

**NUTRITION STATUS AND FEEDING PRACTICES OF CHILDREN BELOW
TWO YEARS IN PASTORALIST AND CROP FARMING COMMUNITIES
IN MVOMERO DISTRICT, TANZANIA**

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
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ABSTRACT

This study aimed to determine nutrition status, nutrient adequacy and feeding practices of infants and young children among pastoralist and crop farming communities. A cross-sectional study design was adopted. A total of 348 caregivers of children between 0 to 23 months old were randomly sampled from Dakawa and Lubungu in Mvomero district, Morogoro region. Among these, 206 caregivers were from crop farming and 142 were from pastoralist communities. *ProPAN* standardized research tools and procedures were adopted for data collection. Socio-demographic and feeding practices information were collected using caregiver survey. Semi-structured interview and opportunistic observation were conducted to collect qualitative data. Quantitative data from caregiver survey and 24-hour dietary recall were processed using *ProPAN* software in which descriptive statistics, t-test and Chi-square test were done by SPSS version 21 software. Qualitative data from semi structured interview and opportunistic observation were manually analysed using the *ProPAN* matrices. Finally, qualitative and quantitative data were integrated qualitatively to identify facilitators and barriers to ideal feeding practices. Relatively high proportion of crop farmers (66.5%) initiated breastfeeding within one hour after delivery compared to about 35% in pastoralists. Pre-lacteal feeding was more common among pastoralists (37%) compared to crop farmers (22%). Plant-based foods were the most common complementary foods reported. There was inadequate intake of calcium, iron, zinc and vitamin A from complementary foods in both populations. Limited knowledge on infant and young children's nutrition needs and cultural restrictions which forbid consumption of some nutritionally dense foods were among the barriers to optimal infant and young child feeding practices. High proportions of children in pastoralist than in crop farming community were underweight and wasted. Stunting was 34% in crop farming community and 32.7% in pastoralist community. To promote optimum feeding practices in both communities, stakeholders should consider planning programs on educating community while addressing cultural specific barriers.

DECLARATION

I, **Martha Godfrey Kibona**, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work done within the period of registration and that it has neither been submitted nor being concurrently submitted to any other institution.

Martha Godfrey Kibona.
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Date

The above declaration is confirmed by;

Dr. Akwilina Mwanri
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Date

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DEDICATION

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LIST OF ABBREVIATION

ANC	Ante Natal Care
ANOVA	Analysis of Variance
CF	Complementary Foods
CI	Confidence Interval
EBF	Exclusive Breastfeeding
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
HIV	Human Immunodeficiency Virus
IDA	Iron Deficiency Anaemia
IDD	Iodine Deficiency Disorders
IYCF	Infant and Young Child Feeding Practices
NBS	National Bureau of Statistics
PAHO	Pan American Health Organization
PEM	Protein Energy Malnutrition
<i>Pro</i> PAN	Process for Promoting Child Feeding
RCH	Reproductive and Child Health
RDA	Recommended Dietary Allowance
SD	Standard Deviation
UN	United Nations
UNFPA	United Nations Fund for Population Activities
UNICEF	United Nations Children's Fund
VAD	Vitamin A Deficiency
WB	World Bank
WHO	World Health Organization

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Infant and young child feeding are a cornerstone of care for childhood development (Baye, 2016; Binns *et al.*, 2017). Appropriate feeding practices are basic component for survival, growth and development of children (Black *et al.*, 2008; Saha *et al.*, 2008). The first two years of life have been proven to be a critical window for ensuring optimal child growth and development (Dewey and Prado, 2014; Cusick *et al.*, 2016). Adverse disruptions like poor nutrition during this period can lead to underweight, wasting and stunting, the latter is associated with impaired cognitive development, reduced school and work performance and hence low economic productivity (Dewey and Prado, 2014).

Poor feeding practices accompanied with the burden of infection are the primary cause of malnutrition worldwide (Black *et al.*, 2008; Bain *et al.*, 2013). Globally only 42% of newborns are introduced to breastfeeding the first hour of birth, about two fifths of infants 0-5 months of age are exclusively breastfed and only one in six children receive a minimum acceptable diet in low and lower-middle-income countries (UNICEF, 2018). In Tanzania although breastfeeding is universally practiced; pre-lacteal feeding, short duration of exclusive breastfeeding, inappropriate timing of introducing complementary foods, poor food preparation, low meal frequency and complementary foods with low energy and nutrient density are common practices (Muhimbula and Issa-Zacharia, 2010; Safari *et al.*, 2013; Vitta *et al.*, 2016). According to NBS (2016) report, 59% of infants less than 6 months are exclusively breastfed, only 9% of children age 6-23 months are fed according to the minimum acceptable dietary standards. In addition, the levels of

undernutrition among children under 5 years of age are unacceptable; 34.7%, 14%, 5% of the children are stunted, underweight and wasted respectively (NBS, 2016).

In their efforts to ensure good nutrition, growth and development, health and survival of children, the United Nations Children's Fund (UNICEF) and Pan American Health Organization (PAHO) developed validated set of recommendations to promote infant and young child feeding practices. The recommendations are appropriate in improving breastfeeding and complimentary feeding practices especially in developing countries. UNICEF (2018) stated that adoption of optimal feeding practices is fundamental to a child's survival, growth and development, but too few children benefit (UNICEF, 2018).

Optimal IYCF practices during infancy and early childhood feeding have been proven to increase child survival and help the child to attain its full potential (Patel *et al.*, 2015; Chowdhury *et al.*, 2015). Breastfeeding alone has been shown to decrease the child mortality by 13% in under five children in developing countries (Black *et al.*, 2013). Adequate feeding from 6 months onwards can prevent undernutrition and decrease the risk of infectious diseases, like diarrhoea and pneumonia (UNICEF, 2018).

A good understanding of the circumstances behind communities feeding practices and their differences in malnutrition prevalence is crucial in identifying and designing appropriate interventions that will improve nutrition and well-being of children. This study has gathered information on nutrition status of children of age 6-23 months children in crop farming and pastoralist communities in Mvomero district, the extent to what PAHO/UNICEF infant and young child feeding recommendations are being observed also barriers and facilitators to their actualisation in these communities. The information

gathered seeks to strengthen provision of infant and young child feeding (IYCF) interventions and hence improve nutrition status.

1.2 Problem Statement

Sub-optimal feeding practices are among the main cause of malnutrition in young children. Along with unacceptable levels of malnutrition, poor infant and young child feeding practices have been widely documented in Tanzania (Safari *et al.*, 2013; Kulwa *et al.*, 2015; Vitta *et al.*, 2016). According to NBS (2016), nearly half of the children (49%) were not breastfed within the first hour of birth, more than one third (40%) of the children below six month were not exclusively breastfed, only 9% of children age 6-23months are fed according to the minimum acceptable dietary standards and 28% of sick children with diarrhoea were given less or no fluid (NBS, 2016).

In Morogoro 62% of the children were breastfed within the first hour of birth, more than one third of the children below six month were not exclusively breastfed and only 16.5% children aged 6-23 months who received minimum acceptable diet (TFNC, 2014). Various studies conducted in different areas of Morogoro have continuously reported inadequate feeding practices (Mamiro *et al.*, 2005; Maseta *et al.*, 2008; Safari *et al.*, 2013) however, data segregation by livelihood is rarely available. According to WHO (1995), classification of severity of malnutrition by prevalence, Morogoro has high rate of stunting (33.4%) and medium underweight (11.5%) and medium wasting (6%).

Inadequate breastfeeding practices have been proven to increase the risk for infectious illnesses and death in early childhood (Chowdhury *et al.*, 2015). Infants are particularly vulnerable during complementary period, a gradual transition from exclusive breastfeeding to eating family foods. Poor complementation practiced during this period

increase their vulnerability to undernutrition which limit them reach their full development potential.

The aim of this study was to fill the gap of information concerning the infant and young child feeding practices in crop farming and pastoralist communities.

1.3 Justification of the study

The findings of this study provide the precise information on how current infant and young child feeding practices in crop farming and pastoralist communities conform to UNICEF/PAHO recommendations. The study also details the circumstances that lead to current practices i.e. the barriers and facilitators to optimal infant and young child feeding practices. With the information obtained from this study; policy makers and other stakeholders of child nutrition would be in a better position to come up with appropriate policies and intervention programs that will promote optimal infant and young child feeding practices and hence ensure good nutrition and health to children. The information will also assist the Government, and other stakeholders to have proper planning and channeling of resources according to the needs.

1.4 Study Objectives

1.4.1 Overall objective

The overall objective of this study was to determine nutrition status, dietary adequacy and feeding practices of infants and young children among pastoralist and crop farming communities in Mvomero district.

1.4.2 Specific objectives

The above mention overall objective were attained by undertaking the following specific objectives:

1. To determine nutrition status of children 6-23 months of age among pastoralist and crop farming communities in Mvomero district.

2. To assess the ideal breastfeeding and complementary feeding practices of infants and young children among pastoralist and crop farming communities
3. To determine nutrient adequacy of children between 6-23 months of age among pastoralist and crop farming communities

1.5 Research Questions

This study will be guided by the following research questions:

- 1) Are there differences in nutritional status among children 6-23 months of age from crop farming and pastoralist community?
- 2) What are the current breastfeeding and complementary feeding practices of infants and young children in farmers and pastoralists communities?
- 3) What are the barriers and facilitators to optimal feeding practices?
- 4) Do the 0-23 month's children in farmers and pastoralists communities have adequate nutrient intake?

CHAPTER TWO

2.0 LITERATURE REVIEW

This chapter identifies, locates, evaluates and details the information known related to the topic of the study as researched, documented and written by others. This literature review is organized in accordance with the specific objectives of this study irrespective of their serial ordering.

2.1 Nutrition Status

2.1.1 Overview of nutrition status assessment

Nutritional assessment is the systematic process of collecting and interpreting information in order to make decisions about the nature and cause of nutrition related health issues that affect an individual (BDA, 2012). Nutritional assessment includes anthropometric measurements of body composition; biochemical measurements of serum protein, micronutrients, and metabolic parameters; clinical assessment of altered nutritional requirements and social or psychological issues that may preclude adequate intake; and measurement of dietary intake. Nutritional status of individuals has been widely evaluated in field studies and nutritional surveillance programmes through the use of anthropometry; that is, by taking body measurements, such as weight, height and circumferences, which are then compared with averages for well-nourished people in the same age and sex classes. Anthropometric measures can be described as outcome indicators, in that they reflect the end result (in an individual) of all the factors that impact nutritional status (FAO, 2001). In general, nutrition assessment provides a rationale for the nutritional intervention.

2.1.2 Indicators of nutritional status of children

Child growth is internationally recognized as an important indicator of nutritional status and health in populations (WHO, 2009). Stunting, underweight and wasting are indicators used to measure nutritional imbalance resulting in undernutrition.

2.1.2.1 Stunting

Stunting is the term used to describe a condition in which children fail to gain sufficient height, given their age. By definition stunting is defined as the percentage of children, whose height for age is below minus two standard deviations (moderate and severe stunting) and minus three standard deviations (severe stunting) from the median of the WHO child growth standards (UNICEF, 2017). Stunting is caused with long-term factors such as chronic malnutrition, especially protein-energy malnutrition, repeated infection, and inadequate psychosocial stimulation (Petri *et al.*, 2008; Oliveira *et al.*, 2015). Stunting can therefore be interpreted as an indication of impact of deprived environmental conditions or long-term restriction of a child's growth potential (WHO, 2009). It is the best overall indicator of children's well-being and a precise reflection of social inequalities (Onis and Branca, 2011).

Effects of stunting which last a lifetime include underdeveloped brain, with long-lasting harmful consequences, such as diminished mental ability and learning capacity and poor school performance in childhood (Cesar *et al.*, 2008; Dewey and Begum, 2011). Also, reduced earnings and increased risks of nutrition-related chronic diseases, such as diabetes, hypertension and obesity in later stages of life (Cesar *et al.*, 2008). Stunting is almost irreversible but it can be prevented by improving nutrition for women and children in the first 1,000 days (Dewey, 2011).

About 151 million children under the age of five were stunted around the world in 2017 (WHO, 2017). Approximately 75% of the world's stunted children live in Sub-Saharan Africa or South Asia (WHO, 2017). In Tanzania, according to NBS (2016) the proportion of children below five years with low height for age is still high.

2.1.2.2 Underweight

Underweight is the term used to describe a situation where a child weighs less than expected, given his or her age. It is measured as the percentage of children less than five years of age whose weights are more than 2 standard deviations below the median of a standard population such as that of NCHS/WHO table of child weights (WHO, 2017). It reflects current and acute as well as chronic malnutrition. The percentage of children who have low weight for age (underweight) can reflect wasting (i.e. low weight for height), indicating acute weight loss, stunting, or both. Thus, underweight is a composite indicator and may therefore be difficult to interpret (WHO, 2009).

Underweight have impact on child survival and development as it increases children's risk of death, limits their cognitive development, and affects health status later in life (Block *et al.*, 2010; Rodríguez *et al.*, 2011). In Tanzania according to NBS (2016), the proportion of children below five years with low height for age is still high about (14%). The prevalence of underweight of children below five years in Morogoro region is 11.5% (NBS, 2016).

2.1.2.3 Wasting

Wasting is the term refers to a situation where a child has failed to achieve desirable weight for height (W/H). Wasting, or low weight for height, is a strong predictor of mortality among children under five (Caulfield *et al.*, 2004; Schaible and Kaufmann, 2007; Cesar *et al.*, 2008). It is usually the outcome of acute significant food shortage

and/or disease which affect food intake or nutrients utilization of an individual (UNICEF, 2017).

Wasting is prevalent in many of the developing countries mainly due to food insecurity, poverty, nature disasters and political instabilities (Prost *et al.*, 2008; Kerac *et al.*, 2011). In Tanzania according to NBS (2016), the proportion of children below five years with low height for age is still high about 4% (NBS, 2016).

2.1.3 Causes of malnutrition

Malnutrition has multi-factorial causes as highlighted by conceptual framework of causes of malnutrition developed by UNICEF (1991); it results when there is inadequate dietary intake and/or diseases, these two being the immediate causes. In developing countries, infectious diseases, such as acute respiratory diseases, diarrheal diseases, are accountable for most nutrition-related health problems (Petri *et al.*, 2008; Oliveira *et al.*, 2015).

Inadequate access to food intake and insufficient health services and unhealthy environment are the factors contributing to inadequate dietary intake and diseases (immediate causes). In some cases foods are readily available and there is an appropriate health system and a "healthy" environment and malnutrition is still prevalent due to ineffective use of these resources. Therefore, the absence of proper care in households and communities is the third necessary element of the underlying causes of malnutrition (Hamel, 2015).

Finally, human and environmental resources, economic systems and political and ideological factors are basic causes that contribute to malnutrition. This comprises the degree to which political and economic system that determines how income and assets are

distributed; and the ideologies and policies that govern the social sectors are taking into account the fight against malnutrition (FAO, 2001). Malnutrition, particularly undernutrition, mainly affects the most vulnerable and most disadvantaged populations, especially children, women and rural communities.

2.1.4 Variation of communities in prevalence of malnutrition

Local norms and beliefs and means of earning life are among the factors likely to shape the ways in which people feed and care their children. Means of earning life, livelihood is a strong determinant of food access and hence predicts food security. A livelihood system of community is an essential first step that identifies the options they have for improving their nutrition status. A study done in Kilombero by Nyangile (2013) found that peasant's children are nutritionally better compared with the agro-pastoral children. Livelihood assets like natural resources, education of household spouses, tradition and culture of the people were identified as significant factors affecting food and nutrition security (Nyangile, 2013). A study by Mboera *et al.* (2015) in Kilosa, Tanzania indicated that there are variations in terms of risk to diseases and nutritional statuses between communities living in with different livelihoods practices whereby children from the rice growing community had larger number of the underweight children than the pastoral community. A study of Lawson (2014) conducted in Tanzania to compare nutrition status of children from Maasai, Rangi, Meru and Sukuma tribes reported that the Maasai are substantially disadvantaged compared to neighboring ethnic groups and signs of vulnerability showed to increase with relying on livestock keeping.

2.2 Infant and Young Child Feeding Practices (IYCF)

2.2.1 Recommended infant and young child feeding

In recognizing the importance of adequate nutrition in early life stages WHO/ PAHO developed a list of 12 ideal (improved) breastfeeding and complementary feeding

practices which were defined based on the *Guiding principles for complementary feeding of the breastfed child* (PAHO/WHO, 2003) and the *Guiding principles for feeding non-breastfed children 6–24 months old* (WHO, 2005).

Ideal practices for infant feeding include exclusive breastfeeding for 6 months followed by timely, adequate, safe, and properly fed complementary foods together with continued breastfeeding for 2 years or beyond (WHO, 2013). The ideal practices were developed as a direct and effective strategy for preventing child malnutrition. They are as follows:

- All infants breastfed for first time within 1 hour of birth.
- All infants should not be fed anything other than breast milk during first 3 days of life.
- All infants fed on colostrum.
- All infants and young children breastfed on demand, day and night.
- All infants less than 6.0 months exclusively breastfed.
- All children breastfed through the age of 2 years old or older.
- All infants fed semi-solid complementary foods at the age of 6.0 months (180 days).
- All infants and young children aged 6.0–23.9 months meet recommended daily energy and nutrient requirements.
- All infants and young children aged 6.0–23.9 months fed nutrient and energy dense foods.
- All infants and young children 6.0–23.9 months fed recommended number of meals daily.
- All infants and young children 6.0–23.9 months fed by caregiver responsive to child.

- All infants and young children 6.0–23.9 months fed as recommended during and after illness.

2.2.1.1 Breastfeeding

Mothers' own milk is the ideal and best source of infant nutrition, it provides all the energy and nutrients that the infant needs for the first six months of life, and it continues to provide up to half or more of a child's nutritional needs during the second half of the first year, and up to one-third at the second year of life (WHO, 2002).

Breast milk promotes sensory and cognitive development, and provides protective factors which protect the infant against infectious and chronic diseases. Exclusive breastfeeding is efficient in decreasing infant mortality due by it prevent common childhood illnesses such as pneumonia diarrhea, and helps for a quicker recovery during illness (Kramer, 2008).

For optimal breastfeeding WHO/ PAHO recommend that all infants should be breastfed for first time within one hour of birth. Shortly after birth a baby is placed skin to skin contact with their mother. Evidence indicates that skin-to-skin contact between mother and infant helps to initiate early breastfeeding (Bramson *et al.*, 2010). Breastfeeding within the first hour ensures that the infant receives the colostrum which is highly nutritious and has antibodies that protect the newborn from diseases. Early initiation of breastfeeding increases the likelihood of exclusive breastfeeding as well as the overall duration of breastfeeding.

In Tanzania 51% of children 0-23 months initiated breastfeeding within 1 hour (NBS, 2016). This is slightly higher than the national rate recorded in 2010, 48.7% (NBS, 2010). Several factors has influence the rate of early initiation of breastfeeding in Tanzania.

Breastfeeding within one hour after birth is more common in urban areas (62%) than in rural areas (45%). Assistance during delivery: mothers who were assisted by profession health care provider during delivery are more likely to initiate breastfeeding within one hour after birth (58 percent) than those who were assisted by a traditional birth attendant (46%), other attendant (35%), or no one (23%). Mother's education status: the likelihood that a child is breastfed in the first hour after birth increases considerably with the mother's educational status and wealth quintile (NBS, 2010).

WHO recommends that all infants should be exclusively breastfed for the first six months of life to achieve optimal growth and development and health. Exclusive breastfeeding (EBF) means that the infant receives only breast milk without any additional food or drink, not even water with the exception of oral rehydration solution, or drops/syrups of vitamins, minerals or medicines (WHO, 2013). Exclusive breastfeeding up to 6 months of age has the greatest potential impact on child survival. Early introduction of complementary foods is a common practice. In developing countries, many studies have been continuously reporting early introduction of complementary foods before the age of six months (Mbagaya, 2009; Katepa-Bwalya *et al.*, 2015; Burns *et al.*, 2016). Factors like maternal education, socioeconomic class, mode of delivery and infants first feed are important maternal predictors of EBF practice (Onah *et al.*, 2014; Madhavi and Manikyamba, 2016).

In Tanzania less than 59% of infants below six months of age were exclusively breastfed and the rate of EBF declines with age (NBS, 2016). A study done in Morogoro by Safari *et al.* (2013) to compare nutritional status of children aged 6-36 months revealed that no child in age above 4 months was exclusively breastfed.

Studies show that the early introduction of complementary feeding have a number of effects including to earlier cessation of breastfeeding (Brownell *et al.*, 2015), increase the risk of food allergy (Fiocchi *et al.*, 2006), increase the risk for anaemia (Wang *et al.*, 2017), undernutrition (Okwori *et al.*, 2011) and increase risk of overweight (Hunsberger, 2014).

It is also recommended that a child should be breastfed on demand during day and night and breastfeeding should continue to two years or beyond (WHO/PAHO, 2013). Although breastfeeding is the most natural and healthiest way to feed a child during early life given the advantages it offers to mothers, infants, and young children and the fact that it is practiced by a vast majority of mothers in sub-Saharan Africa, often for long durations; cessation of breastfeeding before two years has been reported in some studies (Blyth, 2004; Doherty, 2012). Inadequate breastfeeding support, being undecided about how to feed the child were most strongly factors associated with stopping breastfeeding earlier before two years.

Extending breastfeeding to two years or beyond is of great significance since breast milk can provide half or more of a child's energy needs between the ages of six and 12 months, and one third of energy needs between 12 and 24 months (WHO/UNICEF, 2008). However, global progress on this intervention is both uneven and suboptimum (Cai *et al.*, 2012).

2.2.1.2 Complementary feeding

The period of complementary feeding refers to the time when foods or liquids are offered to young children in addition to breast milk. WHO recommends that all infant's foods at the age of six months (180 days) should be fed semi-solid complementary. The period is

critical and vulnerable time in the growth and development of children (WHO, 2013). Any problems to this vulnerable period of development, including poor nutrition, increase the risk of morbidity and mortality among young children.

Even with optimum breast-feeding during this period, children are at risk of being malnourished if adequate quantity and quality of complementary food is not given beginning at six months of age. To ensure adequate nutrition of the children at this age WHO/PAHO recommends that children during this time should be fed as per recommended number of meals daily with nutrient and energy dense foods which meet their recommended daily energy and nutrient requirements (PAHO/WHO, 2013). The number of meals of children per day is reliant on the energy gap for stated age, child's gastric capacity, and energy density of the meal (kilocalories per gram). Thus, for a given age interval and level of breast-milk intake, calculating the recommended number of meals requires information about the energy density of the foods. For older children requiring larger quantity of food in a day, the food needs to be sub-divided in multiple servings compared to their younger counterparts' thus larger number of meals.

In Tanzania the introduction of complementary foods is not timely, the time at which infants are being introduced to complementary feeding it is either too early or too late (NBS, 2016). Complementary foods are mainly plant-based with little or no addition of animal products (Muhimbula and Zacharia, 2010; Vitta *et al.*, 2014; Kissa *et al.*, 2015).

2.2.2 Variation of communities in infant and young child feeding practices

Local norms and beliefs tend to affect feeding habits, caring practices and health seeking behavior and all of these has an impact on the nutrition status of a child. A study done by

Mwaseba *et al.* (2016) indicated that existing food habits and feeding practices in Mvomero and Njombe districts seem to be informed by norms and beliefs which limit the communities to meet the current international recommendations on child feeding. Another study done by Chege *et al.* (2015) in Kajiado, Kenya indicate that culture influence the dietary practices among children under five years where by some food taboos prohibit consumption of wild animals, chicken and fish limits the food diversity and hence nutrient intake. Maasai culture encourages introduction of blood, animal's milk and bitter herbs to infants below six months, which affects exclusive breast feeding.

2.3 Nutrient Adequacy

Human growth, development and health throughout the life course, from preconception until death, are dependent upon adequate nutrition. Nutrient adequacy refers to being nutrition secure through the appropriate consumption of energy and all essential nutrients in sufficient amounts overtime (Yetley *et al.*, 2017). Complementary foods are anticipated to cover the gaps in energy and nutrient requirements for infants and young children that can no longer be met through breastfeeding (PAHO/WHO, 2013).

2.3.1 Nutrient content of the complementary foods

Complementary foods are expected to bridge the gaps in energy and micronutrients between total recommended dietary allowance and the amount taken through breast milk for infants and children aged 6-23.

2.3.2 Energy intake

The energy requirements needed to be covered from complementary foods for infants with average breast milk intake in developing countries are approximately 200 kcal per day at 6-8 months of age, 300 kcal per day at 9-11 months of age, and 550 kcal per day at 12-23

months of age (WHO/UNICEF, 1998). Energy needs from complementary foods are estimated by deducting average breast milk energy intake from total energy requirements at each age. The total daily energy requirements of breastfed, healthy infants are approximately 615 kcal/d at 6-8 months, 686 kcal/d at 9-11 months and 894 kcal/d at 12-23 months of age (Dewey and Brown, 2002). For infants who consume more or less than average breast milk; energy requirements from complementary foods will differ accordingly (WHO, 2003). It is also very important to note that energy requirements of the child differ depending on the breast milk intake, growth rate, health status and environment (WHO, 2003). The recommended daily complementary food energy intake for infants and young children, by age group and breastfeeding status are displayed in Table 1.

Table 1: Recommended daily complementary food energy intake for infants and young children, by age group and breastfeeding status

Age group (months)	Breastfed		Not Breastfed	
	kcal	kcal/kg ^c	kcal	kcal/kg ^c
6.0–8.9	202.0	25.3	615.0	76.9
9.0–11.9	307.0	34.5	686.0	77.1
12.0–23.9	548.0	49.8	894.0	81.3

^c Recommended kcal/day / ideal body weight

Source: Dewey and Brown (2003)

2.3.3 Nutrient intake

Nutrient requirements per unit body weight of infants and young children are very high due to the rapid rate of growth and development during the first two years of life (WHO, 2003). Breast milk can provide a considerable contribution to the total nutrient intake of protein and many of the vitamins for children between 6 and 24 months of age but it is relatively low in several minerals such as iron and zinc. At 9-11 months of age, for example, the proportion of the Complementary foods are expected to cover 97% for iron,

86% for zinc, 81% for phosphorus, 76% for magnesium, 73% for sodium and 72% for calcium of the recommended Nutrient Intake (Dewey, 2001).

Iron and zinc were identified as problem nutrients in the first year of life as most of the complementary foods in different population were reported no to provide sufficient amount of these nutrients (Gibson *et al.*, 2010). In most developing countries, where the commonly consumed complementary foods are plant-based foods amount of key (especially, iron, zinc, and calcium) nutrients are commonly reported to be lower than recommend (Abeshu *et al.*, 2016). Thus, it is advisable to include animal source foods like meat, poultry, fish or eggs in complementary food diets frequently (WHO, 2013). Animal source foods are rich sources of readily absorbable iron and zinc, while plant-based foods especially unrefined cereals, nuts and legumes, contain high levels of phytate and, at times, polyphenols which inhibit iron and zinc absorption (WHO/FAO, 2004). Dairy products beside the presumption that they are good sources of some nutrients, such as calcium, but do not provide adequate iron unless they are fortified (WHO, 2003). The recommended daily nutrient and density of complementary foods for infants and young children, by age group and breastfeeding status display in Table 2.

Table 2: Recommended daily nutrient and density of complementary foods for infants and young children, by age group and breastfeeding status

Nutrient	Age group in months	Recommended Intake		Density of complementary foods	
		Breastfed	Non-breastfed	Breastfed	Non-breastfed
Protein	6.0–8.0	2.0	9.1	1.0	1.5
	9.0–11.0	3.1	9.6	1.0	1.4
	12.0–23.9	5.0	10.9	0.9	1.2
Iron	6.0–8.0	20.8	21.0	10.3	3.4
Low bioavailability	9.0–11.0	20.8	21.0	6.8	3.1
	12.0–23.9	11.8	12.0	2.2	1.3
	6.0–8.0	10.8	11.0	5.3	1.8
Medium bioavailability	9.0–11.0	10.8	11.0	3.5	1.6
	12.0–23.9	5.8	6.0	1.1	0.7
	6.0–8.0	4.2	5.0	2.1	0.8
Zinc	9.0–11.0	4.3	5.0	1.4	0.7
	12.0–23.9	5.8	6.5	1.1	0.7
	6.0–8.9	13.0	350.0	6.0	57.0
Vitamin A	9.0–11.9	42.0	350.0	14.0	51.0
	12.0–23.9	126.0	400.0	23.0	45.0
	6.0–8.9	0	25.0	0	4.1
Vitamin C	9.0–11.9	0	25.0	0	3.6
	12.0–23.9	8.0	30.0	1.5	3.4
	6.0–8.9	336.0	525.0	166.0	85.0
Calcium	9.0–11.9	353.0	525.0	115.0	77.0
	12.0–23.9	196.0	350.0	36.0	39.0

a Assuming average breast milk intake

b (WHO, 1998) (Table 26)

c (WHO, 1998) (Table 25)

d Recommended daily nutrient intake x 100 / recommended daily energy intake (Dewey and Brown, 2003a) (Table 1)

e RE: retinol equivalent

Source: WHO (1998); FAO/WHO (2004); PAHO/WHO (2013)

CHAPTER THREE

3.0 MATERIALS AND METHODS

This chapter details materials and methods that were used in the study. It includes narrative description of the study area, study population, study design, sampling techniques; tools and techniques used in data collection and data analysis.

3.1 Description of the Study Area

The study was conducted at Mvomero district; one among the seven districts of Morogoro region. Mvomero District is located at North East of Morogoro region between 6°00' and 8°00' latitudes south of Equator also between longitudes 36°00' and 38° East of Greenwich. The district has a total area of 7325 square km and a total population of 312 109; 154 843 males and 157 266 females (NBS, 2012).

Administratively, Mvomero is made up of four divisions, 17 wards, and 128 registered villages. According to 2012 National census, the average household size was 4.3 people per household (URT, 2013).

The district has two rainfall seasons annually, with a long wet season extending from March to May and a short wet season from October to December. Majority of the district's population derive their livelihood from crop farming growing paddy and maize and only the population in the southern part of the district depends primarily on livestock keeping, raising goats and traditional zebu cattle (Lugendo, 2013).

The study was conducted at Sokoine and Kimambira villages in Dakawa and Lubungo wards, respectively; which are located in West of Mvomero District. Both villages have a mixture of communities of interest (crop farming and pastoralists communities).

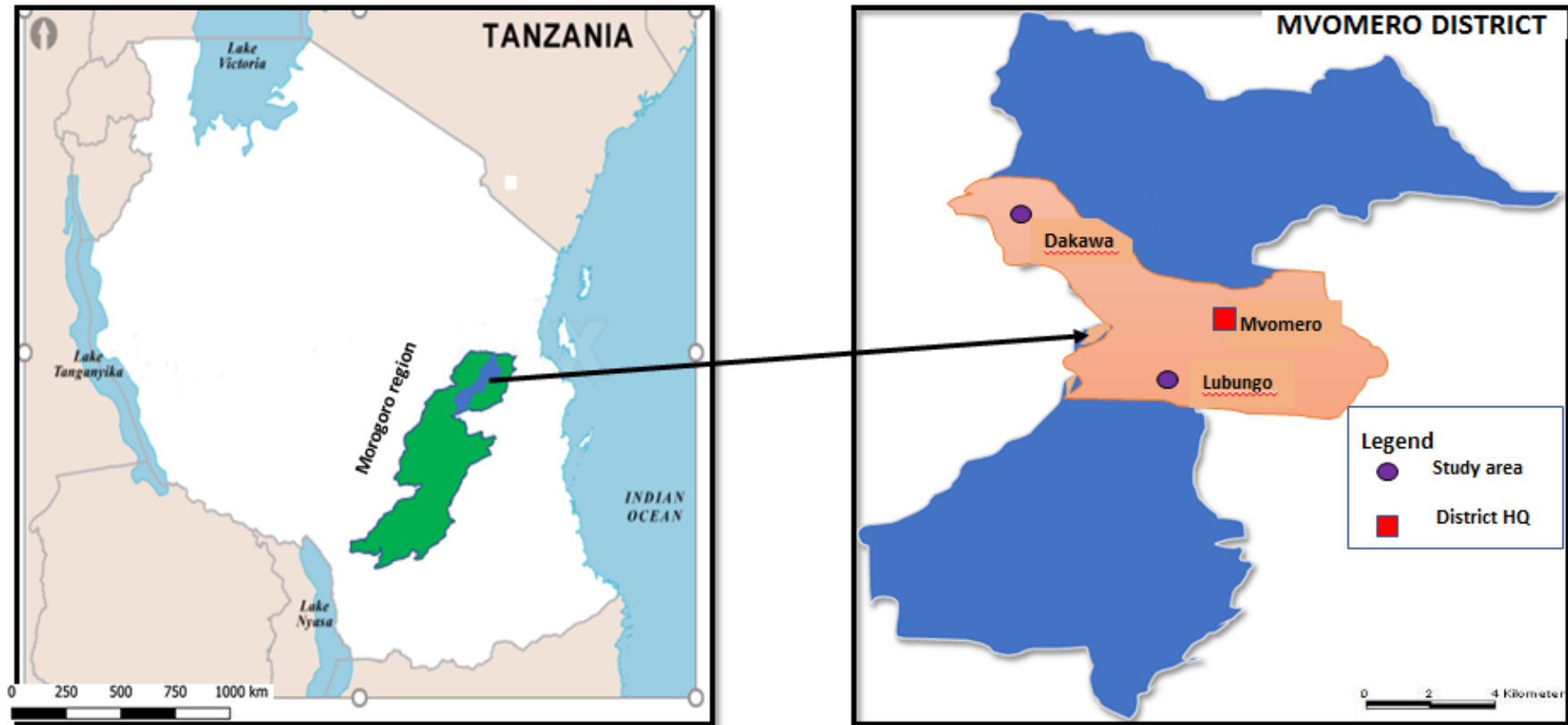


Figure 1: Map of Mvomero showing study area

3.2 Study Population

The study population comprised of caregiver child pair of children between 0–23 months old from crop farming and pastoralist communities in Mvomero district.

3.3 Study Design

The study adopted cross sectional research design for data collection whereby qualitative and quantitative data were collected once. The design allowed collection of data at a single point in a time, while allowing estimation of prevalence and identification association (Kothari, 2004). In addition, the design was cost-effective, and took little time while assuring appropriate quality of data.

3.4 Sample Size and Sampling Technique

3.4.1 Sample size

The sample size was computed using the following formula (Fischer *et al.*, 1991);

$$n = z^2 pq / d^2$$

Whereby:

n = desired minimum sample size, Z = the standard normal deviate corresponding to

95% Confidence Interval, p = the proportion of an indicator measured, $q = 1 - p$

d = degree of accuracy or desired precision

Taking the prevalence of stunting in Morogoro 33% or 0.33 (NBS, 2016), Z statistic corresponding to 95% confidence interval for a two-tailed test as 1.96, and degree of accuracy at 0.05, the sample size from this calculation was:

$$n = (1.96)^2 \times 0.33 \times 0.67 / (0.05)^2 = 339.7 \text{ approximately } 340 \text{ participants}$$

About 348 respondents were recruited for the study to represent the crop farming ($n=206$) and pastoralist communities ($n=142$). More respondent recruited from crop farming

because there is high proportion of households practicing crop farming compared to pastoralist community in the studied area.

3.4.2 Sampling technique

Purposive sampling was applied to select the villages with a mixture of both the crop farming and pastoralist communities which are the target of this study. Simple random sampling was used to select the 348 households with children aged 0-23 months old from the selected villages. For the households with more than one child under 24 months children the youngest one was selected. Children with any form of disability, serious sick children and those who were temporary resident in the area were excluded from the study.

3.5 Data Collection

3.5.1 Data collection tools

ProPAN research tools were adopted for collection of quantitative and qualitative data. The forms and guides used for collection of quantitative and qualitative data were: structured caregiver questionnaire; semi structured interview form; 24-dietary recall forms and opportunistic observations form (PAHO/WHO, 2013).

In this study the target population were children below 24 months of age. Some tools are specific for certain age groups. Tools like Caregiver Survey, opportunistic observation tools and semi structured questionnaire were applied to all caregivers of children from 0-23 months of age while 24 hours dietary recall and anthropometry were only used for caregivers of children from 6-23 months of age.

Before data collection questionnaires were pre-tested in 10 randomly selected households having children aged 0-23 months at Kambala village in Morogoro partivillage.

Appropriate corrections were then made to modify questions that were found to be unclear to the respondents before the actual data collection started. Enumerators, who assisted in data collection, were trained for four days prior to data collection. Procedure and techniques for data collection, research ethics were communicated theoretically and practically during the training.

3.5.2 Caregiver interview

Face to face interview with 348 caregivers of children 0-23 months were carried out by using *ProPAN* structured caregiver's questionnaire (Appendix 1) which had both open and close ended questions (WHO/PAHO, 2013). The questionnaire is divided in 5 sections: Section A collects preliminary (basic) information about the child. Section B gathers information on socio-economic status and demographic characteristics of the caregiver. Section C obtains detailed information on breastfeeding and complementary feeding practices. Section D collects information on utilization of health and other services while section E inquired information about household hygiene and sanitation.

3.5.3 Anthropometric measurements and determination of nutrition status

Child's weight and length were measured to identify the current prevalence of underweight, stunting and wasting in 269 children between 6-23 months in crop farming and pastoralist communities. Standard procedures and equipment were used to measure weight and length of children. Weight of the child was measured by using UNICEF Mother/Child electronic scale manufactured by SECA (Seca gmbh and co. kg, Hammer Steindamm 3-25 22089 Hamburg Germany) and it was recorded to nearest 100g (0.1 kg). Before the child was weighed the scale was adjusted to zero. A caregiver was allowed to stand on a scale allowing her weight to be recorded within the system of the scale and then tared to zero. Then the child was given to the caregiver while still standing on the

scale and the new weight of the child was displayed and recorded. For a child who was able to stand freely; a child was told to stand in upright position at the centre of the weighing scale bare footed with the feet placed in a v-shape and only with light clothes. While taking measurements the weight was recorded to the nearest 0.1 kg.

Length of the child was measured by using a measuring board (Shorr Productions, Perspectives Enterprises & Portage, Missouri USA) reading a maximum of 200cm and capable of measuring to the nearest 0.1 cm. The measuring board was placed on a hard flat surface. The child was placed with the face upward, the head towards the fixed end and the body lying parallel to the long axis of the board. The shoulder-blades rested against the surface of the board. The child was measured while barefooted with the toe pointing directly upward and the child's knees kept straight. The movable footboard piece was placed firmly against the child's heels. The measurements were taken to the nearest 0.1 cm and recorded in the anthropometric form (Appendix 2).

The nutritional indices used for assessing nutritional status of children in this study were weight-for-age z-score (WAZ), height-for-age z-score (HAZ) and weight-for-height z-score (WHZ). Age of the child, used for determination of weight for age and height for age was retrieved from growth monitoring clinic cards. Child's degree of malnutrition of either normal, moderate or severe was interpreted using growth references standards (WHO, 2006).

3.5.4 Dietary assessment

During household visits the person who fed the child during the previous 24 hours was asked to provide the dietary intake information of the child for the past 24 hours. A total of 269 caregivers of children aged between 6-23 months in crop farming and pastoralist

communities were engaged in dietary assessment. Each caregiver was asked to recall foods and beverages she/he fed the index child in the 24 hours prior to the interview. Utensils used to feed the child were used to estimate the amount of food and beverages served and consumed. Food weight was measured by using TANITA kitchen scale. Measurements of amount of food served and consumed were recorded in the 24 hours dietary recall form (Appendix 3). The amount in grams consumed by a child was converted to nutrient equivalents by using the *ProPAN* software and in cases where recipe information was not available, data for an average recipe was obtained from the Tanzania Food Composition Table. Mean intake of energy, protein, vitamin A, vitamin C, iron, calcium and zinc was calculated for groups and was then compared with Recommended Dietary Allowances (RDA) and proportion of children who met the RDA was then obtained.

3.5.5 Semi-structured interview

Caregivers of 0-23 months' children were interviewed. Interviews were conducted by using a semi- structured interview guide (Appendix 3). The tool is designed mainly as a conversation guide and it enabled collection of information that increased understanding of circumstances that influenced the current practises of the two communities and identify facilitators of and barriers to each ideal feeding practice. During the interviews, researcher asked respondents from the guide listened attentively and kept track of the answers also probed more question whenever necessary. Following the interview guide, enumerators noted important points from conversations and later on summarised into a matrix, *ProPAN* Form I-8.2(Appendix 6). In the matrix, caregiver's reasons for current practices and knowledge/attitudes about ideal practices were summarised.

3.5.6 Opportunistic observation

Researcher and enumerators took advantage of their proximity to caregivers to note various details about caregiver's practices especially on the aspects of breastfeeding,

complementary feeding, child-caregiver interaction during mealtime, food preparation and hygienic practices (*ProPAN* Form 1-7) was used as a guide for the opportunistic observation (Appendix 6). Facilitators and barriers to the ideal feeding practice were noted. The target group in this assessment was caregivers of 0-23 months' children. A total of 30 child-caregiver pairs, (15 pairs from each community) were observed: in each community 8 observed pairs were from 0-11 age group and another 7 pairs were from 12-23 months age group.

3.6 Data Processing and Analysis

After data collection, data was cleaned, sorted and explored for normality ready for analysis. Quantitative data of caregiver survey, anthropometric and 24-hour dietary recalls from crop farming and pastoralist communities were entered and analyzed separately using *ProPAN* software with Epi-info (PAHO, 2013). After analysis of these data in *ProPAN* software to generate descriptive statistics (means, frequencies, standard deviation, variances) Z-score generated from anthropometric data and feeding practices outputs were imported into SPSS Version 21 for windows for further analysis. Independent t-test and Chi-square statistics were used to test for the significance difference between the two communities.

Qualitative data from semi-structured interviews and opportunistic observations were summarized in matrices. They showed the reasons for certain practices, knowledge and attitude of caregivers towards the ideal practices also barriers of and facilitators to ideal practices.

3.7 Data Integration

According to the *ProPAN* procedure (Fig. 2), the data on breastfeeding and complementary feeding practices, collected primarily through the caregiver survey and the

24-hour dietary recall and anthropometry, was integrated with the data on facilitators and barriers, to optimal infant and young child feeding practices. These data were then summarized using the master matrix for summarizing facilitators of/barriers to ideal practices, *ProPAN* Form I-10.1(Appendix 7) which included the information collected about each ideal practice (Fig. 2).

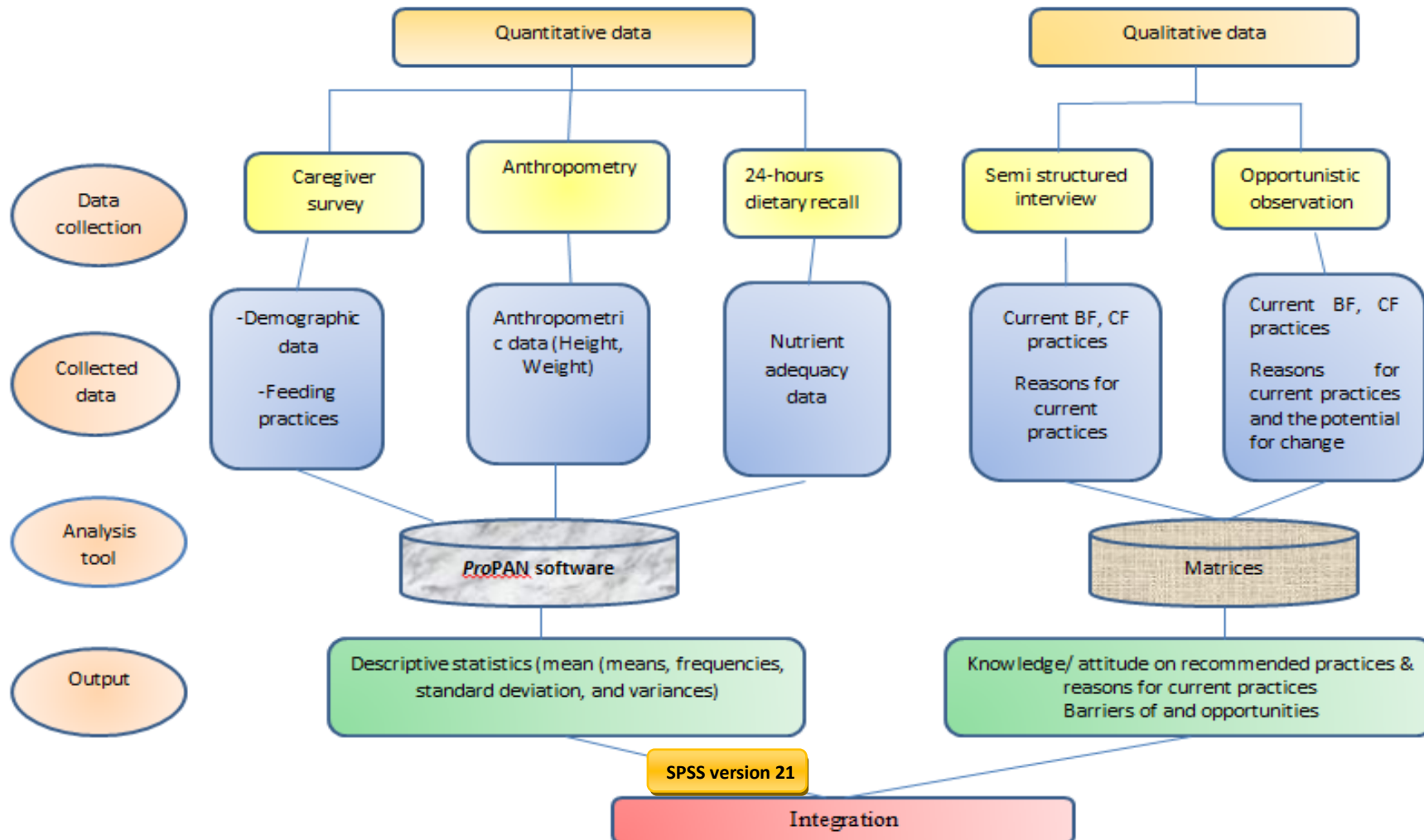


Figure 2: Flow chart of data collection and analysis

3.8 Ethical Issues and Permission to Conduct the Study

A letter to conduct research was obtained from Sokoine University of Agriculture and Mvomero District Authority. Before administering any questionnaires, enumerators explained to the caregivers why they are being sought for interviews and request their consent to participate in the study. Written consent was used as the study needs some personal information. Enumerators were required to always carry identification and introduction letter describing the research purpose and explaining their presence in the community. Information collected was purely used for the research purpose of the study, and not shared for any other.

CHAPTER FOUR

4.0 RESULTS

This chapter presents the findings from the study area. Findings are presented based on the specific objectives with the following main sub-sections: background information relevant to health and nutrition status of the children (socio - economic and demographic characteristics of the caregivers and the children, use of health services and environmental hygiene and sanitation); nutritional status of the children (prevalence of underweight, stunting and wasting); feeding practices (breastfeeding and complementary feeding practices) and nutrient adequacy of the studied children).

4.1 Socio - economic and Demographic Characteristics of the Caregivers and the Children

A total of 348 children below 24 months from crop farming (n =206) and pastoral (n = 142) households were involved in this study. The pastoralist households were of the Maasai ethnic origin while the crop farming households were of the Luguru, Kaguru and other tribes. Mean age for children from crop farming and pastoral communities were 12.1(SD 6.3) and 12.5 (SD 6.4) months respectively. The pastoral households had mean household size of 8.4 while that of crop farming had mean household size of 5.2 persons per household. Mean age of caregivers from pastoralist was 26.4 (SD 8.3) and crop farming communities was 26.4 (SD 8.3) years. Most caregivers in each community were married; but it was noted that pastoralist community had higher proportion of caregivers who were married (100%) compared to their counterpart from crop farming (Table 3). There was education difference between these communities, whereby 35.2% (n=50) of pastoralist caregivers had no formal education while among the crop farming 92.7% of caregivers had at least attended primary school (Table 3).

Table 3: Characteristics of caregivers and children 0-23 months of age

Variables	Crop farming (n=206)		Pastoralist (n=142)		P value
	n	%	n	%	
Age of the children (months)					
0 - 5	39	19.0	23	16.2	0.521
6 -11	53	25.7	41	28.9	
12-17	60	29.1	41	28.9	
18 -24	54	26.2	37	26	
Sex of the children					
Male	97	47.1	68	47.9	0.986
Female	109	52.9	74	52.1	
Maternal age (years)					
<18	5	2.4	16	11.3	0.039*
18 – 24	62	30.1	55	38.7	
25 -35	110	53.4	45	31.7	
>35	29	14.1	26	18.3	
Marital status					
Married	181	87.8	142	100	<0.001*
Single	25	12.3	0	0	
Maternal education level					
Informal education	15	7.3	50	35.2	<0.001*
Primary education	158	76.7	83	58.5	
Secondary education and post-secondary	33	16	9	6.3	
If mother/caregiver know how to read and write					
Yes	182	88.3	99	69.7	<0.001*
No	18	8.7	38	26.8	
Read only parts of sentence	6	2.9	5	3.5	
Maternal occupation					
Do not involve in any paid work the past 7 days	171	83	139	97.9	<0.001*
Vendor	17	8.2	3	2.1	
Agriculture work	8	4	0	0	
Formal employment	10	4.8	0	0	

*Significant at $P \leq 0.05$

4.2 Use of Health Services

Almost all mothers (99.4%) attended antenatal clinic in both communities as shown in Table 4. Among these 18.4% and 3.5% from crop farming and pastoralist communities, respectively, reported to attend ANC clinic more than three times. There was a considerable variation in the number of women who received assistance by professional health workers during delivery between mothers from crop farming and pastoralist communities. Majority of the mothers (89.3%) in crop farming community delivered in health facilities while only 9.1% of the mothers from pastoralist community gave birth in health facilities. There was significant difference in attendance to growth monitoring

clinic between crop farming and pastoralists communities, $P=0.049$ whereby 98.1% and 93.7% of the children from crop farming and pastoralists communities respectively were taken to growth monitoring clinic. Larger proportion of caregivers in crop farming than in pastoralist community received infant and young child information within the previous three months.

Table 4: Use of health services

	Crop farming n =206		Pastoralist n=142		P-value
	n	%	n	%	
Number of ANC visits					
Never	1	0.7	1	0.7	0.859
Once	34	23.9	19	13.4	
Twice	78	54.9	92	64.8	
Thrice	110	53.4	17	12.0	
More than thrice	38	18.4	5	3.5	
Not sure	9	4.4	8	5.6	
Place of delivery					
In health facility	185	89.8	13	9.2	<0.001*
At home	17	8.2	72	50.7	
At TBA's house	4	2.0	56	39.4	
On the way to hospital	0	0	1	0.7	
Assistance during delivery					
Health professional	184	89.3	13	9.1	<0.001*
TBA	18	8.7	65	45.8	
Untrained person	4	2.0	64	44.4	
Attending MCH growth monitoring clinic					
Yes	202	98.1	133	93.7	0.049
No	4	1.9	9	6.3	
Caregivers received information on child feeding					
Yes	130	63	81	57	<0.001*
No	76	37	61	43	
Children aged 6-59 months who had received vitamin A in the last 6 months					
Yes	161	97.0	107	90	0.034*
No	5	3.0	12	10	

*Significant at $P \leq 0.05$

4.3 Water Availability and Sanitation

The main source of water for households in both communities were surface water precisely dams; accounting for 59.2% and 90.8% in crop farming and pastoralist community respectively (Table 5). Majority of mothers in both communities spent less

than an hour to go fetch water and come back. Small proportion of households treated water in crop farming and pastoralist communities i.e. 34.5% and 15.5% respectively. Main means of making water safe for drinking was adding bleach (26.8%) in crop farming community and letting the water to stand before drinking (90.9%) in pastoralist community. Large proportion (85.2%) of households in pastoralist community defecates in bush as they do not have toilet facilities.

Table 5: Water availability and sanitation

Variable	Crop farming n=206		Pastoralist n=142	
	n	%	n	%
Source of water				
Surface water (dam, river, pond, canal, irrigation channel)	122	59.2	129	90.8
Protected well	24	11.7	7	4.9
Tap	59	28.6	3	2.1
Rainwater collection	1	0.4	1	0.7
Time spent to collect water				
Less than 30 minutes	162	78.6	88	62.0
30 minutes or more	44	21.4	54	38.0
If anything is done to water to make it safer to drink				
Yes	71	34.5	22	15.5
No	135	65.5	120	84.5
Procedure(s) done to make water safer to drink				
Boil	19	26.8	1	4.5
Add bleach/chlorine	25	35.2	1	4.5
Strain it through a cloth	9	12.7	0	0
Use water filter (ceramic, sand, composite, etc.)	3	4.2	0	0
Let it stand and settle	15	21.1	20	90.9
Type of toilet facility used by household's members				
Flush toilet	25	12.1	2	1.4
Pit latrine	179	86.9	19	13.4
No facility, bush, field	2	1	121	85.2

4.4 Nutrition Status of the Surveyed Children

Generally, about a third (33.5%) of the children in surveyed communities were stunted (low height-for-age), 13% were underweight (low weight-for-age) and 3.3% were wasted (low-weight-for height). Prevalence of underweight was higher (14.2%) in children from pastoralist compared to their counterpart from crop farming community (12.6%). There

was no significant difference in the mean height-for-age z-score, but underweight and wasting were significantly higher among children from pastoralist community.

Table 6: Nutrition status of the surveyed children 6-23 months

Nutrition status	Communities				Overall prevalence		P value
	Crop farmers n=156		Pastoralist n=113		n=269		
	n	%	n	%	n	%	
Weight-for-Age (WAZ)							
Normal	137	87.8	97	85.8	234	87.0	0.023*
Moderate	18	11.5	13	11.5	31	11.5	
Severe	1	0.6	3	2.7	4	1.5	
Overall underweight	19	12.2	16	14.2	35	13.0	
Height for age (HAZ)							
Normal	103	66.0	76	67.3	179	66.5	0.440
Moderate	39	25.0	28	24.7	67	25.0	
Severe	14	9.0	9	8.0	23	8.5	
Overall stunting	53	34	37	32.7	90	33.5	
Weight for Height (WHZ)							
Normal	152	97.4	108	95.6	260	96.6	0.001*
Moderate	3	2.0	3	2.6	6	2.2	
Severe	1	0.6	2	1.8	3	1.1	
Overall wasting	4	2.6	5	4.4	9	3.3	

*Significant at $P \leq 0.05$

Nutrition status of surveyed children by age categories

Results of nutritional status by age categories of children in the crop farming and pastoralist1 communities are shown in Table 7. Age of children were categorized in two groups: 6-11 and 12-23.9 months. Older children group (12-23 months) in crop farming community had a higher proportion of stunted children (44.3%) compared to younger age group (6-11 months) (12%). Pastoralist community showed similar cases of stunting whereby older children were more stunted (41.1%) compared to the younger age group (17.5%). Likewise, more children of older category were more underweight compared to younger children in both communities. Furthermore, proportion of wasted children in older age category (2.8%) in crop farming community was slightly higher than that of younger children (2%) but the case was different in pastoralist community whereby younger children were more wasted (5%) compared to older children (4.1%).

Table 7: Nutrition status by age categories Age categories of children in months

Communities/ Nutrition status	Age categories			
	6-11 (n=50)		12-23 (n=106)	
Crop farming community	n	%	n	%
Weight for age				
Normal	46	92.0	91	85.8
Underweight	4	8.0	15	14.2
Height-for-age				
Normal	44	88.0	59	55.7
Stunting	6	12.0	47	44.3
Height-for-weight				
Normal	49	98.0	103	97.2
Wasting	1	2.0	3	2.8
Pastoralist community				
	6-11 (n=40)		12-23 (n=73)	
	n	%	n	%
Weight for age				
Normal	35	87.5	62	84.9
Underweight	5	12.5	11	15.1
Height-for-age				
Normal	33	82.5	43	58.9
Stunting	7	17.5	30	41.1
Height-for-weight				
Normal	38	95.0	70	95.9
Wasting	2	5.0	3	4.1

4.5 Infant and Young Child Feeding Practices

4.5.1 Breastfeeding practices

Table 8 presents the findings about feeding practices of 0-23month old surveyed children. Nearly all the children (99.7%) from both communities had ever been breastfed. Significantly more mothers in crop farming community (66.5%) than in pastoralist community (34.8%) initiated breastfeeding within one hour after birth. Almost all respondents (98.3%) from both communities gave colostrum to their babies. About 22% and 37% of the children from crop farming and pastoralist communities respectively were given pre-lacteal feeds, warm water being the most common pre-lacteal drink given in both communities. There was a significant difference between the two communities in the duration of breastfeeding, Furthermore, about 74.2% and 92% of the children in crop farming and pastoralist communities respectively were breastfed up to the age of two years.

Table 8: Breastfeeding practices of children 0-23 months

	Crop farming n=206		Pastoralist n=142		P value
	n	%	n	%	
Ever breastfed					
Yes	206	100	141	99.3	0.228
No	0	0	1	0.7	
Total	206	100	142	100	
Initiation of breastfeeding <i>*Excludes children who were never breastfed</i>					
Within 1 hour	137	66.5	49	34.8	0.003*
1-3 hours	52	25.2	70	49.6	
More than 3 hours	10	4.9	13	9.2	
Doesn't know	7	3.4	9	6.4	
Total	206	100	141	100	
Children given colostrum <i>*Excludes children who were never breastfed</i>					
Yes	200	97.1	141	100	0.149
No	6	2.9	0	0	
Total	206	100	141	100	
Child given anything other than breast milk during the first three days after birth <i>*Excludes children who were never breastfed</i>					
Yes	45	21.8	52	36.8	0.009*
No	159	77.2	88	62.4	
Doesn't know	2	1	1	0.7	
Total	206	100	141	100	
Pre-lacteals given <i>*excludes children who were not given pre-lacteals)</i>					
Water (including sugary water)	23	51.1	23	44.2	0.2
Other non-breast milk	10	22.2	19	36.5	
Others (tradition medicine, ghee, porridge)	12	26.7	10	19.2	
Total	45	100	52	100	
Whether the child was breastfed yesterday <i>*Excludes children who are not breastfed</i>					
Yes	189	91.7	135	97.9	0.016*
No	17	8.3	3	2.1	
Total	206	100	141	100	
Breastfeeding on demand <i>*Excludes children who are not breastfed</i>					
Whenever the child wanted	186	98.4	137	99.3	0.172
On a fixed schedule	3	1.6	1	0.7	
Total	189	100	138	100	
Exclusive breastfeeding (6 months)					
Yes	80	39	11	7.8	<0.0001*
No	126	61	130	92.2	
Total	206	100	141	100	
Continued breastfeeding at 2 year <i>*Children 20-23 months of age who are fed breast milk</i>					
Yes	23	74.2	22	91.7	0.096
No	8	25.8	2	8.3	
Total	31	100	24	100	

*Significant at $P \leq 0.05$

4.5.2 Complementary feeding practices

All the children (100%) from 6 to 8 months involved in this study had already started consuming complementary foods, (Table 9). About 48% and 87.2% of the caregivers introduced complementary foods to their children for the first time when they were less than four months in crop farming and pastoralist communities respectively (Fig. 3).

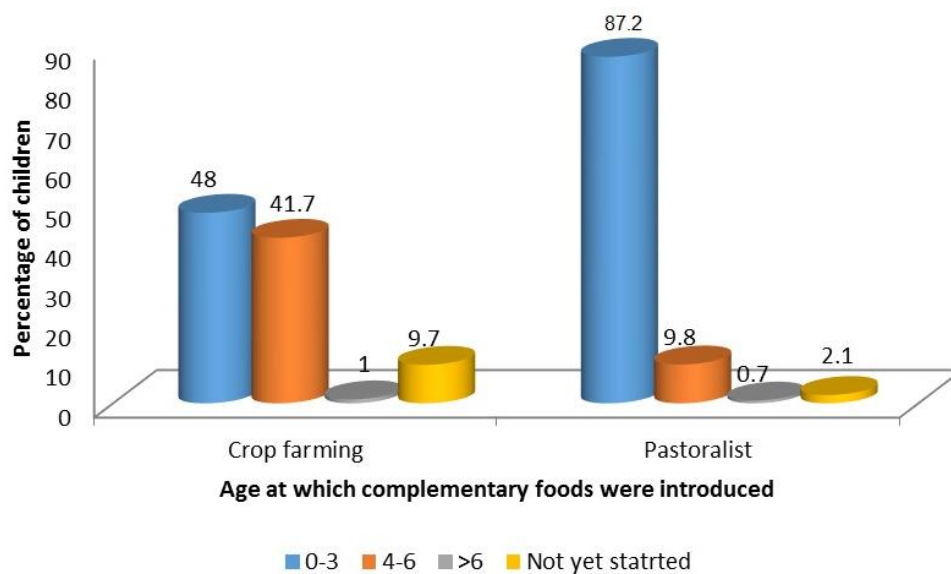


Figure 3: Age in months of child when started feeding complementary foods in crop farming community

Majority of mothers in both communities were responsible for deciding on what to feed their children. Numbers of meals consumed in a 24-hour period was about three meals in both communities and large proportion of children in both communities met the recommended number of meals (Table 9).

Table 9: Proportion of children (6-23 months) consuming the minimum recommended meal time frequency in a 24-hour period, stratified by age group

Children categories	Recommended number of meals	Crop farming		Pastoralist	
		n	%	n	%
All the children	Not reached	43	27.6	27	24.0
	Reached	113	72.4	86	76.0
	Total	156	100	113	100
Children aged 6-11 months	Not reached	22	44.0	24	60
	Reached	28	56.0	16	40
	Total	50	100	40	100
Children aged 11-23 months	Not reached	21	19.8	11	15.1
	Reached	85	80.2	62	84.9
	Total	106	100	73	100

Where minimum number of meals is defined as:

2 times for breastfed infants 6-8 months

3 times for breastfed children 9-23 months

4 times for non-breastfed children 6-23 months

Meals include formal and informal meals.

Source: WHO, 2008.

4.5.3 Responsive feeding and feeding during and after illness

More than half of the caregivers in both communities practice responsive feeding. Infant and young child feeding practices during illnesses are far from optimal in both communities whereas only 7.5% (n=12) in crop farming and 3.4% (n=4) from pastoralist community were fed as recommended during and after illness (Fig. 4).

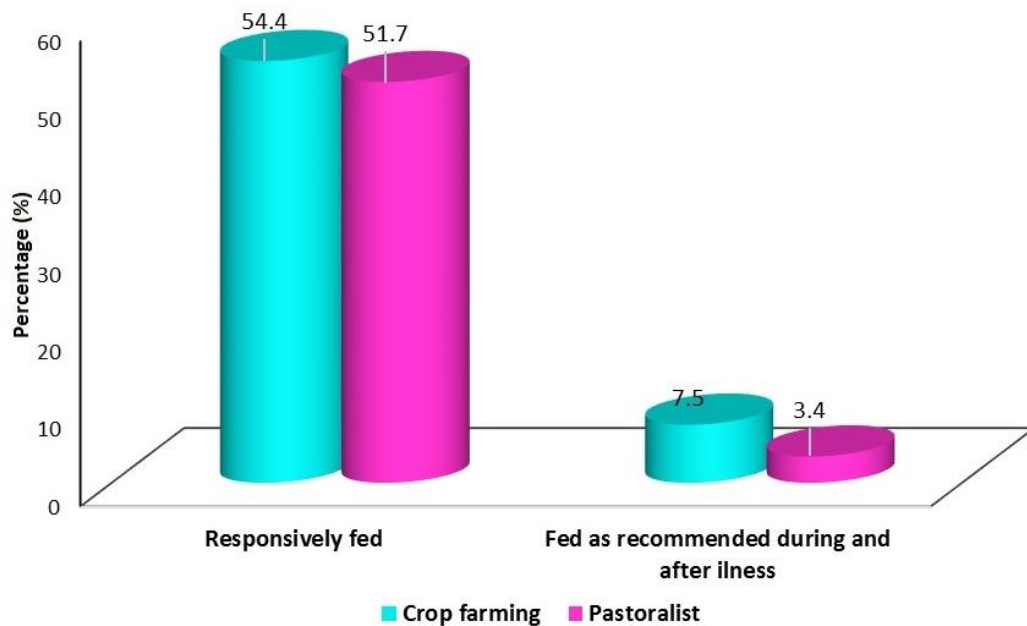


Figure 4: Responsive feeding and feeding during illness in crop farming and pastoralist communities

4.5.4 Most frequently consumed foods reported in 24 hours dietary recall

4.5.4.1 Most frequently consumed foods by 6-23months children in crop farming community

Figure 5 shows the food items reported for the 24-hour recall period in crop farming community and their frequency. Plant based foods were mostly consumed foods compared to animal source foods. Maize stiff porridge was reported to be consumed by more than three quarter of the children (84%) and it was mostly consumed with kidney beans, sardine or vegetables relishes. Sardine relish was the mostly consumed food of animal source (25.6%). Fewer children consumed dairy foods, only 3.8% of the children consumed cow's milk and 1.3% consumed maize porridge with cow's milk. Vegetables were included in meals more frequently compared to fruits which were seldom taken.

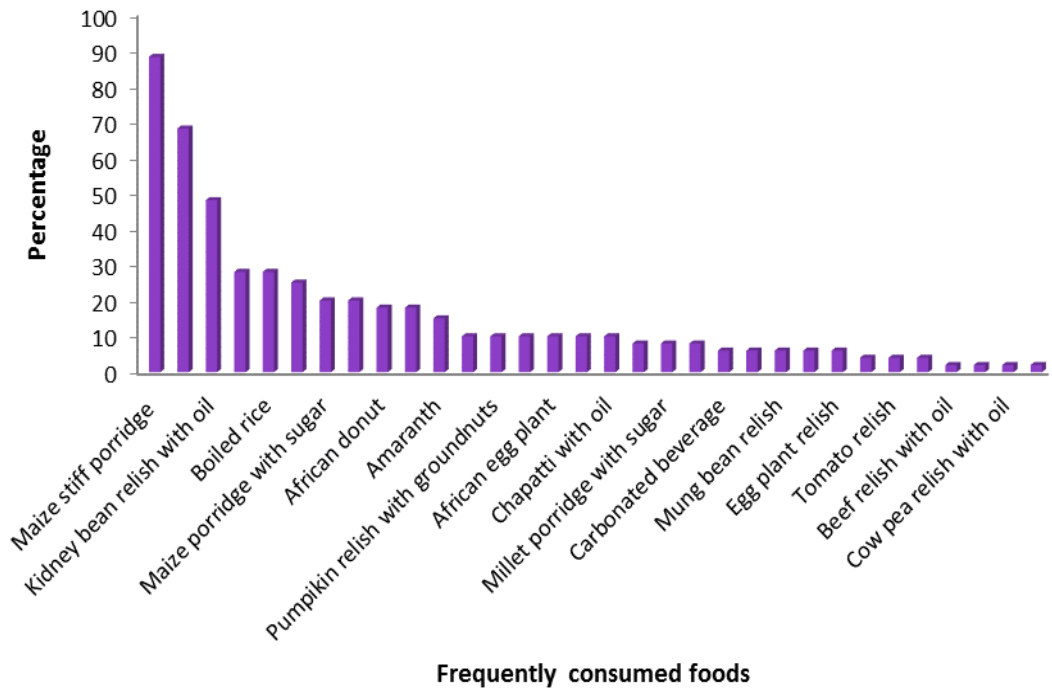


Figure 5: Most frequently consumed foods by 6-23months children in crop farming community

4.5.4.2 Most frequently consumed foods by 6-23months children in pastoralist community

Maize stiff porridge was the mostly consumed food by 6-23 months children in pastoralist community. It's often consumed with kidney beans, cow's milk or tomato relish (Figure 5). Cow's milk was the mostly consumed food of animal source; it was added in porridge, consumed as a beverage or taken as side dish. About 54% and 17.7% of the children were reported to consume cow's milk and maize porridge with milk respectively. Tomato relish was the most common vegetable given to children (30.1%). None of the children was reported to consume fruits.

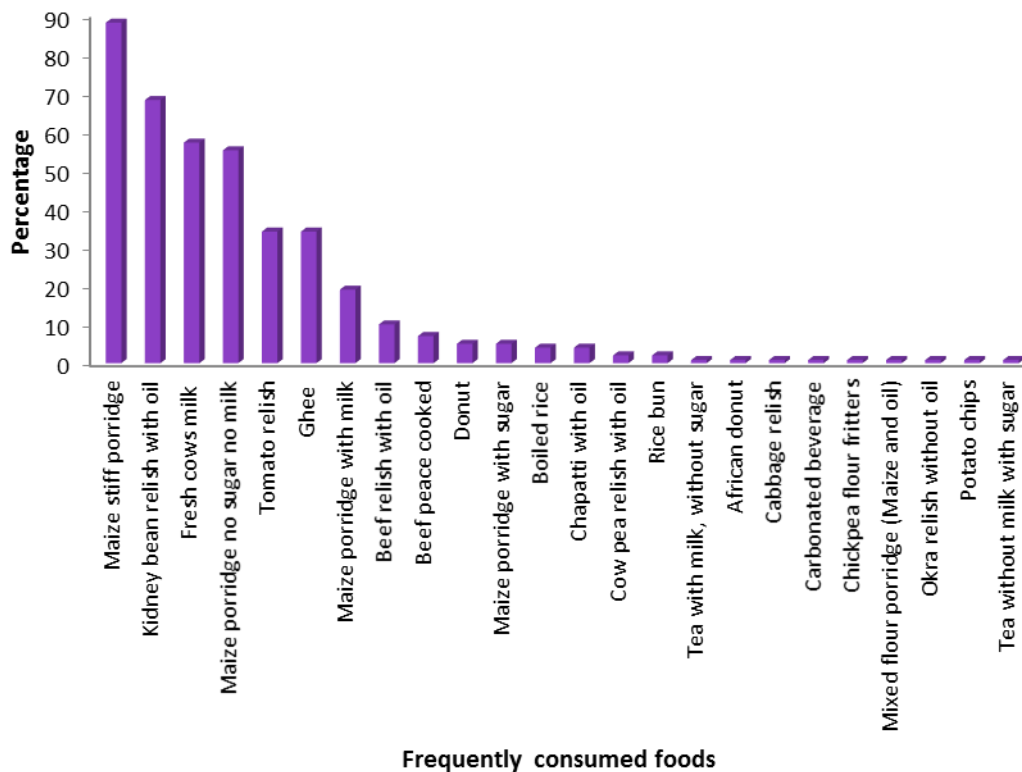


Figure 6: Most frequently consumed foods by 6-23months children in pastoralist community

4.6 Nutrient Adequacy of Meals Fed to 6-23 Months Children in Crop Farming and Pastoralist Communities

4.6.1 Energy intake of 6-23 months children in crop farming and pastoralist communities

Table 10 summarizes the energy (kilocalories) consumed in a 24-hour period. In general, more than half of the surveyed children (58%) consumed 100% or more of the recommended amount of energy. The mean energy intake in crop farming community was 526.3(SD 347.6) kcal and 659.2 (SD 433.2) kcal in the pastoral community. Categorizing children by their age groups nearly half (48%) of children in the elder group (12-23 months) did not meet the recommended levels. None of the non-breastfed children in

pastoral community and only 5.9% in crop farming community consumed the amount of kilocalories recommended.

Table 10: Energy intake of 6-23 months children in crop farming and pastoralist communities

Age groups and breastfeeding categories	Crop farming n=156		Pastoralist n=113		General N=269 Percent of children who met the RDA
	Percent of children who met the RDA	M±SD	Percent of children who met the RDA	M±SD	
Total	53.8	526.3± 347.6	63.7	659.2±433.2	58.0
Energy intake by age categories					
6-11months	68	337.8 ± 242.9	72.5	437.3± 280.2	70
12-23 months	47.2	615.3± 354.8	58.9	780.8± 455.0	51.9
Energy intake by breastfeeding status					
Breastfeeding	59.7	521.2± 359.2	64.9	659.7± 436.8	62
Non-breastfeeding	5.9	568 ± 235.8	0	629.3±166.8	5.2

RDA: For breastfed 6 -11 months 202-307 kcal; non-breastfed 6-11 months 615-686 kcal; for breastfed 12-23 months ~548 kcal; for non-breastfed 12-23 months 894 kcal (PAHO/WHO, 2003)

4.6.2 Nutrient intake

Table 11 and 12 summarizes children's protein, iron, zinc, vitamin A, vitamin C and calcium intake in a 24-hour period preceding the survey. In both communities' children's diets were insufficient for all assessed micro nutrients (iron, zinc, calcium and vitamin A) in exception of vitamin C.

Table 11: Nutrient intake of children 6-23 months in crop farming community**(n=156)**

	Nutrients					
	Protein (g)	Iron (mg)	Zinc (mg)	Vitamin A (µ/RE)	Vitamin C (mg)	Calcium (mg)
Total						
Mean	10.3	4.3	1.6	7.6	9.8	241.4
SD	9.1	4.0	1.5	38	16.4	356.2
Percentage of children met RDA	89.7	2.1(39.7)*	3.8	3.8	64.1	35.9
6-11months						
Mean	5.5	2.2	1.1	3.8	5.0	142.4
SD	4.1	1.8	1.0	27.3	12.8	219.8
Percentage of children met RDA	82	2.0(2.0)*	2	2.0	100	26
12-23 months						
Mean	12.5	5.2	1.9	9.3	12.1	288.1
SD	9.9	4.4	1.7	42.2	17.5	397.4
Percentage of children met RDA	93.4	2.1(57.5)*	4.7	4.7	47.2	40.6

*Low (medium) bioavailability assumed

EAR for the Specific Nutrient Intake:

Protein: 6-11 months, 1.3-2.0g for breastfed; 6-6.3g for non-breastfed.

12-23months, 3.3g for breastfed; 7.2g for non-breastfed.

Iron: 6-11 months, 7.1mg for breastfed; 3.8mg for non-breastfed.

12-23 months, 7.3mg for breastfed; 4.0 mg for non-breastfed.

Zinc: 6-11 months, 3.5 – 3.6mg for breastfed; 4.2mg for non-breastfed.

12-23 months, 4.8mg for breastfed; 5.4mg for non-breastfed.

Vitamin A: 6-11 months 9.3- 30.0mcg RAE for breastfed; 250.0mcg RAE for non-breastfed;

12-23 months 90.0 mcg RAE for breastfed; 285.7mcg RAE for non-breastfed.

Vitamin C: 6-11 months, 0mg for breastfed; 20.8mg for non-breastfed.

12-23 months, 6.7mg for breastfed; 25.0mg for non-breastfed.

Calcium: 6-11 months, 280 -294.2mg for breastfed; 437.5mg for non-breastfed.

12-23 months, 163.3mg for breastfed; 291.7 mg for non-breastfed

Recommended Dietary Allowances (PAHO/WHO, 2003).

Table 12: Nutrient intake of children 6-23 months in pastoralist community n=113

	Nutrients					
	Protein (g)	Iron (mg)	Zinc (mg)	Vitamin A (µ/RE)	Vitamin C (mg)	Calcium (mg)
Total						
Mean	13.8	3.8	1.8	0.0	4.7	198.6
SD	8.5	2.4	1.3	0.0	5.5	154.9
Percentage of children met RDA	92.9	0.0(48.7)*	4.4	0.0	68.1	50.4
6-11 months						
Mean	8.1	2.0	1.2	0.0	1.9	151.4
SD	6.0	1.3	0.9	0.0	3.0	163.0
Percentage of children met RDA	82.5	0.0(0.0)*	2.5	0.0	100	17.5
12-23 months						
Mean	17	4.8	2.1	0.0	6.2	224.5
SD	8.1	2.3	1.4	0.0	6.0	145.0
Percentage of children met RDA	98.6	0.0(75.3)*	5.5	0.0	50.7	68.5

*Low (medium) bioavailability assumed

EAR for the Specific Nutrient Intake:

Protein: 6-11 months, 1.3-2.0g for breastfed; 6-6.3g for non-breastfed.

12-23 months, 3.3g for breastfed; 7.2g for non-breastfed.

Iron: 6-11 months, 7.1mg for breastfed; 3.8mg for non-breastfed.

12-23 months, 7.3mg for breastfed; 4.0 mg for non-breastfed.

Zinc: 6-11 months, 3.5 – 3.6mg for breastfed; 4.2mg for non-breastfed.

12-23 months, 4.8mg for breastfed; 5.4mg for non-breastfed.

Vitamin A: 6-11 months 9.3- 30.0mcg RAE for breastfed; 250.0mcg RAE for non-breastfed;

12-23 months 90.0 mcg RAE for breastfed; 285.7mcg RAE for non-breastfed.

Vitamin C: 6-11 months: 0mg for breastfed; 20.8mg for non-breastfed.

12-23 months: 6.7mg for breastfed; 25.0mg for non-breastfed.

Calcium: 6-11 months, 280 -294.2mg for breastfed; 437.5mg for non-breastfed.

12-23 months, 163.3mg for breastfed; 291.7 mg for non-breastfed

Recommended Dietary Allowances (PAHO/WHO, 2003).

4.7 Qualitative Information on Circumstances Influencing IYCF Practices among

Crop Farming and Pastoralist Communities

Qualitative information on circumstances that influence IYCF practices were taken from semi-structured interviews and opportunistic observations and summarized in matrix 1, 2 and matrix 3 (Appendix 6). Knowledge and attitudes towards each ideal practice, reasons for their IYCF practices are summarized in matrix 1. The main reasons for current feeding practices were lack of knowledge on the recommendations, underutilization of health facilities, social influence and poor beliefs. For example, due to lack of knowledge on the recommendation and effect of pre-lacteals; during semi structured interview one mother

stated: *“Only little amount of milk is coming out during the first days after birth, so I always start to feed my babies with goat milk on the second day after birth”*(a caregiver from crop farming community).

Another mother added ‘There is no harm to give the baby warm water to clear the intestine before starting to breastfeed. Water is always clean’ (a mother from farming community)

‘We always give ghee to a, new born baby to induce passing out of meconium hence keep the child’s intestine clean. We were told by our parents and we continue doing that. We have not observed any problem with that so far’ (a mother from pastoralists).

For the mothers who reported to implement recommended child feeding practices, they mentioned some facilitators including availability of health facilities, community health workers and peer support groups who provide education and counselling, and perceived benefits of breast milk. One mother from crop farmers said *“I learnt the benefits of exclusive breastfeeding from Mwanzo Bora groups and I had a desire to practice it for my child. My child is healthy and gained weight as required. I feel it is a good practice”*. (a mother from crop farming community). The inclusion of animal source foods in child’s food was also emphasized during peer group sessions. However, the main constraint was cost especially for the crop farmers while for the pastoralists; the main barrier was limited knowledge.

The barriers and facilitators to optimal breastfeeding observed during opportunistic observations are summarized in matrix 3 (Appendix 9). The main barriers observed were misinterpretation of baby’s hunger or satiety cues for example; It was observed that some mothers did not breastfed to satiety. Most mothers breastfed for only a short time sometimes as response to soothe the baby when crying and stop it shortly after it stops

crying. Breastfeeding is regarded as a way to stop the child from crying without considering satiety cues. Other barriers observed were cultural restrictions which forbid consumption of some nutritional dense foods and limited knowledge for mothers on techniques to attain optimal feeding practices.

Matrix 2, master matrix containing the summary for integrated data on facilitators and barriers, identified mainly in Opportunistic Observations, Semi-structured interviews and quantitative data collected primarily through the Caregiver Survey and the 24-hour Dietary Recall and Anthropometry.

CHAPTER FIVE

5.0 DISCUSSION

This study aimed to determine nutrition status, nutrient adequacy and feeding practices of infants and young children among pastoralist and crop farming communities. This chapter discusses results based on the specific objectives, it includes the following main sections: nutrition status of the surveyed children; infant and young child feeding practices nutritional and nutrient adequacy of the studied children. Factors like use of health services; water availability and sanitation are also discussed.

5.1 Nutrition Status of Children: Comparison of Pastoralists and Crop Farmers

It was observed in this study that children from pastoralist community had significantly higher prevalence of underweight and wasting compared to their counterpart. The observation of higher prevalence of underweight and wasting in pastoralist community could be attributed to numerous social, health and economic problems faced by the pastoralist populations that have been taken into account by other studies (Downie, 2011; IUCN, 2013; Unshur *et al.*, 2013). No significant difference was observed in prevalence of stunting between the two communities. Stunting prevalence in both communities was higher according to WHO (2000) classification of severity of malnutrition in a community by prevalence for children under 5 years of age. A study of Lawson (2014) conducted in Tanzania to compare nutritional status of children from *Maasai, Rangi, Meru and Sukuma* tribes reported similar findings where the Maasai were substantially disadvantaged compared to neighboring ethnic groups and signs of vulnerability showed to increase with relying on livestock keeping.

It is important to note that in this study the prevalence of malnutrition in children from both communities increased with the increase in age of the children. This may be attributed to the fact that at this age children were introduced to family meals, which may be insufficient to meet their physiological demands of rapid growth and that that they were becoming more able to feed by themselves and hence could be more exposed to food-borne pathogens (Dewey, 2013). Similar trend of undernutrition was reported in a study done in Simanjiro (Nyaruhucha *et al.*, 2006). A study done by Mgongo *et al.* (2017) found that the odds ratio of being underweight increased with the increase in child's age.

5.2 Infant and Young Child Feeding Practices

This study assessed the conformity of crop farming and pastoralist communities to UNICEF/PAHO recommendations of infant and young child feeding stipulated in *ProPAN* field manual. The recommendations were defined based on the *Guiding principles for complementary feeding of the breastfed child (PAHO/WHO, 2003)* and the *Guiding principles for feeding non-breastfed children 6–23 months old (WHO, 2005)*.

5.2.1 Breastfeeding practices

Breastfeeding has the unsurpassed important implications for the health and growth of infants. PAHO/WHO (2013) recommends that breastfeeding should be initiated within an hour after birth. Early initiation of breastfeeding reduces the risk of death and hospitalization (Chowdhury *et al.*, 2015; Lambert *et al.*, 2013) as it facilitates exclusive breastfeeding and colostrum ingestion which bears a wide range of protective factors. About a half of the children involved in this study were breastfed within the first hour of birth. Whereby proportion of children breastfed within the first hour was higher among crop farming households. The reasons for those who didn't start breastfeeding in time were post-delivery medical complications mainly caesarean section, breast abnormalities,

poor perception that milk cannot start flowing immediately after giving birth and other activities which delayed the process like belief that mothers are unclean after delivery process thus they need to take time to clean themselves and babies before they start breastfeeding.

Beside the negative effects of pre-lacteal feeding on the growth and development of children considerable number of children from communities were given pre-lacteal feeds between one and three days after they were born, warm water being the most common pre-lacteal drink given. The reasons for feeding babies with pre-lacteals were the perception that mother's milk is too little to satisfy the baby for the first days and attempts to relieve infants with stomach pain. Ghee was also reported among the pre-lacteals in pastoralist, believed to induce passing out of meconium to newborns.

Colostrum the first milk contains a large number of protective factors that provide protection against a wide range of pathogens. Colostrum decreases the risk of neonatal death (URT, 2008). Majority of children in this study were reported to feed on colostrum. Similar results of colostrum feeding to infants were reported by a study conducted in Morogoro (Safari *et al.*, 2013). The positive observation could be due to the widespread of education and information on benefits of the colostrum. During semi structured interview when mothers were asked about feeding their children with colostrum it was stated that: *"First milk is not discarded since most of us are aware of its benefits"*.

Prevalence of exclusive breastfeeding in both communities was lower than the national average. The perceived reasons for shorter duration of exclusive breastfeeding included the perception that milk is insufficient and improper advice from family members. It is possible that the high rates of malnutrition in the studied communities could be a result of failure to follow breastfeeding recommendations. Other studies done in rural and urban

areas of Morogoro, Kilimanjaro and Tanga Tanzania also found a lower prevalence of exclusive breastfeeding (Safari *et al.*, 2013; Mgongo *et al.*, 2014; Maonga *et al.*, 2015).

The duration for breastfeeding is long in Tanzania (Hussein, 2005). Based on NBS (2016) the median duration of breastfeeding among children in Tanzania is 20 months. In this study the proportion of pastoralist children who were breastfed up to the age of two years was higher than crop farming children. However, there was no significant difference between crop farming and pastoralist in adhering to this practice. A study conducted in pastoralist communities reported similar results of pastoralist groups to have relatively prolonged breastfeeding duration than other groups (Sellen and Smay, 2001; Lawson, 2014).

Main barriers to optimal breastfeeding in this study were poor knowledge of the best practices to optimal breastfeeding, perceived milk shortage, women workload, late ANC attendance, home delivery social influence and medical complications. Generally, there is group counseling and prenatal education given to pregnant women during ANC. It is possible that some women do not receive the education or they don't pay much attention to it. Another reason for such barriers could be cultural norms where by child feeding is much more guided by cultural believes within a particular community. It is worth noting that such barriers are not odd as they correspond with findings of other studies done in Nigeria, Congo DRC and Zimbabwe that the influence of the family members are the greatest barriers to optimal breastfeeding (Onah *et al.*, 2014; Muchacha *et al.*, 2015; Burns, 2016).

Despite the numerous barriers to optimal breastfeeding some facilitators were noted which provide the opportunity for optimal breastfeeding. Motivation of mothers to practice optimal breastfeeding due to perceived benefit and advantages of breastfeeding, presence

of health centers with skilled health providers, which increases the chances to deliver in health facilities, presence of health care providers at the community who provide education on the importance of optimal breastfeeding. The facilitators, if well used can raise best practices of optimal breastfeeding in Tanzanian communities. Nutrition education to promote the current good practices and while discouraging bad practices and beliefs will improve child feeding practices hence nutrition and health status of children will be improved.

5.2.2 Complimentary feeding

It was observed that majority of infants were introduced to complementary foods at the age less than six months. Early introduction of complementary foods could probably be a contributing factor to higher levels of stunting in these communities. Although analysis of association between child feeding practices and nutrition status was not done, it was reported in other studies that early introduction of complimentary foods is associated with undernutrition (Okwori *et al.*, 2011; Tassema *et al.*, 2013). Early introduction of complementary foods before the recommended age of 6 months is common in developing countries as it has been reported by (Safari *et al.*, 2013; 2015 Katepa-Bwalya *et al.*, 2015; Burns *et al.*, 2016).

All infants aged 6–8 months in both communities met the WHO IYCF indicator of receiving semisolid or soft foods at this age. Cereal based foods dominated major part of children's meals; maize stiff porridge being the mostly consumed food. Maize is the main staple in most Tanzania communities as most of the communities are the maize growers. Maize production accounts for more than 70 percent of the cereals produced in the country (Suleiman, 2015). Similar findings were reported in studies done in Tanzania

where maize was an integral part of the children's meals (Muhimbula and Zacharia, 2010; Vitta *et al.*, 2014; Kissa *et al.*, 2015).

Cow's milk was the mostly consumed food of animal source in pastoralist community. Majority of children did not receive cow or goat milk in crop farming community, which highlights the significance of continued breastfeeding for children in this situation. These results are in consistent with previous research reporting high milk consumption for pastoralists than in other groups (Lawson, 2014).

consumption of animal sources foods (ASF) is known to increase nutrient intakes and it is therefore recommended that meat, fish, poultry, or eggs should be consumed daily, or as often as possible (PAHO/WHO, 2013). Animal source foods rather than milk were less frequently consumed even in pastoralist community who are presumed to consume meat frequently than crop farmers. Animals are slaughtered only on special occasions since they are considered as a sign of wealth. Poultry and fish are not consumed in this community due to cultural prohibitions, which forbid consumption of these foods although these beliefs are changing quite rapidly. Similar findings of less frequent meat consumption in pastoralist community were also observed in other studies done in Kenya and Ethiopia (Chege *et al.*, 2015; Mengistu *et al.*, 2017).

Tomato relish was the most vegetable taken by pastoralist community. Green leafy vegetables are rarely consumed since the reputation of these vegetables as food is very low in their community. Also, none of the children was reported to consume fruits in this community the previous day before survey. Fruits and vegetables are among the major dietary sources of many valuable micronutrients, hence low intake could lead to low micronutrient status especially because intake of animal source foods is already low. Poor

intake of fruits and vegetable among pastoralist community was also reported by a study done in Kenya (Chege *et al.*, 2016).

World Health Organization (2008) recommends an average healthy breastfed infant aged 6-8 and 9-23 months to be fed 2-3 times and 3-4 times per day respectively with additional one or two snacks in between meals also 4 times for non- breastfed children 6-23 months. Majority of the mothers in both communities fed their children three times a day irrespective of their age groups and breastfeeding status. The reasons for this practice could be because in most households a child is fed as per family meal routine. This could lead to inadequate intake of energy and nutrient hence failure to meet recommended energy and micronutrient intake. This practice has also been reported elsewhere (Nyaruhucha *et al.*, 2006; Chege *et al.*, 2015).

Beside the evidence that positive caregiver verbalizations during feeding increases child acceptance to food; some of the caregivers in this study were not practicing responsive feeding. This could also be linked to culture that the child will definitely eat if it is hungry. It is also a common practice to force the child to eat. Poor motivational practices during feeding have been reported in other studies (Gibson *et al.*, 2009, Begum *et al.*, 2016). Consequently, irresponsive feeding practices are associated with feeding problems and contribute to development of under or over nutrition (Harbron *et al.*, 2013; Bentley, 2011).

Diseases and infections have direct effect on the nutritional status of children since they can alter child's dietary intake and utilization. WHO recommend that mothers should increase breastfeeding, give more fluids and offer soft favorite foods during illness. Feeding practices during illness were far from optimal in the present study; only few

mothers observed the recommended practices. Consequently, these practices during common childhood illness can lead to deficiencies in key nutrients such as vitamin A and zinc weaken the immune system (Linkages, 2006). Poor feeding practices during illness still emerged as a predictor of underweight in infants and young children (Weisz *et al.*, 2011; Tosheno *et al.*, 2017).

This study noted that the low level of knowledge regarding optimal complementary feeding among the caregivers, cultural food restriction, social influence and economic status as the constraints barriers to good dietary practices to optimal complementary feeding. Similar factors were highlighted as factors associated with poor complementary feeding practices by other studies (Victor *et al.*, 2017). Poor complimentary feeding may lead to delayed growth, increase risk for undernutrition and cause anaemia in infants (Chen *et al.*, 2010; Huo *et al.*, 2015).

5.3 Nutrient Adequacy of the Studied Children

5.3.1 Energy Intake

In general energy and protein intake was sufficient since more than 50% of children from each community met the recommendation. Energy deficits were apparent when children were categorized by their age and breastfeeding status. Less than half of the older children in crop farming community met the recommended energy intake. None of the non-breastfed children in pastoral community and only 5.9% in crop farming community consumed the amount of kilocalories recommended. Low energy intake than recommended for these children can be explained by consumption of complementary foods of low energy density, which are cereal based specifically thin porridge and to which sugar or other energy rich items are often added. Less feeding frequency could also be a contributing factor.

Mean energy intake of children in pastoralist community was higher than that of their counterparts in crop farming community. Addition of food items like ghee was among the good practice observed in pastoralist community as it enhances energy, protein and calcium content and hence dietary quality but majority of the children had nothing added to their porridge in crop farming community.

5.3.2 Nutrient intake

In both populations children's diets were insufficient for all assessed micronutrients (iron, zinc, calcium and vitamin A) in exception of vitamin C. This could be due to higher consumption of plant based foods which are poor source of these nutrients. Traditionally unfortified homemade cereal based foods provide limited amount of these nutrients due to high levels of phytate hindering bioavailability of iron, zinc and calcium (Dewey and Vitta 2013). Low intake of these nutrients is commonly reported in studies done in Tanzania and in other developing countries (Mamiro *et al.*, 2005; Mengistu *et al.*, 2012). Limited intake of these nutrients estimated to affect the health, mental and physical function, and survival of these children (Lozoff, 2007; Biesalski, 2014). Traditional food processing and preparation practices to enhance the bioavailability of micronutrients were uncommon to the studied communities. It is likely that micronutrient deficiency is among the common malnutrition problem in the studied communities.

5.4 Study Limitation

It is worth mentioning that this study was a cross sectional retrospective therefore in collecting information on children's dietary intakes during past 24 hours preceding the survey, the probability of recall bias and misreporting were likely to happen.

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

From the study, it was observed that most of the children feeding practices were far from optimal compared to the UNICEF/ PAHO/WHO recommendations. Proportions of underweight and wasted children were significantly higher in pastoralist community than in crop farming community. Prevalence of underweight and stunting in both communities were above the WHO acceptable threshold levels.

Majority of mothers in both communities did not exclusively breastfeed their infants but significantly large proportion of mothers in pastoralist community did not practice exclusive breastfeeding compared to crop farmers. Significantly large proportions of children in crop farming community were breastfed within one hour after birth. Feeding practice during and after illness in both communities were far lower from optimal.

Plant based foods have been reported as frequently used complementary foods in both communities and most infants are fed three times a day as per family routine. Animal foods other than milk are not taken frequently in both communities.

When children's nutrient intakes were compared to international nutrient recommendations to determine the adequacy of nutrient intake; micronutrient intakes for iron, zinc, vitamin A and calcium were lower than recommended in both communities. Micronutrient densities of the complementary diets were also less than the desired density for iron, zinc and vitamin A in both communities.

Common barriers to optimal feeding practices were: knowledge and awareness of the recommendations, poor perception, misconception, social influence, cultural beliefs, workload, lack of support, limited resources, underutilization of health services and medical complications.

Presence of health facilities, health care providers, peer social groups, health care providers, awareness of the recommendations and desirable common practices were the facilitators enabled mothers to conform to the recommended WHO/PAHO recommendations.

6.2 Recommendations

Based on the findings of this study, the researcher's observation, and the above conclusions, the following are the recommendations for policy makers, Non-Governmental Organizations (NGOS), researchers and health communities or agencies.

To promote optimum feeding practices in both communities government, NGOs should consider planning programs on educating community on the benefits of early breastfeeding initiation, exclusive breastfeeding for six months. Also, the mothers/caregivers should be educated on the importance of including nutrient-dense foods and consider diversification in their children's meals, feed them as per recommended frequency depending on their age.

Since social influence has been observed as one of the barrier to optimal IYCF practices community based interventions should be formulated to increase community awareness on IYCF recommendation and to mobilize them to support IYCF practices.

- i. Most of the studied children in both livelihoods did not meet nutrient requirement for iron, zinc, vitamin A and calcium hence interventions to increase accessibility of fortified foods, promote the indigenous nutrient dense foods, traditional food processing, inclusion of animal source foods and home fortification are necessary; as they enhance intake of these nutrients.
- ii. The fact that children from pastoralist community are more wasted and underweight compared to children from crop farming community, the government and NGOs projects aiming to combat undernutrition should focus more on children living in pastoralist community.

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APPENDICES

Appendix 1: Care giver survey questionnaire

Caregiver Survey Form

<i>I. IDENTIFICATION</i>	
1. Date survey is applied	Date.....__ / __ / ____ day month year
2. Field Worker's code	Code.....__ __
3. Survey results	Complete.....01 Incomplete.....02 Dates of follow up visits: Visit 1.....__ / __ / ____ day month year Visit 2.....__ / __ / ____ day month year
4. Child's code	Code.....__ __ __
5. Full Address WRITE THE DISTRICT, UNION, VILLAGE, STREET, AVENUE, KILOMETER, NEIGHBOR- HOOD, ETC.)	_____ _____ _____
6. Supervisor's code	Code.....__ __
7. Date reviewed by supervisor	Date.....__ / __ / ____ day month year

<i>II. INTRODUCTION</i>	
10. What is your name?	_____
11. What is the [child's name]?	_____
12. What is your relation to [child's name]?	Mother..... 01 Father..... 02 Other, specify: _____ 77
13. Are you the primary caregiver of [child's name]?	Yes..... 01 No..... 02
(IF THE CHILD HAS ALREADY HAD HER/HIS 24 MONTH BIRTHDAY, STOP THE SURVEY.)	

III. SCREENING		
20. Could you please show me an immunization record or birth certificate with [child's name] birthdate?	Yes.....01 No.....02	
21. What is [child's name] birth date? [IF UNKNOWN(If unknown, estimate by asking questions about the proximity of the child's birth to local holidays or festivals.)	Date__ __/ __ __/ __ __ day month year	
22. How many months old is [child's name]?	__ __ Months	
23. Is [child's name] a boy or a girl?	Male..... 01 Female..... 02	
IV. BREASTFEEDING and COMPLEMENTARY FEEDING		
Now I am going to ask you some questions regarding your pregnancy, what you fed the baby in the first few days after he/she was born and current breastfeeding and complementary feeding practices.		
30. During the pregnancy with [child's name], how many times did you visit a health care center for a prenatal visit?	Number of visits.....__ __ Does not know.....99	
31. Where was [child's name] born?	In the hospital.....01 In the health center, doctor's office, private clinic.....02 In the home.....03 In the midwife's home.....04	

	Other, specify:.....77 Does not know.....99	
32. Was [child's name] ever breastfed?	Yes.....01 No.....02 Does not know.....99	02->50 99->0
33. How many hours after birth was [child's name] breastfed for the first time?	Within 1 hour after birth.....01 From 1 to 3 hours after birth.....02 More than 3 hours after birth.....03 Does not know.....99	
34. Was [child's name] fed colostrum? (Explain that colostrum is the breast milk the first few days after birth, it is more yellow and more liquid and less thick than mature breast milk.)	Yes.....01 No.....02 Does not know.....99	
35. During the first 3 days after birth, was [child's name] given anything other than breast milk?	Yes.....01 No.....02 Does not know.....99	02->37 99->37
36. What was [child's name] given? (READ ALL OPTIONS)	Tea.....01 Water (includes sugar water).....02 Infant formula.....03 Other non-breastmilk milks.....04 Other, specify:.....77 Does not know.....99	

37. During the first 3 days after birth, were you offered any practical support or advice to help you start breastfeeding [child's name]?	Yes.....01 No.....02 Does not know.....99	
<i>Now I have few questions about breastfeeding [child's name] since this time yesterday.</i>		
38. Yesterday, was [child's name] breastfed?	Yes.....01 No.....02 Does not know.....99	
39. Yesterday, did [child's name] drink breastmilk from a cup or a bottle?	Yes.....01 No.....02 Does not know.....99	01->50
40. Yesterday, was [child's name] breastfed whenever he/she wanted or on a fixed schedule?	Whenever the child wanted.....01 On a fixed schedule.....02 Does not know.....99	
<i>Now I would like to ask about feeding solid or semi-solid foods to the child.</i>		
50. Who mainly decides what [child's name] should and should not eat?	The mother.....01 A grandparent.....02 A sibling.....03 An aunt/uncle.....04 A neighbor/friend.....05 The father.....06 Other, specify:.....77 Does not apply (child does not eat solid foods).....88	
51. Generally speaking, how is [child's name]'s appetite when she/he is healthy? (READ FIRST THREE OPTIONS)	Eats too much.....01 Eats well.....02 Eats a little.....03 Does not know.....99	
52. At what age was [child's name] fed his/her first solid/semi-solid food? By solid or semi-solid foods we mean food that is thick, not a soup, broth or thin porridge.	Age in months Less than 1 month.....00 Does not know.....99	
<i>Now we are going to discuss the feeding of [child's name] since this time yesterday.</i>		
53. Are you the person who fed [child's name] yesterday?	Yes.....01 No.....02	02-> 67
54. Yesterday, what liquids other than breastmilk was [child's name] given? (READ ALL OPTIONS)	None.....01 Tea.....02 Water (includes sugar water)03	

	Infant formula.....04 Other non-breastmilk milks.....05 Other, specify:.....77 Does not know.....99	
55. Yesterday, did [child's name] have anything to drink from a bottle with a nipple?	Yes.....01 No.....02 Does not know.....99	

56. Yesterday, did [child's name] eat any solid or semi-solid foods?	Yes01 No.....02 Does not apply (child does not eat solid foods).....88 Does not know.....99	02->67 88->67 99->67
<i>Now I would like to ask some questions about how [child's name] was fed yesterday during the main meal.</i>		
60. Yesterday, at the main meal, did [child's name] eat all the food you thought he/she should?	Yes.....01 No.....02 Does not know.....99	
61. Yesterday, during the main meal, did you do anything to encourage [child's name] to eat?	Yes.....01 No.....02	02-> 63
62. What did you do? (Write down the caregiver's answer and code it later. Multiple responses are acceptable. Circle all codes that apply.)	Offered another food or liquid.....01 Encouraged verbally.....02 Modeled eating (with or without toy).....03 Ordered strongly or forced the child to eat.04 Another person helped feed child.....05 Another form of encouragement.....06 Does not know.....99	
63. Yesterday, during the main meal while feeding [child's name], did you talk to her/ him?	Yes.....01 No.....02 Does not know.....99	02-> 65 99-> 65
64. What did you say? (Write down the caregiver's answer and code it later. Multiple responses are acceptable. Circle all codes that apply.)	Ordered child to eat.....01 Praised child.....02 Asked child questions.....03 Talked about the food04 Threatened the child.....05	

	Told child that she liked the food.....06 Rewarded the child.....07 Talked about other things08 Does not know.....99	
65. Yesterday, during the main meal, did [child's name] self-feed (eat by him/herself, using hands or utensil) at any moment during the meal?	Yes.....01 No.....02 Does not know.....99	02-> 67 99->67
66. Yesterday, during the main meal, did [child's name] self-feed the whole time, half of the time, or for a little time?	All of the time.....01 Half of the time.....02 Little bit of time.....03 Does not know.....99	
<i>Now we are going to talk about the breast milk, liquids and foods you gave to [child's name] during the last time he/she was sick.</i>		
67. The last time [child's name] was sick, did you offer less, more or the same amount of breast milk as when [child's name] is healthy? (If response is "less", ask additional questions to determine why.)	Less, because the child did not want it.....01 Less, because mother's decision.....02 More.....03 The same.....04 Child never breastfed or child breastfeeding before last illness.....05 Child has never been sick.....88 Does not know.....99	88->80

68. The last time [child's name] was sick, did you offer less, more or the same amount of non-breast milk liquids as when [child's name] is healthy? (If response is "less", ask additional questions to determine why.)	Less, because the child did not want it.....01 Less, because mother's decision.....02 More.....03 The same.....04 Child never fed non-breast milk liquids...88 Does not know.....99	
69. The last time [child's name] was sick, did you offer less, more or the same amount of foods as when [child's name] is healthy? IF THEY RESPOND "LESS" THEN PROBE "WHY?"	Less, because the child did not want it.....01 Less, because mother's decision.....02 More.....03 The same.....04 Child never fed foods.....88 Does not know.....99	88->80
70. After the illness ended, did you offer less, more or the same amount of food as when [child's name] is healthy? (If	Less, because the child did not want it.....01 Less, because mother's decision.....02 More.....03	

<i>response is “less”, ask additional questions to determine why.)</i>	The same.....04 Does not know.....99	
V. HEALTH AND OTHER SERVICES		
<i>Now I would like to discuss [child’s name]’s visits to health facilities in the last 3 months.</i>		
<i>80. In the past 3 months, since _____ (MONTH), have you taken [child’s name] to a hospital, health center, mobile unit, or any other health service? (READ ALL OPTIONS)</i>	Hospital.....01 Health center, clinic.....02 Community health post.....03 Mobile unit.....04 Doctor’s office.....05 Other, specify _____77 Has not taken child.....88 Does not know.....99	88->82 99->82
<i>81. In the past 3 months, at any of these places (health facilities), was [child’s name] measured for: (READ ALL OPTIONS)</i>	Yes No Does not know Weight 01 02 99 Length 01 02 99 Upper arm 01 02 99	
<i>Next I have a few questions about vitamin and mineral supplements and other nutrition products.\</i>		

<i>83. During the past 6 months, since _____ (month), did [child’s name] ever take a vitamin A capsule, supplement or syrup?</i>	Yes.....01 No.....02 Does not know.....99	
VI. HEALTH COMMUNICATION		
<i>Now, I would like to discuss where you receive messages about feeding children.</i>		
<i>90. In the past 3 months, did you hear or receive any messages or information on child feeding?</i>	Yes.....01 No.....02 Does not know.....99	02->93 99->93
<i>91. Where or from whom did you receive the messages? (Do not read list aloud. Multiple answers are acceptable. Choose all that apply.)</i>	Yes 01 - Health facility 01 02 - Community health worker 01 03 - Traditional health providers 01 04 - Family member 01 05 - Neighbor/friend 01 06 - Child who attends school 01	

	07 - Community gathering 01 08 - Radio 01 09 - Television 01 10 - Internet 01 11 - Mobile phone messaging 01 12 - Printed materials 01 13 - Religious institution 01 14 - Mother-to-mother group 01 77 - Other, specify _____ 01 99 - Does not know/remember 01	
92. Do you remember what the message(s) said? (IF THE MOTHER/ CAREGIVER ANSWERS NO, ASK HER TO TRY TO REMEMBER, REPEAT THE QUESTION AND WAIT FOR A REASONABLE AMOUNT OF TIME)	Yes.....01 Please describe: _____ _____ _____ No.....02	
93. How often do you listen to the radio?	Daily (7 days a week).....01 2 to 6 days a week02 Once a week.....03 Once every 2 weeks04 Once a month.....05 Rarely.....06 Other, specify_____77 Does not know.....99	
94. Do you ever watch television?	Yes.....01 No.....02	
95. Do you participate in any community organizations or social programs? (MENTION EXAMPLES SUCH AS COMMUNITY KITCHENS, PARENT ASSOCIATIONS, CREDIT ASSOCIATIONS, HEALTH COMMITTEES, ETC.)	Yes.....01 No.....02 Does not know.....99	02->100 99->100
96. In which organizations or programs do you participate? (WRITE DOWN ANY ORGANIZATIONS AND PROGRAMS that are	_____ _____ _____ _____	

mentioned.)		
-------------	--	--

VII. FAMILY INFORMATION		
<i>Now, I will ask you some questions regarding this family and home.</i>		
100. How many people live in the home? (Clarify that the respondent should include herself, any other adults, including the elderly, and all children. Record the number in column B.)	Number.....__ __	
101. How many of them are under five years of age? (Record the number in next column)	Number.....__ __	
102. How old are you?	Age.....__ __ Does not know.....99	
103. Are you (the mother/caregiver).....? (READ THE FIRST THREE OPTIONS aloud.)	Single.....01 Married/have a partner.....02 Separated/divorced/widowed.....03 Does not know.....99	
104. Do you know how to read and write? [IF THE RESPONDENT SAYS "YES", ASK HER TO READ A SENTENCE IN LOCAL/NATIONAL LANGUAGE]	Yes (able to read whole sentence.....01 No (cannot read at all.....02 Able to read only parts of sentence.....03 Blind/visually impaired.....04	
105. What is the highest grade/form/year of school that you completed?	Grade/form/year.....__ __ Did not study.....00 Does not know.....99	
106. In your household, who usually makes decisions about purchasing food or taking CHILD'S NAME to health services?	Mother/caregiver.....01 Husband/partner or other man in the household.....02 Mother/caregiver and father together.....03 Elder person in household/family (e.g. the grandparent of the child.....04 Mother/caregiver together with the elder person.....05 Other person, specify _____77 Mother/caregiver together with this other	

	person.....06 Does not know.....99	
107. In what store or markets do you buy food? (WRITE THE NAME AND APPROXIMATE LOCATION)	_____ _____ _____ _____	
Now, I would like to discuss any employment you may have.		
108. Aside from your own housework, have you done any paid work in the last seven days?	Yes.....01 No.....02 Does not know.....99	02->110 99->110

109. If yes, what is your occupation, that is, what kind of work do you mainly do?	Vendor.....01 Agricultural worker.....02 Office worker.....03 Service worker.....04 Education/research.....05 Healthcare.....06 Other, specify _____77	
110. Does anyone in your household grow food? If yes, tell me about all the types of food that are grown. (CHECK ALL THAT APPLY)	Yes (grains, roots, tubers).....01 Yes (legumes, nuts).....02 Yes (orange or yellow fruits & vegetables)...03 Yes (green leafy vegetables).....04 Yes (any other fruits & vegetables).....05 Yes (other: specify _____).....77 No.....07 Does not know.....99	
111. Does this household own livestock, herds, other farm animals, poultry or fish? If yes, tell me about all the types of animals that you have. (CHECK ALL THAT APPLY)	Yes (chickens, ducks, or other birds: for the meat).....01 Yes (chickens, ducks, or other birds: for the eggs).....02 Yes (cows, goats, sheep, pigs, camels or other large mammals for the meat).....03 Yes (cows, goats, sheep, or camels for the milk).....04 Yes (rabbits, guinea pigs, or other small mammals).....05	

	Yes (fish).....06 No.....07 Does not know.....99	
VIII. HOUSING		
<i>Now I would like to talk about your home.</i>		
120. What is the main source of drinking water for members of your household?	Piped water Piped into dwelling.....01 Piped into compound, yard or plot.....02 Piped to neighbor.....03 Public tap / standpipe.....04 Tube well, Borehole.....05 Dug well Protected well.....06 Unprotected well.....07 Water from spring Protected spring.....08 Unprotected spring.....09 Rainwater collection.....10 Tanker-truck.....11 Cart with small tank / drum.....12 Surface water (river, stream, dam, lake, pond, canal, irrigation channel).....13 Bottled water.....14 Other, specify:.....77 Does not know.....99	01->122

121. How long does it take to go there, get water and come back?	Number of minutes.....__ __ Does not know.....99	
122. Do you do anything to the water to make it safer to drink?	Yes.....01 No.....02 Does not know.....99	02->124 99->124
123. What do you usually do to make the water safer to drink? (PROBE WITH QUESTIONS LIKE: "ANYTHING ELSE"? RECORD EVERYTHING THAT IS MENTIONED.)	Boil.....01 Add bleach / chlorine.....02 Strain it through a cloth.....03 Use water filter (ceramic, sand, composite, etc.).....04 Solar disinfection.....05	

	Let it stand and settle.....06 Other, specify:.....77 Does not know.....99	
<i>124. What kind of toilet facility do members of your household usually use?</i>	Flush / Pour flush Flush to piped sewer system.....01 Flush to septic tank.....02 Flush to pit (latrine).....03 Flush to somewhere else.....04 Flush to unknown place / Not sure / Does not know where.....05 Pit latrine Ventilated Improved Pit latrine (VIP)06 Pit latrine with slab.....07 Pit latrine without slab / Open pit.....08 Composting toilet.....09 Bucket.....10 Hanging toilet, Hanging latrine.....11 No facility, bush, field.....12 Other, specify:.....77 Does not know.....99	
<i>125. What type of fuel does your household mainly use for cooking?</i>	Electricity.....01 Liquefied Petroleum Gas (LPG).....02 Natural gas.....03 Biogas.....04 Kerosene.....05 Coal / Lignite.....06 Charcoal.....07 Wood.....08 Straw / shrubs / grass.....09 Animal dung.....10 Agricultural crop residue.....11 No food cooked in household.....12 Other, specify:77	
<i>126. Does your household have:</i>	Yes No A) Electricity 01 02 B) Radio 01 02 C) Television 01 02 D) Phone (landline or mobile) 01 02 E) Refrigerator 01 02	

73 IX. HIV/AIDS AND CHILD FEEDING																						
<i>Now I would like to talk about AIDS.</i>																						
<i>130. Have you ever heard of an illness called AIDS?</i>	Yes.....01 No.....02	02-> end of survey																				
<i>131. Can the virus that causes AIDS be transmitted from a mother to her baby:</i> <i>During pregnancy?</i> <i>During delivery?</i> <i>By breastfeeding?</i>	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;">Yes</th> <th style="text-align: center;">No</th> <th style="text-align: center;">Does not know</th> </tr> </thead> <tbody> <tr> <td>During pregnancy</td> <td style="text-align: center;">01</td> <td style="text-align: center;">02</td> <td style="text-align: center;">99</td> </tr> <tr> <td>During delivery</td> <td style="text-align: center;">01</td> <td style="text-align: center;">02</td> <td style="text-align: center;">99</td> </tr> <tr> <td>By breastfeeding</td> <td style="text-align: center;">01</td> <td style="text-align: center;">02</td> <td style="text-align: center;">99</td> </tr> <tr> <td>Other, specify _____</td> <td style="text-align: center;">01</td> <td style="text-align: center;">02</td> <td style="text-align: center;">99</td> </tr> </tbody> </table>		Yes	No	Does not know	During pregnancy	01	02	99	During delivery	01	02	99	By breastfeeding	01	02	99	Other, specify _____	01	02	99	
	Yes	No	Does not know																			
During pregnancy	01	02	99																			
During delivery	01	02	99																			
By breastfeeding	01	02	99																			
Other, specify _____	01	02	99																			
<i>132. Are there any special drugs that a doctor or a nurse can give to a woman infected with the AIDS virus to reduce the risk of transmission to the baby?</i>	Yes.....01 No.....02 Does not know..... 99																					
<i>133. Have you learned about ways to prevent passing the AIDS virus from mother to child during breastfeeding?</i>	Yes.....01 No.....02																					
<i>134. How did you learn about ways to prevent passing the AIDS virus from mother to child during breastfeeding? (DO NOT READ OUT THE LIST) (MULTIPLE ANSWERS ARE ACCEPTED, CIRCLE ALL CODES THAT APPLY.)</i>	Yes 01-Health personnel (doctor,nurse, midwife).....01 02 - Community health worker, peer counselor.....01 03 - Traditional health provider (healer, TBA).....01 04 - Family member.....01 05 - Neighbor/friend.....01 77 - Other, specify.....01 99 - Does not know.....01																					
<i>135. Were you tested for the AIDS virus during your pregnancy with CHILD'S NAME?</i>	Yes.....01 No.....02 Does not know.....99																					

<p><i>(Thank the mother/caregiver. If her child is 6.0 Month or older, ask her if it would be ok to continue the interview with some questions about what the child ate yesterday (i.E., Administer the 24-hour Dietary Recall and Anthropometry).</i></p> <p>If not, ask if it would be possible to return another day at a more convenient time. If she agrees, ask what would be the most convenient day and time, and write in observations below.</p> <p>If you have any observations (e.g., How to locate the home, or some extra information about any of the answers given by the respondent, write them in the space below.)</p>	
<p><i>170. Observations</i></p>	<hr/> <hr/> <hr/>

Appendix 2: Anthropometry Form

Good morning, my name is _____ and I'm working on a child feeding project for the _____.

Could I ask you some questions regarding what the child you care for ate yesterday? The information that you provide will remain confidential.

1. Child's code: <input type="text"/>	2. Date of interview <input type="text"/> <input type="text"/> <input type="text"/> Day Month Year	3. Location <input type="text"/>	4. Field worker's code: <input type="text"/>
Child's name: _____ Paternal last name Maternal last name First name			
Caregiver's name: _____ Paternal last name Maternal last name First name			
5. Child's sex (1 = M, 2 = F) <input type="text"/>	6. Date of birth: <input type="text"/> <input type="text"/> <input type="text"/> Day Month Year		
7. Age (months): <input type="text"/>	NOTE: IF THE CHILD IS YOUNGER THAN 6.0 MONTHS OR 24.0 MONTHS OLD OR OLDER, DO NOT APPLY THE SURVEY		
8. Was (child) breastfed yesterday? (0 = No, 1 = Yes) <input type="text"/>	9. Yesterday, was it a holiday in the community? (0 = No, 1 = Yes) <input type="text"/>		
10. Yesterday, was there a celebration in the family? (0 = No, 1 = Yes) <input type="text"/>	11. Yesterday, was the child sick with fever, cough or diarrhea? (0 = No, 1 = Yes) <input type="text"/>		
If anthropometric measurements were taken:			
12. Child weight in kilograms <input type="text"/>	13. Child length in centimeters <input type="text"/>		
14. Child mid-upper arm circumference (MUAC) in millimeters <input type="text"/>			

Explain the questionnaire to the caregiver before beginning.

Help her recall (remember) the previous day, based on the times when the child woke up, the activities the child had, etc. Go slowly.

Appendix 4: Semi-structured interview guide

Semi-structured Interviews Guide (Form I-8.1)

This is a conversation guide. Therefore, the questions should not be posed verbatim as they are in a survey. To conduct a more fluid and natural interview, the Field Worker should be familiar with the topics and questions so that when needed he/she can adapt them to the child's age group.

Good morning (afternoon), my name is _____ and I come from _____. As you may remember, I am here to talk with you about young children's eating patterns.

I. General information

(If possible, this section should be completed before the interview.)

1. Child's code
2. Child's name
3. Child's age (in months).....
4. Caregiver's name
5. Date of interview (dd/mm/yyyy)
6. Date notes completed (dd/mm/yyyy)
7. Field Worker's name and code

II. Questions to ask caregivers of children 0–5.9 months old

Ideal practice 1. All infants are breastfed for the first time within the first hour after birth

8. *How long after birth was the baby breastfed for the first time?*

- [IF IT TOOK MORE THAN 1 HOUR] *Why did it take that long?*
- [IF IT TOOK MORE THAN 1 HOUR] *Would it have been possible to breastfeed within the first hour after birth?*
- *What would have needed to happen to make it possible for the baby to be breastfed for the first time within the first hour after birth?*

Ideal practice 2. All infants are not fed with anything other than breast milk in the first 3 days of life

9. *Was the baby given (by you or anyone else) anything to eat/drink before he/she was first breastfed?*

- [YES] *What was given to the baby?*
- *Why was it given to her/him? [ASK FOR EACH FOOD/DRINK THAT WAS GIVEN TO THE BABY]*

- *How did they give her/him this?* [UTENSIL USED; ASK FOR EACH FOOD/DRINK THAT WAS GIVEN TO THE BABY]

- *Who advised you to give this to the baby?* [ASK FOR EACH FOOD/DRINK THAT WAS GIVEN TO THE BABY]

*If a friend told you she was **not** going to give [NAME ANY PRELACTEAL THAT CAREGIVER OR SOMEONE ELSE HAS GIVEN TO THE BABY] to a baby before first breastfeeding, what advice would you give your friend?*

Ideal practice 3. All infants are fed colostrum

10. *When did you first get your first milk [COLOSTRUM]?*

- Did you give that first milk to the baby?
- [YES] Why?
- [NO] What did you do with that first milk?
- Why didn't you give it to the baby?
- If you cared for another child, would you give her/him colostrum?
- Is there something that would help you do this?

Ideal practice 5. All infants less than 6 months old are exclusively breastfed

11. *What do you think about feeding a baby with only breast milk (without water and other liquids) for the first 6 months of life?*

- If you were to care for another baby, would you be willing to only feed her/him breast milk for the first 6 months of life (that is, until she/he turns 6 months old)?
- What would make it easy for you to do this?
- What would make it hard for you to do this?
- What advice would you give to a friend who wanted to do this?

Ideal practice 7. That all infants are fed semi-solid complementary foods beginning at 6 months of age.

12. Have you given any food to your baby?

- How old was your baby when you gave him/her food?
- Why did you think your baby needed food?
- What was the first food you gave your baby to eat?
- Why did you decide to start with this particular food?
- At what age would you advise a friend to start feeding her baby food?
- What food or foods would you recommend?

Ideal practice 12. All infants and young children 6.0–23.9 months old are fed as recommended during and after illness

13. *How do you feed the child when he/she is sick?*

- *Would you encourage the child to breastfeed more when he/she is sick?*
- *If yes, how would you do this?*

III. Questions to ask caregivers of children 6.0–23.9 months old

Ideal practice 4. All infants and young children are breastfed on demand, during the day and night

14. *Are you currently breastfeeding the baby?*

- *[YES] How often do you breastfeed?*
- *Do you breastfeed 1) on a fixed schedule or 2) each time the baby asks to be fed?*
- *[IF 1:] Why? What conditions would be necessary for you to breastfeed only when the baby wants to feed and not on a fixed schedule?*
- *[IF 2] Has anyone recommended that you breastfeed on a fixed schedule? Who?*

Ideal practice 6. All children are breastfed up to 2 years of age or more

15. *Until what age do you plan to breastfeed the baby?*

- *Why that age?*
- *IF LESS THAN 2 YEARS OF AGE: If you decided to breastfeed until the baby is 2, would you be able to do it?*
- *Why? Why not?*

16. *At what age did you stop breastfeeding?*

- *Why did you stop at that age?*
- *Is there anything that would convince/permit/help you to be able to continue breastfeeding until the baby turns 2 years old?*

Ideal practice 7. All infants are fed semi-solid complementary foods at 6.0 months of age (180 days)

17. *Have you given any food to the baby?*

- *What was the first thing you gave the baby to eat?*
- *Why did you decide to start with this particular food?*
- *How old was the baby when you gave her/him this particular food for the first time?*
- *[BEFORE 6 MONTHS] Did you know that giving only breast milk, not even water, for 6 months would prevent the child from getting some diseases?*

- *If you decided to only give breast milk to a baby for the first 6 months of life what would make it easy for you to do it?*
- [AFTER 6 MONTHS] *Did anyone tell you that at 6 months of age the child needs to begin eating foods?*
- *If you had another baby, would you consider to begin giving food to the child at no later than 6 months of age? Why/why not?*

Ideal practice 8. All infants and young children 6.0–23.9 months old meet their recommended daily energy requirements

18. *If you realized it was necessary to increase the amount of food that you give the child, would you be able to do this?*

- *What difficulties would you have? What would help you to do this?*

Ideal practice 9. All infants and young children 6.0–23.9 months old are fed nutrient- and energy-dense foods

19. *Do you prefer to feed the child foods that are more liquid or more solid (thicker)?*

- [IF PREFERS “MORE LIQUID” FOODS] *Do you think thicker, more solid, foods should be given to small children in some situations or at some age? When?*
- *What would you say to a friend who is giving, or thinking of giving, thicker, more solid foods to a 6-month-old baby?*

Ideal practice 10. All infants and young children 6.0–23.9 months old are fed the recommended number of meals daily

20. *How many times a day do you feed the child? [ASK ABOUT MAIN MEALS AND SNACKS]?*

- [IF THE FREQUENCY IS LESS THAN THE RECOMMENDED FREQUENCY FOR THE AGE GROUP] *If a health professional asked you to increase the number of times you feed the child each day, and you agreed with this, would you be able to do it? What difficulties would you have? What would help you to do this?*
- [IF THE FREQUENCY IS MUCH MORE THAN THE RECOMMENDED FREQUENCY FOR THE AGE GROUP] *If a health professional asked you to decrease the number of times you feed the child each day, what would be your reaction?*

Ideal practice 11. All infants and young children 6.0–23.9 months old fed by caregiver responsive to child

21. *If the child stops eating, and you think he/she is still hungry or did not eat enough, what do you do?*

IF THE MOTHER ANSWERS: “I WOULD MOTIVATE HER/HIM TO EAT”:

- *How would you motivate her/him to eat?*
- *What could you do so that the child has someone to help or motivate her/him eat at every meal?*
- *What difficulties would you have in doing this?*

IF THE MOTHER DOESN'T SAY SHE WOULD MOTIVATE:

- *Why wouldn't you motivate?*

Ideal practice 12. All infants and young children 6.0–23.9 months old are fed as recommended during and after illness

22. *How do you feed the child when he/she is sick?*

- *Do you breastfeed more, less or the same as when he/she is healthy?*
- *Do you give more food, less food or the same amount as when he/she is healthy?*
- *Do you give the child more, less or the same amount to drink as when he/she is healthy?*

IF MORE:

- *How do you get the child to breastfeed more when he/she is sick?*
- *How do you get the child to eat more when he/she is sick?*
- *How do you get the child to drink more when he/she is sick?*

IF LESS:

Why?

If you thought the child needed to breastfeed/eat/drink more, when he/she is sick, can you think of a way to make the child to breastfeed/eat/drink more?

23. *How do you feed the child in the week after he/she has been sick?*

- *How do you get/would you get the child to eat more in the week after he/she has been sick?*

Appendix 5: Opportunistic observation form

Opportunistic Observations Form (Form I-7.1)

It is possible to observe all key elements of breastfeeding and complementary feeding in a single caregiver-child pair or in a single observation. However, Field Workers should refer to the key data items below nonetheless whenever it is possible to observe the feeding of a child under 2 years old, recording as much data as possible.

Topic	Observation
I. Identification Date of observation (dd/mm/yyyy): _____ Name of Field Worker: _____ First and last name of child being observed (if possible to obtain): _____ _____ Place of observation (home, market, park, etc.): _____ Child's age in months (even if only an approximation): _____ Child's sex: M () F () Age of person feeding child (even if only an approximation): _____ Sex of person feeding child: M () F () Mealtime observed (e.g., breakfast, lunch, dinner or snack): _____	
II. Breastfeeding 1. Caregiver-child interaction: _____ _____ • Does the caregiver pay attention to the child? _____ • Is the child breastfed to satiety? _____ • Are any difficulties observed? [If so, describe below.] _____ _____ _____ _____	
III. Complementary feeding During mealtime 1. When serving the food, does the caregiver: • Wash the child's hands? Yes () No () • Serve the child first? Yes () No () 2. Child eats: by himself/herself () with family members ()	

Topic	Observation
3. How is the child fed during the mealtime? • The child feeds self without help from caregiver () • The child mostly feeds self but receives help from caregiver () • The child is fed mostly by caregiver but sometimes feeds self () • The child is fed only by caregiver (i.e., child does not touch food or utensils). ()	
4. Is the child served food on his/her own plate? _____ _____ Is a spoon, bottle, or other utensil used to feed the child? _____ _____	
5. What is the location of caregiver in relation to child? _____ _____ • Caregiver is near the child and attentive () • Caregiver is not near the child and/or busy with another activity ()	
6. Foods, dishes, and drinks served to child: _____ _____	
7. Are any foods, dishes, or drinks served only to the child (not to other members of the family)? If so, which types of foods, dishes, or drinks? _____ _____	
8. Is the child only served portions of the foods, or drinks that are served to the rest of the family, or are some foods or drinks prepared specially for the child? _____	
9. Are any foods or drinks served only to the rest of the family (not to the child)? _____	
Caregiver-child interaction	
10. Does the caregiver talk to the child, verbally encouraging him/her to eat? What does the caregiver say? _____ _____	
11. Does the caregiver encourage the child when he/she is eating well? What does the caregiver do or say? _____ _____	
12. Does the caregiver ever motivate the child to eat more using gestures or games, or by demonstrating to her/him how to eat? _____ What strategies does the caregiver use? _____ _____	
13. Does the caregiver ever physically force the child to eat during the meal? _____	

Appendix 6: List of matrices for reasons for current IYCF practices, barriers and facilitators ideal practices infants and young child feeding in crop farming and pastoralist communities

Matrix 1: Summary of the reasons for certain practices, and knowledge and attitude towards the ideal practices by mother in crop farming and pastoralist communities

Ideal practice 1: All infants are breastfed for the first time within the first hour after birth	
Current practices	Reasons, knowledge, and attitudes
Breastfed the child for the first time within one hour for the first after birth.	<ul style="list-style-type: none"> Professional assistance during delivery. During interview respondent mentioned that <i>“ In hospital now days we are encouraged to start breastfeeding soon after birth ”</i> Maternal knowledge on baby hunger cues <i>“I breastfed within the first hour since the baby was born hungry as it was searching (rooting) for the breast”</i> cited one mother during interview.
Breastfed the child for the first time within the first hour after birth	<ul style="list-style-type: none"> Limited knowledge of mothers on the recommendation and its benefits Non-skilled birth attendant, who are not aware of the benefits of breastfeeding within the first hour; hence mothers are engaged in other activities after birth before breastfeeding. For example; mother took some time to clean herself and the baby, take tea (believed to boost energy after delivery). During interview one mother stated: <i>“ In our tradition mother need to clean herself first before start breastfeeding although the experience is difference if you give birth at the health center ”</i>

	<ul style="list-style-type: none"> • Misconception of breast milk secretion mechanism, a belief that milk cannot start flowing immediately after giving birth • A perception that mothers are too weak after birth thus newborns are handled to helper for sometimes for mother to gain energy first before breastfeeding thus limit skin to skin contact between mother and the baby • Medical condition e.g. caesarian section, newborn was unable to suck milk due to sickness. During interview one mother stated that <i>“It was not easy to breastfed earlier after giving birth since the baby was sick and too weak to suck”</i>.
<p>Ideal practice 2: All infants not fed anything other than breast milk during first 3 days of life</p>	
<p>Current practice</p>	<p>Reasons, knowledge, and attitudes</p>
<ul style="list-style-type: none"> • Sugar plus salt water solution given with spoon • Thin maize porridge solution given with spoon • Goat or cow milk diluted with water given with spoon 	<ul style="list-style-type: none"> • Lack of knowledge on the recommendation and effect of pre-lacteals. <i>“Only little amount of milk is coming out during the first days after birth, so I always start to feed my babies with goat milk on the second day after birth”</i> stated one of the mothers during semi structured interview and explained that she was advised by her elder relatives since the first birth • Social influence <i>“I didn’t feed my baby with anything, but it’s common to feed the baby with lukewarm water to calm stomachache”</i>.

	<ul style="list-style-type: none"> Ghee is commonly given to pastoralist newborns with the belief that it induces the passage of meconium.
Ideal practice 3: <i>All infants are fed colostrum milk</i>	
Current practice	Reasons, knowledge, and attitudes
Majority of infants were fed on colostrum	<ul style="list-style-type: none"> It is a common practice to feed a baby on mother's milk Advised that it is good for a child nutrition and it has protection properties by health professionals <p><i>"First milk is not discarded since most of us are aware of its benefits"</i> explained one mother during interview</p>
Ideal practice 4: <i>All infants and young children are breast fed on demand, during the day and night</i>	
Current practice	Reasons, knowledge, and attitudes
Percentages of children 0-23 months who are fed on demand during the day and night were 98.4 in crop farming community and 99.3 in pastoralists communities respectively	
-Majority breast fed on demand	<ul style="list-style-type: none"> Mothers and babies are always in closer proximity -Mother's knowledge on the importance of breastfeeding whenever the baby demand -Mothers consider breastfeeding as the way to soothe and stop baby from crying and in this manner, satiety is not considered
-Breastfed on a fixed schedule	<ul style="list-style-type: none"> Poor knowledge regarding the benefits of breastfeeding to two years -Preparation to stop the baby from breastfeeding -To make the child to consume more foods than relying on breastfeeding only.

	<i>"I do not breastfeed frequently lately to make the child eat more food and to prepare it for cessation"</i> one mother stated during interview.
Ideal practice 5. All infants less than 6 months old are exclusively breastfed	
Current practice	Reasons, knowledge, and attitudes
Few mothers breastfed their child exclusively (indicate the percentage for pastoralists and crop farmers)	<p>-They believe that mother's milk is sufficient for the baby <i>" I breastfed my baby because I'm aware of the benefits"</i></p> <p>-They believe that baby's stomach is not ready to receive other foods before six and feeding the baby with these food may lead to gastrointestinal problems</p>
Majority were not practicing exclusive breastfeeding (indicate the percentage here!!)	<p>-Believe that mother's milk is not sufficient to cover all of the baby's needs such as thirst, hiccups so giving the baby water is unavoidable. It was stated that: <i>"I usually start to give cow's milk earlier than six month since I don't have enough milk to satisfy the baby"</i>.</p> <p>-Misconception that infants cry often because mother's milk is not sufficient so complimentary foods should be added to satisfy the baby.</p> <p>-Improper advice from family members as they believe it's a common practice for a baby to be given other foods; therefore, they don't understand why she should not do the same to her baby</p> <p>-The belief that early complementation does not cause any harm as it is commonly practiced in their community.</p>

Ideal practice 6: <i>All children breastfed through the age of 2 years old or older</i>	
Current practice	Reasons, knowledge, and attitudes
Children 20.0–23.9 months were breastfed the previous day	<ul style="list-style-type: none"> • Common practice <p>It's a common practice in their culture to breast for two years or beyond</p>
Breastfeeding was ceased before two years	<ul style="list-style-type: none"> • During interview one participant stated: “I had to cease breastfeeding earlier to make her eat more food as she was refusing to eat”
Ideal practice 7: <i>That all infants are fed semi-solid complementary foods beginning at 6 months of age.</i>	
Current practice	Reasons, knowledge, and attitudes
Started too early before 6 months (indicate the percentage from your data)	<ul style="list-style-type: none"> • Poor knowledge and perception <p>-Perception that the baby is crying often because mothers milk is not sufficient</p> <p>-A belief that mother cannot produce enough milk to satisfy the infant needs like thirst, hiccups</p> <ul style="list-style-type: none"> • It's a common practice <p>-The belief that early complementation does not cause harm as it is commonly practiced in their community.</p>
Ideal practice 8. <i>All infants and young children 6.0–23.9 months old meet their recommended daily energy and nutrients requirements</i>	
Current practice	Reasons, knowledge, and attitudes
Feed the baby as recommended (Indicate the percentage of those who received recommended)	<ul style="list-style-type: none"> • Mothers concern on the child's nutrition and health <p>-They believe that it is important to feed properly for good health and proper growth</p>

energy intake)	<ul style="list-style-type: none"> • Favorable common practices - Inclusion of indigenous nutritious foods like jute mallow leaves enhance intake of calcium -Social peer groups set as an opportunity to increase mother’s knowledge <p><i>“We were taught through Mwanzo bora groups that it’s very important to include animal source foods, although I can’t practice it very often”</i></p> <p><i>“According to our tradition children are not fed on some offal parts, as they are believed to cause pneumonia to children, but through social group I have learned from my fellows that they are not harm beside they are more nutritious”.</i></p> <p>One mother stated during group interview.</p>
Appears to feed below recommended levels (in terms of n of feeding)	<ul style="list-style-type: none"> • Economic constraints which limit food access <p>-Mothers claim that they feed their babies family foods and in a usual family routine as they cannot afford buying special foods for their babies neither feeding them frequently as recommended.</p> <ul style="list-style-type: none"> • Lack of knowledge on using locally available foods to prepare special food for the children <p>-Mothers lack knowledge on food preparation procedures to enhance energy and nutrients</p> <p>-Limited knowledge about commercially fortified foods</p>
Ideal practice 9. All infants and young children 6.0–23.9 months old are fed nutrient-and energy-dense foods	
Current practice	Reasons, knowledge, and attitudes
Limited inclusion of both energy and nutrient-dense foods in meals.	<ul style="list-style-type: none"> • Lack of knowledge and resources to incorporate nutrient and energy dense foods in their babies foods

	<p>-Mothers lack knowledge on food preparation procedures to enhance energy and nutrients</p> <p>-Limited knowledge about commercially fortified foods</p> <ul style="list-style-type: none"> • Poor common practices <ul style="list-style-type: none"> -Children are fed on plant-based foods which are poor source key nutrients like zinc, iron and calcium • cultural and tradition beliefs <ul style="list-style-type: none"> -Cultural beliefs in pastoralists community prohibit consumption of wild animals, fish, poultry which are known to be good source of key nutrients
IDEAL PRACTICE 10: <i>All infants and young children 6.0 – 23.9 months are fed the recommended number of meals daily</i>	
Current practice	Reasons, knowledge, and attitudes
Children fed a smaller number of meals than recommended (indicate the percentage for your qualitative data)	<p>-It's a common practice for some families that a child is fed as per family meal routine</p> <p>-Mother don't have knowledge that the baby needs to be fed frequently</p> <p>-Preparing a baby's food frequently is perceived as a waste of firewood</p> <p>-The feeding frequency of 2-3 times in a day for a bay appears to be sufficient as it's a common practice passed from generation to generation</p> <p>-Economically a family cannot afford to buy extra food for a baby</p>

Ideal practice 11: All infants and young children 6.0 – 23.9 months are fed by a responsive caregiver and encouraged to eat to satiety during meal times	
Current practice	Reasons, knowledge, and attitudes
<p>Mothers respond to the cues of hunger and satiety</p> <ul style="list-style-type: none"> -Caregivers motivate the child to eat if the child stops eating while she/he have not eaten enough -Caregiver verbally encouraged the child to eat by speaking affirmative words or sing to encourage the child to eat -Ask another family member to help feed the child -Caregiver modeled eating while complimenting the food like saying the word “this food is so sweet” 	<ul style="list-style-type: none"> -Most mothers spend much of the time with their babies and they are the one who fed them usually so they have learned on the signs given by babies when hungry or when they full -Believes that a child needs to be motivated to eat as required. It was stated that: <i>“Feeding the young children need patience, you need to play with them, sing for them to make them it”</i>. <i>“He eats very well when fed with another person, so I usually ask my sister to feed him”</i>
<ul style="list-style-type: none"> -Caregivers forced the child to eat by giving strong commands or holding him/her and pushing the food in the mouth -Caregivers did not do anything to encourage 	<ul style="list-style-type: none"> -Caregivers misinterpretation of their child’s refusal to accept food as a sign of poor appetite. -Caregivers concern that she has to do whatever it takes for the child to eat. -Believes that effort is needed for the child to eat enough food

their children to eat during the main meal	It was stated that: <i>“Sometimes you need to use force for the child to eat since she will lose weight by not relying on breast milk only”.</i>
Ideal practice 12: All infants and young children are fed as recommended during and after illness	
Current practice	Reasons, knowledge, and attitudes
-Children are fed less food during sickness	-Children refusal to food and poor awareness of caregivers about the feeding needs of children during and after illness
-Children were fed more often -Children were fed with the food they prefer most	-Advice from the health personnel It was stated that: <i>“I had to feed her more often during sickness since enough food is needed for medicine to work properly and a child to recover fast”.</i>

Matrix 2: Summary of barriers and facilitators of ideal among 0-23 months children in crop farming and pastoralist communities (Form I-7.2)

Ideal practice	Current practice	Barriers	Facilitators
Ideal practice 1: All infants are breastfed for the first time within the first hour after birth	The practice was not observed		
Ideal practice 2. All infants are not fed with anything other than breast milk in the first 3 days of life	The practice was not observed		
Ideal practice 3. All infants are fed colostrum	The practice was not observed		
Ideal practice 4: All infants and young children are breast fed on demand, during the day and night	Some of the mothers breastfed on demand		Mothers are always closer to their infants as most of them are house wives - Understanding her infants cues to breastfeed -Mothers breastfeed to stop the baby from distracting her to attend other obligations -Community encourage mothers to breastfeed whenever the baby demand it
	Some mothers don't breastfeed on demand	-Workload, family doesn't support mother to breastfed	
Ideal practice 5: <i>All infants less than 6 months are exclusively breast fed</i>	Infants were introduced to complementary earlier before six month	- It's a common practice to feed the baby earlier before 6 months and perceived as it doesn't cause any harm. -Lack of intention to practice exclusive breastfeeding -Lack of basic knowledge regarding the strategies to attain breastfeeding	
	-Some mothers practiced exclusive breastfeeding for 6 months		-Awareness on the recommendation and intention to breastfeed exclusively for 6 months and its benefits -Presence of health care providers who provide education on exclusive breastfeeding
Ideal practice 6: <i>All children are breast fed</i>	Some mothers stop breastfeeding before the	-Sickness -Poor child spacing	

<i>up to 2 years of age or more</i>	age of 2 years		
	Some mothers breastfed to the age of two or more		-It's a common practice for mothers to breastfed to age of two and more -Mothers believes that breastfeeding should continue until the baby is less depending on it - Mother believe she will not get pregnant if she continues with breastfeeding
Ideal practice 7: <i>All infants are fed semi-solid complementary foods at 6.0 months of age (180 days)</i>	Mothers introduce complimentary foods before 6 months	-It is a common practices and regarded as not harmful -Bad advice and influence from family members, friends etc.	
	Some mothers Introduced complementary foods within the recommended age		-Advice from health personnel, friend, relatives -Knowledge and intention to practice exclusive breastfeeding
Ideal practice 8: All infants and young children 6.0 – 23.9 months meet their recommended daily energy requirements	Practice was not observed		
Ideal practice 9: All infants and young children 6.0 – 23.9 months are fed nutrient and energy-dense foods	Infants and young children are fed on meals which are not nutrient dense	-Limited knowledge about preparing complementary foods which are nutrient dense - cultural prohibitions which restrict consumption of some foods e.g. Fish, Poultry, eggs -Lack of knowledge about strategies to enhance intake of nutrient dense foods e.g. grinding of sardines, meat to make it easy for the baby to consume	
	Inclusion of energy rich food items which increase energy intake e.g. Ghee		-It's a common practice in community

Ideal practice 10: All infants and young children 6.0 – 23.9 months are fed the recommended number of meals daily	Practice was not observed		
Ideal practice 11: All infants and young children 6.0 – 23.9 months are fed by a responsive caregiver and encouraged to eat to satiety during meal times	-Inadequate mother-child interaction while breastfeeding.	-Mother multitasking while breastfeeding. -Workload -Lack of support from family members -Lack of knowledge on proper breastfeeding practices	
	-Mother breastfed to soothe the baby when crying and do not breastfed to satiety	-Mother believe breastfeeding is the way to stop the child from crying do not considers child satiety	
	-A child is left to eat with other young children	-Mother believes that the child will learn to eat more from other kids	
	-Mother feed the baby porridge by hands without observing hygiene	It's a common practice	
Ideal practice 12: All infants and young children are fed as recommended during and after illness	-Mother increases breastfeeding during illness of child		-Mother believes that she must breastfeed more frequently as the child refuses to eat

Matrix 3: Master matrix for summarizing integrated quantitative and qualitative data

Ideal practice 1: All infants are breastfed for the first time within the first hour after birth			
Current practice: Percentage of children 0–23 months breastfed for first time within 1 hour of birth was 66.5 in crop farming and 34.8 in pastoralist communities			
Barriers		Facilitators	
Internal	External	Internal	External
<ul style="list-style-type: none"> • Underutilization of health services <ul style="list-style-type: none"> -Late attendance at ANC clinic -Mother miss education sessions where health care providers offer health education including breastfeeding issues -Home deliveries -Mother and child must be bathed first before breastfeeding • Misconception about breastfeeding <ul style="list-style-type: none"> -A belief that milk cannot start flowing immediately after giving birth • Poor knowledge of mothers on breastfeeding <ul style="list-style-type: none"> -Lack of knowledge on the benefits of EIBF • Medical complications e.g. Caesarian section 	<ul style="list-style-type: none"> • Underutilization of maternal health services <ul style="list-style-type: none"> -Preference of traditional birth attendance over professional assistance during birth 	<ul style="list-style-type: none"> • Trust towards what is taught by health care providers 	<ul style="list-style-type: none"> • Availability of health facilities and health care providers <ul style="list-style-type: none"> - Assures professional assistance during delivery -Offers breastfeeding education

-Baby was born sick thus too weak to suck -Breast abnormalities milk			
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Ideal practice 2: <i>All infants not fed anything other than breast milk during first 3 days of life</i>			
Current practice: Percentage of children 0–23 months who were fed anything other than breast milk during first 3 days of life was 21.8 in crop farming and 36.9 in pastoralist communities			
Barriers		Facilitators	
Internal	External	Internal	External
<ul style="list-style-type: none"> • Poor knowledge of mothers -Lack of knowledge on the risk associated with pre-lacteal feeding • Misconception about breastfeeding -Perception that milk won't satisfy a newborn on the early days • Early pregnancies -Inadequate knowledge and skills breastfeeding 	<ul style="list-style-type: none"> • Poor traditional beliefs - Belief that ghee induces passing out of meconium to newborn -Belief that hot water will soothe the newborn's stomachache 		

IDEAL PRACTICE 3: All infants are fed colostrum milk			
Current practice: Percentages of children 0-23 months who were fed on colostrum was 97.1 in crop farming and 100 in pastoralist community			
Barriers		Facilitators	
Internal	External	Internal	External
<ul style="list-style-type: none"> • Poor knowledge -Lack of knowledge regarding the benefits of colostrum	<ul style="list-style-type: none"> • Poor traditional beliefs 		-It is a common practice to feed a baby on mother's milk
IDEAL PRACTICE 4: All infants and young children are breast fed on demand, during the day and night			
Current practice: Percentages of children 0-23 months who were fed on colostrum was 97.1 in crop farming and 100 in pastoralist community			
Barriers		Facilitators	
Internal	External	Internal	External
<ul style="list-style-type: none"> • Maternal concern about the child's weight, nutrition -Mothers are reducing frequency of breastfeeding to make the baby to eat more food <ul style="list-style-type: none"> • Poor baby spacing 	<ul style="list-style-type: none"> • Workload, family doesn't support mother to breastfed 	-Mothers are always closer to their infants as most of them are house wives - Mothers understanding their infants cues to breastfeed -Mothers breastfeed to stop the baby from distracting her to attend other obligations	-Community encourages mothers to breastfeed whenever the infant demands

Ideal practice 5: All infants less than 6 months old are exclusively breastfed			
Current practice: Percentages of infants 0-5 months of age who were fed exclusively with breast milk only were 48.7% and 39.1 in crop farming and pastoralist communities respectively			
Barriers		Facilitators	
Internal	External	Internal	External
<ul style="list-style-type: none"> • Limited knowledge of mothers on EBF -Poor knowledge regarding the strategies to practice breastfeeding • Poor maternal perception - Perceived milk shortage -Perception that milk cannot cover all of the infants needs e.g. hiccups, thirst -Perception that infants cry often because mother's milk is not sufficient so complimentary foods should be added to satisfy the baby • Underutilization of maternal health services -Late ANC attendance -Home deliveries • Lack of intention to practice exclusive breastfeeding -Lack of confidence among mothers to practice breastfeeding 	<ul style="list-style-type: none"> • Social influence -Improper advice from family members - It's a common practice to feed the baby earlier before 6 months and perceived as it doesn't cause any harm 	<ul style="list-style-type: none"> • Motivation of mothers to practice EBF -Mothers understanding the benefits of EBF -Intention to practice exclusive breastfeeding for 6 months 	<ul style="list-style-type: none"> • Advice from health care providers • Peer supporting group "<i>I learned the benefits of exclusive breastfeeding from Mwanzo bora groups and I had a desire to practice it for my child</i>"

Ideal practice 6: All infants and young children are breast fed on demand, during the day and night			
Barriers		Facilitators	
Internal	External	Internal	External
<ul style="list-style-type: none"> • Maternal concern about the child's weight, nutrition <p>During interview one participant stated:</p> <p><i>"I had to cease breastfeeding earlier to make her eating more food as she was refusing food"</i></p> <ul style="list-style-type: none"> • Poor baby spacing 		<ul style="list-style-type: none"> -Awareness of mothers on the recommendation -Trust of mothers toward what is taught by health providers 	<ul style="list-style-type: none"> • It's a common practice for mothers to breastfeed their children to the age of two or more • Advice from health care providers
<p>Ideal practice 7. That all infants are fed semi-solid complementary foods beginning at 6 months of age.</p> <p>Current practice: The mean age at which complementary foods were introduced to children was 3.5 (SD 2.2) months in crop farming community and 2.2 (SD 1.4) in pastoralist community.</p>			
Barriers		Facilitators	
Internal	External	Internal	External
<ul style="list-style-type: none"> • Poor maternal perception <ul style="list-style-type: none"> -Perceived milk shortage -Lack of knowledge on the effect of early complementation -Misinterpretation that the baby is crying often because breastfeeding is no longer satisfying 	<ul style="list-style-type: none"> •Social influence <ul style="list-style-type: none"> -Improper advice and influence from family members, friends etc. -It's a common practice to feed the baby earlier before 6 months and perceived as it doesn't cause any harm 	<ul style="list-style-type: none"> • Awareness on the recommendations <ul style="list-style-type: none"> -Trust of mothers toward what is taught by health providers 	<ul style="list-style-type: none"> • Advice from health care providers • Peer supporting group

Ideal practice 8: <i>All infants and young children 6.0 – 23.9 months meet their recommended daily energy and nutrient requirements</i>			
Current practice: Percentages of infants and young children 6-23.9 months who met the recommended daily energy requirements were 53.8 and 63.7 in crop farming and pastoralists communities respectively. Lower than recommended micronutrient intake in exception of vitamin C			
Barriers		Facilitators	
Internal	External	Internal	External
<ul style="list-style-type: none"> • Limited knowledge on infant and young children’s nutrition needs <p>-Limited knowledge on how to prepare energy and nutrient dense foods by using locally available foods</p> <p>-Lack of knowledge about food preparation process that increases food energy or nutrient density</p>	<ul style="list-style-type: none"> • Cultural restrictions which forbid consumption of some nutritional dense foods e.g. Poultry, Fish, eggs etc. • Limited access to nutrition dense foods <p>-Households do not have enough resources to afford nutrient dense foods e.g. fortified flours, Animal source foods</p> <p>-Children are fed on family foods as per family routine</p> <p>-Mother regard preparation of infant’s food separately from family foods as time consuming and expensive as it consumes more firewood and time</p>	<p>- Mothers desire for their children attain good health and nutrition children</p>	<p>-Common practices that increases energy and nutrient density of foods energy intake e.g. addition of ghee in infants foods</p> <p>-Consumption of indigenous foods which are rich in nutrients e.g. Jute mallow</p>

Ideal practice 9: All infants and young children 6.0–23.9 months old are fed nutrient-and energy-dense foods			
Current practice: Complementary foods were less dense especially on micronutrients compared to the desired density			
Barriers		Facilitators	
Internal	External	Internal	External
<ul style="list-style-type: none"> • Limited knowledge regarding infant and young children’s nutrition needs <p>-Poor knowledge on how to prepare energy and nutrient dense foods by using locally available foods</p> <p>-Lack of knowledge about food preparation process enhance or hinder nutrients utilization</p>	<ul style="list-style-type: none"> • Cultural restrictions which forbid consumption of some nutritional dense foods e.g. Poultry, Fish, eggs etc. • Limited access to nutrition dense foods <p>-Mother do not have enough resources to afford nutrient dense foods e.g. Fortified flours, Animal source foods</p> <p>-Mothers regard preparation of infant’s food separately from family foods as time consuming and expensive as it consumes more firewood and time. <i>“I understand that a baby needs extra special food rather than family foods but I don’t have money to afford ingredients to prepare unga</i></p>	<p>- Mother’s desire for their children to attain good health and nutrition</p>	<p>-Common practices that increases energy and nutrient density of foods energy intake e.g. addition of a in infants foods</p> <p>-Consumption of indigenous foods which are rich in nutrients e.g. Jute mallow</p> <ul style="list-style-type: none"> • Peer supporting group <p><i>“We were taught through Mwanzo bora groups that it’s very important to include animal source foods, although I can’t practice it very often”</i></p> <p><i>“According to our tradition children are not fed on some offal parts, as they are believed to cause pneumonia to children, but through social</i></p>

	<p><i>wa lische (composite flour)</i>”.</p> <p>One mother explained the challenge to prepare energy dense foods to their children.</p>		<p><i>group I have learned from my fellows that they are not harm beside they are more nutritious</i>”.</p> <p>One mother stated during group interview.</p>
<p>Ideal practice: 10: <i>All infants and young children 6.0 – 23.9 months are fed the recommended number of meals daily</i></p> <p>Current practice: Percentages of infants and young children 6-23.9 months who were fed the minimum number of meals was 72.4 in crop farming and 76 in pastoralists communities</p>			
Barriers		Facilitators	
Internal	External	Internal	External
<ul style="list-style-type: none"> • Limited resources <p>-Households do not have enough resources to afford children extra meal or nutritious snacks meal apart from family meals thus children fed as per family meal</p> <p>children are fed as per family routine</p> <ul style="list-style-type: none"> • Workload <p>-Mother regard preparation of infant’s food separately from family foods as time consuming and expensive as it consumes more firewood and time</p>	<ul style="list-style-type: none"> • It’s common for children to be fed as per family routine -Some mothers regard feeding their children as per family routine as a common experience with no harm. <p><i>“We are raising our children the same way we were raised, we were fed the same foods and we are healthy as you can see”.</i></p>	<ul style="list-style-type: none"> • Mothers concern to attain for her child’s health and nutrition 	<ul style="list-style-type: none"> • Peer supporting group -During group interview mothers stated <p><i>“We were taught through peer social group groups that a child below five years should be fed up to five meals”.</i></p>

Ideal practice 11: <i>All infants and young children 6.0 – 23.9 months are fed by a responsive caregiver and encouraged to eat to satiety during meal times</i>			
Current practice: Percentages of infants and young children 6-23.9 months who were fed responsively and encouraged them to eat to satiety was 54.4 in crop farming and 51.7 in pastoralists communities			
Barriers		Facilitators	
Internal	External	Internal	External
<ul style="list-style-type: none"> • Concern about baby health and nutrition -Caregivers use force to feed the child as he believes baby to eat the baby will lose some weight <i>“Without forcing the child to eat she will lose weight”</i> one mother stated during interview -Frustration after baby refusal to eat • Misinterpretation of baby’s hunger or satiety cues -Caregivers misinterpretation of their child’s refusal to accept food as a sign of poor appetite • Poor mother-child interaction during breastfeeding -Mothers do not breastfeeding to satiety -Mother trying to attend other thing during 		Mother’s awareness on responsive feeding	Peer supporting group provide mother’s with knowledge of responsive feeding

breastfeeding •Poor knowledge on responsive feeding -Poor knowledge about motivational practices during feeding			
Ideal practice 12: All infants and young children are fed as recommended during and after illness Current practice: Percentages of infants and young children who were fed as recommended during and after illness was 7.5 in crop farming community and 3.4 in pastoralist community			
Barriers		Facilitators	
Internal	External	Internal	External
<ul style="list-style-type: none"> • Poor knowledge on how to feed children during and after illness -Mothers are not aware about the increased needs during feeding Mothers frustration after baby refusal to food <i>“Doctors often advice to feed babies more food during sickness, but how I’m I going to achieve this while a child refuse everything I offer”</i> 		-Mother believes that she must breastfeed more frequently as the child refuses to eat	- Peer supporting group increases knowledge and skills of feeding during and after illness