FACTORS INFLUENCING NUTRITIONAL STATUS OF CHILDREN BELOW FIVE YEARS IN MBARALI DISTRICT, MBEYA REGION, TANZANIA

BY

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ABSTRACT

Undernutrition continues to be a major cause of high infant and below five years children mortality in Tanzania. This study was carried out to find out factors influencing nutritional status of under five year's children in Mbarali district. Nutritional assessment was done by using of anthropometric measurements which were subsequently compared to WHO criterion (SD classification) using summary indices of nutritional status: weight-for-age, height-for-age and weight-for-height and MUAC. Overall one hundred sixty (160) children aged below five years were included in the study. Socio-economic, health, environment sanitation and food availability factors were also assessed. Chi-square test was used to detect association between variables which could affect nutritional status of a child. Results showed a total of 39.4% of children were underweight out of whom13.8% were severely underweight. Wasted children were 27.5%, among them 5% were severely wasted. Prevalence of stunting was 30.7%, out of whom 5% were severely stunted. Based on sex of the child 2.5% female were stunted and male were 3.1%. Mid Upper Arm Circumference by sex showed that 1.8% female were severely undernourished, while 3.1% male children were severely undernourished. The study also explored relationship between socio- economic factors (age, occupation, education of the mother and family size) with nutritional status. Statistical analysis showed no significance though mothers with informal and primary education had more children with severely stunted children (5%) compared to secondary school leavers. Other factors that influenced nutritional status were found to be birth weight, diseases, type of food storage, and weaning age of the children. The study concluded that under nutrition is still a problem in the area. Awareness on age of

introducing food to children, frequency of feeding, education against low birth weight, public encouragement on good practice of personal hygiene and proper environment sanitation practices should be conducted to families and community members to reduce the problem.

DECLARATION

I, Tufingene Reuben Malambugi, do thereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own work and that it has neither been submitted nor being concurrently submitted for degree award in any other Institution.

_____ _____

Tufingene Reuben Malambugi. **Date**

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The above declaration is confirmed

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DEDICATION

This dissertation is dedicated to my children Lilian, Erick and Rosemary who gave me an encouragement.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACC/SCN	-	Administrative Committee on Coordination Sub-Committee on Nutrition
FAO	-	Food and Agriculture Organization
gm		Gram
haz	-	Height for Age
Kcal	-	Kilocalories
kg	-	Kilogram
i.e	-	That is
MDG	-	Millennium Development Goal
mg	-	Milligram
MUAC	-	Mid-Upper Arm circumference
NCHS	-	National Centre for Health Statistics
RDA	-	Recommended Daily Allowance
SD	-	Standard Deviation
SNAL	-	Sokoine National Agricultural Library
TDHS	-	Tanzania Demographic and Health Survey
TFNC	-	Tanzania Food and Nutrition Centre
UNICEF	-	United Nations Children's Fund
URT	-	United Republic of Tanzania
waz	-	Weight-for- Age
whz	-	Weight- for –height
WHO	-	World Health Organization
MHSW	-	Ministry of Health and Social Welfare

MAC	-	Ministry of Agriculture and Cooperatives
MGCCD	-	Ministry of Gender Children and Community Development

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Nutrition is a fundamental pillar of life, health and development across the entire life span, from the earliest stages of fetal development, at birth, through infancy, childhood, adolescence and on into adulthood and old age. Proper food and good nutrition are essential for survival, physical growth, mental development, performance and productivity, health and well being. In addition nutrition is an essential foundation for human and national development. The fundamental WHO goal of health for all means that every person should be given the opportunity to reach and maintain the highest attainable level of health (WHO, 1998). On a worldwide scale, undernutrition continues to be a significant problem, especially among children who cannot feed themselves adequately (URT and UNICEF, 2002).

In Tanzania, poor nutrition and health is a major problem and is one of the main causes of child morbidity and mortality. All groups are affected by undernutrition especially children below five years. Poor nutrition has serious long term effects hence influences their physical and mental development. In some cases undernutrition may be mild enough to show no symptoms. But, in some cases it may be so severe where symptoms can be seen (WHO, 1998). The rate of undernutrition differs from place to place. The common nutritional problems in Tanzania are protein energy under nutrition, iron deficiency, anemia, iodine deficiency disorders and vitamin A deficiency (ACC/SCN, 2000). Tanzania is one of the countries with high rates of child mortality (about 160 000 under the age of

five years die every year, 100 000 of them being infants within the first year of life). Over 80% of these deaths occur at home, away from health facilities and in most cases without prior contact with the health system (URT and UNICEF, 1990).

Poor health services, poor environmental health and sanitation, water supplies, inadequate care for children and poor access to information have been identified as underlying causes of child mortality. The structures of economy, various institutions which are formally organized as well as non-formal organizations, which play roles in the decision-making processes for resources in favor of children and levels of income per households, contribute to the undernutrition problems. These are identified as basic causes of malnutrition and death in Tanzania (URT and UNICEF, 1990).

1.2 Problem Statement

According to Tanzania Demographic and Health Survey child mortality rates were 147 per one thousands live birth, malnutrition rate was 43.8 % in the country (TDCHS, 1999). In 2004, child mortality rates were 112 per one thousand live births, while malnutrition was 38%, severe stunting was 13%, wasting was 3%, moderate underweight 21 % and severe underweight was 4%. In rural areas of Mbeya, child mortality was 179 per one thousand live births, malnutrition was 21.2% and severe malnutrition was 2.0% (URT, 2005). In Mbarali district the mortality rate was 25% while national figure was 29%. Underweight 29.4 % while severe underweight was 5.9 % (Tanzania Bureau of Statistics, 2005).

Despite several interventions instituted to improve children's health such as production and food availability, primary health care, mother and child health clinics, mother and child welfare promotion, the problem of undernutrition in Mbarali district still persists at both the household and individual level (URT, and UNICEF, 2002). A good understanding of the nutrition situation of an area is necessary for improved planning in order to change the situation. This study is geared towards investigating factors that contribute to poor nutritional status of below five children in Mbarali district and suggest the ways of improving their nutrition status.

1.3 Justification of the Problem

It has been observed that there is a difference in nutrition and health status of children residing in rural areas and urban areas. For example feeding frequencies in rural areas are low (on average of twice or three times per day compared to urban children). Most families children below five years take only two meals per day. That is why there is a difference in terms of nutrition and health status of children residing in rural areas and those living in urban areas (Ishengoma, 1992).

Rural people suffer more from illnesses than urban people, because rural people use available health services less often than people in urban areas and therefore infant mortality rates appear to be much higher in the former than the latter. The National Health Policy has focused on equal access to basic health services, to ensure that the majority of populations have access to health services. In Mbarali district only 39% have access to clean and safe water and 22 % had access to sanitary latrines (URT, 2007).

These results will be useful to the Ministry of Health and Social Welfare (MHSW), Ministry of Agriculture and Cooperative (MAC) and Ministry of Women, Children and Community Development (MWCCD) to develop interventions or programs that will improve the situation.

1.4 Overall Objective

To investigate factors influencing nutritional status of children below five years in Mbarali district.

1.4.1 Specific objectives

a) To assess nutritional status of children below five years.

b) To assess food availability and accessibility per household.

c) To identify energy and protein consumption per child per day in the Households.

d) To examine availability and use of health facilities.

e) To determine effects of feeding practices on child nutritional status

1.5 Hypothesis

Inadequate food intake and diseases do not cause nutritional problems in children below five years.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Factors Influencing Nutritional and Health Status

2.1.1 Nutritional status

Nutritional status can be defined as the interpretation of information obtained from the method of nutritional assessment. The information obtained is used to determine the health status of individuals or population groups as these are influenced by their intake and utilization of nutrients by the body. Body needs three major classes of nutrients, i.e. carbohydrates, proteins and fats. These supply the energy and the building blocks that are needed to synthesize cellular contents. The body also needs micronutrients especially vitamins and minerals because they are necessary for optimum cellular metabolism (ACC/SCN, 2000).

Nutritional status can be assessed by direct or indirect methods. Indirect methods use clinical, biochemical or dietary assessment. The direct method involves anthropometric assessment (King and Burgess, 1998).

2.1.1.1 Dietary Assessment

Dietary assessment involves measuring the quantity and quality of food consumed in one to several days, or assessment of the pattern of food consumed during previous days or months. This nutritional assessment involves dietary assessment, in which dietary assessment intake may appear to meet nutritional but confounding factors such as diseases, anti-nutrients dietary components, interfere with ingestion, digestion, absorption, transport, finally utilization of nutrients (Gibson, 1990).

2.1.1.2 Clinical Assessment

Clinical methods use physical examination to assess direct signs and symptoms associated with undernutrition. It has been documented by Gibson (1990) that signs and symptoms are nonspecific and only develop during the advanced stages of nutritional diagnosis of nutritional deficiencies. However, this should not rely exclusively on clinical method. The method should be backed-up with either biochemical or anthropometric measurements.

2.1.1.3 Biochemical assessment

Biochemical methods measure nutrient or its metabolites in the body fluids or varieties of other components that relate to nutritional status. Nutritional deficiencies may be detected due to either the reduction of its level or its metabolites in certain tissues or body fluids. (Static test or functional test, i.e. physiological or behavioral changes of functions that are dependant on specific nutrient) (Margaret and Nelson, 1995).

2.1.1.4 Anthropometric assessment

The anthropometric assessment is the most common method used in assessing parameters e.g. weight, height, age and mid upper arm circumference. Body composition measures fat mass and fat free mass (lean body mass). In anthropometric assessment the raw measurements are obtained to form indices, and then the indices are used to interpret and classify the measurements. The indices are weight- for- age (W/A), height- for- age (H/A), and weight- for- height (W/H). These are compared with the recommended reference by National Center for Health Statistics (NCHS) or WHO standards. The cut-off points used for children below

five years of age are in terms of standard deviation (SDs) being below or above the median (WHO, 1998).

2.1.4.1.1 Weight-for-age (W/A) reflects body mass relative to chronological Age

Prevalence of underweight children is the percentage of children with a weight that is below –2SD below the reference weight-for-age of the WHO international growth reference value (WHO, 1998). Low W/A is influenced by both the height of the child (height-for-age) and his or her weight (weight-for-height). Its composite nature makes interpretation complex. For example, weight-for-age fails to distinguish between short children of adequate body weight and tall or thin children. However, in the absence of significant wasting in a community, similar information is provided by weight-for-age and height-for-age as both reflect the long-term health and nutritional experience of the individual or population. In general terms, the world-wide variations and age distribution of low W/A are similar to those of low height-for-age (WHO, 2007).

2.1.4.1.2 Height-for-age (H/A) reflects height relative to chronological age

Low H/A is called stunting. Stunted growth reflects failure to reach linear growth potential as a result of sub-optimal health and/or nutritional conditions. On a population-wide basis, high levels of stunting are associated with poor socio-economic conditions and increased risk of frequent and early exposure to adverse conditions such as illness or inappropriate feeding practices (WHO, 1998).

2.1.4.1.3 Weight-for-height (W/H) Reflects Body Mass Relative to Height

Low W/H (wasting or thinness) indicates in most cases a recent and severe process of weight loss, which is often associated with acute starvation or severe diseases. Prevalence of wasted children is an indication of deficit in tissue and fat mass compared with the amount expected in a child of the same age (WHO, 1998).

2. 2 Nutrients

Nutrients are required for normal growth and development. The body requires adequate nutrients that will supply sufficient energy, protein, fats, vitamins and minerals. It has been observed that clinical signs of nutrition deficiency normally appear sooner in infant and early childhood than in other age groups because of rapid growth, large surface area in relation to their weight, rapid psychomotor development and increased physical activity especially after age of four months. These nutrients are usually divided into two categories i.e. macro and micro nutrients (Cameron and Hafvander, 1983).

2.2.1 Macronutrients

Macronutrients are substances needed for growth, metabolism, and for other body functions. These are carbohydrates, proteins and fats which are needed in large amounts because each of these provides calories. It is estimated that 1gm of carbohydrate provides 4 Kcal, 1gm of protein provides 4 Kcal, and 1gm of fat provides 9 Kcal (UNICEF and TFNC, 1996).

2.2.1.1 Carbohydrates

Infants and young children grow fast; hence their energy needs are relatively high for their size. Carbohydrates are the main source of fuel in the body tissues and cells. Cells use energy which is mainly found in starchy foods, fruits, milk and legumes. In order to take enough energy a child requires 110-200 kcal per body weight (http:www.unicef.org/ nutrition).

2.2.1.2 Protein

Protein is needed for growth, immune system for production of hormones and enzymes. A child must have enough food in terms of both quantity and quality. The dietary quality of protein depends on the amount of protein it contains. Protein can be used in making energy when carbohydrates are insufficient. Protein can be found in meat poultry, fish, pulses etc. and in small quantities in starchy foods and vegetables. The requirement is 1.0 - 1.5 mg per body weight of a child (TFNC, 1996).

2.2.1.3 Fat

Lipids (fats and oils) provide essential fatty acids, namely linolenic and linoleic acids which are essential for growth and development of children and for vitamin absorption. Fat is the most energy concentrated nutrient which supplies between 40-50% of the total energy consumed in infancy. It is very important in the diet of the children because it is difficult for small children to eat enough food to cover its energy requirements. Fats can be found in meat, poultry, nuts, milk and products, oils and it is recommended that 1gm of fats provides 9 kcal (Latham, 1997).

2.2.2 Micronutrients

Micronutrients are substances required by the body in small amounts, but they play a very important role in metabolic activities. These include water, minerals and vitamins such as vitamins A, B and C and minerals such as zinc, calcium, iodine and iron. The body requires micronutrients from the diet because it does not make all the nutrients for optimum functions. Micronutrients are needed in all ages. The effect of their inadequate intake is particularly serious during periods of rapid growth e.g. in early childhood, pregnancy, and lactation (WHO, 1998).

The clinical manifestation of this nutritional deficiency include xerophthalmia, goiter, and iron deficiency. These manifestations have been identified as major problems with increasing public health significance for children of age 2-5 years being among the group most affected by micronutrient deficiency (ACC/SCN, 1993).

2.2.2.1 Vitamin A

Vitamin A (retinal) is an essential nutrient needed in small amounts by children for the normal functioning of the visual system, growth and development and maintenance of epithelial cellular integrity and immune function. The dietary needs for vitamin A are normally provided for as preformed retinal (mainly as retinal ester) and provitamin A carotenoids. In children, lack of vitamin A causes severe visual impairment and blindness, and significantly increases the risk of severe illness, common childhood infections like diarrhea disease and measles and finally death (King and Burgess, 1993).

There are two sources of vitamin A, the preformed vitamin or retinal which is present only in foods from animals. It is found as a protein and is fat soluble found in meat, fatty fish, eggs and milk fat. Another source is pro- vitamin or carotene which comes mainly from plants. Vitamin A has an advantage because it can be stored in the liver (Josh, 2000).

It has been observed by Suharno and Munila (1996) that there is a strong relationship between vitamin A and iron status in the body, since iron deficiency is easily corrected when there is no vitamin A deficiency. The recommended intake per body weight of children varies considerably for which a requirement estimate of 180 mg RE/day seems to be appropriate.

2.2.2.2 The 'B' vitamins

The most important are thiamine, riboflavin and niacin. The main function of these water soluble vitamins is in the breakdown of carbohydrate during energy production and regulating the body use of protein. All are essential for normal growth and any shortage is likely to reduce appetite. Niacin can be obtained directly from food or it can be formed in the body from essential amino acid (tryptophan), where 60mg tryptophan is equivalent to 1mg of niacin. The requirement of thiamine, riboflavin and niacin are related to the energy intake of adequate diet of children (Enstrom *et al.*, 1986).

2.2.2.3 Vitamin C

Vitamin C (Chemical name ascorbic acid) is a six-carbon lactones which is synthesized from glucose by many animals. The best source of vitamin C for infants is breast milk. There is three times as much as in other milk but the level depends to some extent on the mother's diet. It can also be obtained by eating citrus fruits. Vitamin C is an electron donor (reducing agent or antioxidant), and probably all of its biochemical and molecular roles can be accounted for by this function (Food and Nutrition Board, 2000).

In children, 8mg/day is sufficient to prevent vitamin C deficiency. In developing countries supply is often determined by the seasonal availability of water. The vitamin C content of food is thus strongly influenced by season, transport to market and length of time on the shelf and in storage, cooking practices, and the chlorination of the water used in cooking. Cutting or bruising of produce releases ascorbate oxidase. Blanching techniques inactivate the oxidase enzyme and help to preserve it. Vitamin C is very labile, and the loss of vitamin C resulting from boiling milk provides one dramatic example of a cause of infantile scurvy (Beard, 1989).

2.2.2.4 Folate and Vitamin B_{12}

Folates and Vitamin B_{12} are water soluble; folates are very easily destroyed by heat during cooking. Adequate varieties of food including green leafy vegetables and other plant foods are good sources providing sufficient of both these nutrients to meet recommended intakes. Deficiency of these nutrients causes megaloblastic anemia (Fleming, 1996).

2.2.2.5 Iron

These nutrients are essential for normal blood formation along with a selection of other nutrients including proteins and vitamin C (Fleming, 1996).

Iron is required for normal growth and maintenance of hemoglobin. The requirement is high during the rapid growth of the child i.e. 0-6 month of age, and then supplementation is needed. If mother's diet was adequate during pregnancy, a baby will be born with reserves enough for physiological needs to last for 4-6 months; thereafter the baby will require iron supplementation with RDA 7mg/day during 6-12 month, and 10mg/ day for 1-5 years children (WHO, 1997).

The small proportional of iron in the diet is usually absorbed which also depends on the total iron in the meal eaten, e.g. some animal protein foods like meat, liver, fish and poultry are excellent sources. Human milk contains 0.02/100 g of iron and is easily absorbed, but non- human milk contains 0.05/100 g thus it is a poor source of iron. Eggs contain iron but it is inefficiently absorbed and used. In Tanzania iron deficiency is a major factor contributing to the prevalence of anemia. Due to the fact that the main diet commonly used is cereals and legumes which are in a complex form, and are not well absorbed, due to presence of anti-nutritional factors such as phytates, fiber, tannins, and polyphenolic compounds which bind iron (Mamiro *et al.*, 2004).

Poor supply of iron reduces the transport of protein apotransferrin, which results in a decrease in transferrin saturation and an increase in transferring receptors in the circulation and on the surface of cells, including the erythron. The more severe stages of iron deficiency are associated with anemia (Mendoza *et al*., 2001).

There are mild to moderate forms of iron deficiency in which hemolytic occurs due to malaria (glucose-6-phosphate dehydrogenase deficiency), congenital hereditary defects in hemoglobin synthesis and deficits in other nutrients, e.g. vitamins A, B_{12}, C, and folic acid, blood loss such as the one associated with schistosomiasis, hookworm infestation, which can also result in both iron deficiency and anemia (URT and UNICEF, 1990).

2.2.2.6 Effect of Iron deficiency

Iron deficiency reduces cognitive performance, behavior, and physical growth of infants. It also reduces the immune status and morbidity from infections and leading to impaired gastrointestinal functions and altered patterns of hormone production and metabolism. The latter includes neurotransmitters and thyroidal hormones which are associated with neurological, muscular, and temperature-regulatory alterations that limit the capacity of individuals exposed to the cold to maintain their body temperature. In addition, DNA replication and repair involve iron-dependent enzymes (Hershel, 1970).

There is strong evidence that iron deficiency anemia has been conclusively seen to delay psychomotor development and impair cognitive performance of infants as reported by Walter *et aI.* (1983) in Chile, and Lozoff (1989) in Guatemala In Costa Rica, children who had moderate anemia when they were infants achieved lower scores on intelligence quotient (IQ) tests and other cognitive performance upon entry in school than did children who were not anemic during infancy, results which were confirmed by Walter et *al.* (1996) in Chile. A study done in Thailand

reported poor performance language and mathematics tests of children with low hemoglobin levels. In developing countries an estimated 30-80% children are anemic at 1 year of age while in Tanzania it accounts for 6%. These children will have delayed psychomotor development, and when they reach school age they will have impaired performance in tests of language skills, motor skills, and coordination (WHO, 1998).

2.2.2.7 Resistance to infection

Morbidity from infectious disease is increased in iron-deficient populations. Iron deficiency decreases immune system which causes the leukocytes to reduce the capacity of killing the ingested microorganisms and lymphocytes as it was reported by Srikantia and Chandra (1976).

Iron deficiency alters the production of triiodothyronine (T3) and thyroid function in general, and the production and metabolism of catecholamines and other neurotransmitters, resulting in impaired temperature response to a cold environment. In both experimental animals and human subjects, those with iron deficiency anemia become more readily hypothermic and have a depressed thyroid function (Martinez, 1984).

2.2.2.8 Zinc

Zinc is needed for protein synthesis, growth and immune function. It is obtained by eating meat, legumes and whole grains. Too little of the nutrient causes delayed wound healing, night blindness, diarrhea and hypogeusia. Too much zinc in the body will cause anemia, diarrhea, vomiting, renal failure and abnormal cholesterol levels in adults (Marder, 2004).

2.2.2.9 Calcium

Calcium is needed for bones and teeth formation in children, which is important for their rapid growth. The requirement is 400mg/day for the first six months (Binet and Kooh, 1996).

2.2.2.10 Iodine and Iodine Deficiency Disorders (IDD)

Iodine deficiency disorders refer to all of the consequences of iodine deficiency in a population that can be prevented by ensuring that the population has an adequate intake of iodine. Iodine deficiency occurs when iodine intake falls below the recommended levels. When iodine intake falls the below recommended levels, the thyroid may no longer be able to synthesize sufficient amounts of thyroid hormone. The resulting low level of thyroid hormones in the blood (hypothyroidism) is the principal factor responsible for damage in the developing brain and other harmful effects known collectively as “Iodine deficiency disorders. Iodine deficiency is critical during early childhood stages, and during pregnancy (Hetzel, l983).

In its most extreme form of IDD, it results in cretinism, but of much greater public health importance are the more subtle degrees of brain damage and reduced cognitive capacity which affects the entire population. As a result, the mental ability of ostensibly normal children and thus, the potential of a whole community are reduced by iodine deficiency and where the deficiency is severe, there is little chance of achievement and underdevelopment is perpetuated. In iodine-deficient population, everybody may seem to be slow and rather sleepy, the quality of life is poor, ambition is blunted, and the community becomes trapped in a self-perpetuating cycle (URT, 1992).

2.2.3.11 Nutrients Interaction

According to Lozoff (1989) there are some nutrients interactions such as:

- Poor supply of iron reduces the transport protein apotransferrin, a condition which results in a decrease in transferrin saturation and an increase in transferring receptors in the blood circulation and on the surface of cells, including the erythron.
- Vitamin A deficiency inhibits normal metabolism of iron, which can result into anemia.
- Iron deficiency alters the production of triiodothyronine (T3) and thyroid function in general, and the production and metabolism of catecholamines and other neurotransmitters, resulting in impaired temperature response to a cold environment.
- In calcium homeostasis, 1, 25-(OH) 2D works in conjunction with parathyroid hormone (PTH) to produce its beneficial effects on the plasma levels of ionized calcium and phosphate.

2.3 Child Malnutrition

Malnutrition can be defined as an impairment of health resulting from a deficiency or excess of nutrients. Children are particularly vulnerable to nutritional inadequacies because of their rapid growth, their dependence on other people and their increasing exposure to various environmental hazards. Children with severe malnutrition are at risk of several life-threatening problems like hypoglycemia, hypothermia, serious infection and severe electrolyte disturbances especially in the case of protein energy malnutrition (Jason *et al.*, 1984).

2.4 Relationship between Diseases and Child Malnutrition

Microorganisms are more likely to get into the child's body through the skin and the cell lining the gut and respiratory tract if they are less healthy and less able to resist the infection. Moreover, infections reduce the child's appetite. Diseases interact with nutrients from the food when it is eaten, digested and absorbed and finally to the time it is utilized in the body (TFNC, 1996).

Both infections and infestations have great influence on nutritional status of the child. Infection increases the demand and utilization of antioxidant vitamins C, E and beta- carotene and minerals such as zinc, iron, and selenium. Therefore, with less intake and greater needs, the infected child with poor reserves is tipped into malnutrition (Nyaruhucha, 2003).

Therefore malnutrition occurs because infections lead to diarrhea, vomiting, or loss of appetite which interfere with the intake and absorption of food. In kwashiorkor children, antibody formation and leucocytes activities are impaired due to severe nutrient deficiency and poor immune response to fight the infections (Josh, 2000).

Acute infections affect iron metabolism while chronic infection in general shorten the erythrocyte life span. It has been observed that infections may interfere with metabolism of electrolytes such as calcium and phosphorus and cause potassium and chloride loss (TFNC, 1996).

2.5 How Diseases Interact with Nutrition

2.5.1 Poor appetite

Poor appetite may reduce food intake because, even if enough food is available it may be difficult for the child to consume adequate amount due to poor appetite caused by illness (WHO, 1998).

2.5.2 Digestion

When the appetite is overcome and adequate food is eaten, then the child has to digest it; but if the disease is present such as diarrhea and vomiting it will prevent it by rushing the food out of the gut before it is digested. Also if a few toxins contained in certain foods as in the case of malnourished child, the digestive enzymes secretion is often seriously impaired. Hormones like thyroid and adrenal which secrete and control utilization of nutrient, are also impaired by diseases (Warren, 1993).

2.5.3 Cell metabolisms

Fever causing diseases have a great effect on the rate of utilization of energy in the body. When the body temperature raises energy requirement also increases and body protein destruction is doubled or tripled with high fever (Ministry of Health, 2000).

2.6 Food and Nutrition Policy

According to food and nutrition policy of Tanzania 2000, nutrition has an effect on food security as it have strategies for food production, harvesting, preservation, processing, distribution, preparation and proper utilization of that food. In order to

ensure food security societies must have good traditional and customs and sound economic base to ensure food availability. Food security depends on the existence of appropriate strategies for food production.

2.6.1 The objectives of food and nutrition policy

- To prepare a viable system for coordinating, balancing and guiding food and nutrition activities which are being undertaken by various sectors
- To rectify the state of food availability and formulate proper strategies and techniques to ensure the availability and utilization of food in accordance with nutritional requirement.
- To prepare guidelines and techniques to combat food and nutrition problems in the country and enable each sector to play its role.
- To involve all sectors which deal with deal with issue pertaining to food and nutrition in realizing and strengthening the methods of improving the nutritional situation
- To incorporate food and nutrition consideration in development plans and to allocate available resources towards solving the problem of food and nutrition at all levels
- To use nutrition as one of the indicator in assessing social development achievements of economic and health improvement project.
- To formulate and develop research which will facilitate solving of food problems. In order to achieve the objectives of the policy the following important areas have been identified
    - Food security

- Care for special group
- Essential human services
- Food and nutrition committees
- Roles of various sectors in the implementation of the food and nutrition in Tanzania.

2.6.2 Lack of adequate and appropriate techniques, implements and inputs

As most of Tanzanians farmers use hand hoe which reduce area for crop production either does not use farm inputs such as fertilizers, pesticides to control pests as well as herbicides to control stubborn weeds.

2.6.3 Drought, floods and other natural disasters

These reduces crop production per unit area, low food crop productivity

Therefore in order to avoid the problem of in adequate food production it is necessary to improve and consolidate the production of various food stuffs

2.6.4 Food harvesting and preservation

A considerable part of food crop is wasted through destruction by insects used in crop harvesting and preservation also contribute food looses hence food insecurity. In order to eliminate the problem of wastage and destruction of food crops in the country, it is advisable to harvest and preserve crops through ways and means that conserve their quantity and quality nutritionally. In order to eliminate the problem of wastage and destruction of food crops it is advisable to harvest and preserve crops through ways and means that conserve their quality.

Some of the methods which should be used to ensure that food crops are properly preserved

- To introduce and consolidate appropriate crop harvesting and preservation knowledge and skills in the curricular of school and training institutions.
- To educate people on appropriate principles of harvesting and preserving various food crops
- To improve and consolidate appropriate and basic science and technology in the harvesting and preservation of food crops
- To improve and maintain construction of durable granaries of storage of cereals at village level.

2.6.5 Food processing and preparation

Each type of food requires specific processing and preparing methods to enable consumption or longer periods of its preservation without adverse effects on its nutritional value to the consumer. In order to make sure that processed food does not lose its nutritive value in quantity and quality of all processing regulations should be observed. Therefore in order to ensure that food being processed meets the nutritional requirements the following must be observed;

- Adhere to appropriate procedures pertaining to food crop harvesting and storage before processing.
- The processed food should be well stored for desirable period after processing
- Appropriate ways of storing food at all levels must be developed and promoted

- Early detection of malnutrition secondary to communicate diseases must be emphasized.

The Tanzania Food and Nutrition Center under Ministry of health in collaboration with the ministry of Agriculture is responsible for this area and has developed a comprehensive nutrition policy to guide the implementation of this element. Tanzania Agriculture policy also has a linkage in food security as it's the central role in Tanzania economy it contributes the country′s gross domestic product GDP, export earnings and employment in the sector accounts for 60% and 84% respectively. Crucial components of the agricultural sector are food crops, livestock and traditional export crops whose contribution currently stands at respectively 55%, 30% and 8% of the total GDP.

2.6.6 The objective of food and nutrition policy

To improve national standard of nutrition by increasing output, quality and availability of food commodities. In order to achieve these production growth rates of food crops and livestock products will have to be at 4% and 5% per productivity and area expansion while livestock growth will be through encouraging the private sector based initiatives in the industries.

- To improve standards of the rural area through increased income generation from agricultural and livestock production, processing and marketing.
- Increase foreign exchange earnings for nation by encouraging the production and increased exportation of cash crops products , other agricultural surpluses including food crops by product and residues

- To produce and supply raw materials including crops, livestock, by product and residues for local industries while also expanding the role of the sector as a market for industrial output through the application of improved production, marketing and processing technologies.
- To develop and introduce new technologies which increase the productivity of labor and land
- To promote integrated and sustainable use and management of natural resources such as land, soil water and vegetation in order to conserve the environment
- To develop human resources within the sector in order increase the productivity of labor and to improve ability, awareness and morale.
- To provide support services to the agricultural sector this cannot be provided by private sector.

To promote specifically the access and youth to land, credit, education and information (URT, 2000).

2.7 Health Policy

The health policy of Tanzania is aimed at improving the health status of all people wherever they are, in urban and rural areas by reducing morbidity and mortality and raising life expectancy health i.e. physical, mental and social well being is a major resource and economic development the objective are;

- To increase per capita income of the population
- To increase life expectance from 35 - 40 to 50 years

The overall objective of the health policy in Tanzania is to improve the health and well being of all Tanzanians with a focus on those most at risk and to encourage health system to be more responsive to the needs of the people and one of the specific objectives was to ensure that health services are available and accessible to all After independence the government approved the first five year development plan 1964-1969 with section of health. In a speech delivered in parliament on 12 may 1964 in relation to the plan, the first president Mwalimu Julius K. Nyerere in the third five year plan the government gave priority to the following areas. Environmental sanitation, good nutrition. The party initiated various health campaign like ″chakula ni uhai″(food is safe) and″ mtu ni afya″(A person is Health). This was the beginning of cooperation with other sector involved in the implementation of primary health care.

2.7.1 Primary health care

One of the primary health care elements is food and nutrition in the act 1.3.2 which says that adequate intake of nutritious food is essential for the promotion and maintenance of physical and mental health. A good nutrition state will enable individuals and families to lead socially and economically productive lives, therefore to achieve this. Activities which promote household food security must be promoted.

- Availability of adequate food in quality and quantity among vulnerable groups (children, pregnant women and breast feeding mothers must like wise be promoted)
- Proper feeding practices (breast feeding and weaning habits infants and young children will be encouraged

- Nutrition diseases should be prevented or detected early
- Appropriate ways of storing food at all levels must be developed and promoted
- Early detection of malnutrition secondary to communicate diseases must be emphasized.

Tanzania Food and Nutrition Center under ministry of Health in collaboration with the ministry of Agriculture is responsible for this area and has developed comprehensive nutrition policy to guide the implementation of this element

2.7.2 The human right to food

After World War II, the atrocities that grew both from historical and escalating trade conflicts, and from genocide together with a disavowal of basic human rights, received a heightened level of attention at the international scale. Part of the argument to establish the World Bank and the International Monetary Fund (IMF) was to enhance trade and development as a strategy to secure peace through economic improvement.

Concurrently, the newly incorporated United Nations (UN) attempted to charter universally recognized basic human rights. As one integral component of human rights, the right to food was UN Universal Declaration on Human Rights 1948. Article 25 (1) reads, everyone has the right to standard of living adequate for the health and well-being of himself and his family, including food, clothing, housing and medical care and necessary social services Article 25 (1) represents the moral legitimacy.

2.8 Food Adequacy

Adequate food means there is enough food to eat or the food can provide sufficient energy, protein, fat, carbohydrate, micronutrients (vitamins and minerals) and other essential food components, or the body can utilize properly the food eaten (FAO, 2001). Enough food can be presented into different ways: as a minimum level of food consumption or as food adequate to meet nutritional needs (Makundi *et al.*, 2001).

2.9 The Concept of Enough Food

Report of a Join FAO/WHO (1996) documented that 40 % of total Africa population face the problem of food inadequacy due to poor production. In Tanzania, it is mainly attributed to climatic condition, labor availability and poor use of agricultural inputs (FAO, 1996).

2.10 Food Security

Household food security means the household has physical, socio- cultural and economic access to food that are adequate in terms of quality, quantity and safety all the time for their well being. Food security is the function of production, availability and accessibility (Maxwell, 1990). Thus food security involves the following aspects; food availability, food access, food utilization. Food crop production of various food crops in this country is generally still inadequate due to the following reasons. Improper land use e.g the use of organic fertilizers which improves soil texture hence increase food crop production. The use cover crop to minimize soil erosion and preserve moisture.

2.11 Food Insecurity

It reflects quantity and quality of food that is not enough to meet daily requirement by providing all essential nutrients for all members of the household or society. Food insecurity at household level can be temporary because of unforeseen and unpredictable circumstances. Seasonal food insecurity is when there is irregular pattern in the periodicity of inadequate access to food, which may be due to logistical difficulties or prohibitive cost of storing food (Lorri and Kavishe, 1990). Food imbalances are estimated to have affected 40% of the population, 28.7% are chronically food insecure since land is too small to provide sufficient food for subsistence (FAO, 1996).

Tanzania is known to be self sufficient in a normal year of food production, but many households have limited access to food during the wet season and families are food insecure, including Mbarali District

2.12 Food Access

Household's access to food depends on the ability to buy or what a household is able to produce especially the traditional cereals, tubers and legumes and the distribution within the household. Some families especially in rural areas do not have purchasing power to secure enough food they need either by production or cannot store enough food of their own, and have also poor food distribution within the members (Frankenberger, 1996).

2.13 Stability of Food

This is the continuous flow and availability of food in households either through quantity stored or from external sources which can be achieved through equitable income distribution and effective markets (FAO, 1992a).

2.14 Food Security and Coping Strategies

Household food security depends not only on the availability of an adequate and sustainable supply of food, but also on the strategies employed by households for its acquisition. Secure access to enough food means risk avoidance of acute food shortages in the events of crop failure, naturally due to disasters such as drought, heavy rainfall, pests, as well as the risk of fluctuations in crop or prices. Households can adopt a variety of coping mechanism to offset the effect of production short falls and deal with food shortages or meet their compelling household needs so as to get them through the period of stress (Mamiro and Mtebe, 1998).

2.15 Agriculture and the Poor

Climate and soil resources provide significant potential for agricultural productivity. Inequitable land ownership is probably the major factor explaining variation in agricultural growth among areas in Tanzania. Land ownership is highly unequal. It is estimated that a one percent increase in yields reduces the number of poor by only 0.1%. Agriculture makes other important contributions to nutrition, food security, and macroeconomic stability beyond the poor (FAO, 1992b).

2.16 Other Factors Influencing Nutritional Status of Children

2.16.1 Weaning age and weaning practices

With regard to the care of children, several feeding practices are known to be the key of health, nutrition, and development. Initiation of breastfeeding should begin almost immediately after birth, and exclusive breastfeeding should continue for the first six months of life. By six months, high quality complementary foods should be introduced, and breastfeeding should be continued into the second year of a child's life. Since young children have relatively high nutrient requirements but are limited by their small gastric capacity and naive immune system, they need to be fed frequently. Additionally, because of the associated exposure to pathogens and interference with successful breastfeeding, current feeding recommendations strongly discourage use of baby bottles throughout childhood *(*Dewey *et al.* 1999).

2.16.2 Breast feeding week

In 1990, UNICEF organized a 3-day meeting involving 17 national and international organizations to strategize for a coordinated global effort to protect promote and support breastfeeding. The two main workable actions that emerged at that meeting was the idea of a World Breastfeeding Day which later evolved to become World Breastfeeding Week and a Baby-Friendly Hospital campaign (UNICEF, 2004a).

Worldwide current data show that only about one third of children are being exclusively breastfed from 0 to 6 months (UNICEF, 2004b).This is far from the ideal recommendation of exclusive breastfeeding for full 6 months. WHO and UNICEF have been spearheading a new effort to use the findings in the Lancet series on child survival, newborn survival and maternal and child under nutrition to

raise support and commitment to increase rates of exclusive breastfeeding and continued breastfeeding, thus contributing effectively to decreasing child morbidity and mortality. The *Global Strategy for Infant and Young Child Feeding* (adopted in 2002) provides a framework of action for all concerned parties in achieving Millennium Development Goals (MDGs) and sets the operational targets to achieve the MDG4. The *Planning Guide for national implementation of the Global Strategy for Infant and Young Child feeding* provides specific recommendations on how to conduct the process of implementation and which elements are needed at each stage. This strategy reflects a growing awareness of the contribution of community-based activities to child survival and development. The strategy indicates the need to ensure that the health and other relevant sectors protect, promote and support exclusive breastfeeding for six months and continued breastfeeding up to two years of age or beyond, while providing women access to the support they require in the family, community and workplace (WHO, 2008).

2.16.3 Age pattern of breast feeding

It is recommended to start breast feeding immediately after birth, because breast feeding protects the baby from most risks of various diseases, e.g. diarrhea, acute respiratory infections, also stimulates the immune system. In Tanzania it has been observed that 13.9 % of children who have suboptimal breast feeding were affected by acute respiratory infection and 14.3 % diarrhea (URT, 2005). Frequent and exclusive breast feeding is important in the early weeks of lactation in order to stimulate optimal milk production. Breastfeeding is an ideal way of providing food for the health, growth and development of an infant and has unique biological and emotional influence to the health of both mother and child (Piechulek *et al.*,. 1999).

In some communities, people have fixed attitudes, customs and beliefs about breast feeding practice e.g. some women do not breast feed their babies immediately after birth because of their local beliefs that the first milk is dirty (Latham, 1997).

2.16.4 Weaning practices

Young children (aged 3–15 months) in low-income countries commonly have growth faltering in relation to international reference patterns (Shrimpton, 2001). The primary explanations for slower growth during this period include insufficient or inappropriate dietary intakes and frequent infections. Infants of 6 month old require complementary foods of appropriate energy and nutrient densities in addition to breast milk to meet their physiologic needs (Brown *et al.,* 1995). Complementary foods should be introduced because breast milk is no longer enough after six months (King and Burgess, 1998).

2.16.5 Type of weaning food

Type of weaning food can also influence nutritional status of a child. As mostly Tanzanian weaning foods are typically based on starchy products and watery due to dilution, therefore large amounts will be needed to satisfy energy requirements (Mosha and Svanberg, 1990).

2.16.6 Frequency of feeding

Viscosity or consistency is another very important quality of weaning food, since infants cannot tolerate a solid diet because their digestive physiology and their eating skills are not fully developed. The bulkiness and low energy density of the

traditional diet are factors limiting energy intake particularly when a child is fed twice a day only. If traditional weaning food is unable to compensate for cessation of breast feeding, therefore children need to feed four to six times a day (Laswai *et al.*, 1998).

Energy intake is associated with frequency of eating, dietary bulkiness and energy density of food, appetite, infections, seasonality of food and breast feeding. During illness or stress there is increased need of energy foods (WHO, 1998). In order to ensure adequate energy intake by the child it is important to increase frequency of feeding, reduce bulkiness of food and give a variety of foods (Maletnlema, 1977).

Ideally a child should be fed four to six times a day, the relatively high energy requirements of young children, together with their limited gastric capacity, make it difficult for them to eat enough food, particularly if only a few meals per day are offered or if the foods have low energy density, or both (Kingamkono, 1987).

2.16.7 Socio- economic status

It was documented by URT and UNICEF (1990) that the higher the socio- economic status the lower the mortality levels. This situation is justified by the fact that socio-economic status is indirectly related to income, number of children per household, occupation and education level, access to information, access to good health facilities, better housing and water sanitation all of which have an effect to nutrition. Better occupation may indirectly improve nutrition status, for those working in relatively underpaid jobs are more susceptible to infectious disease and malnutrition (UNICEF and URT, 1990).

2.16.8 Environmental problems affecting child health

Environment is the collective term used to describe all living and non- living things that make up surroundings. This includes the biological, physical, cultural and social, economic and political environment. The physical environment consists of air, water, climate and other physical condition. Biological environment include living things plants animals and micro organisms, the social and political environment, the family, culture, beliefs, politics, and the government all have effect on child health (Wood *et al.*, 1992).

Environment has effects on health and nutritional status of the child because inadequate housing leads to overcrowding, and lack of ventilation that favors the transmission of air borne diseases. The problems of malaria and diarrhea diseases are closely associated with problem of water. Mosquitoes breed in water pools, and bushy environments consequently become mosquito breeding grounds which in turn transmit malaria, poor hygiene and sanitation and improper disposal of excreta lead to an increase in oral transmission and spread of diarrhea diseases (**http://www.unicef.org**/nutrition).

2.16.9 Water

Water supply and safety of food are important determinants of health and nutrition status, because improved water and sanitation lowers childhood mortality. Therefore provision of adequate quantities of safe water near to the people′s home is one of the most important aspects of primary prevention of those diseases (Kapinga, 2006).

2.16.10 Customs

Traditions and customs can also affect child nutrition, because some communities believe that good quality food is not good for a child e.g. have restriction on giving eggs or fish e.g. in the Nyakyusa in Mbeya region the adult men have priority over others in the household (Maletnlema, 1977). Ignorance can also affect nutritional status of a child as people believe that nothing more is required than full stomach i.e. they do not know the importance of eating a balanced meal (King and Burgess, 1993).

2.16.11 Women workload

Women workload can be defined as the expenditure of time and energy in undertaking various tasks. Women workload reduces the time for food preparation of hence reducing the number of meals. Activities like engagement in crop production, post harvesting activities, rearing of livestock, construction work, collecting fire wood, fetching water, weaving, embroidery and other domestic chores reduce the time for food preparation (Leslie, 1998).

Structural adjustment programs have forced many households to adopt survival strategies with detrimental effects on women e.g. income generating activities resulting into many women to be engaged in money making activities for survival of the family hence reduces child care and management (FAO, 1992b).

2.16.12 Maternal nutrition

Maternal nutrition during pregnancy influences the growth of offspring beyond the intrauterine period. It influences children nutritional status both during pregnancy

and early childhood. Women who are malnourished are more likely to deliver smaller babies, who in turn are at increased risk of poor growth and development. Additionally, malnourished women may be less successful at breastfeeding their children, all of which hamper their ability to adequately care for the young child (WHO, 2006).

2.17 Definition of variables

Term	Definition
Diseases	Any deviation from normal
Inadequate feeding	Less food intake than required per body weight
Poor food availability and accessibility	No money to purchase, or poor production per household
Traditional and customs	Informal institutions affecting child health
Low agricultural products	Low production per unit area.
Poor health facilities	In adequate health facilities or its of poor quality
Poor socio-economic status	In ability of households to meet basic needs
Health status	Free from illness
Inadequate care for children	Less care for children

CHAPTER THREE

3.0 METHODOLOGY

3.1 Description of the Study Area

The study was conducted in Mbarali District which is one of the seven districts in Mbeya region. The district lies between latitudes 7^0 00' and 9^0 00' south of the Equator and between longitude 33.8^0 and 35^0 00' East of Greenwich. On the east of Equator it is bordered by Iringa Rural district. To the North-East of Equator bordered by Mufindi and, Njombe district and to the North is Chunya. According to the Population and Housing Census (2002) Mbarali district had a population of 234 101 with an annual growth rate of 2.8% (URT and UNICEF 2002). Administratively, the district is divided into two divisions, 11 wards and 98 registered villages. The district has a total area of 16 000 km.^{2}The study was conducted at Lyambogo village in Chimala ward of Rujewa division.

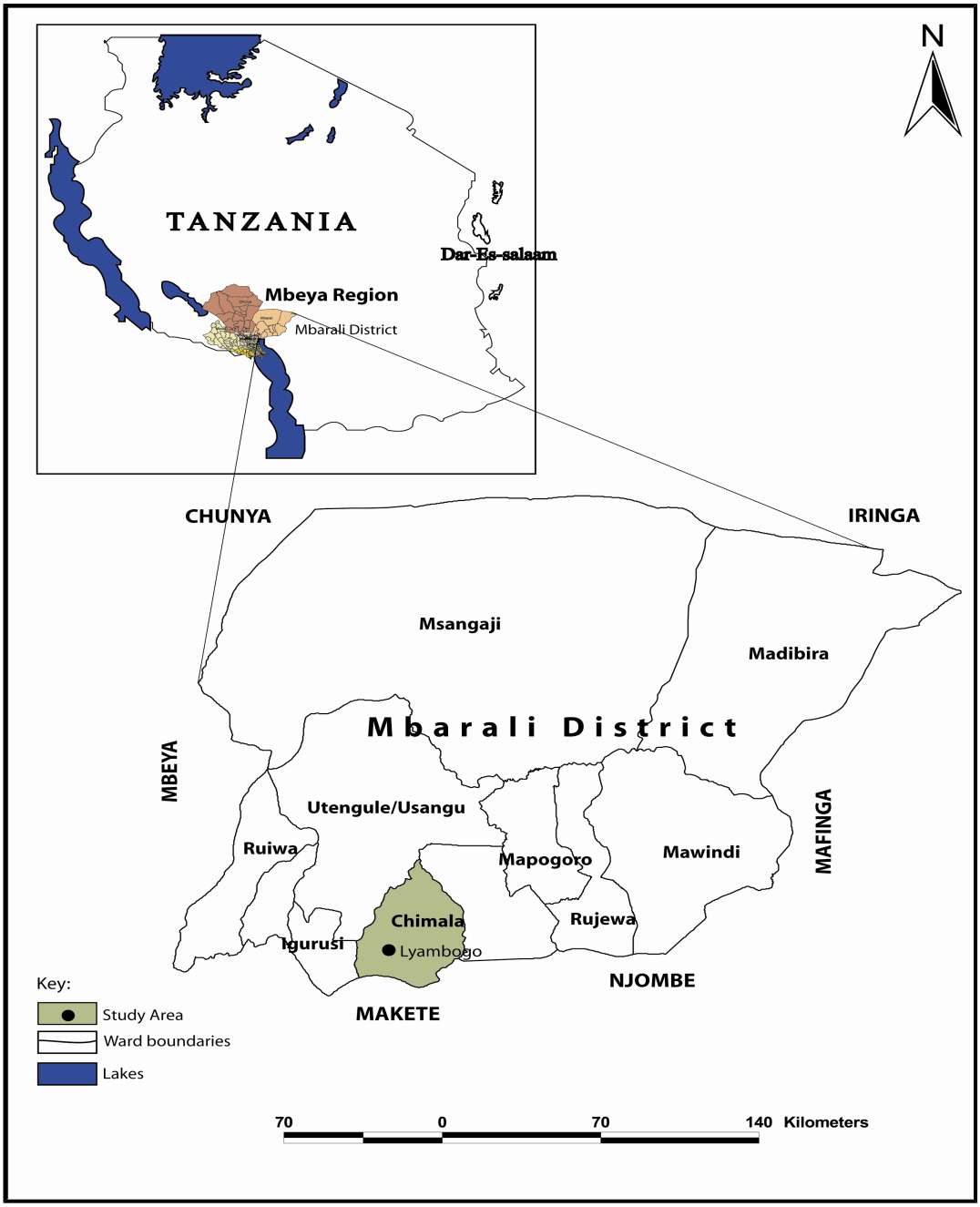


Figure 1: Map showing the study area

3. 2 Topography and Drainage

Mbarali district lies within the Great Rift Valley. There are three main drainage basins, the Ruaha, which extends towards the east, the Lake Nyasa basin in the south and Lake Rukwa in the north (URT and UNICEF, 2002).

3.3 Climate

The climate is influenced by altitude which is generally tropical with marked seasonal and altitudinal temperature variations, defined by dry and rain seasons. Temperature ranges from 16^0 C in the highlands to 25^0 C in the lowland areas. Annual rainfall ranges from 650 mm to 2600 mm (URT and UNICEF, 2002).

3.4 Socio-Economic Information

Activities include subsistence agriculture producing mainly cash crops, food crop and livestock keeping. The main agricultural crops include maize, rice, banana, round potatoes, and wheat. Livestock include cattle, sheep and goat (URT and UNICEF, 2002).

3.4.1 Education

About 99% of the rural villages were provided with primary schools. But problems facing primary schools in Tanzania are similar, allover (URT, 2000). The main problems include shortage of school infrastructure, and teaching/learning materials (textbooks, library etc).

3.4.2 Health

Like in other place, health facilities are in most villages, in Mbarali a good number of the people have an access to them. The main problem which again is common in allover the place is the “shortage of medicines”, user charges and the poor state of the health infrastructure (URT, 1999).

3.6 Study Design

The study assumed a cross-sectional study in which the collection of data was done once at a time without repetition due to limited resources and time (Kothari, 2004).

3.7 Study Population

Mother-child pair who attend MCH clinic in a selected area formed the sampling frame

3.8 Sampling and Sample Size

Multistage, purposive and simple random sampling techniques were used to select the region, districts, and village based on the malnutrition rates in the district. Sampling started at regional level where Mbarali district out of the seven districts was selected. Then Chimala ward in Rujewa division was selected purposely due to its easier accessibility of public transport than other wards. Lyambogo village was selected purposely from among the 98 villages found in Rujewa division and Chimala ward.

3.9 Sample Size Determinations

Sample size of 160 children was estimated, degree of accuracy was set at 0.05 level of confidence according to Kothari (2004). The formula used was;

$$nf = \frac{n}{(1+\frac{n}{N})}$$

nf= sample desired when populations < 10 000

n= sample desired when population > 10 000

N= the estimated population size i.e. less than 10 000

3.10 Data Collection

3.10.1 Pre-testing

Pre-testing of questionnaires was conducted by random sampling on twenty mother–child pair who was not included in the final sample to ascertain validity of questions and then corrections were incorporated.

3.10.2 Primary and secondary data

Both closed and open-ended questions were used in the face to face interview to obtain primary data. Secondary data was obtained from literature search e.g. books, journals and other reports or any other sources e.g. Sokoine National Library (SNAL), University of Dar es salaam, UNICEF, WHO and FAO.

3.10.3 Anthropometric measurements

Anthropometric measurements used in the study were weight, height and Mid–Upper Arm Circumference (MUAC).These were presented according to cut–off points in terms of z-scores based on the standard deviation SDs from a reference median value(z-score) being above or below the cut –off points.

Table 1: Classification of nutritional status based on SDs

Cut-off points in standard deviation	State of nutrition
Below (-3SD)	Severe under nutrition
Between (–3SD) to (-2SD)	Moderately under nutrition
Between (-2SD) and (-1SD)	Mildly under nutrition
From (-1SD) and above	Normal nutrition
Above (+2SD)	Over nutrition

Source: WHO (1995)

Weights of the child were measured and recorded to the nearest 0.1 kg (accuracy of 100 g) using salter scale with a capacity of 25 kg (Model 235 6S – England) adjusted to zero point before starting the reading. The Salter scale was hanged on the rafter at the Mother and Child Health Clinic. The child was hung on the scale and the measurement was recorded as soon as the pointer on the scale had stabilized. Height was measured by using stadiometer at supine position or recumbent position of the child, by use of measuring board which had a fixed head rest and a movable foot piece and placed on a flat surface the foot piece was moved to touch the feet and length and measurement was recorded. Children with height more than 100 cm were measured by using stadiometer (Leicester height measure), the measurement was recorded while the subject was standing without shoes on a horizontal flat with heels together, back straight and eyes looking straight ahead, and the board was pressed firmly horizontally against the board then the measurement was recorded. The MUAC was measured by using Talc insertion tape at the midpoint between the shoulder and elbow of the child by halving the distance between the shoulder and the tip of elbow. The child's arm was uncovered as far as the shoulder and hanged straight. During the measurement process, the tape was placed comfortably around the arm at the marked mid-way point, and measurement were taken and recorded. Children were classified according to nutritional classification.

Table 2: Nutrition variable classification based on MUAC

Nutrition variable	Classification	Remarks
MUAC	Above 13.5 cm	Normal
	Between 12.5-13.5 cm	Moderately malnourished
	Below 12.5 cm	Severe malnourished

Source: Gibson (1990)

3.11 Dietary Assessment

Mothers were requested to give the type and amount of food, which the child had consumed in the last 24 hours. Then the amount was weighed by use of digital weighing scale and measuring cylinder for liquid foods and total energy and nutrient intake were determined using the food composition table.

3.12 Other Information

Household heads were asked additional questions to gather information on socio-economic activities, e.g. non- agricultural activities such average income, food availability and accessibility based on previous harvests/amount sold; amount stored, storage facilities, etc.

3.13 Data Organization and Analysis

Data were organized from previously coded interview schedule and entered individually in a pre-coded computer spread sheet then analyzed by Statistical Package for Social Science (SPSS) Computer software, Version 11.5 (Norusis/ SPSS Inc, 2003). Descriptive data on relevant variables was performed which was then presented in tables e.g. percentages, frequencies. Anthropometric data was analyzed by a computerized program Epi Info 6 version. Chi- square test was done, to see if there was any association between categorical variables (Kothari, 2004).

CHAPTER FOUR

4.0 RESULTS

This chapter presents the results on factors influencing nutritional status of children below five years of age in Mbarali district. The results are divided into four sections nutritional status, socio-economic factors which affect nutritional status of children, health and environmental sanitation and food availability.

4.1 Nutritional Status of Under Five Children in z-scores by Age Groups

Nutritional status of under five children was assessed using z-scores and were compared to reference population recommended by (WHO, 1995) as shown in Table 3.

4.1.1 Nutritional status using Weight- for - age z-score (waz)

Table 3 indicates that 39.4% children were under weight. Among them 13.8% were severely underweight and 15.6% were moderately underweight, Three per cent of children were overweight. The most severely under weight children were in the age of 13-24 months.

Table 3: Weight - for -age z-score (waz)

Age in months	Severely underweight n (%)	Moderately underweight n (%)	Normal n (%)	Overweight n (%)	Total n (%)
0-12	3 (1.8)	2 (1.3)	32 (20.0)	1(0.6)	38 (23.8)
13-24	8 (5.2)	11 (7.0)	27 (17.0)	2(1.3)	48 (30.0)
25-36	5 (3.2)	4 (2.5)	23 (14.0)	0(0.0)	32 (20.0)
37-48	3 (1.8)	7 (4.2)	17 (10.6)	1 (0.6)	28 (17.5)
49-59	3 (1.8)	1 (0.6)	9 (5.6)	1(0.6)	14 (8.7)
Total	**22(13.8)**	**25 (15.6)**	**108(67.2)**	**5(3.1)**	**160 (100)**

4.1.2 Nutritional status using Weight- for- height z- score (whz)

Table 4 indicates that 27.5% children were wasted out of these 5% were severely wasted and 22.5% were moderately wasted. The most severely wasted were in the age of 25-36 months.

Table 4: Weight- for- height z- score (whz)

Age in months	Severely wasted n (%)	Moderately wasted n(%)	Normal n (%)	Overweight n (%)	Total n (%)
0-12	1 (0.6)	14 (8.7)	31 (19.3)	1 (0.6)	47 (29.3)
13-24	2 (1.3)	8 (5.0)	34 (21.2)	1 (0.6)	45 (28.1)
25-36	5 (3.1)	4 (2.5)	20 (12.5)	0 (0.0)	29 (18.1)
37-48	0 (0.0)	3 (2.0)	22 (13.8)	1 (0.6)	30 (18.9)
49-59	0 (0.0)	7 (4.4)	3 (3.8)	0 (0.0)	9 (5.6)
Total	**8(5.0)**	**36 (22.5)**	**113 (70.6)**	**3(1.8)**	**160 (100)**

4.1.3 Height- for- age (haz)

Nutritional status of children using height–for-age index shows that 30.7% of the children were stunted, out of these 5.0% were severely stunted and 25.7% were moderately stunted. Most of severely stunted children were from age 25-36 months group and most of moderately stunted were in 0-12 months of age group (Table 5).

Table 5: Height- for- age z- score (haz)

Age in months	Severely stunted n(%)	Moderately stunted n (%)	Normal n(%)	Giant n (%)	Total n(%)
0-12	1 (0.6)	15 (9.4)	31 (19.4)	0 (0.0)	47(29.4)
13-24	3 (1.9)	8 (5.0)	44 (27.5)	1 (0.6)	56 (35.0)
25-36	3 (1.9)	8 (5.0)	20 (12.5)	1 (0.6)	32(20.0)
37-48	0 (0.0)	7 (4.4)	5 (3.1)	1 (0.6)	13 (8.1)
49-59	1 (0.6)	3 (1.9)	8 (5.0)	0 (0.0)	12(7.5)
Total	**8 (5.0)**	**41(25.7)**	**108 (67.5)**	**3 (1.8)**	**160(100)**

4.1.4 Nutritional status according to sex of the children (Weight-for- age)

Table 6 shows that 2.5% female children were severely underweight, 5.6% moderately underweight, while 3.1% male children were severely underweight and 8.1% moderately underweight. The study found no significant association between sex of the child and nutritional status.

Table 6: Nutritional status according to sex of the children (Weight-for- age)

Nutritional indicator	Female n(%)	Male n(%)	Total n (%)
Severely underweight	4(2.5)	5(3.1)	9(5.6)
Moderately underweight	9(5.6)	13(8.1)	22(13.8)
Normal	33(20.7)	93(58.2)	126(78.8)
Obese	2 (1.2)	1(0.6)	3(1.8)
Total	**48 (30.0)**	**112 (70.0)**	**160 (100)**

4.1 5: Nutritional status according to sex of the children (Height- for-age)

Results in Table 7 show that 1.9% of females were severely stunted and 2.5% were moderately stunted, while 5.1% of male children were severely stunted and 4.3% were moderately stunted. There was no significant association between sex of the child and nutritional status.

Table 7: Nutritional status according to sex of the children (Height-for age)

Nutritional indicator	Female n (%)	Male n (%)	Total n (%)
Severely stunted	3(1.9)	8(5.1)	11(6.9)
Moderately stunted	4 (2.5)	7(4.3)	11(6.9)
Normal	39(24.4)	96(60.0)	135(84.4)
Obese	2 (1.2)	1(0.6)	3(1.8)
Total	**48(30.0)**	**112 (70.0)**	**160 (100)**

4.1 6: Nutritional status according to sex of the children (Weight- for-height)

Table 8 shows that about 2% of female children were severely wasted and 5% were moderately wasted. Three percent of male children were wasted, while 17% were moderately wasted. There was no significant association between sex of the child and nutritional status.

Table 8: Nutritional status according to sex of the children (Weight- for-height)

Nutritional indicator	Female n (%)	Male n (%)	Total n (%)
Severely wasted	3(1.8)	5 (3.1)	8 (5.0)
Moderately wasted	8 (5.0)	28 (17.3)	36 (22.5)
Normal	34(21.4)	78 (48.0)	112 (70.0)
Taller	3(1.8)	1(0.6)	4 (2.5)
Total	**48 (30.0)**	**112 (69.0)**	**160 (100)**

4.1.7 Mid upper arm circumference by sex of the child

Based on Mid Upper Arm Circumference (MUAC) 1.8% female children were undernourished, 14% moderately undernourished. As for males 3.1% were severely undernourished and 5.6% moderately undernourished (Table 9).

Table 9: Mid Upper Arm Circumference by sex of the child

Nutritional Indicator (MUAC)	Female n (%)	Male n (%)	Total n (%)
Below 12.5 cm	3 (1.8)	5(3.1)	8 (4.9)
Between 12.5 cm -13.5 cm	22(14.0)	9 (5.6)	31 (19.40
Above 13.5 cm	23 (14.2)	98 (61.3)	121(75.7)
Total	**48 (30.0)**	**112 (70.0)**	**160 (100.0)**

4.1.8 Birth weight and nutritional status (Weight- for- age)

Results in Table 10 show that 13.1% of children born with weight below 2.5kg, none were severely underweight, while 6.9 % were found moderately underweight. Out of 86.9% children born with weight above 2.5 kg, 1.2% children were severely

underweight and 12.5% were moderately underweight. There was a significant association (P<0.05) between birth weight and nutritional status.

Table 10: Association between birth weight and nutritional status (Weight-for- age)

Birth in Kg	Severely underweight n(%)	Moderately Underweight n(%)	Normal n(%)	Over n(%)	Total n (%)	X^2	P-value
Below 2.5 kg	0 (0.0)	11 (6.9)	8 (5.0)	2 (1.2)	21(13.1)	**76.86**	**0.00**
Above 2.5kg	2 (1.2)	20 (12.5)	106(66.3)	11(6.9)	139(86.9)		
Total	**2 (1.2)**	**31(19.4)**	**114(71.3)**	**13 (8.1)**	**160(100)**		

4.1.9 Association between socio-economic factors and nutritional status using Height- for- age indicator

Most of the severely stunted children were of the mothers aged 18-27 years. Although families with >6 members had the highest proportional of children who were severely stunted, the test of significance showed no relationship between family size and nutritional status. While mothers with primary school education had 4.4% severely stunted children secondary school leavers had no severely stunted children. About nine percent of farmers had severely stunted children, while other occupations had 5% severely stunted children. Married mothers had highest number of severely stunted children compared to people with other marital status. There was no relationship between socio-economic factors and nutritional statuses (Table 11).

Table 11: Relationship between socio-economic factors and nutritional status (Height- for- age indicator)

Characteristics	Severely stunted	Moderately stunted	Normal	Taller than	Total

	n (%)	n (%)	n (%)	Average n (%)	n (%)
Mothers age (yeas)					
18-27	6 (3.8)	22 (13.8)	112 (70.0)	2 (1.2)	142 (89.0)
28-36	2 (1.2)	0 (00.0)	6 (3.8)	2 (1.2)	10 (6.0)
38-47	0 (0.0)	2 (1.2)	6 (3.8)	0 (0.0)	8 (5.0)
Total	**8 (5.0)**	**24(15.0)**	**124 (77.6)**	**4 (2.4)**	**160 (100)**
Family size					
1-3	0 (0.0)	4 (2.5)	1 (0.6)	4 (2.5)	9 (5.6)
4-6	1 (0.6)	7 (4.4)	3 (1.9)	9 (5.6)	20(12.5)
>6	7 (4.4)	25 (15.6)	17 (10.6)	82 (51.3)	131 (89.9)
Total	**8 (5.0)**	**36 (22.5)**	**21 (13.1)**	**95 (59.4)**	**160 (100)**
Education level					
Informal	1 (0.6)	0 (0.0)	1 (0.6)	2 (1.2)	4 (2.5)
Primary.	7 (4.4)	31 (19.4)	20 (12.5)	91 (56.9)	149 (93.1)
Secondary	0 (0.0)	5 (3.1)	0 (0.0)	2 (1.3)	7 (4.4)
Total	**8 (5.0)**	**36 (22.5)**	**21(13.1)**	**95(59.4)**	**160 (100)**
Occupation					
Farming	14 (8.8)	24 (15.0)	33 (20.6)	46 (29.0)	117 (73.2)
Other occupation	8 (5.0)	10 (6.0)	16 (10.0)	9 (5.6)	43 (26.8)
Total	**22 (13.8)**	**34(21.0)**	**49 (30. 6)**	**55 (34.6)**	**160 (100)**
Marital status					
Single	2 (1.2)	2 (1.2)	6 (3.8)	3 (1.9)	13 (8.1)
Married	19 (11.9)	31 (19.4)	42 (26.3)	51 (31.9)	143 (89.3)
Divorced	1 (0.6)	1 (0.6)	1 (0.6)	0 (0.0)	3 (1.8)
Cohabit	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.6)	1 (0.6)
Total	**22 (13.7)**	**34 (21.2)**	**4 9 (30.7)**	**55 (34.4)**	**160 (100)**

4.1.10 Relationship between health center availability, walking distance, sources of water and nutritional status (Weight- for-height)

Children without nearby health facility had more number of severely wasting children (15.6%). Respondents who walked one hour to health centre had 6.2% severely wasted children compared to those walk less than one hour distance. Furthermore, respondents who use tap water and bore hole wells were observed to have few severely wasted children compared to those who accessed other sources of water like natural spring, rivers and rain water. Families who use boiled water had less number of wasted children compared to those who do not use boiled water. There was no significant association between children with health center

availability, walking distance, sources of water and nutritional status access to (Table 12).

Table 12: Relationship between health centers availability, distance covered, sources of water and (Weight- for- height)

Health facility And their usage	Severely wasted n(%)	Moderately wasted n (%)	Normal n (%)	Heavier n (%)	Total n (%)
Availability					
No	25 (15.6)	25 (15.6)	104 (65.0)	1 (0.6)	155 (97.0)
yes	1 (0.6)	3 (2.0)	1 (0.6)	0 (0.0)	5 (3.0)
Total	**26 (16.2)**	**28 (17.6)**	**105 (65.6)**	**1 (0.6)**	**160(100.0)**
Walking distance					
Below 15 min	1 (0.6)	5 (3.2)	15 (9.3)	20 (12.6)	41 (25.6)
15min	0 (0.0)	13 (8.1)	10 (6.3)	19 (11.8)	42 (26.3)
30min	1 (0.6)	3 (2.0)	1 (0.6)	4 (2.5)	9 (5.6)
1 hour	10 (6.2)	12 (7..5)	22 (13.7)	6 (3.7)	50 (31.2)
More than 1 hour	3 (2.0)	5 (3.1)	4 (2.5)	6 (3.7)	18 (11.3)
Total	**15 (9.4)**	**38 (23.9)**	**52 (32.4)**	**55 (34.3)**	**160(100.0)**
Sources of water					
Tap water	0 (0.0)	3 (2.0)	2 (1.2)	2 (1.2)	7 (4.3)
Natural spring	3 (2.0)	3 (2.0)	2 (1.2)	2 (1.2)	10 (6.3)
River	19 (12.4)	9 (5.0)	6 (3.7)	6 (3.6)	41 (25.5)
Rain water	3 (2.0)	13 (8.0)	21 (13.1)	39(25.0)	75 (46.9)
Drilled water	1 (0.6)	8 (5.0)	11 (6.8)	7 (4.0)	27 (17.0)
Total	**26 (17.0)**	**36 (22.0)**	**42 (26.0)**	**56(35.0)**	**160(100.0)**
Boil water					
Yes	2 (1.3)	2 (1.3)	1 (1.6)	20 (12.5)	25 (15.6)
No	20 (12.5)	22 (13.8)	44 (30.0)	35 (28.1)	135 (84/.4)
Total	**22 (13.8)**	**24 (15.0)**	**49 (30.6)**	**65 (40.6)**	**160 (100.0)**

4.1.11: Relationship between type of diseases and nutritional status (Weight- for- height)

Results in Table 13 show that 4% and 9.3% children severely and moderately wasted respectively had a record of diarrhea in the past 3 months. There was a significant association between type of diseases and nutritional status.

Table 13: Type of diseases and nutritional status (Weight-for- height)

Diseases	Severely n (%)	Moderately n (%)	Normal n (%)	Total n (%)	X^2	P-value
Malaria	5(4.0)	10 (6..2)	10 (6.2)	25(15.6)		
Diarrhea	5(4.0)	15 (9.3)	30 (18.7)	50(31.25)	**15.197**	**0.028**
Malaria /cough	7(4.3)	13 8.1)	15 (9.4)	35 (21.9)		
Not disease	0 (0.0)	2 (1.3)	48 (9.4)	50(31.25)		
Total	**17(12.3)**	**40 (25.0)**	**103(64.4)**	**160(100)**		

4.1.12 Type of diseases and nutritional status (Weight-for-age)

Results in Table 14 indicate 3.1% children who got malaria were severely stunted, 16.9% were moderately stunted and for other diseases 16.9% were moderately stunted. There was a significant relationship (P< 0.05) between diarrhea and nutritional status.

Table 14: Type of diseases and nutritional status (Height-for-age)

Indicators	Severely stunted n (%)	Moderately stunted n (%)	Normal n (%)	Total n(%)
Diseases	0 (0.0)	7 (4.3)	6 (3.7)	13(8.1)
Malaria	5 (3.1)	27 (16.9)	13 (8.1)	45(28.1)
Diarrhea	2 (1.2)	8 (5.0)	10 (6.2)	20 (12.5)
Malaria/ cough	3 (1.9)	6 (3.8)	3 (1.3)	12 (7.5)
Other diseases	0 (0.0)	25(15.6)	45(28.1)	70 (43.7)
Not got any disease	0(0.0)	2(1.2)	5(3.0)	7(4.0)
Total	**10(6.2)**	**73 (45.6)**	**77 (48.1)**	**160 (100.0)**

4.1.13 Type of diseases and nutritional status (Weight-for- age)

Children who got malaria in the past three months before survey comprised 7.5% of the severely and moderately underweight, among them 2.5% were severely underweight and 5% children were moderately underweight. The association was not significant between malaria and nutritional status (Table 15).

Table 15: Type of diseases and nutritional status (Weight-for -age)

Indicators	Severely underweight n(%)	Moderately underweight n (%)	Normal Normal n (%)	Total n (%)
Diseases				
Malaria	4 (2.5)	8(5.0)	42 (26.2)	54(33.7)
Diarrhea	4(2.5)	8(5.0)	68(42.5)	80(50.0)
Malaria / cough	0(0.0)	4(2.5)	16(10.0)	20(12.5)
Other diseases	2(1.3)	0(0.0)	0(0.0)	2 (1.3)
No diseases	0(0.0)	2(1.3)	2(1.2)	4 (2.5)
Total	**10(6.3)**	**22(13.8)**	**128(79.9)**	**160 (100)**

4.1.14 Association between latrine availability and nutritional status (Height-for- age)

As far as latrines were concerned, respondents who said they had latrines and used them had no severely stunted children while 5.0% of their children were moderately stunted. Respondents having no latrine had 5% children who were severely stunted (Table 16).There was no relationship between latrine availability, usage and nutritional status.

Table 16: Latrine availability, in relation to nutritional status (Height- for-age)

Availability	Severely stunted n (%)	Moderately stunted n (%)	Normal n (%)	Total n (%)
Yes	0 (0.0)	8 (5.0)	129 (80.6)	137 (85.6)
No	8 (5.0)	0 (0.0)	15 (9.4)	23 (14.4)
Total	**8 (5.0)**	**8 (5.0)**	**144(90.0)**	**160 (100)**

4.1.15 Latrine availability, the usage in relation to nutritional status (Weight-for- height)

Table 17 indicates latrine availability, usage and nutritional status. For respondents who had latrines and used them, none of their children were severely wasted. Among 160 respondents, 148 reported availability of latrines. Respondents without latrines had 5% severely wasted children. There was no significant association between latrine availability and nutritional status.

Table 17: Latrine availability, the usage, in relation to nutritional status (Weight- for- height)

Latrine	Severely wasted n(%)	Moderately wasted n(%)	Normal n (%)	Total n (%)
Yes	0 (0.0)	8 (5.0)	140(87.5)	148 (92.5)
No	8 (5.0)	0 (0.0)	4(2.5)	12 (7.5)
Total	**8(5.0)**	**8 (5.0)**	**144(90.0)**	**160 (100)**

4.1.16 Relationship between food availability and nutritional status (Weight-for- age)

Table 18 indicates respondents whose food was enough during the survey period had 3.7% children who were underweight and 20.6% were moderate underweight. Households whose food was not enough during survey period had 10% severely underweight children and 31.3% were moderately underweight. With respect to people who produced crops below 1 acre had 5% of their children severely underweight and 15.6% were moderately underweight. For those produced above 1 acre had 8.7% children severely under weight and 36.3% children moderately underweight. Respondents whose use modern storage of food had 4.4% of their severely underweight weight children and 14.4% were moderately underweight. Those who use traditional storage had 0.6% of their children severely under weight and 1.9% moderately under weight. There was no relationship between food availability and nutritional status.

Table 18: Relationship between food availability and nutritional status (Weight-for-age)

Indicators	Severely underweight n (%)	Moderately underweight n (%)	Normal weight n (%)	Over weight n (%)	Total n (%)
Food availability					
Enough food	6 (3.7)	33(20.6)	17(10.6)	0(0.0)	56(34.9)
Not enough f	16 (10.0)	50(31.3)	38(23.8)	0(0.0)	104(65.1)
Total	**22(13.7)**	**83(51.9)**	**55(34.4)**	**0(0.0**	**160(100.0)**
Area produced					
Below I acre	8(5.0)	25(15.6)	23(14.3)	0(0.0)	56(34.9)
1-2 acre	9(5.6)	43(26.9)	26(16.3)	0(0.0)	78(48.8)
2.5 acre /above	5(3.1)	15(9.4)	6 (3.8)	0(0.0)	26(16.3)
Total	**22(13.7)**	**83(51.9)**	**55(34.4)**	**0.(0..0)**	**160 (100)**
Measures taken					
Avoid selling	4(2.5)	4(2.5)	50(31.2)	0(0.0)	58(36.2)
Produce more	2(1.3)	5(3.1)	33(20.6)	0(0.0)	40(24.9)
early maturing	2(1..3)	8(5.0)	37(23.1)	0(0.0)	47(30.2)
storage	0(0.0)	4(2.5)	11(6.9)	0(0.0)	15(9.3)
Total	**8(5.1)**	**21(13.1)**	**131(81.8)**	**0(0.0)**	**160(100)**
Food storage					
Modern	7(4.4)	23(14.4)	91(56.8)	0(0.0)	121(75.6)
Traditional	1(0.6)	3(1.9)	35(21.9)	0(0.0)	39(24.4)
Total	**8(5.0)**	**26 (16.3)**	**126 (78.7)**	**0(0.0**)	**160(100)**

4.1.17 Relationship between food availability and nutritional status (Height-for-age)

Table 19 indicates respondents whose food was enough during the survey period had 0.6% children who were stunted and 13.7% were moderate stunted. Households whose food was not enough during survey period had 4.4% severely stunted children and 21.9% were moderately stunted. With respect to people who produced crops below 1 acre had 2.5% of their children were severely stunted and 1.2% were moderately stunted. For those produced above 1 acre had 1.9% children severely stunted and 9.4% children moderately stunted. Respondents whose use modern storage of food had 3.8% of their severely stunted children, 25.6% were moderately stunted and for those who use traditional storage had 1.3% of their children severely

stunted 10% moderately under weight. There was no relationship between food availability and nutritional status.

Table 19

: Relationship between food availability and nutritional status (Height-for-age)

Indicators	Severely underweight n (%)	Moderately underweight n (%)	Normal n (%)	Overweight n (%)	Total n(%)
Enough	1(0.6)	22 (13.7)	32 (20.0)	1 (0.6)	56(35.0)
Not enough food	7 (4.4)	35(21.9)	62 (38.8)	0 (0.0)	104(65.0)
Total	**8(5.0)**	**57 (35.6)**	**94 (58.8)**	**1 (0.6)**	**160 (100)**
Area produced					
Below I acre	4 (2.5)	2 (1.2)	47(29.3)	1(0.6)	54 (33.7)
1-2 acre	3 (1.9)	15 (9.4)	64(40.0)	0(0.0)	82 (51.2)
2.5 acre and above	1 (0.6)	4 (2.5)	19 (11.9)	0 (0.0)	24 (15.0)
Total	**8 (5.0)**	**21 (13.1)**	**130(81.2)**	**1(0.6)**	**160 (100)**
Measures taken					
No selling crops	7 (4.4)	26 (16.2)	22 (13.8)	0(0.0)	55(34.4)
Produce more	6 (3.9)	25 (15.6)	11 (6.9)	0(0.0)	42(26.2)
Use early maturing	6 (3.9)	26 (16.2)	16 (10.0)	0(0.0)	48(30.0)
Effective storage	3 (1.9)	6 (3.8)	6 (3.8)	0 (0.0)	15(9.4)
Total	**22(14.1)**	**83(51.9)**	**55(34.50**	**0(0.0)**	**160(100)**
Food storage					
Modern	6(3.8)	41(25.6)	72 (45.0)	0(0.0)	119(33.4)
Traditional	2(1.3.0)	16(10.0)	23(14.4)	0 (0.0)	41(66.4)
Total	**8(5.1)**	**57(35.6)**	**95(59.4)**	**0 (0.0)**	**160(100)**

4.1.18 Association between food availability and nutritional status (Weight-for-height)

Among respondents whose food was enough during the survey period 3.7% of their children were wasted severely, 20.6% were moderately wasted. On the contrary 10% children were severely wasted among respondents whose food was not enough during the survey, while31.3% were moderately wasted. Respondents who produced below 1acre had 5% severely wasted children, 20.6%% were moderately wasted and for those who produced between 1-2 acre had 5.6% severely wasted, 15.6% were moderately wasted. To avoid selling of crops was one of the measures taken to reduce scarcity of food. Those who avoided selling of crops had 5% severely and

moderately wasted children. For those who produced more than one acre had 4.4% severely and moderately wasted children and for those who resorted to early maturing varieties and effective storage had 1.3% severely wasted children and about 7.5% were moderately wasted. Respondents who use modern storage of food had 18.8% combined severely and moderately wasted while those who use traditional storage had 2.5% combined severely and moderately wasted. There was a significant association (P<0.05) between method of storage and nutritional status.

Table 20
: Relationship between food availability and nutritional status (Weight-for-height)

Indicators	Severely wasted n (%)	Moderately wasted n (%)	Normal weight n (%)	Slightly wasted n (%)	Total n (%)	X^2 P value
Food availability						
Enough food	6 (3.7)	33(20.6)	17(10.6)	0(0.0)	56(34.9)	
Not enough food	16 (10.0)	50(31.3)	38(23.8)	0(0.0)	104(65.1)	
Total	**22(13.7)**	**83(51.9)**	**55(34.4)**	**0(0.0**	**160(100.0)**	
Area produced						
Below I acre	3(2.0)	29(18.5)	66(41.2)	0(0.0)	56(34.9)	
1-2 acre	2(2.3)	6(3.0)	8(5.0)	0(0.0)	78(48.8)	
2.5 acre +	0(0.0)	0(0.0)	44(26.8)	0(0.0)	26(16.3)	
Total	**5(4.3)**	**35(21.5)**	**118(73.0)**	**0 (0.0)**	**160 (100)**	
Measures taken						
Avoid selling crops	4(2.5)	4(2.5)	50(31.2)	0(0.0)	58(36.2)	
Produce more early maturing	2(1.3)	5(3.1)	33(20.6)	0(0.0)	40(24.9)	
Effective storage	2(1.3)	8(5.0)	37(23.1)	0(0.0)	47(30.2)	
Total	0(0.0)	4(2.5)	11(6.9)	0(0.0)	15(9.3)	
Food storage	**8(5.1)**	**21(13.1)**	**131(81.8)**	**0(0.0)**	**160(100)**	
Modern	7(4.4)	23(14.4)	91(56.8)	0(0.0)	121(75.6**)**	**3.389 0.05**
Traditional	1(0.6)	3(1.9)	35(21.9)	0(0.0)	39(24.4)	
Total	**8(5.0)**	**26 (16.3)**	**126 (78.7)**	**0(0.0**)	**160(100)**	

4.1.19 Feeding practices and nutritional status (Height- for- age)

Table 21 shows that there was no child who was severely stunted or moderately stunted from those who were breast fed immediately after delivery. Among children who were breastfed after 1-2 days 3% were severely stunted and 6% were

moderately stunted. For children weaned before 4 months 19% of them were severely stunted and for those weaned after 6 months of age 12% of them were moderately stunted. Children who ate once per day had 3.1% severely and moderately stunted children in each category. The association was significant (P<0.05) between number of meals per child per day and nutritional status.

Table 21: Association between feeding practices and nutritional status (Height-for- age)

Indicators	Severely stunted n (%)	Moderately Stunted n (%)	Normal n (%)	Slightly taller n (%)	Total n (%)	X^2	P-value
Breast feeding initiation							
Few hours	0(0.0)	10(6.2)	98(61.2)	0 (0.0)	108 (67.4)		
After 1-2 days	3(2.0)	30(19.0)	10(6.2)	1(0.6)	44 (27.6)		
Takes 2 days	1(0.6)	0(0.0)	1(0.6)	1(0.6)	3 (2.0)		
not breast feed	1(0.6)	2(1.2)	1(0.6)	1(0.6)	5 (3.0)		
Total	**5(3.2)**	**42(26.4)**	**110(68.6)**	**3(1.8)**	**160(100)**		
Weaning							
Before4months	19(11.8)	30(19.0)	51(32.1)	0 (0.0)	100 (62.9)	**27.40**	**0.028**
After 6 months	15(9.3)	12(7.5)	31(19.0)	2(1.3)	60 (37.1)		
Total	**34(21.1**)	**42(26.5)**	**82(51.1)**	**2 (1.3)**	**160 (100)**		
No of meals							
Once	5(3.1)	5(3.1)	3 (2.0)	1(0.6)	14 (9.0)	**9.596**	**0.03**
2times	1(0.6)	2(1.3)	22 (14.0)	0(0.0)	25 (15.4)		
>3 times	1(0.6)	20(12.5)	100(62.2)	0(0.0)	121 (75.6)		
Total	**7(4.3)**	**27(16.9)**	**125(78.2)**	**1(0.6)**	**160 (100)**		

4.1.20 Association between feeding practices and nutritional status (Weight-for-age)

Results in Table 22 show the relationship between different feeding practices and nutritional status. Among children who were breast fed few hours after delivery, 16.9% combined were severely and moderately underweight. Those who were breast fed after1-2 days after delivery 16.3% of them were underweight, and for those who took 2 days to be breastfed and those who were not breastfed at all 2.5% of them were severely underweight. There was no association between time

elapsed to breastfed and nutritional status. Weaning age before 4 month had 16.3% severely and moderately underweight, those who were weaned after 6 months of age were 5.1%. The association was significant (P< 0.05) between weaning age and nutritional status.

Table 22: Association between feeding practices and nutritional status and (Weight-for- age)

Indicator	Severely underweight n(%)	Moderately underweight n (%)	Normal weight n(%)	Over weight n (%)	Total n(%)	X^2	P-value
Breastfeeding Initiation							
Few hours after delivery	2(1.3)	25(15.6)	40(25.0)	9(5.6)	76(47.5)		
After 1-2 days	6(3.8)	20(12.5)	30(18.8)	5(3.1)	61(38.1)		
Takes 2 days	0 (0.0)	8(5.0)	8(5.0)	0(0.0)	16(10.0)		
Not breast fed	0(0.0)	4(2.5)	3(1.9)	0(0.0)	7(4.4)		
Total	**8(5.1)**	**57 (35.6)**	**8(50.7)**	**14(8.7)**	**160(100)**		
Weaning age							
Before 4 months	6(3.8)	20(12.5)	110(687	10(6.2)	146(91.2)	**7.097**	**0.035**
After 6 months	2(1.3)	6 (3.8)	3 (1.9)	3 (1.9)	14(8.8)		
Total	**8 5.1**	**26(16.2)**	**113(70.6**	**13(8.1)**	**160 (100)**		
No of meals							
Once	12(7.5)	19(11.9)	34(21.2)	34(21.2)	99 (61.9)		
Once	2 (1.3)	5(3.1)	5(3.1)	4(2.4)	16(10.0)		
2 times	8(5.0)	10(6.2)	10(6.2)	16(10.0)	44 (27.5)		
More than 3 times	0 (0.6)	0(0.6)	0(0.6)	1(0.6)	1(0.6)		
Total	**22 (14.4)**	**34(21.8)**	**49(31.1)**	**55(34.3)**	**160(100)**		

4.1.21 Relationship between feeding practices and nutritional status (Weight-for- height)

Table 23 indicates that 5.7% of children who were breastfed few hours after delivery were severely and moderately wasted while 4.1% of those who were breastfed 1-2 days after delivery were moderately wasted. Children who ate once

per day 40.6% of them were severely and moderately wasted, who ate two times per day 7.6% were severely and moderately wasted and among who ate more than 3 times per day 17.5% were severely and moderately wasted. Seventy percent of children weaned before 4 months of age were wasted, for those weaned after 6 months 4.3% were severely and moderately wasted. The association was significant (P<0.05) between feeding practices and nutritional status.

Table 23: Relationship between feeding practices and nutritional status (Weight- for- height)

Indicator	Severely wasted n (%)	Moderately wasted n (%)	Normal weight n (%)	Bigger n (%)	Total n (%)	X^2	P-value
Breast feeding Initiation							
Few hours	6(3.8)	3(1.9)	5(3.1)	58(36.3)	72(45.0)		
After 1-2 days	0 (0.0)	5(3.1)	6(3.8)	49(30.6)	60(37.5)		
Takes 2 days	1(0.6)	0(0.0)	1(0.6)	14(8.8)	16(10.0)		
Not breast fed	1(0.6)	5(3.1)	1(0.6)	5(3.1)	12(7.5)		
Total	**8(5.0)**	**13(8.1)**	**13(8.1)**	**126(78.8)**	**160(100)**		
Weaning age							
Before 4 months	20(12.5)	79(49.4)	52(32.5)	0(0.0)	151(94.0)	**17**	**0.048**
After 6 months	2(1.8	4(2.5)	3(1.9)	0(0.0)	9 (6.0)		
Total	**22(14.4)**	**83(51.5)**	**55(34.4)**	**0(0.0)**	**160 (100.0)**		
No of meals							
2 times	2(1.3)	10(6.3)	4 (2.5)	0 (0.0)	16(10.1)		
More >3 times	8(5.0)	20(12.5)	17(10.6)	0(0.0)	45(28.1)		
Total	**22(13.8)**	**83(51.9)**	**55(34.3)**	**0(0.0)**	**160 (100)**		

4.1.22: Percentage RDA Energy (kcal) consumption by age

Results in Table 24 show that 10.8 % of the children obtained energy below 50% of RDA per day. About 89% obtained energy above 50% of RDA. General results show that children aged between 0-12 months obtained energy more than other children

Table 24: Percentage Energy (kcal) consumption in ages

Age in months	**< 50% RDA Energy kcal** n(%)	**> 50%RDA Energy (kcal)** n (%)
0-12	2(1.2)	99(61.9)
13-24	9 (5.6)	13(8.1)
25-36	1 (0.6)	12(7.5)
37-48	0 (0 .0)	14 (8.6)
49-60	5 (3.0)	5(3.1)
Total	**17(10.8)**	**143 (89.2)**

4.1.23 Percentage RDA of protein consumption per child by age

Results in Table 25 indicate that 20.7 % of the children obtained protein below 50% of the recommended daily allowance following dietary assessment and most of them (10.6%) were from 49-60 months age group.

Table 25: Percentage RDA of protein consumption per child by age

Age in month	**< 50 % protein n (%)**	**> 50 % protein n (%)**
0-12	2 (1.2)	9 (5.6)
13-24	3 (2.0)	16 (10.0)
25-36	5 (3.1)	13 (8.1)
37-48	6 (3.8)	11 (6.9)
49-60	17 (10.6)	78 (48.7)
Total	**33 (20.7)**	**127 (79.3)**

4.1.24 Relationship between dependent and independent variables

Table 26 shows a summary of relationship between dependent and independent variables where by birth weight, type of food storage, breast feeding initiation, weaning age, indicated to affect nutritional status

Table 26: Chi-Square test on relationship between dependent and independent variables

Variables	Chi-square	df	P-value
Sex of the child and weight- for- age (waz)	1.958	3	0.581
Sex of the child and height- for- age (haz)	1.1948	3	0.909
Sex of the child and weight- for- height (whz)	5.008	3	0.074
Birth weight of the child and weight- for-age(waz)	76.869	66	0.000
Mothers age and height- for-age (haz)	3.526	6	0.807
Family size and height- for-age (haz)	5.822	6	0.569
Educational level and height- for-age (haz)	1.513	6	0.673
Occupation and height- for-age (haz)	3.59	3	0.807
Marital status and height- for-age(haz)	85.24	75	0.137
Walking distance weight- for- age (waz)	5.602	12	0.075
Sources of water weight- for- age (waz)	8.980	12	0.866
Boiling of water weight- for- age (waz)	10.104	9	0.041
Enough food during the survey period weight- for- age (waz)	9.764	9	0.041
Enough food during the survey period height- for- age haz)	4.048	6	0.678
Enough food during the survey period weight- for- height (whz)	4.020a	6	0.912
Reasons for not enough food weight- for- age (waz)	9.764	9	0.897
Reasons for not enough food weight- for- age (haz)	9.764	9	0.897
Reasons for not enough food weight- for- age (whz)	9.764	9	0.897
Area produced and weight- for- age (waz)	4.779a	6	0.145
Area produced and height- for- age (haz)	4.51a	6	0.912
Area produced and weight – for height (hwz)	11.520	6	0.145
Measure taken to ensure food availability and height- for- age (waz	5.436	9	0.666
Measure taken to ensure food availability and height- for- age (hwz)	9.698a	9	0.086
Measure taken to ensure food availability and height- for- age (hwz)	6.092	9	0.705
Type of storage height for- age - (haz)	3.689	3	0.053
Type of storage weight- for- age (waz)	1.19a	3	0.494
Type of storage weight- for- height (hwz)	7	9	0.385
Breast feeding initiation and weight for age (waz)	19.094	9	0.043
Breast feeding initiation and height – for – age (haz)	12.151a	9	0.339
Breast feeding initiation and weight- for height (hwz)	9.069	9	0.747
Weaning age and weight -for -age (waz)	8.596	6	0.090
Weaning age and weight- for- height (hwz)	7.097a	3	0.035
Weaning age and height for age (haz)	17	9	0.048
Number of meals and weight- for -age (waz)	9.596	9	0.004
Number of meals and weight- for- height (hwz)	10.540	9	0.065
Number of meals and height- for – age (haz)	5.547a	9	0.652
Different types of diseases and height- for-age (haz)	15.197	9	0.020
Different types of diseases and weight- for-height (hwz)	7.649	9	0.385

CHAPTER FIVE

5.0 DISCUSSION

5.1 Nutritional Status Using (Weight- for –age) by Age Groups

A child can be underweight because he is stunted or both. The problem of underweight has no specific age because if a child was not breastfed properly or not weaned properly and experienced a frequent illness, underweight can occur (URT, 1992 and TDCHS, 2005). It is a combination of poor weight for height and poor height for age nutritional status, but does not distinguish between acute and chronic malnutrition (URT, 1999 and URT, 2000). Results indicated that 39.4% of children were underweight among them 13.8% children were severely underweight. From National bureau of Statistics the national average of underweight was 4% in 2005). In this study most of children who were found to be severely and moderately underweight were at the age of 13-24 and 25-36 months. These could be due to the fact that children were not weaned properly either stated later or early than the recommended time and may be the food was of poor quality. In addition children at these ages are in rapid growth, vulnerable to infections and infestation from contaminated environment or eating of contaminated foods

5.2 Nutritional Status (Weight- for- height) by Age Groups

Weight below the recommended value is an indication of poor nutritional status of children. Low weight- for- height reflects poor linear growth. Results showed that 27.5% of children were wasted, of whom, 5% children were severely wasted, This percentage is higher than the national value which was 3% as reported by WHO in 2007.Severely wasted children were mostly in the age of 25-36 months. Surveys conducted by others in Tanzania (URT, 2002; TDCHS, 2005) observed the same problem.

5.3 Nutrition status (Height- for- age) by Age Groups

The study found that 5.0% children were severely stunted. The national figure of severely stunting children in 2005 was 13% as reported by Poverty and Human Development Report PHDR in 2005. Most of severely stunted children were in the age 13-36 months. The first two years of life in children is very important because nutrient requirement is high especially micronutrients due to rapid growth. Therefore adequate nutrients should be supplied to the children (TDHS, 2005).

5.4 Other Factors Associated with Nutritional Status

5.4.1 Demographic variables

5.4.1.1 Age of the mother

The minimum age of bearing children of the mother were 18 years, the maximum age were 45 years, (TBS, 2000 and THRS, 2005) showed the minimum age for child bearing is 20 years and the maximum of child bearing age to be 35 years. But in the study most of severely stunted children born by mothers whose aged 18-20 years. Age of mother can affect nutritional status of children in the following ways; the younger mother normally below age 20 may have poor child management, and may also have less milk production due to undeveloped breasts. Inexperience related to required feeding practices and early detection of child illness contribute to poor management. Mothers above 35 years heavy workload related to family responsibility and other commitment to the community therefore mothers may not have too much time to prepare and feed their children properly. (Maurice and Namfua, 1992; FAO, 1992a and WHO, 1996).

5.4.1.2 Education of the mother

Numerous studies have consistently concluded that maternal education is a critical resource for child health, nutrition, and survival (Armar-Klemesu *et al*., 2000) More educated women are more able to get information, acquire skills, and model positive caring behaviors. They tend to be able to use health-care facilities, interact effectively with health-care providers, comply with treatment recommendations, and keep their living environment clean. They are also more committed to childcare and tend to stimulate their children more (Engle and Zeitlin 1996). However, findings from this study showed mother's education had no relationship with nutritional status of children although it showed mothers with informal and primary education had more children with severely stunted children compared to secondary school leavers.

5.4.1.3 Marital status, family size and (Height- for- Age)

Marital status had no influence on nutritional status since findings showed there was no association between marital status and nutritional status. Married mothers were found to have more stunted children. A relationship between family size and nutritional status were not evident, although other studies showed larger family affects child's nutrition status as large family tend to increase food budget (URT and UNICEF, 1990).

5.4.1.4 Association between occupation of mother and (Height-for-age)

Mother's occupation had no significant influence on nutritional status though other studies indicated significance e.g the Hehe tribe of Iringa (URT, 1999).The study

shown a high number of undernutrition children both severe and moderate children were from those mothers who are engaged in farming activities, may be farmers are out of home most of the time those activities takes lot of time to be accomplished and they fail to attend their children.

5.5 Association between Birth Weight and Nutritional Status (Weight-for age)

Birth weight is an important predictive element of child mortality because it determines the ability to adapt to a new environment and normal growth. In Tanzania, average birth weight is 3.2 kg (Ministry of health 2000). The low birth weight is most likely due to a certain degree of intrauterine dystrophy in some of the children (undernourished mothers), as well as an insufficient prenatal monitoring.

In this study it was found that there was a significant relationship between birth weight and nutritional status. Babies born with low birth (i.e. weight below 2.5 kg) have greater risk of continuing to be undernourished if not fed properly especially during the first year of life (http: Unicef.org/programme/ nutrition/overview.htm).

In addition low birth weight children are at a disadvantage in terms of physical growth and they are vulnerable to infection (FAO, 2001). Other research conducted by WHO in Romania in 1991 had the same observation.

5.6 Association between Source of Water, Latrine Use and Nutritional Status (Height- for- age)

Diarrhea and other water borne diseases are a result of poor sanitary conditions which cause poor health condition in young children and finally death (URT, 2005). In this study the association between sources of water and nutritional status were not significant, but river and rain water users had more severely stunted children may be they are stunted because of frequent illness especially diarrhea compared to bore well and tap water users. This is because tap water and bore wells are some how protected. Improved water supplies and sanitation condition is very important to children health. Additionally cleaner environment and safe storage of waste products provides a safer environment with a reduced risk of diseases (UNICEF and URT, 1990).

5.7 Relationship between Type of Diseases and Nutritional Status (Weight- for- age)

The study observed that there was a significant association ($P<0.05$) between nutritional status (weight- for –age) and incidence of diarrhea. A study conducted elsewhere (UNICEF 1998, URT and UNICEF 1990; URT, 2000) observed that diarrhea is one of the main causes of poor nutrition in children and is one of the disease killer in children. Infections increase the demand and utilization of nutrients and antoxidants such as vitamin C, E and beta carotene.

5.8 Relationship between Food Availability, Storage and Nutritional Status (weight- for-height)

The availability of food is achieved when sufficient quantities of food can be supplied through food production which also depends on several factors such as area cultivated, rainfall availability, soil type, storage facilities and purchasing power (Lorry and Kavishe, 1990; Mamiro and Mtebe, 1998). This study showed significant relationship between type of storage and nutritional status related to weight- for- height. Poor storage of food may cause food unavailability in the family. Poor storage involves storing food in gunny, sisal materials bags, and other traditional storage structures made from bamboo, mud, etc. These storage facilities, in study area are referred to as traditional food storage facilities. These facilities allow entry of storage pests such as maize weevils, beetles and others storage pests. Food stored in traditional storage facilities may rot because of excessive moisture and heat or by a combination of both.

5.9 Feeding Practices in the Study Area

Poor feeding habit is one of the strong factors which can contribute to low nutritional status of children below five years. In Tanzania weaning age is between 3-6 months (URT and UNICEF, 1990) and the recommended age for weaning children by UNICEF is six months. At age six months a high quality complementary foods should be introduced, in order to supply adequate nutrient for rapid growth of the child and breastfeeding should be continued up to the second year of a child life (Shrimpton *et al.,* 2001). Early introduction of other food is not advisable as recommended by WHO (1998) because of undeveloped digestive

system Delay in initiating breastfeeding denies nutritional value present in colostrums even if colostrums would be supplied later.

In the study area children weaning age were associated with weight- for- height indicator and found to be significant. Other feeding practices were breast feeding initiation, for those who did not start breast feeding immediately after delivery had more severely stunted children, may be they were stunted because they did not started breast feeding immediately after being born (WHO, 2006).

5. 10 Number of Meals per Day and Nutritional Status

The study showed that children who had less than 3 meals per day had poor nutritional status related to weight for age. Feeding frequency of less than 3 times a day is associated with poor nutrition in children (Ishengoma, 1992). Fewer meals per day reduces nutrient intake these can be due to workload of the mother, less food in the family. Under normal circumstances a young child is supposed to be fed 5 to 6 times a day because of bulkiness of the weaning food (URT and UNICEF 1990; FAO / WHO 1992; Laswai *et al.*, 1998). Children have small stomach and need to eat several times throughout the day. Intra-household distribution could also affect nutritional status as some of the families leaving the children of different age group to eat from the same pot. Therefore small ones compete with the older, also some children have poor appetite, thus adds to vulnerability of not consuming enough of the food served. Frequency of feeding more than 3 times a day in children is recommended. In addition, provision of small meals and snacks frequently will maintain a consistent supply of energy and other nutrients for growth of the child are advisable.

5. 11 Energy intake by age group

Energy food intake is very important to the growth of the child. Children who have energy intake of below 50 % per day cannot grow well. The study observed that the amount of food given to children aged 0-12 months supplied 50% only energy intake required per day which is was not sufficient. These may be their not fed properly either not taking enough nutrient by eating or they are sick for along time, thus reducing energy intake below recommended amount. It is recommended that the energy intake for 7-12 months should be 98kcal/kg and energy for 13-24 months children should be 106 kcal /kg (FAO, 1992a).

5.12 Protein Intake by Age Group

Protein intake is very important at any stage of child growth. Poor intake leads to kwashiorkor and other nutritional disorders (URT and UNICEF, 1990). The recommended protein intake is one gram per kg body weight. Estimated protein intake of children in the study about ten percent children aged 49-60 months obtained less of the recommended protein.

Seventy eight percent obtained more than 50%. The later are likely to have been stopped breast feeding earlier than; that mothers and guardians were not aware about the need for increased protein intake. Daily protein requirements can be achieved by using wide varieties of foods and encouraging frequent feeding by increasing the number of meals per child. A study conducted by Brown *et al.* (1995) in Guatamala had the same observation of elder children having less protein than the recommended intake.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Nutritional deficiencies was the result of inadequate food intake either due to poor quality and poor quantity of food resulted to underweight, wasting and stunting of children in the study area. In addition to that, there were factors associated with poor nutritional status such as birth weight, breastfeeding initiation, weaning age, and different types of diseases. Another factor influenced poor nutritional statuses in that area were type of food storage used by the family.

6.2 Recommendations

- Correct information should be given to mothers on proper child feeding such as type of weaning food, weaning age, frequency of feeding and proper way of storing food.

- Mother and child feeding should be part of a coherent policy, promoting health and effective intervention from the government to the community on addressing strategies on Maternal and child health.

- The health and well-being of women and their children are completely linked. There is a strong consensus that maternal, newborn and child health (MNCH) programmes will only be effective if there is a strong continuum of care, from pregnancy through childbirth into childhood. This continuity requires greatly strengthened health systems.

REFERENCES

ACC/SCN (1993). Addressing micronutrient malnutrition. The global situation SCN News No 9.United Nations, Geneva. pp. 12-45

ACC/SCN (2000). Administrative Committee on Coordination Sub Committee on Nutrition Fourth Report on the World Nutrition Situation. United Nation, Geneva. pp. 20 - 34.

Armar-Klemesu, M., Ruel, M. T. Maxwell, D. G., Levin C. E. and Morris, S. S (2000). Poor maternal schooling is the main constraint to good childcare practices in Accra. *Journal of Nutrition* 130 (6): 1597-1607.

Beard, J. (1989). Iron Deficiency, Thyroid Function and Thermoregulation. In: Enwonwu CO, ed. Annual Nutrition Workshop Series, Vol. III Functional significance of iron deficiency. Nashville, TN, Me Harry Medical College, pp. 71-80.

Binet, A. and Kooh, S.W. (1996). Persistence of vitamin D deficiency rickets in Toronto in the 1990s. *Canadian Journal of Public Health* 87:227–230.

Brown, K., Sanchez, M., Perez, F., Peerson. J, Ganoza, M. and Stern, J. (1995). Effect of dietary energy density and feeding frequency on total daily energy intakes of recovering malnourished children. *American Journal of Medicine* 62:13– 8.

Cameron, M. and Hafvander,Y. (Eds) (1983).Manual on Feeding Infants and Young Children 3 rd ed. International Development Authority, Chapman and Hall Stockholm. pp. 41- 49.

Dewey, K., Cohen, R., Brown, K., Canahuti, J. and Rivera, L. (1999). Age of introduction of complementary food and growth of term, low birth weight breastfed infant a randomized intervention study in honduras. *American Journal of Clinical Nutrition* 69: 679-686.

Engle, P., Zeitlin, M. (1996) Active feeding behavior compensates for low interest in food among young Nicaragua children. *Journal of Nutrition 126: 1808-1816.*

Enstrom, J., Kanim, L. and Breslow, L. (1986).The relationship between vitamin C intake, general health practices, and mortality in Alameda County, California. *American Journal of Public Health* 76:1124–1130.

FAO (1996). The Special Programme for Food Security United Nations Conference on Environment and Development International Conference on Nutrition of The United Nations Rome. p. 21.

FAO/WHO. (1992) Improving Household Food Security Major Issues for nutrition

Strategies International Conference on Nutrition. pp.1-25

FAO (1992a). Creating a well-fed World. *Food and Nutrition Bulleting 62:50-59.*

FAO (1992b). Food Security: A Domestic Approach. Food and Agriculture Organization of The United Nations Rome p. 41.

FAO (2001). Human Energy Requirements Report of a joint FAO/WHO/UNU expert consultation Rome, 17-24 October Food and Nutrition Technical Report series 1[http://www.fao.org/docrep/007 /y5686e/y 5686eod. htmsite]visited on 5/6/2009

Fleming, A. (1996). Hematological Diseases in the Tropics. In: Masons Tropical Diseases Ed. by Saunders, W.B. University Press, New York. pp. 19-173.

Food and Nutrition Board (2000). Dietary reference intakes for thiamin, riboflavin, niacin, vitamin B6, folate, vitamin B12, pantothenic acid, biotin, and choline. National Academy Press. Washington DC. pp. 61-67.

Frankenberger, T. (1996). Measuring Household Livelihood Security: An Approach for Reducing Absolute Poverty CARE –USA. pp. 19-126.

Gibson, R. (1990). Principles of Nutritional Assessment. Oxford University Press. New York. pp. 3-10.

Hershel, C. (1970). The effect of chronic iron deficiency on some biochemical functions of the human haematopoietic tissue. *American Journal of Public Health* 36:321-329.

Hetzel, B. (1983). Iodine deficiency disorders (IDD) and their eradication. *Lancet* 2:1126–1129.

[http://www.unicef.org/nutrition]. World Breast Feeding Week Site visited on 27/06/2007.

[htpp/www.unicef.org/programme/ breastfeeding] Breast feeding and Complementary Feeding. Site visited on 20/2/2007.

Husaini, M., Karyadi, D. and Gunadi, H. (1981). Evaluation of nutritional anemia intervention among anemic female workers on a tea plantation. In: Hallberg L, Scrimshaw NS, eds. Iron deficiency and work performance.Washington, DC, Nutrition Foundation. pp. 72-85.

Ishengoma, E. (1992). Prevalence of child malnutrition and factors associated with it; Case of Morogoro Urban. Dissertation for Award of M.Sc. Degree Dissertation. at Sokoine University of Agriculture, Morogoro, Tanzania. pp 150.

Jason, J., Nieburg, P. and Marks, J. (1984). Mortality and infectious disease associated with infant - feeding practices in developing countries. *Pediatrics* 74:702-727.

Josh, S. (2000). Nutrition and Pediatrics. McGraw Hill, New Delhi. pp. 564 - 669.

Kapinga, D. (2006). Compendium on Rural Development Issues at Sokoine University of Agriculture, Morogoro, Tanzania. pp. 68-105.

Katani, J. (1999). Copping Strategies against Deforestation: Impact of social-economic Factors with Special Attention to Gender-based Indigenous Knowledge. Dissertation for Award of M.Sc. Degree at Sokoine University of Agriculture, Morogoro, Tanzania. pp. 160.

King, F. and Burgess, A. (1993). Nutrition for Developing Countries, 2nd ed. Oxford University Press, New York. pp. 151-360.

King, F. and Burgess, A. (1998).Nutrition for Developing Countries, 2nd ed. Oxford University Press, New York. pp. 462.

Kingamkono, R. (1987). Effect of food consistency on nutrient intake in young children. Proceedings of a workshop held in Nairobi, Kenya, 12–16 October, 1985. pp. 185.

Kothari, C. (2004). Research Methodology, Methods and Techniques 2nd ed. New Age International Publishers, Delhi India pp. 95-122.

Laswai, H., Mosha, T. and Dakiyo, S. (1998. Breast feeding, weaning practices and anthropometric status of children in Morogoro Municipality. Tanzania *Ecology of Food and Nutrition 37: 309-338.*

Latham, M., (1997). Human Nutrition in Development World. Food and Agricultural Organization of United Nations, Rome. pp. 20-120.

Leslie, J. (1998).Women workload and child nutrition in the third word. *Word Development journal 16 (11):1341-1362.*

Lorri, W. and Kavishe, F. (1990). Household Food Security and Relation to Nutrition. In: Proceedings of National workshop on food security. Dar es salaam, Tanzania. pp. 5 - 23.

Lozoff, B. (1982). Behavioral abnormalities with iron deficiency. In: Pollitt E, Leibel R, eds. Iron deficiency: brain biochemistry and behavior. Oxford University Press, New York. pp. 183-194.

Lozoff, B. (1989). Methodological issues in studying behavioral effects of infant iron-deficiency anemia. *American Journal of Clinical Nutrition.* 50: 641-654.

Makundi, F., Kawa, I., Makuki, A. and Ndunguru, P. (2001). Food Security a review of Tanzania Situation.*Uongozi, Journanal Management. Development*, 13: 52-61.

Marder, S. (2004). Human Biology: Mcgraw-Hill Company companies, Inc., 1221 Avenue of the America New York. pp. 20-470.

Mamiro, P. Kolsteren, P.,VanCamp, J.,Robertfroid, D., Tatala,S and Opsomer, A (2004). Processed complementary food does not improve growth or hemoglobin status of rural Tanzanian infants from 6-12 months of age in Kilosa Districts, Tanzania. *Journal of Nutrition.* 132:108-109.

Mamiro, P. and Mtebe, K. (1998). Household food security situation in selected district in Tanzaia, Knowledge, Attitude and Practice (KAP) of community leadership A UNICEF study. pp. 47.

Maletnlema, T. (1977). The Importance of Nutrition in Social-Economic Development Paper Presented at the WHO Regional Conference, Brazzaville, Congo. April, 1977.

Margareth, B. and Nelson, K (1995). Measuring dietary exposure in nutritioal epidemiological studies.*Nutritional Reseach Review* 8 3: 165-178.

Martinez, Z. (1984). Effective exposure to low temperature on normal and iron deficient subjects. *American Journal of Physiology* 246 : 380 -383.

Maurice, C. and Namfua, P. (1992). Some Determinants of nutrition Status of 1-4 years old children in low income urban area in Tanzania. *Journal of Tropical pediatrics. Oxford Journals* 38 : 299-306.

Maxwell, S. (1990). Food security in developing countries: *IDS Bulletin*. 21 (3): 2 -13.

Mendoza, C., Viteri, F., Lonnerdal, B., Raboy,V., Young, K. and Brown, K. (2001). Absorption of iron from unmodified maize and genetically altered low phytate maize fortified with ferrous sulphate or sodium iron EDTA. *American Journal of Clinical Nutrition* 73 : 80-88.

Ministry of Health (2002).Overview of the Situation of Women and Children in Tanzania. Opening Remark at the ECC-SGD Workshop 17-20 April 2000. Dar es salaam, Tanzania.

Mosha, A. and Svanberg ,U. (1990). The acceptance and intake of bulk-reduced weaning Foods the luganga village study. *Food and Nutrition Bulletin* 12:69-73.

Norusis, MJ and SPSS Inc 2003 .Data analyisis for SPSS for windows Professional statistics. Englewood cuffs, Preatice Hall. pp.49.

Nyaruhucha, C. (2003). Compendium on Community Health at Sokoine University of Agriculture, Morogoro, Tanzania. pp. 14-19.

Piechulek, H., Aldana, J. and Hassan, M. (1999). Feeding practices and malnutrition in rural Bangladesh. *Food and Nutrition Bulletin* 20 (4): 395 – 400.

Shrimpton, R., Victora, C., Lima, R. Blössner, M. and Clugston, G. (2001). Worldwide timing of growth faltering: implications for nutritional interventions. *Pediatris* 107: 75.

Srikantia, S. and Chandra, A. (1976). Anemia and immune response. *Lancet* 1:1307 - 1309.

Suharno, D. and Munila, L. (1996). Vitamin A and nutritional anemia. *Food and Nutrition Bulletin* 17 (1) : 7 - 10.

Tanzania Bureau of Statistics (2005). Tanzania Demographic and health survey 2004-5. Dar essalaam, Tanzania National Bureau of statistics and ORC Macro. pp. 1- 381

TDCHS (1999).Tanzania Demographic and Child Health Survey, Preliminary Report. Dar es Salaam, Tanzania. p. 50.

TDCHS (2005).Tanzania Demographic and Child Health Survey, Preliminary Report. Dar es Salaam, Tanzania. pp. 1- 226.

TFNC (1996). Anemia A nutritional problem in Tanzania. TFNC report No 1820 Dar es salaam Tanzania. pp.17-26.

TRHS (2005). Tanzania Reproductive and Health Survey Preliminary Report. Dar es Salaam, Tanzania. pp. 1- 220.

UNICEF and TFNC (1996). Opportunity for micronutrient intervention facts country series, Dar essalaam, Tanzania. pp. 12-36.

UNICEF (1998). The state of children. Oxford University Press, New York. p. 98.

UNICEF (2003). The problem of malnutrition. University press Inc. New York 462p Vesta, A [http: //w.w.w.Unicef. org/programme/ nutrition/ overview. Htm sited 28/2/2008.

UNICEF (2004a). The state of children. Oxford University Press, New York p.109

UNICEF (2004b). Tanzania Statistics. United Nations Children Funds [http//www. unicef org/files/] site visited 29/6/ 2008.

URT (1992). Population Census 1988 Preliminary Report Bureau of statistics Ministry of finance Economic affairs and Planning Dar- es-salaam Tanzania. p. 202.

URT (1999). Tanzania Demographic and health survey National Bureau of statistics Dar essalaam, Tanzania.. p. 202.

URT and UNICEF, (1990). An Overview Situation Analysis of Women and Children in Tanzania. Dar -es -Salaam, Tanzania. pp. 140-154.

URT and UNICEF (2002). An Overview Situation Analysis of Children in Tanzania. Dar es Salaam, Tanzania. pp. 169.

URT (2002). Mbarali. Socio-Economic profile. Joint publication by the planning commission Dar es Salaam and Regional Commissioner's Office. Dar-es-salaam, Tanzania. pp.19-20.

URT (2002). Tanzania health policy Dar-es-Salaam, Tanzania. pp. 54-59.

URT (2000). The food and Nutrition Policy Dar-es-Salaam, Tanzania. pp. 38-41.

URT (2002). Demographic and Health survey National Bureau of Statistics Planning Commission Dar-e s-Salaam, Tanzania. p. 28.

URT (2005). Poverty and Human Development Report,The Research and Analysis Working Group. Mkuki na Nyota Dar-es-Salaam, Tanzania. p. 21.

URT (2005). Demographic and Health survey National Bureau of Statistics Planning Commission Dar-es-Salaam, Tanzania. p. .24

URT (2007). Mbarali District Council annual Report Dar es salaam Tanzania.

Walter, T. (1986). Effect of iron therapy on phagocytes and bactericidal activity in

neutrophils of iron deficient infants. *American Journal of Clinical Nutrition* 44:877- 882.

Walter, T., Kovalsys, J. and Stekel, A. (1983). Effect of mild iron deficiency on infant mental development scores. *Journal of Pediatrics* 102:519-522.

Warren, K.P (1993). Helmith Infection. In World Bank Health Sector Priorities Review. Washington D.C. pp. 24-103.

WHO (1995). WHO Multi- country study on Women's and Domestic Violence against Women .WHO press Geneva, Switzeland. pp. 1-200.

WHO (1995). Physical Status, the Use and Interpretation of Anthropometry Report of WHO Expert Committee WHO Technical Report Series No 854 Geneva Swaziland. p. 125.

WHO (1996). Report of a Join FAO/WHO Consultation on Preparation and use of food-based dietary guidelines. World Health Organization Technical report Series, No. 880).

WHO (1997). Iron Deficiency Indicators for Assement and Strategies for prevention. WHO/NUT/96.12 Geneva pp. 23-37.

WHO (1998). The World Health Report. Life in the 21 Century; A Vision for all. World Health Organization, Geneva. p. 27.

WHO (2006). Nutrition for Health and Development http//:w.w.w. who.org visited on 2/5/2008.

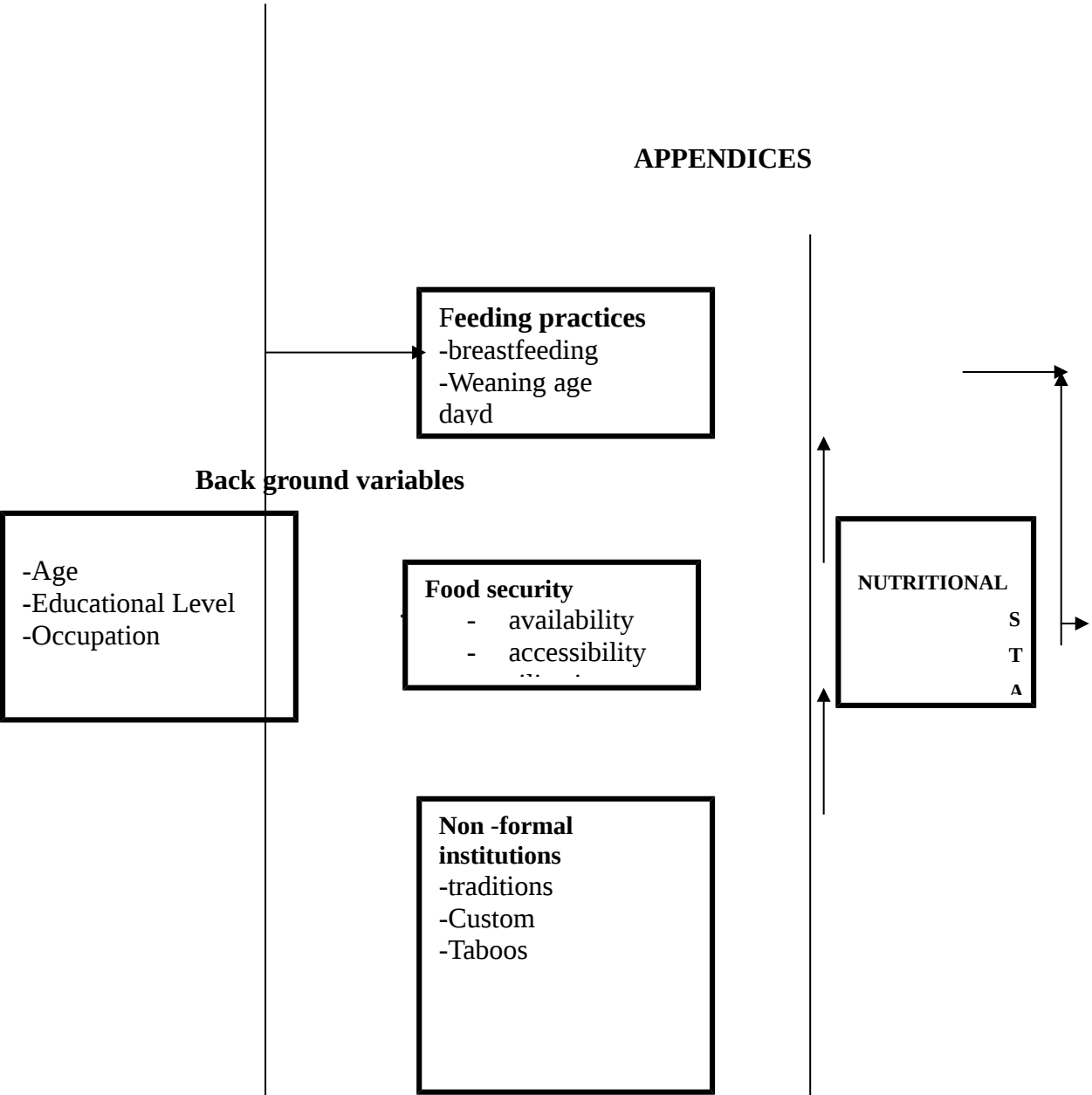
WHO (2007). Cut off points and summary statistics [htt://www.int/nutgrowthdh/about/introduction/en/index5.htm] sited 12 June 2007

WHO (2008). Consultation on approaches for scaling up breastfeeding interventions at community level: 28 - 30 April 2008 venue: salle d, who, geneva, Switzerland.

Wood, C., Vaughan, J. and Glanville, H. (1992). African Medical and Research Foundation Nairobi Kenya. pp. 342 -362.

World Bank, (1995). The Challenge of reforms, Growth, Income and Welfare, the main report Washington D.C USA p. 37.

APPENDICES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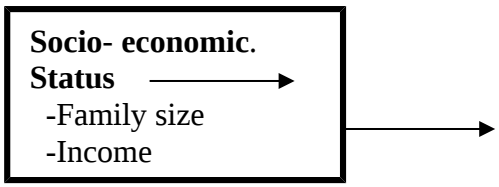

Appendix 1: Conceptual framework of the study

Appendix 2: Questionnaire for factors influencing nutritional status of below five years in Mbarali District

Questionnaire No……..

Date of interview……..

A: BACK GROUND INFORMATION

District…….

Ward…….

Village……..

Name of interviewer…….. Name of respondent……..

Age of respondent…….

Marital status 1 = single, 2 =married, 3 = divorced, 4 = separated, 5 = cohabit

Education level

1= no formal

2= primary school

3=secondary school

4=adult education

main occupation

1=no occupation

2=farmer

3=any other specify

B: NUTRITIONAL STATUS ASSESSMENT OF U-5 YEARS

No	SEX	B/W (Kg)	Age (Month)	Weight (Kg)	Height (Cm)	MUAC (Cm)	Green	Grey	Red
1									
2									
2									
4									

C : CHILD CARE

1. How long did you take to breast feed your child after delivery

1= Immediately after delivery

2= After 1-2 days

3= It takes more than 2 days

4= Others specify

2. What was the reason?

1= no milk let down

2=The mother was sick

3=The child was un able to suck

4=It is accustom

5=It is recommended

6=Others specify

3. At what age did you introduced weaning food to the child**?**

1= before 4 months of age

2= at 6 month of age

3= above 6month

4=others specify

4. What was the reason?

1=The baby was crying

2=The breast was not enough

3=She/he was malnourished

4=Advised by elders

5=Taught at antenatal clinic

6=Others specify

5. How many meals did you feed your child yesterday?

1= One meal

2=Two meals

3=Four meals

4=Five meals

5= More than five meals

6. Do you attend village health days

1=Yes

2=No

6. Source of water

1=Tap water

2=natural spring

3=River

4=Rain water

5=Bore well

7. How long does it take from the source of water to your home?

1=less than one hour

2=One hour

3=Less than two hours

4=More than two hours

8. Do you boil drinking water?

1=Yes

2=No

9. If no why?

1=Time consuming

2=Lack of fire wood

3=Not used to

4=Water is clean

5=Others

10. Do you have a latrine (observe)

1=Yes

2=No

11. Where do you dispose the waste?

1=In a pit

2=In a farm

3=Burning

4= Random disposal

5=Any other specify

12. At three months ago what diseases did your child suffered

1=malaria

2=Diarrhea

3=upper respiratory infection

4=Any other specify

D.CROP PRODUCTION

13. which food did you and your household member grew in the last agriculture season (Tick)

Crop grow	Harvested in bags	Sold in bags	Food bought in bags
Maize			
Sorghum			
Rice			
millet			
Cassava			
Cowpeas			
Potatoes			
Beans			
Others specify			

14. Did the crop produced enough for your family needs for the whole year

1=yes

2=No

15. If no, what is the reason for insufficient food production in your household

1=scarcity of land

2=scarcity of seeds

3=due to low rainfall

4=due to pest attack

5=other reasons specify

16. what measure did you take to make sure that you have enough food until next season?

1= no selling of crop produce

2=to produce more in the coming season

3=use of early maturing crop varieties

4=effective storage

5=others specify

17. what are the plans to ensure sufficient food production in the coming years?

1=use of manure or any fertilizers

2=timely planting

3=use of improved seed

4=consult an agric. Extension officer

18. Do you store your after harvest

1=yes

2=No

19 If yes what type of storage system do you use to store your grain

1=modern storage

2=Traditional storage

3= On pit of the floor

4= sulphate bags

5=gunny bags

20What amount of food do you normally store in a normal year?

Table: cereals, legume, roots tubers stored in 2007/2008

cereals	Amount stored (kg)
maize	
rice	
sorghum	
millet	
wheat	
others	
legumes	

beans	
Pigeon peas	
Green gram	
Roots	
cassava Potatoes	

1bag=100kg

E FOOD HABIT

21. How many meals do you usually have each day

1=only once/day

2=two meals/day

3=3meals/day

4=more than 3/day

23. What food is the favorite food for family?

24. What is the food special for under five children?

Types	amount	Once/day	2 times/day	3 times/day	More than 3 times

ASSESSMENT OF FOOD INTAKE BY CHILDREN (24 HR RECALL

Time	Name of food	Ingredients and amount used	Amount served	Amount consumed
morning				

Between meal				
Lunch				
Between meal				
Dinner				