NUTRITIONAL STATUS AMONG CHILDREN AGED 6 TO 23 MONTHS AND MOTHERS KNOWLEDGE ON COMPLEMENTARY FEEDING PRACTICES IN SELECTED VILLAGES OF CHAMWINO DISTRICT

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By

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A Dissertation Submitted in (partial) Fulfillment of the Requirements for the Degree of Master of Public Health of Muhimbili University of Health and Allied Sciences

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CERTIFICATION

The undersigned certify that he has read and hereby recommend for acceptance by Muhimbili University of Health and Allied sciences a dissertation entitled: **Nutritional status among children aged 6 to 23 months and mothers knowledge on complementary feeding practices in selected villages of Chamwino district, Dodoma,** in partial fulfillment of the requirements for the degree of Master of Public Health of Muhimbili University of Health and Allied Sciences.



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I, Jane Esther Mushaija, declare that this dissertation is my original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

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DEDICATION

I dedicate this work to the following:

I would like to dedicate this work to may late beloved parents Mr and Mrs E Mushaija who always aspired my success.

My beloved husband Raymond Mungaya, my precious daughters Lisa and Constansia, my brothers Gilead and Elisha, and the family of Mr. and Mrs. Ngunangwa.

ABSTRACT

Adequate nutrition during infancy and early childhood is fundamental to the development of each child's full human potential. During the period of complementary feeding, children are at high risk of under nutrition. Complementary food is the additional nutrient-rich food and drink that is recommended for children from six months of life.

This study aimed at studying nutritional status by using criteria of stunting and underweight among children of 6 to 23 months. Also the study aimed to ascertain whether mother's knowledge on complementary feeding practices and other factors were associated with nutritional status of these children in Chamwino district.

This was a cross-sectional study done in Chamwino district, involving mothers of children aged six to 23 months who were attending RCH clinic. Total sample size was 264. Anthropometric measurements using weight-for-age and height-for-age criterion were employed to assess the nutritional status. Chi-square test was used to examine the association between the dependent and independent variables. Multivariate logistic regression was performed to determine independent variables that predict nutritional status.

The study showed that (62.9%) were stunted and (17.1%) were underweight. Majority of mothers (65%) were found with moderate knowledge on complementary feeding practices followed by (28%) in poor and (7%) in high knowledge categories. The most common type of complementary foods was grains food and green vegetables. There was a statistically significant association between fever and underweight.

Nutrition should be improved at this age, in order to have beneficial effects on growth and health of children. There is an urgent need to improve traditional complementary foods in terms of energy density and bioavailability of macro and micronutrients. Efforts should also be undertaken to mobilize the community members to adopt practices that favor good nutrition of children.

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LIST OF ABREVIATION

MDG	Millennium Development Goals
MPEE	Ministry of Planning, Economy and Empowerment
NBS	National Bureau of Statistics
PAHO	Pan American Health Organization
RCH	Reproductive and Child Health
SPSS	Statistical Package for Social Sciences for Windows
TDHS	Tanzania Demographic Health Survey
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
USAID	United States Agency for Internal Development
WHO	World Health Organization
WISHH	World Initiative for Soy in Human Health

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background information

Adequate nutrition during infancy and early childhood is fundamental to the development of each child's full human potential. It is well recognized that the period from birth to two years of age is a "critical window" for the promotion of optimal growth, health and behavior development. Longitudinal studies have consistently shown that this is the peak age for growth faltering, deficiencies of certain micronutrients, and common childhood illnesses such as diarrhea. After a child reaches 2 years of age, it is very difficult to reverse stunting that has occurred earlier (Martorell *et al*, 1994).

Children, as one of our most vulnerable populations face unusually high health risks as they grow. This shows most clearly and especially in children, they are under 5 years old. Most brain development happens before a child reaches three years old. In the past almost people were not understandable that all cognitive, psychological and functioning of brain will enlarge rapid growth and change during the first three years of life. In the first three-year period of life, children develop their abilities to think and speak, learn and reason and lay the foundation for their values and social behaviors as adults. With brain connections proliferating during the first three years of life, children are detecting new things helpful every waking moment. At birth a child has about 100 billion brain cells. Most of them cannot connect to each other. These connections are wonders of the human body depending partly on genes and on the events of early life. Many kinds of experience affect how young brains develop, but nothing is more important than early care and nutrition (UNDP 2001).

Complementary food is the additional nutrient-rich food and drink that is recommended for children from six months of life. The transition from exclusive breastfeeding to complementary feeding (which includes continued breastfeeding) typically covers the period

from six to 18–23 months of age. This is a very vulnerable period as it is the time when malnutrition starts in many children. Thus, it is essential that infants receive appropriate, adequate and safe complementary foods to ensure the right transition from breastfeeding to the full use of family foods.

Many researchers agree that socio-economic and environmental conditions, together with feeding practices, are important determinants of malnutrition in developing countries. Inadequate quantity and poor quality of food result in growth faltering, which is exacerbated by the high prevalence of fevers and diarrhea diseases. Inappropriate feeding patterns may also contribute to child malnutrition (Vella *et al*, 1992; Mwadime and Baldwin, 1994).

Under nutrition is responsible for at least 35% of under-5 deaths (Black *et al*, 2008). It is also a direct cause of mortality, and a major disabler preventing children who survive to reach their full developmental potential. An estimated 32% of children less than 5 years of age in developing countries are stunted. Lack of appropriate breastfeeding and complementary feeding practices can also initiate the problem of overweight and obesity that may only become most apparent in children beyond the age of 2 years (WHO, 2008).

The effects of malnutrition on human performance, health and survival have been the subject of extensive research for several decades and studies show that malnutrition affects physical growth, morbidity, cognitive development, reproduction, and physical work capacity. Malnutrition is an underlying factor in many diseases children and it contributes greatly to the disability-adjusted life years worldwide. Malnutrition is particularly prevalent in developing countries, where it affects one out of every three preschool-age children (UN, 2004).

Despite improvements over the last five years, rates of malnutrition among Tanzanian children remain high. According to data from the Tanzania Demographic and Health Survey (TDHS) 2004/05, about 40% of children under five years of age are stunted, i.e. they are short for their age, which is an indicator of chronic under nutrition. About 3% are wasted, i.e. they

have low weight for height, which is an indicator of acute under nutrition (NBS, 2005). Approximately 22% of children are underweight (low weight-for-age), which is a composite measure of long and short-term under nutrition. This last indicator is one of the Millennium Development Goals (MDG) indicators. MDG1 aims to halve the prevalence of underweight children under fives years of age in Tanzania from 28.8% (1990 baseline) to 14.4% by 2015 (MPEE, 2006), which will only be achieved with much greater, focused effort). Infant and young child feeding practices are important determinants of the health and nutrition status of children below the age of five years

Complementary foods should be introduced when a child is six months old to reduce the risk of malnutrition. In Tanzania early complementation is common with about 7 percent of infants being complemented at the age of 2 months and 32 percent at 2 -3 months. The data also shows that about 9 percent of infants are not complemented at 6 – 9 months of age. The frequency of child feeding is too low; the nutrient density is inadequate. (TDHS, 2004-2005).

In Dodoma complementary foods were reported to be introduced when the infant is three to four months of age (Mabilia 1996). Mabilia established that weaning patterns were influenced by seasonal factors, with adult staples being introduced at the end of long rains in Dodoma.

Mothers should have access to skilled support to help them initiate and sustain appropriate feeding practices, and to prevent difficulties and overcome them when they occur (WHO/UNICEF, 2003).

1.2 Operational Definitions

Complementary feeding - The process starting when breast milk alone or infant formula alone is no longer sufficient to meet the nutritional requirements of infants, and therefore other foods and liquids are needed, along with breast milk or a breast-milk substitute. The target range for complementary feeding is generally taken to be 6 to 23 months (PAHO & WHO, 2002).

Nutritional status - In this study nutritional status was measured by using height-for-age (Stunting) and weight-for-age (underweight) to children aged 6 to 23 months.

Mothers - In this study, women are individuals of female gender who have infant and young children aged 6 to 23 months in Chamwino district, who is attending antenatal care.

Children - In this study, children are that older infant and young child whom their ages range between 6 to 23 months, in Chamwino district.

Under nutrition - the outcome of insufficient food intake and repeated infectious diseases. It includes being underweight for child's age and too short (stunting) for child's age.

1.3 Problem Statement

Malnutrition among underfive years old children is a public health concern in Tanzania with the high prevailing rates showing little improvement over the years. Growing children in particular are most vulnerable to its consequences. Breast milk may be a sole and sufficient source of nutrition during the first 6 months of life (PAHO & WHO, 2001). However, towards middle of first year, even breast milk provided by the best-nourished mother is insufficient to support the growing infant (Weaver, 1994). This critical transition period is associated with dramatic increase in malnutrition among infants (Mamiro *et al*, 2005).

By residence, the nutritional status of rural children is significantly poorer than urban children. TDHS 2004/05 data show that 41% of rural children under five years of age were stunted compared with 26% of urban children (NBS, 2005).

Generally, nutritional status among children is affected by food intake, health, and caring practices (Leach *et al*, 2009). Without proper nutrition, children suffer devastating consequences. Malnutrition leads to more severe childhood illnesses, stunted physical and mental growth, and death. Many undernourished children are too fragile survive even the

most common illnesses like diarrhea. As a result, malnutrition is an underlying cause of more than one out of every three child deaths in poor countries each year and a major contributor to the burden of disease worldwide (USAID, 2009).

Infant and young child feeding practices directly affect the nutritional status of children under two years of age and, ultimately, have an impact child survival. Improving infant and young child feeding practices in children 6-23 months of age is therefore critical to improved nutrition, health and development of children (WHO, 2008). Poor feeding practices are major threat to social and economic development; they are among the most serious obstacles attaining and maintaining health that face this age group. Proper feeding practices are the cornerstones of care for infants and young children (WHO, 2002).

Infants and children are among the most vulnerable victims of natural or human-induced emergencies. Interrupted breastfeeding and inappropriate complementary feeding heightened the risk of malnutrition, illness and mortality (WHO, 2003). Inadequate knowledge about appropriate foods and feeding practices is often a greater determinant of malnutrition than the lack of food.

Children under two years are a most vulnerable group due to dramatically changes of their growth, and they are susceptible to many health problems like malnutrition (poor nutritional status). Appropriate complementary feeding practices and access to adequate amounts of appropriate foods are essential for optimal infant and young children's nutrition. Indeed, some researchers have reported or suggested that mothers do not consider nutritional status, but rather use developmental criteria, such as the child's physical and mental independence from the mother (ability to walk or to eat independently, willingness to be separated from the mother) for introduction of complementary foods. (Brown *et al*, 1998).

Mothers' proper knowledge on complementary feeding practices play vital role to enhance health status of their children. However, perceptions and practices of mothers on using breast

milk substitute are not well-documented (Roy *et al*, 2002). In Dodoma, where level of stunting (61%) and underweight (47%) are the major public health problem, little is known about the interaction between mother's knowledge on complementary feeding practices and nutritional status. Therefore, a study was designed to determine the mothers' knowledge on complementary feeding practices in relation to the nutritional status of their children.

1.4 Study Rationale

Little research in Tanzania has been done to look into details the association of nutritional status and mother's knowledge on complementary feeding practices. This study focused on nutritional status and mother's knowledge on complementary feeding practices. The study findings will be used as a base for recommendations on how to improve the level of mothers' knowledge and practice in complementation practices of infants and young children. This increase will contribute to the nutritional status hence lower malnutrition of children under two years.

The study will also contribute to the already existing body of knowledge on the complementary practices. Recommendations based on extent of knowledge and nutritional status will facilitate on reducing child morbidity and mortality, which are caused by malnutrition by practicing good complementary practices.

1.5 Research Questions

1. What is the current nutritional status among the children in the study area?
2. Do types of complementary food, frequency of eating per day influence nutritional status of the child?
3. Is there an association between the nutritional status of children and their mothers' knowledge on complementary feeding practices?
4. How nutritional status of the child is affected by illness?

1.6 Study Objectives

1.6.1 Broad objective

To assess nutritional status among children aged 6 to 23 months and mothers' knowledge on complementary feeding practices.

1.6.2 Specific Objectives

1. To determine the nutritional status of children aged 6 to 23 months, by age and sex using weight-for-age and height-for-age.
2. To assess knowledge of mothers on complementary feeding practices in relation to nutrition status of their children.
3. To identify the type of complementary foods fed to children using 24 hours diet recall.
4. To assess nutritional status of children in relation to feeding practices during and after illness.

1.7 Conceptual framework diagram

Causes of malnutrition in children are complex, ranging from biological and social to environmental factors (Wamani *et al*, 2005). Base on previous research about the causes of malnutrition, a conceptual framework was constructed. In this model (Fig. 1) variables were divided into two groups: direct causes of malnutrition were indicated by the feeding frequencies, knowledge on appropriate foods, socioeconomic status, knowledge on weaning debut, feeding frequency and level of mother's education. Indirect causes were indicated by cultural practices, poor hygiene, inadequate supply of water, ill health. These variables in turn, may affect the nutritional status of children.

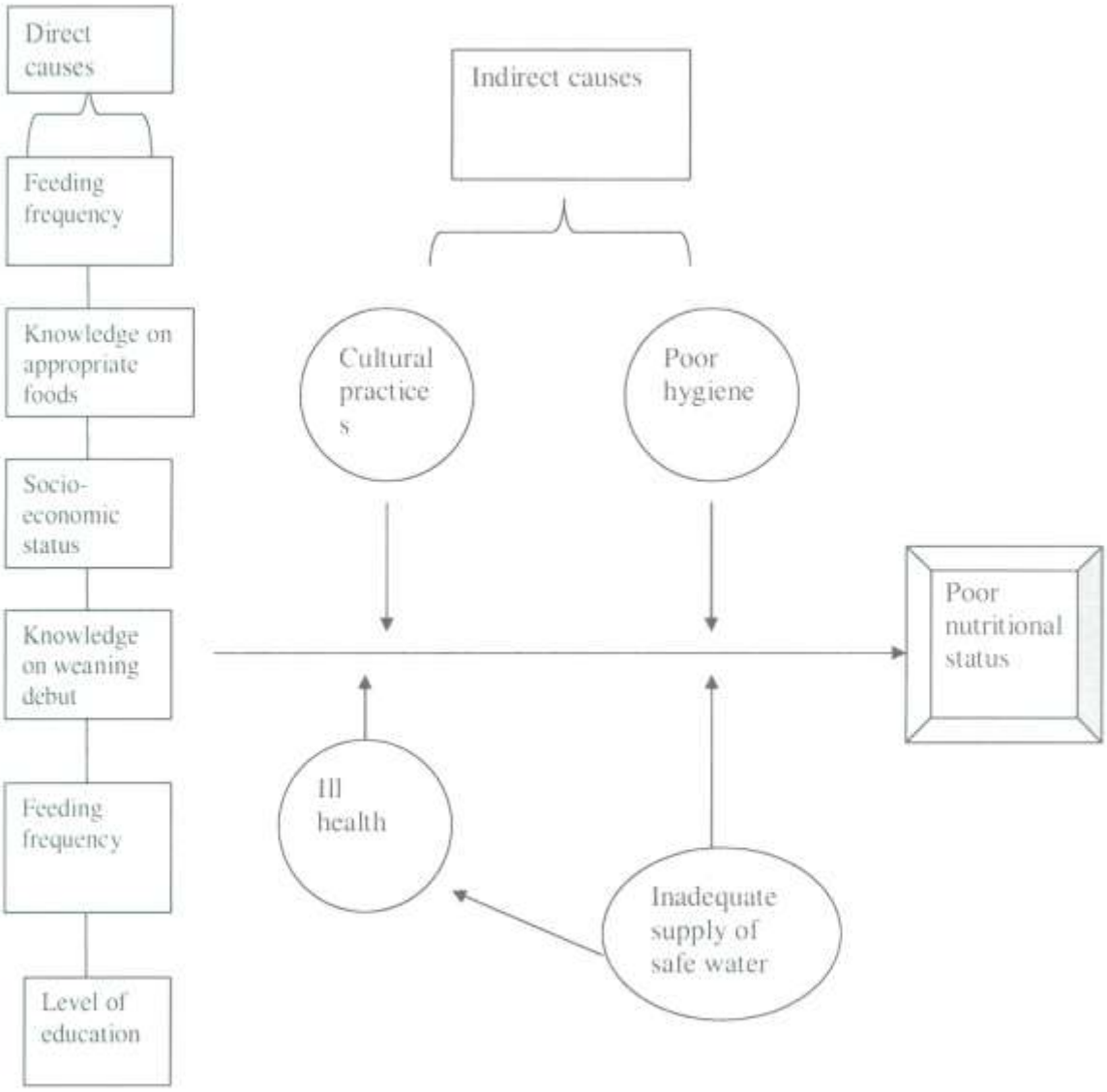


Figure 1: Conceptual framework for the causes of malnutrition in children under two years of age

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Nutritional status of children aged 6-23 months

Good nutrition is the cornerstone for survival, health and development. Well-nourished children perform better in school, grow into health adults and in turn give their children a better start in life. Infant and young child feeding practices, including breastfeeding and the introduction of complementary foods are important determinants of the nutritional status of children, which in turn influence their health status. Infants and young children from 6-23 months are particularly vulnerable to malnutrition. To ensure that their nutritional needs are met, complementary feeds need to be timely, nutritionally adequate, safely prepared and property fed (WHO, 2002).

According to the World Bank, repositioning nutrition is central to development (World Bank, 2006). There underlying causes of malnutrition in children which are; inadequate access to food, insufficient health services and unhealthy environment, and inadequate care for mothers and children. Inadequate care is least taken into account in nutrition interventions. Six categories of care are recognized; care of women, young child feeding practices, psychosocial care, and preparation of meals, hygiene behaviors, and health behavior.

Adequate complementary feeding is necessary for maintaining good nutritional status of children under-two years. This is also the most complex intervention, because complementary foods for children 6-23 months need to be contextually appropriate, in terms of both using locally available foods and optimizing positive culture beliefs and behaviors, while minimizing or changing negative behaviors.

The health and nutritional status of infants and children aged 6-23 months is largely influenced by the feeding practices. According to the TDHS (2004-05), the prevalence of underweight, stunting and wasting are high in Tanzania. A study done by Kulwa *et al*, (2006)

in Dar es salaam results show that the prevalence rates of stunting, underweight, wasting and morbidity were 43%, 22%, 3% and 80%, respectively. The prevalence of exclusive breastfeeding was very low (9%), and most stunted children (88%) were not exclusively breastfed for the first 6 months.

2.2 Breastfeeding

Breastfeeding is an unequalled way of providing ideal food for the healthy growth and development of infants; it is also an integral part of the reproductive process with important implications for the health of mothers. As a global public health recommendation, infants should be exclusively breastfed 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 while breastfeeding continues for up to two years of age or beyond. Exclusive breastfeeding from birth is possible except for a few medical conditions, and unrestricted exclusive breastfeeding results in ample milk production (WHO, 2002).

Even after complementary foods have been introduced, breastfeeding remains a critical source of nutrients for the young infant and child. It provides about one-half of an infant's energy needs up to the age of one year, and up to one third during the second year of life. Breast milk continues to supply higher quality nutrients than complementary foods, and protective factors. It is therefore recommended that breastfeeding on demand continues with adequate complementary feeding up to 2 years or beyond (PAHO & WHO, 2002).

Reviews of studies from developing countries show that infants who are not breastfed are 6 to 10 times more likely to die in the first months of life than infant who are breastfed (WHO, 2000; Bahl *et al*, 2005). Diarrhea and pneumonia are more common and more severe in children who are artificially fed, and are responsible for many of these deaths (De Zoysa *et al*, 1991; Bachrach *et al*, 2003). Diarrhea illness is also common in artificially fed infants even in situations with adequate hygiene.

The timing of the introduction of complementary food in addition to breast milk has important implications for the health of the child. Thus, while the practice of exclusive breast-feeding for up to six months of age is considered beneficial, additional food prior to this age is considered to have no added advantage. After the age of six months, breast milk alone can no longer satisfy the child's increased physiological requirements for energy and specifically for macro- and micro-nutrients: therefore, other food to complementary breast milk should be given (Maseta *et al*, 2008).

2.3 Complementary Feeding Practices

After the period of exclusive breastfeeding, the diet undergoes a change, from a single food-breast milk, to a variety of complimentary foods plus breast milk, to meet infants' nutritional requirements. This period is associated with not only increasing and changing nutrient requirements, but with rapid growth, physiological maturation and development of the infant. Poor nutrition during this critical period of life may increase the risk of growth faltering and micronutrient deficiencies, and may have adverse effects on health and mental development. Thus, improved complementary feeding practices at this period of life are among the most cost-effective public health tools.

From the age of 6 months, an infant's need for energy and nutrients starts to exceed what is provided by breast milk, and complementary feeding becomes necessary to fill the energy and nutrient gap (Dewey et al, 2003). If complementary foods are not introduced at this age or if they are given inappropriately, an infant's growth may falter. In many countries, the period of complementary feeding from 6-23 months is the time of peak incidence of growth faltering, micronutrient deficiencies and infectious illnesses (Dewey and Adu-Afarwuah, 2008).

Complementary foods need to be nutritionally, adequate, safe, and appropriate fed in order to meet the young child's energy and nutrient needs. However, complementary feeding is often fraught with problems, with foods being too dilute, not fed often enough or in too small amounts, or replacing breast milk while being of an inferior quality. Both food and feeding

practices influence the quality of complementary feeding, and mothers and families need support to practice good complementary feeding (PAHO & WHO, 2002).
For good growth, children need to eat a mixture of foods. Foods like sorghum, millet, rice, maize, cassava, potato and plantain all provide energy. These are often made into soft porridges for babies. Small amount of bodybuilding, protective and energy-rich foods need to be added to this porridge made from staple foods. Fats and oil are very rich in energy (UNESCO).

Infants and young children need to be fed a variety of foods to ensure that nutrient needs are met. Meat, poultry, fish or eggs should be eaten daily, or as often as possible. Vegetarian diets cannot meet nutrient needs at this age unless nutrient supplements or fortified products are used. Vitamin A-rich fruits and vegetables should be eaten daily. Mothers should provide diets with adequate fat content. They should avoid giving drinks with low nutrient value, such as tea, coffee and sugary drinks such as soda. Amount of juice offered to avoid displacing more nutrient-rich foods should be limited (WHO, 2001).

A number of independent factors, such as the child's appetite, the caregiver's feeding behaviors, and the characteristics of the diet themselves, may influence the amounts of complementary foods that are consumed (Dewey and Brown, 2003).

Many children stop growing well when they are about 6-12 months old. Often this is because they do not obtain enough energy from their food. Young children cannot get enough energy from thin porridges made from cereal flour like maize or millet. This is because the flour swells up when it is mixed with water and cooked. A child's stomach will only hold about one cupful of food and this amount of thin porridge will not provide enough energy to grow. Children need energy-rich meals (UNESCO).

2.3.1 Frequency of feeding complementary foods

Mothers or caretakers should increase the number of times that the child is fed complementary foods, as he/she gets older. The appropriate number of feedings depends on the energy density of the local foods and the usual amounts consumed at each feeding. For the average healthy breastfed infant, meals of complementary foods should be provided 2-3 times per day at 6-8 months of age and 3-4 times per day at 9-11 and 12-23 months of age. Additional nutritious snacks (such as piece of fruits or others) may be offered 1-2 times per day, as desired. Snacks are defined as foods eaten between meals, usually self-fed, convenient and easy to prepare. If the child is no longer breastfed, meals that are more frequent may be required (WHO, 2001).

Young children most of them may not get enough energy is because they are not fed often enough. Children are often fed only once or twice a day. This is not enough. Small children need to have meals and snacks at least 4 to 5 times a day (UNESCO).

2.3.2 Timing of introduction of complementary foods

The target age range for complementary feeding is generally taken to be 6 to 23 months of age, even though breastfeeding may continue beyond two years. The human milk in reasonable quantities alone cannot provide all the energy and protein required for maintaining an adequate velocity of growth for the infant after the age of 6 months. It is therefore necessary to introduce more concentrated nutritional supplements beyond this age. Complementary before 6 months is called early and after 9 months is called late, early complementary feeding is associated with obesity, stress the immature gut, kidneys and immune system. The late complementation may result in under nutrition and feeding problem (Wilson *et al.* 1998). In the population, infants exclusively breastfed up to 6 months are less affected by diarrhea and do not have growth deficits (WHO, 2003).

Complementary feeding practices starts at the age of 6 months. Between the ages of 6-8 months, pureed and mashed foods can be introduced and given from a cup or bowl. Viscosity of the foods can affect the volume and nutrient consumption of the complementary foods (Kimmons *et al*, 2004; Stephenson *et al*, 1994). From 8-12 months of age cut up foods that can be handled by the child are appropriate. After 12 months of age, family foods should be relied on for nutrient supplies (WISHH, 2006)

In rural Mexico, show that the mean age at which children was introduced to other liquids was 2 months (range 0-5) and to solids 4 months (range 1-8). Food was introduced at 2 to 6 months of age when milk was not enough to satisfy the child's hunger (Lipsky *et al*, 1994). A study done at Rajasthan on infant feeding and weaning practices, results show that 9.1% of mothers introduced supplementary foods before 3 months of age, 15.6% of mothers introduced these foods at 3-6 months of age, 36.0% began supplementation at 6-12 months, and 24.1% waited until after 12 months of age. The mean age at food supplementation initiation was 8.7 months far beyond from the recommended time of 4-6 months (Singh *et al*, 1997). A study conducted in rural Bangladesh showed that 2.4% of infants were given complementary foods at 1 month of age. At 6 months of age two-third (66.7%) of infants were fed with complementary foods that increased to 95% at 9 months of age (Saha et al, 2008).

A study done by Kikafunda et al, (2003) in Central Uganda looked at weaning foods and practices; results showed that the negative weaning practices of introducing complementary foods too early was highly prevalent with almost half of the children (44.1%) having started complementary feeding before the age of four months.

In Tanzania, available literatures show that complementary foods are usually introduced at an early age. Study done by Kulwa *et al*, (2006) in Dar es Salaam show that the mean age at which complementary foods and fluids were introduced was 3.26 +/- 1.12 months (range, 1 to 5 months), where as in Dodoma , most breastfed infants are provided with additional foods after 3-4 months (Mabilia, 1996).

2.3.3 Mothers' knowledge on Complementary feeding practices

Appropriate complementary feeding depends on accurate information and skilled support from the family, community and health care system. Inadequate knowledge about appropriate foods and feeding practices is often a greater determinant of malnutrition than the lack of food. Moreover, diversified approaches are required to ensure access to foods that will adequately meet energy and nutrient needs of growing children, for example, use of home- and community- based technologies to enhance nutrient density, bio- availability and the micronutrient content of local foods (WHO, 2003).

Mothers, fathers and other caregiver's should have access to objective, consistent and complete information about appropriate feeding practices, free from commercial influence. In particular, they need to know about the recommended period of exclusive and continued breastfeeding; the timing of the introduction of complementary foods; what types of food to give, how much and how often; and how to feed these foods safely (WHO/UNICEF, 2003). Mothers should have access to skilled support to help them initiate and sustain appropriate feeding practices, and to prevent difficulties and overcome them when they occur.

Among the nomadic tribes, such as the Wadatoga of Mbulu district, a combination of maternal self-perception, assessment of infant well-being, and indicators of household food supply influenced the actual progression of weaning for individual children (Sellen, 2001)

Many parents struggle to provide nutritious balanced meals for their young children because they lack the resources to grow or purchase nutritious foods, and lack the time or knowledge on how to prepare appropriate meals with the local foods available in their households (Elisaria, 2009).

Study done by Shirima *et al*, (2001) in Morogoro show that the urban mothers were nearly always more knowledgeable in respect to early infant feeding issues than the rural ones. In

breast-feeding management, most mothers in both were unaware of key issues. Advantages of breastfeeding mentioned by all mothers were related only to the baby.

2.3.4 Feeding a sick child

Children become malnourished because their diets do not contain sufficient nutritious food or because of repeated episodes of ill health. These diseases include malaria, attacks of diarrhea, pneumonia and other illnesses. Tanzanian children are often affected by poor diets and ill health at the same time. When children get sick, they lose their appetite while their bodies demand extra energy and nutrients to fight the infections are leading causes of malnutrition in Tanzania. Factors such as poor water supply, hygiene and sanitation increase the risk of illnesses (Elisaria, 2009).

Sick children may not want to eat – this is very dangerous. Sick children need to be encouraged to eat and drink as often as possible. A child who has been ill needs extra food. He can be fed at least 6 times a day until he gets back the weight he lost during the illness. Children with diarrhea and chest infections need to eat soft foods, which are easy to eat, taste good and are free from germs (UNESCO).

Fluid intake during illness should be increased, including more frequent breastfeeding, and mothers/ caregivers should encourage the child to eat soft, varied, appetizing, favorite foods. After illness, children should be given food more often than usual and encouraged to eat more (WHO, 2003).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study design

The study design was an analytical cross-sectional, using quantitative method of data collection and analysis. Analytical cross-sectional study design is used to investigate the association between a putative risk factor and a health outcome (Hennekens *et al.*, 1987). In this study the design was used to establish an association between nutritional status and other factors.

3.2 Study area

The study was conducted in Chamwino district, one of the six districts in Dodoma region, Central of Tanzania. The area was purposively chosen because Dodoma is among the regions that have high prevalence of malnutrition: according to TDHS 2004-05. The prevalence of stunting and underweight in the region (according to TDHS 2004-05) is as follows: stunting is 44.4% and 16.6% for moderate and severe stunting respectively; while for underweight it is 30.4% and 16.6% for moderate and severe underweight respectively. Chamwino district was chosen because according to the TDH survey done, rural areas have high prevalence of malnutrition than in urban areas.

The district has 5 divisions, 28 wards and 72 villages. According to 2008 district statistics; the estimated total population of the district was 294,829 people of which 58,966 are women of childbearing age. The survey was conducted in 8 villages, namely Mvumi, Ndebwe, Handali, Ilolo, Mvumi makulu, Manchari, Chinangali, and Chamwino Ikulu.

The total number of health facilities is 52 including 48 dispensaries, 3 health centers and one hospital. One dispensary and the hospital are owned by faith-based organizations while the rest of the facilities belong to the Government. The district has 7 mobile services and 36 outreach services to the places where there are no health services.

3.3 Study populations

The subjects were infants and young children, aged 6-23 months and their mothers, from Chamwino district, who were attending reproductive and child health clinics. Only one child per mother was studied.

3.3.1 Inclusion and exclusion criteria

Mothers with children of six to 23 months was eligible for the study because at the age of six months is the age appropriate for introduction of complementary foods as per WHO. Only children whose mothers were available and willing to participate in the study were recruited. Children who were below 6 months of age and above 23 months of age, and those whose mothers were not available or were not able to participate, were excluded from the study.

3.4 Sample size

A sample size of 264 children was obtained. The sample size obtained by using the single proportion formula (Kirkwood, 2003):

$$n = \frac{z^2 p (100 - p)}{\varepsilon^2}$$

Where:

n = the minimum desired sample size

p = 22 %, proportion of underweight children in Tanzania

z = standard normal deviate value that corresponds to some confidence level (e.g. z =1.96 for 95% confidence level)

ε = margin of error on estimated proportion (put at 5% in this study)

$$n = \frac{3.84 \times 22(100-22)}{25}$$

n = 264 children

3.5 Sampling technique

The subjects of study consisted of all mother-child pairs who attended ante-natal care clinics. A multistage random sampling technique was used whereby two out of five divisions of Chamwino district were randomly selected in the first stage. From the two divisions, four wards were selected randomly. From each ward, two villages were randomly chosen. Mothers of selected children who attended RCH clinic during the time of the survey and those who were willing to participate in the study were interviewed for collecting the desired information. The RCH cards of their children were checked to confirm the age of the child before the interview.

3.6 Data collection techniques and tools

Face-to-face scheduled interviews with the sampled mothers were conducted using a questionnaire with both open and closed ended questions prepared to address all the important variables. A questionnaire was developed and implemented to collect data on demographic characteristics of mothers, child related data such as breastfeeding, child feeding, weight and length, feeding practices during and after illness and mother's nutritional knowledge on complementary feeding practices. The questionnaire were first prepared in English and then translated into Swahili language to ensure that the questions are clear and easily understood to the research assistants and participants. The interview was carried out individually and in private at the health centres. The health facilities were the interview took place was Mvumi mission hospital, Chamwino health centre, and at the dispensaries of Chinangali, Ndebwe, Handali, Manchari, Mvumi makulu and Ilolo dispensary, dispensary.

3.6.1 Dietary assessment

A qualitative 24-hours food recall was employed to capture all the foods and beverages consumed by the child 24 hours prior to the interview. The usual diet of the children was assessed using the diet history method whereby the mothers were asked if they usually fed listed foods to their children. Mothers were asked to recall about general feeding patterns in

the previous day, i.e. whether the baby was still breastfed, and the feeding of plain water, fruit juice, cow milk, and semisolid and solid foods. The data also included number of times the baby was breastfed during the day and night and the use of a bottle with a nipple to feed the baby.

3.6.2 Nutritional status assessment

A well-nourished child is one with access to adequate food supply, care and health. Such a child will have weight and height measurements that compare very well with the standard normal distribution of length (L) and weight (W) of healthy children of the same age and sex. Thus, the best way to evaluate the nutritional status and overall health of a child is to compare the child's growth indices with the cut-off points in the standard normal distribution of well-nourished children that are associated with adequate growth (de Onis *et al*, 1993).

The nutritional status of 264 children was assessed by anthropometric measurement using weight-for–age (WAZ) and length-for-age (LAZ) indices. The interview took place at the antenatal care clinics and weight measurements were taken from all infant and young children below the age of 2 years using the Salter hanging scale. Weight measurements were taken to the nearest 0.1 Kg with subjects wearing minimal clothing. Low weight-for-age index identifies the condition of being underweight, for a specific age. The advantage of this index is that it may reflect both past (chronic) and/or present (acute) under nutrition.

Height-for-age index is an indicator of past under nutrition or chronic malnutrition. For children below 2 years of age, the term is length-for-age. As of the study the age population of children was under 2 years therefore length-for-age was used instead of height-for-age. Recumbent length measurements were taken to the nearest 0.1cm using locally manufactured length boards, with the children shoeless.

The age of each child was obtained from the mother and confirmed from neonatal cards which are kept for each child until the age of five years. The Z-scores outcome was used as children

nutritional status according to WHO criterion on basis for length-for-age and weight-for-age for stunted and underweight respectively. For the anthropometric indices, the z-scores were calculated with reference to National Centre for Health Statistics (NCHS) standards. Classification of nutritional status basing on standard deviations (SD) was done according to WHO (1995) cut-off points were:

- Below or equal (-3SD) were classified as severely stunted or underweight
- Between (-3SD) and below (-2SD) were classified as moderately stunted or underweight,
- Between (-2SD) and (+2SD) defined as normal nutritional status (WHO 1995).

3.6.3 Mothers' knowledge on complementary feeding practices

Knowledge of complementary feeding practices among mothers was measured by asking 15 questions to the respondents on nutritional status classifications, frequency of breastfeeding, frequency of feeding according to age, composition of foods, and time and duration of complementary foods. Scores of 1 and 0 were assigned for correct and wrong response for each question, respectively. Thus, knowledge score of a respondent could range from 0 to 15, where 0 would indicate lowest score and 15 would indicate the highest score of knowledge on complementary feeding practices. The scores were put into three categories of 0-5 for low knowledge; 6-10 for moderate knowledge; and 11-15 for high level of category.

3.7 Pre-testing of data collection instruments

A questionnaire were developed and pre-tested on 5 mothers visiting the ante-natal care at Agakhan health in Dodoma urban district. Following this pilot test some questions were rephrased accordingly.

3.8 Recruitment and training of interviewers

The principal investigator recruited two research assistants. One-day training was undertaken for data collectors and emphasis was made on understanding the aim of the research and the

meaning of each question in the interview schedules by the principal investigator. Research assistants were trained in basic interviewing techniques and in taking weight and length measurements.

3.9 Reliability and Validity

- Pretest was launched to refine the instruments
- The physical measurement techniques were practiced to ensure a consistent and reliable application
- Leading questions were avoided as far as possible
- Examiners were trained before and during the survey in order to minimize potential errors
- Number of research assistants was limited in order to get accuracy data
- Different indicators were used for anthropometry (weight and height)

3.9 Data collection procedures

Data collection was conducted on June 2010 in two weeks by principal investigator and research assistants. Consent was first taken from health facility administration prior to interview sessions. Also informed consent was obtained from mothers of children about their participation in the study. Standardization of the questionnaire was done everyday after data collection and check for inconsistencies and omission. This helps to improve the quality of data collected.

3.10 Study variables

3.10.1 Dependent variable

Nutritional Status (weight-for-age to measure underweight and length-for-age to measure stunting).

3.10.2 Independent variables

1. Feeding practices
2. Age of starting complementary food
3. Mothers' nutritional knowledge
4. Frequency of feeding
5. Feeding practices during and after sickness
6. History of illness in past two weeks

3.11 Data processing and analysis

Collected data were edited during and after collection, sorted and coded. All data were entered into the SPSS version 13.0 for windows. Anthropometric data were processed and analyzed using a computer programme Epi Info (version 6). Z-scores of weight-for-age and length-for-age were computed using EPINUT of Epi-Info, according to the National Centre for Health Statistics standards, reference of 1978 (CDC/WHO). Other analyses i.e. frequencies, bivariate, and regression analysis were performed using SPSS.

Frequencies of variables were generated and cross tabulations made as bivariate analysis to test the significance of relationship between predictor variables and the nutritional status of children. An alpha level of 0.05 was considered statistically significant.

The study was intended to analyze the effects of various variables on nutritional status of children. Multiple linear logistic regression analysis was performed to determine independent variables that significantly predict the nutritional status of children under two years, with weight-for-age and height-for-age as the dependent variables. For both measurements of nutrition status (weight for age and height for age), variables that were found to be significantly associated with the dependent variable in bivariate analyses at 1% level (i.e. $P<0.10$), were included in the logistic regression model.

3.12 Ethical considerations

3.12.1 Permission to conduct the research

Ethical approval was obtained from Ethics Committee of the Muhimbili University of Health and Allied Science. Permission from the district administration, health authorities and in-charges of health facilities was obtained.

3.12.2 Voluntary participation

Mothers of targeted children were informed verbally about the purpose and benefit of the study. The right of respondents to participate in the study or not was respected. In addition to that, the respondents have all right to withdraw at any time during the process of interview.

3.12.3 Informed consent

Details of the study were explained to the mothers of the target children, and informed consent was obtained from caregivers before children were enrolled.

3.12.4 Confidentiality and anonymity

The study participants were assured for an attainment of confidentiality. In addition, the research assistant was trained to maintain confidentiality.

3.13 Study Limitations

Cultural issues were not well identified and how it affects mothers' knowledge on nutrition of their child. This was minimized by collecting data in different areas of the district. Another limitation of this study was small number of study participants, therefore the results cannot be directly generalized to the larger community of Tanzania, and this was due to time and financial constraints. Respondents may decide not to provide full information on what they know about feeding of their children even the way they feed their children daily. Also information bias may appear as respondents may decide to tell what the researcher wants to hear from them, but this was limited by avoiding leading questions.

CHAPTER FOUR

4.0 RESULTS

4.1 Characteristics of mothers

A total of 264 of mothers with children aged six to 23 months participated in the study. A large proportion (89.8%) of the respondents was older than 20 years, their mean age was 28.6 (± SD 11.9) ranging from 15 to 47 years. A larger proportion (50%) had completed primary school. Women with no formal education and primary school incomplete accounted for 33% and 10.6%, respectively of all the respondents. Few mothers had secondary (6.1%) and college education (0.4%). High percentage (86.4%) of the mothers participated in the study was married as compared to single (9.8%). When occupation was considered, the majority (92.4%) were peasant farmers. Probably due to low literacy levels, the rest (7.6%) were either housewife, employed or involved in business (Table 1).

4.2 Characteristics of Children

Among 264 children who were included, (149) 56.4% were males. Six to eight months were 85 (32.2%), 9-11 were 53 (20.1) and 12 -23 were 126 (47.7). The mean age (±Std deviation) of the children was 12.2 (±5.2).

Table 1: Demographic characteristics of Mothers

Variables	Number (%)
Age (years)	
<20	27 (10.2)
20-35	186 (70.5)
36-50	51 (19.3)
Education level	
Primary school complete	132 (50)
No formal education	87 (33)
Primary school incomplete	28 (10.6)
Secondary school	16 (6.1)
College/University	1 (0.4)
Occupation	
Peasant	244 (92.4)
Petty business	9 (3.4)
Housewife	9 (3.4)
Employed	2 (0.8)
Marital status	
Married	228 (86.4)
Single	26 (9.8)
Separated	6 (2.3)
Widowed	3 (1.1)
Cohabiting	1 (0.4)

4.3 Nutritional status

The nutritional status of children under two years of age was assessed on the basis of two indicators: weight-for-age (Underweight) and height-for-age (Stunting). In total more than half (62.9%), (95% CI 56.7- 68.7) of all sampled children were malnourished according to

height-for-age criteria; 31.8 (31.8%) were moderately malnourished, and 82 (31.1%) were severely malnourished. Also nutritional status of children was determined by measuring weight for age (underweight). According to weight for age classification; 219 (83%) were normal, 40 (15.2%) were moderately underweight and 5 (1.9%) were severely underweight (95% CI 12.7 – 22.1).

4.3.1 Stunting

The data indicate further that stunting was concentrated more in male children (65.1%) than in female children (34.9%) ($p < 0.05$). The level of stunting of boys seemed to be significantly higher than that of girls.

The prevalence of stunting is lowest at the age of six to eight months, increases as the child gets older. Stunting becomes increasingly common as children become older ($p<0.05$) and almost twice as many more children are stunted by the time they are 12 months and older (Table 2).

4.3.2 Underweight

The 12 – 23 months age group was the most affected by underweight (27%). Children less than one year old were less vulnerable to underweight i.e. six to eight months (3.6%), and nine to 11 months (15.1%). There were statistically significance difference among age group of the child ($p<0.01$). The prevalence of underweight among male children was high (21.5%) compared to female children (11.3%), but there was no significant difference among them. The summary of underweight by age group and sex is shown in Table 3.

Table 2: Nutritional status by age group and sex of the child as measured by height-for-age (stunting)

	Nutritional Status				
Demographic Characteristic	Severe stunting (%)	Moderate stunting (%)	Normal (%)	χ^2	P-value
Age (months)					
6-8	14 (16.5)	28 (32.9)	43 (50.6)	**26.4**	**<0.01**
9-11	11 (20.8)	18 (34)	24 (45.3)		
12-23	57 (45.2)	38 (30.2)	31 (24.6)		
Sex					
Male	56 (37.6)	52 (34.9)	41 (27.5)	**14.2**	**<0.01**
Female	26 (22.6)	32 (27.8)	57 (49.6)		

Table 3: Nutritional status by age group and sex of the child as measured by weight-for-age (underweight)

	Nutritional Status				
Demographic Characteristics	Severe underweight (%)	Moderate underweight (%)	Normal (%)	χ^2	P-value
Age					
6-8	1 (1.2)	2 (2.4)	82 (96.5)	**20.5**	**<0.01**
9-11	1 (1.9)	7 (13.2)	45 (84.9)		
12-23	3 (2.4)	31 (24.6)	92 (73)		
Sex					
Male	3 (2)	29 (19.5)	117 (78.5)	**5**	**0.08**
Female	2 (1.7)	11 (9.6)	102 (88.7)		

4.4 Feeding practices

4.4.1 Breastfeeding practice

As shown in Table 4, nearly all children under two years of age were still breastfeeding at the time of the survey (93.1%). The survey also collected information on reasons among the 20 mothers to stop breastfeeding before the age of two years: majority of the mothers reported refusal by the child (35%), the rest were mother was ill/weak, child ill/weak, no enough breast milk, and their mother become pregnant.

Table 4: Breastfeeding practice

History of breastfeeding	Number (%)
Ever breastfed	262 (99.2)
Still breastfeeding	244 (93.1)
Reasons to stop breastfeeding	
Child refused	7 (35)
Child ill/weak	5 (25)
Mother ill/weak	4 (20)
Others	2 (10)
Become pregnant	1 (5)
No enough milk	1 (5)

4.4.2 Complementary feeding practices

It was observed that (40.9%) of the children starts complementary foods before they were six months old, while 51.1% were started at six months. Although 51.1% mothers introduced semisolid and solid foods as recommended, 3.4% of the mothers introduced new foods than recommended when their infants were above six months old, and during the time of the survey, 4.5% were not yet started (Table 5).

Table 5 shows that feeding frequency of three times per day was practiced by about one third of the mothers. Most infants were fed at least three times per day from the age of six to eight months and 12 to 23 months. Good proportion of mothers reported to practice low feeding frequency of twice and once per day.

Table 5: Complementary feeding practices

Complementary feeding	Number (%)
Age of initiating complementary foods	
Early complementary feeding (<6 months)	108 (40.9)
Normal complementary feeding (6 months)	135 (51.1)
Late complementary feeding (7-13 months)	9 (3.4)
Not yet started	12 (4.5)
Feeding frequency	
Once per day	18 (7.4)
Twice per day	66 (27)
Three times per day	91 (37.3)
Four times per day	66 (27)
Fives times or more per day	3 (1.2)

4.4.3 Mixed feeding practices

Majority of infants and young children (81.4%) were given plain water. The proportion of children given fresh fruit juice were low only 4.2%. The feeding of other liquids (such as cow's milk, commercially produced infant formula, carbonated drinks and tea) was generally low, and increased slightly with the age of a child.

As shown in Table 6, large proportion (95.6%) of women was given their children foods made from grains. More than half (57.1%) of the children were given dark green vegetables. The proportion of children who was given other foods such as vitamin A rich fruits, other fruits and vegetables, beef, chicken, fish, legumes was low.

The majority of the children were given either porridge mixed with other ingredients or plain porridge. More than half of the mothers were adding protein-rich ingredients such as beans, groundnuts, milk, soybean, eggs, rice flour or dried sardines.

Table 6: Mixed feeding practices

Variables	Number (%)
Breast milk	247 (93.6)
Plain water	215 (81.4)
Commercially produced infant formula	7 (2.7)
Tinned milk/cow milk	15 (5.7)
Fresh fruit juice	11 (4.2)
Coffee/tea	19 (7.2)
Carbonated drinks	12 (4.5)
Traditional medicine	1 (0.4)
Complementary foods taken	
Food made from grain	241 (95.6)
Foods made from roots/tubers	15 (6)
Dark green vegetables	144 (57.1)
Vitamin A rich fruits	14 (5.6)
Other fruits/vegetables	22 (8.7)
Beef/	15 (6)
Chicken	1 (0.4)
Fish	11 (4.4)
Eggs	14 (5.6)
Legumes/nuts	23 (9.1)
Organ meat	1 (0.4)
Foods added to porridge	
Plain porridge	110 (41.7)
Porridge with dried sardines	57 (21.6)
Porridge with groundnuts	142 (53.8)
Porridge with beans flour	48 (18.2)
Porridge with eggs	7 (2.7)
Porridge with milk	16 (6.1)
Porridge with soybean	10 (3.8)

4.5 History of illness

Among 264 of all sampled children, 153 (58%) reported to have illness during the two weeks preceding the survey. Cough was reported in 74 (28%) children, fever in 67 (25.4%) children,

diarrhea in 57 (21.6%) children and 7 (2.7%) of the children were reported had rapid/difficult breathing. The rest have been reported has rashes 9 (3.4%), chest problem 3 (1.1%), eyes problem 18 (6.8%), stomachache 10 (3.8%), pneumonia 1 (0.4%), sickle cell 1 (0.4) and fits 1 (0.4%). There was no association between stunting and categories of illness (Appendix I). Also in underweight there were no associations between categories of illness and underweight except in children who have fever seemed that there is statistically significant between underweight and a child having fever ($p<0.05$) (Appendix II).

4.5.1 Association between nutritional status and Illness of the child

Table 7 shows that there were no significant differences in nutritional status (i.e. stunting and underweight) between children with history of illness and those without illness during the two weeks preceding the survey.

Table 7: Nutritional status (according to height-for-age and weight-for-age) by History of illness of the child

Variables	Nutritional Status			χ^2	P-value
	Severe stunting (%)	Moderate stunting (%)	Normal		
Illness history				2.076	0.354
Child ill previously	52 (34)	44 (28.8)	57 (37.3)		
Child not ill	30 (27)	40 (36)	41 (36.9)		
	Nutritional Status				
	Severe underweight (%)	Moderate underweight (%)	Normal		
Illness status				5.78	0.056
Child ill previously	5 (3.3)	27 (17.6)	121 (79.1)		
Child not ill previously	0	13 (11.7)	98 (88.3)		

4.5.2 Association between nutritional status and feeding practices during and after illness

Among those children who were ill during the time of the survey, their breastfeeding practices status was as follows: those who breastfeed less than usual were 50 (35.7%), same as usual 67 (47.9%), more than usual 17 (12.1%), and those who did not breastfeed 6 (4.3%). During illness, frequency of feeding were as follows; 46 (31.1%) ate less than usual, 47 (31.8%) ate same as usual, 7 (4.7%) ate more than usual and 48 (32.4%) didn't eat anything during illness. Among those who were sick during the past two weeks before this survey, some had already recovered. Regarding frequency of breastfeeding after recovery, only one child (1.6%) reported to breastfeed less than usual, 52 (85.2%) breastfeed same as usual and eight children (13.1%) breastfeed more than usual.

As regard to frequency of feeding after recovery, only four children (6.3%) reported to eat less than usual, 49 (77.8%) ate as same as usual, five of the children (7.9%) ate more than usual and five(7.9%) were reported that they did not eat anything.

There was no association between stunting and breastfeeding practices during illness (p=0.144), feeding practices during illness (p=0.657), breastfeeding after illness (p=0.25) and feeding after illness (p=0.727) (Appendix III). However, there was association between underweight and breastfeeding during illness (p=0.017), but there were no association between underweight and feeding during illness (p=0.417), breastfeeding after illness (p=0.081) and feeding practices after illness (p=0.182) (Appendix IV).

4.6 Mother's knowledge on Complementary Feeding Practices (CFP)

Figure 2 shows that highest proportion of mothers were in moderate category of complementary feeding knowledge 172 (65.2%), followed by 74 (28%) in poor category and 18 (6.8%) in high category.

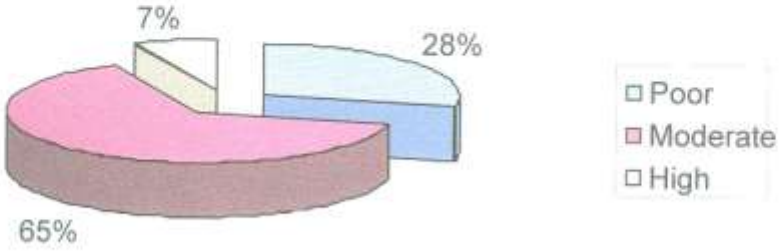


Fig 2: Knowledge on Complementary feeding Practices

4.6.1 Association between mother's knowledge on Complementary feeding practices and nutritional status

Results in Table 8 show that majority of the children who were moderate stunting 27(36%) were found in low knowledge category. Also majority of the children who were in normal nutritional status were found in moderate knowledge category. However, the relationship between nutritional status (height-for-age) of children and mothers' knowledge was not statistically significant (p=0.686).

Table 8 revealed that (88.9%) of children who were in normal nutrition category were found in high knowledge category. Furthermore (15.8%) of children who were in moderate underweight were found in moderate knowledge category. Also (5.6%) of children who were in severe underweight were found in high knowledge category. The relationship between nutritional status (weight-for-age) category and nutrition knowledge of the mother was not statistically significant (p=0.614).

Table 8: Mothers' knowledge on complementary feeding practices and nutritional status of children < 2 years

	Nutritional Status			χ^2	P-value
	Severe stunting (%)	Moderate stunting (%)	Normal (%)		
Knowledge level				**2.269**	**0.686**
Low	25 (33.3)	27 (36)	23 (30.7)		
Medium	51 (29.8)	51 (29.8)	69 (40.4)		
High	6 (33.3)	6 (33.3)	6 (33.3)		
	Nutritional Status				
	Severe underweight (%)	Moderate underweight (%)	Normal (%)		
Knowledge level				**2.674**	**0.614**
Low	1 (1.3)	12 (16)	62 (82.7)		
Medium	3 (1.8)	27 (15.8)	141 (82.5)		
High	1 (5.6)	1 (5.6)	16 (88.9)		

4.7 Multivariate analysis

4.7.1 Stunting and associated factors

A multiple logistic regression analysis was performed to examine the extent to which some variables (covariates) predict the child's nutritional status. For this analysis all the variables (sex and age of the child, types of food eaten by children i.e. dark green leafy vegetable, fruits, legumes, breast milk and fresh fruit juice) were simultaneously entered in the model as predictor variables and stunting as the outcome variable.

As can be seen from this Table 9a, sex and age of the child, dark green leafy vegetables and fresh fruit juice were the ones which were independently associated with stunting after the effects of the other variable have been controlled for.

Male children are two times more likely to be stunted as compared with female children, containing other variables constant (OR = 2.479, 95% CI 1.412- 4.352). Being a child aged six to 23 months is more likely to be stunted as compared to other age groups containing the other variables are kept constant (OR = 1.47, 95% CI 1.028 –2.102).

Those children who eat dark green vegetables are two times less likely to be stunted compared to those who don't eat dark green vegetables [OR = 2.16, 95% CI 1.151- 4.052). Those children who drink fresh fruit juice are less likely to report stunted as compared to those who don't drink fresh fruit juice, containing other variables constant (OR = 0.174, 95% CI 0.037 – 0.821).

Fruits and vegetables, legumes and other milk apart from breast milk on the other hand were not found to be statistically significant (at 5% level) once the other variables have been controlled for.

Table 9a: Model one: Multiple logistic regression of nutritional status (Stunting) on some variables

Variables	B	Odds Ratio	95% CI for Odds ratio		P-value
			Lower	Upper	
Sex (Male)	0.908	2.479	1.412	4.352	0.002
Age of the child	0.385	1.47	1.028	2.102	0.035
Fruits and vegetables	-0.487	0.615	0.188	2.01	0.421
Legumes food	1.217	3.379	0.923	12.363	0.066
Dark green leafy vegetables	-0.77	2.16	1.151	4.052	0.016
Tinned/powdered/fresh milk	1.189	3.283	0.743	14.499	0.117
Fresh fruit juice	1.748	0.174	0.037	0.821	0.027
Constant	-1.239	0.29			0.002

The four variables (sex, age of the child, dark green leafy vegetables, and fresh fruit juice) that showed significant association with stunting were kept in the final logistic regression model as presented in Table 9b. The three strongest significant independent predictors of stunting in this study were sex (OR = 2.575, 95% CI 1.48–4.49), age of the child (OR = 1.5, 95% CI 1.06 – 2.12) and dark green leafy vegetables (OR = 2.14, 95% CI 1.16 – 3.94).

Table 9b: Model two: Multivariate logistic regression of nutritional status on some variables

Variables	B	Odds Ratio	95% C.I for Odds Ratio		P-value
			Lower	Upper	
Sex (Male)	0.946	2.575	1.477	4.489	0.001
Age of the child	0.402	1.495	1.056	2.116	0.023
Dark green leafy vegetables	0.76	2.139	1.161	3.94	0.015
Fresh fruit juice	-1.224	0.294	0.079	1.092	0.067
Constant	-1.199	0.302			0.002

4.7.2 Underweight and associated factors

A multiple logistic regression was performed as summarized in Table 10a below. The dependent variable was underweight and the independent variables that were entered in the model were sex and age of the child, breast milk, child illness status, dark green leafy vegetables, vitamin A rich fruits and legumes.

Like in stunting, male children are two times more likely to be underweight as compared to female children (OR = 2.104, 95% CI 0.955 – 4.637). Being a child aged six to 23 months is two times more likely to be underweight as compared to other age groups (OR = 2.409, 95% CI 1.327 – 4.375). Also legumes food where found to be significant predictors of underweight containing other variables constant (OR = 2.823, 95% CI 1.016 – 7.849). Breast milk, dark green leafy vegetables, vitamin A rich fruits, legumes foods and child illness status was not found statistically significant predictors to the model.

Table 10a: Model one: Multiple logistic regression of nutritional status (Underweight) on some variables

Variables	B	Odds Ratio	95% CI for Odds ratio		P value
			Lower	Upper	
Sex (male)	0.744	2.104	0.955	4.637	0.065
Age of the child	0.879	2.409	1.327	4.375	0.004
Breast milk	-0.181	0.834	0.26	2.678	0.761
Vegetables	0.684	1.982	0.818	4.806	0.13
Vitamin A rich fruits	0.819	2.268	0.642	8.017	0.204
Legumes foods	-1.038	2.823	1.016	7.849	0.047
Child illness status	0.432	1.54	0.701	3.384	0.282
Constant	-4.971	0.007			0.000

In the final logistic model those variables that were found significant association with underweight i.e. age of the child and legumes foods were entered in the model to predict the underweight status of the children, and the results are presented in table 10b below. Age of the child (OR = 2.95, 95% CI 1.7 - 5.14) and legumes foods (OR = 3.3, 95% CI 1.27 – 8.59) were the two strongest predictors of underweight in our study sample.

Table 10b: Model two: Multiple logistic regression analysis for the variables predicting child nutritional status (underweight)

	B	OR	95 % CI for OR		P-value
			Lower	Upper	
Age of the child	1.083	2.952	1.696	5.14	0.000
Legumes	-1.195	3.304	1.271	8.592	0.014
Constant	-4.389	0.012			0.000

CHAPTER FIVE

5.0 DISCUSSION

The aim of this study was to assess mother's knowledge on complementary feeding practices and nutritional status of their children under two years of age.

5.1 Nutritional status of the children

5.1.1 Stunting

The results of the study reveal that stunting is the most prevalent type of malnutrition amongst under two years in Chamwino district, as is the case in other areas (Bomela, 2007). Stunting is by far the most prevalent type of malnutrition in the study area, with nearly 63% of the children being stunted (95% CI 56.7 - 68.7). The results show that there is no improvement of stunting in the area as compared to the available data (61%) of stunting for Dodoma region (TDHS 2004/2005). This level of stunting is very high as compared to other studies conducted by Kulwa *et al*, 2006 in Dar es salaam (43%), 41.6% obtained for Kabarole district, Uganda by Turyashemererwa *et al*, 2009. The difference of the study findings may be due to the study area, and availability of food in the study area. Stunting is the result of failure to receive adequate nutrition for a long period of time, also is frequently associated with chronic or repeated infections and consistently inadequate nutrient intake.

The results of this study are similar with other findings from previous survey that stunting increases as the child gets older (USAID, 2008). One of the studies showed that stunting was still increasing at 18-23 months (Wamani *et al*, 2005). Age seemed predicting chronic nutritional status of children under two years; even on the final model of analysis age was seemed to be strongest predictor of stunting. This may be due to the fact that nutritional probiems start at very early stage. This pattern highlights that the first two years of life is the most age for nutritionally vulnerable period for children in the study area. Therefore appropriate nutritional efforts need to be focused at much earlier age.

UNICEF reported that about one in three children in the developing world are stunted, but for the case of this study about two in three children are stunted, this may be due to the small sample size and study area, as reported by TDHS that rural areas are more affected by malnutrition. This is due to the types of foods fed to a child, illness, the child's appetite, and caregiver behaviors affect child growth. Stunting is seldom reversed in later childhood and adolescence and is associated with poor performance in school and lower adult wages.

Stunting is found more likely in male children than in female children. Similar findings also show that male child were associated with higher odds of being stunted (Wamani *et al*, 2005). There is a belief that boys are more influenced by environmental stress than girls (Wells, 2000). However, a study carried out by Sapkota and Gurung (2009) stunting was less likely among males and the association was statistically significant.

5.1.2 Underweight

The study also showed a higher proportion of children who were underweight (17.1%) which is similar to other results in South Africa (17.8%) (Bomela, 2007). The result is different from the findings of Nyaruhucha and *et al*, (2006) in Simanjiro, where the prevalence of underweight was 31%, but is very similar with that of Mahgoub and *et al*, in Botswana (2006) where the prevalence of underweight was 15.6%. Findings indicate that under nutrition is decreasing in the region as compared to the available data (38.5) for Dodoma region (TDHS, 2004/5).

Like stunting, underweight is associated with the age of the child in that case underweight increases with increasing age. Children aged 12 to 23 month had the high rate of underweight followed by those aged between 9-11 and six to eight months. Children less than one year of age were less affected by underweight; this might be due to breastfeeding during their first months of life hence children are growing normally. After one year they may not get enough breast milk and balanced meal that result to underweight. This indicates implication related to feeding practices after six months of age. Results imply that the affected children experience a

combination of inadequate food intake and diseases. Studies suggest initiation of regular supplementary feeding after six months of age to enhance nutritional status of children since mother's milk is not adequate beyond this age. Similar findings, have been reported by Nyaruhucha *et al*, 2006; Gobotswang, 1998; Sah, 2004.

Our findings revealed that underweight were higher among boys than among girls, but there was no significant difference. However, the results from Ghana were different from this study where it was found that there were more malnourished girls than malnourished boys (Appoh and Krengling, 2005).

5.2 Mothers' knowledge on complementary feeding practices and nutritional status

The findings show that most mothers of children under two years of age in the District do not have enough knowledge on complementary feeding practices. However our findings show that there were no statistically significant associations between nutritional status of children and mother's knowledge on complementary feeding practices. The results of this study are in dis-agreement with those of Khan and *et al*. (2007) who found that poor mother's complementary feeding knowledge increased child malnutrition. So mother's knowledge was not affecting nutritional status of children in this study. This difference with other findings may be due to different variables used with other studies to measure mother's knowledge for example different age group, different anthropometric measurement. A significant association among the occurrence of nutritional status and mother's knowledge was not established may be due to small sample size and homogeneous in sample characteristics.

5.3 Complementary feeding practices

Nearly half of the mothers had introduced solids to their infants before the age of six months. The timing of the practice of complementary food in addition to breast milk has important implications to the health of the child. Addition of food to a child before six months of age has no added advantage. The early introduction of solid foods before a baby's gut can digest food other than breast milk may interfere with the benefits of breast milk. This is contrary to

the current recommendations that complementary foods should start at the age of six month (WHO 2003). Infants who are exclusive breastfed for the first six months are less likely to get infections. Early introduction of complementary food has already been documented in Tanzania (Nyaruhucha *et al*, 2006; Maseta *et al*, 2008) and in other countries like South Africa (Mushaphl *et al*, 2008).

Frequency of feeding was reported being three times per day but, which complies well with what was reported elsewhere in Tanzania (Kavishe, 1993). In terms of meals frequency, the number of daily meals appeared to be influenced by the age of the children. High frequency of food intake increases high intake of nutrients.

The data shows that the food intake of children reflects a high intake of carbohydrate rich foods. These starch based complementary foods are characterized by a high water content and low energy and nutrient density. To achieve an intake that is sufficient to meet energy and nutrient requirement, a child is supposed to ingest relatively large volumes of such foods (WHO, 1998). The dietary bulk could be among important factors in contributing malnutrition. In this study very few mothers were giving their children fruits. The geographical area of Dodoma is known for its semi desert area, thereby decreasing access and possible consumption of fruits. The use of commercial foods is low in the rural areas of the region probably because they are expensive and not easily available. This study documented that most of the children were not given animal foods which could be due to issues of consistency and ignorance.

5.4 Association between child's illness status and nutritional status

This study found that there was a significant association between underweight and children having fever. These observations have been reported before, it has been observed that frequent illness such as fever, diarrhea, respiratory infections and worms are likely to exacerbate the problem of undernutrition in such children (Nyaruhucha *et al*, 2006). Turyashemererwa and *et al*, (2009) found that there is no significant association between

child illness previously and nutritional status of the children, but this study targeted specific illness. The current study was able to examine the association of breastfeeding during illness and underweight. Children who are ill or recover from illness if not properly fed they are likely to be malnourished. Illness also increases the metabolism that in turn interferes with absorption of nutrients into the body. Also a report by UNESCO and WHO suggest that, a child who has been ill need extra food.

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

The study has revealed that under nutrition of the under two children is an important public health problem in the area. Malnutrition, especially stunting in this cross-sectional study in Chamwino district, was found to be very high. Data from the survey revealed that poor nutrition mainly affect children between the ages of one and two years. Stunting was associated with age and sex of the child. Underweight was significantly associated with age of the child, episodes of fever and feeding practices during illness of the child.

This study found that there was a lack of knowledge among mothers about nutritional status. No significant association was also found between mother's knowledge and child's nutritional status.

Complementary feeding practices of children were not as recommended, as many children starts solid foods before the age of six months as recommended, and their food intake were mainly stiff porridge and vegetables. Also the intake of animal foods and fruits were very little in the study area. Child's illness status found to be associated with nutritional status.

6.2 RECOMMENDATIONS

- The community based public health education should be promoted to increase knowledge for better assessing and preventing nutritional status.
- Training of health providers at all levels is recommended in for correct and applicable prevention and assessment of nutritional status and other dangerous diseases to ensure better transfer knowledge and better health practices in the community.
- Interventions that require behavior modification toward improving child feeding practices must pay greater attention to gender bias in such settings.

- Future research should provide a better understanding of feeding practices of infants and young children.

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