FACTORS INFLUENCING NUTRITIONAL STATUS OF INFANTS IN CHAMWINO DISTRICT, DODOMA

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ABSTRACT

Malnutrition is one of the most serious health problems affecting infants, children and women of reproductive age. The first year of an infant's life is considered a critical period for child growth and development. A cross-sectional study was carried out in Chamwino district in Dodoma region in Tanzania to assess factors determining the nutritional status of infants. The study explored such issues as socio-demographic, feeding practices and elements of disease pattern that would potentially influence the nutritional status of infants. Random sampling was used to select a sample of 354 mother-child pair from two wards. A structured questionnaire consisting mainly of closed and few open-ended questions was used to collect data from the selected respondents. Anthropometric measurements on the part of infants were taken by using standard procedures and equipment. Quantitative data obtained through structured interview was analyzed by using Statistical Product for Service Solutions, version 20 (SPSS). From it, descriptive statistics such as frequencies, percentiles, and cross tabulations were used to summarize the results. A chi-square test was used to test the association among categorical variables and means comparison was done by Analysis of Variance (ANOVA). Anthropometric data were analyzed by WHO Anthrosoftware (version.3.2.2) and three indices i.e. length-for age, weight-for-length and weight-for-age z-scores were determined to assess the nutritional status of infants. Initiations of breastfeeding, feeding of colostrum and prevalence of exclusive breastfeeding for six months were 82.2, 97.7 and 52.3%, respectively. There was early introduction of complementary feeding, and frequency of feeding per day was suboptimal with half (50.6%) of infants being fed one-to-two times a day. There was a statistically significant difference between weight-for-length and time of commencement ($p= 0.048$) and frequency ($p = 0.043$) of complementary feeding per day. Demographic characteristics like education level of the mother, age and birth weight of infants, and expenditure per day were significantly associated ($p <0.05$) with nutritional status of

infants. Of all the infants, 45.8% as reported from this study, suffered from one disease or the other, with majority (44.4 %) suffering from respiratory infection. Elements of disease pattern were statistically associated with nutritional status as measured by weight-for-length (p= 0.043) and weight-for-age (p= 0.000). The prevalence of undernutrition was 14.6, 4.5, and 2.3% stunting, underweight and wasting, respectively; and that of overweight was higher (7.6%) than the national average figure (5%). Conclusively, the nutritional status of this age group is sub-optimal and therefore attention is needed to address and improve the aforementioned issues that have potential and significant effect on the nutritional status. The approach to address these issues should be mult-sectoral as they are diverse.

DECLARATION

I, Maria Andson Simbowe do hereby declare to the Senate of Sokoine University of Agriculture that, this is my own original work, and has not been submitted nor is it being currently submitted for a degree award in any other university.

_____ _____

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The above declaration is confirmed by

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(Supervisor)

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
EBS	Exclusive Breastfeeding
CF	Complementary Feeding
RCH	Reproductive and Child Health Clinic
NBS	National Bureau of Statistics
NCHS	National Centre of Health Statistics
OXFAM	Oxford Committee for Famine Relief
SPSS	Statistical Product for Service Solutions
TDHS	Tanzania Demographic and Health Survey
TFNC	Tanzania Food and Nutrition Centre
UNICEF	United Nations Children's Fund
URT	United Republic of Tanzania
USAID	United States Agency for International Development
WFP	World Food Program
WFS	World Food Summit
WHO	World Health Organization

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Nutritional status refers to the interpretation of information obtained from the methods of nutrition assessment (Gibson, 2005).This is influenced profoundly by diet, infectious and parasitic diseases and is a major determinant of child's health and survival (Joosje *et al.*,1997). Thus, poor feeding practices and repeated infections and parasitic diseases lead to malnutrition. Malnutrition is one of the most serious health problems affecting infants, children and women of reproductive age (WHO, 2013).

Right from birth, caring practices play an important role in the development of infant health. The first year of an infant's life is considered a critical period for child growth and development. In this regard, the World Health Organization recommends feeding behaviours and best practices during the first year of life for maximizing growth, development, and survival (Gillespie and Haddad, 2001; Dewey, 2003). These include initiation of breastfeeding within one hour of birth, feeding the first milk secreted (colostrum) to the infant, exclusive breastfeeding for the first six months of life and introduction of complementary foods at the end of six months (180 days after birth) (Dewey, 2003).

As a global public health recommendation, infants should be exclusively breast fed for the first six months of life to achieve optimal growth, development and health. Thereafter, to meet their evolving nutritional requirements, infants should receive nutritionally adequate and safe complementary foods (solid or semisolid foods fed to infants in addition to breast milk) while breastfeeding continues for up to two years of age or beyond (WHO, 2002).

In Tanzania breastfeeding and complementary feeding are not practiced as recommended. Initiation of breastfeeding within one hour of birth is only 59% and the exclusive breastfeeding rate (0-6 months of age) is estimated to be 41%. Early complementary feeding is common with 39% of infants below 3 months already introduced to complementary foods and about 12% of infants are not complemented at the age of 6-7 months. Furthermore, feeding frequency during complementation is too low (about 2-3 feeds a day), nutrient density is low and the preparation and feeding practices are often unsafe. Moreover, the majority of Tanzanian babies are breastfed, for a median duration of 21 months. Fifty-four percent (54%) are breastfed up to two years (URT, 2008).

Young infants who are not exclusively breastfed to 6 months and who are introduced to liquid and solid at the early age of life increase the risk of diarrhoea disease and are an important cause of infant ant young child morbidity and mortality in Africa (Mohamed and Tamiru,2014). Diseases like acute respiratory infection and diarrhoea are a major cause of morbidity and mortality among young children in Tanzania (NBS, 2011)

1.2 Problem Statement and Justification

1.2.1 Problem statement

Inappropriate feeding practices are a major cause of the onset of malnutrition in young children. Children who are not breastfed appropriately have repeated infections, grow less well, and are almost six times more likely to die by the age of one month than children who receive at least some breast milk (WHO, 2002). From six months onwards, when breast milk alone is no longer sufficient to meet all nutritional requirements, infants enter a particularly vulnerable period of complementary feeding during which they make a gradual transition to eating family foods. The incidence of malnutrition rises sharply during the period from 6 to 18 months of age in most countries, and the deficits acquired

at this age are difficult to compensate for later in childhood (WHO, 2002). The level of malnutrition among under-fives is high worldwide. Globally, in 2011 about 101 million children under 5 years of age were underweight and 165 million were stunted (WHO, 2013). This burden is high in developing countries and about 80% of the worlds stunted children live in 14 developing countries residing in two regions of the world; the South Asia and Sub-Saharan Africa (UNICEF, 2013).

Dodoma is one of the regions with malnutrition rates higher than the national average. The stunting rate is 36.5% and underweight 17.1% (NBS, 2016). Despite the fact that many studies have been done in the area on child nutrition and their determinants, factors relating to feeding practices and disease pattern and their role in high chronic malnutrition of children in Dodoma are less documented. Moreover, predictors of breastfeeding and complimentary practices vary between and within countries. Many studies on infant feeding practice have focused on either infant up to six months or from six months to one year in urban or rural areas separately and not the whole infancy period. This study aims at assessing the influence of feeding practices and disease-pattern on nutritional status of infants, and thus filling the mentioned gap.

1.2.2 Justification of the study

The findings obtained from this study would establish how feeding practices and pattern of diseases influence the nutrition status of infants in the study area. The study explored the challenge that mothers face and the coping strategies that they use in ensuring exclusive breastfeeding as well as appropriate establishment and maintenance of complementary feeding. With this information the policy makers and other stakeholders who are champions of child-nutrition would be in a better position to come up with policies and intervention programs that favour, encourage and positively support mothers

to ensure successful breast feeding, complementary feeding and good health for their children. The information from this study would also assist the government in its development of plans to set funds aside purposefully for monitoring and evaluating child nutrition improvement programs in the study area which was lacking at the moment of this study.

1.3 Objectives

1.3.1 General objective

The general objective of this study was to assess the effect of infant feeding practices and diseases pattern on nutritional status of infants in Chamwino district, Dodoma region.

1.3.2 Specific objectives

The specific objectives of this study were to:

i. Assess demographic and socio-economic factors that affect the nutritional status of infants
ii. Examine feeding practices in the study area
iii. Determine the relationship between feeding practices and disease pattern and the nutritional status of infants.
iv. Assess the nutritional status of infants.

1.4. Research Questions

i. Which demographic and socio-economic factors influence the feeding practices of infants?
ii. How do feeding practices and disease pattern affect the nutrition status of infants?

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Overview

This chapter identifies, locates, analyses, evaluates and details the information known related to the topic or question of 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 order.

2.2 Nutrition and Nutritional Status

2.2.1 Nutrition

According to Wardlaw (2004) nutrition entails a systematic, reliable, rigorous and methodical enterprise of gaining knowledge of food in terms of its elements or componential parts, interaction and functions. These elements are nutrients and substances, as they balance in association of health and disease, and the process by which an organism takes food, digests, assimilates, uses and excretes food components. It follows that, health, which in accordance with DeBruyne (2007) is freedom from physical ailments, mental nuances, spiritual disturbances as well as social discord, and disease that connotes an abnormal or dysfunctional condition, partly or wholly, of body organism hinge on food.

2.2.2 Nutritional status

With reference to Brundtland (2000) nutritional status is the healthy state of person as determined by anthropometric measurements such as height, weight or circumference. Also, indicated by biochemical measurements of nutrients or their byproducts in blood and urine. Moreover, as it can be described by physical examination, dietary analysis, and economic evaluation, nutrition status can exclusively exist into three states of being;

undernutrition, normal nutrition, and over nutrition. Undernutrition and over nutrition are two extreme mutually exclusive nutritional status. Either extreme of the two is called malnutrition. This abnormal condition occurs when a persons' dietary intake is in imbalance in relation to his/her nutritional need. Undernutrition is the result of inadequacy of dietary intake by an individual whilst over nutrition is the consequence of excessive dietary ingestion with respect to nutrient needs of the body. This is usually indicated by overweight and obesity (USAID, 2011).

Because humans need necessarily food intake in order to live and function with freedom, infants, babies, children, youths, and adults can be affected by malnutrition unless proper choices are made on food-eating to suit and correspond to nutrients and substance requirement of the body. However, Joosje *et al.* (1997) contend that nutritional status is deeply affected by numerous factors. Some of these are such as diet, infections, and parasitic diseases. They further assert that these are cardinal determinants of children's health and survival.

2.2.3 Malnutrition

Malnutrition refers to disorders resulting from an inadequate (undernutrition) or excessive diet (overnutrition) or from failure to absorb or assimilate dietary elements (UNICEF, 2008). Malnutrition is one of the most serious health problems affecting infants, children and women of reproductive age. Malnutrition in all its forms is closely linked, either directly or indirectly, to major causes of death and disability worldwide. The causes of malnutrition as documented by WHO (2013) are directly related to inadequate dietary intake as well as disease, but indirectly to many factors, among others are household food security, maternal and child care, health services and the environment.

The level of malnutrition among under-fives is still high worldwide. Globally, in 2011 about 101 million children under 5 years of age were underweight and 165 million stunted (WHO, 2013). Despite the fact that, stunting rate in Tanzania has declined from 42% (NBS, 2011) to 34% (NBS, 2016) among underfive children, this rate is still unacceptably high. Many lives of children could be saved with improvement of exclusive breastfeeding practices, adequate and timely complementary feeding, along with continued breastfeeding for up to 2 years or beyond. Furthermore, appropriate breastfeeding and complementary feeding practices not only play a significant role in improving the health and nutrition of young children, they also confer significant long-term benefits during adolescence and adulthood (WHO, 2013)

2.3. Feeding Practices

Giovannini *et al.* (2004) articulates that adequate nutrition in early years is a cardinal importance for determining infants' growth and development as well as for prevention of diseases in adulthood. In addition, breastfeeding is considered a necessary and sufficient for an infant until 6 months, and that is imperative that it continues throughout the complementary feeding. Furthermore, they assert that cows' milk is inadequate for any baby because it contains little iron, linoleic acid and vitamin E, but it is rich in sodium, potassium and protein.

2.3.1 Infant feeding

Infant feeding entails 6 months of exclusive breastfeeding, and continued breastfeeding with complementary feeding from 6 months onwards. Infancy period forms part of the 1000 days (window of opportunity) period. The first 1000 days is the most critical for growth, breastfeeding, and complementary feeding practices and that inadequate dietary intake increases susceptibility to diseases by denying the child the nutrients it needs for

effective immune function (TFNC, 2012). Many lives of children could be saved with improvement of exclusive breastfeeding practices, adequate and timely complementary feeding, along with continued breastfeeding for up to 2 years or beyond (WHO, 2013).

2.3.2 Early initiation

The WHO (2013) recommends to place babies in skin-to-skin contact with their mothers immediately following birth for at least an hour and encourage mothers to recognize when their babies are ready to breastfeed, offering help if needed. Early initiation promotes exclusiveness and duration of breastfeeding. Several studies have shown that early contact increases breastfeeding both soon after delivery and two to three months later.

In Tanzania less than half of children (49 percent) are breastfed within one hour after birth. Breastfeeding within one hour after birth is more common in urban areas (62 percent) than in rural areas (45 percent). The rate of early initiation in Tanzania is influenced by several factors. Children of mothers assisted at delivery by health professionals are more likely to initiate breastfeeding within one hour after birth (58 percent) than are those whose mothers were assisted by a traditional birth attendant (46 percent), other attendant (35 percent), or no one (23 percent). The likelihood that a child is breastfed in the first hour after birth increases substantially with the mother's educational status and wealth quintile (NBS, 2010).

2.3.3 Exclusive breastfeeding

Exclusive breastfeeding (EBF) takes place when an infant receives only breast milk without any additional food or drink, not even water. As a global public health recommendation, infants should be exclusively breast fed for the first six months of life to achieve optimal growth, development and health (WHO, 2002). Introducing breast milk

substitutes to infants before 6 months can contribute to malnutrition as well as breastfeeding failure. Substitutes, such as formula, other kinds of milk or porridge, are often watered down and provide too few calories (TFNC, 2012). In Tanzania, only 59 % of infants under 6 months are exclusively breastfed (NBS, 2016).

Evidence demonstrates that mothers and other caregivers require active support for establishing and sustaining appropriate breastfeeding practices as it is considered a cornerstone of any malnutrition prevention strategy given the evidence of preventing infant illness and mortality (Jimenez and Stone, 2014). Factors like maternal education, socioeconomic class, mode of delivery and infants first feed are important maternal predictors of EBF practice. Decreased likelihood of EBF practice is found among mothers of lower educational attainment (Onah *et al*., 2014).

2.3.4 Complementary feeding

Complementary foods (solid or semisolid foods fed to infants in addition to breast milk) are recommended to be started at the age of 6 months. This is because, at this age, breast milk alone is no longer sufficient to maintain the child's optimal growth. Children are fed small quantities of solid and semisolid foods while continuing to breastfeed up to 2 years or beyond. The amounts of feeds are increased gradually from 6 to 23 months, which is the period of transition to eating the family diet. This period is characterized by an increase in the prevalence of malnutrition because of poor feeding practices and infections (NBS, 2011).Successful complementary feeding is critical for preventing malnutrition. Growth faltering is most evident during this time period, particularly between 6 and 12 months when foods of low nutrient density begin to replace breast milk and rates of diarrhoeal are at their highest (WHO, 2013). According to Tanzania Demographic and Health Survey (TDHS) report (NBS, 2011),diarrhea prevalence was about three times

more in children aged 6-11 months than children in other groups. After about two years of age, it is very difficult to reverse stunting that occurred at earlier ages (WHO, 2013).

2.3.5 Minerals and vitamins to infants

According to George Mateijan Foundation (2017), vitamin and minerals for infants depend on the quality of the breastfeeding and mothers' diet. Mothers' diet must be filled with a balanced mix of whole and natural foods. Moreover, infants' nutritional needs are different from parents' needs. Infants require nutrients for growth and development whereas parents' food is only to sustain and maintain their adult body. So, key nutrients to include in the mothers' diet are iron, calcium, vitamin D, zinc, vitamin A and vitamin C.

Iron plays an important role in the formation of haemoglobin, the red blood cells that transports oxygen around the body, and supports the babys' brain development. Source of this nutrients are like chicken meat, hardboiled egg, beef, spinach, etc. When it comes to calcium, is important for normal bone development, aids blood clotting, nerve and muscle function, and helps teeth healthy when a child grows. Milk and yogurt are rich source of calcium. Additionally, zinc is an essential for growth, bone metabolism, wound healing and enzymatic function. It also affects infants' sense of taste and smell. Thus the mother is required to eat meat, milk, bread and cereals.

Furthermore, vitamin A is crucial for vision, skin and cellular health. In order to get this vitamin mothers should eat eggs, green and orange vegetables including fruits. Also, carrots, orange fleshed sweet potatoes, mango, spinach and cabbage are good source of vitamin A. Moreover, for an infant to get vitamin E, mother must make sure she eats food rich in vitamin E. these are spinach, tomatoes, oranges, fresh fruits and vegetables. Notice,

vitamin C supports the functioning and developing the immune system of infants and is a natural antoxidant is an antihistamine (George Mateijan Foundation, 2017)

2.4 Diseases and Malnutrition

The prevalence and debilitating effects of malnutrition are increasingly alarming in a number of countries. Malnutrition prompts short and long-term problems on both health and economic progress of individuals, families and nation. The main health problems associated with malnutrition are protein energy deficiency (PED), iodine deficiency disorders (IDD), iron deficiency anaemia (ADA), and vitamin A deficiency (VAD) (ACC/SCN 2000). Furthermore, the Tanzania Food and Nutrition Centre (TFNC) (2012) articulates that malnutrition adversely affects child's health across the complete cycle of life, commencing in the womb, when the mother becomes ill of any disease, for stance, malaria, to adulthood due to maternal malnutrition. In addition, they explain and emphasize the need of ensuring good nutrition for girl-child for at least 1000 days so as to curb the possibilities of them being malnourished when they become women and give birth to low weighing infants as a result. Consequently, transfer malnutrition from one generation to another.

Moreover, URT and UNICEF (1990) expound that malnutrition promotes a lot of diverse debilitating effects on growth and health. They assert that undernourished children would experience mental retardation. This implies that such children would experience learning difficulties and have some social conformity and coping problems. As such, these undernourished children would contribute less, if not all, to the development and progress of their communities. Thus, malnutrition has emotional, human and economic repercussion. TFNC (2012) reckons that malnutrition is one of important problem that has significant contribution to mortality of children in Tanzania. According to Institute for

Health Metrics and Evaluation (IHME) (2017), protein energy malnutrition is among the top ten leading cause of death in Tanzania, others being, HIV/Aids, lower respiratory infections, diarrheal diseases, ischemic heart disease, malaria ,tuberculosis, cerebrovascular disease, neonatal encephalopathy, and neonatal preterm birth.

While the cause of malnutrition is inadequate dietary intake and diseases, the major cause of child mortality was found to be pneumonia, malaria and diarrhea as well as prevalence of HIV in pregnant women. This indicates that malnutrition is closely linked to child mortality indirectly or directly. The indirect effects of malnutrition in the community are long lasting. A high general death rate, high infant mortality, high sickness rate and lower life expectancy, all can be attributed to malnutrition. In addition, over nutrition causes obesity, diabetes, hypertension, cardiovascular diseases, renal diseases, diseases of the liver, and gallbladder. Additionally, malnutrition is direct responsible for deficiency diseases such as kwashiorkor, marasmus, Vitamin A deficiency, anemia and goiter (Anthikad, 2009).

Above all, malnutrition is responsible for adverse child birth and growth. Stunting, underweight, low birth weight and wasting are common growth formidable problems due to malnutrition. Stunting is a hampered growth rate in human physical and cognitive development. In childhood it is the primary cause of recurrent infections, such as diarrhoea and helminthiasis. This condition can be brought in by a malnourished mother. More importantly, stunting in children has negative health consequences such as being prone to illness and premature death, delay in mental development hence poor performance in school, childbirth complications for women, and intergenerational cycle of malnutrition (Wikipedia, 2017a).

Low birth weight denotes that a baby is born with below 2.5 kg. This is one of the determinant factors that relate maternal nutrition to the birth outcome, subsequent survival, growth and the development of a child (TFNC, 2012). Furthermore, babies born with low weight can experience some medical complications like respiratory disease syndrome (RDS), patent ductus arteriosus (PDA) which is a heart problem particularly for premature babies, and necrotizing enterocolitis (NEC). This is a problem in baby's intestines. When not fully developed can lead to feeding problems, swelling in the belly and other complications (March of Dimes Foundation, 2014).

In contrast, underweight signalizes, weight-for-age of a baby, that he or she falls in the region less than negative twice the standard deviation (-2SD) of the median concerning the given population. This is influenced by the height of and his or her corresponding weight. It can be used to describe the individuals' or populations' long term health and nutritional experience in absence of wasting or overweight, in particular (TFNC, 2012). As reported by NBS (2016) the average of underweight in Tanzania is approximately 14%. This raises concern that these children may experience decrease in immunity hence be prone to infections. In addition, these can easily contract diseases such as tuberculosis or hyperthyroidism. Also, may have low stamina and a weak immune system, which are underlying causes of death. Later in adulthood this can be responsible for amenorrhea, infertility, anemia and hair loss (Wikipedia 2017b)

As regard to wasting, (which is low weight- for-height/length), results when children lose weight rapidly due to low caloric intake and/or repeated infections. It is an indicator of acute malnutrition. Factors like ongoing food insecurity, insufficient diets in terms of quantity, quality and diversity, suboptimal breastfeeding and recurrent episodes of diseases lead to wasting (WHO, 2014a). This is the single most predictor of mortality among underfive children as wasted children have twice the risk of mortality as stunted

children. According to NBS (2016), wasting accounts for 5% of all children underfive years old.

2.5 Sanitation and Hygiene

The WHO (2014b) defines sanitation as "the provision of facilities and services for the safe disposal of human urine and faeces". The organization further exporends that "inadequate sanitation is a major cause of diseases worldwide" and the WHO asserts that improvement of sanitation is known to have "a significant beneficial impact on health both in the households and across communities".

The general aim of sanitation system is to enhance clean environment for the promotion and improvement of human health, hence breaking a recurrent of disease. Change in hygiene behavior and sanitation practices lead to health impacts in children underfive years old, such as preventing them from diarrhoea health debilitating effects, which is the leading cause of child death (Suzan, 2008).

Sanitation is intimately related to hygiene. According to WHO, (2017b) "hygiene refers to conditions and practices that help to maintain health and prevent the spread of diseases". Moreover, hygiene includes life style issues, environment and all facilities that promote health and safety. According to Wardlaw *et al*. (2004) hygiene and sanitation have a significant contribution to people's deaths of undernutrition, especially in developing countries. Poor sanitation heightens the risk of children to infections so does the undernutrition, so forming a lethal combination. The fact that unsanitary housing conditions claimed the life of 5000 people in 1994 in India, sanitation and hygiene cannot be underestimated at all. Moreover, Wardlaw and his team reports that sanitation and

hygiene have been responsible for half million of child deaths under five in developing countries. These can be prevented by improving the standards of environmental hygiene.

Furthermore, this condition is exacerbated by the high birth rates and migration of people to the towns from the country side, as it is reported that 5 to 7% is the growing rate of towns to cities, therefore, making sanitation and hygiene a formidable challenge. This in turn is debilitating to nutrition of children and corrosive to members to these communities. In addition, the movement of people from rural to urban life adversely affects infants and children. Because of high probability of unsafe water in urban areas, and inability to protect perishable foods, infants and children are more likely to drink contaminated water or eat unsafe food. Furthermore, infants are often given complementary food early partly because the mother has to find employment and she would be impelled to resort to sophiscated formula. Thus, plunging the health of an infant to heightened risk of undernutrition (WHO, 2014c).

2.6 Water

In accordance with Gleick (1993) water is essential and necessary for all forms of life. In particular safe drinking water is essential for human flourishing and thriving though it provides no calories nor does it provide organic nutrients. Despite the fact that, Gleick contends, access to safe drinking water has been improving over the last decade, a roughly estimate of a billion people are deprived of access of safe drinking water due to inadequate sanitation.

Above all the U.S Department of Interior (2016) in their geological survey explains that the paramount uses of water are the level of the household. At this level water is utilized indoor and outdoor purposes. This includes drinking water, preparation of food, bathing,

washing clothes and dishes, personal hygiene and gardening. Generally people access water through either public supplies delivery or self supplied delivery. Water through self-supplied delivery can be obtained by ground water, boreholes or running rivers.

Heyns (1991) argues that water in semi-arid areas like Dodoma is hardly available. The low rainfall and intense evaporation accounts for this phenomenon. This condition renders water supply for domestic, industrial and agricultural uses very complex. Moreover, the situation of security of water in semi-arid areas is compounded by a "distinct rain season that is succeeded with a considerable period of dry season for the remainder of the year. Consequently, this condition could impel women in developing countries to spend valuable amount of time in fetching water. Thus, affect the ability of the breastfeeding women to take care of their babies properly and as required.

Mkonda (2015) when conducted a study on water shortage and its implications in Dodoma found that about 70% of rural communities were hard hit by shortage of water. The study further discovered that women had to spend more time on fetching water than attending to other activities. These findings have a lot of ramifications on nutritional status of infants.

2.7 Demographic Characteristics and Socio-economic factors

Sound nutrition can ensure good health and longer life. However, an individual's choice and preference turn out to be of debilitating effect on sound nutrition. Choice and preference are in turn affected or influenced by age, occupation, availability of food, convenience of the part of individual and economy, and level of education (Health Unit, 2006).

Age influences people's food choice. Infants depend on others to choose food for them. Older children also rely on others but become more active in selecting food that taste sweet, palatable and are familiar to them while rejecting those whose taste or texture they dislike. This can build up to a habit that children carry on to adulthood, consequently, adversely, affecting them and their offspring (Mamiro *et al*., 2005). Furthermore, availability influences people's selection of food for them to eat or feed their offspring as well as other members of the household. If food is not available, then it would depend on people's purchasing capacity. Also, conveniently people may choose to prepare food by themselves or bring home the ready-to-eat-foods. In addition, some people have occupation as a source of income, that keep them away from home for hours or days at a time or require them to conduct business in restaurants or at meetings or involve hectic schedule that allow little or no time to have meal at home. For these people the kind of restaurants available to them and the cost of eating out as often, can limit food choices, thus, affecting their nutrition as a result (DeBruyne *et al*., 2007).

Findings in the study on feeding practices and nutritional status in Morogoro by Safari *et al.* (2013) showed that socio-demographic characteristics had significant influence on nutritional status of infants as did with feeding practice. Moreover, Hug and Tasnim (2008) implied that low level of parent's education, women in particular, could potentially and indirectly have negative influence on nutritional status of infants or child nutrition. In addition, Mosha and Philemon (2010) explained that not only low education had adverse effects on the understanding, making decisions and implementing them regarding nutrition but also improving people's socio-economic conditions.

In contrast, Montalto *et al.* (2010) contended that formally employed mothers, though well-educated, were unable to feed their children appropriately because, they would

spend a lot of time at work and the work place was not suitable nor supportive for either frequent breastfeeding or feeding children. However, Onah *et al. (*2014) argues that the level of education or even the correct knowledge about nutrition does not necessarily guarantee the translation of knowledge into practice. In their study they found that there was a mismatch between knowledge and practice regarding breastfeeding.

This gap between awareness and practice could be attributed to attitudes, traditions, experience, cultural factors and values concerning food. Regarding this Al-Sahab *et al*., (2010) advances that, specific individual differences in attitudes, beliefs and experience influences the mothers' decision on choices of food and breastfeeding. Furthermore, having many years of education, giving birth at older age, having had previous pregnancies and living with a partner increases the probability of choosing appropriate food for an infant and exclusive breastfeeding for six-months exclusively. It follows that demographic and socio-economic factors of mothers like age, level of education, marital status, source of income, and order of birth have a direct as well as indirect impact or influence on nutritional status of infants.

2.7.1 Age of the mother

According to THRS (2005), the recommended age for child bearing is 20 years while the maximum child bearing age is 35 years. The age of the mother has direct bearing on the nutrition status of a child. A younger mother than the minimum age may have poor child management and child caring skills. Lack of experience and immaturity of this kind of mothers may lead to inappropriate feeding practices, failure in detection of symptoms of an ill-child and misconception in breastfeeding as well as complementary feeding. Over 35 years old mothers can be so absorbed in work, overwhelmed by family responsibilities,

and distracted by other community commitments, consequently, have a slim time for care of their children and result to fast food or easier- to- cook-food (WHO, 1996).

2.7.2 Education level

The education of the mother can neither be underestimated nor overestimated for the well-being and good of children. Armar-Klemesu *et al. (2000)* assert that maternal education is essential for health, nutrition and proper growth of a child. These mothers are mature enough and can actualize their capacity to gain child care skills, the importance of adequate and nutritional food, and are able to put their understanding into practice than the less educated ones. These educated mothers are able to seek treatment and adhere to prescription, gain insight of nutritional requirement of children and make informal decisions about child up-bringing (URT and UNICEF, 1990).

Yashpal *et al*. (1995) explain that children with mothers whose schooling is of the highest level have good growth pattern. Moreover, Abuya *et al.* (2012) argue that malnutrition relentless perpetuates to adversely affect health of a myriad of people in sub-saharan Africa, in particular. They demonstrate that 48% of children under five are stunted whereas 36% are underweight, and that these are attributed to the level of the mothers' education. They contend "maternal education is as strong predictor of child stunting with minimal attenuation of the association by other factors at maternal, household and community level". Furthermore, because good nutrition in the infancy is incredibly important for brain development and physical growth, and as benefits of good nutrition begin while the child is in the womb of the mother, during the fetal development, mothers' education is vital for the growth and development of a child (Bright Hub Education, 2014).

2.7.3 Marital status and order of birth

According to URT and UNICEF (1990), marital status has two dichotomous effects on nutritional status of a child. On one hand can render the possibility of labour division in a family, and thus enable the mother to have more time for the baby as well as preparation of an adequate food for the family, on the other hand marital status can lead to a larger family, for larger family tend to deplete the family's financial resources by increasing budget, causing food insecurity, and hence negatively affecting the nutritional status of children.

2.8 Food Security

The phrase "food security" is extensively used in publications, articles, assertions and different avenues, to mean different things or concept. Nevertheless, the meaning one gives to it varies substantially: for many, the phrase surrounding hunger, famine and food security are imprecise and these words are often used interchangeably.

Food security is defined in accordance to FAO (2002) as "food security exists when people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life" whereas food insecurity exists when people do not have adequate physiological and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life. The number of people suffering food insecurity is reported to be increasing and so is, since a few years, the proportion of the overall population suffering from insufficient food has been reported. For example, the industrialization of agrifood system led to huge gains in agricultural production per acre and per person in many countries. However poor people must purchase food and do not have the money to do it. Globally, the hungry are almost all in

the developing world (96%) and about one-fourth of them are children (Scanlan *et al.*, 2010).

2.8.1 Dimensions of Food Security

Food Security involves four aspects entitled the Four Dimensions of Food Security. Those four dimensions are easy to extract from the World Food Summit (WFS) (1996) definition and are, together, equally useful as a tool for food security analysis.

2.8.1.1 Availability

The first dimension is the availability. In the WFS (1996) definition it refers to the term "sufficient". It is defined by WFP as "The amount of food that is present in a country or area through all forms of domestic production, imports, food stocks and food aid" (WFP, 2009). The definition apparently refers to net commercial imports, once deducted the commercial and other exports, additionally the definition does not only apply to countries or areas but also to villages and households. A previous definition by WFP did also refer to "commercial imports including cross-border trade" and is still part of their operational manual.

Although the final declaration adopted by the FAO Founding Conference stated that "the first cause of malnutrition and hunger is poverty", for a long time it has been considered that food security was a synonym to availability of food (Shaw, 2007). Most of the efforts undertaken by researchers, practitioners and teachers during the last three decades consist demonstrating and trying to convince that food security is not simply a question of availability of food.

2.8.1.2 Access

The second dimension of food security is the access. In the WFS (1996) definition, it refers to "have physical, economical and social access". Although Amartya Sen first presented the concept of access to food in the early 1980's, it is not yet necessarily common to refer to it as an important element of food security. Moreover, since the Niger food crisis in 2005 and the World food expenses crisis in 2008, many are tempted to limit the access dimension of food security to its economical or financial dimension. World Food Programme (WFP) (2009) for example, defines the food access as "A household's ability to acquire adequate amount of food regularly through a combination of purchases, barter, borrowings, food assistance or gifts". In fact, there are three components in the access to food: physical, financial and socio-cultural, which in its totality can affect the food security (Napoli, 2011).

The understanding that food commodities being available but not affordable by people would determine a situation of food insecurity is still recent in the story of food security. During the least years, however, this has been increasingly recognised. As a consequence, one could observe a sudden interest shown, towards the market by food security analyst and practitioners. For many years, in fact, the problematic of food security had been perceived as that of rural population living in almost complete autarchy and sometimes, for climatic and other reasons, not producing enough food to meet their own requirements and hence suffering famines and malnutrition (OXFAM, 2007).

2.8.1.3 The utilization dimension

The third dimension of food security is food utilization. In the WFS (1996) definition it refers to "safe and nutritious food, which meets their dietary needs". It is not sufficient that food is available and accessible to households to ensure that people will have a "safe

and nutritious" diet. A number of elements intervene here such as: the selection of food commodities, their conservation and preparation as well as the absorption of nutrients. Food has to be of good quality and safe.

It should not be taken for granted that all people, even in so called traditional societies, know how to best utilise food commodities, not to mention the fact that dietary habits are changing very quickly, including in so called traditional societies. This is even more true for displaced persons and refugees and people, victim of a shock that may have modified the commodities value chains. Training may be required to help people heightening their use of the food that is available and to which they have access. In fact, a number of observations have been made, including by WFP of population living where food is available, having a full access to food and still suffering from malnutrition mainly because of a non-correct utilisation of the food commodities (Conte and Morrow, 2002).

Food utilization is also related to clean water, sanitation and health care. This dimension, thus, not only refers to nutrition but also to other elements that are related to the use, the conservation, the processing and the preparation of the food commodities. It shows, however, how closely nutrition is linked to food security and therefore confirms that it is a useless repetition to speak about food security and nutrition, as there could not be any food security without proper nutrition. It further brings the attention to the problematic of food safety, which, unfortunately, has been dealt with mostly in the context of developed countries and needs to be fully recognised as an essential part of food security in general in both developing and developed countries (Napoli, 2011).

2.8.1.4 The stability

The fourth dimension of food security is stability. In the WFS (1996) definition it refers to: “at all times”. This stability applies in the first instance to the previously mentioned three dimensions of food security. Food security is “a situation” that does not have to occur a moment, a day or a season only but on a permanent basis with sustainability. Based on the stability dimension of food security, one speaks about chronic and transitory food insecurity: Chronic food insecurity is a long term or persistent inability to meet minimum food requirements and transitory food insecurity is a short term or temporary food deficit. There is also cyclical food insecurity such seasonality (Devereux, 2006).

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Description of the Study Area

The research was conducted in Chamwino district, which is among six districts of Dodoma region. The district lies on the central plateau of Tanzania in the western bearing along Dar es Salaam-Dodoma road between Longitude 35^0 and 39^0 East and Latitude 4^0 and 9^0 South. It has a total area of 8 056 square kilometers. On western front, the district borders Dodoma Municipality, Kondoa District to the North, Kongwa and Kiteto Districts on the East and Mpwapwa District and Iringa rural to the Southwest. It also borders Bahi district to the South East front. The district has 5 divisions, 32 wards and 78 villages. Altitude is about 910m above sea level.Chamwino district produces sorghum, maize, and cassava. Other crops grown include grapes, sunflower, sesame (simsim), groundnuts, bulrush millet and paddy. Livestock keeping is ranked very high **(**NBS, 2013**).** Out of seven districts, Chamwino was purposely selected for two reasons. Firstly, the district had two fold aspects of being partly rural and partly peri-urban. Majeleko ward represented rural characteristics whereas Buigiri ward had the peri-urban attributes. Secondly, the district was chosen because it was easily reachable, consequently, saving time and financial resource, thus, conducting the study efficiently.

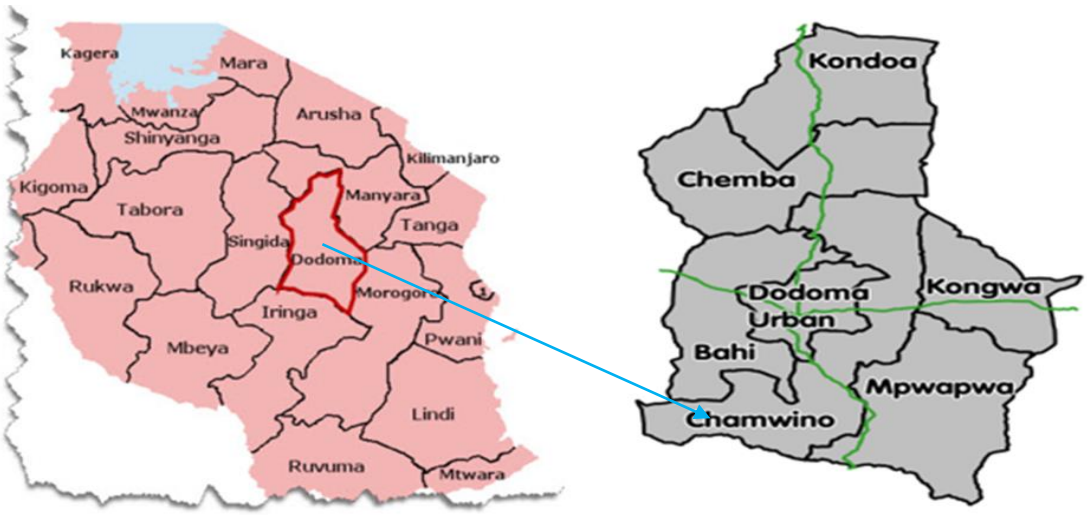

Figure 1: Map of Dodoma showing the study area (Chamwino)

3.2 Study Design

The research was a cross-sectional study. The design was chosen because it entails collection of data on a number of cases at a single point in time in order to collect a body of quantitative and/or qualitative data (Bryman, 2004).

3.3 Populations, Sampling Units, and Sampling Procedures

3.3.1 Population for the research

The population for the research was women with infants less than one year (0-11.99 months) in Chamwino district selected from two wards in the district. It also included medical personnel and health workers who were working at various dispensaries in the district.

3.3.2 Sampling units and sample size

There were two sampling units: (1) women with infants; (2) key informant interviewees specifically Medical Officers at dispensaries, and community health workers. The sample size for women with infants was 379 using the formula by Bartlett *et al. (*2001) but the

sample collected was 354 (93%). The researcher was unable to reach 25(7%) respondents because of time and financial constraints. This number of interviewees counts for 0.07 probability of diluting the sample size and thus could not affect the results of this study. The formula byBartlett *et al. (*2001), was used to determine the reasonable sample size. That is

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

n = sample size

Z = a value on the abscissa of a standard normal distribution (from an assumption that the sample elements are normally distributed), which is 1.96 and corresponds to 95% confidence interval;

p = estimated variance in the population from which the sample is drawn, which is equal to the prevalence of stunting in the area i.e. 56%

d = acceptable margin of error (or precision).In this research, 5% error was used .

Using a Z-value of 1.96, a p-value of 0.56, a q-value of 0.44, and a d-value of 0.5% (which is equivalent to 0.05), the sample size (n) was determined to be 379.

$n = \frac{1.96^2 * 0.56 (1 – 0.56)}{0.05^2} = (3.8416 \times 0.2464)/0.0025 = 378.6 = 379$

The sample size of key informant interviewees depended on their having desirable attributes.

3.3.3 Sampling techniques

Purposive sampling was used to select two wards in the district depending on the features of representativeness of peri-urban and rural and key informants depending on their having desirable attributes. Simple random sampling was used to select four representative

villages from the two wards and women from each selected village. Women with infants were identified from Reproductive and Child Health (RCH) clinic to make a sampling frame from which a study sample was drawn.

3.4 Instruments for Data Collection

Two instruments were used for data collection: (1) a questionnaire for mothers/caregivers (was administered to the 354 mothers); (2) checklist of items for key informants. The questionnaire set was mainly for quantitative data collection, with little qualitative information; the other instrument was mainly for qualitative data collection with very little quantification. Weighing scales and stadiometer were used to measure weights and lengths respectively, from which nutritional indices were calculated

3.5 Data Collection

3.5.1 Questionnaire pre-testing

Before the actual survey, pre-testing was done to test the instruments that would be used in data collection. The researcher and two enumerators did the pre-testing to mothers with infants at Kikuyu dispensary after which necessary modifications and corrections were incorporated. The findings were not included in this report.

3.5.2 Primary data collection

A face-to-face interview with the sampled mothers was conducted using a semi-structured questionnaire. The interview collected information on demographic, social and economic factors, and types of traditional or local methods for feeding practices for infants; coping strategies used to ensure exclusive breastfeeding and frequency and pattern of diseases among infants.

3.5.3 Anthropometric measurement

Anthropometric variables that were used in this study were weight, length, and age of infants. Standard procedures and equipment were used to measure weight and length of infants. Weight was measured and recorded to nearest 100g (0.1 kg) by using UNICEF Mother/Child electronic scale manufactured by SECA. After adjusting the scale to zero a mother was allowed to stand on a scale allowing weight of the mother to be stored. Then the child was given to the mother while still standing on the scale and the weight of the child was indicated. The scale was adjusted before weighing every mother-child by setting it to zero. Length of the child was measured recumbently by a measuring board (stadiometer) reading a maximum of 200cm and capable of measuring 0.1 cm. The child was made to lie flat on the length board. The sliding piece was placed at the edge of bare feet and the head touching the other end of the measuring device. Date of birth of each child was recorded from his/her clinic card to determine exact age of the child.

An assessment of nutritional status as recommended by the World Health Organization (WHO, 1995), was performed by z-scores. The z-scores are indicators of anthropometric measurements. These scores were used for the determining of nutritional status of infants.

Table 1: Classification of nutritional status based on standard deviations (SDs)

Cut-off point in standard deviation(SDs)	State of nutrition
Below (–3SD)	Severe undernutrition
Between (–3SD) and < (-2SD)	Moderate undernutrition
Below (–2SD)	Total undernutrition (i.e.severe+moderate)
Between (–2SD) and (+2SD)	Normal nutritional status
Above (+2SD)	Overnutrition

Source: WHO (1995)

Z-score cut-off point of<-2SD is used to classify low weight-for-age, low height-for-age and low weight-for-height as moderate and severe undernutrition, and <-3SD to define

severe undernutrition. The cut-off-point of >+2SD classifies high weight-for-height as overweight in children (WHO, 2017a)

3.6 Data Analysis

The Statistical Product for Service Solutions, version 20 (SPSS) was used to analyze quantitative data that was obtained through structured interviews. Moreover, it was used to determine the correlation among independent and dependent variables and impacts of independent variables on the dependent variable. The collected data was first classified into meaningful categories in order to make analysis easy and viable, and hence derive descriptive statistics in the form of percentages, mean, frequencies and cross tabulation. A chi-square test was used to test the association of categorical variables and means comparison was done by Analysis of Variance (ANOVA). In addition, a content analysis technique was used to analyze the qualitative data from key informants. Anthropometric data was analyzed by WHO Anthrosoftware (version.3.2.2) and three indices i.e. length-for age, weight-for-length and weight-for-age z-scores were determined to assess the nutrition status of infants as compared to National Centre of Health Statistics (NCHS)/WHO reference standards.

3.7 Ethical Issues

A letter to conduct research was obtained from Sokoine University of Agriculture. Permission was sought from the Chamwino District Authority to conduct the study in the district. Participants were requested for their informed consent to affirm their willingness to participate in the study. Objectives of this study were explained to each participant before interview. Those who were willing to participate signed a consent form to affirm their consent.

CHAPTER FOUR

4.0 RESULTS

4.1 Overview

This chapter presents the results from the study area. Based on the specific objectives, this chapter comprises the following main sub sections: demographic characteristics and socio-economic factors; feeding practices of the study area; nutritional status of the infants and relationship between nutritional status and disease pattern. Elements of food security, womens' workload, and hygiene and sanitation are also presented.

4.2 Demographic Characteristics and Socio-economic Factors of the Respondents

This section describes the results pertaining to age, level of education, and marital status of the respondents. In addition, this subsection depicts occupation, source of income, and household expenditure by the interviewee. This section, further, illustrates sex, age, order of birth as well as birth weight of infants at the study area of Chamwino in Dodoma

4.2.1 Demographic characteristics of respondents

Table 2 shows that while 234 (66.1%) had attained the age of giving birth, 21(5.9%) of the informants gave birth to infants when under aged. Moreover, the table reveals that among these respondents, 126(35.6%) had no formal education whereas only 30(8.5%) had pursued education beyond primary school. Furthermore, the table manifests that 297(83.9%) were married while 57(16.1%) were not married.

Table 2: Distribution of respondents by age, level of education and marital status

Characteristic	Frequency	Percent
Age (Years)		
Less than 18	21	5.9
18-19	56	15.8
20-35	234	66.1
Greater than 35	43	12.2
Total	**354**	**100.0**
Level of education		
No formal education	126	35.6
Primary school education	198	55.9
Secondary school education	23	6.5
Advanced secondary level education	1	0.3
Certificate/diploma level	2	0.6
Tertiary education	4	1.1
Total	**354**	**100.0**
Marital status		
Single	38	10.7
Married	297	83.9
Divorced	14	4.0
Widow	5	1.4
Total	**354**	**100.0**

4.2.2 Socio-economic characteristics of respondents

Table 3 indicates that most of respondents, 291(82.2%), were farmers. Sources of income were farm produce (crop or livestock), business, salary and remittance, 262(74%) of the informants earned their living on farm produce. Regarding amount spent per day by respondents, the table shows that respondents would be able to spend on average, at most Tsh 2000 per day, equivalently, less than a dollar per day.

Table 3: Distribution of respondents by occupation, source of income and household expenditure

characteristic	Frequency	Percent
Occupation		
Farmer	291	82.2
Employed	14	3.9
Business woman	42	11.9
Student	1	0.3
Casual labor	2	0.6
House wife	4	1.1
Total	**354**	**100.0**
Income source		
Selling of farm produce (crop or livestock)	262	74.0
From business	58	16.4
Salary from husband/wife	26	7.3
Remittance	8	2.3
Total	**354**	**100.0**
Money spent per day		
Less than 1500Tsh.	61	17.2
1500- 2000Tsh	110	31.1
2100-5000Tsh	140	39.6
5100-10,000Tsh.	43	12.1
Total	**354**	**100.0**

4.2.3 Demographic characteristics of infants

A table 4 articulates the sex, age, order of birth, including birth weights of infants who were in this study. The table reveals that of all infants 187(52.8%) were female and 167(47.2%) were male. Among these infants, majority 105 (29.7%) were at most three-months old. Moreover, while 97(27.4%) of infants were first born, most of them 241(68.1) at least second born or at most fifth born babies. As regards the birth weight, majority 223(63.0%) were born with birth weight ranging from 2.5 to 3.9 kg

Table 4: Distribution of infants by sex, age, birth order and birth weight

Characteristic	Frequency	Percent
Sex		
Female	187	52.8
Male	167	47.2
Total	**354**	**100.0**
Age (months)		
0-3	105	29.7
4 - 5	56	15.8
6 – 7	68	19.2
8 -9.99	59	16.7
10-11.99	66	18.6
Total	**354**	**100.0**
Birth order		
1	97	27.4
2	79	22.3
3	80	22.6
4	58	16.4
5	24	6.8
6	8	2.3
7	6	1.7
8	1	.3
9	1	.3
Total	**354**	**100.0**
Birth weight (kg)		
Unknown	61	17.2
Less than 2.5	25	7.1
2.5 up to 3.9	223	63.0
4 and above	45	12.7
Total	**354**	**100.0**

4.3 Feeding Practices

Feeding practices were conceived of being one of the factors that would affect, or influence, the nutritional status of infants in the study area. This subsection consists of two broad elements of feeding practices namely, breastfeeding and complementary feeding. In addition, food security and mother's workload were also considered.

4.3.1 Initiation of breastfeeding and feeding of colostrum

Table 5 shows the responses by the informants who were under this study to the question that required them to mention the period after birth in which infant was to be initiated with breastfeeding, and whether they had fed their babies with colostrum or not. The results in the table indicate that 316(89.2%) stated that they commenced to breastfeed their infants

within an hour and that 346(97.7%) of all interviewees reported that they fed their babies with colostrum.

Table 5: Initiation of breastfeeding and feeding of colostrum

Variable	Frequency	Percent
Initiation		
Within one hour	316	89.2
Within two hours	19	5.4
More than two hours	19	5.4
Total	**354**	**100.0**
Feeding of Colostrum		
Yes	346	97.7
No	8	2.3
Total	**354**	**100.0**

4.3.2 Knowledge exclusive breastfeeding

Table 6 contains information on the knowledge of exclusive breastfeeding. The findings indicate that 197(55.7%) of all informants had a correctly mentioned six months as the period for exclusive breastfeeding as per guidelines given by WHO (2001) and the remaining (44.3%) stated a period of less than six months, of which the minority 20(5.6%) stated a period of three months or less to be appropriate.

Table 6: Time for exclusive breastfeeding (EBF)

Time of EBF (months)	Frequency	Percent
Less than 3	10	2.8
3	10	2.8
4	53	15.0
5	84	23.7
6	197	55.7
Total	**354**	**100.0**

4.3.3 Frequency of breastfeeding per day

Table 7 comprises information about number of times each respondent would breastfeed her baby per day. The table shows that amongst 354 informants, 222 (62.7%) breastfed their infants when the infants demanded on the need of the breast feeding while 116(32.8%) did it often.

Table 7: Frequency of breastfeeding per day

Breastfeeding frequency	Frequency	Percent
Often	116	32.8
Sometimes	13	3.7
Somewhat	3	0.8
On demand	222	62.7
Total	**354**	**100.0**

4.3.4 Introduction of complementary feeding and type of food introduced

Table 8 consists of information of whether the respondents had started complementary feeding to their infants or not. The table shows that 243(68.6%) of all respondents responded had commenced complementary feeding with their infants. Among these, 51(21%) of them reported to introduce complementary food to three-months-old babies while 127(52.3%) of respondents initiated their children with complementary feeding when their infants were six months old.

The table further indicates the kind of food that was first introduced to infants. Majority 205 (84.4%) of respondents fed their infants with porridge made from maize flour with either sugar or salt added whereas 33 (13.6%) used a mixed flour (Lishe) as first food to their infants.

Table 8: Introduction of complementary feeding and type of food introduced

Variable	Frequency	Percent
Started CF		
Yes	243	68.6
No	111	31.4
Total	**354**	**100.0**
Age at which CF was started		
Less than 3	9	3.7
3 months	42	17.3
4 months	30	12.3
5 months	29	11.9
6 months	127	52.3
7-8 months	6	2.5
Total	**243**	**100.0**
Type of food introduced		
Maize porridge plus salt or sugar	205	84.4
"Lishe" (Soy beans, "Mbaazi", groundnuts and cereals)	33	13.6
cereals plus groundnuts porridge	2	0.8
Milk	3	1.2
Total	**243**	**100.0**

4.3.5 Frequency of feeding, preparation of food and the practice of feeding

Table 9 consists of information pertaining to the frequency over which infants were fed with complementary food per day and results regarding preparation of food and the practice of feeding for infants. The findings indicate that almost half (50.6%), of all respondents fed their babies with complementary food once or twice a day, while only 7.5% of them fed their children more than thrice per day. In addition, the results suggest that 21 (86.2%) of all respondents prepared and served food for their infants separate from other members of the family.

Table 9: Feeding frequency, preparation of food for the babies and the practice of feeding

Variable	Frequency	Percent
Frequency of feeding		
Once per day	37	15.3
2 times	85	35.3
3 times	101	41.9
4 times	13	5.4
5 times	5	2.1
Total	**241**	**100.0**
Food preparation		
Separately from the family meal	203	86.8
Together with the family meal	31	13.2
Total	**354**	**100**
Way of Feeding the child		
From the common plate	20	8.6
Separately from his/her plate/cup	210	86.2
Eat with other children	2	5.2
Total	**232**	**100.0**

4.3.6 Main source of food for household.

Table 10 contains information on source of food. The findings indicate that production, purchase/ business/ salary were considered for this study. Majority 197(55.7%) of respondents depended on crop production and livestock keeping.

Table 10: Main source of food for household

Source of food	Frequency	Percent
Production	197	55.7
Purchase/business/salary	37	10.5
Production and purchase	120	33.9
Total	**354**	**100.0**

4.3.7 Production of maize per season

Table 11 shows the frequency distribution for the production of maize in bags per season in the study area. Maize being the common and staple food in this area of study, it was considered an important element of food security for households as well as the availability of food for infants. The results in the table show that more than half 203(62.5%) of all could produce less than or equal to 3 bags per annum.

Table 11: Production of maize

Number of bags	Frequency	Percent
Nil	20	6.2
1	80	24.6
2-3	103	31.7
4-5	29	8.9
6-10	55	16.9
More than 10	38	11.7
Total	**325**	**100.0**

4.3.8 Livestock keeping

Since the researcher had observed that livestock could be tamed in the study area and since this could be a salient source of food such as meat and milk, the investigation was done to determine whether the respondents kept any livestock or used any animal product. Findings in Table 12 reveal that two-third (61.3%), kept livestock. These results suggest that in every three respondents, two out of these would tame domestic animals.

Table 12: Livestock keeping

Keep livestock	Frequency	Percent
Yes	217	61.3
No	137	38.7
Total	**354**	**100.0**

4.3.9 Use of animal products as food for the household

Given the fact that livestock can be kept for other purposes such as ploughing land, farm yard manure or symbol of status in this area, questions were asked to confirm whether the respondents kept domestic animals for human consumption or otherwise. Table 13 indicates that most 286(80.8%) used animal products for food, and that they preferred eggs and meat (42.7%) to milk.

Table 13: Use of animal products as food for the household

Consumption of animal products	Frequency	Percent
Yes	286	80.8
No	68	19.2
Total	**354**	**100.0**
Type of animal product consumed		
Milk	7	2.4
Eggs plus meat	122	42.7
Both meat and Milk	66	23.1
Meat	84	29.4
Meat, eggs and Milk	7	2.4
Total	286	100.0

4.3.10 Shortage of food

Having considered source of food and security of food, the researcher resolved to do some survey on shortage of food as experienced by respondents. This shortage of food, if experienced by the informants, then it would have an adverse effect on infant's nutritional status. As results manifest in Table 14, a big number of these respondents 258 (72.9%) experienced scarcity of food in their households. This shortage of food was mostly attributed to two cardinal causes, namely low production of crops including livestock (50%) and financial constraints in purchasing food (45%)

Table 14: Food shortage and the causes

Variable	Frequency	Percent
Experience food shortage		
Yes	258	72.9
No	96	27.1
Total	**354**	**100.0**
Cause of food shortage		
Low production	129	50.0
Low production and lack of money to buy food	116	45.0
Shortage of food in the market	1	0.4
Drought	12	4.6
Total	**258**	**100.0**

4.4 Mother's Workload

The absorption of a mother in work, tasks and household chores for a long time of the day can destruct her attention on her baby, limit the frequency of breastfeeding her infant and

cause her to be inconsistent in terms of breastfeeding and preparation of food for her child. Under this subsection, the following sub-sections are considered: fuel commonly used, person responsible for ensuring the availability of fuel, time spent on collecting fuel, source of water, period of time taken to fetch water and person responsible for fetching water.

4.4.1 Kind of fuel used in cooking, person responsible and time taken to collect

Table 15 indicates that 267(75.4%) of the respondents used fire wood, 16.1% of the subjects reported that they used charcoal while 23(6.5%) relied on both firewood and charcoal as fuel. The table further reveals that 287(81.1%) said that the mother is responsible for collecting fuel. These findings also reveal that most subjects 130 (36.7%) spent a range of three to five hours searching for fuel. Since most mothers were responsible for collecting fuel, babies were somewhat affected adversely unless mothers carried their babies with them during this activity.

Table 15: Type of fuel, person responsible and time taken to collect fuel

Variable	Frequency	Percent
Type of fuel		
Fire wood	267	75.4
Charcoal	57	16.1
Kerosene	1	0.3
Gas	6	1.7
Firewood and charcoal	23	6.5
Total	**354**	**100.0**
Fuel collector		
Mother	287	81.1
Father	23	6.5
Children	18	5.1
Member of household	13	3.7
Buying Fuel	13	3.7
Total	**354**	**100.0**
Time to collect fuel		
Less than hour	78	22.0
1-2Hours	109	30.8
3-5 Hours	130	36.7
More than 5 hours	37	10.5
Total	**354**	**100.0**

4.4.2 Main source of water

The study area is a semi-arid hit by drought frequently. This has rendered water scarce hence an invaluable resource for this area. Because of this situation, the researcher pre-conceived that it would take some time and effort of mothers from attending their babies properly, thus making it worth of investigating. Table 16 shows that the main sources of water are bore hall and tape/piped water, accounting for 174(49.2%) and 139 (39.3%) of all correspondents respectively. Moreover, the findings show that the majority, 293 (82.8%) of interviewees claimed that it would take less than an hour to fetch water and only 23(6.5 %) spent more than two hours in fetching water. The table further reveals that 264 (74.6%) of the mothers would fetch water while only 23(6.5%) placed the responsibility on the fathers' shoulders.

Table 16: Main source of water, time spent and responsible person for collection of water

Variable	Frequency	Percent
Source of water		
Bore hole	174	49.2
Well	38	10.7
River/Stream	2	0.6
Tape/Piped water	139	39.3
Harvested rain	1	0.3
Total	**354**	**100.0**
Time spent		
Less than an hour	293	82.8
More than an hour	38	10.7
More than two hours	19	5.4
3 hours	4	1.1
Total	**354**	**100.0**
Responsible person		
Mother	264	74.6
Father	23	6.5
Children	63	17.8
Buying water	5	1.1
Total	**354**	**100.0**

4.5 Nutritional Status of Infants

The findings for the assessment were presented and discussed based on nutritional status in relation to weight- for- length, length –for- age, weight- for-age. Furthermore, the

assessment was performed on the basis of sex of infants as related to weight for age, and weight for length.

4.5.1 Nutritional status of infants by weight – for - length z-score

Table 17 shows the results of assessment for nutritional status related to weight- for-length. The information in the table reveals that 8 (2.3%) of all babies under this survey were moderately malnourished. Of the moderately malnourished infants, 5(62.5%) were aged below or equal to three months. Moreover, results show that out of all infants, 27 (7.6%) were overweight. Of these, 14 (51.9%) were aged below or equal to three months. These results indicate that infants aged 0-3 months were more likely to be malnourished than other age groups. These results were significant at $p<0.05$.

Table 17: Nutritional status of infants by weight-for-length z-score

Age of the child (months)	**Weight for height Z-score**			
	(<−2SD) – (−3SD)	**(−2SD) – (+2SD)**	**>(2SD)**	**Total**
	n (%)	n (%)	n (%)	n (%)
0-3	5 (62.5)	86 (27.0)	14 (51.9)	105(29.7)
4 - 5	2 (25.0)	49 (15.4)	5 (18.5)	56 (15.8)
6 – 7	1 (12.5)	64 (20.1)	3 (11.1)	68 (19.2)
8 -9.9	0 (0.0)	55 (17.2)	4 (14.8)	59 (16.7)
10-11.99	0 (0.0)	65 (20.4)	1 (3.7)	66 (18.6)
Total	**8 (100.0%)**	**319 (100.0)**	**27 (100.0)**	**354 (100.0)**

4.5.2 Nutritional status with respect to length- for- age Z-score

Results in Table 18 show that 48(13.6%) were moderately stunted, and 3(0.8%) severely stunted. Additionally, out of 13.6% of those moderately stunted, majority 17(35.4%) were aged between 0-3 months. Those who were severely stunted were equally distributed amongst different age groups as indicated in the table below.

Table 18: Nutrition status with respect to length for age Z-score

Age (months)	Length for age z-score				
	< (3SD)	< (−2SD) – (−3SD)	(−2SD) – (+2SD)	>(2SD)	Total
0-3	n (%)	n (%)	n (%)	n (%)	n (%)
	1 (33.3)	17 (35.4)	86 (28.5)	1 (100.0)	105 (29.7)
4 - 5	0 (0.0)	8 (16.7)	48 (15.9)	0 (0.0)	56 (15.8)
6 - 7	1 (33.3)	5 (10.4)	62 (20.5)	0 (0.0)	68 (19.2)
8 -9.9	1 (33.3)	4 (8.3)	54 (17.9)	0 (0.0)	59 (16.0)
10-11.9	0 (0.0)	14 (29.2)	52 (17.2)	0 (0.0)	66 (18.6)
Total	**3 (100.0%)**	**48 (100.0)**	**302 (100.0)**	**1 (100.0)**	**354 (100.0)**

4.5.3 Nutritional status with reference to weight- for- age z-score

Table 19 contains information of nutritional status as assessed in terms of weight in relation to age. The results indicate that 16(4.5%) were moderately underweight, and six (1.7%) were overweight. Moderately underweight was more 6 (37.5%) in infants aged 0-3 months, while overweight was more and equal 2(33.3%) in 0-3 and 8-9.9 age groups.

Table 19: Nutritional status with reference to weight for age z-score

Age of the child (months)	Weight for Age Z score			
	< (−2SD) – (−3SD)	(−2SD) – (+2SD)	(>2SD)	Total
	n (%)	n (%)	n (%)	n (%)
0-3	6 (37.5)	97 (29.2)	2 (33.3)	105 (29.7)
4 - 5	3 (18.8)	52 (15.7)	1 (16.7)	56 (15.8)
6 - 7	0 (0.0)	68 (20.5)	0 (0.0)	68 (19.2)
8 -9.9	2 (12.5)	55 (16.6)	2 (33.3)	59 (16.7)
10-11.9	5 (31.3)	60 (18.1)	1 (16.7)	66 (18.6)
Total	**16 (100.0)**	**332 (100.0%)**	**6 (100.0)**	**354 (100.0)**

4.5.4 Nutritional status of sex related to weight -for -age, length for age- and - weight for length-z-scores

Findings in Table 20 entail the nutritional status related to sex as measured by weight- for -age, length – for - age and weight – for - length. Of all the infants, 52.8% were female and 47.2% were male infants. The table indicates that male infants were more malnourished by 62.5, 58.3 and 75% as measured by weight- for- age, length- for -age and weight- for- length respectively, than female. In the other hand, female infants were more (66.7, and 51.9%) overweight as measured by weight for age and weight for length

respectively, than male infants. These findings show that there was a difference between female and male infants' nutritional status, though not statistically significant (p>0.05)

Table 20: Nutritional status of sex by weight for age, length for age and weight for length-z-score

	Weight for age z- score			
Sex	**(<−2SD) – (−3SD)**	**(−2SD) – (+2SD)**	**(>2SD)**	**Total**
	n (%)	n (%)	n (%)	n (%)
Female	6 (37.5)	177 (53.3)	4 (66.7)	187 (52.8)
Male	10 (62.5)	155 (46.7)	2 (33.3)	167 (47.2)
Total	**16 (100.0)**	**332 (100.0)**	**6 (100.0)**	**354(100.0)**

$\mathbf{X^2}$ = 2.574, **df** = 2, **p-value** = 0.276 ns

	Length for-age z-score				
Sex	**(-3SD)**	**(<-2SD) – (-3SD)**	**(-2SD)-(+2SD)**	**>2SD**	**Total**
	n (%)	n (%)	n (%)	n (%)	n (%)
Female	2 (66.7)	20 (41.7)	165 (54.6)	0 (0.0)	187 (52.8)
Male	1 (33.3)	28 (58.3)	137 (45.4)	1 (100.0)	167 (47.2)
Total	**3 (100.0)**	**48 (100.0)**	**302 (100.0)**	**1 (100.0)**	**354 (100.0)**

$\mathbf{X^2}$ = 4.146, **df** = 3, **p-value** = 0.246 ns

	Weight for length z-score			
Sex	**(<−2SD) – (-3SD)**	**(-2SD)-(+2SD)**	**>2SD**	**Total**
	n (%)	n (%)	n (%)	n (%)
Female	2 (25.0)	171 (53.6)	14 (51.9)	187 (52.8)
Male	6 (75.0)	148 (46.4)	13 (48.1)	167 (47.2)
Total	**8 (100.0)**	**319 (100.0)**	**27 (100.0)**	**354 (100.0)**

$\mathbf{X^2}$ = 2.001, **df** = 2, **p-value** = 0.368 ns
ns means not significant.

4.5.5 Demographic characteristics and nutritional status

4.5.5.1 Nutritional status and age of infants

The results in Table 21 show that there was a statistically significant difference between the age of infant (p = 0.01) and nutrition status at as measured by weight-for-length. Moreover, the findings show no significant difference between nutrition status and age of infants as measured by length-for age and weight-for-age.

Table 21: Interaction between nutritional status and age of infants (ANOVA)

Variable	Source of variation	Sum of Squares	df	Mean Square	F	p-value
Weight-for-length Z-score	Between Groups	7.871	4	1.968	3.111	0.016 *
	Within Groups	220.754	349	0.633		
	Total	228.624	353			
Length-for-Age Z-score	Between Groups	.875	4	0.219	1.295	0.272 ns
	Within Groups	58.947	349	0.169		
	Total	59.822	353			
Weight-for-Age Z-score	Between Groups	.803	4	0.201	1.063	0.375 ns
	Within Groups	65.931	349	0.189		
	Total	66.734	353			

ns means not significant; *means significant (P<0.05)

4.5.5.2 Nutritional status and education level of the mother

Findings in Table 22 show that there was association between education level of the mother and nutritional status as measured by weight-for-length (p=0.000) and weight-for-age (p=0.003) but there was no association between length-for-age and education of the mother.

Table 22: Association between education level and nutritional status of infants

Variables tested	Chi-square value	df	p- value
Weight-for-length and mothers education	52.367	10	0.000 *
Weight- for- age and mothers' education	26.226	10	0.003*
Length –for-age and mothers, education	9.868	15	0.828ns

ns means not significant, *significant (P<0.05)

4.5.5.3 Nutritional status and birth weight of infants

Findings from ANOVA test show a significance difference between birth weight of the child and nutritional status as measured by length-for- age (p = 0.045) and weight-for-age (p = 0.045) . The test further shows no significance difference between birth weight and weight-for-length Z-score (Table 23).

Table 23: Association between nutritional status and birth weight of infants (ANOVA)

Variable	Source of variation	Sum of Squares	df	Mean Square	F	P-value
Weight- for-length Z-score	Between Groups	0.926	3	0.309	0.473	0.701ns
	Within Groups	227.635	349	0.652		
	Total	228.561	352			
Length- for -Age Z-score	Between Groups	1.361	3	0.454	2.709	0.045 *
	Within Groups	58.435	349	0.167		
	Total	59.796	352			
Weight for -Age- Z-score	Between Groups	1.524	3	0.508	2.719	0.045 *
	Within Groups	65.202	349	.187		
	Total	66.725	352			

ns means not significant, *means significant ($p<0.05$)

4.5.5.4 Nutritional status and house hold expenditure per day

The ANOVA test indicates that there was a significance difference ($p = 0.038$) between money expenditure per day and nutritional status as measured by weight-for-age. The test also shows that there was no significant different ($p < 0.05$) between money expenditure and nutritional status as measured by length-for-age and weight-for-length Z-score (Table 24).

Table 24: Association between nutritional status and expenditure per day

Variable	Source of variation	Sum of Squares	df	Mean Square	F	p-value
Weight- for-length Z-score	Between Groups	2.262	4	.565	.872	0.481 ns
	Within Groups	226.363	349	.649		
	Total	228.624	353			
Length-for- Age Z-score	Between Groups	0.780	4	0.195	1.153	0.332 ns
	Within Groups	59.042	349	.169		
	Total	59.822	353			
Weight–for-Age Z score	Between Groups	1.912	4	0.478	2.574	0.038*
	Within Groups	64.822	349	0.186		
	Total	66.734	353			

ns means not significant,*means significant ($p<0.05$)

4.5.6 Feeding practices and weight-for-age

Analysis of variance was performed to determine relationship between nutritional status as measured by weight- for- age and frequency a child is fed, exclusive breastfeeding, period

of time of exclusive breastfeeding, commencement of complementary feeding, and kind of food introduced. The results reveal that there was no statistically significant difference ($p>0.05$) between feeding practice and nutritional status as measured by weight-for-age (Appendix 8)

4.5.7 Feeding practices and length-for-age

The analysis reveals no significant interaction between nutritional status and feeding of colostrum, lapse of time that an infant is fed after birth, exclusive breastfeeding, point of time of the start of complementary feeding, type of food given and the frequency a baby is fed **(**Appendix 9).

4.5.8 Feeding practices and weight-for-length

According to the results as shown in Table 25, nutritional status as measured by weight-for- length significantly interacted at $p = 0.048$ with the month at which complementary feeding was commenced and the number of times a child was fed per day ($p= 0.02$). Furthermore, the findings show that nutritional status as measured by weight- for-length bare no statistically significant the elapse of time after birth before a baby is breast fed, feeding a baby of colostrum, time for exclusive breastfeeding, type of food introduced to the infant nor was the type of food introduced to the child.

Table 25: ANOVA test on nutritional status as measured by weight-for-length and feeding practices

Variable	Source of variation	Sum of Squares	df	Mean Square	F	p-value
Initiation of breastfeeding	Between Groups	0.182	2	0.091	0.373	0.689ns
	Within Groups	85.640	351	0.244		
	Total	85.822	353			
Feeding colostrum	Between Groups	0.020	2	0.010	0.446	0.640 ns
	Within Groups	7.799	351	0.022		
	Total	7.819	353			
Breastfeed the child exclusively	Between Groups	0.323	2	0.161	0.922	0.399 ns
	Within Groups	61.314	350	0.175		
	Total	61.637	352			
Time for exclusive breastfeeding	Between Groups	3.920	2	1.960	2.787	0.063 ns
	Within Groups	244.068	347	0.703		
	Total	247.989	349			
Start of complementary feeding	Between Groups	1.365	2	0.683	3.065	0.048*
	Within Groups	76.380	343	0.223		
	Total	77.746	345			
The type of foods that were introduced	Between Groups	0.284	2	0.142	0.328	0.720 ns
	Within Groups	102.729	238	0.432		
	Total	103.012	240			
Frequency of feeding	Between Groups	6.054	2	3.027	3.719	0.026*
	Within Groups	193.738	238	0.814		
	Total	199.793	240			

ns means not significant,*means significant ($p<0.05$)

4.6 Disease Pattern and Nutrition Status

One of the specific objectives was to determine whether there was proportional relation or inverse proportionality existed between disease pattern and nutrition status of infants in the study area. Under this section some components pertaining to pattern of diseases are presented and discussed. Thereafter, the relationship between disease pattern and nutrition status are investigated.

4.6.1 Morbidity of infants

Table 26 indicates that 162 (45.8%) amongst infants suffered from one disease or another while 192 (54.2%) infants had not become sick of any illness two weeks prior to the conduction of the study. Moreover, the table shows that out of those who became sick as by reported by respondents, most of them had suffered from respiratory infection (44.4%) and diarrhoea (30.8%).

Table 26: Illness and type of the disease that the infant suffered in previous two weeks

Variable	Frequency	Percent
The child sick within the previous two weeks		
Yes	162	45.8
No	192	54.2
Total	**354**	**100.0**
Disease type		
Malaria	22	13.6
Diarrhoea	50	30.8
Respiratory infection	72	44.4
Skin infections	14	8.6
Others	4	2.5
Total	**162**	**100.0**

4.6.2 Receipt of vitamin A by infants and immunization

Literature shows that vitamin A prevents infants from infections, respiratory infections among others. Table 27a shows the number of babies who had received vitamin A within last six months-time. The table indicates that only 96 (27.1%) of all babies had been given vitamin A while 257(72.9%) of all infants were yet to receive. Despite the fact that 193 infants (who were at the age of six months and above) among all infants deserved to receive vitamin A, (50.3%) of the infants had not received vitamin A. Findings further indicate that majority (96%) of all the infants were immunized for age (Table 27b)

Table 27a: Receipt of vitamin A

	The child received Vitamin A for the last 6 month		
Age (months)	**Yes**	**No**	**Total**
	n (%)	n (%)	n (%)
0-3	5 (4.8)	100 (95.2)	105 (100)
4 – 5	6 (10.7)	50 (89.3)	56 (100)
6 – 7	20 (30)	47 (70)	67 (100)
8 -9.9	26 (44)	33 (56)	59 (100)
10-12	39(59)	27 (41)	66 (100)
Total	**96 (27.1)**	**257 (72.9)**	**353 (100)**

Table 27b: Immunization status for age

Immunized	Frequency	Percent
Yes	340	96.0
No	14	4.0
Total	**354**	**100.0**

4.6.3 Disease pattern and nutritional status of infants

Table 28 presents relationship between the pattern of disease with nutritional status as measured by weight- for- length and weight-for-age. The elements of pattern of disease were sickness of an infant for the previous two weeks and illness that baby suffered from. As indicated by the results in this table, there was interaction between sickness and weight-for-age (p=0.00) and the type of the disease an infant suffered and nutritional status as measure by weight-for-length and weight-for-age (p=0.043). There was no statistically significant association between length-for-age and disease pattern.

Table 28: Chi-square test for the association of nutritional status and type of sickness of the infant

Variables tested	Chi-square value	Df	p-value
Weight-for-length and type of disease	15.977	8	0.043 *
Weight- for- age and state of sickness	22.547	4	0.000 *

*=significant at p<0.05

4.7 Hygiene and Sanitation and their Association to the Nutritional Status of Infants

The elements of hygiene and sanitation considered under this study were water treatment to make it safe for drinking and different conditions of which a mother would be required to wash her hands in order to prevent contamination of food, water and utensils used to for feeding the child. Table 29 indicates that more than half 209(59%) of the respondents did not treat water for drinking. Only 40.4% reported boiling water for drinking. The table further reveals that most mothers (74.3%) washed their hands before and after eating, and after using toilet. Only 24.4 and 23% exclusively reported to wash their hand before feeding the child and cooking respectively.

Table 29: Hygienic condition and sanitation

Variable	Frequency	Percent
Treatment water for drinking		
Not treated	209	59.0
Boiling	143	40.4
Using chemical e.g. water guard	2	0.6
Total	**354**	**100.0**
Time for Washing Hands		
Before eating, after eating, before cooking, before feeding the baby, after going toilet	80	22.6
Before eating, before feeding the child, after going toilets	5	1.4
Before cooking, before feeding the child, after going to toilet	2	0.6
Before eating and after eating	4	1.1
Before eating ,After eating and after going to toilet	263	74.3
Total	**354**	**100.0**

4.7.1 Nutritional status and hygiene and sanitation

A chi-square test confirmed to no statistically significant association ($p>0.05$) between nutritional status as measured by all three indices and hygiene and sanitation parameters.

4.8 Determinants of Nutritional Status of Infants in the Study Area

Table 31 indicates a summary of determinants of nutritional status as measured by all three indices that were significant in the study area. Main determinants were birth weight and age of infants; education level of the mother and level of expenditure per day; time at which complementary feeding was commenced and frequency of feeding per day; and type of the disease an infant suffered prior to study period.

Table 30: Summary of the determinants of nutritional status of infants in the study area

Type of index	Factors with significance association	Type of test (value)	p-value
Length –for-age	Infants' birth weight	ANOVA (F=2.709)	0.045*
Weight-for-length	Age of infant	ANOVA (F=3.111)	0.016*
	Mothers' education	Chi-squire (52.367)	0.000 ***
	Commencement of complementary feeding	ANOVA (3.065)	0.048*
	Frequency of complementary feeding per day	ANOVA (3.719)	0.026*
	Type of disease	Chi-square (15.977)	0.043*
Weight-for-age	Mothers' education	Chi-squire (26.226)	0.003**
	Infants' birth weight	ANOVA (F=2.719)	0.045*
	House hold expenditure per day	ANOVA (F=2.574)	0.038*
	Type of disease	Chi-squire (22.547)	0.000***

*** means significant at p< 0.05, ** means significant at p<0.01, *** means significant at p< 0.001**

4.9 Report on the Key Informants

To complement the results from the formal survey, the researcher had a list of items asked to key informants from the two wards in which the study was undertaken. The key informants that were involved are clinical officers in charge and trained village nutritional workers at the respective wards as discussed in chapter five.

CHAPTER FIVE

5.0 DISCUSSION

5.1 Overview

This chapter discusses the findings from the study area. Based on the specific objectives, this chapter comprises the following main sub sections: demographic characteristics and socio-economic factors; feeding practices of the study area; nutritional status of the infants and relationship between nutritional status and disease pattern. Factors like food security and mothers' workload are also discussed.

5.2. Demographic Characteristics and Socio-economic Factors of the Respondents

This main subsection discusses findings related to age of the respondents, level of education of the respondents, marital status of the respondents, occupation of the informants, source of income of the subjects, and expenditure on household needs by interviewee and their effect to nutrition status of infants. In addition, this section describes the demographic characteristics of infants pertaining to sex, age, and order of birth, birth weights, in relation to their nutrition status of the study area of Chamwino in Dodoma.

5.2.1 Maternal characteristic and nutrition status of infants

In different studies, maternal age, marital status and level of education are found to be associated with infant feeding practice which in turn is reflected in the nutrition status of infants (Health Unit, 2006; Onah *et al*., 2014). In this study, most respondents had their age ranging between 20 and 35 years. Additionally, a considerable number were teenager mothers. This is less than that found in a study done in Simanjiro (Nyaruhucha *et al*., 2006). Although this would imply that most mothers were adults at expected age to bear children, the consequences that would be associated with these teenage mothers in this population cannot be ignored. Teenage mothers have increased nutrient demand to meet

requirement for their own growth and development and that of their infants through pregnancy and lactation. Additionally, teenage mothers have complex social, emotional and social factors that pose a great challenge to themselves and that of their infants. They are likely to deliver premature babies, low birth weight babies, stillbirth and have prolonged labour than older women (Boyle and Holben, 2006). Also being a teenage mother would mean that their pursue for education is cut shot. As it has been observed in this study as did NBS (2010), there is a strong relationship between education level of the mother and nutrition status of children. In this study malnutrition was evenly distributed in all age categories of mothers. A chi-squire test at $p>0.05$ showed insignificant relationship between nutrition status of infants of teenage mothers and older women. This implies that nutritional status of infants does not directly depend on the age of the mother.

The results further revealed that the education level of women in the study area was very low with majority having either informal education or basic education at a primary level. A low number had either attained secondary school or pursued further education at college level or university. From these results, it can strongly be argued that most mothers had limited exposure to knowledge on child health and nutrition. The level of malnutrition as measured by all three indices was high among mothers of low level of education than in mothers with high level of education. Among those who were wasted, stunted and underweight respectively, majority were infants of mothers with low level of education. The prevalence of overweight as measured by weight-for-length and weight-for-age was also high in same group of respondents. In this study nutrition status as measured by weight-for-length and weight-for-age z-score correlated significantly ($p<0.05$) with maternal education level. These results were similar to other studies done in other parts of Tanzania. A study in Kilimanjaro by Abubakar *et al*. (2012) found out that maternal education significantly predicted all three nutrition indicators. A study in Simanjiro

(Nyaruhucha *et al*., 2005) also found a lower prevalence of malnutrition among mothers of higher education. Another study in Mbarali (Malambugi, 2010) demonstrated that large number of undernourished children was likely to be found amongst mother with few years at school, though it was not statistically significant.

Marital status of respondents was also considered among the factors affecting infant's nutrition status. In this study most of malnourished infants were from married mothers and just a few from mothers who single handedly raised their children because they were single, divorced or widowed. Contrary to other studies, high level of malnourished children as measured by all three indices were likely to be found among married mothers. Studies have shown that mothers, who are single, divorced or widowed, are likely to have malnourished children as such mothers would not have proper practice of feeding to their infants. Such mothers are less likely to initiate breastfeeding within the expected time, have unsuccessful exclusive breastfeeding and go against WHO (2001) guidelines with regard to complementary feeding (Health Unit, 2006). A study in Botswana indicated that children raised by single parents suffered from underweight to a significantly higher level than children rose by both parents (Mahgoub *et al.*, 2006). This contradiction with some studies could be attributed to the fact that being married would mean high production rate leading to a large family size which would lead to a draining of more family financial resources by increasing budget, causing food insecurity, and hence negatively affecting the nutritional status of children (URT and UNICEF, 1990). As observed in this study, married mothers were likely to have more children than single mothers.

In this study economic status was measured by the amount of money spent by household per day. As indicated by results from this study a large amount of money was between Tsh 2000 and Tsh 5000 (39.3%). This implies that most of them earn and live below or just

above poverty level which is $ 2 (World Bank, 2017), which is equivalent to Tsh 4400-4600 as per current exchange rate. This can be attributed to the fact that most of these women engaged and depended on farming as the main occupation and source of income. As indicated in the section of food security, these women do not produce enough to even satisfy household needs for food. This situation would limit respondents' access to food and health services as they have limited income. Consequently, this would have a negative effect to child's health and nutritional status. In this study , the level of undernutrition as measured by weight-for-age was significantly associated with the amount of money a house hold spent per day (p=0.038) but there was no significant association between economic status of the mothers and nutritional status as measured by other two indices. A study in Simanjiro found similar results (Nyaruhucha *et al.,* 2005).

5.2.2 Infants' characteristics and nutrition status

Under this sub-section, factors related to infants were age, sex, birth weight and birth order of a child. In this study less than half of all the infants were aged below six months and more were aged six months and above. Studies have shown that the rate of malnutrition rises sharply when the child reaches six months and above. It follows that breastfeeding alone at this time is not sufficient to meet infants' nutrition requirement. Therefore, children at this age enter a particular vulnerable period of complementary feeding. It becomes a vulnerable period because in most cases the guidelines for introduction and feeding of complementary feeding to infants are not adhered to. In Tanzania for example, the introduction of complementary feeding is not timely, either infants are being introduced to complementary feeding too early or too late. The kind of food given is not adequate in terms of quantity and quality, not safe and children are not properly fed (TDHS, 2010).

As a result of the above, infants get repeated infections and diseases which result into undernutrition. Contrary to the existing literature, the rate of wasting and underweight in the present study was found to be high among children aged below six months than children aged six months and above. The rate of stunting and underweight were almost equally distributed in the two groups, the six months and above; and those aged below six months. This contradiction could be attributed to many factors observed in the study area. First, at the time when mothers were exclusively breastfeeding their nutrition should have been adequate in terms of energy, protein and micro-nutrients. It was observed from the study area that most mothers produced less and were too poor to buy food rich in both macronutrients and micronutrients, making them prone to food insecurity. Moreover, apart from these mothers spending their time in production activities, they also spent more time in household chore activities like fetching water and collection of fuel, thereby adding to their total work load. This would imply that the time for feeding this child who absolutely depends on her/his mothers' milk would be low, compromising the expected outcome of exclusive breastfeeding. The analysis of variance test showed a statistically significance difference ($p= 0.016$) between age of the child and nutrition status as measure by weight-for-length z-score.

With regard to sex of infant, most of them were female and a few were male children. The nutritional status of female infants as measured by weight- for- length, weight- for -age and weight-for-length was better (though not statistically significant) than that of male infants. This follows the same trend as that observed in national demographic and health survey and in studies done in other parts of the country. According to NBS (2010) report, male children were more wasted, stunted and underweight than female children. Studies conducted in Mbarali (Malambugi, 2010), Simanjiro (Nyaruhucha *et al.*, 2005) and Kilimanjaro (Abubakar *et al.*, 20012) mentioned earlier, observed the same trend.

Birth weight is another factor associated with nutrition status of infants. Infants with low birth weight are at increased risk of early growth retardation, infectious diseases, developmental delay and death during infancy and childhood (WHO, 2011). In this study, few infants under study were born with weight less than 2.5 kg, which according to WHO (2001) were underweight. Majority were born with normal weight while some of these had birth weight of 4kg and above, which is abnormal. Birth weight of few infants was unknown making it difficult to judge whether they were born underweight or normal. The level of stunting and underweight significantly ($p<0.05$) correlated with birth weight of infants.

5.3 Infant Feeding Practices and Nutritional Status of Infants

Feeding practices were conceived of being one of the factors that would affect, or influence, the nutrition status of infants in the study area. This subsection consists a discussion of two broad elements of feeding practices namely, breastfeeding and complementary feeding in relation to nutrition status of infants in the study area.

5.3.1 Initiation, feeding of colostrum and exclusive breastfeeding

As per global recommendation, breastfeeding should start early, within one hour after birth as this promotes exclusiveness and duration of breastfeeding. It also ensures early skin-to-skin contact helping prevent hypothermia and establishing bond between mother and child. Above all, it stimulates production and ejection of milk. After initiation a mother should continue to feed the child with colostrum. This is the fluid secreted from the breast during late pregnancy and the first few days' post-partum (DeYoung, 2004). Colostrum provides protective antibodies and indispensable nutrients, especially acting as a first immunization for newborns, strengthening their immune system and reducing the chances of death in the neonatal period (URT, 2008). Initiation within one hour was

practiced by majority in the study area. This rate is higher than that of a national figure as reported by NBS (2011). Large number of subjects also reported to have fed their infants with colostrum. A study by Safari *et al*. (2013) done in Morogoro reported similar results of colostrum feeding to infants. With these results it can be asserted strongly that, majority of the subjects knew when to initiate breastfeeding and the necessity of feeding infants on colostrum.

The knowledge and practice of excusive breastfeeding among respondents were suboptimal. Findings indicate that almost half of all informants knew the period for exclusive breastfeeding and just more than a half of them started complementing their infants at the age of six months. This implies that practice of exclusive breastfeeding in the study area was inadequate. This is less than national average of exclusive breastfeeding as documented by NBS (2016).

5.3.2 Complementary feeding

Complementary feeding is the giving of solid or semisolid foods to infants in addition to breast milk. This starts at the age of six months. If care is not taken, infants can be vulnerable during this transition period of complementary feeding. The WHO (2001) in its global strategy on infant and young feeding report, suggested that in order to ensure that nutrition needs are met during this period, complementary food should be timely introduced when the needs for energy and nutrients exceed that provided by exclusive breastfeeding , should be adequate to provide energy, protein and micro-nutrients to meet nutrition needs of growing infants and such food should be hygienically prepared and stored, fed with clean hands using clean utensils and children to be properly fed according to meal frequency and feeding method.

It was observed from this study that mothers do not adhere to such guiding principles when introducing complementary feeding to their infants. Most of infants were introduced to complementary feeding at the age less than six months, with a greater of them being infants of three months or below whereas the rest being infants aged between 4 and 5 months. From these results it can be argued that early introduction of complementary feeding is common in the study area.

Moreover, the food given/introduced was of low quality not meeting nutritional needs of infants at the respective age. Most mothers fed their infants with maize porridge with salt or sugar added. Furthermore, the frequency of feeding was low with most infants being fed once, two- to three times a day. With the poor quality of food given to these infants coupled with low frequency of feeding, makes these infants to be at risk of malnutrition. These results are not surprising as many studies including that done at national level (NBS, 2010) have shown similar trend. Commencement of complementary feeding and frequency of feeding significantly related at $p<0.05$ to nutrition status of infants as measured by weight- for- length.

5.4 Disease Pattern and Nutrition Status of Infants

One of the specific objectives was to determine whether there was proportional relation or inverse proportionality between disease pattern and nutrition status of infants in the study area. Among the infants surveyed, at least a half of them had fallen ill within the previous two weeks prior to commencement of the study. Majority of these infants had suffered from respiratory infection and diarrhea. These results were supplemented by the report from the key informants who affirmed that the prevalence of respiratory infection and diarrhea was higher than that of other diseases in the study area. A great number of these children becoming sick of respiratory infection indicate that most of them had commenced

complementary feeding earlier (WHO, 2001) and that the food introduced may have lacked some vital nutrients. Additionally, it would suggest that condition under which such food was prepared and fed to infants was not safe. As it was shown in the section of hygiene and sanitation a few of them reported to wash their hands before feeding their infants, and a limited number of them boiled water for drinking. In this study, among the eight infants who were wasted, more than half were among the diseased infants especially those with respiratory infection. With regard to receipt of vitamin A, 7 (2%) of the wasted children were of the group that had not received vitamin A. Chi-squire test showed that nutrition status as measured by weight-for-length and weight-for-age z-score significantly ($p<0.05$) associated with the type of sickness an infant suffered.

In the present study, sickness, type of the disease and vitamin A status were found to be associated with nutrition status of infants especially as measured by weight-for-length z-score, though only type of the disease an infant suffered was statistically significant at $p<0.05$. This is affirmed by the description given by WHO (1997) which describes that low weight -for–height indicates in most cases a recent and severe process of weight loss, often associated with acute starvation and/or severe disease.

5.5 Nutritional Status of Infants

As stated early, an assessment of nutrition status as recommended by the World Health Organization (WHO, 1995), was performed by z-scores. Under this section, findings were discussed based on nutrition status in relation to weight for height, with respect to length for age, and with reference to weight for age. Furthermore, discussion was narrowed on the basis of sex of infants as related to weight for age, and weight for height.

The single best indicator of baby's nutritional status is growth. This can be manifested through weight gain relatively in a considerable short period time and height in the long run. Eating poor diet as an infant has a debilitating effects on the babies' growth. Overall eating good diet during adulthood, having been eating poorly in the infancy, does not reverse the condition of this individual.

As per nutritional status, most infants had normal nutritional status as measured by all the three indices. The respective prevalence of undernutrition was 14.6, 2.3 and 4.5% stunting, wasting and underweight respectively. On the other hand, the level of over nutrition was 7.6% as measured by weight-for-length. There is variability in the level of undernutrition when compared to that of a national and to regional prevalence. The prevalence of undernutrition in this study as measured by all three indices was lower than that of the national and regional averages (NBS, 2016). This difference could be due to difference in population under study, sample size, feeding practices and the level of food security and the area of coverage. Stunting which is height or length that is two or more standard deviations below the global WHO child growth standards reference has a complex etiology (Shekar *et al*., 2016). In the study area many factors could have contributed to failure of some children to achieve their linear growth. This could be a reflection of lack of appropriate quality and quantity of food to the infants, repeated infections and diseases, low birth weight, poor nutrition knowledge of mothers, poor hygiene and sanitation and lack of income to purchase food. Overweight was higher than that of the national average.

As discussed previously, nutrition status of female infants as indicated by all three indices was better (but not statistically significant) that of male infants. Male children were more likely to be wasted, stunted and underweight than female children.

5.6 Report of the Key Informants

Several issues emanated from the report of key informants. As reported, the main method used to assess the nutritional status of infants in the RCH clinics is the measurement of weight which is plotted on the child's clinic card to indicate weight-for-age. This implies that malnutrition as measured by weight-for-age can be detected early but missing the early diagnosis of other forms of malnutrition, both acute and chronic as indicated by weight-for-length and height- for- age, respectively.

It was also reported that there is a belief that when a child cries, it is a sign that the child is not satisfied with breast milk thus needs to be supplemented with other foods. This could be one of the contributing factors to the suboptimal exclusive breastfeeding and early introduction of complementary feeding. This in turn may have contributed to high rates of respiratory infection and diarrheal disease as reported by clinical officers and health workers, as key informants and respondents in the study area.

The report further shows an existence of some nutritional interventional programs in some areas. In some RCH clinic, they were provided with cereal mix enhanced by addition of powdered milk and micro-nutrients by WFP which was given to pregnant and lactating mothers with infants less than six months and children less than 5 years. This may not have an impact to the nutritional status of infants as the provisional of such feed was not regular and no follow up made to the households to ensure that it was consumed by the intended group and not other members of the household especially other children, given the situation of food insecurity in the study area.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Overview

This study assessed factors that would affect the infants' nutritional status. The means by which it set out to achieve these ends may be classified into four major categories that are based on specific objectives, namely demographic characteristics including socio-economic factors, feeding practices, nutritional status as well as relationship between nutritional status and pattern of disease. Far from being independent and mutually exclusive, however, these categories are complementary and overlapping salient features most readily in evidence where evaluation is sought to come to grips with complex factors related to the study. This chapter presents conclusions and recommendations corresponding to the specific objectives based on the major findings of this study.

6.2 Conclusion

This section comprises of conclusions emanating from the results of this study. These conclusions are classified in accordance with specific objectives of this study. Based on the evidence indicated in the results under each specific goal, conclusions are drawn.

6.2.1 Demographic characteristics and socio-economic factors

In this regard, elements such as age, education level, marital status, occupation, source of income, amount to spend by household each day, order of birth and birth weight were considered for this objective.

Findings indicate that most mothers of this area were of required age to give birth, 20-35 years. Results further show that the majority of them were semi-illiterate, thus experience and physiological maturity would play an important role to take care for their infants.

Hence, poor feeding of some babies can be attributed to semi-illiteracy of mothers in this area, meager income, and shortage of food at times.

6.2.2 Feeding practices

Findings in this study are such that most of mothers knew when to initiate breastfeeding and the period over which their infants were supposed to be exclusively breastfed. In contrast, the results indicate that mothers did not breastfeed their children frequently and exclusively enough, some would introduce solid food to their babies before six months of age, and some did not start provision of complementary food when they were supposed to begin giving. Thus, these results suggest that mothers in this study area do not understand the importance of, firstly, breastfeeding the child exclusively and frequently, and secondly, commencing with the provision of solid foods timely.

Furthermore, findings indicate that the staple food for this area was maize. However, the results reveal that in spite of producing maize, these people would experience shortage of food. Therefore, possibly children in this area do not have proper nutrition throughout a year, hence affecting the nutritional status of children.

6.2.3 Mother's work load

Infants, need specific attention focused on them, they need to grow in conductively stimulating environment as well as a sense of security. This implies that there must be balance between work load and some time for attention focused on a child. Regarding this, results manifest that mothers spent quite some time on collecting firewood, fetching water, including house chores such as cooking for the family, doing laundry, let alone farm work. Consequently, mothers would have constrained time for the baby and as a result affect nutritional status of infants negatively.

6.3.4 Nutritional status of infants

The results indicate that although majority of infants had normal nutritional status, a significant number of infants were either underweight or overweight. This could be due poor feeding and infections, thus affecting infants 'growth negatively.

Nonetheless some of children having their nutritional status affected, results indicate that female babies had better nutritional status than male ones. In addition, findings show that there was in significant interaction between demographic characteristics, in which socio-economic status was embedded, and weight of infants.

6.2.4 Relationship between disease pattern and nutritional status

Findings of this study show that infants often suffer from respiratory infection and diarrhoea. Administration of Vitamin A to infants prevents, apart from other infections, respiratory infections. In contrast commencement of complementary feeding particularly solid food earlier than required can cause the infection. As results show, the problem in the receipt of vitamin A and the start of complementary feeding before a child is six months old appear to be the cause. Conclusively, infants in the study area suffer as the consequences of beginning complementary feeding before the suggested time.

6.3 Recommendations

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

(i). Parents should be educated on the difference between knowledge and application of exclusive breastfeeding. This can be done by nutrition officers, health workers, clinical nurses, and community development officers. Putting knowledge into practice will ensure the proper growth children and avoid unnecessary infections for babies.

(ii). Parents should be trained on feeding practices pertaining to feeding at infancy as well as the consequences starting complementary feeding earlier than required. Again, nutrition officers, clinical nurses, health workers, and development officers can be of valuable service.

(iii). Local government and agricultural officer should conduct seminar, training and initiate pilot projects of agricultural production to parents who are farmers on issues of crops of nutrient dense that can sustain nutritional status of babies.

(iv). Developmental community officer should train parents, particularly, husband on the importance of paying special attention to young babies and to helping mothers with their workload for mothers to have ample time to feed and take care of their infants and children so that they can grow and thrive.

(v). Policy makers should establish policies that ensure that all girl-children continue with their education to at least a level of secondary before they get married so that they will have developed capability to take care of their babies health wise and properly.

(vi). There should be deliberate efforts by local government and community development officers on helping mothers who eke out their living on small scale business with nutritional knowledge, entrepreneurship, and loans.

6.4 Suggestion for Further Research

There is a need for further research that can either replicate this study for under five children or challenge that mothers face in fully breasting their infants as well as feeding their children. Along these, the research on strategies that parents apply to copy with challenges they face can be executed separately or in combination. This research can help policy makers, community development officers, health workers, and local governments to assist parents improve their methods to face these challenges.

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APPENDICES

Appendix 1: Nutritional status and birth weight of infants

		Sum of Squares	df	Mean Square	F	Sig.
Weight for length Z-score	Between Groups	.926	3	.309	.473	0.701 ns
	Within Groups	227.635	349	.652		
	Total	228.561	352			
length for Age Z-score	Between Groups	1.361	3	.454	2.709	0.045 *
	Within Groups	58.435	349	.167		
	Total	59.796	352			
Weight for Age Z score	Between Groups	1.524	3	.508	2.719	0.045 *
	Within Groups	65.202	349	.187		
	Total	66.725	352			

Ns means not significant

*means significant

Appendix 2: Nutritional status and age of the child

		Sum of Squares	df	Mean Square	F	Sig.
Weight for height Z-score	Between Groups	7.871	4	1.968	3.111	0.016 *
	Within Groups	220.754	349	.633		
	Total	228.624	353			
Height for Age Z-score	Between Groups	.875	4	.219	1.295	0.272 ns
	Within Groups	58.947	349	.169		
	Total	59.822	353			
Weight for Age Z score	Between Groups	.803	4	.201	1.063	0.375 ns
	Within Groups	65.931	349	.189		
	Total	66.734	353			

Ns means not significant

*means significant

Appendix 3: Nutritional status and money spent for day:

		Sum of Squares	df	Mean Square	F	Sig.
Weight for length Z-score	Between Groups	2.262	4	.565	.872	.481 ns
	Within Groups	226.363	349	.649		
	Total	228.624	353			
length for Age Z-score	Between Groups	.780	4	.195	1.153	.332 ns
	Within Groups	59.042	349	.169		
	Total	59.822	353			
Weight for Age Z score	Between Groups	1.912	4	.478	2.574	.038*
	Within Groups	64.822	349	.186		
	Total	66.734	353			

Ns means not significant, *means significant

Appendix 4: Education level and length- for- age –z score

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	9.868[a]	15	0.828 ns
Likelihood Ratio	8.369	15	0.908
Fisher's Exact Test	26.383		
Linear-by-Linear Association	1.226[c]	1	0.268
N of Valid Cases	354		

a. 19 cells (79.2%) have expected count less than 5. The minimum expected count is .00.

Appendix 5: Education level and weight- for- age –z score

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	26.226[a]	10	0.003 *
Likelihood Ratio	13.459	10	0.199
Fisher's Exact Test	18.820		
Linear-by-Linear Association	2.237[c]	1	0.135
N of Valid Cases	354		

a. 13 cells (72.2%) have expected count less than 5. The minimum expected count is .02.

***means significant**

Appendix 6: Education level and weight- for- age –z score

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	52.367[a]	10	0.000*
Likelihood Ratio	16.012	10	0.099
Fisher's Exact Test	19.649		
Linear-by-Linear Association	1.787[c]	1	0.181
N of Valid Cases	354		

a. 13 cells (72.2%) have expected count less than 5. The minimum expected count is .02.

***means significant**

Appendix 7: Feeding practices and nutritional status as measured weight –for-length

Variable	Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Initiation of breastfeeding	Between Groups	.182	2	.091	.373	.689
	Within Groups	85.640	351	.244		
	Total	85.822	353			
Feeding colostrums	Between Groups	.020	2	.010	.446	.640
	Within Groups	7.799	351	.022		
	Total	7.819	353			
Breastfeed the child exclusively	Between Groups	.323	2	.161	.922	.399
	Within Groups	61.314	350	.175		
	Total	61.637	352			
Time for exclusively	Between Groups	3.920	2	1.960	2.787	.063
	Within Groups	244.068	347	.703		
	Total	247.989	349			
Start of complementary feeding	Between Groups	1.365	2	.683	3.065	.048*
	Within Groups	76.380	343	.223		
	Total	77.746	345			
The type of foods that were introduced	Between Groups	.284	2	.142	.328	.720
	Within Groups	102.729	238	.432		
	Total	103.012	240			
Frequency of feeding	Between Groups	6.054	2	3.027	3.719	.026*
	Within Groups	193.738	238	.814		
	Total	199.793	240			

- **Means significant**

Appendix 8: Feeding practices and nutritional status as measured weight-for-age

Characteristic	Source of variation	Sum of Squares	df	Mean Square	F	Sig.
Initiation of breastfeeding	Between Groups	.608	2	.304	1.253	.287
	Within Groups	85.214	351	243		
	Total	85.822	353			
Breastfeed the child exclusively	Between Groups	.438	2	219	1.252	.287
	Within Groups	61.200	350	.175		
	Total	61.637	352			
Time for exclusive breastfeeding	Between Groups	1.500	2	.750	1.056	.349
	Within Groups	246.489	347	.710		
	Total	247.989	349			
Age at which complementary feeding was started	Between Groups	.045	2	.023	.099	.905
	Within Groups	77.701	343	.227		
	Total	77.746	345			
The type of foods that were introduced	Between Groups	1.716	2	.858	2.016	.135
	Within Groups	101.296	238	.426		
	Total	103.012	240			
How many times the child is feed	Between Groups	2.176	2	1.088	1.310	.272
	Within Groups	197.617	238	.830		
	Total	199.793	240			

Appendix 9: Feeding practices and nutritional status as measured length- for- age

Characteristic	Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Initiation of breastfeeding	Between Groups	.106	3	.035	.144	.934
	Within Groups	85.716	350	.245		
	Total	85.822	353			
Feeding of colostrum	Between Groups	.002	3	.001	.034	.991
	Within Groups	7.817	350	.022		
	Total	7.819	353			
Breastfeed the child exclusively	Between Groups	1.285	3	.428	2.47	.061
	Within Groups	60.352	349	.173		
	Total	61.637	352			
Time for exclusive breastfeeding	Between Groups	1.517	3	.506	.710	.547
	Within Groups	246.471	346	.712		
	Total	247.989	349			
Started giving complementary feeding	Between Groups	.107	3	.036	.157	.925
	Within Groups	77.639	342	.227		
	Total	77.746	345			
The type of foods that were introduced	Between Groups	.051	3	.017	.039	.990
	Within Groups	102.961	237	.434		
	Total	103.012	240			
Frequency of feeding	Between Groups	2.763	3	.921	1.10	.347
	Within Groups	197.030	237	.831		
	Total	199.793	240			

Appendix 10: Weight for-age and child's sickness Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	22.547[a]	4	0.000 *
Likelihood Ratio	7.707	4	0.103
Fisher's Exact Test	11.074		
Linear-by-Linear Association	1.759[c]	1	0.185
N of Valid Cases	354		

a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is .02.

***means significant**

Appendix 11: Report of the key informants

S/N	List of item	Responses of Buigiri Clinical officer and trained nutrition worker	Response of Majeleko Nurses.
1	Diseases that are more prevalent in the health facility	• Respiratory infection • Diarrhoeal • Skin infection	• Dirrhoeal • Respiratory infection
2	Diseases related to nutrition	• Not common	• Few cases of underweight
3.	Is the prevalence of such cases known?	• Not known	• Not known
4	Where do most mothers deliver their babies	• Mostly At the health facility than home	• Mostly At the health facility than home
5	Are mothers provided with nutrition education with regard to infant feeding?	• Yes	• Have a recorded tape that mothers listen to when they attend clinic.
6	Topics covered	• Preparation of food by mixed meal plan • Proper hygiene during food preparation and child feeding	• Important of exclusive breastfeeding • Feeding during pregnancy
7	Do you think the education you give helps.	• It helps as it is shown in children's improvement	• Helps few mothers who able to concentrate and listen
8.	Is there any other nutrition intervention program for children? What is it and who initiated the program	Yes • The WFP provides an infant feed that is given to infants ≥6 months, lactating mothers and pregnant mothers. • Education on poultry keeping (Mwanzo Bora)	• None
9	Are there any predominant norms and cultural beliefs that may affect infant feeding?	• A belief that when an infant cries is a sign that is not satisfied with breast milk and therefore another food should be introduced. • A child is to stop breastfeeding as soon as the mother becomes pregnant.	• Didn't know
10	How are men helped to ensure support to their wives with regard to feeding practices?	• At times they are educated on care taking of their wives during pregnant • Educate them on women empowerment • With all that it is still challenging as changing men's attitude is hard.	• It's difficult to get men, they just come when the wife starts antenatal clinic

Appendix 12: Questionnaire on Factors Influencing the Nutrition status of Infants in Chamwino district Dodoma

A: DEMOGRAPHIC, SOCIAL AND ECONOMIC DATA

1. Respondent's no----------
2. Age of respondent----------
3. sex (should be female)
4. ethnic group----------
5. ward----------
6. village----------
7. marital status (tick appropriate)
    1. single
    2. married
    3. divorced
    4. widow
8. education level (tick appropriate)
    1. no formal education
    2. primary school education
    3. secondary school education
    4. advanced level education
    5. certificate/diploma level education
    6. higher level education
9. occupation (tick appropriate)
    1. farmer
    2. employed
    3. business woman
    4. student

5. others (specify)

10. source of income (tick appropriate)
    1. selling of farm produce (crops or livestock)
    2. from business
    3. salary
    4. remittance
    5. others (specify)
11. By average, how much do you spend per day?
    1. Less than 1500
    2. 1500-2000
    3. 2100-5000
    4. 5100-10,000
    5. More than 10,000
12. Of the money that you spend per day, how much do you use to buy infant's food? -
13. The house you are living in, it is
    1. Yours (owned)
    2. Rented
    3. Borrowed
    4. Others (specify)
14. Observe what the walls are made of
    1. Thatch, straw
    2. Mud and poles
    3. Bricks
    4. Cement blocks
    5. Stone
    6. Others (specify)

15. Observe what the roofs are made of
    1. Thatch, straw
    2. Mud
    3. Wood
    4. Iron sheet
    5. Asbestos
    6. Roofing tiles
    7. Others (specify)
16. Observe the floor material
    1. Earth
    2. Cement
    3. Tiles
    4. Bricks
    5. Stone
    6. Wood
    7. Other (specify)
17. What type of fuel do you often use for cooking?
    1. Fire wood
    2. Charcoal
    3. Kerosene
    4. Electricity
    5. Gas
18. Who collects the fuel?
    1. Adult female
    2. Adult males
    3. Girl children

4. Boy children

19. How much time do you spend collecting fuel?
    1. Less than 1 hour
    2. 1-2 hours
    3. 3-5 hours
    4. More than 5 hours
20. What is your household's main source of water?
    1. Bore hall
    2. Well
    3. River/stream
    4. Tape/piped water
    5. Harvested rain
21. Time taken to reach water source----------
22. How reliable is water?
    1. Always available
    2. Seasonal
    3. Occasional problems
    4. Frequent problems
23. How do you treat water for drinking?
    1. Not treated
    2. Boiling
    3. Using chemicals
    4. Filter
    5. Sedimentation
    6. Solar disinfection
    7. Others (specify)

24. Who fetches water?
    1. Adult female
    2. Adult male
    3. Girl children
    4. Boy children
    5. Others (specify)
25. What type of toilet do you typically use?
    1. No facility (open defecation)
    2. Pit latrine without slab/open pit
    3. Pit latrine with slab
    4. Ventilated improved pit latrine
    5. Flush toilet to pit
    6. Flush toilet to septic tank
    7. Flush toilet to sewer system
26. When do you wash your hands (tick all that she mentions)
    1. Before eating
    2. After eating
    3. Before cooking
    4. Before feeding the child
    5. After going to the toilet
27. What do you normally wash your hands with?
    1. Water only
    2. Water with soap
    3. Water with ash
    4. Others (specify)

PART B: PARITY OF THE MOTHER AND FEEDING PRACTICES

28. Age of the mother with first pregnancy----------

29. What order of birth is your current child? ----------

30. How old is your current child? ----------

31. Was the child born single or multiple?

    1. Single
    2. Twins
    3. Triplets
    4. More

Breastfeeding

32. When your child was born, what was the first thing you fed him/her?

    1. Breast milk
    2. Water
    3. Herbal medicine
    4. Very thin porridge
    5. Other (specify)

33. After the child was born, how long did it take to breastfeed him/her

    1. Within one hour
    2. Within two hours
    3. More than two hours

34. Did you breastfeed your child with yellowish milk (colostrum) produced for the first three days?

    1. Yes
    2. No

If the answer above is no give reasons

35. Do you breastfeed your child exclusively?
    1. Yes
    2. No

If yes go to the following question (qn 36)

If no why?

36. How many times do you breastfeed your child per day? ----------
37. How do you know that your child is satisfied when breastfeeding him/her?
    1. The child stops suckling
    2. The child sleeps
    3. The child urinates and defecates frequently
    4. The volume of the milk in the breast is reduced
    5. Others (specify)
38. How do you breastfeed your child?
    1. Both breasts at a time
    2. Let the child feed from one breast until it is empty then give him/her another breast
    3. Others (specify)
39. How long do you think a child should be exclusively breast fed?
    1. 3 months
    2. 4 month
    3. 4-6 months
    4. More than 6 months
40. How do you ensure exclusive breastfeeding to your child when you are at work/farm?
    1. Express breast milk

2. Your employer gives you permission to come home and breastfeed
3. The child is brought to your working place to be breastfed
4. You set time aside for breastfeeding
5. Others (specify)

41. If the answer above is (1), what technique do you use to express the breast milk?
    1. A hand
    2. A machine
42. Who gave you the idea of expressing milk for your child? ----------
43. What strategy do you use to make sure you express enough milk for your child?
    1. No strategy used
    2. Let the child suck before expressing
    3. Drink a lot of fluids
    4. Others (specify)
44. How do you store the expressed milk before it is fed to the child?

45. Before giving the stored expressed milk to the child, what do you do?
    1. Boil the milk
    2. Warm the bottle containing milk in hot water
    3. Leave the milk in an open air
    4. Nothing is done
46. Who feeds the child when you are not around? ----------
47. Do you face any challenge in ensuring exclusive breastfeeding to your child? Mention any 3.
    1. ----------
    2. ----------
    3. ----------

48. Does your society have any myth regarding breastfeeding?
    1. A woman who becomes pregnant must stop breastfeeding
    2. A baby with diarrhea should not be breastfed
    3. A breastfeeding mother has to drink a lot of fluids
    4. A breast feeding mother cannot take birth control pills
    5. A breast feeding baby needs extra water in hot weather
    6. The first yellow milk is dirty and not good for the baby

Complementary feeding

49. Is your child still breastfeeding?
    1. Yes
    2. No

If the answer is no

50. Why are you not breastfeeding?
51. At what age did you start giving foods other than breast milk to your child?
    1. 3 months
    2. 4 months
    3. 5 months
    4. 6 months
    5. 7-8 months
52. What foods were introduced first?
53. How did you prepare the first you introduced to the child?
54. How many times do you feed your child?
    1. 2 times
    2. 2-3 times

3. 3-4 times
4. 5 times

55. How do you prepare your child's meal?
    1. Separately from the family meal
    2. Together with the family meal
    3. No food is prepared particularly for the child
56. How do you normally feed the child?
    1. From the common plate
    2. Separately from his/her plate
    3. Eat with other children
    4. Feed the child when all members of the family are eating
57. Food fed to the child for the past 24 hours (yesterday)

(Ask the mother if the child eat anything yesterday. Also ask if yesterday was a normal day. Then let her tell you the foods that were given to the child from the time she/he woke up to the time the child went to sleep. Ask all ingredients used to prepare mixed meals.

The food should be at least 15 grams.)

breakfast	snacks	lunch	snacks	dinner	snacks

58. Transfer the information of food intake to the IDDS sheet.

59. Did your child eat as always yesterday?

    1. Yes
    2. No

If the answer above is no

60. What was the reason?

PARTY C: DISEASE HISTORY AND HEALTH SERVICES

61. Was your child sick within the previous two weeks?

    1. Yes
    2. No

If the answer above is yes

62. What was she/he suffering from?

    1. Malaria
    2. Diarrhea
    3. Respiratory infection
    4. Others (specify)

63. Where was the child taken for treatment?

    1. Health facility
    2. Tradition doctor
    3. No where
    4. Others (specify)

64. How far is the health facility? ----------

65. Does your child sleep under the net?

    1. Yes
    2. No

If the answer is no

66. Why is he/she not sleeping under the net?

67. Has the child received Vitamin A for the last 6 month?
    1. Yes
    2. No

68. Has the child been immunized according to her/his age? (Ask the mother to give you a clinic card for the child to confirm with immunization)
    1. Yes
    2. No

PART D: ANTHROPOMETRIC MEASUREMENTS OF A CHILD

69. What was the birth weight of the child? ---------- (see the clinic card for birth weight)
70. Was the child born mature of pre-mature
    1. Mature
    2. Pre mature

71. Take the following measurements of the child.

Name	sex	Age (in months)	Weight (kg)	Length(cm)