THE ROLE OF EDIBLE NON-TIMBER FOREST PRODUCTS IN MATERNAL AND CHILD DIETS IN RURAL HOUSEHOLDS OF CHONGWE DISTRICT, ZAMBIA

BY

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A dissertation submitted to the University of Zambia in partial fulfilment of the requirements for the award of a Master of Science degree in Human Nutrition

THE UNIVERSITY OF ZAMBIA

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I hereby solemnly declare that this dissertation represents my own work and that it has not previously been submitted for a degree to this or any other university.

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DEDICATION

I dedicate this dissertation to my four beloved children; my daughter; Chisama Mulenga and my three sons; Sabi Mulenga, Chama Mulenga and Mwenge Mulenga.

TABLE OF CONTENTS

LIST OF TABLES ..... **x**

LIST OF FIGURES ..... **xi**

ACRONYMS ..... **xii**

ABSTRACT ..... **xiv**

OPERATIONAL DEFINITIONS OF TERMS ..... **xv**

CHAPTER 1: INTRODUCTION **1**

1.1 Background 1

1.2 Statement of the Research Problem 3

1.3 Justification 4

1.4 Main Objective 5

1.4.1 Specific Objectives 5

1.5 Hypotheses 5

1.6 Significance of the Research 6

1.7 Assumptions 7

1.8 Limitations 7

1.9 Organisation of the dissertation 7

CHAPTER 2: LITERATURE REVIEW **8**

2.1 Non -timber forest products definition 8

2.2 Global perspective on the utilisation of edible NTFPs 8

2.3 Utilization of edible NTFPs in rural households 11

2.4 Dietary diversity food groups for women and children 12

2.5 Nutritional status of children and women 13

2.6 Factors influencing nutritional status 14

2.7 Assessment and classification of nutritional status 15

2.8 Conceptual framework for NTFPs consumption 18

2.9 Summary of literature 20

CHAPTER 3: METHODOLOGY **21**

3.1 Research design 21

3.2 Study site profile 21

3.3 Target population 21

3.4 Sample size 22

3.5 Sampling procedure 23

3.6 Inclusion and exclusion criteria 23

3.7 Ethical considerations 23

3.8 Data collection tools and procedures 24

3.8.1 Qualitative data collection 24

3.8.2 Quantitative data collection 25

3.9 Pretesting 26

3.10 Data analysis 26

3.10.1 Qualitative data analysis 26

3.10.2 Quantitative data analysis 27

3.10.2.1 Descriptive statistics 27

3.10.2.2 Inferential statistics 28

3.10.3 Hypothesis testing 29

CHAPTER 4: RESULTS **31**

4.1 Household socio-economic characteristics 31

4.2 Qualitative data results 33

4.3 Quantitative data results 34

4.3.1 Availability of edible non-timber forest products by season 34
4.3.2 Frequency of consumption of edible NTFPs by mothers and children 35
4.3.3 Maternal food consumption 37
4.3.4 Dietary diversity for mothers in the study site 38
4.3.5 Children's food consumption 39
4.3.6 Dietary Diversity for children in the study site 40
4.3.7 Maternal nutritional status 40
4.3.8 Children's nutritional status 41
4.3.9 Correlations between edible NTFPs consumption and child's nutritional status (WAZ/HAZ) 42
4.3.10 Correlation between edible NTFPs consumption and maternal nutritional status (BMI) 43
4.3.11 Predictors of maternal nutritional status 44
4.3.12 Predictors of stunting in children 45

CHAPTER 5: DISCUSSION 46
5.1 Qualitative data Interpretation 46
5.2 Availability of edible non-timber forest products by season in the study sites 46
5.3 Frequency of consumption of edible NTFPs in the study area 47
5.4 Maternal food consumption and dietary diversity in the study area 48
5.5 Children's food consumption and dietary diversity in the study area 49
5.6 Maternal nutritional status and its predictors in Mwalumina and Manyika wards 50
5.7 Children's nutritional status and its predictors in Mwalumina and Manyika ward 51

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS 52

6.1 Conclusion 52

6.2 Recommendations 52

REFERENCES 53

APPENDICES 59

LIST OF TABLES

Table 1: Classification for assessing severity of malnutrition by prevalence ranges below the age of five years 14

Table 2: BMI cut-offs for adults 16

Table 3: Classification of nutritional status according to Z-scores 17

Table 4: Socio-demographic characteristics of households 32

Table 5: Identified edible NTFPs in their appropriate food groups 33

Table 6: Availability by seasons of edible NTFPs 35

Table 7: Frequency of consumption for edible NTFPs 36

Table 8: Nutritional status of mothers in Mwalumina and Manyika wards 40

Table 9: Nutritional status of children in Mwalunina and Manyika wards 41

Table 10: Correlations between children nutritional status (HAZ/WAZ) and edible NTFPs consumption 42

Table 11: Prevalence of underweight among children who consumed and those who did not consume edible NTFPs……..……..…..42

Table 12: Correlation between maternal nutritional status (BMI) and edible NTFPs consumption…….…….43

Table 13: Comparison between proportions of malnourished mothers who consumed and those who did not consume edible NTFPs..……..43

Table 14: Predictors of maternal nutritional status 44

Table 15: Predictors of stunting in children 45

LIST OF FIGURES

Figure 1: Modified conceptual framework showing associations between edible NTFPs consumption in maternal and child diets and nutritional status...…...19

Figure 2: Proportion of maternal consumption of cultivated foods edible NTFPs in each food group……..…….38

Figure 3: Minimum dietary diversity of mothers who consumed and those who did not consume edible NTFPs……...…….....38

Figure 4: Proportion of children who consumed cultivated foods and edible NTFPs in each food group……...……39

Figure 5: IYCF- Minimum Dietary Diversity of children who consumed and those who did not consume edible NTFPs…….…….....40

ACRONYMS

BMI	Body Mass Index
CSO	Central Statistical Office
CSO-SUN	Civil Society Organization-Scaling Up Nutrition
DRGS	Directorate of Research and Graduate Studies
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
HAZ	Height-for-age Z-score
HLPE	High Level Panel of Experts
ICDPs	Integrated Conservation and Development Projects
IYCF	Infant and Young Child Feeding
IYCF-MDD	Infant and Young Child Minimum Dietary Diversity
MDD-W	Minimum Dietary Diversity for Women of reproductive age
MFL	Ministry of Fisheries and Livestock
MoA	Ministry of Agriculture
MoH	Ministry of Health
NFNC	National Food and Nutrition Commission
NTFPs	Non-Timber Forest Products
SD	Standard Deviation
SPSS	Statistical Package for Social Sciences
UNICEF	United Nations Children's Fund

UNZA University of Zambia

UNZABREC University of Zambia Biomedical Research Ethics Committee

WAZ Weight-for-age Z-score

WHO World Health Organization

WHZ Weight-for-height Z-score

ZDHS Zambia Demographic Health Survey

ABSTRACT

Zambia has a lot of edible non-timber forest products (NTFPs). However, not all edible NTFPs have been documented. Therefore, the main objective of is to identify the edible NTFPs available and their contribution to maternal and child diets in rural households of Chongwe district. A cross sectional research design was employed. Data was collected using semi-structured questionnaire and focus group discussions (FGDs). A sample of 158 mother/child pair comprising of non-pregnant women aged 15 to 49 years and their children aged 6 to 23 months were interviewed. Quantitative data was analysed using the SPSS software (version 20.0) while qualitative data was analysed thematically. Mother and child dietary diversity were determined. Anthropometric data for children was analysed using WHO Anthro-plus software version to compute children's nutritional status. A child with Z-score <-2 SD was considered malnourished. Body Mass Index (BMI) was used to determine nutritional status of the non-pregnant women. A woman with a BMI <18.5 and >24.9 was considered malnourished.

A total of 35 different edible NTFPs were identified in relation to their seasonal availability. The most consumed edible NTFPs were obtained from the "other fruits" food group, which was consumed by 21.5 percent of mothers. About 15.2 percent of children and 19 percent of women consumed edible NTFPs from "other fruits and vegetables" food group respectively. The mean dietary diversity score for women was 5.94 while for children was 4.19. About 71.5 percent of the women met the minimum dietary diversity and about 95.6 percent of the children met the infant and young child feeding minimum dietary diversity. Pearson correlation results showed a weak negative linear correlation (-.079) between children's nutritional status (weight-for-age z-score) and consumption of edible NTFPs. Similarly, there was a weak negative correlation (-.029) between maternal nutritional status (body mass index) and consumption of edible NTFPs.

There was no significant relationship between consumption of edible NTFPs and maternal as well as children's nutritional status in the study area. The research findings imply that usually edible NTFPs are consumed as a coping strategy during the lean periods when agricultural produce is depleted resulting in reduced contribution to dietary diversity and improved nutritional status of mothers and women. Therefore, this research recommends that future researchers should investigate nutrient composition of certain edible NTFPs such as wild yam that have not been analysed and incorporated in the Zambian Food Composition Tables. Secondly, appropriate strategies and programs are required to promote optimal consumption of available edible NTFPs among rural households in Manyika and Mwalumina wards to alleviate the emerging issues of wasting and overweight/obese among children and women respectively.

Keywords*:* *Edible non-timber forest products, Maternal and child diets, Nutritional status*

OPERATIONAL DEFINITIONS OF TERMS

Contribution of edible NTFPs to diets refers to total share/proportion of edible NTFPs consumed compared to food products from domesticated and other food sources.

Dietary Diversity is a qualitative measure of food consumption that reflects household access to variety of foods, and is also a proxy for nutrient adequacy of the diet of individuals (FAO, 2010).

Dietary Intake refers to daily eating patterns of an individual, including specific foods and calories consumed and related quantities.

Diet quality refers to diversified, balanced and healthy diet, which provides energy and all essential nutrients for growth and a healthy and active life.

Edible Non-timber forest products (NTFPs) are forest-based food products that are used for human consumption.

Food Security is when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, 2009).

Household is one or more people living in the same dwelling and also share meals or living accommodation, and may consist of a single family or some other grouping of people. A single dwelling will be considered to contain multiple households if either meals or living space are not shared.

Household Diet Diversity Score is a count of all food groups consumed by one or more members of the household inside of the home.

Household Food Security refers to the ability of households to secure, either from its own production or through purchases, adequate food for meeting the dietary needs of all members of the household (FAO, 2010)

Individual dietary diversity score (IDDS) is a simplified method for assessing the quality of diets, defined as the number of food groups represented in the diet over a period of time.

Nutrition Security means access by all people at all times to the adequate utilization and absorption of nutrients in food, in order to live a healthy and active life.

Nutritional status is the condition of the body in those respects influenced by the diet; the levels of nutrients in the body and the ability of those levels to maintain normal metabolic integrity (National Health Institute, 2017).

Overweight is excessive fat accumulation that may impair healthy.

Rural area is a place that is located outside towns and cities with few or none modern amenities such as tarred roads, piped water or electricity.

Stunting is low height-for-age due to impaired growth and development in children experiencing poor nutrition, repeated infection and inadequate psychosocial stimulation (WHO, 2010).

Underweight refers to an individual having too low weight to be health.

Utilisation refers to the action of making practical and effective use of edible NTFPs in maternal and child diets.

Ward is any of the divisions into which a council area is divided for the purpose of elections administration.

Wasting is low weight for height caused by moderate or severe malnutrition below -2 z-score.

CHAPTER 1: INTRODUCTION

1.1 Background

Non-wood products are derived from forest resources comprising of a broad variety of forest products, collectively described as non-timber forest products (NTFPs). Non-timber forest products have been categorized into four groups: forest-based food products, medicinal plants, woody florals and craft products, and specialty woods (Jimoh, 2006).

Globally, non-timber forest products, often referred to as NTFPs, are an important aspect of forests and forest use in many parts of the world. Pimentel et al. (1997) and FAO (2014) found that the integrity of forests is vital to world food security, mostly because of the dependence of the poor on forest resources. They further stated that NTFPs have also been recognised as an important source for improving household food security, nutrition, health and reduction of poverty in recent years. FAO (2017) during the High Level Panel of Experts (HLPE) conference estimated that 80 percent of the population of the developing world use NTFPs to meet some of their health and nutritional needs and also indicated that the current and potential value of NTFPs for local communities is being utilised in Integrated Conservation and Development Projects (ICDPs).

In Sub-Saharan Africa, forests are considered important for rural livelihoods in most parts as sources of food, medicine, shelter, building materials, fuels, and cash income (Jumbe et al, 2007). Generally, some NTFPs are used for subsistence while others are the main or only source of income. According to Foppes and Ketphanh (2004), NTFPs at subsistence normally address livelihood strategies such as provision of food, securing of health care needs, and concerns to reduce risk factors of being poverty stricken. This means that NTFPs can be directly consumed as food, and also support livelihood by being sold in domestic markets or exported to other markets. Many wild plants and animals provide foods with greater nutrient densities than alternative domesticated

animals and garden foods (FAO, 1996). All these benefits of NTFPs help to increase access to variety of food that improves household diets and nutritional status.

Achieving optimal nutritional status of the Zambian population is one of the priorities of the Zambian government. This has been reflected in the Government's economic development strategies and policies including the development of the National Food and Nutrition Policy (2006) and the National Food and Nutrition Strategic Plans (2011-2015). Chiefly, the government among other activities is promoting utilisation of all available food resources for improvement of nutritional status (NFNC, 2018). The Zambian government has even domesticated and is promoting production and utilisation of edible NTFPs such as mushrooms, honey and fish for household consumption. Some edible NTFPs such as caterpillars and mushrooms are utilised in household diets and their nutrient content have been analysed and documented in the Zambian Food Composition Tables (MoH, 2009). Generally, most edible NTFPs might not be captured in food consumption survey and yet they are rich in nutrients that may alleviate macronutrient and micronutrient deficiencies.

In Zambia, the most commonly extracted and traded NTFPs include roof-thatching materials, wild honey, mushrooms, ants, caterpillars and medicinal plants (Mutamba, 2008). Participation in activities related to NTFPs is more common among rural households. For people living in agricultural based communities, they also utilise aquatic animals and land animals such as fish, birds, rodents and many others as food gathered from the forest. These forest products are important sources of protein as indicated in the Food Composition Tables and are required in the diet. According to Mulenga et al (2011), many households subsist in part by collecting leaves, roots, fruits and nuts from trees and other wild plants, and by hunting wild animals, fish, and insects for consumption. Those people living in and around forest reserves harvest a range of products from forests for sale, trade, or barter, such as wood for timber, fuelwood, roof thatching materials, construction poles, honey, mushroom, caterpillars and medicinal plants. Therefore, forest products are vital in many communities as sources of food.

Zambia is currently overburdened with high prevalence of both undernutrition and over-nutrition i.e. stunting being at 40 percent in children under the age of 5 years and overweight/obesity at 23 percent in women of child bearing age ranging between 15 and 49 years (CSO, 2015). Prolonged food inadequacies and limited food variety in household diets is the main cause of chronic malnutrition (Prendargast and Humphrey, 2014). The most vulnerable groups affected with chronic malnutrition due to inadequate food variety, unavailability and reduced food intake are children under the age of 5 years and the women in the child bearing age (15 to 49 years). This is usually the situation that is faced by people in most rural areas of Zambia.

Lusaka province, like is the case at national level, is equally faced with a triple burden of malnutrition; high levels of stunting, micronutrient deficiencies and overweight/obesity. The province has the prevalence rate of stunting at 36 percent, underweight at 11 percent for children and wasting at 8 percent for women (CSO, 2015) . The figures still indicate a problem as they are above World Health Organisation (WHO) threshold and that a gap still exists to establish the contribution that edible NTFPs play in household diets. It is also a known fact that in Zambia children in rural areas (42%) are more likely to be stunted than those in urban areas (36%) (CSO, 2015).

Therefore, promotion of edible NTFPs in household diets may contribute in addressing the problem of chronic malnutrition among the Zambian population. This study provides findings on the contribution of edible NTFPs to maternal and child diets in rural households of Chongwe District in Lusaka province of Zambia.

1.2 Statement of the Research Problem

In many parts of rural Zambia, forests provide one or more different types of edible NTFPs. A number of indigenous and edible NTFPs were discovered in Chongwe during the 2015 Food Change Lab project (Hivos and IIED, 2015). These edible NTFPs included tubers, bulbs, wild fruits and indigenous vegetables. Though, nutritious these wild foods may be, they are not consumed by the majority of the population as they are considered inferior and unappealing, especially among the younger population (Chilufya, 2016). Despite the district having access to these edible NTFPs, it is not

known whether or not they are used as part of the family diet as there has been no empirical evidence on the contribution of NTFPs to household diets. In addition, most farmers in Chongwe rural communities have concentrated on maize production as the staple crop, and few other crops as supplements, which is likely to contribute to low dietary diversity in the area. Therefore, the local people in rural communities of Chongwe district have limited food variety and inadequate quantities of cultivated food for consumption to meet their food needs all year round (UNDP, 2013). To complement these cultivated food crops to improve food variety and food adequacy in household diets, consideration of edible NTFPs can be an effective means to contribute to dietary diversity and food availability in rural communities.

In Chongwe district, the main economic activity of the rural people is subsistence farming, charcoal burning and hunting of small animals. The indigenous people; the Soli tribe have relinquished much of the district land to the central government where there are resettlement schemes for small scale business farmers. The remaining land is chiefly occupied traditionally by the local people as rural areas of Chongwe district (GRZ, 2017). Given this district scenario, these factors have contributed to limited variety of food and food deficits for maternal and child diets in rural households of Chongwe district. Therefore, this research sought to investigate and identify the available edible NTFPs according to seasonality and their contribution to maternal and child diets in the rural households of Mwalumina and Manyika wards in Chongwe district.

1.3 Justification

NTFPs are particularly important in supporting poor households because of inexpensive extraction technology and ease of access. There have been few studies done on the role of forest products in relation to household diet and nutritional security in Zambia. The study by Mulenga et al (2011) assessed the relationship between NTFPs and income generation in all the ten provinces of Zambia. The results showed that Eastern and Lusaka Provinces had less than the national sample average in terms of the share of households deriving income from NTFPs such as mushroom, ants/caterpillars and

honey from other provinces. In another study on contribution of NTFPs to livelihoods (Muino, 2009), results showed that the contribution of NTFPs to rural household income is basically for providing a safety net during periods of low crop yields. This entails that the consumption of NTFPs among household members is not significant to household income and food security but it plays an important role in poverty reduction. Furthermore, the study indicated that a wide range of wild foods is common in rural areas and used for generating income from sales. However, the study did not focus on the type of NTFPs consumed and their contribution in rural household diets. In addition, there are no studies in the country conducted on the contribution of edible NTFPs to maternal and child diets in rural households. Therefore, this research determined the contribution of non-timber forest products to maternal and child diets in rural households of Chongwe district in Lusaka province, Zambia.

1.4 Main Objective

To explore the contribution of edible non-timber forest products to diets and nutritional status of mother-child dyads in rural households of Chongwe district in Zambia.

1.4.1 Specific Objectives

i. To identify edible NTFPs consumed and their availability by season.
ii. To determine dietary diversity of mother and child diets.
iii. To determine nutritional status of non-pregnant women of child bearing age (15-49 years) and their children aged 6-23 months.
iv. To establish the relationship between consumption of edible NTFPs and nutritional status of mothers and children aged 6-23months.

1.5 Hypotheses

i. Edible NTFPs do not contribute to maternal and child diets in rural households of Chongwe district in Lusaka province of Zambia.
ii. There is no difference in nutritional status in the proportions of mothers and children consuming edible NTFPs and those that do not.

1.6 Significance of the Research

Thousands of children and women suffer from one or more forms of nutrient deficiencies due to several reasons that include inadequate food intake, food deficit and limited food variety. Several strategies have been implemented to alleviate these forms of nutrient deficiencies and still more effort is required to reduce the scourge to acceptable levels. Promotion of adequate food intake and variety is one of the nutrition strategies that are targeted on reduction of micronutrient deficiencies. Edible NTFPs should not be viewed as a remedy for issues related to food security and nutrition however; in some areas they have been perceived not having significant role. They are basically considered as poor people's foods and their reliability remain questionable. Detailed inventories of edible NTFPs exist only for specific areas and the literature is scattered. There is also a wide margin in the documentation of edible NTFPs consumption among mothers and children. Therefore, this research raises awareness among the rural community members in the study areas about the types of edible NTFPs available and their contribution to maternal and child diets. In addition, through interactions during the research data collection, more people are likely to recognize such foods and include them in their normal diets not only in emergencies and lean periods. The study also provides information that can promote edible NTFPs in food diversification in the households of the study area.

Furthermore, the research provides useful information that may be utilized in the development of nutrition programmes for edible NTFPs under relevant implementing ministries such as, Ministry of Agriculture (MoA) and Ministry of Fisheries and Livestock (MFL). The MoA and MFL may develop policies to focus on the utilization of edible NTFPs in the country. Ultimately, through the recognition, accessibility and utilization of edible NTFP's in household diets, there may be reduction in the prevalence of micronutrient and macronutrient deficiencies.

Overall, the study contributes to the body of knowledge on the existing edible NTFPs in Zambia and provides recommendations on the opportunity for other researchers to

investigate nutrient composition of certain edible NTFPs that have not been analysed and included in the Zambian Food Composition Tables.

1.7 Assumptions

It is assumed that household members especially mothers and children in the study site do consume identified edible NTFPs. This is so because NTFPs are perceived as poor people's food and mostly women and children are the most vulnerable and feed on the less valued foods in rural households.

Secondly, it is assumed that all identified edible NTFPs are available within the forest areas near the study sites. The availability of edible NTFPs enhances consumption in the households due to closer proximity of forest for easy accessibility.

1.8 Limitations

In this research the possible limitations with regard to methodology that may have influenced the interpretation of study results is the recall bias. Respondents may not have recalled some of the edible NTFPs consumed which were not on the food list at the time of data collection. The study was also conducted in one season (cool and dry). It is possible that some NTFPs were not available. The cross sectional nature of the study is a limitation as cause-effect relationships between variables cannot be established.

1.9 Organisation of the dissertation

This dissertation is organised in chapters with subheadings focussing on the edible NTFPs consumption in maternal and child diets. Chapter one is an introduction section that provides insights on research topic NTFPs. Chapter two is literature review that surveys relevant sources on similar topic of interest. Chapter three is methodology section that provides explanations on the research design and research process. The fourth chapter is the result section with findings of the research process and analysis of data. A thorough discussion of the findings follows in chapter five. Lastly, chapter six provides concluding statements and recommendations. All parts of the dissertation are included in the table of contents and helps easy navigation of the document.

CHAPTER 2: LITERATURE REVIEW

2.1 Non -timber forest products definition

According to Jimoh (2006), NTFPs are produce or services other than timber that are gathered from the forests. They include edible and non-edible biological materials that may be extracted from natural ecosystems and can be utilized within the household, marketed, or have social cultural or religious significance (Neumann and Hirsch 2000). Forests offer to humans, in addition to timber, many valuable forest products such as food, medicines, construction and decorative materials (Kumar et al, 2014). With the understanding of Jimoh's (2006) definition, NTFPs have been categorized into four groups: 1) forest-based food products for example mushrooms and berries; 2) medicinal plants for example aloe Vera; 3) woody florals for decorative use and craft products; and lastly 4) specialty woods for example vines for wreaths. However, different users define NTFPs differently, depending on their interests and objectives. Therefore, in this research NTFPs are referred to as edible NTFPs classified under forest-based food products for human consumption.

2.2 Global perspective on the utilisation of edible NTFPs

Globally, the status and potential of many NTFPs is not fully understood and appreciated. Not much has been documented on the utilisation of forest products in many countries. According to Banegas **(**2015**)** report released by the International Union of Forest Research Organizations (IUFRO), it states that throughout history, people have always relied with varying degrees on forests and tree-based agricultural systems such as shifting cultivation, agroforestry, and tree crops for food and nutrition. The IUFRO report further stated that even in our increasingly urbanized world, nearly one in six people on our planet depend directly on forests (Banegas, 2015). NTFPs such as wild foods, fuelwood and fodder are essential parts of household diets and livelihood in Zambia (Bwalya, 2004). In some parts of the world, particularly in the tropics, highly developed systems of forest management have been developed and modified over many generations for high production of a variety of forest foods.

With regard to forest management, South Asia countries, particularly India and Nepal, is taking initiatives to conserve and develop NTFPs with the goal of sustaining food security. Also Bangladesh has also placed the importance of NTFPs towards socio-economic development (Mukul et al 2015). The proper utilisation of NTFPs as demonstrated a proper utilisation of NTFPs which ultimately have a bearing on the nutritional status of women and children (Mukul, et al., 2015). Similarly, the rich nutritional benefits of NTFPs can be seen in the former hunter-gatherers groups of Cameroon who became undernourished when they stopped collecting food from the forest (Barry & Hewlett, 2014).. Another instance is the Congo Basin is among the world's major reservoirs of biological diversity and is the home of millions habitants of which the livelihoods of many depends on the forest (FAO, 2013). Therefore, a proper management and utilisation of forest based foods is associated with diets high in protein and energy for adequate supply of nutrients that the body requires (HLPE, 2017). The challenges that most NTFPs are characterized with are limited quantities and seasonal availability problems. Despite the challenges with NTFPs and also agriculture being the major source of food for people around the world, NTFPs complement domesticated agricultural products. Thus, the link between forests and food production and nutrition could be a key to enhance rural household diets (Chauvin, et al 2012).

The UN report (2016) also provides useful insights into how NTFPs respond to elimination of global hunger. Many rural households subsist in part by collecting leaves, roots, fruits and nuts from trees and other wild plants, and by hunting wild animals, fish, and insects for consumption. Millions of people depend on food from forests and domesticated fruits to increase the nutritional quality and diversity of their diets (FAO, 2017).

According to FAO (2017), about 800 million people in the world are food insecure and over a third of humans are affected by micronutrient deficiencies despite advances in agricultural production globally. In particular, deficiencies of iron, vitamin A, iodine and zinc are the most prevalent among women and children. These deficiencies are associated with poor growth and cognitive development in children, and increased mortality and morbidity in both adults and children. Most of the countries with food

insecurity and high prevalence of micronutrient deficiencies are in sub-Saharan Africa. Micronutrient deficiencies occur within the context of inadequate nutrient intake and can be addressed by using food security measures such as utilization of edible NTFPs (FAO, 2017)

Furthermore, its known that forests have been one of the important sources of income for many of the world's poor population (Angelsen *et al*, 2014) and even contributed to diets of people (Jamnadass *et al*, 2011). According to Sharma et al. (2015), the collection of NTFPs by the people living in forest areas was primarily for meeting their household needs. Over time, these NTFPs became a source of income generation due to the rising demand. Most of the rural households and a large proportion of urban households depend on NTFPs to meet some of their nutritional, health, and raw material needs. The income generated from sale of NTFPs can also be used to improve household diets. However, determining exactly how forests contribute to rural household diets and nutritional status has not been fully investigated, hence the focus of this study. It is also necessary to have a full understanding of how edible forest products are currently being utilized in enhancing household diets.

In Zambia, most rural households residing near forests extract a range of forest products for both direct consumption and trade including food products and wood/charcoal for cooking fuel. Forest products are among the sources of household income in some rural areas of Zambia. Households engage in trade of NTFPs because of low capital requirements to start up a business. NTFPs help bridge seasonal gaps in income for many farmers, and they provide a safety net for many rural households during years with low crop yields (Mulenga et al 2012). Studies conducted by Jumbe et al (2007) and Mulenga et al (2011) in Zambia have related NTFPs to income generation and poverty alleviation but with little or no relation to maternal and child diets. These studies on NTFPs focused much on income generation, poverty alleviation and people's socio-economic status. Therefore, the gap still exists in relation to the contribution that edible NTFPs has on maternal and child diets for rural households.

2.3 Utilization of edible NTFPs in rural households

Rural populations of Central Africa have historically practiced self-reliant hunting activities predominantly because bush-meat is an important source of animal protein in their diets. Fish is another major food and economic resource in Central Africa. (FAO, 2017). Gathering of vegetables, fruits, insects and mushrooms also provide food for maternal and child diets particularly at household level. A number of countries have demonstrated the significant role that foods gathered from forests play in most rural communities.

Zambia's agriculture seasons fall broadly into three main periods namely hot-wet (rainy or summer) season running from November to April, then the cool-dry (winter) from May to August and the third is hot-dry running from September to October. Weather patterns among provinces is almost the same, variations may be observed between valley and plateau areas. Farming mainly relies on the rain season which is relatively short and the produce may not meet the demands of households throughout the year. As a result during lean periods, households may use other means of acquiring food of which edible NTFPs may be part of the strategies. Most wild foods extracted in Zambia such as fish, wild fruits, tubers, mushrooms, honey, caterpillars, insects and vegetables are commonly consumed in rural diets and are rich in micronutrients and macronutrients. Most of these edible NTFPs are seasonally available and can be gathered and preserved when in season. Preserved edible NTFPs can be a reliable source of nutrients in the months of the year when they are out of season. Nutrient content of some edible NTFPs have been quantified in the Zambian Food Composition Table document. For instance, dry red-yellow mushrooms *(Chitondo)* are rich in Iron with 58.9mg and baobab fruit contains 284mg of calcium as per 100g (MoH, 2009). Despite this existing literature by MoH (2009), not all NTFPs have been identified according to districts or communities in Zambia and their contribution in household diets. When gatherers collect in excess of what they would consume at household level, the surplus is sold to earn income. The income realised from sale of NTFPs can also be used to purchase other foods and improve household food security among other household needs.

2.4 Dietary diversity food groups for women and children

Dietary diversity is vital to ensure optimal intake of micronutrients and macronutrients among women and children. Less diverse diets are a risk factor for malnutrition among vulnerable groups such as women and children (Mukuka R. M., and Musonda M., 2016). Many women and children in most rural communities consume diets that have limited dietary diversity (Francesco *et al*, 2011). Most diets consumed in food insecure rural communities are low in a number of micronutrients resulting in malnutrition. Various methods have evolved over time to assess dietary diversity and currently the most used is the dietary diversity score (DDS) for women in the reproductive age 15 to 49 years and children aged 6 to 23 months with a reference period of previous 24 hours. Foods for women in the reproductive age group 15 to 49 years have been categorized into ten food groups (FAO and FHI 360, 2016). The minimum dietary diversity for women (MDD-W) is used to reflect the micronutrient adequacy for women's diets in the reproductive age. The ten MDD-W food categorisation are: 1) grains, white roots and tubers and plantains, 2) pulses (beans, peas and lentils), 3) nuts and seeds, 3) dairy, 5) meat, poultry and fish, 6) eggs, 7) dark green leafy vegetables, 8) other vitamin A-rich fruits and vegetables, 9) other vegetables, and 10) other fruits. In addition to the ten food groups, there are six optional and two required categories but these are not part of the indicator calculation (FAO and FHI 360, 2016). Women who consume foods from five or more out of the ten food groups are said to have a diversified diet.

There are seven (7) food groups for children aged 6 to 23 months that are used to determine infant and young child feeding minimum dietary diversity (IYCF-MDD). The dietary diversity score is a diet quality indicator used to assess complementary infant and young child feeding (IYCF) practices among children. The IYCF-MDD food groups include: 1) grains, white roots, and tubers 2) legumes and nuts 3) dairy products 4) flesh foods 5) eggs 6) vitamin-A rich fruits and vegetables and 7) other fruits and vegetables (WHO and UNICEF, 2010). For the child to be said to have a diversified diet, he or she should consume foods from at least four out of seven food groups.

According to ZDHS (CSO, 2015), the national average for minimum dietary diversity among children aged 6 to 23 months is reported to be 22 percent. This shows that there

is room for improvement in order to reduce micronutrient deficiencies among children. However, nutrition approaches that combine NTFPs and agricultural food products to improve diet diversity have been limited in their development and implementation in Zambia. Therefore, introduction of edible NTFPs in household diets will play a major role in diet diversification.

Mother and child dietary diversity scores are based upon the categories of foods consumed both inside and outside the home. Thus, Individual Dietary Diversity Score (IDDS) for mother and child indicates diet quality of that particular household. Therefore, IDDS provides a snapshot of intra-household food security (Kennedy et al., 2010).

2.5 Nutritional status of children and women

According to Zambia Demographic Health Survey of 2013/14, nutrition situation in Zambia is still a public health concern that calls for national strategies to address it. Undernutrition is a common problem in children under the age of five years in Zambia with stunting being at 40 percent, underweight 15 percent, wasting 6 percent, Vitamin A Deficiency 54 percent and Iron Deficiency Anaemia 53 percent (CSO, 2015). However, childhood obesity does not seem to be a problem in Zambia as the levels have remained the same at 1 percent since 1992. Analysis of nutritional status by age groups shows that stunting is highest (54%) in children age 18-23 months and lowest (14%) in children less than 6 months of age (CSO, 2015). The period from 6 to 24 months of age is a stage when children are fed with complementary foods while continuing breastfeeding. This same period is marked with poor growth due to macro- and micronutrient deficiencies. Nutrient deficiency is a major contributor to childhood morbidity and mortality.

In Lusaka province, the prevalence rate of underweight among children under five years of age is at 11 percent, stunting at 36 percent and wasting at 7 percent (CSO, 2016). This clearly indicates that there is a problem as all the rates are above the thresholds set by World Health Organisation (Table 1).

Table 1 shows the thresholds for malnutrition levels according to WHO standards. For instance if prevalence of stunting is above or equal to 40 percent, underweight above or

equal to 30 percent and wasting is above or equal to 15 percent, malnutrition is said to be very high.

Table 1: Classification for assessing severity of malnutrition by prevalence ranges below the age of five years

Indicator	**Severity of malnutrition by prevalence ranges in (%)**			
	Low	Medium	High	Very high
Stunting	<20	20-29	30-39	>=40
Underweight	<10	10-19	20-29	>=30
Wasting	< 5	5-9	10-14	>=15

Source: LCMS report 2010.

Women's nutritional status, as measured by their BMI, has an impact on the level of stunting in their children. The prevalence of overweight or obesity in women aged 15 to 49 years is at 23 percent while underweight is at 10 percent (Feed the Future FEEDBACK, 2013). Nutritional status is the reflection of food availability, distribution, consumption and utilization amongst household members.

Prevalence of overweight or obese women in Lusaka province is at 35 percent and the proportion of women who are undernourished (BMI less than 18.5 kg/m^2) is at 8 percent. Younger women aged 15 to 19 years are most likely to be undernourished (16 %). Rural women are also more likely to be undernourished (12 %) compared to urban women (8 %) (CSO, 2015). Proportion of households who usually have three meals a day in Lusaka province is at 74.1 percent and 6.3 percent have an average of more than three meals per day (CSO, 2016).

2.6 Factors influencing nutritional status

There are several factors that influence nutritional status of an individual. Nutritional status is very important for health, as it is a major determinant of health. It depends on many factors such as biological factors which include age, gender, growth, disease and genetic-makeup. Among non-biological factors, socio-economic status such as poverty is one of the causes of variation in nutrient intake and requirements as well as type and frequency of food taken (Shrivastava, 2014).

A woman's nutritional status has important implications for her health as well as for the health of her children within the household. It is important to ensure that women enter pregnancy with adequate height and weight and free from being anaemic. Maternal education can also influence the nutrition status of both mother and her child. Studies have shown that both in high and low income that women who have attained high level of education tend to have better nutritional status for herself and her child (Makoka, 2013). A combination of nutrition-specific interventions with improved dietary intake and health services of women deserve special attention (Sheila, 2016). Malnutrition in women results in reduced productivity, increased susceptibility to infections, slowed recovery from illness, and a heightened risk of adverse pregnancy outcomes (UNICEF, 2014). For example, a woman with poor nutritional status indicated by a low BMI, short stature, anaemia, or other micronutrient deficiencies, has a greater risk of poor birth outcomes. This is one of the pathways through which the nutritional status of the mother can affect the health of the child (Prendargast and Humphrey, 2014).

The nutritional status of children under five years of age is also an important proxy measure of children's health. Some of the factors that influence the nutritional status include inadequate nutrient intake and infections. The inadequate nutrient intake will result in reduced physical and mental development. Disease affects nutritional status due to the fact that nutrients absorption is impaired and some nutrients are used to fight infections ultimately affecting nutrition status of an individual. Nutritional status is also influenced by household food security which can be improved by gathering of edible NTFPs for household consumption and trade.

2.7 Assessment and classification of nutritional status

The anthropometric data evaluation allows identification of subgroups of the population that are at increased risk of faltered growth, disease, impaired mental development, and death. Nutritional status can be assessed by using anthropometry, biochemical, clinical and dietary data. Dietary and Anthropometric data are commonly used as means of assessing nutritional status in most nutrition researches. Frequency of consumption for

food items is used to estimate dietary diversity while height/length and weight measurements are taken to determine nutritional status of individuals.

According to WHO (2006), weight and height collected on non-pregnant women aged 15 to 49 years can be computed to determine the individual Body Mass Index (BMI) and be interpreted. BMI values below 18.5 kg/m^2 are considered underweight, and those ranging from 18.5 to 24.9 kg/m^2 are considered to be healthy. A BMI value of 25 to 29.9 kg/m^2 is considered overweight, whereas a BMI value of 30 kg/m^2 and above is obese. BMI indicator is age and sex independent and allows one to evaluate if one is at an appropriate weight based on their height and weight. The international classification of adult underweight, overweight and obesity according to BMI is presented in summary in Table 2.

Table 2: BMI cut-offs for adults

Classification	**BMI(kg/m^2) cut-off points**
Underweight	**<18.50**
Severe thinness	<16.00
Moderate thinness	16.00 - 16.99
Mild thinness	17.00 - 18.49
Normal range	**18.50 - 24.99**
Overweight	**≥25.00**
Pre-obese	25.00 - 29.99
Obese	**≥30.00**
Obese class I	30.00 - 34.99
Obese class II	35.00 - 39.99
Obese class III	≥40.00

Source: WHO (2006).

For the children aged 6-23 months, nutritional status can be computed using height-for-age z-score (HAZ) to determine stunting. The HAZ index is an indicator of linear growth retardation and cumulative growth deficits in children. Further, it indicates that children whose HAZ-score is below minus two standard deviations (-2 SD) from the median of the WHO reference population are considered short for their age (stunted), or chronically malnourished. Children who are below minus three standard deviations (-3 SD) from the reference median are considered severely stunted (WHO, 2006).

The weight-for-height z-score (WHZ) index measures body mass in relation to body height or length and describes current nutritional status. WHZ indicates that children with Z-scores below minus two standard deviations (-2 SD) from the reference population median are considered thin (wasted) or acutely malnourished. Children with a WHZ index below minus three standard deviations (-3 SD) from the reference median are considered severely wasted. The WHZ index further provides data on overweight and obesity. Children more than two standard deviations (+2 SD) above the weight-for-height median are considered overweight or obese (WHO, 2006).

Weight-for-age z-score (WAZ) is a composite index of height-for-age and weight-for-height. It takes into account both chronic and acute undernutrition. Children whose weight-for-age is below minus two standard deviations (-2 SD) from the reference population median are classified as underweight. Children whose weight-for-age is below minus three standard deviations (-3 SD) from the reference median are considered severely underweight (CSO, 2015). The three indicators namely HAZ, WHZ and WAZ have been classified according to the level of nutritional status (Table 3).

Table 3: Classification of nutritional status according to Z-scores

Indicator	< -3 SD **(Severe undernutrition)**	< -2 SD **(Moderate)**	-2 to +2 SD **(Normal)**	>+2 SD **(Overweight)**	>+3 SD **(Obese)**
Height-for-age	severely stunted	stunted / chronically malnourished	Normal		
Weight-for-height	severely wasted	wasted / acutely malnourished	Normal	overweight	obese
Weight-for-age	severely underweight	Underweight	Normal	overweight	obese

2.8 Conceptual framework for NTFPs consumption

Figure 1 presents edible NTFPs conceptual framework, originally adapted from UNICEF framework on the causes of child malnutrition and death (UNICEF, 1990). The framework brings out the relationship between the immediate, underlying, and basic determinants of child nutritional status. This research has adapted and modified the UNICEF conceptual framework, which identifies three levels of edible NTFPs contribution to mother and child diets which ultimately affects the nutritional status. The contribution of edible NTFPs to mother and child diets can have an effect on the immediate, underlying and basic causes of malnutrition.

Edible NFTPs can be gathered and be consumed directly within households as part of food and contribute to diets and nutritional status of the women and children. It is also possible for the households to sell the edible NTFPs, assuming part of the money realized is used for purchasing other household foods that could contribute to household food consumption and improve variety for mother and child diets. Edible NTFPs can also be domesticated and the produce harvested be used for home consumption. All the three pathways have contributed to household food accessibility and availability as well as improvement of mother and child diets, and ultimately good nutritional status for all household members. Therefore, this edible NTFPs model is a guide showing the link among the three pathways that contribute to mother and child diets and nutritional status.

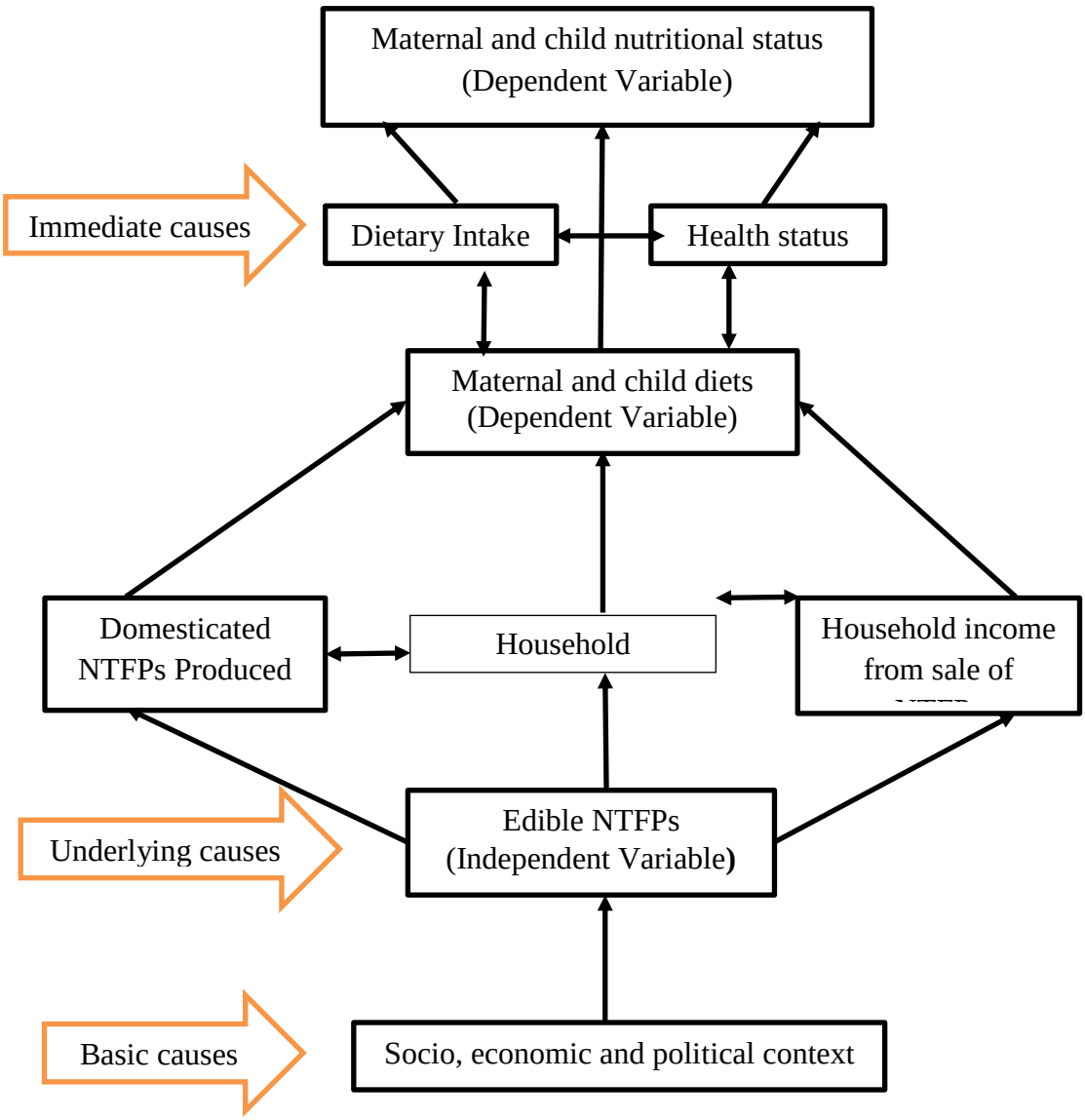

Figure 1: Modified conceptual framework showing associations between edible NTFPs consumption in maternal and child diets and nutritional status.

Source: UNICEF (1990)

2.9 Summary of literature

Forests have been one of the important sources of food and income for many of the world's rural population. However, there is limited information and documentation on the utilisation of edible NTFPs in many countries.

In Zambia, most rural households residing near forests extract a range of forest products for both direct consumption and trade. However, most diets consumed in food insecure rural communities are low in a number of micronutrients resulting in malnutrition. Undernutrition is a common problem in children under the age of five years in Zambia. Therefore, given this scenario on edible NTFPs in Zambia, there is need to identify, determine and establish the association between consumption of edible NTFPs in maternal and child diets and nutritional status in rural households of Mwalumina and Manyika wards in Chongwe district of Lusaka province.

CHAPTER 3: METHODOLOGY

This section presents the research design, sampling technique, data collection and analysis used in this study.

3.1 Research design

The research employed a cross sectional research design which is descriptive in nature. The design combined both qualitative and quantitative methods (mixed methods). The purpose for using the mixed methods is meant to complement explanations and interpretations of results from both qualitative and quantitative data.

3.2 Study site profile

Chongwe district has a tropical savanna climate with three seasons namely; rainy, cold and hot seasons. The district is the home to the Soli people and has one constituency that is divided into 19 wards with the total population of 141,301 people (CSO, 2016). The 19 wards are namely Chalimbana, Chinkuli, Chongwe Central, Kanakantapa, Kapete, Kapwayambale, Kasenga, Katoba, Lukoshi, Lwimba, Madido, Manyika, Mulenje, Mwalumina, Nakatindi, Nchute, Njolwe, Ntandabale and Palabana. Two wards; Mwalumina and Manyika were purposively selected among 19 wards based on their location being rural and are farming communities situated near the forest that borders Chongwe and the newly created district Rufunsa. In addition, most households in the two wards depend on agricultural produce for food. The two study sites Mwalumina and Manyika wards are located adjacent to each other in the southern part of Chongwe district. Mwalumina ward has a population of about 15,129 people while Manyika 10, 617 people. The target population were households with mother/child pair; non-pregnant women aged 15 to 49 years and their children aged 6 to 23 months old.

3.3 Target population

Households on the village register identified with mothers aged 15 to 49 years and their children aged 6 to 23 months were randomly selected. If a household had more than one mother/child pair, only one pair was picked purposively. Thus, the target population

included households with mother/child pair i.e. non-pregnant women aged 15 to 49 years and their children aged 6 to 23 months old.

3.4 Sample size

Using National average indicator for minimum acceptable diet for children aged 6 to 23 months 11 percent (CSO, 2015), the sample size was determined using the following formula:

Sample Size = Z^2 P [(1-P)]/ $(\delta)^2$

Where; 'Z' is confidence level set at 95 percent (1.96 z-score Value)

'P' = the proportion of children aged 6 to 23 months having a minimum acceptable diet at 0.11

'$\boldsymbol{\delta}$' = the margin of error at 95 percent confidence level at 0.05

Sample Size = Z^2 P [(1-P)]/ $(\delta)^2$

Sample Size = $(1.96)^2 \times 0.11$ [(1-0.11)]/ $(0.05)^2$

Sample Size = 150.437 which was rounded off to 150 households

Attrition rate was rated at 5 percent of the sample size (150) to allow for dropouts without affecting the sample size.

Therefore: Attrition rate=5%×150

Attrition Rate=7.5

Sample Size plus attrition at 5%=150 + 7.5

Sample Size plus attrition rate at 5%= 157.5

Sample Size plus attrition rate at 5% =158 households

Therefore, the sample size came to a total of 158 households from both wards; Mwalumina and Manyika. The two wards had similar socioeconomic characteristics; hence the sample was treated as one with equal representation of households from each ward.

3.5 Sampling procedure

A list of households with non-pregnant women of reproductive age 15-49 years and their children aged 6-23 months (mother/child pair) was compiled from the village registers with the help of the village committee members. Households that met the inclusion criteria were clustered according to the villages within the ward. Simple random sampling was applied to select the households from each cluster of villages to arrive at the sample size. To achieve this, households were assigned numbers which were shuffled and picked at random.

3.6 Inclusion and exclusion criteria

- Households with women of child bearing age 15 to 49 years of age and their children aged 6 to 23 months (mother/child pair) were included in the sample population.
- For mothers with twins or more than one child aged 6 to 23months, the youngest child between or among them was chosen and enrolled in the study.
- Participants of the selected households were residents of the study area for a minimum period of three months.
- Selected households that declined to sign the consent form were dropped off the study and replaced with other households on the sampling frame.
- Households that had unforeseen circumstance such as a bereavement during data collection did not take part in the study and were replaced.

3.7 Ethical considerations

The ethical approval from the University of Zambia's Biomedical Research Ethics Committee (UNZABREC) was obtained prior to the commencement of the research

(ethical approval reference number 001-04-18). Informed consents were signed and obtained from mothers enrolled in the research. Mothers who could not read and write, the consent was explained to them and were allowed to thumb stamp on the consent form. The details of the nature and procedures of the research, and associated potential risks and benefits were clearly stated in the information sheet and explained before mothers signed the consent form. This enhanced participation of mothers and made an informed decision.

3.8 Data collection tools and procedures

Focus group discussions and a semi-structured questionnaire were used to collect data. Data was collected in the month of June, 2018 during the cold and dry season (winter).

3.8.1 Qualitative data collection

The focus group discussion (FGD) checklist was used for identification of available edible NTFPs in the study areas. The FGD checklist contained a list of questions to guide the researcher during the discussions for collection of data on edible NTFPs available and consumed in rural households of Mwalumina and Manyika wards.

The three focus groups discussions comprised of eight respondents assembled by purposive sampling to represent the households within the two wards. The focus groups consisted of equal number of participants from the two wards. The selected participants for FGDs were active members in one or more community based groups such as Farmers' club and Cooperatives. Two focus groups were composed of homogeneous gender; that is having one group with males only and the other group with women only. The third group was of mixed gender; that is having a group with an equal number of males and females together. The discussions were held separately for each individual group on the same research objective of identifying edible NTFPs. Following the guide, the researcher prompted participants to respond freely. This facilitated productive discussions and the data obtained on the identified edible NTFPs from these different groups was included in the semi-structured questionnaire. FGDs sessions were conducted in the local language and audiotaped alongside with note taking. Then these

audiotapes were translated and transcribed in English to have a written record of responses on the newly identified edible NTFPs which were then included into the food frequency questionnaire (FFQ).

3.8.2 Quantitative data collection

A semi-structured questionnaire with different sections that included social demographics, anthropometric data, list based 24 hour recall and food frequency section was used for data collection. The socio-demographic section included the names of the village, district and the province, respondent's age, gender and age of the child, age distribution and other socioeconomic characteristics of the household. Anthropometry section involved taking measurements on weight and height/length using standardized techniques for use in determining the nutritional status of the non-pregnant mothers aged 15 to 49 years; and their children aged 6 to 23 months. The Seca 213 portable stadiometer or height board was used to measure the height/length, and Seca digital weighing scale to take weight of children aged 6 to 23months and non-pregnant women of the child bearing age from 15 to 49 years in the selected households. The precision of the digital scales was calibrated to 0.01gram.

The food frequency questionnaire was used to assess the frequency of consumption and seasonal availability of edible NTFPs and other foods consumed by the targeted mother and child in the selected households. A generated list of foods with associated set of frequency-of-use response categories such as once or twice per week/month/year was used to collect dietary data. The edible NTFPs and other foods were grouped according to FAO/WHO categorization of the ten food groups for Minimum Dietary Diversity for Women aged 15 to 49 years (MDD-W), and one optional group on "insects and small animals" was included as the eleventh group. The Infant and Young Child Feeding Minimum Dietary Diversity (IYCF-MDD) was incorporated in the MDD-W. The IYCF-MDD score is a diet quality indicator with seven food groups designed by WHO to assess complementary infant and young child feeding (IYCF) practices among children 6-23 months old. Both indicators; MDD-W and the IYCF-MDD are dichotomous based on the number of food groups consumed on the previous day or

night, and are important dimensions of diet quality in terms of micronutrient adequacy (FAO and FHI 360, 2016). The two indicators (MDD-W and IYCF-MDD) have been made into dichotomous variables representing whether or not women or children have consumed the minimum number of food groups. The minimum number for women is 5 food groups and for children is 4 food groups as defined by FAO and FHI360 (2016) and WHO (2010) food categorisations respectively. The list-based 24 hour recall method was used to gather information on the foods consumed during the previous day and night from each of the food categories. The enumerator read out loud a list of food items for each category in the "food item column" of the questionnaire to the mother who provided a response as either "yes" or "no" for consumption of any food item mentioned in the previous day and night. Food frequency questionnaire assisted in collecting data on dietary patterns of the mother and child dyads in the selected households as well consumption of wild foods when they are out of season.

3.9 Pretesting

Data collection instruments which included focus group discussion guide and semi-structured questionnaire were pre-tested in a different ward (Lwimba) with similar characteristics within Chongwe district. The reason for conducting the pre-test in a different ward was to avoid interviewing the same respondents during actual data collection. Pretesting was conducted from a non-participating ward on 5 percent of the sample size which was 8 households with mother and child dyad. A group of both genders was constituted for FGD. Pre-test was necessary to ensure corrections and adjustment of the tools were done before applied on the targeted population.

3.10 Data analysis

3.10.1 Qualitative data analysis

The generated data on edible NTFPs from FGDs was analysed thematically. Thematic analysis was used to pinpoint the actual name of the identified edible NTFPs and assign each one to an appropriate food group. This thematic analytical approach derived themes from WHO and FAO food categorisation where each edible NTFP identified

was assigned to a specific food group following the physical appearance and the nutrient content of individual edible NTFP. Classification and interpretation of data on identified edible NTFPs was dependent on respondents' contributions and also the researcher's technical knowledge regarding the food groupings. The audiotaped data was translated and transcribed in English to have a written record of responses on the newly identified edible NTFPs which were then included into the food frequency questionnaire (FFQ) as part of the food list.

3.10.2 Quantitative data analysis

3.10.2.1 Descriptive statistics

Statistical Package for Social Sciences (SPSS) for windows version 20 was used to analyse the quantitative data. Descriptive statistics was applied to summarize the data, percentage and means generated for demographic and socioeconomic variables; frequency of consumption of edible NTFPs gathered and their contribution to mother and child diets. Univariate analysis was used to determine the frequency of consumption of individual foods.

3.10.2.1.1 Analysis of dietary data for mother and child

The dietary diversity score was calculated using data from the list based 24 hour recall. The foods were categorized into ten (10) food groups for women of reproductive age (FAO and FHI 360, 2016). The eleventh optional food group for "insects and small animals" was incorporated into "meats, poultry and fish" group at the analysis stage as it contains foods rich in proteins. Each food group was coded; "0" for "no" and "1" for "yes". A score of one (1) was given for each food group consumed. However, there is no additional point received if a different food item from the same food group is consumed. The ten MDD-W food groups were first summed into a score ranging from 0 to 10. The dietary diversity score for each individual woman was calculated. Individual mothers who scored 5 or more met the minimum dietary diversity. Thereafter, the proportion of women who scored 5 or more was determined (FAO and FHI 360, 2016).

The dietary diversity for children was based on the seven food groups. The IYCF-MDD scores were summed up in the range 0 to 7 by WHO/UNICEF, (2010). IYCF-MDD for children was also determined using the recommendation by WHO/UNICEF, 2010. Descriptive statistics were applied to establish proportion of children 6–23 months of age who consumed foods from 4 or more food groups. Thus, dietary information was transformed into Individual Dietary Diversity Score (IDDS) for individual mother and child to indicate diet quality of maternal and child diets.

3.10.2.1.2 Determining the nutritional status of children and women

Anthropometric data for children was analysed using the WHO Anthroplus software and indices generated to determine the nutritional status. The data generated was exported to SPSS for further analysis. Nutritional status was computed using height-for-age z-score (HAZ), weight-for-height z-score (WHZ) according to WHO standards (WHO, 2006). Weight and height measurements for non-pregnant women aged 15 to 49 years were used to determine individual BMI. Thereafter, BMI was interpreted according to WHO categorization of nutritional status.

3.10.2.2 Inferential statistics

Inferential statistics were done at a set confidence level of 95 percent. Chi-square test was used to establish differences in nutritional status for mothers and children in relation to edible NTFPs and other foods consumed. Spearman rho correlation was used to determine the association between edible NTFPs consumption and nutritional status of mother and child. Both descriptive and inferential statistics were presented using graphs and tables.

Binary logistic regression was used to establish the predictors of nutritional status of mothers. The BMI index for nutritional status for mothers was considered a dichotomous variable categorized as either malnourished or well-nourished. In this case, all mothers with BMI from 18.5 to 25 kg/m^2 were considered to be well nourished while those outside this range were considered to be malnourished.

Binary logistic regression was also used to establish the predictors of nutritional status of children. HAZ and WAZ nutritional status indices were converted into dichotomous variables, one (1) for stunting and underweight while zero (0) for not stunted and not wasted. HAZ and WAZ were used because they take into account both chronic and acute undernutrition respectively. Children who were between minus two standard deviation (-2 SD) and plus two standard deviation (+2) were considered normal. Those who were outside this range were considered to be malnourished.

The binary logistic model used was estimated as follows:

$$\ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

where;

- P = probability of being well nourished
- 1- P = probability of being malnourished
- β_0 = the Y-intercept or constant
- β_1, β_2, and β_3 = coefficients estimated
- X_1, X_2 and X_3 = independent (explanatory) variables (diet score, age and household size)
- ε = the error term

The independent variables used in the model included age, household size, expenditure on food, employment of household head, education level of household head, religion of household head, NTFPs consumption and dietary diversity. The identification of the independent variables used in the model is based on what other scholars have found in similar studies (Makoka, 2013); (Prendargast and Humphrey, 2014).

3.10.3 Hypothesis testing

i. Edible NTFPs do not contribute to maternal and child diets in rural households of Chongwe district in Lusaka province of Zambia.

Test of Independence was applied using chi-square test to evaluate whether the variables in a data set were independent. Chi-square test was also applied to test the null hypothesis in order to ascertain the inclusion and appropriateness of edible NTFPs consumption as a categorical or dichotomous variable in the model i.e. edible NTFPs consumed or not consumed in maternal and child diets.

ii. There is no difference in nutritional status in the proportions of mothers and children consuming edible NTFPs and those that do not.

The hypothesis was tested using logistic regression with nutritional status variables (BMI for the mother and WAZ/HAZ for children) categorized as dependent variables. Also frequency of consumption of edible NTFPs proportionally to other foods in the main diet (eaten and not eaten) was categorised as dependent variable. The independent variables included socio-economic demographic variables for maternal and for a child included age, household size, expenditure on food, employment of household head, education level of household head, NTFPs consumption and dietary diversity. The data was summarized by counts in tables 11 and 12.

CHAPTER 4: RESULTS

The main objective of the research work was to establish the contribution of edible non timber products to the diets and nutritional status of mother-child dyads in rural households of Chongwe district in Zambia. This chapter presents the key findings of the study.

4.1 Household socio-economic characteristics

Results on socio-demographic characteristics are presented in Table 4. The sample size was 158 households (Table 4). The mean age for the mothers was 26.51 ± 6.97 years and almost 90 percent (n=142) of the households were male-headed. The mean household size was 6.51± 2.52 and 88 percent (n=139) were male breadwinners regardless of their marital status. About 89 percent (n= 141) of the household heads had either attained the level of grade nine or grade seven or had no formal education. Only 10.8 percent (n=17) of the household heads had either completed secondary school or tertiary education. Results on employment indicate that about 20.3 percent (n=32) of household heads are in formal employment while the rest are either unemployed or self-employed or providing casual labour. About 79 percent (n=125) of households' food expenditure is less than five hundred kwacha (K500) per month, while 21 percent (n=33) of the households spent more than five hundred kwacha (K500) per month of food. About 97 percent (n=154) of the households were christians, while 3 percent (n=4) were non-christians.There were no statistically significant differences in socio-economic characteristics between the two study communities.

Table 4: Socio-demographic characteristics of households

Variable	Ward name			
	Mwalumina (n=79)	**Manyika (n=79)**	**P-value**	**Overall (N=158)**
Child's age in months (mean ± SD)	13.29 ± 5.11	13.48 ± 5.57	0.827	13.39 ± 5.33
Child's gender			0.65	
Female – n (%)	45 (57%)	38 (48.1%)		83 (53%)
Male – n (%)	34 (43%)	41 (51.9%)		75 (47%)
Maternal age in years (mean ± SD)	26.30 ± 6.94	26.72 ± 7.92	0.708	26.51 ± 6.97
Gender of household head (%)			0.114	
Female-headed – n (%)	5 (6.3%)	11(13.9%)		16 (10%)
Male-headed – n (%)	74 (93.7%)	68 (86.1%)		142 (90%)
Household size Mean ± SD	6.29 ± 2.47	6.72 ± 2.57	0.517	6.51 ± 2.52
Breadwinner for household head			0.28	
Female-headed – n (%)	5 (6.3%)	14 (17.7%)		19 (12%)
Male-headed – n (%)	74 (93.7%)	65 (82.3%)		139 (88%)
Employment status of household head			-	
Informal job – n (%)	63 (79.7%)	63 (79.7%)		126 (80%)
Formal job – n (%)	16 (20.3%)	16 (20.3%)		32 (20%)
Education level of household head			0.797	
Not completed secondary education – n (%)	71 (89.9%)	70 (88.6%)		141 (89%)
Completed secondary / tertiary education – n (%)	8 (10.1%)	9 (11.4%)		17 (11%)
Expenditure on food			0.845	
Less than 500 Zambia Kwacha – n (%)	63 (79.7%)	62 (78.5%)		125 (79%)
Greater than 500 Zambia Kwacha – n (%)	16 (20.3%)	17 (21.5%)		33 (21%)
Religious denomination			0.311	
Non-Christians – n (%)	3 (3.8%)	1 (1.8%)		4 (3%)
Christians – n (%)	76 (96.2%)	78 (98.7%)		154 (97%)

4.2 Qualitative data results

Table 5 shows edible NTFPs which were identified and assigned to appropriate food groups based on their physical appearance and the nutrient content of individual edible NTFP as guided by FAO and WHO food categorisation. Most edible NTFPs identified were found to be in the "Other fruits and vegetables" and "small animals and insects" food groups. There was no record of edible NTFPs identified under "dairy and dairy products" food group as well as "pulses" food group. Information obtained from the FGDs indicated that edible NTFPs are not usually fed to children under the age of two years for fear of being choked or developing an allergy. FGDs Respondents also indicated that availability of most edible NTFPs now are limited due to reduced forest area where they naturally grow.

Table 5: Identified edible NTFPs in their appropriate food groups

Ten (10) food groups in the MDD-W	**Seven (7) food groups in the IYCF MDD**	**Edible NTFPs**
1. Grains, white roots and tubers, and plantains	1. Grains, roots and tubers	• Wild Yam (*Bipama*) • *Busala* (*Discorea hirtiflora*)
2. Pulses (beans, peas and lentils) 3 Nuts and seeds	2. Legumes and nuts	• Wild cucumber (*makowa* seed) • *Bitunguswa* or *vitunguza* seed
4. Dairy	3. Dairy products	
5. Meat, poultry and fish	4. Flesh foods (meat, fish, poultry and liver/organ meats)	• Fish (e.g. *Mola / milonge / mulamba*) • Small fish (e.g. *kapenta, Chinsense*) • Wild Game Meat • Wild Birds (e.g. *tubwile*)
6. Eggs	5. Eggs	• Wild water ducks eggs • Wild guinea fowl (kanga) eggs • Wild quail eggs • water monitor eggs
7. Dark green leafy vegetables 8. Other vitamin A-rich fruits and vegetables	6. Vitamin A-rich fruits and vegetables	• *Chabululushi* • *Kalulalula* • *Mpumpule* • *Chabombela* • *Mutiili* • Yellow fruit (Malolo)
9. Other vegetables		• Mushrooms (e.g. *Pampa, Busefwe, Tente, Chitondo*) • Wild delele (*katate, tindingoma, lumanda*)

Ten (10) food groups in the MDD-W		Seven (7) food groups in the IYCF MDD		Edible NTFPs
10	Other fruits	7.	Other fruits and vegetables	• Black jack (*mbwelele or kanunka*) • Baobab Fruit (*mabuyu*) • Figs (*Umukunyu*) • Kiwi fruit • Wild Loquat (*Masuku*) • Wild Bauhinia (*Musekese*) • *Imfungo,* • Mobola Plum (*Impundu or Imbula*) • *Ifikome or Tukoke,* • Wild Apricot (*Amabungo or Imawi or mashimbilili*) • *Amabuyu* • *Tumbulwa* • *Matowa or makole* • Blue *mpande* or *matako four*
	OPTIONAL GROUP			
11	Insects and other small animals	11	Insects and other small animals	• Termites (inshinge) • Beetles (Ubutete) • Caterpillars (Vinkubala or mafulufute) • Grasshoppers (fikobo) • Mice (mbeba or masansa) • Moles(shikatukwe or ifuko) • Guinea pigs (Impanya)

4.3 Quantitative data results

4.3.1 Availability of edible non-timber forest products by season

Table 6 shows information obtained from the food frequency data on proportions of respondents who indicated the availability of edible NTFPs in each season. Wild custard apple (*malolo*) and termites (*inswa*) were reported to be mostly found during the rainy season by approximately 76.6 and 81 percent of mothers respectively. African chewing gum (*matowa*) and monkey fingers (*mucingacinga*) are mostly available in cold and dry season while caterpillars (*ifikobo*) and wild delele (*katate*) are found mostly in hot and dry season. However, some edible NTFPs such as the wild birds and mice (*mbeba*) are available throughout the year. Seasonal products like mushrooms and caterpillars are also available when out of season in dried form. Food frequency questionnaire was used to collect data on foods that were not in season during data collection.

Table 6: Availability by seasons of edible NTFPs

	Availability		
Food Item (English name, local name)	**Hot and wet (%)**	**Cold and Dry (%)**	**Hot and Dry (%)**
Wild yam (*bipama*)	11.4	31.6	46.2
Busala (*Dioscorea hirtiflora*)	9.5	21.5	66.5
Wild birds (different types)	4.4	8.9	81.6
Wild custard apple (*Malolo*)	76.6	12	6.3
Wild delele (*Katate*)	19	12.7	64.6
Monkey fingers (*Mucingacinga*)	20.9	64.6	10.8
Wild loquat (*Masuku*)	70.9	25.9	1.9
Mobola plum (*Imbula*) (*parinari curatellifolia*)	17.7	63.9	4.4
Mushrooms (different types)	62.7	13.3	34.1
African Chewing gum (*Matowa*)	25.9	67.7	2.5
Termites (*Inswa*)	81	5.7	7.6
Caterpillars (*fikobo*)	15.8	8.9	67.1
Grasshoppers	21.5	10.8	60.1
Mice (*mbeba*)	8.9	16.5	56.3

4.3.2 Frequency of consumption of edible NTFPs by mothers and children

Table 7 shows the frequency of consumption of edible NTFPs by mothers and children in the households when available or in season. Results indicate that the most frequently consumed edible NTFPs in the "other vitamin A-rich fruits and vegetables" food group as indicated by majority of respondents is wild custard apple (*malolo*) (63.9%). The other most frequently consumed edible NTFPs are from "other vegetables" food group are mushrooms (*ndelema*) (60.8%), and from the "other fruits" food group is wild loquat (*Imbula*) (57%). The least consumed edible NTFPs include wild birds (64.9%), *Busala* (*dioscorea hirflora*) (58.9%), Baobab (*Mabuyu*) (60.1%), wild bauhimia (*musekese*) (55.1%) and wild yam (*bipama*) 53.8%. However, some edible NTFPs that were consumed in the past ten years as from 2008 by residents in the study site are not currently being consumed, even though the foods are available. Such foods include; *blue-mpande* (other fruits food group) and water monitor eggs (eggs food group).

Table 7: Frequency of consumption for edible NTFPs

NTFPs	**Never**	**Less consumed (*sometimes, once/week & once/week*)**	**Frequently consumed (*2-6 times/week, daily, several/month/year*)**
Wild Yam (*Bipama*)	25.3%	53.8%	20.9%
Busala (*Dioscorea hirtiflora*)	5.1%	58.9%	36.1%
Wild Cucumber (*Makowa Seed*)	50.6%	32.3%	17.1%
West Indian gherkin seed (*Bitunguza Seed*)	49.4%	33.5%	17.1%
Wild Game Meat	21.5%	58.2%	20.3%
Wild Birds	15.2%	64.6%	20.3%
Water Ducks Eggs	91.8%	6.3%	1.9%
Wild Guinea Fowl	54.4%	25.3%	20.3%
Wild Quail Eggs	91.1%	4.4%	4.4%
Water Monitor Eggs	98.7%	1.3%	0%
Wild custard apple (*Malolo*)	11.4%	46.8%	41.8%
Mushrooms (different types)	1.9%	34.2%	63.9%
Wild delele (*Katate*)	5.7%	33.5%	60.8%
Black Jack (*Kanunka*)	39.9%	32.9%	27.2%
West Indian gherkin fruit (*Ifitunguza*)	30.4%	45.6%	24.1%
Baobab (*Mabuyu*)	13.3%	60.1%	26.6%
Bush Figs (M*ukunyu*)	28.5%	50.6%	20.9%
Monkey fingers (*Mucingacinga*)	10.1%	55.1%	34.8%
Wild loquat (*Masuku*)	3.2%	39.9%	57.0%
Wild bauhinia (*Musekese*)	27.2%	55.1%	17.7%
Black plum (*Imfungo*)	60.1%	29.1%	10.8%
Mobola plum (*Imbula*)	23.4%	46.8%	29.7%
Wild orange (*Tukoke)*	80.4%	12.0%	7.6%
Wild apricot (*Amabungo*)	30.4%	43.0%	26.6%
Batoka plum (*Tumbulwa*)	15.8%	55.1%	29.1%
African chewing gum (*Matowa*)	10.1%	56.3%	33.5%
Wild medlar (Blue-mpande)	91.8%	6.3%	1.9%
Termites (*Inswa*)	17.7%	47.5%	34.8%
Beetles	84.8%	12.0%	3.2%
Caterpillars (*mafulufute*)	15.8%	54.4%	29.7%
Grasshoppers (*fikobo*)	25.3%	53.8%	20.9%
Mice (*Imbeba*)	36.1%	31.6%	32.3%
Mole (*Katukwe*)	69.0%	14.6%	16.5%
Others rodents (different types)	73.4%	16.5%	10.1%

4.3.3 Maternal food consumption

Figure 2 shows the proportion of mothers who consumed both agricultural foods and edible NTFPs from each food category in a day. There are ten food categories and one optional food group for "insects and small animals" represented as per FAO 2016 food categorization. When determining the MDD-W and IYCF-MDD, the optional food group of "insects and small animals" was included under "meats, poultry and fish" food group as part of protein rich foods. There was no significant change in terms of proportion of mothers who consumed both agricultural foods and / or edible NTFPs. This is because regardless of the number of food items consumed in one food group the score is one. However, the change can be in terms of variety and quantity of food items consumed. Majority of mothers (98.7%) consumed agricultural foods items from "grains, white roots and tubers, and plantains" food group and about 89.9 percent of mothers consumed agricultural foods from "other vitamin A-rich fruits and vegetables" food group.

Results indicate that there was no record of consumption for edible NTFPs in the "seeds and nuts" and "dairy products" food groups due to non-availability of edible NTFPs identified in the two groups. About 21.5 percent of mothers indicated that they consumed wild fruits such as wild apricot (*mashimbilili*) and monkey fingers (*muchingachinga*) obtained from the "other fruits" group. The "insects and small animals" optional food group also indicated about 19 percent of mothers consumed edible insects and small animalls from this food group such as caterpillars (*vinkubala*), termites (*Inswa*) and mice (*imbeba*). Only 1.3 percent of women consumed edible NTFPs obtained from the "eggs" food group. The edible NTFPs consumed under the "meat, poultry and fish" group included game meat and wild birds.

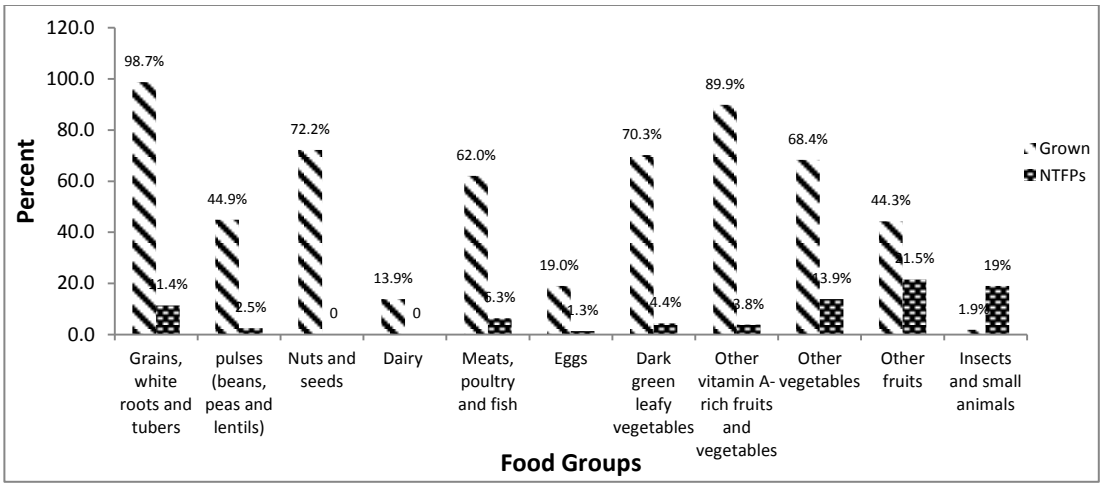

Figure 2: Proportion of maternal consumption of cultivated foods and edible NTFPs in each food group

4.3.4 Dietary diversity for mothers in the study site

Figure 3 shows the proportion of mothers who consumed and those who did not consume edible NTFPs in relation to dietary diversity. About 75.9 percent of the mothers who did not consume edible NTFPs and 71.5 percent who consumed met their MDD-W, respectively.

Chi-square result showed that there was no significant difference in proportion of mothers meeting MDD in Mwalumina and Manyika (*p*-value = 0.136).

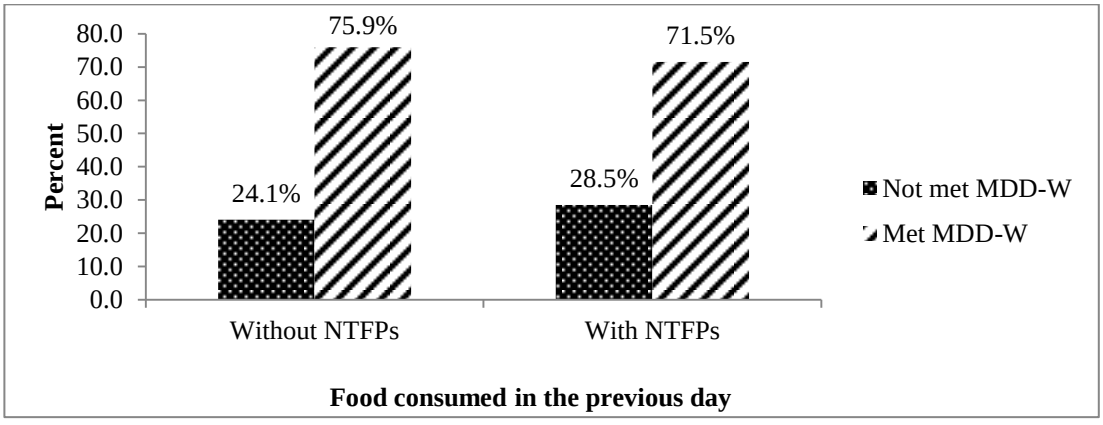

Figure 3: Minimum dietary diversity of mothers who consumed and those who did not consume edible NTFPs.

4.3.5 Children's food consumption

Figure 4 shows the proportion of children who consumed edible NTFPs as well as those who consumed cultivated foods in each food category. About 98.1 percent of the children consumed diets containing cultivated foods from "grains, roots and tubers" group, and about 90 percent from "vitamin A-rich fruits and vegetables" food group. About 20.9 percent of children consumed agricultural produce from "dairy products" food group. .

Only 15.2 percent of children consumed edible NTFPs in the "other fruits and vegetables" food group. Edible NTFPs consumed from "other fruits and vegetables" food group included wild delele (*Katate*), mushrooms (e.g. *ndelema*, *bowa nganda*), monkey fingers (*muchingachinga*), wild loquat (*masuku*) and wild apricot (*mashimbilili*). A smaller proportion of children (0.6%) consumed edible NTFPs from the "legumes and nuts" food group. The edible NTFPs consumed in the "legumes and nuts" food group were mainly the wild cucumber seeds (*makowa seeds*).

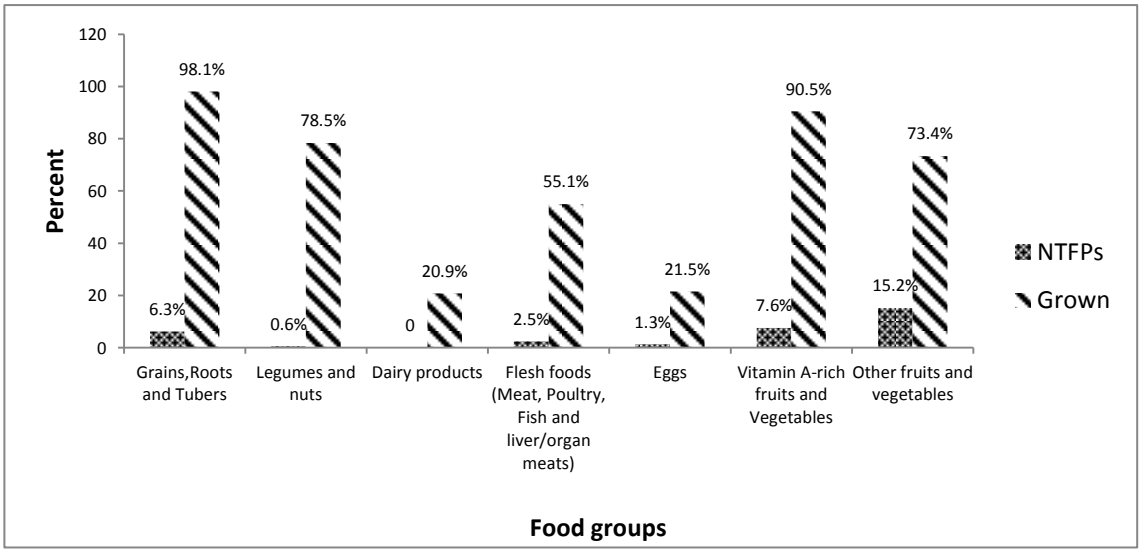

Figure 4: Proportion of children who consumed cultivated foods and edible NTFPs in each food group

4.3.6 Dietary Diversity for children in the study site

Figure 5 shows the proportion of children who consumed and those who did not consume edible NTFPs in relation to dietary diversity. About 96.4 percent of the children who did not consume edible NTFPs and 95.6 percent who consumed met their IYCF-MDD, respectively.

Chi square result showed that there was no significant difference in the proportion of children meeting IYCF-MDD in Mwalumina and Manyika wards (*p*-value = 0.212)

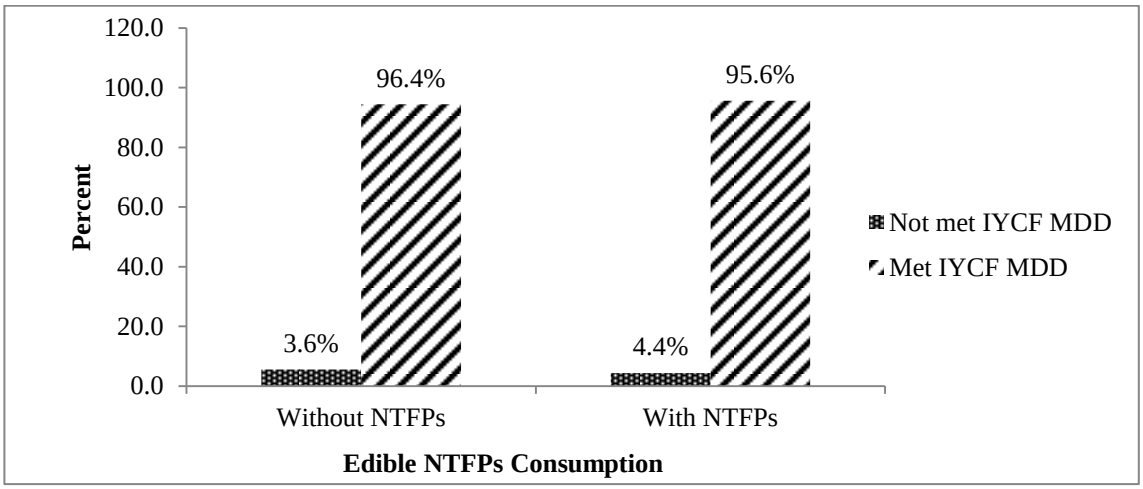

Figure 5: IYCF- Minimum Dietary Diversity of children who consumed and those who did not consume edible NTFPs.

4.3.7 Maternal nutritional status

Table 8 presents findings on nutritional status of the mothers in Mwalumina and Manyika wards. Overall, most women (69.6%) were within the normal BMI range. About a quarter of the women (24.1%) were overweight.

Table 8: Nutritional status of mothers in Mwalumina and Manyika wards

Ward name	Mothers' BMI categorization				Total respondent N(%)
	<18.5 (underweight)	18.5 - 24.9 (Normal)	25 - 29.9 (overweight)	> 30 (Obese)	
Mwalumina (n)	5	56	15	3	79 (50%)
Manyika (n)	1	54	23	1	79(50%)
Total (n/%)	6 (3.8%)	110 (69.6%)	38 (24.1%)	4 (2.5%)	158(100%)

4.3.8 Children's nutritional status

Results in Table 9, indicates that stunting prevalence among children was at 15.8 percent, while wasting was 7 percent. About 6.3 percent and 5.7 percent were underweight and overweight respectively. There were no significant differences in nutritional status between the two wards.

Table 9: Nutritional status of children in Mwalunina and Manyika wards

Category	**Mwalumina**		**Manyika**		**Overall**	
HAZ	**n**	**%**	**n**	**%**	**n**	**%**
Normal	70	88.6	63	79.7	133	84.2
Stunted	0	0	0	0	0	0
Moderate stunted	9	11.4	16	20.3	25	15.8
Severely stunted	0	0	0	0	0	0
Total	**79**	**100**	**79**	**100**	**158**	**100**
WHZ	**n**	**%**	**n**	**%**	**n**	**%**
Normal	66	83.5	72	91.1	138	87.3
Wasted	0	0	0	0	0	0
Moderate wasted	7	8.9	4	5.1	11	7
Severe wasted	0	0	0	0	0	0
Overweight	6	7.6	3	3.8	9	5.7
Total	**79**	**100**	**79**	**100**	**158**	**100**
WAZ	**n**	**%**	**n**	**%**	**n**	**%**
Normal	75	94.9	73	92.4	148	93.7
Underweight	0	0	0	0	0	0
Moderate underweight	4	5.1	6	7.6	10	6.3
Severe underweight	0	0	0	0	0	0
Total	**79**	**100**	**79**	**100**	**158**	**100**

4.3.9 Correlations between edible NTFPs consumption and child's nutritional status (WAZ/HAZ)

Table 10 shows the relationship between consumption of edible NTFPs and children's nutritional status. There was no significant correlation between consumption of edible NTFPs and children's HAZ, (r = -0.079, p = 0.324), as well as WAZ (r = 0.025, p = 0.752).

Table 10: Correlations between children nutritional status (HAZ/WAZ) and edible NTFPs consumption

	Height-for-Age (HAZ)		Weight-for-Age (WAZ)	
Variables	Spearman rho	P-value	Spearman rho	P-value
Edible NTFPs Consumption	-0.079	0.324	0.025	0.752

In Table 11, the proportion of underweight children who consumed as well as those who did not consume edible NTFPs is compared. Pearson chi-square showed no statistically significant difference in child's nutritional status between those who consumed and those who did not consume edible NTFPs (p-value = 0.136).

Table 11: Prevalence of underweight among children who consumed and those who did not consume edible NTFPs

Classification	**Underweight (n)**	**Percent (%)**	**p-value**
Consumed NTFPs	4	5.2	0.136
Not Consumed NTFPs	6	9.5	
Frequency	10	6.3	

4.3.10 Correlation between edible NTFPs consumption and maternal nutritional status (BMI)

Table 12 shows that there was a negative relationship between maternal nutrition status and consumption of edible NTFPs. The relationship was however not statistically significant; BMI, (r = -0.111, p = 0.167).

Table 12: Correlation between maternal nutritional status (BMI) and edible NTFPs consumption

	Body Mass Index (BMI)	
Variables	Spearman rho	P-value
Edible NTFPs Consumption	-0.111	0.167

Table 13 indicates that 11.4 percent of mothers who were malnourished did not consume any edible NTFPs. About 19 percent of the mothers who were malnourished consumed edible NTFPs. Pearson chi-square showed no statistically significant difference in maternal nutritional status between those who consumed and those who did not consume edible NTFPs.

Table 13: Comparison between proportions of malnourished mothers who consumed and those who did not consume edible NTFPs

Classification	Malnourished (n)	Percent (%)	p-value
Consumed NTFPs	31	19.6	0.165
Not Consumed NTFPs	18	11.4	
Total	49	31	
Overall total (N)			158

4.3.11 Predictors of maternal nutritional status

Table 14 shows relationship between nutritional status of the mother and some selected independent variables. Mothers who consumed edible NTFPs were 0.681 times more likely to be well nourished compared to mothers who did not consume edible NTFPs. In addition, results show that there is a significant relationship between nutritional status and maternal age {(*p*-value = 0.04), (C.I.: 0.222 – 0.965), (odds = 0.462)}. The likelihood of a mother being well nourished decreases by 53.8 percent as age increases. However, results for all other predictors in the model are insignificant at p-value of 0.05. Independent variables in the model include employment, education level and religion of household head, child's age, mother's age, household size, expenditure on food, edible NTFPs consumption and dietary diversity.

Table 14: Predictors of maternal nutritional status

Variables	**Exp(B)**	**95% C.I. for EXP(B)**		
		Lower	**Upper**	**Sig.**
Household size	1.052	0.900	1.228	0.525
Maternal age (years)	0.462	0.222	0.965	0.040
Expenditure on food (ZMW)	0.533	0.216	1.320	0.174
Employment of household head	1.112	0.452	2.736	0.817
Education level household head	0.351	0.116	1.059	0.063
Religion household head	2.623	0.333	20.652	0.360
NTFPs consumption	0.681	0.315	1.470	0.328
Dietary diversity for mother	0.867	0.336	2.241	0.769

EXP(B) – odds ratio; C.I. – Confidence Interval

4.3.12 Predictors of stunting in children

Binary logistic regression was used to predict stunting in children using different variables presumed to be associated with nutritional status of a child at household level. There was no variable that was found to be significant predictor of stunting in children at 95 percent C.I. as shown in Table 15.

Table 15: Predictors of stunting in children

		95% C.I.		
Variables	Exp(B)	Lower	Upper	Sig.
Child's age (months)	0.884	0.508	1.541	0.665
Household size	1.06	0.874	1.286	0.551
Mother's age (years)	0.978	0.917	1.043	0.5
Expenditure on food (ZMW)	0.606	0.198	1.855	0.381
Employment of household head	2.064	0.553	7.704	0.281
Education level household head	1.548	0.311	7.699	0.593
NTFPs consumption	1.248	0.447	3.483	0.672
Dietary diversity for child	1.572	0.564	4.377	0.387

EXP(B) – odds ratio; C.I. – Confidence Interval

CHAPTER 5: DISCUSSION

This chapter provides a full discussion of the findings, ensuing from the research objectives. The purpose of the study was to establish the contribution of edible non-timber forest products to diets and nutritional status of mother and child dyads in rural households of Chongwe district in Lusaka province of Zambia.

5.1 Qualitative data Interpretation

In this study, a variety of 35 edible NTFPs were identified but mostly with limited availability due to reduced forest cover where these NTFPs grow naturally as indicated by respondents in FGDs. The most consumed edible NTFPs with high proportion of women (21.5%) were in the "Other fruits" food group and for children (15.2%), in the "Other fruits and vegetables" food group. These food groups comprised of wild fruits and vegetables. This is line with the systematic review findings on wild edible fruits (WEFs) by Sardeshpande and Shackleton, (2019). They found that wild edible fruits (WEFs) are among the most widely consumed NTFPs and important sources of nutrition (Sardeshpande and Shackleton, 2019). Information obtained from the FGDs indicated that edible NTFPs improve household food security through regular consumption of the harvested products as safety nets during periods of agricultural produce scarcity.

5.2 Availability of edible non-timber forest products by season in the study sites

Data from the study area has shown that the two wards have a variety of edible edible NTFPs were available throughout the year either fresh or dried. This finding compares very well with the findings by Msuya et al, (2010) who also found that forest food products were available throughout the year in West Usambara Mountains (WUM) of Tanzania. The availability of edible NTFPs throughout the year does not only guarantee to food security at household level but also contribute to the nutrition status of family members (Msuya et al. 2010). Food and Agricultural Organisation also states that the range of edible NTFPs available throughout the year indicates considerable nutritional importance that might contribute to household food security and nutrition (FAO, 2017). However, increase in abundance of the edible NTFPs is largely

dependent on season and the forest cover around communities. Some edible NTFPs are more abundant in one season and less in the other depending on the quantities preserved during the times of abundance. In this study, findings from the FGDs confirmed that some of the edible NTFPs are rarely found in the area because part of the forest where these edible NTFPs used to grow has been cleared for agricultural production as substantiated with earlier findings of the Seventh National Development Plan 2017-2021 (Ministry of National Planning, 2017). Respondents for FGDs confirmed that part of the forest has been cleared in the study area, and thus there was limited numbers and quantities of some edible NTFPs available due to reduced forest area where they naturally grow.

5.3 Frequency of consumption of edible NTFPs in the study area

Identified edible NTFPs were assigned according to individual food groups except in the two groups; "seeds and nuts", and "dairy and dairy products" were no edible NTFPs identified. In each food category, a number of identified edible NTFPs were consumed by a number of mothers and their children. However, consumption of edible NTFPs is relatively low as indicated by the proportion of mothers and children who consumed edible NTFPs in each food category (Table 6). In addition, frequency of consumption for some edible NTFPs such as wild quail eggs, wild oranges was relatively low.

Edible NTFPs that had a low frequency of consumption of less than twice per week or per month included wild yam (about 53.8% of households) and baobab (60% of households). On the other hand, there were households who consumed more frequently of other edible NTFPs that are preferred and available in the area such as mushrooms (about 64% of households) and wild delele (about 61% of households). The other food groups that were found to be most important and constituting part of the household diets were "other fruits", "other vegetables" and "small animals and insects". These three food groups indicated higher frequency of consumption of food items such as mobola plum (*impundu*), mushrooms (*ubowa*), and caterpillars (*ifishimu*) respectively. Such wild foods are frequently consumed and have also contributed significantly to maternal and child diets, especially during the rainy season

(November-April) when they are available. These foods provide essential proteins, vitamins, and minerals to the households diets (NFNC, 2009).

Respondents emphasized the importance of edible NTFPs, such as mushrooms, caterpillars and wild fruits in their diets. The most widely consumed edible NTFPs were mushrooms, wild delele (*katate*), wild loquat (*masuku*) and wild palm fruits (*malolo*) which are available seasonally. Some of these edible NTFPs such as mushrooms are preserved and consumed during other times of the year when these foods are out of season. The contribution of edible NTFPs to maternal and child diets varied from one household to the other. Religion was key in determining consumption of edible NTFPs. The households who are staunch Seventh Day Adventist tended to consume few of edible NTFPs compared to those who belong to other denominations in the study communities. This is due to their doctrine which does not allow consumption of certain small animals and insects such as mice and caterpillars as reported by women in the focus groups as well as in individual household interviews. The frequency of consumption of edible NTFPs among the households with young mothers was also lower than those with older mothers of above 35years of age due to limited knowledge on certain edible NTFPs. It is important that the traditional uses of edible NTFPs are properly documented and disseminated. The edible NTFPs identified were frequently consumed in varying patterns as daily, 2 to 6 times per week, several times in a month and several months in a year. These varying consumption patterns were grouped into three categories as ‘not consumed’, ‘less consumed’ and ‘frequently consumed’. Therefore, the frequency of consumption patterns of edible NTFPs available in the year reflected their contribution in maternal and child diets.

5.4 Maternal food consumption and dietary diversity in the study area

The majority of mothers (98.7%) consumed cultivated foods and edible NTFPs from “grains, white roots and tubers, and plantains” food group and about 89.9 percent of mothers consumed food items from “other vitamin A-rich fruits and vegetables” food group. The high proportions of women consuming foods from the two mentioned food groups could have been due to food being readily available in the study area. The high

proportion of women consuming food items from "grains, white roots and tubers and plantains" food group is contrary to the findings by Msuya *et al* (2010), who found that consumption of foods in this food group is relatively lower in Tanzania.

This study did not record maternal consumption of edible NTFPs from the "pulses" food group. This could be due to the fact that most foods in this group are not known and unavailable in the study areas for human consumption. Only 19% of the women consumed food from "insects and small animals" food group. Collection of insects and hunting of small animals is a very common practice in most rural areas in Africa as corroborated by Mulenga et al., 2010. Small animals such as mice and insects like caterpillars are usually very good sources of protein in rural households of Manyika and Mwalumina wards. These food sources of protein are cardinal to alleviate rural poverty and micronutrient deficiencies among most rural households who cannot afford other sources of protein as is common in most urban settings. However, on the overall, the proportion of mothers consuming edible NTFPs in this study is relatively low (below 30%); the highest being 22 percent. The low consumption could point to the fact that edible NTFPs are mostly consumed when agricultural foods are scarce and are viewed as inferior food for the poor as also confirmed in a research conducted by Food and Agricultural Organisation (FAO, 2014). Similar findings by Jumbe *et al*., (2007), also confirmed that forest products are an important source of food and income for rural people, and provide safety nets in times of need.

Dietary diversity of mothers in addition to meal frequency plays a very critical role in the nutritional status of mothers. Edible NTFPs usually make a contribution to the diet of mothers in most rural areas world over (Pandey, *et al*., 2016). The lower percentage of women who met the minimum dietary diversity (71.5 percent with NTFPs and 75.9 percent without NTFPs) in the study area was way lower than the average for Luapula and Northern provinces in Zambia that stands at 99 percent (Halimatou, *et al*., 2014).

5.5 Children's food consumption and dietary diversity in the study area

About 98.1 percent of the children consumed diets containing agricultural foods and edible NTFPs from "grains, roots and tubers" food group and about 90.5 percent of children consumed foods from "vitamin A-rich fruits and vegetables" food group. The

high proportion of children consuming foods from these two food groups could be due to foods in the two food groups being readily available. A high proportion of children (over 95%) in the study area met the IYCF-MDD as compared to the national average that stands at 22 percent (CSO, 2015). The majority of households in the study area were able to spend a maximum of K500 per month on food. This is because much of the food consumed was obtained from agricultural produce and partially from edible NTFPs harvested from the forest. These available local foods contributed much to the households having met the MDD regardless of the food procured.

5.6 Maternal nutritional status and its predictors in Mwalumina and Manyika wards

Nutritional status is dependent on the nutritional value of the food consumed and frequency of infections. In Zambia, poverty has continued to be more prevalent among rural than urban residents; 78 percent and 28 percent, respectively (CSO, 2015). Consumption of edible NTFPs in addition to the exotic foods is expected to improve the nutritional status of the women in the study area (Ahenkan & Boon, 2011). Maternal nutritional status is very important among women of reproductive age. This is because poor maternal nutritional status will ultimately affect the offspring in terms of physical and mental development, as well as economic development. Poor nutritional status in new born babies is often linked to undernutrition in pregnant women and malnutrition in women of childbearing age (Francesco, *et al*., 2015). However, there are many other factors that have an impact on maternal nutritional status. This study found that there was a significant relationship between maternal age and maternal nutritional status. This study also established that an increase in maternal age increases the likelihood of being overweight by 2.16 times, regardless of whether they consume edible NTFPs or not. This is because women as they advance in age become less physically active and prone to fat deposition (Makgoba, *et al*., 2011). Nutritional status of mothers was normal mainly due to consumption of agricultural products which were supplemented by edible NTFPs.

5.7 Children's nutritional status and its predictors in Mwalumina and Manyika ward

The prevalence of stunting and underweight in Mwalumina and Manyika ward was 15.8 and 6.3 percent which was below the national average in Zambia that stands at 35 percent and 12 percent respectively (CSO, 2019). The low stunting and underweight rating could be attributed to availability of agricultural produce in the study area. Wasting (7%) was found to be in the medium severity of malnutrition according to WHO classification. Wasting is usually due to acute malnutrition (WHO, 2010). The study did not find any variable that significantly predicted either stunting or wasting in children. The study established that there was no significant relationship between the nutritional status of the children and edible NTFPs. However, this is contrary to the findings in a study done in Ghana that found that there was a relationship between nutritional status and edible NTFPs (Ahenkan & Boon, 2011).

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

There was a wide variety of edible NTFPs consumed by most households in the Manyika and Mwalumina wards. The study revealed that edible NTFPs complement agricultural produce and contribute to household diets, particularly during the lean periods. Meal frequency and dietary diversity were found to be within acceptable limits even with or without edible NTFPs consumption. There were no cases of severe malnutrition in the study area. Some edible NTFPs were available throughout the year, hence helping improve the food security of households in the study area, but not for improvement of dietary diversity or nutritional status of mothers and children. Edible NTFPs were mostly consumed at the time of scarcity of agricultural produce as a coping strategy for food security. Therefore, there was no significant relationship between consumption of edible NTFPs and maternal nutritional status as well as children's nutritional status in the study area.

6.2 Recommendations

My research recommendations include

i. Studies in future should consider investigating on individual quantities of edible NTFPs consumption to establish nutrient intake adequacy.
ii. These research findings have provided an opportunity for future researchers to investigate nutrient composition of certain edible NTFPs identified such as wild yam that have not yet been analysed and incorporated in the Zambian Food Composition Tables.
iii. Future researchers should consider investigating the possibility of domesticating the commonly consumed edible NTFPs in order to enhance availability throughout the seasons.
iv. Key stakeholders should put in place strategies and programmes to promote consumption of edible NTFPs, not only during lean periods but whenever available, in order to improve dietary diversity.

In a nutshell, these recommendations will assist in promoting utilisation of edible NTFPs at household level and contribute to human nutrition and health status.

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APPENDICES

Appendix A: Consent form

The researcher has described to me what is going to be done, the risks, the benefits involved and my rights regarding this study. The study is about "*edible non-timber forest products and their contribution to maternal and child diets in rural households of Chongwe district in Zambia.*" I understand that my decision to participate in this study will not negatively change or harm my usual life. In the use of the information that I will provide on this study, my identity will be undisclosed. I am also aware that I may withdraw my participation in the study at any time if I am not comfortable with the requirements of the researcher. I understand that by signing this form, I do not relinquish any of my legal rights but it is an indication that I have been informed about the study in which I am voluntarily agreeing to participate.

Respondent's Name: ……

Signature or thumb print of participant ……

Date signed (DD/MM/YY)……

Name of witness…….. ……

Signature or thumb print of witness…….

Date signed (DD/MM/YY)……

Researcher's name: Idah Chama.
University of Zambia Box 32379, Lusaka. Phone number: +260 977634856

For further clarification contact, the Chairperson of UNZABREC, Ridgeway Campus, Box 50110, Lusaka or on telephone number +26021126067.

Appendix B: Focus group discussion checklist

No. of Participants: Adult Males: …….. Adult Females ……....

Date of discussion: …….....

District: …… Village: …….

Facilitator's name: ……

1. What are the main sources of food in this community?
2. In this community, who provides food for most households?
3. Where the head of household is a man, what role do women play in determining what foods should be provided in the home?
4. In your opinion, do men and women have different opinions about the type of food to eat in the household?
5. What foods are provided and commonly eaten in the households of this community?
6. What foods are gathered from the forest do households in this community consume?
7. During which season are the mentioned WILD foods available? (Use the seasonal calendar) Draw on the flipchart the seasonal calendar as indicated below. Use the marking key to indicate 1, 2, 3, or 0 as answers

Food Item	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
e.g. Mushrooms	3	3	2	1	1	0	0	0	0	0	1	2

Key: **3 = Excessive; 2 = Enough; 1 = Little; 0 = Not available**

8. Are there any NTFPs available but obtained outside your community, name them?
9. What role do NTFPs play in household diets?
10. What perception do individuals or families have on NTFPs consumption?
11. Any other comments regarding NTFPs in this community?

THANK YOU FOR YOUR PARTICIPATION!

Appendix C: Questionnaire

NB: This questionnaire is meant for a mother in the household aged 15 to 49 years of age who has a child or children aged 6 to 23 months of age at the time of interview.

Date of Interview: …… Household Identification Number…….
Province Name……...District Name…….
Village Name…….
Respondent's age: ……..Date of Birth: ……...
Interviewer's Name…….Interviewer's Phone Number……
Start Time of Interview ……..End Time of Interview…….

Section A: General Respondent's Profile

Indicate the response in form of a number in the spaces provided against each question.

1. Age distribution in the household

Age distribution of the household		Females	Males	Total
1a	How many people live in this house?			
1b	How many children are under the age of two years?			
1c.	How many people are between 2-15 years live in this household?			
1d	How many people are between 15 to 49 years live in this household?			
1e	How many people are above 49 years in this household?			

2. Socio-economic characteristics of the household

Circle the response provided

2a. Who is the head of your household?	1[ ] Father	2[ ] Mother	3[ ] Grandfather	4[ ] Grandmother	5[ ] Uncle	6[ ] Aunt	7[ ] Sister	8[ ] Brother	9[ ] Other family member	10[ ] Other
2b. Who is the breadwinner for your household?	1[ ] Father	2[ ] Mother	3[ ] Grandfather	4[ ] Grandmother	5[ ] Uncle	6[ ] Aunt	7[ ] Sister	8[ ] Brother	9[ ] Other family member	10[ ] Other
2c. What is the highest formal education level of the Household Head (HH)?	1[ ] None	2[ ] Primary School	3[ ] Some secondary school			4[ ] Completed Secondary School	5[ ] Tertiary	6[ ] Other		
2d. What is the employment status of the Household Head (HH)?	1[ ] Unemployed	2[ ] Housewife by choice	3[ ] Self-Employed			4[ ] Wage-Earner	5[ ] Self-employed Professional	6[ ] Casual Labour	7[ ] Other	
2e. What is the average income of this household per month?	1[ ] Too little to estimate	2[ ] Less than K500	3[ ] Between K500 and K1000			4[ ] Between K1000 and K5000	5[ ] Between K5000 and K10000	6[ ] Above K10000	7[ ]	
2f. What is the religion of the Household Head (HH)?	1[ ] None	2[ ] Christianity: Specify: ……	3[ ] Islam			4[ ] Hinduism	5[ ] Non-religious	6[ ] Other		

Section B: Anthropometric measurements

3. Measure height/length and weight for non-pregnant women aged 15 to 49years and their children aged 6 to 23months (mother/child pair) in the selected household.

Instructions:

- Ask for the under-five card to confirm the date of birth for the child.
- If one mother has twins or more than one child aged 6 to 23 months, take the measurements of the youngest child.
- Take each measurement three times and record the average of the three measurements taken on each child and mother respectively.

Woman 1: Age ……..DOB…… Child 1: F/M.. Age ……. DOB…….

Weight1: | | | . | | | kg

Height/ length1: | | | . | | | cm

Weight2: | | | . | | | kg

Height/ Length2: | | | . | | | cm

Section C: Edible NTFPS and other Foods Consumed in Individual Rural Household Diets.

Instructions:

- Indicate the corresponding number i.e. one [1] for "Yes" and Zero [0] for "No" for each food item according to season on the "available" and "Consumed" Column, and a tick on the corresponding answer for the "frequency of consumption" columns.
- Respond to the following questions according to you and your child's food consumption in this home.

4. What types of foods; domesticated or gathered from forest, river and bush are available and/or consumed in this household? Use the food frequency list provided.

No	Food categories	Examples of food items commonly consumed in the study area(s).	Available Yes = 1 No = 0		Consumed Yesterday during the day or at night, did you and your child eat or drink: Yes =1 No = 0			Frequency of Consumption How often do you consume such a food when available? [Tick {√} where applicable]							
			Hot and Wet Season	Cold and Dry Season	Hot and Dry Season	Mother	Child	Never	Once per Week	2-4 Times per week	5-6 Times per week	Daily	Once per Month	Several Times in a month	Several months per year
1	Any foods made from grains, white roots and tubers or other foods made from these starchy foods	**a. Grown**													
		Maize													
		Rice													
		Millet													
		Sorghum													
		Cassava													
		Irish Potatoes													
		White fleshed sweat Potatoes													
		White Yam													
		Bananas													
		Yam *(Chilungwa)*													
		Mutamba or mumbu													
		b. NTFPs (wild)													
		Wild Yam *(Bipama)*													
		Busala (Discorea hirtiflora)													
2	**Any pulses or other legume** products	**a. Grown**													
		Mature fresh beans													
		Common dry beans													
		Lentils													
		Cowpeas													
		Lentil													
		Soya bean													
		b. NTFPs													

No	Food categories	Examples of food items commonly consumed in the study area(s).	Available Yes = 1 No = 0		Consumed Yesterday during the day or at night, did you and your child eat or drink: Yes =1 No = 0			Frequency of Consumption How often do you consume such a food when available? [Tick {√} where applicable]							
			Hot and Wet Season	Cold and Dry Season	Hot and Dry Season	Mother	Child	Never	Once per Week	2-4 Times per week	5-6 Times per week	Daily	Once per Month	Several Times in a month	Several months per year
		(wild)													
3	**Any nuts or seeds** or certain seeds or nut/seed "butters" or pastes	**a. Grown**													
		Groundnut/peanut													
		Bambara nuts													
		Sunflower seed													
		Pumpkin seeds													
		Cotton seed													
		Gourd seed (*Mponda seed)*													
		Cucumber seed *(Bibimbi seed)*													
		b. NTFPs (wild)													
		Wild cucumber *(makowa seed)*													
		Bitunguswa or vitunguza seed													
4	Dairy and Dairy products but NOT including butter, ice cream, cream or sour cream	**a. Reared**													
		Cheese													
		Yoghurt													
		b. NTFPs (wild)													
5	**Any meat, poultry and**	**a. Reared**													
		Liver													

No	Food categories	Examples of food items commonly consumed in the study area(s).	Available Yes = 1 No = 0		Consumed Yesterday during the day or at night, did you and your child eat or drink: Yes =1 No = 0			Frequency of Consumption How often do you consume such a food when available? [Tick {√} where applicable]							
			Hot and Wet Season	Cold and Dry Season	Hot and Dry Season	Mother	Child	Never	Once per Week	2-4 Times per week	5-6 Times per week	Daily	Once per Month	Several Times in a month	Several months per year
	fish whether fresh or dried.	Kidney													
		Heart													
		other organ meats													
		blood-based foods													
		Beef (*nyama*)													
		Pork *(kumba)*													
		Lamb (*mbelele*)													
		Goat (*mbuzi*)													
		Rabbit (*kalulu*)													
		Chicken *(kuku)*													
		Duck *(icibata)*													
		Dove *(Kanga)*													
		Guinea fowls (*kanga*)													
		Quails													
		b. NTFPs (wild)													
		Fish (e.g. *Mola / milonge / mulamba)*													
		Small fish (e.g. kapenta, Chinsense)													
		Wild Game Meat													
		Wild Birds (*tubwile*)													
6	Any Eggs from poultry or any other bird	**a. Reared**													
		Chicken (*kuku*) eggs													
		Ducks eggs													

No	Food categories	Examples of food items commonly consumed in the study area(s).	Available Yes = 1 No = 0		Consumed Yesterday during the day or at night, did you and your child eat or drink: Yes =1 No = 0			Frequency of Consumption How often do you consume such a food when available? [Tick {√} where applicable]							
			Hot and Wet Season	Cold and Dry Season	Hot and Dry Season	Mother	Child	Never	Once per Week	2-4 Times per week	5-6 Times per week	Daily	Once per Month	Several Times in a month	Several months per year
		Guinea fowl (*kanga*) eggs													
		Quail eggs													
		Turkey eggs (*Kalukuluku)*													
		b. NTFPs (wild)													
		Wild water ducks eggs													
		Wild guinea fowl (*kanga*) eggs													
		Wild quail eggs													
		water monitor eggs													
7	**Any dark green leafy**	**a. Grown**													
		cassava leaves													
		bean leaves													
		pumpkin leaves													
		amaranth leaves													
		Green beans													
		Chinese cabbage													
		Cowpea leaves													
		Sweet potato leaves													
		Okra leaves													
		Spinach													
		Rape													
		Kale (*Mpilu*)													
		b. NTFPs (wild *leafy vegetables*)													

No	Food categories	Examples of food items commonly consumed in the study area(s).	Available Yes = 1 No = 0		Consumed Yesterday during the day or at night, did you and your child eat or drink: Yes =1 No = 0			Frequency of Consumption How often do you consume such a food when available? [Tick {√} where applicable]							
			Hot and Wet Season	Cold and Dry Season	Hot and Dry Season	Mother	Child	Never	Once per Week	2-4 Times per week	5-6 Times per week	Daily	Once per Month	Several Times in a month	Several months per year
		Chabululushi													
		Kalulalula													
		Mpumpule													
		Chabombela													
		Mutiili													
8	**Any vegetables or fruits or roots that are yellow or orange-colored inside**	**a. Grown**													
		Pumpkin (*cipushi*)													
		Carrots													
		Squash													
		Orange or dark yellow fleshed sweet potatoes													
		Tomatoes													
		Red pepper													
		ripe mango													
		ripe pawpaw													
		passion fruit													
		red palm fruit													
		b. NTFPs (wild)													
		Yellow fruit *(Malolo)*													
9	Any Other vegetables	**a. Grown**													
		Cabbage													
		Cauliflower													
		Cucumbers													
		Egg plants													
		Green pepper													

No	Food categories	Examples of food items commonly consumed in the study area(s).	Available Yes = 1 No = 0		Consumed Yesterday during the day or at night, did you and your child eat or drink: Yes =1 No = 0			Frequency of Consumption How often do you consume such a food when available? [Tick {√} where applicable]							
			Hot and Wet Season	Cold and Dry Season	Hot and Dry Season	Mother	Child	Never	Once per Week	2-4 Times per week	5-6 Times per week	Daily	Once per Month	Several Times in a month	Several months per year
		Lettuce													
		Onion													
		b. NTFPs (wild)													
		Mushrooms (e.g. *Pampa, Busefwe, Tente, Chitondo*)													
		Wild delele *(katate, tindingoma*)													
		Black jack (*mbwelele or kanunka*)													
10	Any Other fruits	**a. Grown**													
		Avocado													
		Guava													
		Oranges													
		Mandarin Oranges													
		Tangerines													
		Lemon													
		Lime													
		Pineapples													
		Apples													
		Pears													
		Strawberry													
		Coconut fruit													
		Grape fruit													
		Jack fruit													
		Mulberry													

No	Food categories	Examples of food items commonly consumed in the study area(s).	Available Yes = 1 No = 0		Consumed Yesterday during the day or at night, did you and your child eat or drink: Yes =1 No = 0			Frequency of Consumption How often do you consume such a food when available? [Tick {√} where applicable]							
			Hot and Wet Season	Cold and Dry Season	Hot and Dry Season	Mother	Child	Never	Once per Week	2-4 Times per week	5-6 Times per week	Daily	Once per Month	Several Times in a month	Several months per year
		b. NTFPs (wild)													
		Baobab Fruit *(mabuyu)*													
		Figs (*Umukunyu*)													
		Kiwi fruit													
		Wild Loquat (*Masuku)*													
		Wild Bauhinia (Musekese)													
		Imfungo,													
		Mobola Plum *(Impundu or Imbula)*													
		Ifikome or Tukoke,													
		Wild Apricot *(Amabungo or Imawi or mashimbilili)*													
		Amabuyu													
		Tumbulwa													
		Matowa or makole													
		Blue mpande or matako four													
11	Insects and other small animals	**a. Reared**													
		b. NTFPs (wild)													
		Termites (*inshinge*)													
		Beetles (*Ubutete*)													
		Caterpillars													

No	Food categories	Examples of food items commonly consumed in the study area(s).	Available Yes = 1 No = 0		Consumed Yesterday during the day or at night, did you and your child eat or drink: Yes =1 No = 0			Frequency of Consumption How often do you consume such a food when available? [Tick {√} where applicable]							
			Hot and Wet Season	Cold and Dry Season	Hot and Dry Season	Mother	Child	Never	Once per Week	2-4 Times per week	5-6 Times per week	Daily	Once per Month	Several Times in a month	Several months per year
		(Vinkubala or mafulufute)													
		Grasshoppers *(fikobo)*													
		Mice *(mbeba or masansa)*													
		Moles*(shikatuk we or ifuko)*													
		Guinea pigs *(Impanya)*													

Thank you for your participation.

……End Time of interview: ……