive individuals have been reported from the consequences and effects of diagnostic criteria and the use of certain antiretroviral therapies. Lipotoxicity and adipokines have been reported as key influencers of metabolic syndrome among HIV positive individuals. Also several studies have linked antiretroviral therapy as a key predisposing factors of metabolic syndrome among HIV positive individuals (Olamide et.al, 2019).

In Zambia, a significant increase in the burden of non-communicable disease and their risk factors have been observed in the recent past (Tateyama et al, 2019). These non-communicable disease are strongly associated with a common set of behavioural risk factors like consumption of high energy foods, alcohol consumption, tobacco smoking, physical inactivity and obesity. Building on that background, the current research aimed to also explore if dietary patterns could influence the risk of metabolic syndrome among HIV positive individuals. This is because of the changes in dietary lifestyle of people, including HIV positive individuals who are already at risk, emanating from the demographic and epidemiological transitions.

1.2 Statement of the problem

Africa is facing a rapidly growing non-communicable disease burden while at the same time already experiencing high prevalence of HIV infection especially in sub-Saharan Africa (Abudakr, 2016).

The rapidly observed non-communicable disease has been associated with increased urbanization, demographic and epidemiological transitions that have led to an increased problem of overweight and obesity among adult individuals (Sahal & Braverman, 2012; Tomiyama et al., 2016). Also these transitions have been regarded as the main driver for the rising burden of non-communicable diseases of which in Zambia the problem is now considered as one of the public health concerns (Mulenga and Makunu, 2017). Most people's diets apparently are shifting to more of snacks, high calorie beverages, eggs, sweetened beverages, condiment, high fat dairy foods, fatty meats and refined cereals. These diets have been associated with increased risk of developing metabolic syndrome which is a precursor of cardiovascular diseases (Wilson et al, 2015).

These high energy yielding diets have been reported to increase lipid profiles in the body and consequently putting individuals at risk of developing non-communicable diseases such as hypertension, diabetes mellitus and central obesity which are predictors of metabolic syndrome (Oh and Hegele, 2015).

Zambia is experiencing an increase in the prevalence of overweight and obesity among adult individuals from (4.3%) in 2000 (ZDHS, 2000) to (5.1%) in 2004 (ZDHS, 2004) to 17.1% in 2010 (ZDHS, 2010). In 2014, prevalence of overweight stood at 12.8 among adult population (CSO et al, 2014). Makumu, 2017 also revealed that non-communicable diseases are becoming a emerging health concern in Zambia, prompting the government to begin initiating a policy response.

A paucity of epidemiological data on demographic and clinical characteristics of metabolic syndrome among HIV positive individuals has been observed in Zambia (Hamooya et al, 2021). However, hypothesis surrounding HIV infection with metabolic syndrome suggest that antiretroviral therapy for HIV infection predisposes individuals to metabolic syndrome.

The current study therefore aimed to explore the important issue of dietary patterns surrounding the association of the impact of urbanization within the Zambian setting and the hypothesis that antiretroviral therapy for HIV increases the risk of developing metabolic syndrome.

1.3 Justification

In Zambia, the prevalence of overweight and abdominal obesity among men and women stands at 22.8% and 8.0 % respectively (WHO Steps 2017). However, so far no research has been conducted to associate dietary patterns and the risk of metabolic syndrome among HIV positive individuals in Zambia. Research also hypothesize that antiretroviral for HIV increases the risk of developing metabolic syndrome (Hamooya et al, 2021). Therefore there is limited information on the association of dietary patterns and the risk of non-communicable disease and /or MetS prevalence among HIV positive individuals in our country.

Results of the current study therefore will provide empirical evidence/ informing policy for interventions to reduce the risks of non-communicable diseases and /or metabolic syndrome among HIV positive individuals in Zambia

1.4 Objectives

1.4.1 Main objective

To determine the dietary patterns and the risk of metabolic syndrome among HIV positive individuals from selected health facilities in Lusaka District in Zambia.

1.4.2 Specific objectives

1. To determine the prevalence of metabolic syndrome among HIV positive individuals from selected health facilities in Lusaka District.
2. To identify frequently consumed foods by HIV positive individuals from selected health facilities in Lusaka District.
3. To determine factors associated with metabolic syndrome among HIV positive individuals from selected health facilities in Lusaka District.

1.4.3 Research question

Are dietary patterns associated with the prevalence of metabolic syndrome among HIV positive individuals?

1.5 A conceptual framework

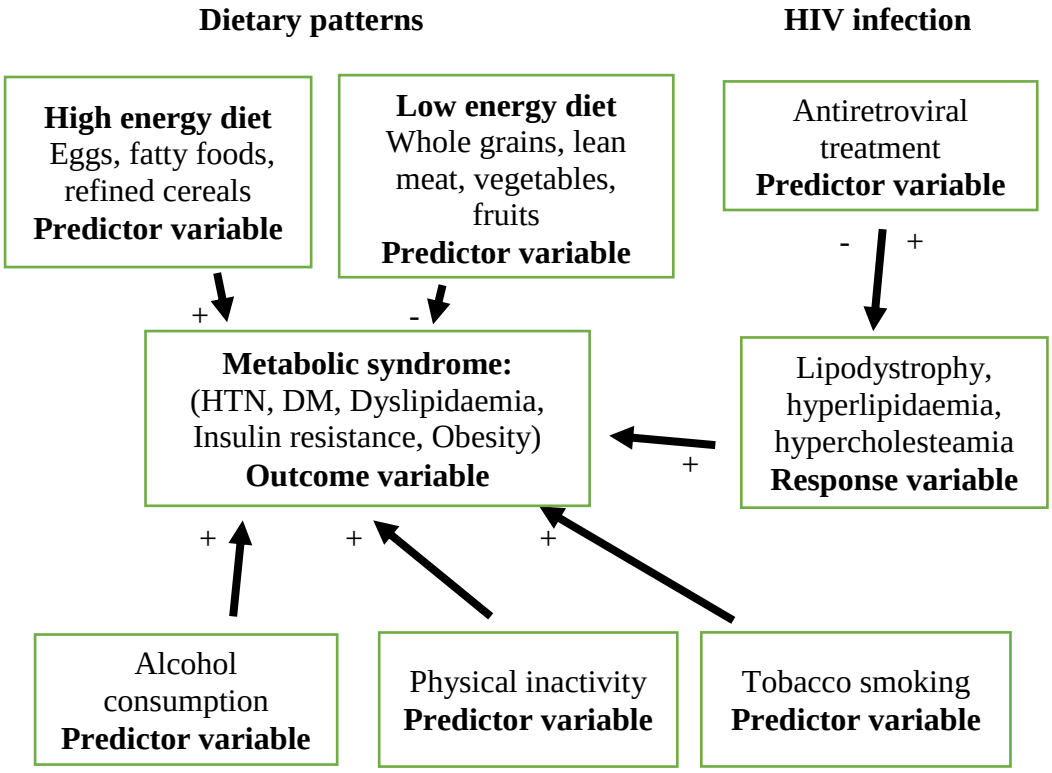

Figure 1: Conceptual framework on the association between dietary patterns and the risk of metabolic syndrome among HIV positive individuals

Source: Adapted from Nigatu et.al, 2016

The figure above portrays the linkages between high energy yielding dietary patterns and the effects of antiretroviral drugs on how the two predictor variables are associated with the risk of metabolic syndrome (insulin resistance, abdominal obesity, atherogenic dyslipidaemia, elevated serum triglycerides levels, hypertension and low high- density lipoprotein cholesterol levels). High energy yielding diets as well as antiretroviral drugs that raises lipid profiles in the body are associated with the high risk of metabolic syndrome (Roberto Fabiani et.al, 2019 and Olamide, O. et.al, 2019). This is shown by the positive arrows on the conceptual framework. Other lifestyle factors like being sedentary, alcohol consumption and smoking are associated with metabolic syndrome and/or its components (Silva V. and Grande A. J., 2013), indicated by the positive arrows.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Search strategy and data source

The researcher conducted a comprehensive literature search using PubMed, PubMed Central, Google Scholar, and Research Gate. Key words like dietary patterns, metabolic syndrome, hypertension, insulin resistance, dyslipidaemia were used either alone or in combination to look for the research papers. The papers reviewed included studies that only focused on the subject matter and were written in English language. Also included were all the full-text articles that were collected ethically and legally.

2.2 Definitions of metabolic Syndrome

Metabolic syndrome has been defined differently but there are four most commonly used definitions of MetS. These definitions are by the National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III), European Group for the Study of Insulin Resistance (EGIR), International Diabetes Foundation (IDF) and the WHO (Huang, 2009).

World Health Organization defined metabolic syndrome when:

1. Fasting plasma glucose is 7 mmol/L (126 mg/dl) or 2-hour post glucose load is 11.1mmol/l (200 mg/dl), confirming diabetes mellitus.
2. Fasting plasma glucose is 7 mmol/l (126 mg/dl) and 2-hour post glucose load is 7.8 mmol/L (140 mg/dl) and 11.1 mmol/l (200 mg/dl, confirming impaired glucose tolerance.
3. Fasting plasma glucose is 6.1 mmol/l (110 mg/dL) and 7 mmol/l (126 mg/dl) and (if measured) 2-hour post glucose load is 7.8 mmol/L (140 mg/dl, confirming Impaired fasting glucose.

These definitions are recognized by the European Group for the Study of Insulin Resistance (EGIR), the National Cholesterol Education Program (NCEP), the European Group for the Study of Insulin Resistance (EGIR) and the Adult Treatment Panel III (ATP III) (Rubenfire M and Brook R.D., 2013).

Table 1: Definitions of Metabolic syndrome

	ATP III, 2001	WHO, 1998	EGIR,1999	IDF, 2005
Precondition	None	Insulin resistance	Insulin resistance	Central obesity
Criteria	Any three of the four criteria below	Insulin resistance plus two of the four criteria below	Insulin resistance, plus two of the four criteria below	Obesity, plus two of the four criteria below
Obesity	Waist Circumference. above 40 inches (M) & 35 inches (F)	Waist to hip ratio: >0.90 (M), >0.85 (F); or BMI >30 kg/m^2	Waist circumference: 94 cm (M), 80cm (F)	Central obesity already required
Hyperglycemia	Fasting glucose 100 mg/dl or	Insulin resistance already required	Insulin resistance already required	Fasting glucose 100 mg/dl
Dyslipidemia	Triglyceride (TG) ≥150 mg/dl	TG ≥150 mg/dl or HDL-C: <35 mg/dl (M), <39 mg/dl (F)	TG 177 mg/dl or HDL-C <39 mg/dl	TG ≥150 mg/dl
Hypertension	130 mmHg systolic or >85 mmHg diastolic	≥140/90 mmHg	≥140/90 mmHg	>130 mmHg systolic or >85 mmHg diastolic

Source: WHO, 2012

From Table 1, the definitions agree on the essential components of glucose intolerance, obesity, hypertension, and dyslipidaemia, but they differ in their detail and criteria. Only WHO and EGIR definitions put hyperglycaemia as a precondition for metabolic syndrome. This condition is characterised by raised glucose levels in people, mostly diabetic patients. Typical symptoms of this condition include frequent urination, increased thirst, and increased hunger (Wilson et al, 2015).

2.3 Metabolic syndrome and HIV infection

Metabolic syndrome has become a major public health concern and also some considerable differences in the prevalence of metabolic syndrome in HIV infected individuals have been reported in the recent past (Vecchi et al, 2014). Hussain, (2017) investigated the pathophysiology of metabolic syndrome and cardiovascular complications in HIV infection. Also Duro et al, (2018) showed evidence that both HIV

infection and HIV-related chronic immune activation from antiretroviral therapy are critical factors linking metabolic syndrome complications. From these studies, it can be ascertained that metabolic syndrome can emanate both from the HIV infection in the body and usage of antiretroviral therapy. This could be attributed by the hormonal changes that come due to HIV infection in the body.

The recent Adult Treatment Panel IV recommendations highlighted preventive strategies and therapeutic options on current epidemiological and pathogenetic data on metabolic syndrome and HIV infection. Building on this background, the current research was worth undertaking in the Zambian setting so as to find out both the prevalence of MetS and the associated risk of it from dietary patterns among HIV infected individuals as well the effects of the current antiretroviral regimes given to HIV infected individuals in Zambia.

2.4 Metabolic syndrome and antiretroviral therapy

Some introduction of antiretroviral therapy has been associated with the prevalence of metabolic syndrome among HIV infected individuals (Ergin et al, 2020). However there is controversy surrounding the etiology of metabolic syndrome among HIV infected individual as some research point it to antiretroviral therapy while some point it the HIV infection itself.

2.5 Details about metabolic syndrome

2.5.1 Clinical features of metabolic syndrome

Most of the disorders associated with metabolic syndrome seem not to have definite signs and symptoms. However some research conducted by the Mayo Clinic experts of the United States in 2021 revealed that central, visceral, abdominal obesity, specifically, a waist size of more than 40 inches in men and more than 35 inches in women, fasting blood glucose levels of 100 mg/dL or above and blood pressure of 130/85 mm/Hg or above are typical features observed in people with metabolic syndrome. This study is also in line with Chun, (2020) which stated that having three or more of these factors signifies a higher risk of cardiovascular diseases, such as heart attack or stroke, and type 2 diabetes. The study also revealed that blood triglycerides levels of 150 mg/dL or higher and high-density lipoprotein (HDL) cholesterol levels of 40 mg/dL or less for

men and 50 mg/dL or less for women. The current study agrees with other scholars on the clinical features of metabolic syndrome and has highlighted hypertension as one metabolic syndrome component affecting HIV infected individuals.

2.5.2 Pathophysiology of metabolic syndrome

Metabolic syndrome is a multidimensional clinical unit which is formed by genetic, hormonal and lifestyle aspects and it occurs frequently in the general population especially the elderly groups (Rochlani, Pothineni and Kovelamudi. 2017). Moreira, Pint and Mourão, (2015) suggested that the frequent changes in the definition and diagnostic criteria of metabolic syndrome are indications of the controversy and the challenges surrounding the understanding of this syndrome among researchers. Obesity and insulin resistance are leading risk factors of metabolic syndrome. Furthermore, obesity and hypertension are narrowly related to the upsurge and worsening of oxidative stress.

2.5.3 Risk factors of metabolic syndrome

Khatri, (2020) revealed that metabolic syndrome in itself is not a disease but a group of risk factors (high blood pressure, high sugar levels, unhealthy cholesterol levels and central obesity). Also Wilson et al, (2017) established that different risk factors like age, sex and sedentary lifestyle may predispose one to having metabolic syndrome. Male adults from the age of 40 years upwards are highly predisposed to metabolic syndrome if they live a seriously sedentary lifestyle. Kaur, 2014 suggested that dietary lifestyle that is more focused on the consumption of fatty foods with less of vegetables can lead to the accumulation of their adipose tissues around the abdomen. Policy document of WHO of 2015 on aetiology of non-communicable disease indicated that adipose tissues surrounding the abdomen contain the visceral fatty tissues which is responsible for higher NCDs prevalence.

Zhang et al, (2014) report on the risk of metabolic syndrome among Chinese diabetics investigated the association between type II diabetes mellitus with Metabolic Syndrome. The study revealed that diabetics are at a higher risk of developing metabolic syndrome The evidence was also confirmed by Rhee et al, (2014) which revealed that metabolic syndrome is an indicator of high cardiovascular risk in patients with type II diabetes mellitus.

2.5.4 Management of metabolic syndrome

Management of metabolic syndrome involves tackling individual conditions that define metabolic syndrome. In line with this understanding, Sarkissain (2019) indicated that management of metabolic syndrome is focused on undertaking each of the metabolic syndrome components. The aim of the management is to cut the chances of blood vessel disease and heart disease, which also include diabetes mellitus. The study further reviewed that changes to one's behaviour, such as eating healthier and getting more exercise are the first things the physician might suggest. By approving some healthy habits, one may be able to eradicate the risk factors completely.

Other factors of consideration are physical activity. Being physically activity leads to stead loss of weight. Literature states that gradual weight loss is positively associated with lower blood pressure, low cholesterol levels, and improved insulin resistance. This detail agrees with the common assertion that puts individuals who are physically activity to have less chances of having non-communicable diseases.

Agodi, (2018) revealed that consumption of a diet rich in cereals, fish, and vegetables is negatively associated with the risk of developing MetS. These findings are also in line Baxter et al, (2006) which confirmed that dietary patterns rich in fruits and vegetables lowered prevalence of metabolic syndrome among adults. In general, a diet that is low in saturated fats, trans fat, cholesterol, salt and high in fruits, vegetables, lean meat, beans, low fat dairy, and whole grains has been shown to help people with high blood pressure and a higher risk of cardiovascular disease.

2.6 Definition of dietary patterns

Dietary patterns are defined as the quantities, proportions, varieties or combinations of different foods and beverages in diets and the frequency with which they are habitually consumed (Jill et.al, 2018). In most sub-Saharan African countries, including Zambia, most diets are either processed dietary patterns characterized by fast foods, eggs, sweetened beverages, high fat dairy foods, fatty meats, refined cereals and fats and oils or mixed dietary patterns characterized by vegetables, whole grain cereals, fruits, lean meats, low fatty daily products, clear soups, and low fat salad dressings (Michelle et.al, 2018). The processed dietary patterns are high energy yielding diets and are associated with high incidences of overweight and obesity. However mixed dietary patterns are

low energy yielding diets and are associated with and low incidences of overweight and obesity (Choi et.al, 2015).

2.7 Dietary patterns and the risk of metabolic syndrome

While some lifestyle modifications are recommended for the management of metabolic syndrome, the dietary patterns recommended most beneficial for patients with metabolic syndrome are yet to be ascertained (Olamide et al, 2019). The association between dietary patterns and the risk of metabolic syndrome from many studies has remained unclear. However, Antonella A. et.al, (2018) revealed that diets rich in cereals, fish, fruit and vegetables are associated with lowered risks for metabolic syndrome while the high energy yielding diets with high glycaemic index.have been associated with unhealthier metabolic profiles and higher risk of metabolic syndrome. Assenting to this fact, Roberto et.al, (2019) revealed that healthy dietary patterns were associated with reduced metabolic syndrome and significantly reduced the risk of metabolic syndrome in both sexes among individuals. Kaur, (2014) provided evidence that confirms that nutrition represents an important modifiable factor affecting metabolic syndrome. Also Silva and Grande, (2013) recommended lifestyle modification for the management of metabolic syndrome but also stated that the dietary patterns that are most beneficial for metabolic syndrome patients are yet to be established. The current study therefore confirms that high energy yielding dietary patterns are frequently associated with the risk of metabolic syndrome components.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study design

During the period of April to July 2020 a cross-sectional study was conducted in three out of the twenty six health facilities in Lusaka District. All the selected health facilities offer antiretroviral therapy services to HIV positive individuals. A total of 180 randomly sampled HIV positive individuals aged 18 years and above were included in the present study.

3.2 Sample size determination

Participants sample size was calculated using the formula for proportions at 13% overweight (Frederick, 2009; CSO/MoH, 2014).

$$n = \frac{Z^2 * p (1-p)}{d^2}$$

Where:

n - Sample size

Z- Confidence level set at 95% (1.96 z-scores value)

p- Proportion of overweight (13%)

d- Margin of error (at 95% CL -5%)

Calculations: $n = 1.96^2 \times 0.13 (1-0.13) / 0.05^2$

The sample size (n) was therefore 173.

Adjusted with 7 (4%) and rounded off to 180.

3.3 Inclusion and exclusion criteria

The inclusion criteria for the subjects were adults living with HIV infection and also willing to participate in the study.

The study excluded adults not willing to participate in the study, individuals (0 - ≤17years of age) and pregnant women. All random sampled participants signed an informed consent before data collection.

3.4 Data and data collection techniques

3.4.1 Dietary assessment

A food frequency questionnaire (FFQ) with 53 food items was used to assess the food and nutritional intakes by the trained Nutritionist (Researcher) during a structured interview. This dietary collection tool help to ascertain some habitually consumed food items over a given period of time, applicable when identifying dietary patterns. Participants were asked to recall their frequency of consumption of each food item in the previous 4 weeks. The frequency of food intake was measured using six categories which were as follows: (00) never (1) once per month (2) once or twice per week; (3) 3-6 times a week; (4) once per day; (5) ≥ once per day. Fifty three food items were gathered in 7 predefined food groups on the basis of similarity in nutrient profiles and the grouping scheme used in other studies (Antonella A. et.al, 2018).

3.4.2 Anthropometry

For weight measurements, a digital platform scale and stadiometer (Seca made in Germany) calibrated by Zambia Bureau of Standards were used. Both the digital scale and stadiometer were placed on a hard tile surfaced floor in the improvised examination rooms and were checked to be level and stable.

Height measurements were taken on barefoot participants, standing erect and with the head in the Frankfort plane. Height was measured to the nearest 0.1 cm. In some situations estimations using a 30 cm rule were used to adjust for long hair and extended hair style. Weight (kg) was measured with the participant standing in the centre of the platform with weight spread equally between the two legs, and standing with hands loosely hanging next to the sides of the body. Weight was measured to the nearest 0.1 kg. Body mass index (BMI) was then be calculated as weight (kg)/height $(m)^2$ using the scientific casio fx-100s calculator and the BIA devise, and verified by the reference BMI table and wheel.

3.4.3 Blood pressure

For blood pressure measurement, a sphygmomanometer (Clinical mercury manometer made in China by the Yuyao Jiahua Medical Appliance Co Limited) also calibrated by Zambia Bureau of Standards was used. The subjects were made to sit and rest for 10

minutes before blood pressure was done. The upper arm where the cuff was worn was placed at heart level and was supported to allow relaxation of muscles (WHO, 2010).

3.4.4 Biomedical parameters

A venous blood sample of about 3 - 4ml was also drawn by the trained health practitioner using a 5ml syringe and a green coded needle. The blood sample from each participant was then put in a plain red top vacutainer which was kept in a cooler box for transporting to the identified laboratory (Chelstone health Centre laboratory) for analysis on each data collection day. Analysis for triglycerides, total cholesterol and random blood glucose by the use of the Pentra 2000 Horiba Medical laboratory machine which was operated was done by the laboratory personnel under the close watch of the principal researcher.

3.4.5 Data analyses and management

Statistical analyses were performed using the SPSS version 22 for windows. Data were analysed and the results were expressed as the mean ±, standard deviation (± SD) and percentages. Chi square test was used with the critical value set at < 0.05. Weight and height measurements were used to compute Body Mass Index (BMI) and waist and hip measurements for waist to hip ratio were analysed. The derived indices of BMI and waist to hip ratio were used together with variables on serum triglycerides and total cholesterol to define subjects with or without metabolic syndrome.

Subjects who had more than three of the following conditions (obesity, diabetes mellitus, dyslipidaemia, hypertension, insulin resistance and atherosclerosis) were considered to have metabolic syndrome. The study adopted the WHO definition of metabolic syndrome. Obesity was defined as having BMI of ≥ 30 and above or waist to hip ratio of ≥ 0.90 and above in males and ≥ 0.85 and above in females. WHR was calculated as the waist measurement divided by the hip measurement. Dyslipidaemia was defined as having serum triglycerides levels of 1.5mmol/l and above or total cholesterol of less than 4.5mmol/l in males and less than 4.9mmol/l in females. Hypertension was defined as having a blood pressure reading of 140/90 mm/Hg and above. Food frequency data was categorised into three groups based on frequency of consumption, namely more frequent, medium frequent and less frequent consumption. More frequent consumption was defined as consuming a food item more than twice or

once a day, medium frequent consumption was defined as consuming a food item three to six times and once or two times per week. Lastly less frequent consumption was defined as consuming a food item as once per month or even never.

Principal Component Analysis was performed on collected dietary data to identify similar consumption profile of food items by each individual from the 7 food categories (staples, animal products, legumes and nuts, fruits, vegetables, fats and oils, other foods and beverages) on the food frequency questionnaire. Principal component analysis tend to explain as much variation in dietary intake as possible and most likely it represents actual dietary habits or patterns in populations.

Binary logistic regression model was employed to determine the independent relationship of each predictor variable (dietary patterns, ARVs, alcohol consumption, cigarettes smoking and physical inactivity) with the outcome variable (metabolic syndrome components).

3.5 Ethical Considerations

Ethical approval was sought and granted from the Tropical Disease Research Centre and National Health Research Authority and later on permission to carry out the study from Lusaka District Health Office management was also sought and granted. Confidentiality of the collected data from respondents was upheld by securing the data in the box files which were only accessed by the researcher. Also no information about the respondents pertaining the study has been disclosed to anyone. Respondents aged 18 years and above were requested to give consent as a way of permission to collect primary data from them. The questionnaire used did not contain the name of the research participant for anonymity identity but was tagged with the ID number as a way of reference.

3.6 Study variables of research participants

Table 2: Dependent and independent variables

Dependent variable	Independent variables	
	Continuous	Categorical
Metabolic syndrome Cluster of non-communicable diseases (hypertension, diabetes mellitus, dyslipidemia, cardio-vascular disease).	• Age of respondents • Weight • Height • Waist circumference • Hip circumference • Systolic B.P • Diastolic B.P	Dietary patterns Food groups (Fats and oils, animals and animal products and vegetables and fruits, Staples)

CHAPTER FOUR

4.0 RESULTS

4.1 Anthropometric and socio-demographic characteristics of study participants.

One hundred and eighty subjects participated for in the present study. Their mean age was 43.84±10.685 years and they ranged from 19 years to 63 years old. In total by gender, 53% (n=96) were women and 47% (n=84) were men. The mean weight, waist hip ratio and body mass index was 68.21 ±15.42 kg, 0.86 ±0.0651 and 25.4 ±5.52 kg/m^2 respectively. Most of the study participants were married 53% (n=97) with only 13% (n=23) being separated or divorced (Table 3).

All the study participants had attained at least formal education (Table 3). Majority of the respondents attained primary education 43% (n=78) while only 3% (n=5) did not attain any formal education. The rest of the respondents either attained secondary or tertiary education. The results further show a higher percentage of salaried people 37% (n=67) as compared to the other occupations.

Table 3: Anthropometric and socio-demographic characteristics of study participants N=180

Variables	Mean ± SD and % (n)
Age (years)	43.84 ±10.69
Weight (Kg)	68.21 ±15.42
Waist to Hip Ratio	0.86 ±0.07
Waist circumference	84.8 ±12.13
BMI (Kg/m^2)	25.44 ±5.52
Age range	% (n)
20- 30 years	9 (17)
31- 40 years	28 (50)
41- 50 years	32 (58)
51 and above years	31 (55)
Gender	% (n)
Male	47 (84)
Female	53 (96)
Marital status	% (n)
Single	18 (32)
Married	54 (97)
Divorced/ separated	13 (23)
Widow/widowed	16 (28)
Education level	% (n)
None	3 (5)
Primary	43 (78)
Secondary	36 (65)
Tertiary	18 (32)
Source of income	% (n)
Farming	6 (11)
Salaried	37 (67)
Formal business	32 (58)
Unemployed	25 (44)

4.2 Prevalence of metabolic syndrome predictors and high blood pressure.

Table 4 shows the prevalence of metabolic syndrome predictors (high triglycerides, high waist hip ratio and high waist circumference) and high blood pressure. Physical and biochemical measurements indicated that 39% (n=70) of the respondents had high waist hip ratio, high waist circumference was observed among females 21% (n=38) than among males 4% (n=7). Participants who had high total cholesterol were 52% (n=93), high triglycerides were 46% (n=83) and high blood pressure were 33% (n=60).

Table 4: Prevalence of non-communicable diseases and metabolic syndrome predictors

N=180

Predictor variables	Non-communicable diseases	Metabolic syndrome
Variables	% (n)	%(n)
High WHR	39 (70)	
High waist circumference (cm)*		
Male	4 (7)	
Female	21 (38)	
Overweight and obesity† (BMI ≥25kg/m^2)		
BMI>25		
Male	17 (31)	
Female	19 (34)	
BMI≥ 30		
Female	12 (21)	
High total Cholesterol	52 (93)	
High triglycerides	46 (83)	
High blood pressure*	33 (60)	33 (60)

*WHO definition (SBP ≥ 140mmHg and DBP≥90mmHg); SBP: Systolic Blood Pressure
DBP: Diastolic Blood Pressure. †None of the men was obese.
*WHO definition (Male ≥ 102 and Female ≥ 88)

4.3 Dietary patterns of study participants

Most food group items were consumed either 3 - 6 times or once a week with few of them being consumed once or twice a day, (Table 5). Most respondents consumed staple foods more than once a day, 66% (n=120) vegetables only once a day 66 (n=120). None of the food items were positively correlated with metabolic syndrome predictors, $p < 0.05$. The principal component analysis helped to derive three dietary patterns which reflected; omnivorous; “staples, animal products and fruits”, vegetarian; “legumes and nuts” and the other one, unclassified; “fats and oils, other foods and beverages and vegetables” (Table 5).

Table 5: Dietary clusters from frequently consumed foods by study participants N=180.

Variables	% (n)					
Foods consumed	>once/day	Once/day	3-6 times/week	Once or twice/week	Once a month/never	p.value
	% (n)	% (n)	% (n)	% (n)	% (n)	
Omnivorous						
Staples	66 (120)	15 (22)	12 (21)	6 (10)	1 (2)	0.352
Animal products	1 (5)	1 (5)	15 (28)	64 (115)	19 (35)	0.343
Fruits	1 (4)	1 (4)	6 (10)	41 (75)	3 (90)	0.591
Vegeterian						
Legumes and nuts	1 (2)	1 (2)	37 (66)	48 (87)	13 (24)	0.067
Unclassified						
Vegetables	11 (20)	66 (120)	15 (27)	6 (11)	1 (2)	0.194
Fats/ oils	1 (70)	47 (84)	5 (10)	1 (25)	2 (4)	0.314
Others foods and beverages	6 (11)	6 (11)	59 (107)	26 (47)	15 (8)	0.458

4.4 Association of selected variables with high blood pressure and components of metabolic syndrome

4.4.1 Determinants of high blood pressure

The results in Table 7 show positive correlations between high blood pressure and sex, alcohol consumption and body mass index (r = 0.215**, p=0.004, r= 0.149*, p=0.000 and r= 0.149, p=0.046 respectively). These variables were also significantly associated with high blood pressure ($p<0.05$). Fruits showed negative correlation with high blood pressure (r = -0.084) and were not significantly associated with high blood pressure (p=0.245).

4.4.2 Determinants of high serum triglyceride levels

Table 7 also shows serum triglyceride levels. The variables which significantly correlated with high triglyceride levels were age, staple foods, fats/oils and non-alcoholic beverages. Variables which did not correlate with high triglyceride levels were sex, fruits and alcoholic consumption. Age and body mass index were significantly associated with high triglyceride levels (r= 0.279**, p=0.000 and r= 0.170*, p = 0.002, respectively).

4.4.3 Determinants of high waist hip ratio

High waist to hip ratio was positively correlated with all variables of interest as shown in Table 7 ($p<0.05$). Other foods and non- alcoholic beverages, alcohol consumption and occupation status were not significantly associated (r= 0.125, p=0.094 and r= 0.071, p=0.346 and r= 0.016, p=0.832) with high waist hip ratio.

4.4.4 Determinants of high waist circumference

High waist circumference was positively correlated with all the key variables of interest as shown in Table 7. However, only the consumption of fruits showed some negative correlation (r= -0. 004, p= 0.960) with high waist circumference. Age, alcohol consumption and body mass index were significantly associated (r=0.304*, p=0.000, r= 0.209, p= 0.005 and r= 0.600, p=0.000 respectively) with high waist circumference.

4.4.5 Determinants of high serum total cholesterol levels

High total serum cholesterol was positively correlated with all the key variables of interest as shown in Table 7. Also only the consumption of fruits showed some negative correlation (r = -0.194, p=0.009) with high total cholesterol. All the variables were not significantly associated (p>0.05) with high total cholesterol.

Table 7: Independent variables versus high blood pressure and non-communicable disease predictors N=180.

Independent Variables		Blood pressure and non-communicable disease predictors				
		High blood pressure	High triglycerides	High waist hip ratio	High waist circumference	High total cholesterol
Sex (1=f, 0=m)	Spearman's rho sig	0.215** 0.004	-0.033 0.666	0.235* 0.001	0.009 0.907	0.097 0.196
Age (years)	Spearman's rho sig	0.043 0.569	0.279** 0.000	0.224* 0.002	0.304* 0.000	0.047 0.535
Staple foods	Spearman's rho sig	0.064 0.392	0.096 0.199	0.168* 0.024	0.090 0.230	0.944 0.555
Fruits	Spearman's rho Sig	-0.084 0.245	-0.015 0.845	0.084 0.261	-0.004 0.960	-0.194 0.009
Fats/ oils	Spearman's rho sig	0.058 0.442	0.034 0.652	0.192* 0.010	0.058 0.442	0.058 0.440
Other foods and beverages	Spearman's rho sig	0.125 0.094	0.125 0.094	0.125 0.094	0.125 0.094	0.125 0.094
Alcohol consumption	Spearman's rho sig	0.028 0.708	-0.071 0.345	0.071 0.346	0.209* 0.005	0.047 0.535
Body mass index	Spearman's rho Sig	0.477* 0.000	0.170* 0.022	0.229* 0.002	0.600* 0.000	0.103 0.169
Occupation status	Spearman's rho sig	0.022 0.766	0.079 0.294	0.016 0.832	0.092 0.220	0.084 0.261

N= 180*= significant at p<0.05

(* and ** mean the variable is significant at p<0.05)

4.5 Predictors of the metabolic syndrome, (High blood pressure).

The odds ratio and (95% CIs) of metabolic syndrome and its components in Table 8 shows that the value of test W statistic for sex is 7.552, the value of test statistic W for BMI is 21.847 and the value of test statistic W for waist circumference is 16.754 which are more than critical value from $Z_{(1-\alpha)/2}$ with alpha 0.05. Also the p-value of sex is 0.006, p-value of BMI is 0.000 and p-value of waist circumference is 0.000 which are less than alpha five percent.

Table 8: Binary logistic regression parameters N=180

Source	B	SE *B*	Wald X^2	p	OR	95% CI OR
Sex (M=1, F=2)	0.864	0.314	7.552	0.006	2.372	1.281
Occupation status	0.018	0.174	0.011	0.915	1.019	0.725
Age (Years)	0.053	0.161	0.110	0.740	1.055	0.769
High Total cholesterol	0.309	0.194	0.2.533	0.111	1.362	0.931
High Triglyceride	-0.267	0.162	2.695	0.886	1.082	0.368
High Waist Hip Ratio	0.200	0.402	0.246	0.620	1.221	0.555
BMI (Kg/m^2)	0.192	0.041	21.847	0.000	1.211	1.118
Waist circumference	0.070	0.017	16.754	0.000	1.072	1.037
Alcohol consumption	0.131	0.144	0.823	0.364	1.140	0.859
Staple foods	0.128	0.207	0.384	0.536	1.137	0.757
Fruits	-0.234	0.241	2.264	0.132	0.695	0.433
Fats and oils	0.327	0.382	0.735	0.391	1.387	0.657
Other foods and beverages	0.859	0.619	1.922	0.166	2.360	0.701

Statistical significant set at $p<0.05$ (at 95% CI)

CHAPTER FIVE

5.0 DISCUSSION

This study aimed to determine the dietary patterns and the risk of metabolic syndrome among HIV positive individuals from selected health facilities in Lusaka District. Considering the public health concern of the components of metabolic syndrome (hypertension, diabetes mellitus, obesity, dyslipidaemia and cardio vascular diseases) in Zambia, the research was worth undertaking for the purpose of informing policy on the welfare of HIV positive individuals. Most of the studies, notably; perception of HIV-related health services in Zambia with disabilities who are HIV positive (Stephane et al, 2004); Zambia offering antiretroviral therapy regardless of CD4 count (UNAIDS, 2017) and Zambia Population-Based HIV Impact Assessment (ZAMPHIA, 2020). The present study therefore focussed on dietary patterns and how these predictor variables among other variables can predispose HIV positive individuals to having metabolic syndrome.

Literature shows that as one advances in age, one is more likely to develop non-communicable diseases, so advanced age is identified to have a significant association with metabolic syndrome (Wilson et.al, 2017). This finding is also in line with the finding from the study conducted by Kelliny et al in 2008 which also revealed that metabolic syndrome increases significantly with age in both sexes. All the subjects of the present study had some level of formal education, except that majority 43% (78) of them had primary level of education. Only 3% (5) of them had no formal education at all. Assenting to Bener's, 2009, prevalence of metabolic syndrome is reduced by high level of education. Moreira et al, 2014 also established that occurrence of metabolic syndrome and the relationship with risk factors of cardiovascular complications are attributed to low levels of education. This could be due to the inability of the individuals with low education to know the importance of making informed choices about dietary lifestyles and physical activities among other preventives choices.

The prevalence of high blood pressure and metabolic syndrome predictors in the present study followed the findings of the meta-analysis of WHO 1998 and 2005, (Table 4). According to literature, patients undergoing ART are expected to have higher levels of total cholesterol and triglycerides (Oh and Hegele, 2015).

Out of the 7 food group items which were commonly consumed by study participants, none of the consumed food groups showed a significant association with metabolic syndrome predictors ($p<0.05$), (table 5). The principal component analysis conducted on the food frequency questionnaire helped to identify similar consumption profile of food items by each individual from the 7 food categories on the FFQ as input variables. Three dietary clusters were identified (Table 6) which included omnivorous; "staples, animal products and fruits", vegetarian; "legumes and nuts" and the other one, unclassified; "fats and oils, other foods and beverages and vegetables". None of the food clusters showed significant association with metabolic syndrome or its components (p,value < 0.05).

Ideally, people need to consume staple foods frequently as they are the rich sources of energy (ATP) in the body (Monforte, Mateo and Sanchez, 2015). However, the results of the present study on staple foods consumption shows that HIV positive individuals do not consume a lot of staple foods. Long-time studies suggest that energy requirement increases in HIV infection, so staple foods are vital for the metabolic processes that demand energy expenditure due to HIV infection (Estruch, et.al 2013).

Even though the present study did not account for quantities, frequent consumption of vegetables (29 and 37%) which was observed have the protective nature against non-communicable diseases (Prasad et.al, 2012). However, consumption of fruits and vegetables over metabolic syndrome gets masked when the diet is combined with high quantities of fat (Akter et al, 2013).

Table 7 shows results of the association of independent variables with non-communicable disease (high blood pressure) and cardio-metabolic parameters. There was some positive correlation between high blood pressure and sex, alcohol consumption and body mass index. The findings of the present study are in line with a study by Dhingra et al, 2007 which revealed that consumption of fish, fish oil and omega 3 fatty acids are associated with regulating blood pressure. Findings from the present study showed a positive correlation on age, staple foods, fats/oils and other foods and non-alcoholic beverages with high triglyceride levels. In line with these findings, a study conducted among overweight HIV positive Brazilian women with an aim of investigating the effect of fruit intake on body weight change revealed that daily intake of apples reduced serum triglycerides (Conceicao et al, 2003). Also another study among HIV positive Iranian elderly women with metabolic syndrome showed a reduction in serum triglyceride levels after consumption of soy for 12 weeks (Bakhtiary et al, 2012). In another study, the effect of phytoestogenes from soy supplement on lipid profile was assessed among

healthy post menopause women. The results showed a significant reduction in serum triglyceride levels (Tziioums, 2012).

Large studies that have been conducted over the past years have showed that body fat distribution site contributes to morbidity and mortality beyond the degree of fat accumulation (Rhee, et al, 2014; Sahal and Braverman, 2012). Also some international health organizations, (such as the National Institute for Health and Clinical Excellence) have however recommended the use of body mass index in addition to anthropometric indicators of central obesity like waist and hip circumference in clinical assessments (Huang, 2015).

Individuals whose fat accumulation is around the waist region (android/ abdominal obesity) are at higher risk of developing cardio-metabolic health conditions (Choi, et.al, 2015).

On the other hand fat accumulation around the lower abdomen, thighs and buttocks rarely constitutes a risk for cardio-metabolic conditions. The current study therefore suggest that the location or site of fat accumulation is of great importance to the determination of cardio-metabolic risks.

Prevalence approximations for overweight and obesity reached 1.4 billion adults over the past 20 years, obesity alone covering over 10% of world population. Older age, female sex, being an urban resident, physical inactivity, smoking, hypertension, hypercholesterolemia, hyperglycaemia, diabetes, and having family history of diabetes are also some significant risk factors that increased waist circumference and obesity (Silva and Grande, 2013).

Consumed foods rich in saturated fats and cholesterol raise the blood cholesterol levels. Being overweight is also a risk factor for heart disease. It also tends to increase serum cholesterol levels. However, losing weight can help lower LDL (bad) cholesterol, total cholesterol, and triglyceride levels. It also raises HDL (good) cholesterol level (Whitehead et al, 2014). The present study therefore suggests the consumption of low energy foods, regular physical activity and weight control so that LDL (bad) cholesterol can be lowered and raise HDL (good) cholesterol levels.

Three independent variables of sex, BMI and waist circumference were significant to the binary logistic model (Table 8). These three variables were observed as the influencers of the risk of having high blood pressure among HIV positive individuals in the present study. After controlling for potential confounders, a significant inverse association was observed between sex, BMI and waist circumference (OR: 2.372, 1.211 and 1.072 respectively at α = 5%.) In the current study, no relationship was observed between a healthy diet and metabolic syndrome and its components. This may be justified because the food items from the food frequency questionnaire were not assessed on their nutritive value. Another possible reason may be that

individuals could be following special diets or avoid consuming fast foods and salty snacks. Also it could be due to under reporting of diet by people with non-communicable diseases that could lead to metabolic syndrome.

CHAPTER SIX

6.0 Conclusion, recommendations, study strengths and limitations

6.1 Conclusion

Based on the results of analysis and discussion in the present study, metabolic syndrome prevalence among HIV positive individuals is low. However high blood pressure and some non-communicable disease predictors like high serum triglyceride high waist hip ratio, and high waist circumference were observed. There was also no significant association of the frequently consumed foods with metabolic syndrome predictors, $p>0.05$. Three dietary clusters were obtained from the principal component analysis. From the run binary logistic regression model, hypertension disease is influenced by factors of sex, body mass index and waist circumference at a significance level of five percent. Preventive management of non- communicable disease predictors and/or metabolic syndrome predictors should therefore be considered so that the prevalence of metabolic syndrome or NCDs remain low among HIV positive individuals.

6.2 Recommendation

With the evidence provided in the present study the researcher recommends that metabolic syndrome and/or non-communicable disease- related interventions could be implemented during individual consultations, group and community health messaging sessions so as to avoid any possibility of the HIV positive individuals having metabolic syndrome. These interventions could include messages on consumption of low energy yielding foods, non-strenuous physical activity, stoppage of alcohol consumption and smoking.

6.3 Strengths and limitations of the study

6.3.1 Strength

The study was the first one to be conducted among HIV positive individuals in Zambia that determined the association between dietary patterns and metabolic syndrome. The use of the widely recognised and validated dietary questionnaire.

6.3.2 Limitations

A cross-sectional study design that was employed substituted the case control design since there were not true controls of the subjects. Some information bias from respondents during dietary data collection period.

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APPENDICES

1: Time Line

	2018 March - May	2018 Jun – Aug	2018 Sept – Dec	2019 Jan – Jun	2019 Aug – Dec
Course work					
Supervisor contact					
Proposal course work presentation					
Logistic acquisition					
Data collection & Focus group discussion					
Data analysis					
Dissertation presentation					
Dissertation submission					

2: Research budget

Investment Cost	Description	ZK10, 000.00 ($1, 000.00)		
Operating cost		Quantity	Cost item	Amount (K)
Stationery				
Realm of paper Pencils	Printing and photocopying Questionnaire Recording data	 5 realms 3 dozen	 35.00 20.00	 175.00 60.00
Medical equipments				
Seca scale Height board Measuring tape Blood vacuum tubes Disposable gloves 5mls syringes Green needles B.P Machine Blood sugar machine Glucose sticks Haemacue machine	Anthropometry Anthropometry Anthropometry Haematology purposes Haematology purposes Haematology purposes Haematology purposes Check blood pressure Check blood glucose levels Check blood glucose levels Check Haemoglobin levels	1 machine 1 item 1 tape 200 tubes 2 Boxes 2 Boxes 2 Boxes 1 machine 1 machine 2 boxes 1 machine	200,00 200.00 50.00 1,000.00 80.00 70.00 80.00 450.00 350.00 110.00 270.00	200.00 200.00 50.00 1, 000.00 160.00 140.00 160.00 450.00 350.00 220.00 270.00
Communication				
Air time	Communication with relevant personnel	10 scratch cards	50.00	500.00
Other costs				
Fuel	Mobility purposes	300 litres	12.50	3, 750.00
Snack and drinks	Refreshments during FDGs every two weeks	180 people	300 x 6 times	1, 800.00
Contingencies	In case of devaluation			515.00
Grand Total				10, 000.00

Source of funding: Self

STUDY QUESTIONNAIRE

TITLE: DIETARY PATTERNS AND THE RISK OF METABOLIC SYNDROME AMONG HIV POSITIVE INDIVIDUALS FROM SELECTED HEALTH FACILITIES IN LUSAKA DISTRICT, ZAMBIA

3: PARTICIPANT INFORMATION SHEET

Introduction:

My name is Peryson Kekelwa Kalaluka, and I am a student pursuing a Master of Science Degree in Human Nutrition in the School of Agriculture, Department of Food Science and Nutrition at The University of Zambia. I am carrying out a study on "Dietary patterns and risk for metabolic syndrome in adults living with HIV infection from selected health facilities in Lusaka District, Zambia: A case control study".

Purpose of the study:

The proposed study is concerned about the prevalence of non-communicable diseases like Hypertension, Diabetes Mellitus and Cardio-Vascular Disease like atherosclerosis in Zambia.

It will try to evaluate the relationship between having the HIV infection and the risk of Non-Communicable Diseases (NCDs) in the body. The study will also evaluate how someone's dietary patterns influences the risk for the non-communicable diseases. The other reason for the research will be to bring the results of the relationships of dietary patterns and NCDs in adults living with HIV infection to the attention of policy makers in Zambia. This will ultimately lead into bettering the lives of people living with HIV infection in the country.

Study procedure:

We will ask you few simple structured questions on this questionnaire. The questions asked will help us collect data on what foods and drinks you consume frequently, socio-demographic characteristics. We will also measure your weight, height, waist and the hip by the use of the scale, height board and the measuring tape. Your blood pressure will also be taken using a B.P machine. Lastly some few mills (5mls) of blood will be withdrawn from your arm so as to find out if the sugar levels and cholesterol are high in the blood.

Confidentiality:

The collected data on this questionnaires will be tagged with an ID number as a way of reference. The questionnaire will also be protected by securing it in a box file which

will only be accessed by me as the researcher. Your name will not be mentioned so that your identity remains unknown in this study.

Study benefits:

The study team will help you to be attended promptly today after our activity with you. Also should we need you again for this study, we shall give up back the transport money spent for coming here. If you fall sick may be due any procedure we shall conduct on you, the study team will help you to be seen by the Doctor and buy any drugs for you that may be prescribed for you.

Study Risk:

You may experience fatigue due to the length of the time required for the questionnaire process. We will try to take few minutes of less than 40 minutes to complete our activity with you.

Also to reduce on any fatigue experienced because of our activity with you, you are free to ask for a short break whenever you require it. Another discomfort you will experience is on the needle prick during blood withdraw which we sincerely apologise. We will try to only prick you once.

Voluntariness:

Your participation in this study is purely on voluntary basis. However, if you can decide to withdraw at any point, the care or benefits you receive at his health facility will not be affected by your withdraw from the study.

If you have any doubt or concern that you feel you need clarity, feel free to consult my supervisor

Name: Chiza Kumwenda, PhD

The University of Zambia

School of Agricultural Sciences

Department of Food Science and Nutrition

Cell: 0974-150967 and email: chiza.kumwenda@unza.zm

If you have any complaint about the study, feel free also to contact the:

The Secretary

TDRC Ethics Review Committee

P.O Box 71769

Ndola

Email: tdrc.ethics@tdrc.org.zm Tel: +260-212- 61544

4: INFORMED CONSENT FORM

I understand the information given to me and the participation in this study is completely voluntary and its purpose has been fully explained to me. I also understand that my rights and privacy will be respected.

Right thumb or Name of participant

…….

Signature ...……..

Name of witness

……

Signature

……

Name of Interviewer

.....

Signature

……..

Date of interview

……..

5: DATA COLLECTION TOOL ID no……..

SECTION A: DEMOGRAPHIC AND HOUSEHOLD DATA

a. Gender: 1. Male ☐ 2. Female ☐
b. Age of respondents: 1. 20 -30 years ☐ 2. 31 -40 years ☐ 3. 41 – 50 years ☐
c. 4. 51 years and above ☐
d. Education level of the respondent (Name): 1.None ☐ 2. Primary ☐
   3. Secondary ☐ 4. Tertiary ☐
e. Marital status of the respondent (Name):
   1. Single ☐ 2.Married ☐ 3. Divorced/separated ☐ 4.Widow/widower ☐
f. Occupation status of the respondent:
   1. Farmer ☐ 2. Salaried ☐ 3. Formal business ☐
   4. Others ☐ specify……...
g. Total number of people in the household.....
h. Source of water for the household:
   1. Running water (water kiosks, tap, borehole) ☐ 2. Protected well ☐
   3. Unprotected well ☐
i. May I know the year when you started taking Antiretroviral drugs
   1. Between 2000- 2005 ☐ 2. Between 2006-2010 ☐
   3. Between 2011-2015 ☐ 4. Between 2016- 2019 ☐

j. Are you suffering from any of the following conditions (HTN, D.M, Obesity?)
   1. Yes ☐ 2. No ☐
k. If yes when did you acquire the condition
   1. Before diagnosed of HIV ☐
   2. After being diagnosed of HIV ☐
   3. After starting ARVs ☐
l. May I know your alcohol consumption habit
   1. Drink every day ☐
   2. Drink 3-6 times a week ☐
   3. Drink once or twice a week ☐
   4. Drink once a month ☐
   5. Do not take alcohol ☐

SECTION B: FOOD FREQUENCY QUESTIONNAIRE

For each food or food group, tell me the category that best describes the frequency with which you eat that particular food.

No	Food or Food group	>once per day	Once per day	3-6/ week	Once/ or twice per week	Once/ month	Never
	Staples						
B1	Maize meal, B/F						
B2	Maize meal, Roller						
B3	Rice						
B4	Wheat (Bread, buns, fritters)						
B5	Irish Potato						
B6	Sweet Potato						
B7	Cassava						
	Foods of animal origin						
B8	Egg						
B9	Meat (Beef, chicken etc)						
B10	Organ meat (Liver, heart)						
B11	Whole fat milk						
B12	Low fat milk						
B13	Yoghurt						
B14	Cheese						
B15	Fish						
B16	Insects						
	Legumes and nuts						
B17	Cowpeas, beans						
B18	Soy milk						
B19	Groundnuts						
B20	Any legume						
B21	Soy bean						
B22	Soy products						
	Fruits						
B23	Pawpaw						
B24	Masuku						
B25	Masau						
B26	Oranges						
B27	Mangoes						
B28	Watermelon						
B29	Bananas						
B30	Pineapples						
B31	Apples						
	Vegetables						
B32	Dark green leafy						
B33	Onion						
B34	Pumpkins						
B35	Carrots						

B36	Eggplant						
B38	Tomato						
	Fats and oils						
B39	Margarine						
B40	Butter						
B41	Animal fat						
B42	Avocado pear						
B43	Olive oil						
B44	Other cooking oils						
	Other Foods & beverages						
B45	Sugar and sweets						
B46	100% fruit juices						
B47	Hot beverages (Coffee, Tea)						
B48	Sugar and sweets						
B49	Sweetened soft drinks						
B50	Other sweetened drinks						
B51	Munkoyo with/out sugar						
B52	Tobwa with/out sugar						
B53	Maheu with/out sugar						

Source: Adapted from Rosalind Gibson, 2005

SECTION C: ANTHROPOMETRIC MEASUREMENTS AND BIOCHEMICAL TESTS

MEASUREMENTS			BIOCHEMICAL TESTS		
1	Weight (Kg)		1	Random Blood glucose (mg/dl)	
2	Height (m)		2	HDL Cholesterol (mg/dl)	
3	BMI (For overweight/ obesity)		3	Triglycerides (mg/dl)	
4	Hip Circumference (Cm)		A	Time specimen collected	
5	Waist Circumference (Cm)		B	Date specimen collected	
6	Systolic pressure (mmHg)				
7	Diastolic pressure (mmHg)				
8	Pulse (beats/min)				

Thank you so much for your time

6: LABORATORY FORM

Lusaka District Health Office
Request for Laboratory examination

Subject ID no_____

Age_____ Sex_____

Health Centre_____

Reasons for examination on the subject:

i. Client receiving ART services
ii. Checking possibilities of metabolic syndrome (Combined NCDs) in the ART client

Nature of specimen requested: Blood (4- 5mls)

Date collected _____

Time collected _____

Examination required:

i. HDL Cholesterol ☐
ii. Triglyceride ☐
iii. Random Blood Sugar ☐

Requested by: Peryson K. Kalaluka

Nutritionist / MSc Human Nutrition Candidate - UNZA

Signature_____

Laboratory Use Only

Date received _____

Time received _____

Lab ref no: _____

Results

_____

_____

_____

_____

Name of Laboratory Officer _____

Signature _____

7: Co-founding study variables (Antiretroviral drugs)

Name	Method of administration	Dosage	Side effects (NCDs related only)	Contra-indicated to:
Abacavir 300mg	With or without food	Twice daily in combination with Lamivudine and Zidovudine	Hepatic failure Renal failure Elevated creatinine	Severe hepatic impairment
Aluvia 200mg	With or without food	Twice daily in combination with other ARVs	Not common Obesity, HTN, D.M, Hypocholesteraemia, Increased appetite	Patient hypersensitivity with the drug
Efavirenz	In an empty stomach	Once daily	Lipodystrophy not known	Patient hypersensitivity with the drug
Atazanavir	With food	Once daily	Dyslipidaemia	Liver disease

8: Ethical approval

TROPICAL DISEASES
Tel/Fax +260212 615444
P O Box 71769

ethics.tdrc@tdrc.org.zm
NDOLA, ZAMBIA

RESEARCH CENTRE

TDRC ETHICS REVIEW COMMITTEE
IRB REGISTRATION NUMBER : 00002911
FWA NUMBER : 00003729

TRC/C4/03/2020

11th March 2020

Peryson Kekelwa Kalaluka
Computer Number: 2017014551
The University of Zambia
School of Agriculture
LUSAKA

Dear Mr. Kalaluka,

RE: ETHICAL APPROVAL OF STUDY PROTOCOL

Reference is made to the protocol entitled "**Proposal: Dietary patterns and risk for metabolic syndrome in adults living with HIV infection from selected health facilities in Lusaka District, Zambia"**

On behalf of the Chairperson of the TDRC Ethics Review Committee (ERC), I wish to inform you that the Committee reviewed the responses to the queries it earlier raised and is satisfied with the amendments to the protocol, information sheet consent form. Therefore, ethical approval has been granted based on the following conditions;

Ensure that the information sheet and consent form are translated into the local language to cater for participants that may not be conversant with the English language. No personal identifiers should be used in your study data and the data you will collect from the study shall be used strictly for academic purposes.

You are now required to submit your protocol to the National Health Research Authority for final approval following the link: **https://www.nhra.org.zm.** A final report must be submitted to the Ethics Review Committee Secretariat at the end of the study.

This approval is valid for the period **11th March 2020** to **11th March 2021**

The Committee wishes you success in the execution of the study.

Yours faithfully,

TROPICAL DISEASES RESEARCH CENTRE

Edna Mwale. Simbayi (Mrs)
SECRETARY – TDRC Ethics Review Committee

TROPICAL DISEASES RESEARCH CENTRE
ETHICS REVIEW COMMITTEE
11 MAR 2020
P.O. BOX 71769
NDOLA, ZAMBIA