[INFLUENCE OF NUTRITION KNOWLEDGE ON DIETARY PATTERNS AND NUTRITIONAL STATUS OF WOMEN OF REPRODUCTIVE AGE IN DEDZA DISTRICT, MALAWI

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DECLARATION

I, ***Margaret Elizabeth Bulirani***, hereby declare that this is my original work and has not been previously in its entirety or in part presented for a degree in any other University to the best of my knowledge.

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DEDICATION

To

The memory of my lovely father, Geoffrey Montfort Bulirani whom I still miss every day. His strong and gentle soul taught me to trust in Jesus, believe in hard work and encouraged me to believe in myself.

My dearest mum Ethel Chikhosi Bulirani

For your prayers and always being there for me.

My Children Ndagha and Martha Anganile Ng'ambi

You are very special to me. Thank you for being patient with mum for the period when she was at school

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ABBREVIATIONS AND ACRONYMS

BHEARD	Borlaug Higher Education for Agricultural Research and Development
BMI	Body Mass Index
CI	Confidence Interval
DHS	Demographic Health Survey
FAO	Food and Agriculture Organization
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune deficiency
IDDs	Individual Dietary Diversity score
IMF	International Monetary Fund
MDHS	Malawi Demographic Health Survey
MK	Malawi Kwacha
MUAC	Mid-Upper Arm Circumference
NGO	Non- Governmental Organization
OR	Odds Ratio
RDA	Recommended Dietary Allowance
SPSS	Statistical Package for Social Science
TA	Traditional Authority
UN	United Nations Women
UNESCO	United Nations Education, Scientific and Cultural Organization
UNICEF	United Nations International Children Education Fund
USAID	United States Agency for International Development
WFP	World Food Programme
WHO	World Health Organization
WRA	Women of Reproductive Age

OPERATIONAL DEFINITION

Anthropometric measurements: Measurement of the human physical body composition weight, height, mid-upper arm circumference that will assist in determining the nutritional status of women of reproductive age.

Body Mass Index (BMI): is used as an indicator for adult nutritional status. It reflects thinness, by measuring weight and height. It is calculated as weight (kg)/height (m^2)**.**

Dietary patterns: are defined as the quantities, proportions, variety or combinations of different foods and beverages in diets, and the frequency with which they are habitually consumed.

Food insecure households refers to the household with 'Yes' response to either of these question 'Worry about not having enough food or unable to eat preferred food.

Food security refers to a situation that exists when the household, at all times, have access to sufficient, safe and nutritious food to meet the needs of an active and healthy life.

Household: Refers to one or more person who lives alone or a group of persons who live in the same dwelling , related or unrelated who share food or make common provisions for food and other essentials for living.

Knowledge practices: These are observable actions of the woman that can affect her nutrition, such as eating, feeding, washing hands, cooking and selecting foods.

Malnutrition refers to a condition of health caused by an imbalance in nutrient intake and characterized by a depletion or excess accumulation of nutritional reserves.

Nutrition knowledge: refers to the ability to say facts and demonstrate a practical understanding of preconception nutrition information by the women of reproductive age.

Nutrition refers to the process by which food is eaten, digested and utilized by the body for production of energy, growth, maintenance and regulation of body functions.

Nutrition Status: Refers to whether or not the woman is underweight (< 18.5kg/m^2), normal (18.5 -24.5 kg/m^2), over weight (25- 29.9 kg/m^2) and obesity(> 30 kg/m^2)

Underweight refers to having body mass index of less than 18.5 kg/m^2

Wealth Index refers to household measure of living standard. The index for the study population was built using household income data. The household were categorised into three categories namely; lower (< $5.00/month), middle (> $5 - $10/month) and high wealth index (> $10).

Women of reproductive age: this study will refer to women aged 15–49 years.

ABSTRACT

Nutrition knowledge plays a key role in choosing diets and contributes to the improvement of dietary habits which in turn, result in improved nutrition status of women of reproductive age (WRA). However, an association between nutrition knowledge, dietary patterns and nutrition status of WRA of Malawi has not been clarified. This study was therefore conducted to assess the association of nutrition knowledge, dietary patterns and nutrition status in order to provide information to policy makers to develop evidence based policies or programmes and add to the limited data. Analytical cross section study designs involving 302 WRA was conducted in Dedza district of Malawi from August to September 2017. A pretested questionnaire was used to collect data. Individual Dietary Diversity score (IDDs) and 24-hour dietary recall are tools that were used to determine dietary patterns. Nutrition status was assessed using Body Mass Index (BMI). Data was analyzed using SPSS and nutrisurvey software. Results showed that older women (33-49 years) were more knowledgeable than young women (15-32 years). WRA from Traditional Authority Chauma had greater nutritional knowledge compared to other TAs. Starchy staples and leafy vegetables was the most identified dietary intake practiced by WRA, with only 15% who consumed fruits. Mean IDDs was 4.4 ± 1.7, while 56.8% of women consumed below the recommended five food groups per day. The diets were inadequate in calcium, vitamin A and deficient in vitamin B12. Nutrition knowledge was significantly associated with dietary patterns with regards to consumption of fruits, eggs and IDDs. The results have also shown that 3%, 19.9% and 6% were underweight, overweight and obese respectively using BM1 cut-off points. Underweight and obesity were more frequent in older women (33 to 49 years) while overweight was common in younger women (15 to 32 years). WRA from all Traditional Authorities were vulnerable to overweight. Bivariate correlation and logistic regression results showed that

morbidity status, wealth index, level of knowledge and assets ownership were significant risk factors associated with nutrition status of the study population. In conclusion, the diets of the WRA in Dedza district are inadequate, poor in quality and do not meet the recommended dietary diversity score. They are influenced by nutrition knowledge with regards to consumption of eggs and fruits. There is undernutrition and overnutrition among WRA in Dedza district, however the prevalence of the latter is higher than the former. Morbidity status, wealth index, level of knowledge and assets ownership are risk factors for nutrition status of WRA in Dedza district. Hence, there is need to promote nutrition education especially on dietary practices, besides empowering women economically. The identified risk factors must be taken into consideration by policy makers when planning, designing, prioritization, targeting and managing of nutrition interventions.

CHAPTER 1: INTRODUCTION

1.1 Background Information

Malnutrition is a broad term that generally refers to undernutrition and overnutrition as well as micronutrient deficiencies (UNICEF, 2006). These aspects of malnutrition are huge burden in developing countries (Müller and Krawinkel, 2005) and over nutrition is growing at an alarming rate in sub- Saharan Africa (Biadgilign et al., 2017). Undernutrition is the condition that occurs when a person is not eating or absorbing enough nutrients to meet body's needs for energy, growth and development (Burgess, 2008), while overnutrition occurs when a person consumes too many calories than physical activity (UNICEF, 2010). Underweight women are at greater risk of experiencing miscarriages, stillbirths, chronic maternal death and illnesses (King, 2016). On the other hand obese women are susceptible to adverse maternal and child health outcomes such as gestational diabetes, neural tube defects and caesarean delivery (Black et al., 2013). Additionally, obesity in women of reproductive age (WRA) raises the risk of overweight or obesity in their children during childhood and primary adulthood (Aviram, Hod and Yogev, 2011) and they are more likely to have cardiovascular diseases and diabetes in later life (Sahoo et al., 2015).

Globally, malnutrition remains a major challenge especially in developing countries (WHO, 2017) and obesity is becoming a worldwide epidemic (Aviram et al., 2011). According to Black et al., (2013) 30 - 40% of WRA in developing countries are overweight or obese while more than 15% of WRA in Africa and Asia are underweight. Anemia is also a problem globally with 32.8% WRA affected. The highest proportions (39%) of these anaemic women live in Sub-Saharan Africa (World Bank, 2016). Anaemia has a negative impact on human health, social and economic development (World Health Organization, 2013).

In Malawi, 7%, 21% and 33% of WRA are underweight, overweight or obese and anaemic, respectively. In Dedza district 25.3% of women (15 – 49 years) are anaemic (MDHS, 2015-16). According to Adamu et al. (2017), high levels of anemia in Malawian women were due to repeated pregnancies and short birth intervals which deplete iron stores, failure to access health services and nutritious food rich in iron such as green vegetables, eggs, liver and fruits containing vitamin C which enhances Iron absorptions. Anemia can result in spontaneous abortions, low birth weight and fetal death (Sifakis and Pharmakides, 2006) hence need to be corrected before and between pregnancies.

Women are the labour bearers in Africa, and yet they have poor diets marked with high consumption of starchy staples accompanied by leafy vegetables combined with limited foods from animal source or fruits. Thereby poor nutritional status is eminent and is likely to be a major contributor to childhood malnutrition and generational cycle of malnutrition leading to poor economic well-being of the country. This study highlighted the risk factors of malnutrition in Dedza District of Malawi in order to bring the issues to the frontline to allow for interventions to prevent adverse maternal and child health outcomes.

1.2 Problem statement

Malawi, like all poor African countries, has women suffering high malnutrition rates (World Bank, 2016). Many interventions and government strategies have been put in place such as Malawi Growth and Development strategy III (MGDS), Iron supplementation, homestead farming, dietary diversification and food fortification yet malnutrition rates among women remain high. In addition, there are very few or no studies that have been put in place to associate the knowledge level, dietary intake and nutrition status of the women of reproductive age. Hence, proper documentation of

nutrition status, nutrition knowledge and dietary patterns among WRA and its associated factors will help policy makers to make informed decision, design and implement appropriate nutrition interventions which can contribute to reduction of high malnutrition level among WRA.

1.3 Justification

There are 38 Non-Governmental Organizations (NGOs) operating in Dedza district (Lunguzi, 2015) and almost half of them are implementing nutrition programmes with an aim of reducing high malnutrition levels (World Health Organization, 2013). Despite all efforts undertaken both by the NGOs and different government sectors (Agriculture, Health, Education and social welfare) to fight malnutrition, the existence of malnutrition among WRA remains relatively unchanged in most parts of the district. In addition, the situation has deteriorated and is the main cause of infant, child and maternal morbidity and mortality.

It is against this background, that this research was conducted in order to assess factors contributing to high levels of WRA malnutrition in Dedza District with the main focus on influence of nutrition knowledge and dietary intake. The results will help women to acquire and improve nutrition knowledge and promote appropriate dietary intake practices. In the long run, there will be a reduction in maternal and child mortality rate hence contributing to the achievement of Malawi Growth Development Strategy III (MDGS) and Sustainable Development Goal (SDG) number three; ensure healthy lives and promote well-being for all at all ages. In addition, the results will help decision makers to make informed decision, programming of relevant intervention such as dietary diversity, nutrition education and better government budgets targeting women.

1.4 Aim of the Study

The aim of this study was to contribute towards Malawi government objective of reducing maternal, infant, young and child mortality rates linked to malnutrition.

1.5 Purpose of the Study

The purpose of the study was to highlight the degree of and factors contributing to high malnutrition levels among WRA, in order to raise awareness especially to women who are in the pre-conception stage.

1.6 Objective

1.6.1 Main Objective

The main objective was to assess nutrition knowledge and dietary intake pattern as determinants of nutritional status of reproductive age in Dedza district, Malawi.

1.6.2 Specific Objectives

1. To describe the demographic and socio-economic profiles of the women of reproductive age in Dedza Malawi.
2. To assess nutrition knowledge of women of reproductive age aged 15 to 49 years and associated risk factors.
3. To determine dietary patterns among women of reproductive age aged 15 to 49 years and associated risk factors.
4. To determine the nutrition status of women of reproductive age aged 15 to 49 years and associated risk factors.

1.7 Hypothesis

1. The older women aged 33-49 years have more nutrition knowledge than young women of 15 to 32years of age.
2. The nutrition knowledge of women of reproductive age is not associated with their nutrition status
3. There is a significant association between nutrition knowledge and dietary patterns of women of reproductive age of Dedza district.
4. There is no significant association between nutrition knowledge, dietary patterns and nutrition status among women of reproductive age in Dedza district.

1.8 Study Challenges

The main challenge was handouts dependency syndrome by most of the study participants. In Malawi, most of its citizen especially the poor have become more reliant than ever before on government/NGOs handouts as a result many respondents were giving false information especially on food consumption during survey with an anticipation of receiving food handouts however numerous efforts were made to minimize this type of error.

1.9 Outline of the Dissertation

The dissertation has four chapters:

- Chapter one presents the general introduction, statement of the problem, justification, objectives, hypothesis, aim and purpose of the study.
- Chapter two presents literature review.
- Chapter three has results on influence of nutrition knowledge on dietary patterns.
- Chapter four is on factors affecting the nutrition status of women of reproductive age.
- Chapter 5, presents a summary of the study and general recommendations.

CHAPTER 2: LITERATURE REVIEW

2.1 Overview of the prevalence of malnutrition among women of reproductive age

Malnutrition is defined as deficiencies, excesses or imbalances consumption of nutrients (WHO, 2017). It causes measurable adverse effects on physical function of the body such as growth, physical work (Puntis, 2010) and clinical outcome which includes compromised immune system, impaired wound healing and deteriorating of muscles (Barker et all, 2011). The major types of malnutrition are; micronutrient deficiency disease and Protein-Energy Malnutrition (PEM). Micronutrient deficiency is lack of vital vitamins and minerals essential for proper growth and development of the body (WHO, 2017) while PEM is a form of malnutrition resulting from insufficient intake of any or all nutrients (Klein, 2012). Micronutrient deficiencies often develop gradually over time, their overwhelming impact not seen until permanent damage has been done (R. Black, 2003).

2.1.2 Factors Contributing to Malnutrition in Reproductive Age Women

There are many factors that contributes to malnutrition in women of reproductive age which includes; poverty, literacy level, inadequate diet and diseases.

2.1.2.1 Poverty

Poverty is another challenge faced by WRA (World Economic Forum, 2013) and is underlying cause of household food insecurity which is a hindrance to both good maternal nutritional status and infant feeding practices (Young et al., 2014). Almost 767 million people of the world's population live on less than US$1.90 a day (World Bank, 2016) and 50% of the extreme poor live in Sub-Saharan Africa. A large proportion of the global poor are women. In 2015, it was estimated more than 18 million women, lived in poverty (UN Women, 2016). In addition to its high incidence of poverty, Sub-Saharan Africa has a significant number of households headed by women (World

Bank, 2016). Generally, female-headed households tend to be poorer (National Women's Law Centre, 2014) than male headed households. Poor women are less likely to access formal education, information on healthy diets and infant care, a diverse variety of affordable, nutritious and safe foods, as well as adequate healthcare and sanitation. Literature has also shown that poverty is the main cause of maternal deaths as it hinders many women from attaining appropriate and suitable medical services due to their incapability to afford good antenatal care (Lanre-Abass, 2008).

2.1.2.2 Literacy level

Illiteracy is a problem throughout Africa, almost 153 million (38%) of African adults are illiterate; two-thirds of these are women (UNESCO, 2017) and Malawi is no exception where illiteracy is also worse among women of 15 years and above (National Statistical Office, 2016). According to UNESCO Institute for Statistics, 2016 the illiteracy rate for women in Malawi is at 41% while in Dedza district is 39.7 % (MDHS, 2015-16). The high illiteracy rate makes it a challenge for women to adopt better lifestyle choices, acquire appropriate skills for preparing balanced meals and able to understand health care issues and follow treatment guidelines (Worsley et all, 2004). In addition, uneducated mothers are more likely to face challenges to access health services that would permit them to come up with a decision about their reproductive health due to financial constraints (WHO, 2001).

2.1.2.3 Diseases

The prevalence of HIV among women has been rising over the past years and is the primary cause of death among WRA(WHO, 2013). Furthermore, it has led to economic burden because of its adverse effects on maternal and children health. Globally in 2015, the population that were

estimated to be living with HIV were 36.7 million people of which 17.8 million were women aged 15 years and above, constituting 51 per cent of all adults living with HIV. The prevalence is worse in sub-Saharan Africa where 56% women are infected (UN Women, 2016). According to UNAIDS 2014, out of the total number of people living with HIV in sub-Saharan Africa 4% are from Malawi. In 2015, almost 980,000 Malawians were HIV positive with high prevalence rate among women between 15 – 64 years to be 12.8% than adult men which was 8.2% (UNAIDS, 2016). Infected women are at a high risk of suffering from non-pregnancy related diseases namely AIDS, pneumonia, and tuberculosis and pregnancy-related sepsis (Moran and Moodley, 2012) which most of the times result in death. Studies have revealed that expectant mothers with higher sensitivities of HIV-related stigma are not likely to deliver in a health facility with a skilled attendant (Turan et al., 2012) hence end up having high maternal and infant mortality rate.

2.4 Preconception nutrition

Preconception care is any intervention given to women of reproductive age, irrespective of pregnancy status or desire, before pregnancy (Salam et all, 2015) to improve health status and minimize health risk factors (Bortolus et al., 2017) that might result in adverse reproductive outcomes (Van Driel et al., 2010). The risk factors includes; miscarriage, premature death of an offspring (stillbirth, neonatal or infant death), fetal growth restriction, birth of an infant with congenital malformation or physical retardation and chronic maternal diseases (King, 2016).

2. 1.2 Health Consequences of Malnutrition in Women

Overweight and obesity is a problem of increasing magnitude both in developed and developing countries. Globally, 300 million women of reproductive age were estimated to have Body Mass Index (BMI) of greater than 25 kg/m^2 (WHO, 2011). The chances of overweight and obese women having preterm births (McDonald et al., 2010) milletius diabetes and cardiovascular disease (Al-

Hakmani et al., 2016) is very high. Conversely, 120 million women in less developed countries are underweight (BMI of less than 18.5 kg/m^2) (Bortolus et al., 2017). These women are at significantly greater risk of having premature, low birth weight newborns if their BMI was less than 18.5kg/m^2 before pregnancy (Han, Crowther and Middleton, 2011). Low birth weight(< 2.5kg), affects greater than 20 million infants globally every year with 18 million (95.6%) of them in less developed countries while in sub-Saharan Africa low birthweight levels is around 15% (UNICEF, 2004) and is the strongest determinant of a child's survival in the first week of life.

According to Alam, (2009) the major determinants of low birth weight are maternal malnutrition prior to and during pregnancy. Low birth-weight infants often suffer from cognitive impairment, poor growth and are greater susceptibility to illness and mortality (Alam, 2009). Preconception weight of a woman has a great effect on birthweight of her child (UNICEF, 2014) hence women of child bearing age needs to have adequate knowledge on the importance of controlling their weight before conception. The problems has not spared Malawi, where number of obese and overweight women has tremendously increased from 10% in 1990 to 21% (MDHS, 2015-16). This means one in every 5 women in Malawi are overweight or obese and 7.2% are thin (MDHS, 2015-16). The increase in obesity is a result of increase in sedentary life styles and high fat diet, eating too much fat (saturated fatty acids), cholesterol, sodium (Meaghan, 2008) and lack of physical activities (Tremblay, 2017).

2.2 Nutrition Knowledge among Women of Reproductive Age

According to Mckinnon, Giskes and Turrell, (2013) nutrition knowledge refers to knowledge of concepts and processes related to nutrition and health including knowledge of diet and disease,

diet and health, foods representing major sources of nutrients, and dietary guidelines and recommendation. Nutrition knowledge is effective in positive behavior change of dietary habits and health quality of WRA (Spronk, Kullen, Burdon and O'Connor, 2014). It enhance dietary intakes by promoting behavioral changes such as food choice and cooking ability (Miller and Cassady, 2015). Nutrition knowledge also plays a key role in communication of nutrition information through labels on packaged foods (Miller and Cassady, 2015). WRA with prior nutrition knowledge are more likely to use label information efficiently, that is, focus on relevant information, comprehend information, and make useful and healthful decisions based on this information (Grunert, Wills and Fernández-Celemín, 2010). Furthermore, literature review have shown a positive associations between nutrition knowledge and dietary intake (Leonard, Chalmers, Collins and Patterson, 2014). Hence WRA needs to be equipped with nutrition knowledge to prevent adverse maternal and child outcomes (Dunneram and Jeewon, 2015)

2.3 Dietary intake practices of women of Reproductive Age

Dietary intake pattern plays a significant role in women of reproductive age health (Bhandari et al., 2016). Poor and inadequate dietary intake pattern in WRA have resulted in micronutrient deficiency especially during pregnancy and lactation (Marangoni et al., 2016). WRA who consume inadequate amount of fruits and vegetables, animal products and fortified foods, are at a greater risk of having micronutrient deficiencies (Huffman, Baker, Shumann and Zehner, 1999). The common and of concern micronutrients deficiencies are folate, calcium, iron, zinc, Vitamin A, B6 and B12 (Gernand et al., 2016). On the other hand, WRA on low carbohydrate and protein diets can be severely malnourished mothers and are at greater risk of child mortality (Black et al., 2013). According to Demissie et al.,(2003), the possible reasons for these micronutrients deficiencies

among WRA are low income level and lack of nutrition knowledge about healthy practices like healthy eating patterns (Bain et al., 2013).

2.3.1 Malawi Dietary Patterns

The Malawian diet is mainly composed of cereals, primarily maize, starchy roots (cassava and potatoes), starchy fruit (plantain) and leafy vegetables. In rare cases fruits complement the diet (FAO, 2010). Literature review has shown that consumption of diet containing high intake of refined carbohydrates is associated with obesity (Paradis et al., 2009) whereas the diets with high consumption of vegetables, fish, milk and milk products and whole grain is associated with lower indices of obesity. Therefore WRA of Malawi are likely to develop diet related diseases.

2.4 Nutrient Requirements for Women of Reproductive Age

WRA are supposed to take the recommended five food groups (FAO, 2014) and 400µg of folic acid supplements per day to prevent micronutrient deficiencies (WHO, 2013) and the risk of neural tube defects in their offspring (Dunneram and Jeewon, 2015). Folic acid can be taken either from food or supplements or a combination of the two (Gironés-Vilaplana et al., 2017). Fruits and vegetables are good sources of and are naturally rich in folates, and some breakfast cereals are enriched with folic acid (Canadian Nutrient File, 2015).

The other vital nutrient that help WRA to have good nutrition status and meet the demands of pregnancy is iron (Mawani and Ali, 2016). Iron deficiency is a major cause of anaemia and the common micronutrient deficiency in both developed and developing countries (Milman, 2011). Globally, anaemia affects 30.2% of the women of reproductive age (WHO, 2008). WRA are at higher risk of becoming anaemic due to menstruation and an increased need for iron during

pregnancy (Bhandari et al, 2016). Women who are anaemic are more prone to fatigue, illnesses, poor mental health and lack of concentration (Mawani and Ali, 2016). Hence iron deficiency need to be addressed to prevent the adverse outcomes. According to Centers for Disease Control and Prevention (CDC, n.d.) Iron deficiency anemia is due to lack of proper diet, poor socioeconomic status, high parity of women, access to poor health and genetic. The recommended hemoglobin level for WRA by WHO is 120 gm/L (Milman, 2011) and women are supposed to take 18mg of iron per day in order to meet this level (Siu, 2015).

2.5 Nutrition Status of Women of Reproductive Age

Malnutrition remains a persistent public health and development challenge in developing countries (WHO, 2017) and WRA are most often affected (Uthman and Aremu, 2008). The degree of malnutrition (<18.5 kg/m^2) among women is between 10% and 40% in most low and middle income countries (Ferede et al., 2017). Adequate nutrition is important for proper health and increased work capacity of women themselves as well as for the health of their offspring (Black, 2003). Poor nutrition status of WRA is an indicative of greater health risk to both the woman and children born to them (Branca, 2015). Previous studies have shown that there is relationship between nutrition knowledge, food intake and nutrition status. According to Laz et al., (2015) an increase in nutrition knowledge among women promotes healthy eating behaviours which in turn contributes to the good nutrition status of the woman. A study done by Valmórbida, et al., (2017) found a significant association between nutrition knowledge and nutrition status of an individual. Furthermore, a study done by Bhandari et al., (2016) has shown that inadequate dietary intake pattern in WRA resulted in the deficiency of essential nutrients. However, O'Brien and Davies, (2007) study found that adequate nutrition knowledge is not the most significant factor of influencing individuals to adopt a healthier diet. This necessitates the need to assess whether

nutrition knowledge and dietary intake patterns are determinants of nutritional status of WRA in Malawi.

2.8 Assessment of Nutrition Status

2.8.1 Anthropometric Measurements

Anthropometry is from a Greek word “anthropo” meaning “human” and “metron” means “measure” (Ulajaszek, 1994). These are measurements of the human figure that are used to determine the shape, mass and structure of the human body (Ulajaszek, 1994). The commonly used methods to collect these dimensions are such as BMI, waist-to-hip ratio, Mid Upper Arm Circumference (MUAC) and skin-folder test. The calculated figures are used to gage wellbeing and nutritional status, illness risk and body composition changes that occur over the adult lifespan Ulajaszek, 1994).

2.5.1.1 Body Mass Index (BMI)

It is a measure of body fat and derived from the weight and height of an individual. BMI is calculated by dividing measured body weight (kilograms) over body height (meters^2). BMI values are also used to categorize subjects as follows; < 18.5 as underweight, 18.5-24.9 as normal or desirable weight, 25.0 - 29.9 as overweight, 30.0 - 34.9 Obese-Class I, 35.0-39.9, obese-Class II, > 40.0 extremely obese (National Institutes of Health, 2016).

2.6.1.2 Mid Upper Arm Circumference (MUAC)

MUAC is the circumference of the right upper arm, measured at the mid-point between the tip of the shoulder and the tip of the elbow (olecranon process and the acromium). It is a useful tool for a fast assessment of the nutritional status and indicator of malnutrition that can be used in WRA

(Velzeboer et al.,1983). The cut off points of MUAC in women is 22cm. Normal MUAC in women is ≥ 22.5cm (Tsai et al., 2010).

2.8.2 Dietary Intake Assessment

2.8.2.1 24- Hour dietary recall

This is method of assessing individuals' nutrient intake in which a person recounts all the foods, beverages and supplements consumed in the past 24 hours (Ma et al., 2009). This type of assessment is vital because it provides information on the frequency and distribution of inadequate diets and/or nutritional status of a population (Deming et all, 2015). It also allows researchers to determine kinds of foods being consumed by individuals in a specific community (Ma et al., 2009). It guides in designing population based interventions targeting the improvement of dietary habits at the community level (Deming et al., 2015). Dietary assessment methodologies are broadly classified into two categories namely; household 24-hour and individual 24-hour dietary assessment. In household or group dietary assessment, food procurement and household inventory method are used while Individual dietary assessment methodologies include 24-hour recall, weighed and estimated food records, the diet history and food frequency questionnaires.

2.5.2.2 Individual Dietary Diversity score(IDDs)

This is the method that is used to measure nutritional quality of an individual's diet. In this method, different food groups consumed are calculated, rather than the number of different foods consumed (FANTA, 2014). The food groups are collected with the dietary diversity questionnaire. The food groups on the questionnaire are described by FAO tool (FAO, 2014). To generate individual dietary diversity score, the foods and drinks that are consumed in the 24-hours prior survey are listed and documented. The number of food groups consumed by the person are calculated and

scored out of 10 food groups then compared to the recommended 5 food groups (FAO/FANTA, 2014)

2.9 Gaps in Knowledge

Nutrition status and dietary patterns of under five children, pregnant and lactating women has been the focus of Malawi and less priority is given to the WRA. In addition, there is an indication that many women of reproductive age are malnourished and have low knowledge on the importance of having good nutrition before conception. Therefore, it is necessary to conduct a research to add on the existing information on WRA and to enhance interventions whose purpose is to improve their nutrition status, dietary patterns and nutrition knowledge.

CHAPTER 3: THE INFLUENCE OF NUTRITION KNOWLEDGE ON DIETARY PATTERNS AMONG WOMEN OF REPRODUCTIVE AGE IN DEDZA, MALAWI

3.1 Abstract

Nutrition knowledge plays a key role in choosing diets and contributes to the improvement of dietary habits which in turn which in turn, result in improved nutrition status of women of reproductive age (WRA). However, an association between nutrition knowledge and dietary patterns of WRA of Malawi has not been clarified. This study was therefore conducted to assess the association of nutrition knowledge on dietary patterns in order to provide information to policy makers to develop evidence based policies or programmes and add to the limited data. Analytical cross section study design was conducted among 302 WRA (15 to 49 years) from end of August to September, 2017. Individual Dietary Diversity score (IDDs) and 24-hour dietary recall are tools that were used to determine dietary patterns. Data was analyzed using SPSS and nutrisurvey software. Results showed that older women (33-49 years) were more knowledgeable than young women (15-32 years). WRA from Traditional Authority Chauma had greater nutritional knowledge compared to other TAs. Starchy staples and leafy vegetables was the most identified dietary intake practice with only 15% who consumed fruits. Mean IDDs was 4.4 ± 1.7, while 56.8% of women consumed below the recommended five food groups per day. The diets were inadequate in calcium, vitamin A and deficient in vitamin B12. Nutrition knowledge was significantly associated with dietary patterns with regards to consumption of roots and tubers, fruits, eggs and IDDs. In conclusion, inadequate nutrition knowledge is major factor that influence the poor dietary habits of WRA in Dedza district. Therefore nutrition education programmes need to be planned for Dedza District.

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3.2 Introduction

Nutrition knowledge is regarded as one of the factors that influence individuals eating behavior (Pirouznia, 2001) and is significantly related with healthy eating (Wardle, Parmenter and Waller, 2000). Furthermore, it encourages consumers to read and understand food labels which in turn assist them to make healthier choices when purchasing food (Baltas, 2001). Hence ensuring that women of reproductive age (WRA) have nutrition knowledge is a pre-requisite of achieving good nutrition status of the women. A study done in Malawi had shown that only 9.3% and 32.2% of the WRA had sufficient knowledge of the Malawian food groups and what comprise a healthy or nutritious diet respectively (Ene-Obong and Amaka, 2015). This is worrisome because poor nutrition knowledge levels have a negative effect on the nutrition status of the women as they do not know about good food sources of different nutrients and health effects of different foods (Ball et al., 2006). Women with poor knowledge are also at a greater risk of giving less consideration to health when making food choices as a result they consume unhealthy diets (Thornton, Olstad, Lamb and Ball, 2016) such as low intake of fruits and vegetables and high intake of fats and refined cereals (Ball et al., 2006).

Healthy diets are vital to good nutrition and healthy life at all stages of life (FAO and World Health Organization, 2004). A healthy diet refers to a diet that provides the body with the nutrients it requires such as fluid, macronutrients, micronutrients and adequate calories for all the systems to function properly (Lean, 2015). According to Baik et al.., (2013), a healthy dietary pattern, contains a variety of different food such as fish, seafood, vegetables, protein foods, fruits, dairy products and grains while an unhealthy dietary pattern comprised of a limited number of food items.. The quality of diet is one of key determinants of nutrition related chronic diseases (WHO, 2014). For example, higher consumption of food rich in energy (fast food and sugar sweetened

beverages) are related to increased risk of overweight, obesity and abdominal adiposity (Nasreddine et al., 2014). It is well documented that individuals with healthy dietary intake are less likely to develop diet related diseases (FAO and World Health Organization, 2004) than individuals without good nutrition are prone to diseases, infections, fatigue and poor performance (Krans, 2016). Inadequate dietary intake is a common cause of micronutrient deficiencies (Shenkin, 2006) and unhealthy dietary habits are major risk factors for chronic diseases such as hypertension, hyperglycemia and high blood pressure, mostly if unhealthy diets were adopted during early years of adulthood (Naja et al., 2013).

Although reports indicated that there is growing number of people understanding the importance of having good nutrition and proper dietary intake in preventing adverse maternal and child health outcomes and rising of non-communicable diseases, there is still majority of reproductive age women who do not consume healthy diets during preconception period. This may result in inappropriate nutrition status that will make them fail to meet the demands of pregnancy without any challenges. Hence, considering that nutrition knowledge has potential of transforming dietary patterns of WRA and bearing in mind that few or no studies have been done on association of nutrition knowledge and dietary patterns of WRA of Malawi. This study was therefore done with the purpose of assessing dietary practices among women of reproductive age in Dedza district of Malawi and examine its associated factors.

3.3 Study Setting and Methodology

3.4.1 Study Setting

The study was conducted in Dedza District which is located around 86km from Lilongwe Capital city of Malawi. The district is found in the central region of the country and rated as the third

largest district in the region. According to Dedza District Social Economic profile 2013-18, the district comprise of 8 Traditional Authorities; Senior Chief Kachindamoto, TA Chilikumwendo, TA Tambala and Sub TA Kamenyagwaza. The Traditional Authorities under study were Kachere, Kasumbu, Chauma and Kaphuka (Figure 3.1). The estimated total population of Dedza is 625,628 people (300,310 males and 225,518 females) and 61,000 households (National statistics of Malawi, 2008).

Figure 3.1: Map of Malawi and a division of Dedza (source: Malawi Atlas)

Dedza has a warm and temperate climate with the average temperature of 18.2 °C and 1041 mm of rainfalls annually. The district receives more rainfall in summer than winter. The major crops grown in the district include maize, sweet potatoes, rice, potatoes, soybeans, cassava, beans, and groundnuts. The fruits that are mostly grown are bananas, citrus fruits, vegetables such as cabbage and leafy vegetables. The livestock that are commonly reared by the farm households in Dedza are; goats, sheep, pigs, rabbits, guinea pigs and poultry (chickens, ducks, turkey, guinea fowl and doves). However the highest proportion of the farm families keep local chicken.

3.4.5 Study Design

The study used analytical cross section design with retrospective component to assess the demographic characteristics, social economic status, nutrition knowledge and dietary patterns of WRA. The data was collected from end of August to September, 2017.

3.4.6 Study Population

The study population consisted of households with WRA (15 to 49 years) within Dedza district.

3.5 Sampling Procedure

3.5.1 Sample Size Determination

Anaemia deficiency statistics for Dedza was used to determine the size of the sample with 25% of WRA suffering from it. The anaemia deficiency rate was selected to come up with a large sample size which can give a true representation of the district as a whole. The overall number of households in the study area is not more than 10,000 hence the sample size was calculated using Fisher's formula (Fisher et al, 1991) as follows;

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

n = desired sample size when population is greater than 10,000

Z = standard normal deviate set at 1.96 corresponding to 95%

P = Prevalence rate of anaemia in women of reproductive age in Dedza (MDHS, 2015-16)

Q= 1-P = 1-0.25= 0.75

d = the degree of accuracy desired at 0.05

Level of significance is 95%

Therefore, $n = \frac{1.96^2 * 0.25 * 0.75}{0.05^2}$

$= 288$

% attrition rate = 0.5 * 288

= 14

Therefore total sample size = 288 + 14

= 302

3.5.2 Sampling Procedure

Dedza district was purposively sampled as a study area because of higher levels of malnutrition and mortality rates. About 25.3% of WRA are anaemic (MDHS 2015-16). The district has 8 Traditional Authorities (TAs). Out these, 4 TAs namely; Chauma, Kachere, Kasumbu and Kaphuka were purposively selected because of high levels of acute malnutrition and easy to reach. A random sampling technique was used to select 3 villages from each selected four TAS. Proportionate sampling was used to allocate number of households to interview per TA and the households in which questionnaire was administered was randomly selected (Figure 3.2). In households where there were more women of reproductive age, one woman was selected randomly. The estimated population size for the traditional authorities Kachere, Kasumbu, Tambala and Chauma are 137097, 71199, 62637 and 20896 respectively. In order to determine the desired number of households from each TA the population proportionate sampling procedure was used and the calculation was done as follows:

n = estimated Population of each TA * Total sample size

The total population size for the three TAs

n= the desired sample size of household per TA

I. Therefore, sample size for Kachere Traditional Authority

$$= \frac{131{,}097 * 302}{356, 970}$$

$$= \mathbf{111}$$

II. The sample size for Kasumbu Traditional Authority

$$= \frac{71{,}199 * 302}{356, 970}$$

$$= \mathbf{60}$$

III. The sample size for Chauma Traditional Authority

$$= \frac{20, 896 * 302}{356, 970}$$

$$= \mathbf{18}$$

IV. The sample size for Kaphuka Traditional Authority

$$= \frac{133, 778 * 302}{356, 970}$$

$$= \mathbf{113}$$

SAMPLING SCHEMA

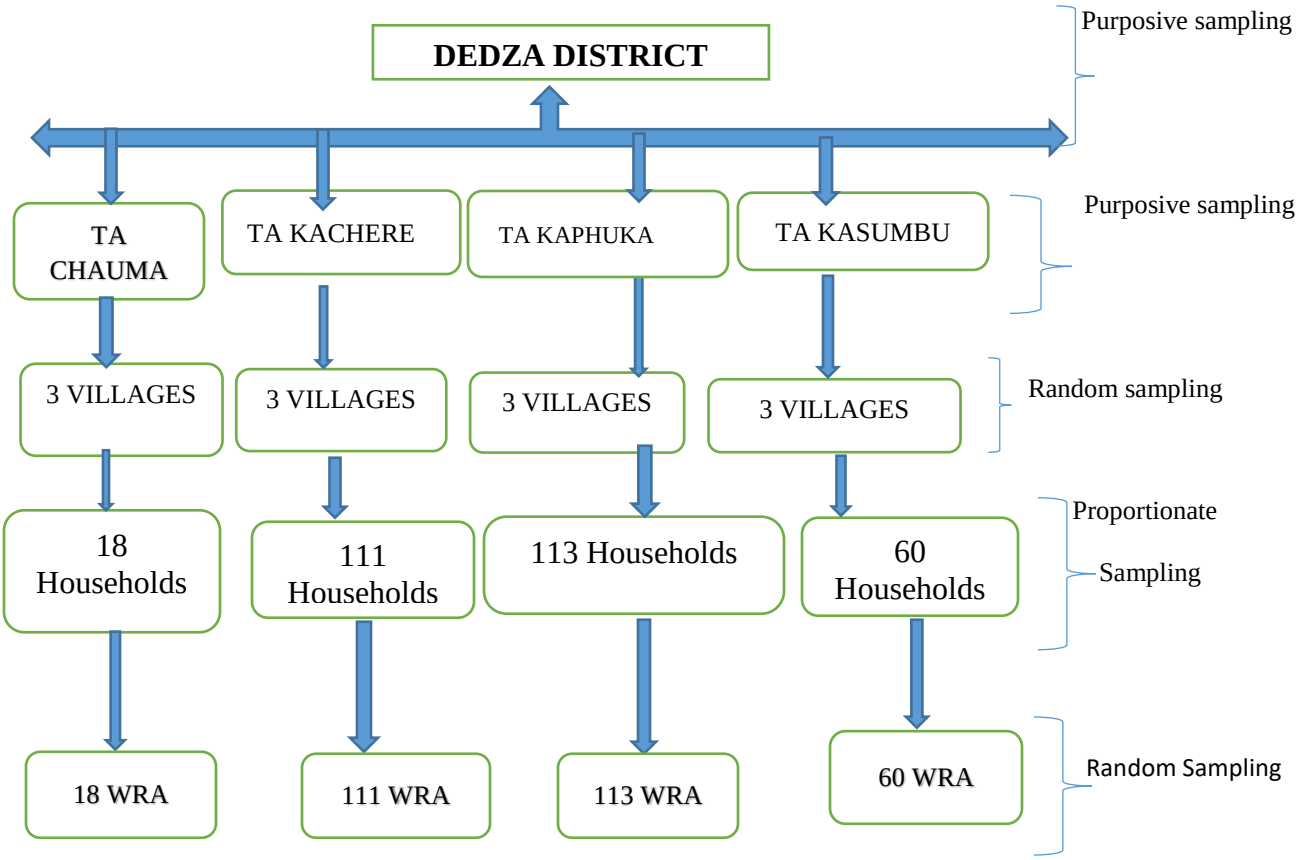

Figure 3.2: Sampling schema

3.5.3 Inclusion Criteria

Women aged 15-49 years who were not pregnant or non-lactating and had not given birth in the past 2 years before the survey living in TA Kachere, Chauma, Kaphuka and Kasumbu. The non-pregnant state among study population was determined by inquiring when they last had their menstrual period.

3.5.4 Exclusion Criteria

Women aged 15 – 49 who were disabled, apparently sick (HIV/AIDS) and those who had missed their menstrual period for the past 1-month.

3.6 Data Collection Tools and Methods

The research used five tools namely questionnaire, kitchen weighing scales, measuring cylinders, Individual Dietary Diversity Score (IDDS) and 24-hour dietary recall (Appendix 1).

3.6.1 Study Questionnaire

Household information on demographic, socioeconomic, nutrition knowledge and dietary patterns of women of reproductive age was collected using a semi-structured questionnaire (Appendix I) developed by the researcher. But before administering the questionnaires, the women were briefed about the objective of the study and their right to participate in the study or not and to withdraw from the study at any stage of the study. Written consent was taken from each study subject. The questionnaire had the questions under the following sections;

3.6.1.1 Socio-demographic characteristics

The section had questions on socio and demographic characteristics such as age, level of education, asset ownership, marital status, morbidity, water and sanitation, food security, household size and source of income.

3.6.2 Nutrition Knowledge

This section consisted of questions intended to assess the source of nutrition information and women understanding on nutrition issues. Assessment of knowledge was based on FAO guidelines on nutrition related Knowledge, Attitude and Practice(KAP) assessment (FAO, 2014). An aggregate score for knowledge was calculated to define the overall score on nutrition knowledge.

3.6.2.1 Nutrition Knowledge Assessment

Level of knowledge was tested using a pretested questionnaire which was developed by the researcher (Appendix I). The knowledge assessment questions were determined by reviewing

studies that conducted research on nutrition knowledge and those that can apply to low income countries. This study used 10 questions to assess WRA nutrition knowledge. The questions were categorised into four sections namely; food and its nutrient content; awareness of diet-disease associations; general questions relating to basics of good nutrition and practices and a last section was on sources of nutrition information. The respondents were assessed based on all three sections. For questions and answers see Appendix II. All question were open ended to give respondents a chance to think of all possible answers. The women were responding according to their knowledge and were graded. The study scoring system was giving a score of 1 to correct answers and a zero to any incorrect or I don't know response. The respondents' answers were marked out of 10 which was the total number of questions. To standardize the results, aggregate score for each respondent was changed to the percentage using the equation below and was used to indicate the level of knowledge of study population.

$$\textbf{Knowledge score (\%)} = \frac{\text{total score of correct answers}}{\text{Total number of questions}} \times 100$$

In order to test knowledge, the scores were graded into low (0 - 40%), median (50 – 70%) and high(80 -100%) but for association of knowledge and social demographic characteristics, the total scores were categorised into good or poor knowledge based on the median score as a cut off points (Bhandari et al., 2016). A score less than the median score was categorised as poor and a score equal to or more than the median score was categorised as good. Associations were considered significant at a value of $p<0.05$

3.6.3 Individual Dietary Intake Assessment

The dietary patterns of the study subjects were determined by Individual Dietary Diversity Score (IDDs) and 24-hour dietary recall.

3.6.3.1 Individual Dietary Diversity Score

To generate individual dietary diversity score, the food groups on the IDDS as described by FAO tool (FAO, 2014) was adopted. The FAO tool has 18 food groups but the researcher modified it by only listing food items that are common and available in Malawi and specifically in Dedza district. This was done in consultation with Dedza District Nutrition Coordination Committee (DNCC) members. Additionally, seasonal food calendar that was developed by the Ministry of Agriculture through the department of nutrition was used to include as much information and enhance its relevance. The listed food groups on are on Appendix 1. The foods and drinks that were consumed in the 24-hours prior survey were listed and documented. The number of food groups consumed by the WRA were calculated by summing up the number of consumed food groups (Appendix I) and scored out of 10 food groups (FAO/FANTA, 2014) then compared to the recommended 5 food groups (IFAD, 2015).

3.6.3.2 24-hour dietary Recall

To measure the quantity of food consumed by the respondents in the past 24 hours, the participating women were asked to mention the kind of foods they had consumed under each food group and how often the food was consumed for the past 24 hours. The weight of the listed food items were estimated using locally available equipment such as pots, cup and plates.

3.7 Ethical Considerations

The study was cleared by District Council Office, the recruited enumerators signed a consent form which had information on legal grounds for undertaking the study. Another consent was obtained from the women of reproductive age who took part in the research.

3.8 Recruitment and Training of Research Assistant

3.8.1 Recruitment

The researcher advertised the post for research assistants in hospitals and agriculture offices that are found in the study area (Appendix III). Those with minimum of two years experience in data collection; and in a possession of diploma or degree in nutrition, public health, social sciences or community development were given priority. Of the applicants, a few were short listed and interviewed. Twelve (7 males and 5 females) applicants were recruited.

3.8.2 Training of Research Assistant

The research assistant were trained for 5 days on the proper use of all research tools and necessary demonstration were given. The training took place during the second week of August at Dedza District Agriculture Development Office. The training content comprised of research objectives, interviewing techniques, proper recording of data, and handling and use of equipment such as height boards, scale and MUAC tapes (Appendix IV).

3.9 Pretesting of Study Tools

The questionnaire was pre-tested on 12 households before commencing actual data collection to ensure familiarization with the questionnaire, equipment, entry into the households, obtaining consent, checking on its validity and find out if it was responding to objectives of the study. The

households for pilot study were not selected from the main study area and the data was not used in the analysis of final study.

3.10 Data Quality Control

To ensure data quality, the researcher developed the following data quality control and assurance plan which was implemented throughout all process from proposal development, data collection, data analysis to report writing.

3.10.1 Questionnaire Development

To ensure that the research used a well-developed questionnaire; the researcher conducted a thorough examination of previous studies and a pre-test before final development of the questionnaire to ensure or test if the desired data will be collected.

3.10.2 Pre-survey measures

1. The researcher employed knowledgeable enumerators which were trained on how to administer the questionnaire.
2. The questionnaire and tools were pre-tested to ensure or test if the desired data will be collected.

3.10.3 Data collection

To ensure that data recorded on the questionnaires by enumerators reflect the actual situation on the ground the following measures took place;

1. The questionnaires were checked if all answers were clearly written and completely filled immediately after coming back from field on daily basis. Where there was anomaly, the responsible enumerator was requested to rectify the identified issue.

2. Re-Calibration of equipment especially scales to check the precision of measurement was done on daily basis by weighing a 1kg packet of sugar.
3. Checking equipment availability and adequacy was done on daily basis to ensure data accuracy.
4. Ensuring privacy and confidentiality
5. The enumerators were supervised by the researcher on daily basis to ensure that they were adhering to research guidelines.

3.10.4 Data Processing

The researcher used field controls whereby only valid values were allowed. In order to avoid use of allowing null (blank) values codes for missing data (e.g., 9 = Missing) were used. Scatter plots, histogram and box plot were used to spot data outliers in fields and overall trends or distribution of the data.

3.11 Data Management and Analysis

3.11.1 Data entry and cleaning

Data entry was done using SPSS computer packages, Microsoft Excel Spreadsheet and Nutri survey software. Entry of data was carried out immediately after data collection, thus first week of October, 2017. Data was cleaned by deleting the records of individual women from the analysis with the following criteria

i. age of less than 15 or greater than 49 years
ii. Age, height and weight were not recorded

Checking of outliers was done by using histogram, scatter plots and box plots. All outliers were excluded from data analysis. But before being excluded, the researcher confirmed whether the entry was correct or typing error.

3.11.2 Data Analysis

A Statistical Package for Social Science (SPSS) software version 20 was used to analyse data and different statistical test was used. Variables that were normally distributed were analyzed using parametric test of independent T-test, while variables that were not normally distributed were analysed using non-parametric test called Chi-square. Chi-square analysis was used to test the association and determine the odds ratio of different variables but in situation where the cell had less than 5 counts then Fischer Exact test was applied. Graphical presentation was done using Excel. Descriptive statistics such as percentages, frequency distribution, mean and standard deviation were used to describe the data.

To determine nutrient adequate of the diet, dietary data was subjected to Nutri Survey software for Windows (2007) to determine dietary energy, macro and micro nutrient intake and analyzed using SPSS version 20 where descriptive statistics such as means, frequencies and percentages were generated. Student's t- test was used to compare dietary energy and nutrient intakes with the Recommended Dietary Allowance (RDA) intakes for the women of reproductive age.

3.12 Results

3.12.1 Social economic and demographic profile of the study population

3.12.1.1 Population Age

The study population from Dedza district, comprised of 302 women of reproductive age (15 to 49 years), 5.9% from Traditional Authority Chauma, 36.8% Kachere, 37.4% Kaphuka and 19.9% Kasumbu. The response rate was 100%. The women were categorized into young (aged 15 to 32 years) and older (aged 33 to 49 years) groups. These cut off points were based on Malawian national youth policy (Republic of Malawi National youth policy, 2013) where youth is defined as

any person in the age bracket of 15 to 35 years. The population age was regrouped into 5-year age groups. The age range of five groups was chosen basically for comparison with MDHS data. About 60.3% of the women were aged 15 to 32 years. The largest proportion of the study population is within the youngest age group of 15 to 19 years (21.9%) and the lowest was women aged 40 to 44years (8.6%). The youngest woman being 15 years and the oldest was 49 years. The average age group was 29.5 ± 9.8 years (Figure 3.3).

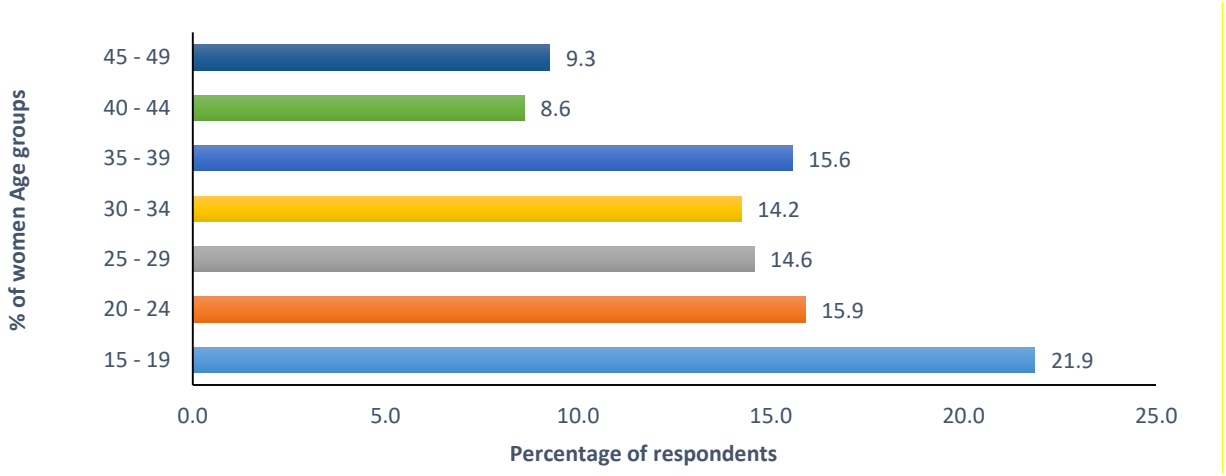

Figure 3.3: Distribution of respondents by age groups

3.12.1.2 Marital Status

The majority of the respondents 176 (58.3%) were married, 25.8% were single while 12% were either separated or divorced (Figure 3.4). Contrary to what was expected there was low rates of childhood marriages with only 13.6% of the younger age (15-19 years) in marriage.

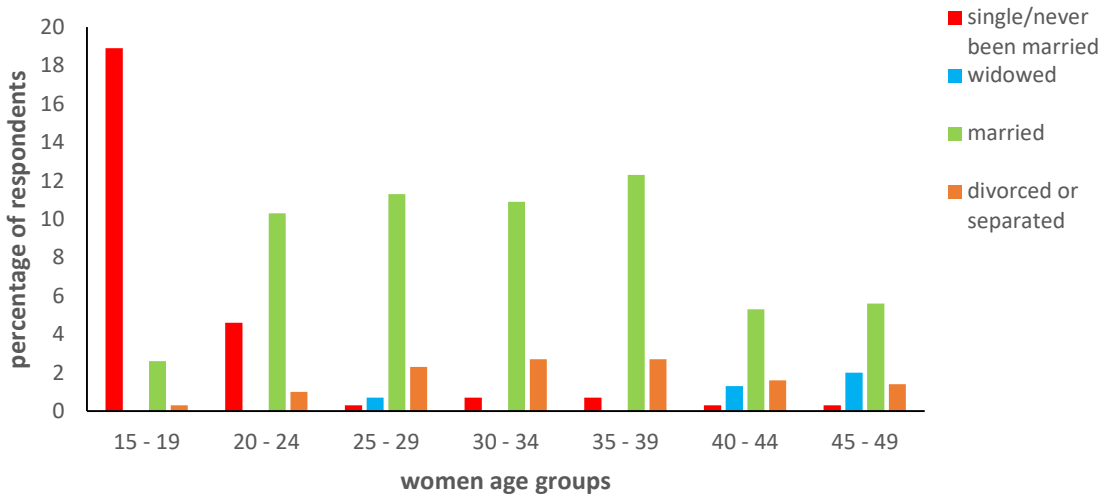

Figure 3.4: Distribution of the respondents by marital status

3.12.1.3 Literacy Level

A total of 57 (18.9%) of the women had no formal education and a few (0.6%) had tertiary level of education (Table 3.1). Moreover, the levels of illiteracy (not able to read and write) were higher among older women (57.9%) than young women (Figure 3.5) with a significance difference (Fishers exact test value of (F = 14.351, df=3 and P =0.002).

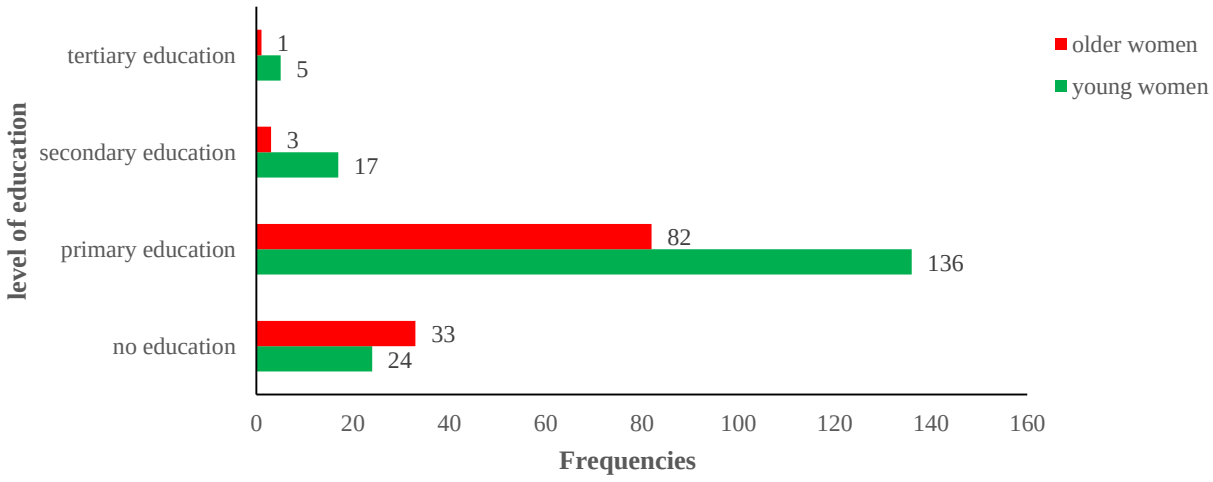

Figure 3.5: Frequency distribution of education attainment levels by age group

3.12.1.4 Household size

The smallest to the largest household size was 1 to 10 people per household, with a mean and median of 5 persons. Out of 302 women, 108(36%) had less than 5 members in their respective households (Table 3.1).

3.12.1.5 Dwelling house

Majority of women (80%) were living in self-owned houses (Table 3.1) and most of them were huts built of mud bricks (72.2%), with a mud floor (93%) and grass thatched roofs (78.5%).

Table 3.1: Demographic characteristics of the WRA of Dedza district by age group

		Women Classification			
Variable	**N**	**Young**	**Old**	**X^2**	**P- Value**
Dwelling house				21.8	**0.00**
Self-owned	242	43.2	36.9		
Hosted by a parent/owner/relative	49	14.3	2.0		
Pay rent	11	3.0	0.7		
Family size				11.01	**0.001**
<5	108	26.3	9.7		
>5	192	34.3	29.7		

3.12.2 Socioeconomic Status

3.12.2.1 Household income

The results showed that 47.7% of the reproductive age women had a monthly income within the range of MK5000 to MK10, 000 ($6.67 to $13.33) per month and 7% had no income for the past month prior to the survey. The median income per month was MK2, 000($2.67). There was no significance difference between the mean income for young and older women (P>0.05). Their

main source of income was selling of farm produce 175(57.9%) followed by casual labour 69(22.8%) and small businesses 25(8.3%) such as selling mandasi and firewood (Table 3.2).

3.12.2.2 Household wealth index

The results showed that more than three quarter (87.7%) of the study population were classified in lower wealth index group (Table 3.2).

3.12.2.3 Household Assets

The common assets owned by the respondents were bicycles (15.9%) followed by mobile phones (10.6%) but majority (58%) had no any kind of assets in their respective households (Table 3.2).

3.12.2.4 Land size

The average cultivated land size owned by the women households was 1.19 acres with large proportion 95(31.3%) of the respondents having 0.5 acres while 19(6.3%) of respondents had no land to cultivate. The average land holding size for young and old women was 1.15 ± 1.09 and 1.38 ± 1.40 respectively but the difference was not significance ($P > 0.05$).

Table 2.2: Social economic status of the study population by age

		Women Classification			
Parameters	**N**	**Young**	**Old**	**X^2**	**P- Value**
Source of income				5.98	0.30
Farming/crop/animal sales	175	32.6	25.2		
Self-employment	29	6.3	3.3		
Casual labour	69	14.6	8.3		
Business	25	6.3	2		
Remittances/gifts	4	0.7	0.6		
Household income				3.96	0.07
<$ 5	85	16.3	11.6		
$5 -$10	144	29.2	18.6		
> $10 - $20	28	6.3	3		
> $20 - $30	11	2.3	1.3		
> $30 - $40	7	0.7	1.7		
> $40	6	1.3	0.7		
No income	21	4.3	2.7		
Type of assets				8.39	0.50
Bicycle	48	10	6		
Hand grain miller	1	0	0.3		
Ox plough	2	0.7	0		
Treadle pump	1	0	0.3		
Food granary	12	1.7	2		
Radio/Television	28	4.7	4.7		
Mobile phone	32	6.3	4.3		
Others	2	0.7	0		
No assets	176	36.5	21.9		
Size of livestock held				1.91	0.75
No livestock	196	39.2	25.9		
Little (only chickens)	72	14	9.6		
Small(chicken and 1 goat)	18	4	2		
Medium(chicken and goats)	11	2.7	1		
Large (chicken, goats, pigs and cows)	5	0.7	1		
Wealth index				0.11	0.95
Lower(< $5/month)	249	49.8	32.9		
Middle(> $5 to $10/month)	46	9.3	6		
Upper (>$10/month)	6	1.3	0.7		

3.12.3 Food Security Situation

The main source of food item consumed (maize) by most respondents was through own production 269(89.1%) followed by purchases 25(8.3%). Table 3.3 shows food security situation of the study population whereby 44.9% of the total population were at risk of being food insecure. The number of households who often did not have enough food to eat was higher among young women (10%) than older women (8%) however the results were not statistically significant (P= 0.09) using Pearson Chi-square test value of 6.35.

Table 3.3: Food security situation for WRA of Dedza district

	Food eaten by WRA households for the 3 months prior survey			
	Enough and nutritious	Enough but not nutritious	Sometimes not enough to eat	Often not enough to eat
Young women	15%	20.9%	14.6%	10%
Older women	5.3%	14%	12.3%	8%

3.12.4 Water, sanitation and hygiene

Almost all the respondents fetched water for drinking a few metres away from their respective homes and had no proper treated drinking water sources. Majority (89.1%) sourced water from the boreholes (Table 3.4). The study results also showed that very few respondents treated drinking water by boiling 27(8.9%) and with waterguard 37(12.3%). Nearly 89% of the women had latrine facilities and 218(72.2%) had a garbage pit.

Table 3.3: Distribution of the respondents by their main sources of water

Source of water	Frequency	Percent
Tap water	17	5.6
Rain water	1	0.3
Borehole	269	89.1
Protected well	11	3.6
Unprotected well	4	1.3

3.12.5 Nutrition Knowledge among Women of Reproductive Age of Dedza District

When assessing the overall knowledge on nutrition by the respondents, a large proportion responds correctly to at least half of the questions. The highest and lowest score was 100% and 0% respectively. The median score was 70%. The results showed that large proportion (44.7 %) of the respondents had medium knowledge and young women were more knowledgeable than older women though not statistically different (Table 3.5). The mean knowledge score attained by older women (67.5 ± 20.5) was marginally statistically higher as compared to a mean score obtained by younger women (62 ± 24) using independent t- test. (t = - 1.986, df = 300, P = 0.048). When data was split by TAs, the results showed that WRA from TA Chauma had greater nutritional knowledge than all other WRA from other TAs. Women from TA Kachere had slightly different levels of knowledge from TA Kaphuka women (Figure 3.6). However, the results were not statistically different (X^2 = 7.46, df = 9, P = 0.6).

Table 3.4: Distribution of respondents according to knowledge Score

Level of knowledge	Range of scores	N	Young women	Old women	X^2	P-Value
Low	0 – 40	59	13.6	6	3.58	0.17
Medium	50 – 70	134	27.2	17.5		
High	80 - 100	108	19.5	16.2		

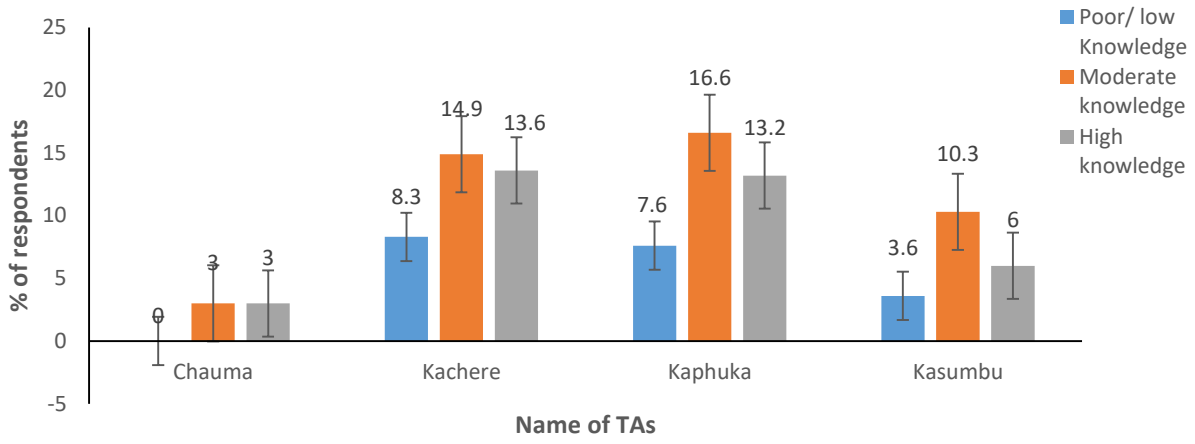

Figure 3.6: Distribution of respondents according to knowledge Score by TA

However, after categorizing the level of knowledge into poor and good knowledge by using median score of 70 as cut-off points, the results showed that more than half (64.1%) of the women had poor nutrition knowledge and nutrition illiteracy was high among young women than in older women though the difference was not statistically significant ($P > 0.05$) using Pearson chi-square test, $X^2 = 3.58$, $P = 0.167$.

On basics of good nutrition and practices, majority (95.7%) of both young and older women demonstrated good knowledge on when to start complementary feeding in infants and 82.1% had knowledge on the key moments to wash hands to prevent germs from reaching food.

When the respondents were assessed knowledge on the foods and nutrient content, 70.5% of the respondents were able to mention sources of iron rich foods and symptoms of iron deficiency. On contrary, when the respondents were asked to mention any type of vitamins that are found in fruits, most of the study participants 181(40.1%) got it wrong and was the least scored question.

On awareness and diet related diseases, half of the respondents had no knowledge on foods which are not healthy for people with diabetes and high blood pressure. The results also showed that

54.3% demonstrated ignorance on dietary risky behaviours before and during pregnancy. The most risk factors recognized by respondents who scored it right were lack of having adequate and nutritious foods, HIV and AIDS and alcohol consumption (Table 3.5).

3.12.5.1 Source of Knowledge

A large proportion of the respondents reported hospital 135(44.9%) as the main source of food and nutrition information, followed by radio 72(23.9%) and extension/health workers 24(7.9%). Other minor sources reported were posters, school books and television.

Table 3.5 : Percentages of correct responses to nutrition knowledge question questionnaire

Questions to assess knowledge	Correct answer	
	n	%
When to start complementary feeding	248	82.1
What are the key moments to wash hands to prevent germs from reaching food?	289	95.7
What are the foods that are rich in Iron?	213	70.5
What are the symptoms of anaemia?	213	70.5
What are the dietary risky behaviours before and during pregnancy?	138	45.7
When should a pregnant mother start attending antenatal clinic?	217	71.9
What are the functions of fruits in the body?	121	40.1
Which foods can increase blood pressure?	151	50.0
Which foods are not good for women with diabetes?	151	50.0
How many food groups do you know?	209	69.2

3.12. 2 Association of Socio-demographic characteristic and nutrition Knowledge

Table 3.6 shows that there was strong significant association between age group, education, household income and nutrition knowledge. Respondents in young age group were 1.5 times more

likely to have poor nutrition knowledge than women in older age group of 33 to 49 (OR = 1.5, CI = 0.92 – 2.4). The odds of women with no formal education were 3 times more likely to have poor nutrition knowledge than women with formal education (OR= 3.2, 95% CI = 1.52 – 6.54). Women with household income were less likely to have poor nutrition knowledge than women with no income (OR= 0.1, 95% CI= 0.01 – 0.61).

Table 3.6: Association of knowledge and socio-demographic characteristics of WRA in Dedza district

		Knowledge Level (%)						95% CI	
Parameter	**N**	**Low**	**Medium**	**High**	**X^2**	**OR**	**p-value**	**Upper**	**Lower**
Categories of education					13.7	3.2	**0.03**	1.52	6.54
No education	57	5.6	10	3.3					
Primary	218	13	31.2	28.2					
Secondary	20	0.7	2.3	3.7					
Tertiary	6	0.3	1.0	0.7					
Age group					48.2	0.9.	**0.00**	0.92	2.4
16 - 19	66	9	11	2.0					
21 - 24	48	2.3	7.3	6.3					
25 - 29	44	1.0	5.0	8.6					
31 - 34	43	2.3	6.0	6.0					
36 - 39	47	1.7	6.6	7.3					
41 - 44	26	2.0	3.3	3.3					
46 - 49	27	1.3	5.3	2.3					
Total household Income					24	0.1	**0.02**	0.01	0.61
<$ 5	84	4.3	11.3	12.3					
$5 -$10	144	11	19.3	17.6					
> $10 - $20	28	2.0	4.7	2.7					
> $20 - $30	11	0.3	2.3	1.0					
> $30 - $40	7.0	1.0	0.7	0.7					
> $40	6.0	1.0	5.6	0.3					
No income	21	4.3	11.3	12.3					
Women classification					3.5	0.17	0.17	0.89	2.3
Young women	182	13.6	27.2	19.5					
Older women	119	6.0	17.5	16.2					

**** p- values in Bold shows that they are significant at p<0.05***

3.12.5 Dietary Intake Patterns among Women of Reproductive Age in Dedza District

3.12.5 .1 Meal Frequency

Table 3.7 shows that more than half of the WRA 191(63.3%) consumed below the recommended minimum of 3 meals per day. The mean meal per day was 2.37 ± 0.72. The minimum and maximum number of meals per day was 1 and 5 respectively. There was no significant difference between numbers of meals taken by young and older women using chi-square ($X^2 = 0.5$, df = 3, P = 0.45). After comparing daily consumption frequency of meals by TA, Figure 3.7 shows that large proportion of respondents from TA Kachere (24.5%) followed by Kaphuka(23.5%) took less than 3 meals a day as compared to other TAs. However, the difference was not significant ($X^2 = 2.9$, df= 3, P = 0.4).

Table 3.7: Daily Consumption frequency of meals by age group

	Number of meals consumed per day					
	N	**< 3 Meals (%)**	**N**	**> 3 meals (%)**	**X^2 Value**	**P-value**
young women	112	37.1	70	23.2	0.57	0.45
older women	79	26.2	41	13.6		

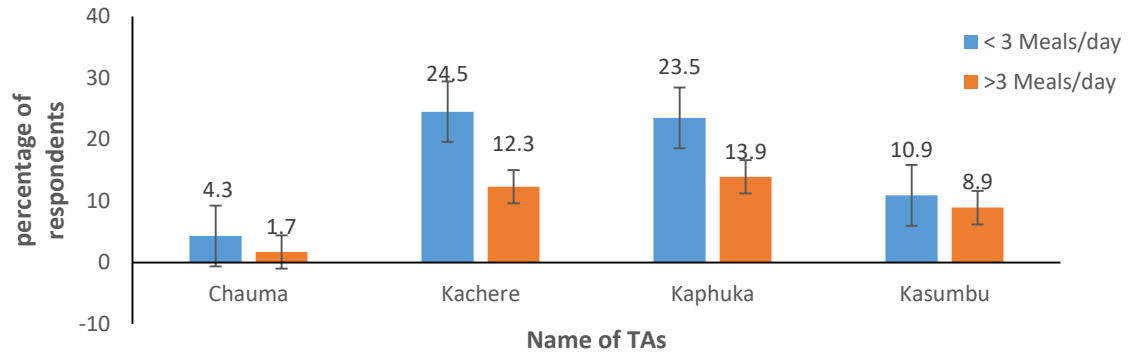

Figure 3.7: Number of meals consumed by Women of Reproductive age by TA

4.13.3 Dietary Intake Pattern

The identified dietary intake patterns for both young and older women were cereal products especially maize (*nsima*) accompanied with leafy vegetables (79.1%) both dark green and common vegetables or staple starch with stewed legumes especially beans (41.7%). Generally, milk and milk products, fruits, organ and fresh meat were hardly consumed while cereals and vegetables were consumed daily. Only a small proportion of WRA (15%) of the women consumed fruits. The least consumed food was organ meat (3%). The main source of protein in the area was fish. Out of 302 respondents, 33.3% reported consuming sweet beverages especially sweet beer which is locally known as *thobwa* as part of the diet and in most households it was taken as a breakfast or in between main meals substituting snacks (Figure 3.8).

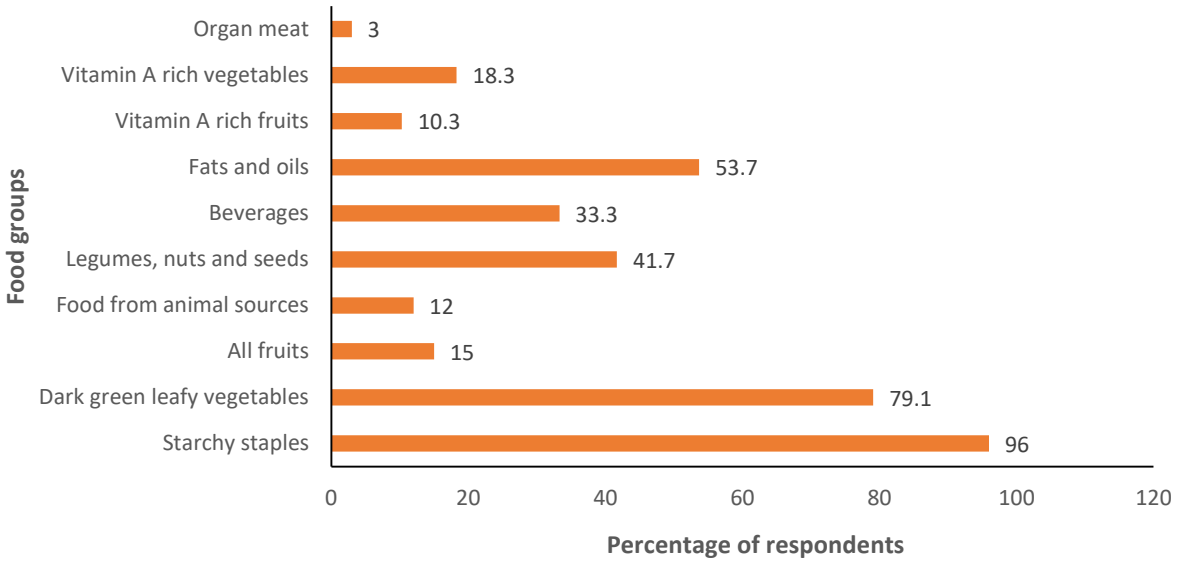

Figure 3. 8: Percentage distribution of food groups consumed by respondents

3.12.6 Individual Dietary Diversity Score (IDDs)

Figure 3.9 shows that 103(34.7%) took less than 3 food groups (low diversity score), 184(62.0%) took between 4 and 7 food groups (medium diversity score) while only 10(3.3%) took more than 8 food groups (high diversity score) per day. The mean dietary diversity score was 4.2 ± 1.7. The mean IDDs for young (4.3 ± 1.85) and older women (4.0 ± 1.59) was not statistically different (t= 1.65, P = 0.09). Young women were the highest in consumption of more food groups compared to older women and the difference was significant (Table 3.8). The odds indicate that young women were less likely to consume < 5 food groups than older women (OR = 0.67, CI= 0.417 – 1.089).

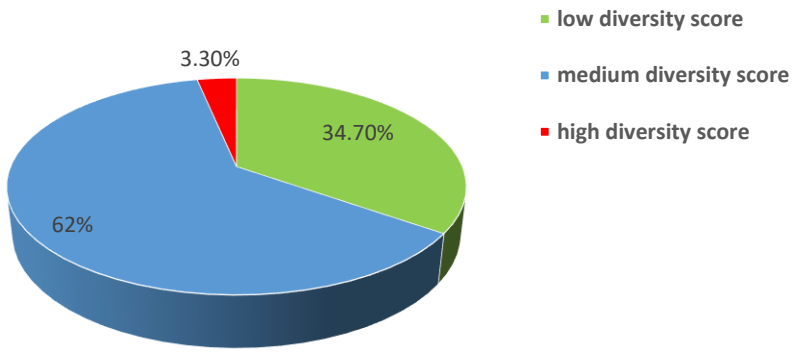

Figure 3.9: Dietary diversity scores for women of reproductive age of Dedza District

Table 3.8 : Distribution of WRA by Individual Dietary Diversity score

IDDS	Categories	Young women		Older women		X^2	P- value
		N	%	N	%		
0 - 3	Lowest	55	18.5	48	16.2	8.79	**0.012**
4 - 7	medium	113	38	70	23.9		
8 and above	high	10	3.4	0	0		

IDDS = Individual Dietary diversity Score
X^2 = Chi-square test

However after data was split by TA, the results shows that more than half of study population 171(56.8%) had IDD score of less than five which means had a dietary diversity score of less than the recommended five food groups per day. WRA from TA Kaphuka were the highest in consumption of more food groups as compared to WRA from other TAs though the difference was not significant using $X^2 = 1.01$, df = 3, P- value 0.79 (Figure 3.10).

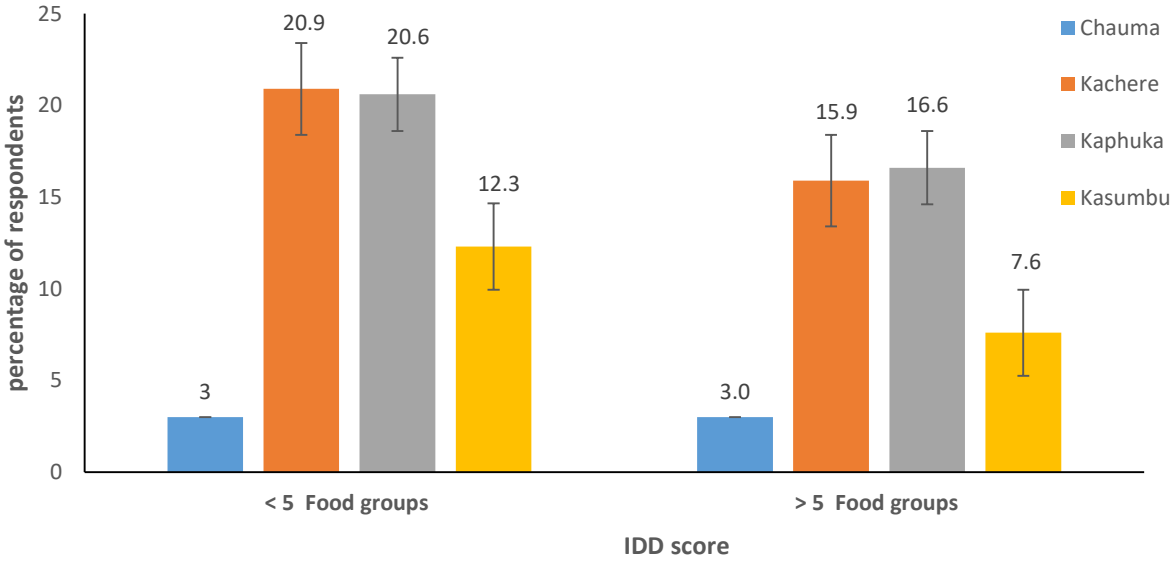

Figure 3.10: Individual dietary diversity score distribution per women groups

3.12.7 Nutrient Adequacy of the Diets Consumed by WRA of Dedza District

The mean energy, iron and vitamin A intake for respondents were 2410.6 kcal ± 2426.8, 24.31 ± 63.36, 2781.56 ± 10459.97 respectively (Table 3.9). The average nutrient intake of vitamin A and calcium were low compared to Recommended Dietary Allowance (RDA) of each nutrient and the diet was deficient in vitamin B12. The results showed that only 13.8% of respondents were taking iron supplements.

Table 3.9: The mean nutrient intake for WRA of Dedza district versus RDA

Name of nutrient	Mean	Units	Std. Deviation	RDA/Day
Energy	2410.61	kcal	2426.81	2100kcals
Protein	68.32	g	124.03	46g
Fat	32.96	g	37.20	45g
Carbohydrates	433.64	g	387.89	130g
Dietary fiber	66.21	g	153.25	25.3g
Cholesterol	124.71	g	246.10	300mg
Vitamin A	2781.56	µg	1045.97	3000µg
Vitamin B1	1.75	mg	5.71	1.5mg
Vitamin B2	1.24	mg	3.38	1.7mg
Folic acid	645.11	µg	2693.71	400mg/day
Calcium	508.21	mg	1796.47	1300mg
Iron	24.31	mg	63.36	18mg
Zinc	12.14	mg	24.12	8mg

RDA = Recommended Dietary Allowance

3.12.8 Factors Influencing Dietary Intake Pattern

3.12. 8.1 Social Demographic Characteristics and Dietary Intake Pattern

Education level

There was no significant difference (P> 0.05) between women with no formal education and their counterparts for intake of cereals, organ meat, vitamin A rich fruits and vegetables but there was significant relationship between formal education and intake of fish, fresh meat and legumes (Table 3.10). The odds were indicating that women with no formal education were less likely to have fresh meat (OR = 0.22, CI = 0.52 to 0.95), legumes (OR = 0.26, CI = 0.13 to 0.5) and fish (OR = 0.49, CI = 0.26 to 0.93) in their diet than women with formal education.

Table 3.10 : Dietary patterns associated with Education levels

	Education levels (%) (N = 299)						
	Yes	**No**	**X^2**	**P-Value**	**OR**	**CI**	
White tubers			13.4	**0.000**	0.3	0.15	0.59
consumed	4.30	40.1					
not consumed	14.7	40.8					
Fish			4.8	**0.03**	0.5	0.26	0.93
consumed	5.00	34.1					
not consumed	14.0	46.8					
Fresh meat	5.70	39.0	6.27	**0.04**	0.22	0.52	0.95
consumed	13.3	42.0					
not consumed							
legumes/pulses			12.46	**0.000**	0.3	0.15	0.6
consumed	4.0	37.8					
not consumed	15.1	43.1					

The results shows that there was no significant relationship (P >0.05) between age and other foods except white roots and tubers (X^2 = 6.5, P= 0.011). The odds indicate that older women were 1.8 times more likely to consume roots and tubers than young women (OR =1.8, CI = 1.15 – 2.98).

There was significant strong relationship between wealth index category and vitamin A rich vegetable dietary, fresh meat, white tubers and cereals but not significant with the intake of fish, legumes, organ meat and fruits using fisher exact test (Table 3.11). Women classified under low wealth index are more likely to consume more cereals than fresh meat, milk and milk products.

Table 3.11: Dietary Patterns associated with Wealth Index

	Wealth Index				
	Low	**Medium**	**High**	**X^2**	**P-Value**
Cereals				6.04	**0.050**
consumed	80.3	14	1.7		
not consumed	2.3	1.3	0.3		
Vitamin A rich Vegetables				10.78	**0.005**
consumed	13.0	5.30	0.0		
not consumed	69.7	10.0	2.0		
White tubers				18.70	**0.000**
consumed	32.0	10.7	1.7		
not consumed	50.7	4.7	0.3		
Fresh meat				8.54	**0.014**
consumed	9.0	2.0	1.0		
not consumed	73.7	13.3	1.0		
Milk and milk products				10.92	**0.004**
consumed	4.0	0.3	0.7		
not consumed	78.7	15.0	1.3		

3.12.8.2 Nutrition knowledge and dietary patterns

Chi-square analysis of this study indicates there was significant association between nutrition knowledge and IDDs (X^2 = 6.9, P = 0.007) (Table 3.12). As expected, women with poor nutrition knowledge were nearer 2 times more likely to have low IDD score than women with high nutrition knowledge (OR= 1.9, 95% = 1.18 to 3.08). The results also showed significant association between intake of fruits, eggs and knowledge but not significant (P>0.05) with the intake of fresh and organ meat, vegetables and fish (Table 3.13). The odds indicated that women with poor nutrition knowledge were less likely to consume fruits and eggs as part of their diet than women with good nutrition knowledge (OR = 0.34, 95% CI= 0.16 to 0.72) and (OR = 0.2, 95% CI= 0.05 to 0.54) respectively.

Table 3.12: Association of nutrition knowledge and IDDs

	Individual Dietary Diversity score						
	N	**Low**	**Medium**	**High**	**X^2**	**P-value**	**95% CI**
Levels of Knowledge					6.9	**0.008**	1.17 to 3.08
Low	59	10.8	8.4	0.7			
Medium	131	14.5	28.4	1.4			
High	106	9.5	25	1.4			

Table 3.13: Dietary pattern associated with nutrition knowledge

	Level of Nutrition knowledge						
	Poor	**Good**	**X^2**	**P-Value**	**OR**	**95% CI for OR**	
						Upper	**lower**
Fruits				**0.004**	0.3	0.16	0.72
consumed	4.3	6.3	8.5				
not consumed	59.7	29.7					
Eggs				**0.001**	0.17	0.05	0.54
consumed	1.3	4.0	11.15				
not consumed	62.7	32					

3.13 Discussion

This study has established that most of the households had low income levels and lived below poverty line ($1.90 per day) and selling of farm produce was their main source of income. The majority of the study population were in young age group (15-24). This is in-line with (National Statistics Office, 2017) which reported relatively larger population in the younger age group (< 20years). The results showed that 18.9% of the WRA had no formal education and 58.3% were married. The average household size for the study population was 5 which is almost similar to 4.5 of national level (MDHS 2015 -16).

3.13.1 Food security

Despite Dedza district being one of the district which grows a variety of crops such as maize, sweet and Irish potatoes, soybeans, cassava, beans and groundnuts, this study observed that most of the

households (44.7%) were at risk of food insecurity. More young women were at a greater risk than older women though the results were not statistically different. These findings are in-line with WFP Malawi, (2017) which reported that most households in Malawi are food insecure due to persistent droughts and high HIV infection rate. However, this study has established that food insecurity among the study population was mainly due to high poverty levels. Almost 82.8% of the WRA lived below poverty line (1.90$/day) hence difficult for them to purchase food and have access to agricultural inputs which can increase household agricultural production. The other reason could be limited opportunity for income generating activities which has led to over selling of farm produce since it is their main source of income. Agbadi, Urke and Mittelmark, (2017) in his study conducted in Ghana emphasizes the need of ensuring food security at household level as it helps households members to acquire a minimum acceptable diet which in turn can led to the improvement of nutrition status. Therefore, the present study proposes a need to improve household food security by engaging women of reproductive age in small income generating activities. This will enable them to have access to a variety of foods.

3.13.2 Nutrition knowledge of the respondents

According to FAO, (2014) knowledge is understanding of any given topic. The results have shown that nutrition knowledge score among large proportion of WRA was moderate and WRA from TA Chauma had greater nutritional knowledge than all other WRA from other TAs. This is inconsistence with the study findings of Samson et al., (2017) and Laz et al.., (2015) found low nutrition knowledge among WRA. The analysis based on the ten assessment questions has shown that the majority demonstrated knowledge on basic nutrition and good practices such as the key moments to wash hands to prevent germs from reaching food and when to start complementary feeding in infant children. This could be attributed to the awareness campaigns done by the

government in conjunction with Non-Governmental Organisation (NGOs) present in the district which are promoting Water, Hygiene and Sanitation (WASH) programmes and good infant feeding practices.

The respondents demonstrated low knowledge on the nutrient content of the fruits but surprisingly they were able to mention functions of the fruits in the body. This study suggest that a number of respondents gave incorrect answers to this question because it was too technical and yet 18.9% of the respondents had no formal education and 35.1% of them had only managed to complete lower primary level. It was also observed that 70.5% of the women were well aware of the locally foods that are rich in iron and the symptoms of iron deficiency and anaemia. Contrary, 30.1% of them had suggestive clinical signs of anaemia which is higher than that of district (25%) and lower than national level which is at 33% (MGDS, 2015-16). The cases of anaemia could be due to unavailability of iron rich foods especially from animal sources. The few households that are keeping livestock prefer to keep them as an asset that they can sell later to get money in times of need than for home consumption. When this study tried to compare which age group was more knowledgeable on sources of iron rich foods and symptoms of anaemia, it was established that young women were more knowledgeable compared to older women. This is similar to research findings conducted by Siddiqui and Kamfar, (2007) and Latha and Mohan, (2017) respectively. High knowledge in young women could be attributed to inclusion of nutrition education as a subject in primary and secondary schools syllabus. This justify the need for more nutrition education as it is an essential component of improving dietary habits and food choices in order to reduce malnutrition.

In the present study, it was realized that knowledge on the diet- related non-communicable diseases such as diabetes, obesity, high blood pressure and which foods to be avoided when one is suffering

from these illnesses was not satisfactory. These results are in-line with study findings conducted in Sri Lanka by Gamage and Jayawardana, (2017) and contrary to a study conducted in Senegal (Holdsworth et al., 2006). Furthermore, this study has observed that women had inadequate knowledge regarding the dietary risk factors before and during pregnancy. The study population only knew HIV and AIDS and alcohol consumption as the main risks factors. This study suggests that this could be one of the reasons why Dedza district is still experiencing high adverse effects of maternal and child health outcomes as majority of WRA may not know how to practice the prevention and reduction measures.

3.13.3 Factors influencing nutrition knowledge

The current study observed that age, educational and household income level were key significant factors influencing women nutrition knowledge in the study area. As predicted, women with no formal education and from low wealth index were more likely to have poor nutrition knowledge than their counterparts. These findings are consistent with previous studies conducted in Saudi Arabia which found a positive association between nutrition knowledge and educational level (Mansour and Hassan, 1994). Studies conducted by Samson et al., (2017) and Laz et al, (2015) found that women who had attained higher level of education had also high nutrition knowledge than their counterparts. Furthermore, Caliendo and Smith, (2010) study confirmed that level of education is one of statistically significant predicting factors of nutrition knowledge score. The high knowledge scores among women who had income or attained formal education in the current study could be attributed to the access to radio. Most of the household who had some level of income had also radio or television as one of their assets which was used as a source of nutrition information while for those with formal education were able to read and understand nutrition

messages that were in posters, newspapers, flyers and booklets than their counterparts. Hence, this study concurs with other studies which indicated that use of radio is an effective means of reaching WRA with nutrition messages.

3.13.4 Dietary patterns of the women of reproductive age

The mean number of meals taken by respondents per day was 2.37 ± 0.72. This is below the recommended minimum meal intake of 4 meals per day hence is likely fail to meet nutrients required by the body (Murphy et al., 2011). The results have also shown that majority of both young and older women skipped breakfast. This could be due to; primarily, unavailability of food worthy for breakfast since most of the study households were food insecure and poor. Secondly, most women were busy with agricultural activities such as land preparation, irrigating crops in their gardens hence no time to prepare breakfast. A study conducted by Katungwe, Geresomo and Mwangwela, (2015) in Ntchisi district of Malawi showed that individuals skipped breakfast due to lack of sugar which is supposed to be added to porridge or tea and lack of knowledge on the importance of breakfast.

This study has also established that more than half of study population 171(56.8%) had IDD score of less than the recommended 5 food groups per day (FAO/FANTA, 2014) and the highest proportion were from TA Kaphuka. This is an indication that diets of WRA in Dedza are of poor quality and this makes them vulnerable to micronutrient deficiencies.

Starchy staples accompanied by leafy vegetables followed by refined carbohydrates with legumes (beans) were the top identified dietary patterns consumed by the study population. The dietary patterns consumed were largely dependent on locally available food items. These study findings are similar to those of a research conducted in Nepal where dietary patterns were also heavily

dominated by starchy staples (Bhandari et al., 2016). It was also observed that very few respondents were able to consume foods from milk and milk products, animal sources, vitamin A rich vegetables and fruits. The main source of animal protein were small fish (*bonya*) and eggs even though were consumed by less than half of the study population (39.3%) and 5.3% respectively. These results concur the findings of National Statistical Office, (2006) which reported that foods from animal sources are seldom consumed among the rural households due to high prices. Possibly this could be one of the reasons why most WRA of the study area had clinical signs of anaemia as they lack heme-iron which found only in animal sources e.g. meat and easily being absorbed by the body than non-heme iron which is found in plant sources e.g. beans.

3.13.5 Nutrient adequacy of the respondents diets

The diets that were consumed by respondents were of low quality in terms of nutrient content. The average nutrient intake of vitamin A and calcium were low as compared to RDA of each nutrient and was deficient in vitamin B12. However, the diets were adequate and slightly higher in calories, iron, proteins and folic acid than RDA for each nutrient. Inadequate intake of vitamin A and B12 among women of child bearing age has also been reported in a study conducted by Nguyen et al., (2013) and Sato et al.., (2010). In contrast, diets for WRA of Kenya, Nigeria and South Africa were deficient in iron but high in diets of Ethiopian women (Harika et al., 2017). Although the current results have shown an adequate iron intake from the diet, the prevalence of anaemia both in this study and at district level among women of Dedza district is high (25%) (MDHS, 2015-16). Hence data from the present study, suggest that prevalence of anaemia among WRA of Dedza could be attributed to inadequate or no intake of fruits rich in vitamin C which enhances bioavailability of iron in the body. Secondly, a large proportion of the respondents took staples with legumes as one of main dietary pattern. Unfortunately, legumes have phytates which binds

with minerals such as iron and inhibits or slows its absorption. Lastly, it was observed that 14 days prior to the survey most women in the studied population suffered from Malaria, which might have lowered the volume of red blood cells and caused an individual to experience anaemia signs. Hence, WRA need to be encouraged to consume foods which are good sources of Calcium, Vitamin B12, A and B2 respectively as they are vital. The nutrients also prepares the body to meet the demands of pregnancy. Low intake of these nutrients might affect women's health and nutritional status and escalate the risk of adverse reproductive health outcomes.

3.13.6 Factors influencing Dietary Patterns of WRA in Dedza District

According to WHO, (2015) food prices, individual preferences and beliefs, cultural traditions, as well as geographical, environmental, social and economic factors all interrelate in a complex manner to shape individuals dietary pattern. According to Jackson, (2003) poverty and socio-cultural factors, such as religion and social status are factors that influence nutritional intake. Furthermore, according to Kuhnlein and Pelto, (1997) reported that food availability (cost, season and site of procurement) and food beliefs are factors that affect food consumption. But this study has identified age, household income and education level as significant factors that influence dietary patterns of the study population. This is similar to a study done by (Thiele, Mensink and Beitz, 2004). Therefore, to promote healthy eating habits among women of reproductive age there is need to educate and empower them economically.

3.13.7 Dietary intake pattern and Nutrition knowledge of women of reproductive age

Previous studies, show that level of knowledge influences dietary intake of an individual during adulthood (Kearney et al., 2000). In study conducted by Asakura, Todoriki and Sasaki, (2017) and Spronk et al., (2014) showed that high knowledge in nutrition was significantly associated with

higher intake of vegetables and fruits. A study done by Nguyen et al., (2013) established that good nutrition knowledge is a vital factor to diversified diet. The results of this study have showed a significant relationship between nutrition knowledge and dietary intake especially with fruits, eggs and white tubers but not with intake of vitamin A rich fruits and vegetables, fish, fresh and organ meat. Perhaps low intake of fruits by WRA with nutrition knowledge has occurred because in most cases having knowledge on the basics of good nutrition practices does not automatically result into an action especially when the women are uncertain on how to apply the acquired knowledge. Therefore, this study provides evidence that nutrition education may not be the most efficient approach to dietary behaviour change as it has no major impact on dietary intake of an individual.

3.14 Conclusion

The diets of WRA in Dedza are inadequate, poor in quality and do not meet the recommended dietary diversity score. The dietary intake of WRA in Dedza district are influenced by age, educational level, household income and nutrition knowledge with regards to consumption of eggs and fruits.

3.15 Recommendations

1. WRA should not only be convinced to meet the minimum number of meals to be consumed per day but should also be sensitized on the significance of having breakfast
2. There is need to conduct dietary diversity campaigns as a strategy of improving micronutrient intakes for women of reproductive age.
3. There is need to promote nutrition education especially on dietary practices, besides empowering women economically.

CHAPTER 4: FACTORS AFFECTING NUTRITION STATUS OF WOMEN OF REPRODUCTIVE AGE IN DEDZA DISTRICT, MALAWI

4.1 Abstract

Women nutrition status plays a key role in preventing adverse maternal and child health outcomes yet there is little existing information on the nutrition status of women of reproductive age (WRA) in Dedza district. Therefore this study was carried out to assess the nutrition status of WRA (15 to 49 years) and estimate associated risk factors. Analytical cross section study designs involving 302 WRA was conducted in Dedza district of Malawi from August to September 2017. A pretested questionnaire was used to collect data which was analysed using SPSS software. The results showed that 3%, 19.9% and 6% were underweight, overweight and obese respectively using BM1 cut-off points. Underweight and obesity were more frequent in older women (33 to 49 years) while overweight was common in younger women (15 to 32 years). WRA from all Traditional Authorities were vulnerable to overweight. The odds indicate that young women were less likely to be underweight than older women though not statistically significant (OR= 0.8). Bivariate correlation and logistic regression results showed that morbidity status, wealth index, level of knowledge and assets ownership were significant risk factors associated with nutrition status of the study population. In conclusion, there is undernutrition and overnutrition among WRA, however the prevalence of the latter is higher than the former. Morbidity status, wealth index, level of knowledge and assets ownership are determinants of nutrition status of WRA in Dedza district. Hence, there is need for government to develop interventions that can control undernutrition and overnutrition among WRA and the identified risk factors must be taken into consideration.

4.2 Introduction

Malnutrition is a major health issue affecting a large proportion of the world population particularly in developing countries and women of the reproductive age are amongst the most vulnerable to malnutrition. In Malawi, malnutrition is one of the most important health problems among women of reproductive age (WRA) and the levels are relatively high. According to MDHS 2015-16, 7% of WRA are underweight while 21% are overweight (MDHS, 2015-16). Micronutrient deficiency disorders is also high among WRA. For example, 33% of WRA in Malawi are anaemic (MDHS 2015-16). Furthermore, reports indicate that malnutrition is one of the leading causes of death among WRA in Malawi (WHO, 2015) and overweight or obese are rapidly increasing in the sub-Saharan countries (WHO, 2015). According to (Munthali, 2017), the main determinants of the current nutrition status among WRA in Malawi are; food insecurity and frequent infections such as Malaria and HIV and AIDS. However a study done by Acharya et al., (2017) indicated that food inadequacy, inadequate nutrition knowledge, low educational levels, income and family size are the key contributors to poor nutritional status of WRA.

Undernutrition in WRA increases the risk of chronic maternal and child death and illnesses (Black et al., 2013). It can also results into low birth weight babies, birth of an infant with congenital malformation or physical retardation, stillbirths and miscarriage (King, 2016). On the other hand, overweight or obese women are susceptible to diabetes which in turn puts them at increased risk of having cardiovascular diseases which is associated with high mortality (Black et al., 2013). Apart from the serious negative effects on WRA health, undernutrition has also an impact on the economy through loss of productivity due to poor physical condition (FAO. 2016). Thus, assessing nutrition status and highlighting the degree of and factors contributing to high malnutrition levels among WRA in Dedza, Malawi will significantly improve nutrition services delivery in the

country. The identified factors will also be vital to the management of the current interventions by helping in planning, designing, targeting and prioritization. Therefore, the main objective of this study was to assess nutrition status and establish risk factors associated with underweight, overweight or obesity among women of reproductive age (WRA) in Dedza district of Malawi.

4.3 Study Setting, Methodology and Sampling Procedure

Study setting and sampling was carried out as outlined in sections of chapter 3

4.4 Inclusion Criteria

Women aged 15-49 years who were not pregnant or non-lactating and have not had a birth in the past 2 years before the survey living in TA Kachere, Chauma, Kaphuka and Kasumbu. The non-pregnant state among study population was determined by inquiring when they last had their menstrual period.

4.5 Exclusion Criteria

Women aged 15 – 49 who were disabled, apparently sick (HIV/AIDS) and those who had missed their menstrual period for the past 1-month.

4.6 Data Collection Tools and Methods

The research used five tools namely questionnaire, electronic weighing scales, stadiometer, Mid-Upper Arm Circumference (MUAC) tapes and Individual Dietary Diversity Score

4.6.1 Questionnaire

Household information on demographic characteristics, social economic status and nutrition knowledge of women of reproductive age was collected using a semi-structured questionnaire. But before administering the questionnaires, women were briefed about the objective of the study and

their right to participate in the study or not and to withdraw from the study at any stage of the study. Written consent was taken from each study subject.

4.6.2 Weighing scales, Stadiometer and MUAC tape

Weighing scale, stadiometer and MUAC tape were used to measure the scale, stature and mid-upper arm circumference of the respondents respectively. They were measured following the WHO guidelines with individuals putting on light attire and barefooted. Measurements were taken two times and average number was the one that was recorded. The figures collected were used to estimate Body Mass Index (BMI) reference value commended by World Health Organization (WHO, 1999) which is a nutrition indicator for determining nutrition status. BMI of the respondents was calculated by dividing the weight (kilogram) to the height (metres squared. Participants were classified into four categories according to WHO International classification: (1) Underweight ($\leq$18.5 kg/m^2) (2) Normal weight (18.5 kg/m^2 to 24.9 kg/m^2) (3) Overweight 25.0 kg/m^2 -30.0 kg/m^2) (4) Obese ($\geq$30.0 kg/m^2) (NHANES, 2007).

4.6.2.1 Height Measurement Procedures

Standing height was measured using stadiometer with a fixed vertical backboard and an adjustable head piece. The subject was requested to stand up straight against the backboard with his body weight evenly distributed on both feet and both the feet flat on the platform. The study subject was then requested to stand with both heels together and toes apart. The subject was assisted to make sure that the back of the head, shoulder blades, buttocks and heels made contact with the backboard. Measurements were recorded to the nearest millimeter. Figure 4.1 illustrates the procedures. This procedure was repeated for the same subject to get two measurements then an average between the two measurements was computed and recorded (NHANES, 2007).

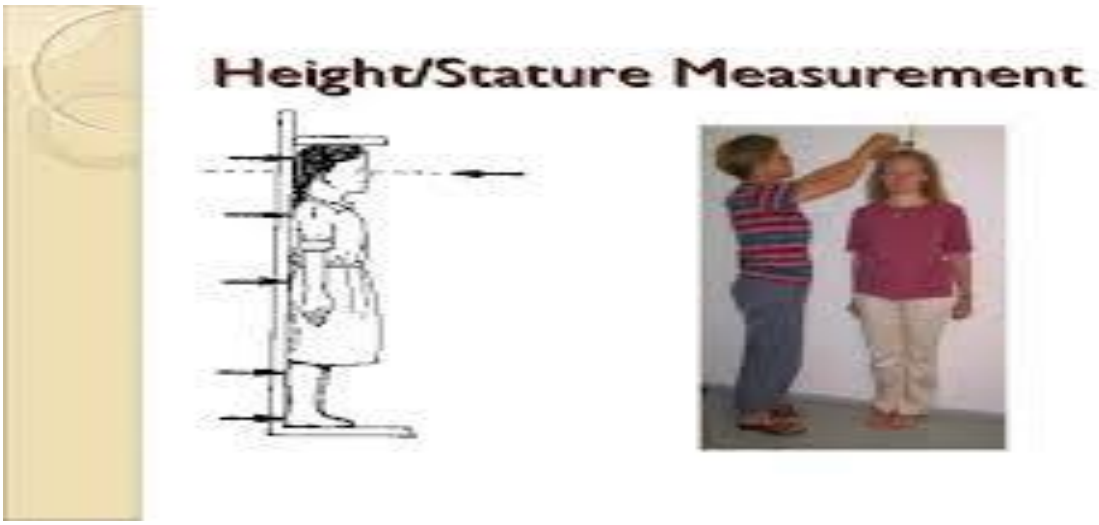

Figure 4.1 illustration of height measurement procedure

4.6.2 .2 Weight Measurement procedure

A digital electronic weighing scale was used for measuring the weight of WRA. The study subject was requested to step up onto the scale and stand still on the centre of the scale with their body weight evenly distributed on both feet. The subject's arms hang freely by the sides of the body, with palms facing the thighs. The subject held their head up, and face forward. Weight was recorded to the nearest 0.1 kilograms. This procedure was repeated for the same subject to get three measurements then an average between the three measurements was computed and recorded (NHANES, 2007). The scale was re-adjusted to zero before each weighing. To ensure that the scale was measuring correctly, a 1kg packet of sugar was weighed.

4.6.2.3 Mid Upper Arm Circumference (MUAC)

An accurate way to measure fat-free mass is to measure the MUAC. The MUAC is the circumference of the upper arm at the midway between the shoulder tip and the elbow tip on the left arm. The mid-arm point is determined by measuring the distance from the shoulder tip to the elbow and dividing it by two. A low reading indicates a loss of muscle mass.

4.7 Ethical Considerations

The study was cleared by District Council Office, the recruited enumerators signed a consent form which had information on legal grounds for undertaking the study. Another consent was obtained from the women of reproductive age who took part in the research.

4.8 Recruitment and Training of Research Assistant

4.8.1 Recruitment

The researcher advertised the post for research assistants in hospitals and agriculture offices that are found in the study area (Appendix III). Those with diploma or degree in nutrition, public health, social sciences or Community development with previous experience in data collection were given priority. Of the applicants, a few were short listed and interviewed. Twelve (7 males and 5 females) applicants were recruited.

4.8.2 Training of Research Assistant

The research assistant were trained for 5 days on the proper use of all research tools and necessary demonstration were given. The training took place during the second week of August at Dedza District Agriculture Development Office. The training content comprised of research objectives, interviewing techniques, proper recording of data, and handling and use of equipment such as height boards, scale and MUAC tapes (Appendix IV).

4.9 Pretesting of Study Tools

The questionnaire was pre-tested on 12 households before commencing actual data collection to ensure familiarization with the questionnaire, equipment, entry into the households, obtaining consent, checking mannerism of the research assistants, checking on its validity and find out if it

was responding to objectives of the study. The households for pilot study were not selected from the main study area and the data was not used in the analysis of final study.

4.10 Data Quality Control

Data quality measure was carried out as outlined in sections of chapter 3

4.11 Data Management and Analysis

4.11.1 Data entry and cleaning

It was done using SPSS computer packages and Microsoft Excel Spreadsheet. Entry of data was carried out immediately after data collection, thus first week of October, 2017. Data was cleaned by deleting the records of individual women from the analysis with age of less than 15 or greater than 49 years and where age, height and weight were not recorded.

All outliers were excluded from data analysis. For example women with BMI of > 40kg/m^2 and those with household size of > 10 people were excluded on the basis that their measurements (weight or height) were incorrectly measured or recorded or they may not give a true representation the population being study.

4.11.2 Data Analysis

A Statistical Package for Social Science (SPSS) software version 20 was used to analyse the study findings. Graphical presentation was done using Excel. Descriptive statistics such as percentages, frequency distribution, mean and standard deviation were used to describe the data.

Bivariate correlation was used to identify risk factors associated with nutrition status. Binary logistic regression models were used to generate odds ratio (ORs) and 95 % confidence intervals (CIs) using BMI as the main outcome variable.

4.12 Results

4.12.1 Socio economic and demographic profile of the study population

The general characteristics of the reproductive age women are the same as outlined in section

4.12.2 Food Security Situation

The main source of food item consumed (maize) by most respondents was through own production 89.1% followed by purchases 8.3%. The results shows that 44.9% of the total population were at risk of being food insecure. The number of households who often did not have enough food to eat was higher among young women (10%) than older women (8%) however the results were not statistically significant($X^2 = 6.35$, df = 3, P= 0.09).

4.12.3 Water, sanitation and hygiene

Almost all the respondents fetched water for drinking a few metres away from their respective homes and had no proper treated drinking water sources. More than three quarter of the WRA (89.1%) sourced water from the boreholes and very few respondents treated drinking water by boiling 27(8.9%) or with waterguard 37(12.3%). Nearly 89% of the women had latrine facilities and 218(72.2%) had a garbage pit.

4.12.4 Morbidity status of the study population

The information on morbidity status of WRA within a period of 14 days before the survey was self-reported by the respondents. The women were asked to indicate if they had been diagnosed with or treated for any chronic diseases such as high blood pressure, diabetes, heart disease, osteoporosis and other illnesses. The results have shown that 162(54.2%) were sick but only 69(39%) were taken to and treated at different health facilities. Among the total sick women, 58% were young women. The difference between young and older women in terms of illness was not

statistically significant (P>0.05) using Chi-square test value of 0.933, P= 0.334. The most frequent suffered illnesses was malaria (26%) followed by respiratory infections (15.2%) (Figure 4.2)

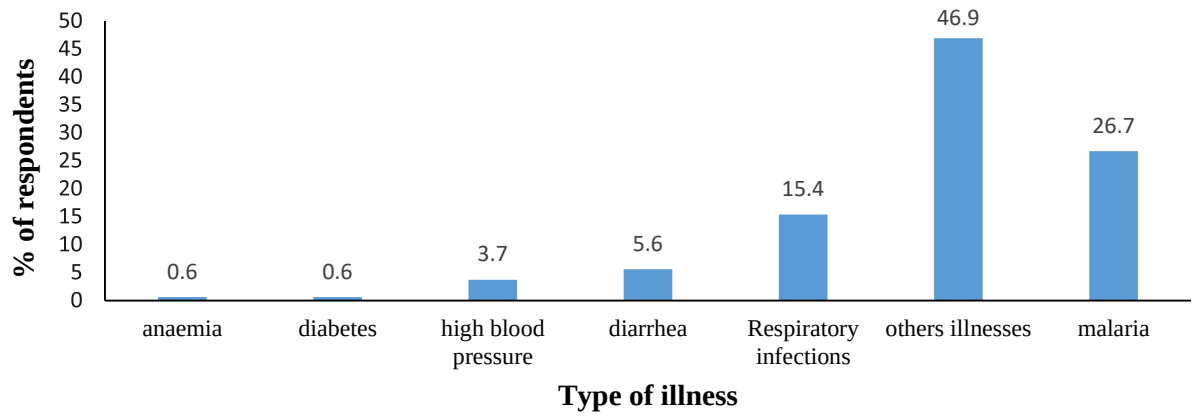

Figure 4.2: Morbidity status as reported by study subjects

4.12.5 Family planning

The results show that 46.8% of the respondents were on contraceptives. The methods that were used are; injection (56.8%), norplant (28%) and pills (7%). The reported common challenges faced by women using contraceptives were nausea (13.8%), bleeding (12.3%) and abdominal pains (13.8%) while fourty three percent didn't face any challenges.

4.12.6 Clinical signs in relation to micronutrient deficiency

The common prevalent clinical signs in relation to micronutrient deficiency were frequent colds, upper respiratory tract infection (53%), cracks at margins of the lips (52.3%) and dizziness 46.7% (Figure 4.3). The results have showed that incidence of night blindness (44.2%) and bleeding gums (40.8%) were dominant in older than young women and were statistically significant at (X^2 = 4.71, df =1, P= 0.03) and (X^2 = 10.108, df =1, P = 0.001) respectively. The odds indicate that young women are less likely to have clinical signs of night blindness and bleeding gums than older

women (OR = 0.6, 95% CI= 0.37 to 0.96) and (OR= 0.5, 95% CI = 0.27 to 0.74) respectively. The occurrence of having pallor face or palms was more in older women (35%) than young women (26.9%) but not statistically significant. Goiter was the least prevalent (1.7 %) clinical sign.

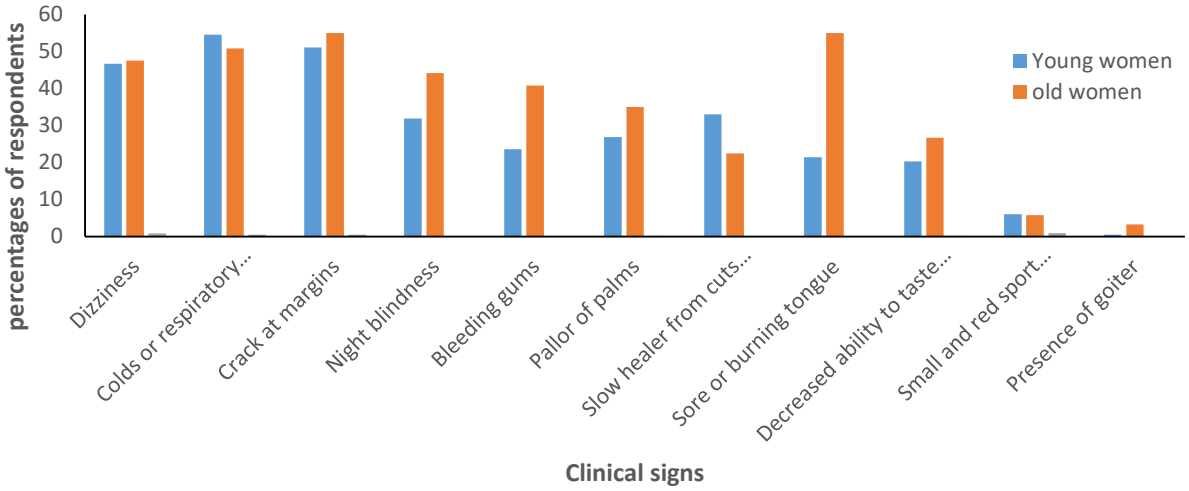

Figure 4.3: Prevalence of micronutrient deficiency signs as reported by study participants

4.12.7 Nutrition status

Overall estimated population mean of body weight (kg), height (cm), BMI (Kg/m^2) and MUAC (cm) of participants of this study are in Table 4.14. Older women had larger BMI (24.3kg/m^2 ± 6.94) than the younger women whose BMI was 22.8kg/m^2 ± 3.10. There was no significant difference between mean weight and height MUAC for young and older women (P >0.05) but statistically difference in BMI (P = 0.012).

Table 4.14: Mean anthropometric measurements of the respondents

	Young women(n = 182)		Older women (n = 120)		
Measurement	**Mean**	**Standard deviation**	**Mean**	**Standard deviation**	**P-value**
Weight(kg)	54.9	8.11	56.7	10.46	0.119
Height(m)	155.09	6.19	153.71	10.09	0.144
BMI	22.85	3.10	24.34	6.94	*0.012
MUAC	26.99	3.43	27.98	4.40	*0.29

***P-value is significant when p>0.05**

Figure 4.4 shows the underweight, overweight and obesity prevalence estimates of the reproductive age women of Dedza district. The analysis revealed that 3% were underweight, 19.9% were overweight and 6% were obese using BM1 cut off points. Underweight (3.4%) and obesity (9.2%) were more frequent in older women while overweight was common in young women (20.3%) though the difference was not significant (P>0.05). After using MUAC, 3.6% of women were identified as malnourished by having MUAC of < 22cm. The odds indicate that young women are 0.8 times less likely to be underweight than older women but not statistically significant (OR= 0.791, 95% CI= 0.28 to 3.0).

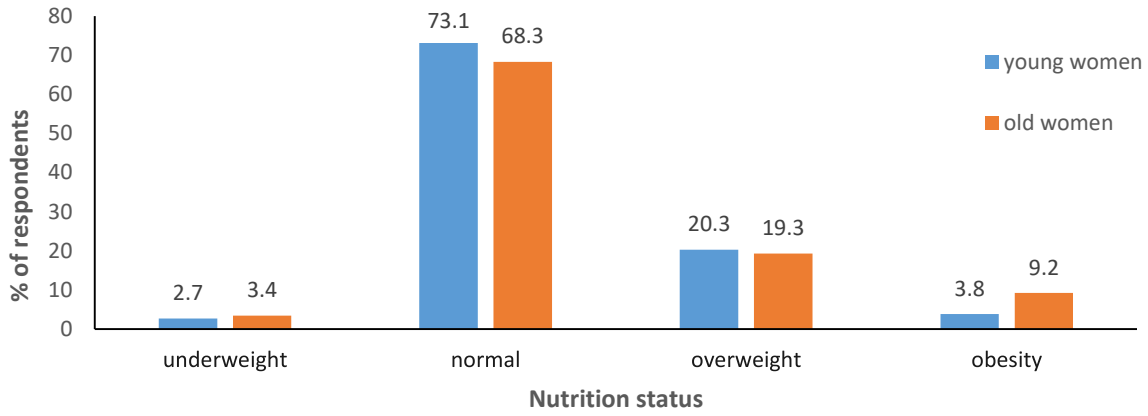

Figure 4.4: Distribution of WRA Nutrition status (BMI) by age

4.12.7 Distribution of WRA Nutrition status (BMI) by Traditional Authority

Chi-square analysis showed that largest and lowest prevalence of underweight WRA were from TA Kaphuka (1.3%) and Chauma (0.3%) respectively. The prevalence of overweight or obesity in TA Kaphuka (9.6%) and Kachere (9.3%) were almost the same. However the difference was not significant (p>0.05). (Table 4.15).

Table 4.15: Distribution of WRA Nutrition status (BMI) by Traditional Authority

		Categories of BMI					
	N	**Underweight**	**Normal**	**Overweight**	**Obesity**	**X2**	**P-value**
Name of TA						3.08	0.97
Chauma	18	1 (0.3%)	14 (4.6%)	2 (0.7%)	1 (0.3%)		
Kachere	111	2 (0.7%)	81 (26.8%)	21 (7.0%)	7 (2.3%)		
Kaphuka	113	4 (1.3%)	80 (26.5%)	22 (7.3%)	7 (2.3%)		
Kasumbu	60	2 (0.7%)	40 (13.2)	15 (5.0%)	3 (1.0%)		
Total	302	9 (3%)	215 (71.2%)	60 (19.9%)	18 (6%)		

4.12.8 Distribution of WRA nutrition status according to nutrition Knowledge score

Table 4.16 Shows no significant association between knowledge score and BMI category (P = 0.5). Overweight or obese WRA had greater nutrition knowledge than underweight women. The prevalence of underweight was high among women with moderate knowledge than their counterparts. A large proportional of women with normal BMI had higher nutrition knowledge compared to overweight or obese women.

Table 4.16: Distribution of WRA nutrition status by level of nutrition Knowledge

	BMI classification					
	Underweight	**Normal**	**Overweight**	**Obesity**	**X^2**	**P-value**
Level of Knowledge					5.5	0.5
Low	2 (0.7%)	42 (13.9%)	13 (4.3%)	2 (0.7%)		
moderate	6 (2.0%)	99 (32.8%)	23 (7.6%)	7 (2.3%)		
high	1 (0.3%)	74 (24.5%)	24 (7.9%)	9 (3.0%)		
Total	9 (3%)	215 (71.2%)	60 (19.9%)	18 (6%)		

4.12.9 Distribution of WRA nutrition status according to social demographic characteristics

Prevalence of underweight was high in women who were on separation (13.3%) than in married women (1.1%). When comparing in terms of education level; underweight was high in women with low education levels than in women who had completed primary school education though the difference was not significant (P = 0.59). Overweight was high among women of the age group of 25 - 29 years(3.7%), single (5.3%) and classified under low wealth index (14.0%) than their counterparts (Table 4.17).

Table 4.17: Distribution of WRA nutrition status according to social demographic characteristics (N=302)

Variable		Nutrition status					
		N	Underweight (%)	Normal (%)	Overweight (%)	Obesity (%)	p-value
Age							0.15
	15 – 19	66	1.0	17.3	3.3	0.3	
	20 – 24	48	0.0	11.3	3.3	1.3	
	25 – 29	44	0.3	10.0	3.7	0.7	
	30 – 34	43	0.7	10.3	3.3	0.0	
	35 - 39	47	0.0	11.3	2.3	2.0	
	40 - 44	26	0.7	4.3	2.3	1.3	
	45 - 49	27	0.3	6.6	1.7	0.3	
Marital status							0.63
	single	78	1.0	18.9	5.3	0.7	
	widowed	12	0	3.3	0.3	0.3	
	married	175	0.7	40.5	5	5	
	divorced	21	0.7	4.3	0.0	0	
	separated	15	0.7	4.0	0.0	0	
Education level							0.59
	no education	57	0.7	13.6	4.0	0.7	
	primary	219	2.3	51.5	14.3	4.3	
	secondary	20	0	4.0	1.7	1.0	
	tertiary	6	0	2.0	0.0	0	
Wealth index							**0.008**
Lower(< $5/month)		249	2.0	62.1	14.0	4.7	
Middle(> $5 to $10/month)		46	0.7	8.6	5.3	0.7	
Upper (>$10/month)		6	0.3	0.3	0.7	0.7	

Table 4.18 shows that underweight was more prevalent in women who were ill and not using contraceptives than their counterparts respectively. However, there was no significant association between morbidity status, contraceptive method and BMI category of WRA.

Table 4.18: Percentage Distribution of WRA Nutrition status (BMI) according to morbidity status

	BMI classification (N=302)					
	Underweight	**Normal**	**Overweight**	**Obesity**	**Total**	**P-value**
Use of contraceptives						0.79
yes	1.0	32.7	10.0	3.0	140.0	
no	2.0	38.3	10.0	3.0	160.0	
Illness						0.69
yes	1.3	40.1	9.4	3.3	162.0	
no	1.7	31.4	10.0	2.7	137.0	

4.12.10 Risk factors associated with Nutrition status

To establish the risk factors associated with nutrition status of the WRA, bivariate Pearson correlation analysis was performed between nutrition knowledge, socio-demographic characteristics, morbidity status, dietary intake patterns and nutrition status. The data on table 4.19 show that there was a moderate positive highly significant correlation between knowledge score and nutrition status. A weak positive highly significant correlation was observed between numbers of living rooms, size of livestock held and nutrition status. A weak negative highly significant correlation was seen between morbidity status, asset ownership and nutrition status. Household wealth index, IDD score and number of meals per day were also identified significant factors associated with nutrition status.

Table 4.19: The bivariate correlations results for risk factors associated with nutritional status

Variable	R	P – value
Age group	0.087	0.132
Marital status	-0.006	0.920
Education level	-0.022	0.704
Household wealth index	0.136	**0.018**
Family size	0.017	0.769
Number of rooms	0.173	****0.003**
Asset ownership	-0. 15	***0.007**
Size of livestock held	0.246	****0.000**
Food security	-0.043	0.461
Morbidity status	-0.239	****0.002**
Knowledge score	0.47	****0.000**
IDD score	0.125	***0.031**
Number of meals per day	0.173	***0.043**

numbers in bold font indicate correlation was significant at p-value <0.05 and ** p-value < 0.01

In order to take care of the confounding factors and quantify the risk factors for WRA nutrition status, binary logistic regression analysis was performed, odds ratio and confidence intervals were obtained. Number of meals, wealth index and type of illness were the only identified significant factors associated with overweight. However, there were no any significant risk factors associated with underweight (Table 4.20).

Table 4.20: Binary Logistic Regression Results

Variable	Risk factor	%	P-value	OR	95% CI for OR	
					Lower	Upper
Age	≤ 32 years	60.5	0.89	1.0	0.52	1.75
	≥32 years	39.5				
Marital status	Married	58.1	0.35	1.3	0.73	2.44
	Not living with a partner	41.9				
Family size	<5 members	36.0	0.44	1.3	0.68	2.36
	>5 members	64.0				
Occupation	Farmer	57.8	0.28	1.4	0.76	2.56
	Others	42.2				
Number of living rooms	House with one room	32.6	0.22	0.7	0.35	1.27
	House with > 1 room	65.8				
Wealth index	Lower index	82.7	**0.008**			
	Medium index	15.3	**0.028**	6.9	1.23	38.62
	Higher index	2.0	0.22	3.1	0.52	18.79
Household food security	Food secure	55.1	0.28	1.2	0.89	1.49
	Food insecure	44.9				
Owns livestock		65.1	0.22	0.7	0.36	1.26
Cultivated land	No land	6.3	0.22			
	Small size	90.7	0.07	23.9	0.73	7.86
	Medium size	2.3	0.42	3.2	0.19	54.03
	Large size	0.7	0.63	2.2	0.08	56.87
Asset ownership	Assets ownership	41.5	0.14	1.6	0.86	2.98
	No assets	58.5				
Educational attainment	No formal education	19.0	0.39	1.37	0.66	2.84
	Educated	81.0				
Knowledge	Poor knowledge	64.1	0.17	0.6	0.41	1.17
	Good knowledge	35.9				
IDD score	Low	34.2	0.29			
	Moderate	60.8	0.19	2.5	0.64	9.45
	High	3.3	0.41	1.7	0.45	6.37
Number of meals	< 3 meals a day	63.1	**0.002**	0.4	0.25	0.72
	≥ 3 meals a day	36.9				
Consumed food group						
cereals and cereal products		96	0.50	1.2	0.66	2.33
White tubers and roots		44.7	0.19	1.5	0.81	2.69
Dark leafy vegetables		79.1	0.26	1.4	0.78	2.51
Legumes and pulses		41.7	0.47	1.2	0.69	2.22
Fish		39.3	0.08	1.7	0.93	3.16
Vitamin a rich vegetables		18.3	0.96	1.0	0.47	2.18
Vitamin a rich fruits		10.3	0.50	0.7	0.25	1.96
Fresh meat		12	0.52	0.7	0.29	1.87
Milk and milk products		5	0.96	1.0	0.25	4.23
Organ meat		3	0.20	2.6	0.58	12.26
All fruits		11	0.62	1.3	0.50	3.13
Beverage		33.3	0.11	0.6	0.28	1.15
Oils and fats		53.7	0.33	0.7	0.39	1.38

The odds indicate that women who possessed assets were 1.6 times more likely to be overweight than their counterparts (OR = 1.6, P = 0.05, CI = 0.86 to 2.98) and those who were living in a house with more than one room were less likely to be underweight than women living in a one room house (P = 0.003, OR= 0.7 CI = 0.35 to 1.27). Number of meals and size of livestock held were strong significant risk factors of nutrition status with (P = 0.002, OR = 0.4, 95% CI 0.25 to 0.72) and (P = 0.01, OR = 0.7, 95% CI= 0.36 to 1.26) respectively. Women with low nutrition knowledge were 0.6 times more likely to be overweight than their counterparts (P = 0.01, OR = O.69, CI= 0.40 to 1.172). The odds of women with low IDD were 2.3 times more likely to be overweight than their counterparts (P = 0.03, OR= 2.26, CI= 0.52 to 9.8).

4.13 Discussion

4.13.1 Nutrition status of reproductive age women

The study results demonstrated that the mean BMI and MUAC for older women was high and different from that of young women. The prevalence of underweight among women was 3% lower than that of 7% the overall population of WRA in Malawi while overweight or obesity was 20.5% slightly lower than the national figure of 21% (MDHS, 2015-16). These results are contrary to the previous study findings that reported Dedza as one of the district in Malawi that has high prevalence of malnutrition. But when compared to the prevalence of underweight in other sub-Saharan countries, it is below than that of Kenya(9%) (KDHS, 2013), Uganda (9%) (UDHS, 2016) and Zambia (10%) (ZDHS, 2013-14l, 2015).

Literature has revealed that overweight or obesity used to be less prevalent among rural than urban women in the previous decades and was intense among women of higher social economic status

(Mendez, Monteiro, and Popkin, 2009). A study done in Cameroon showed high prevalence of obesity in urban than in rural areas (Sobngwi et al., 2002). Systematic reviews have reported an alarming increase in prevalence of obesity and overweight among rural women than their urban counterparts, and the results have confirmed (Tai-Seale and Chandler, 2010) and (Shafique et al., 2007). However a study done by Bridevauxab, Faehcd and Eggimanna, (2007) found no differences in the prevalence of overweight and obesity between rural and urban areas. The high prevalence of overweight or obesity in the study area could be due to easy accessibility and availability of energy dense food such as refined cereals, low consumption of fruits and use of hydrogenated fats in most of their cooked foods. However, Thompson, Minihane and Williams, (2011) argued that there is limited proof from epidemiological studies that increased intake of fats result in weight gain. Additionally, lack of knowledge by large proportion of the study population on diet related diseases could have also contributed to high occurrence of overweight or obese among WRA.

In the present study, the prevalence of both underweight and obesity were high among older women as compared to young women while overweight was high in younger women though the difference was not significant. This is similar to findings of earlier studies done in United States of America which showed high prevalence of obesity in older women aged 40-49 years than young women aged 20 to 39 years (Hales et al., 2017). A study done in Jamaica found occurrence of overweight in all age groups that was associated with increasing age (Kanguru et al., 2017). However, the findings of this study are contrary to these other studies. Lewis et al., (2006) reported high prevalence rate of obesity in young than older women. Poobalan and Aucott, (2016) study indicated that overweight and obesity is mostly affecting young than older women and are prone to these body changes during the transition from adolescence to adult. A study done in Tanzania

showed that women in age group 20-29 and 30-39 years were less likely to suffer from underweight than women aged 15-19 and 40-49 years (Mtumwa, Paul and Vuai, 2016). This study, therefore, suggests that age is not a risk factor of underweight, overweight or obesity when socio demographic characteristics and dietary patterns are similar. Hence nutrition interventions which aim at preventing or managing overweight or obesity must target all WRA regardless of their age group.

4.13.2 Micronutrient deficiency status among the study population

The results showed that high proportion of respondents had frequent colds and respiratory infections (53%), cracks at the margin of the lips (52.3%), dizziness (46.7%) and night blindness (36.8%). The prevalence of these listed micronutrient deficiency may be due to consumption of low quality diets that are dominated by staples, legumes and cereals. Legumes have lower bioavailability of iron and zinc than food from animals. They also have phytates that bind minerals (zinc and iron) and thereby inhibit its absorption (Gropper and Smith, 2000). Secondly, there was low consumption of foods that are rich in vitamin C among the respondents which could have enhanced iron absorption. But in case of anaemia, it might also be due malaria infection and hookworms which might exist in the community because of the few households who practice open defecation. Hookworm infection is mainly acquired by walking barefoot on contaminated soil (Centres for Disease Control and Prevention, 2017). Hence it is possible that some women in the community were walking barefoot. Furthermore, women who were on any contraceptive method cited excessive, continuous menstrual bleeding as one of the challenges they face. It is well documented that prolonged menstruation causes a decrease in hemoglobin levels (Siemienas et al., 2014) and (Cohen and Gibor, 1980). Not only that, Hassan, El-Hussinie and El-Nahal, (1999) and Damm et al.., (1980) in their studies also reported that contraceptive methods are significantly

associated with prevalence of anemia. Consequently, it is possible that more than a quarter of women who had suggestive symptoms of anaemia specifically loosing balance because of dizziness and pallor on the palms and face was due to excessive bleeding which was mainly caused by the contraceptive methods that they were using. This study reinforced previous findings stated that anaemia is still a challenge among women of reproductive age in developing countries.

4.13.3 Factors associated with nutrition status of women of reproductive age

This study found that age was positively correlated with BMI though the relationship was weak. This is similar to a study conducted in Northeast India by Mungreiphy, Kapoor and Sinha, (2011). In contrast, a Norwegian study reported a negative significant correlation between age and BMI (Reas et al., 2007). Another study reported that larger BMI declined with age (Stevens et all, 2005) and (Alam et al, 2015) reported an inverse relationship between age at menarche and obesity or overweight. The existed positive correlation of BMI and age in this study could be one of the reason why more women in older age group were obese than younger women. The results also showed that women aged 15-19 years were less likely to be overweight than those in 25 to 29 age groups. This is similar to study findings done by He et al., (2016) found low prevalence of overweight in younger than older women age group. In another study, overweight was seen in all age groups though was much higher in women aged 35 to 49 years (Biswas et al., 2017). Therefore, this study suggest that the low prevalence of overweight among young women could be due to the reason that adolescent women who were living together with their parents had no or little power over the availability and distribution of food among household members and sometimes they are even being sidelined leading to poor nutrition status.

Level of education attainment was found to be inversely correlated with BMI. Women who had no formal education were more likely to be overweight than women with formal education. This is in line with the results of a study by Hermann et al., (2011). A study conducted by (Reas et al., 2007) found that women with higher education had a lower BMI compared to their counterparts. The low BMI among women with higher levels of education could be attributed to the better knowledge of the consequences of having excessive weight and the importance of consuming healthy diets (particularly consumption of fruits and vegetables) which they have gained or accessed through school lessons, radio and print media. Therefore this study suggest that promotion of girl child participation in secondary education or up to tertiary education level and nutrition education can be some of the interventions that if implemented can contribute to the reduction of the emerging high prevalence rates of overweight or obesity among WRA.

As expected, this study had found a positive significant correlation between BMI and household wealth index. The women that were classified under higher wealth index category were more likely to be overweight than women in the lower index category. These results are comparable to a prior study done by Morgenstern and Sargent, (2009) and are inconsistent with the findings of Reas et al., (2007). The findings of a research done by (Asiseh and Yao, 2016) revealed an inverted U-shaped association between BMI and household income and indicated that extra income in a family is likely to result in higher BMI and higher likelihood of being overweight or obese for the poor than for the rich. In this study there was a positive correlation between wealth index and nutrition status because most of the times women who belong to medium or high wealth index have the ability to easily access to health services and meet their essential basic needs in so doing the women health and nutrition status also improves.

The bivariate Pearson results showed a weak negative highly significant correlations between assets ownership and nutrition status. Owning of assets has an effect on nutrition status of a woman as it strengthens women income-generating capacity (Rodgers and Kassens, 2018). Therefore, in this study, it is possible that the existed negative correlation between nutrition status and assets ownership was a result of spending of the hardly earned money on buying assets such as livestock, bicycles, phones, television and agricultural implements than on nutritious food. It is well documented that when household real income increases much of it is spent on buying assets than inferior goods (Investopidia, n.d.), hence not easy for women owns assets to gain excess weight.

The study results have showed that high proportion of women had moderate level of nutrition knowledge which was highly significantly correlated with nutrition status. Women with poor nutrition knowledge were more likely to be overweight than their counterparts. This is similar to the results of previous study conducted in Brazil which showed a significant association between nutrition knowledge and BMI (Valmórbida et al., 2017) and contrary to a studies done by O'Brien and Davies, (2007) and Zhou et al.., (2017). A study done by Ilich, Vollono and Brownbill, (1999) emphasized the importance of nutrition knowledge as it helps individuals to make better food choices and consume adequate nutritious diets (Nani, 2016). However, according to O'Brien and Davies, (2007) nutrition knowledge is not be the most important factor stopping individual from gaining excess weight or adopting a healthier diet. Therefore, this study suggest that apart from nutrition education which is given to women, there is also need for government to deploy different interventions that will facilitate to change individual dietary practices.

In the present study, there was a weak positive significant association between Individual Dietary Diversity Score (IDDs) and nutrition status of the respondents. Women with low IDDS were more likely to be overweight than their counterparts. These results are in-line with previous studies conducted by Gutiérrez-Pliego et al., (2016) where results showed a direct association between inadequate diet and obesity. Kaur et all, (2009) study showed a positive relationship between eating pattern and BMI. On contrary, previous studies done by Hausman et al., (2011) found that underweight was not associated with dietary intake of an individual. Furthermore, Al-Muammar, El-Shafie and Feroze, (2014) study found no significant differences between BMI category and dietary habits. The likelihood of women with low IDD being overweight could be attributed to high consumption of unhealthy diets which are mainly composed of energy dense foods. As earlier discussed, almost the whole study population relied much on production as their main source of food and lived below poverty line (1.90$/day) hence majority consumed foods that were locally available and very few individuals purchased additional food.

Consistent with (Franko et al., 2008) and (Utter et al., 2008), this study found that there was a weak positive significant correlation between meal frequency and BMI. It is well documented that consumption of breakfast and taking at least three meals over the course of the day is helpful in preventing overweight. On contrary, this study results have shown that majority of women skipped breakfast and took 2 meals per day. Therefore, this study suggests that women should be encouraged not to skip breakfast and take a minimum of 3 meals per day as a preventive measure of overweight.

The results of this study have shown a highly significant correlation between nutrition knowledge level and BMI category of the respondents. This is similar to study done by Valmórbida, Goulart, Busnello, Pellanda, et al., (2017). Possibly the significant association between level of nutrition

knowledge and overweight has occurred because women of the study area did not know how to effectively apply the learned nutrition information when choosing diets to consume. This justify the importance of employing nutrition education approach to improve nutrition status of WRA.

4.14 Conclusion

There is undernutrition and overnutrition among WRA, however the prevalence of the latter is higher than the former. The risk factors for nutrition status of women of reproductive age in Dedza district are; wealth index category, assets ownership, morbidity status, IDDs and nutrition knowledge.

4.15 Recommendation

1. There is need for government to develop interventions such as nutrition education and non-communicable diseases awareness campaigns that can tackle the coexisting of undernutrition and overnutrition among WRA.
2. Women need to be encouraged to diversify their diets and adopt healthy lifestyle behavior that can prevent excessive weight gain.
3. The identified risk factors must be taken into consideration by policy makers when planning, designing, prioritization, targeting and managing of nutrition interventions.

Chapter 6: General Conclusions

1. WRA in Dedza district have low levels of nutrition knowledge and is influenced by attained levels of education and household income.
2. The diets of the WRA are inadequate, poor in quality and do not meet the recommended dietary diversity score.
3. The dietary intake of WRA in Dedza district is influenced by nutrition knowledge with regards to consumption of roots and tubers, eggs and fruits.
4. There is undernutrition and overnutrition among WRA, however the prevalence of the latter is higher than the former
5. The risk factors for WRA in Dedza district are wealth index category, asset ownership, morbidity status, IDDs and nutrition knowledge
6. The majority of WRA in Dedza district have clinical signs of anaemia.

Chapter 7: General Recommendations

1. There is an urgent need to conduct awareness campaigns and develop nutrition education programmes to improve women's levels of knowledge especially on diet-related diseases.
2. There is need to increase consumption of food from animals, fruits and vegetables and limit consumption of highly refined cereals, fats and oils by intensifying implementation of the following interventions; dietary diversification campaigns, kitchen gardens and promote livestock production.
3. There is need to promote nutrition education especially on dietary practices, besides empowering women economically.
4. The identified risk factors must be taken into consideration by policy makers when planning, designing, prioritization, targeting and managing of nutrition interventions.
5. Diversified diets must be encouraged to control and prevent micronutrient deficiencies among WRA.
6. Women need to be encouraged to diversify their diets and adopt health lifestyle behaviour that can prevent excessive weight gain.
7. There is need for further investigations to determine the determinants of anemia in WRA which was not evaluated in this study, with a special focus on use of contraceptives.

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9.0 APPENDIX

Appendix I: Questionnaire

QUESTIONNAIRE FOR ASSESSING NUTRITION STATUS AND DIETARY INTAKE AMONG WOMEN OF REPRODUCTIVE AGE (15 TO 49YEARS) IN DEDZA DISTRICT

Date of interview: _____Questionnaire Number: ____
Name of Interviewer: _____ Village: _____ TA _____
District _____

SECTION A: DEMOGRAPHIC CHARACTERISTICS

1. Name of respondent? _____ Date of birth _____
2. How old are you? _____
3. What is your marital status?
   a. Single/never been married d. Married
   b. Widowed e. Divorced f. Separated
4. What is the highest level of educational you have completed.
   a. Never went to school e. Upper Primary
   b. Kindergarten f. Secondary
   c. Lower Primary g. University h. College/Polytechnique

5. Including yourself, how many people live within your household?[1] _____

6. What is your religious orientation?
   a. Muslim b. Christian c. Others specify _____

SECTION B: SOCIAL ECONOMIC STATUS

7. What is the household main source of income?
   a. Farming/ crop/animal sales e. salaried/wage employment
   b. Self – Employment f. Business
   c. Casual labour g. Remittances/gifts
   d. Others specify _____

8. What was your total household income last month?
   a. 5000 – 10 000 d. 10,00 – 20 000
   b. 20 000 – 30 000 e. 40 000 – 50 000 f. Greater than 50000

9. Please describe the home where you live
   a. Self-owned c. Pay rent
   b. Hosted by parent/owner/relatived. Others specify _____

_____

[1]*number of person who live together and eat from the same port at the time of assessment.*

10. Does your household own any of the following Assets?

	Item	Please Tick
	Type of House (Please Observe)	
12.1	**Roofing**	
a	Grass Thatch	
b	Plastic sheet roof	
c	Iron Roof	
	Other roof (specify) _____	
12.2	**Type of wall**	
a	Mud Wall	
b	Skin wall	
d	Brick/stone wall	
e	Other wall (specify)_____	
12.3	**Type of floor**	
a	Mud floor	
c	Concrete floor	
d	Other floor (specify)_____	
12.4	**Assets**	
a	Bicycle	
b	Hand Grain Miller	
c	Ox-Plough	
e	Treadle pump	
f	Beds	
g	Food Granary	
h	Radio	
i	Television	
j	video player	
k	Mobile phone	
n	Others specify	
		How many? Please indicate (Number/size)
12.5	Number of Rooms in the dwelling place	
12.6	Cultivated Land (acres) last season	
12.7	What is the size of your livestock? 0=no livestock, 1=little, 2=small, 3=medium, 4=Large	
	Bulls (number) Cows (Number)	
	Goats (number)	
	Sheep (number)	
	Poultry (number)	
	Others (specify)_____	

SECTION C: FOOD SECURITY SITUATION

11. Which of these statements best describes the food eaten in your household in the last 3 months?
    1. Enough of the kinds of food we want to eat
    2. Enough but not always the kinds of food we want
    3. Sometimes not enough to eat
    4. Often not enough to eat

12. How do you access food?
    1= Own production 2= purchases
    3= Gifts from friends/relatives 4= food aid
    5= borrowed 6= gathering/wild 8= others, specify _____

SECTION D: SANITATION, WATER AND HYGIENE

13. Where do you get your drinking water?
    1= Tap water 3= Borehole 5. Protected well
    2 = Rain water 4= River 6. Unprotected well
    5 = others (specify) _____

14. Do you treat water? 1= Yes 2= No

    If yes, how do you treat water?
    1= Boiling 3. Nothing
    2= Waterguard/Chlorine 4. Others specify

15. Any pit latrine/toilet in the household? 1= yes 2 = No

16. When do you wash your hands?
    .....
17. Do you have garbage pit?
    1= yes 2=No
18. What do you do with the household leftover food? ……

SECTION E: MORBIDITY

19. Has the woman reduced dietary intake in the last few weeks? 1= Yes 2= No

20. Has the woman been ill in the last 14 days? 1= Yes 2= No

    If yes what type of illness?
    1 = anaemia 3 = hypertension 4 = High Blood Pressure
    2 = diarrhea 5 = diabetes

21. Were you taken to the hospital? 1 = yes 2 = no

22. Have you ever had any of the following conditions? (please circle all that apply)
    1. Diabetes 3. Liver disease 5. osteoporosis
    2. Kidney disease 4. Lung disease

23. Do you take nutritional supplements? 1 = Yes 2 = No
    If yes, what kind of nutritional supplements do you take? (Please include all vitamins, herbs, nutritional supplements [Greens + protein powder etc.])_____
    1 = Iron-folate tablets 2 = Vitamin A supplements
    3 = others specify _____

24. Are you currently use contraceptives? 1 = yes 2 = no
25. Which contraceptive method do you use for family planning? _____

26. Any challenges?

1 = nausea 3= vomiting

2 = loss of blood 4 = others specify _____

SECTION F: CLINICAL SIGNS OF WOMEN IN RELATION TO MICRONUTRIENT DEFICIENCY

27. Do you lose your balance because of dizziness?

1 = yes 2 = no

28. Check presence of pallor on the face and palms of the woman

1 = present 2 = absent

29. Do you have a history of night blindness? 1=Yes 2= No

30. Do you get frequent colds, upper respiratory tract infections or urinary tract infections?

1=Yes 2= No

31. Do you often experience cracks at the margins of your lips? 1= yes 2 = no

32. Do you often experience a sore or burning tongue? 1= Yes 2 = No

33. Have you experienced a decreased ability to taste food? 1=Yes 2= No

34. Do your gums often bleed easily? 1=Yes 2= No

35. Have you noticed small red spots under your skin? 1=Yes 2 = No

36. Are you a slow healer from cuts and wounds? 1=Yes 2 = No

37. Check presence of goiter. 1. Present 2. Absent

SECTION G: NUTRITION KNOWLEDGE

38. How do you access nutrition knowledge?

1. Radio 3. hospital
2. Newspaper 4. Others specify _____

1d	Questions assessing women nutrition knowledge. (Tick yes if the answer she give is right)	Tick yes or no	
		yes	No
1	At what age should babies start eating foods in addition to breastmilk? 6 months		
2	What are the key moments when you need to wash your hands to prevent germs from reaching food? After changing nappies, after visiting the toilet, Before preparing food, before eating food, after handling animals, after handling agro-chemical		
3	What are the foods that are rich in Iron? Bononwe, liver etc.		
4	What are the symptoms of anaemia? Dizziness, fatigue, pale skin. Others specify …….		
5	What are the dietary risky behaviours during pregnancy? Alcohol, smoking, underweight, diabetes, others specify …….		
6	When should a pregnant mother start attending antenatal clinic? 3 months		
7	What are the functions of fruits in the body? To boost immunity		
8	Which foods can increase blood pressure? Foods with high content of salt fat.. ..		
9	Which foods are not good for women with diabetes? excess sugars, foods with high carb counts, a		
10	How many food groups do you know? Staples, fruits, vegetables, fats and oils, legumes and food from meat		
	Total Score		

SECTION H: ANTHROPOMETRY FOR WOMEN AGED 15- 49 YEARS

39. Anthropometric Measurements

Anthropometric Assessment Method	Measurement 1	Measurement 2	Average
Weight (Kg)			
Height (metres)			
MUAC(Centimeters)			
Waist Hip ratio			

SECTION I: FOOD CONSUMPTION AND DIETARY DIVERSITY

I. DIVERSITY OF FOOD

40. What food groups did the respondent consume in the past 24hrs?(Tick all reponses)
    1. Cereals
    2. Vegetables
    3. Fruits
    4. Roots and tubers
    5. Legumes
    6. Animal products
41. How many meals do you eat per day?

    1 = one meal/day
    2 = two meals/day
    3= three meals/day
    4= four meals/day
    5= more than four meal/day

42. Was yesterday a special or feast day where you ate unusual foods? 1=Yes 2 = No

43. Did you eat anything (meal or snack) outside of the home yesterday?1=Yes 2 = No

44. Did you take any supplements yesterday? 1=Yes 2 = No

Repeat questions until respondent indicates she went to sleep until the next day. If respondent mentions a mixed dish, ask about all ingredients that went into the dish, including added oil or sugar. As the respondent recalls foods**, underline the corresponding food and record "1" in the column on the right.** Once the respondent finishes recalling foods eaten, read each food group where "1" was not recorded and ask: "Yesterday during the day or night, did (the woman) eat any foods such as (read examples of food group items)
RECORD: 0= no, 1= yes, 88= don't know

Food Group: Examples	**Code**	**RECORD**: 0= no, 1= yes, 88= don't know
Cereals: Millet/Sorghum/Maize porridge		
Cereal products: rice, bread, mandazi, ugali (sima) or other foods made from grain like: Sorghum, Millet, Wheat		
Vitamin A rich vegetables and tubers: Pumpkins, carrots, orange or yellow fleshy sweet potatoes		
White tubers and roots: Sweet Potato (white), white Yams, Cassava, Irish Potato or any other foods made from roots		
Dark green leafy vegetables including wild green vegetables like: cassava leaves, amaranthus, , pumpkin leaves, , sweet potato leaves		
Other vegetables: Cabbage, Eggplants, Tomatoes, Onions, Green Pepper, Mushroom, Okra		
Vitamin A rich fruits :Ripe mangoes, papayas + other locally available vitamin A rich fruits		
Other fruits: Bananas, Oranges, Lemons, Tangerines, Pineapples, coconut		
Organ meat (iron rich: Liver, Kidney, heart, gizzard or other organ meats		
Fresh meats and offals: Meat, poultry, offal (e.g chicken/poultry, camel/goat meat, beef)		
Eggs: Chickenor other eggs from any kind of birds		
Fish: Fresh or dried fish or shell fish (Tilapi, octopus, crab)		
Pulses/Legume, nuts (e.g beans, lentils, green, cowpeas)		
Milk and milk products (e.g. goat/cow milk, milk powder)		
Oils/fats*(e.g. cooking fat or oil, butter, ghee, margarine)		
Sweets, Sugar, honey, sweetened soda		
Condiments and Spices: Chilies, Pepper, Salt		
Beverages: Thobwa, black tea		

III. FOOD CONSUMPTION

Name of Enumerator _____Respondent: ……Village ……Date……

Meal code	place	Dish name	Ingredients		Amount used in preparation				Total consumed			Left over			Weight and proportion consumed	Total weight consumed
			Name	description	quantity	unit	gram	waste	quantity	unit	gram	quantity	unit	gram	gram	gram

Meal code: 1 = before break fast; 2 =breakfast; 3 = morning; 4 = lunch; 5= afternoon; 7 = evening; 8= night

place: 1 = Home 2=outside home

Appendix II: Consent Form

NUTRITION STATUS AND DIETARY INTAKE AMONG WOMEN OF REPRODUCTIVE AGE OF 15 TO 49 YEARS: A CASE STUDY OF DEDZA DISTRICT

I am a postgraduate student at the University of Nairobi, College of Agriculture and Veterinary Sciences, studying Applied Human Nutrition. I wish to request for your permission, for you to participate in a study that will form part of my degree work. The aim of this study is to contribute towards Malawi government goal of reducing maternal, infant, young and child mortality rates which are due to malnutrition and poor preconception nutrition. The purpose of the study is to highlight the magnitude of and factors contributing to high malnutrition levels among women, with the hope of raising awareness especially to women who are in the pre-conception stage.
In this study, you will be expected to provide truthful information regarding your household to the enumerators assigned to you. The data will be written and analyzed for research purposes only. Your identity will be kept confidential.

Your participation is purely voluntary, there is no monetary gain and you may withdraw from the study at any stage, without any penalty. It will not cost you anything to participate in this study. You are free to ask any Questions about my study if you require any clarification. Contact of Investigator: Margaret Elizabeth Bulirani, District Food and Nutrition Officer, Dedza District council **Tel +265 999 491 850**.

I would therefore appreciate your consent by signing here below:
I …….confirm that I have explained the relevant parts of the study to the participant. Signed: _____ Date: _____
I, the participant, confirm that I have understood the relevant parts of the study and do hereby give consent to participate.

Signed: _____ Date: _____

Appendix III: Advertisement for Household Survey Enumerators

ADVERTISEMENT FOR HOUSEHOLD SURVEY ENUMERATORS

We are planning to conduct a household survey on nutrition status, knowledge and dietary intake pattern among women of reproductive age in Dedza district.

We are in the process of identifying households survey enumerators. Those who are interested should meet the following

1. A person with certificate, diploma or degree in nutrition, social sciences, public health, food science or community development. Those with experience in conducting survey data collection will have an added advantage.
2. Must be willing to participate and available in August/September
3. Must be a person of high integrity
4. They must be fluent in Chichewa.

If you meet the above listed requirements, please submit your application with scanned copies of certificate, 2 Paged curriculum vitae (CV) to the email-address given below

Based on your qualifications we shall shortlist and invite the short listed for interviews.

Please submit your application by **21st July, 2017** to

The principal Researcher, **E-mail:** buliranimargaret@gmail.com

Appendix VI: Time Table for Training of Research Assistant

DAY	TIME	NAME OF ACTIVITY	LEARNING METHODS
Day 1		**Arrival of participants**	
Day 2	8:00 - 8:30	Registration	
	8:30 - 9:30	Opening prayer	
		Introduction to the study	Lecture
		Ground rules	
	9:30 - 10:00	Surveys objectives	
	10:00 - 10:30	**HEALTH BREAK**	
	10:30 - 12:00	Gaining consent	Lecture
	12:00 - 1:00	**LUNCH BREAK**	
	1:00 - 3:00	Household questionnaire and filling questions	Lecture and demonstration
	3:00 - 3:30	**HEALTH BREAK**	
	3:30 - 4:45	Household questionnaire and filling questions	Lecture and demonstration
	4:45 - 5:00	Closing remarks	Supervisor
		Closing prayer	Volunteer
		END OF DAY 2	
Day 3	8:30 - 9:00	Opening prayer and Recap	Volunteer
	9:00 - 10:00	24 hour dietary recall	Demonstration and practice
	10:00 - 10:30	**HEALTH BREAK**	
	10:30 - 12:00	Food frequency questionnaire	Demonstration and practice
	12:00 - 1:00	**LUNCH BREAK**	
	1:00 - 3:00	Anthropometric measurements -weight, height and MUAC	Demonstration and practice
	3:00 - 3:30	**HEALTH BREAK**	
	3:30 - 4:45	Practice/role pray- interview techniques	Role pray
	4:45 - 5:00	Closing remarks	
		Closing prayer	

		END OF DAY 2	
	8:30 - 8:35	Opening prayer	Volunteer
	8:35 - 9:00	Recap	Lecturer
	9:00 - 9:30	Methodology/sampling	
	9:30 - 10:00	Inclusion and exclusion criteria	
	10:00 - 10:30	**HEALTH BREAK**	
	10:30 - 12:00	Quality control	Lecture
	12:00 - 1:00	**LUNCH BREAK**	
	1:00 - 3:00	Consent form	Lecture
		Role pray- taking measurements	
	3:00 - 3:30	**HEALTH BREAK**	
	3:30 - 4:45	Ethics in field work	Lecture
		- courtesy, respect and privacy, empathy, avoiding insensitive communication, manufacturing of data	
	4:45 - 5:00	Team formulation	Lecture
		Closing remarks	Supervisor
	8:15 - 8:30	Opening prayer	Volunteer
	8:30 - 12:30	Pre- testing	Field work
		LUNCH BREAK	
	1:00 - 2:30	Feedback	Lecture and demonstration
	2:30 - 3:00	Closing remarks	Supervisor
		Closing prayer	Volunteer
		END OF DAY 5	