FACTORS INFLUENCING NUTRITION AND FOOD INSECURITY IN KIROKA VILLAGE MOROGORO, TANZANIA

BY

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ABSTRACT

Nutritional status in children is an indicator of health and well-being at both the individual and the population level. Malnutrition rates and incidences are still high in Kiroka village. The aim of the study was to identify causes of recurrence of malnutrition among children below five years of age in Kiroka village in Rural Morogoro, Tanzania. Face-to-face interviews with the sampled mothers were conducted using a semi-structured questionnaire. Anthropometric data were collected using standard procedures and analysed using Emergency Nutrition Assessment by SMART program where Z-scores were generated and imported into the SPSS software programme for further analysis. Anthropometric indicators of weight-for-age, weight-for-height and height-for-age indices were employed to assess the nutritional status of children below five years of age. The prevalence rates of stunting, underweight, wasting, and morbidity were 43%, 13%, 3%, and 87%, respectively. Prevalence of underweight of children reported in Kiroka village increased between 2005 and 2007 from 19% to 22% respectively. Nutritional status of children is affected by both inadequate and quality of food, improper feeding practices, level of education of mother, household size, marital status and disease infections. Generally, children were more susceptible to malnutrition as age increased. An educated mother was less likely to have malnourished children. About 64% of the mothers were able to breastfeed their children within one hour after delivery. However, 85% of the infants in Kiroka village are given pre-lacteal foods such as thin cereal-based porridge and water. Only 3% of infants were exclusively breastfed for six months. About 39% of the children started complementary feeding when they were two weeks old. Duration of food shortage and household size had a negative correlation with weight-for-height z-scores. Community nutrition education and

mobilization of community members to adopt practices that favour good nutrition of children are recommended.

DECLARATION

I, **Domina Esther Nkuba Mbela**, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work, and that it has not been submitted for a higher degree award in any other university.

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The above declaration is confirmed

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DEDICATION

This work is dedicated to my Husband, Jackson and daughters; Grace, Gloria, Flora and Faith and above all, the Lord Almighty God.

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LIST OF ABBREVIATIONS

AAFP	The American Academy of Family Physicians
BTC	Belgium Technical Cooperation
CSPD	Child Survival Protection and Development
ENA	Emergency Nutritional Assessment
FAO	Food Agricultural Organization
GDP	Gross Domestic Production
FGDs	Focused Group Discussions
FEWSNET	Famine Early Warning Systems Network
FSIT	Food Security Information Team
h	Hour(s)
H/A	Height-for-age
HSPH	Harvard School of Public Health
IDD	Iodine Deficiency Disorder
IFPRI	International Food Policy Research Institute
IUGR	Intra-Uterine Growth Retardation
kg	Kilogram(s)
MDG's	Millennium Development Goals
MKUKUTA	Mkakati wa Kukuza Uchumi na Kupunguza Umaskini Tanzania
MUHAS	Muhimbili University of Health and Allied Sciences
n	Sample size
NBS	National Bureau of Statistics
PED	Protein Energy Deficiency

RCH	Reproductive and Child Health care
SPSS	Statistical Package for Social Science
TDHS	Tanzania Demographic and Health Survey
TFNC	Tanzania Food and Nutrition Centre
RDA	Recommended Daily Allowance
RVA	Rapid Vulnerability Assessment
SD	Standard deviation
UNICEF	United Nation Children Fund
VAD	Vitamin A Deficiency
W/A	Weight-for-age
W/H	Weight-for-height
WHO	World Health Organization
WFP	World Food Programme

CHAPTER ONE

INTRODUCTION

1.1 Background

Nutrition status is a measure of the health condition of an individual as affected primarily by the intake of food and utilization of nutrients. Malnutrition is the condition that develops when the body does not get the right amount and required combination of nutrients. Factors that contribute to malnutrition are many and varied. However, many studies have shown that the primary determinants of malnutrition are related to food intake and severe repeated infections or a combination of the two (Mahgoub *et al*., 2006). In the developing world, an estimated 230 million (39%) children below five years of age are chronically malnourished and about 54% of deaths among them are associated with malnutrition (Van de Poel et al., 2007). In Sub-Saharan Africa, 41% of the children below-five years of age are stunted, 31% are underweight and 10% are wasted (Van de Poel *et al*., 2007). In Tanzania, 38% of the children are stunted, 22% are underweight and 3.0% wasted (NBS, 2005). In the case of Morogoro stunting rate is 36%, underweight is 16% and wasting is 2% (NBS, 2005). Nutrition is an integral part of the first Millennium Development Goal (MDG), which aims at reducing poverty and hunger (FAO, 2007). Both MDGs and MKUKUTA (Mkakati wa Kukuza Uchumi na Kupunguza Umaskini Tanzania) have put emphasis on addressing malnutrition (Ministry of Agriculture Food Security and Cooperatives, 2006).

Adequate nutrition is essential to child health and development. The period from conception, birth to two years of age is particularly important because of the rapid growth and brain development that occurs during this time. In most developing countries the

period is often marked by growth faltering, micronutrient deficiencies, and common childhood diseases like diarrhoea, as children transit from exclusive breastfeeding to solid foods in addition to breast milk (Mukuria *et al.*, 2006).

Good nutrition is pivotal for national development and the reduction of income poverty. The goal set by the MDGs is to reduce underweight of children below five years of age from 29% to 15% by 2015 (FAO, 2007). The MKUKUTA has set a target of reducing stunting to 20% from 44% by 2010 (FAO, 2007; NBS, 2005).

1.2 Problem Statement

Malnutrition can lead to increases in mortality, susceptibility to disease, lowers labour productivity and reduces school performance. In Tanzania, all population groups are affected by malnutrition, especially under-nutrition whereby children below five years of age are the most vulnerable especially during transition from breast feeding to consumption of solid foods, and other fluids. This critical transition period is associated with a dramatic increase in malnutrition among infants and children (Mamiro *et al*., 2005). Although the causes of nutritional problems and their effects are widely documented, their prevalence and influence on nutritional status differ from one area to another (Nyaruhucha *et al.*, 2006).

In the 1980s, the prevalence of malnutrition among hospitalised children at Morogoro Region Hospital declined from 6.5% in 1985 to 0.44% in 1989. However, in 1995 the prevalence of malnutrition among children increased to 7%. In 2003, the prevalence of malnourished children declined to 0.52%. However, in 2006 and 2007 there was a big increase in malnutrition whereby 23% (2006) and 41% (2007) of the children were found

to be malnourished and among them 21% were from Kiroka village (Morogoro Hospital Records, 2008).

Although Kiroka village has fertile soils and high food productivity, malnutrition rates and incidences are still high. Children who attend Reproductive and Child Health Clinic (RCHC) at Kiroka dispensary are from Kiroka, Kiziwa and Bamba villages. In the year 2003, 19%, of the children who attended RCHC in Kiroka dispensary were malnourished and in 2007 the prevalence increased to 22%. From January to March 2008 the dispensary had already recorded 15% new cases of malnourished children (Kiroka Dispensary Records, 2008).

The aim of this study was to identify causes of recurrence of malnutrition among children below five years of age in Kiroka village in Rural Morogoro, Tanzania.

1.3 Study Objectives

1.3.1 Overall objective

The general objective was to examine factors influencing nutritional status of children below five years of age in Kiroka village, Morogoro Rural district, Tanzania.

1.3.2 Specific objectives

The specific objectives of the study were to:

i. Determine prevalence of under-nutrition in children below-five years of age;
ii. Assess food security situation among children below five years of age;
iii. Identify factors contributing to food and nutrition insecurity;
iv. Examine feeding practices for the whole family in Kiroka village.

1.3.3 Hypothesis

i. Prevalence of malnutrition in Kiroka village is low.

ii. The current feeding practices of children below five years of age have no effect on their nutrition status in Kiroka village.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Globally, malnutrition contributes about 60% of the 11 million deaths that occur each year among children below four years old (Sunguya *et al*., 2006). In East Africa, prevalence of malnutrition is increasing and is becoming a serious public health problem (Sunguya *et al*., 2006). This problem has serious long-term consequences for children and adversely influences their development. Most common nutritional problems are protein-energy-malnutrition, iron deficiency anemia, iodine deficiency disorders and vitamin A deficiency (Nyaruhucha *et al*., 2006). In Tanzania, prevalence of protein energy deficiency (PED) is 52%, anemia 45%, Iodine deficiency disorder (IDD) 13% and vitamin A deficiency (VAD) 30% (NBS, 2005). The prevalence of low birth weight (LBW) in the country is about 16%–19%, whereas among adolescents it is 48% (Shirima and Kinabo, 2004). The window of opportunity for improving nutrition is small from pre-pregnancy through the first two years of life because of the importance of good nutrition for category of children. The effects that occur during this period are irreversible (Word Bank, 2006). Therefore parents should be educated on child caring practices in order to improve the nutritional status of children. Not only that but also nutritional stakeholders including researchers and high learning institutions, policy makers, district councils, planners, and community should be involved in combating malnutrition.

2.2 Consequences of Malnutrition

Malnutrition affects adversely the growth, health, and development of children. Undernourished children usually attain maturity later than healthy children and their mental capabilities, hence learning skills are very much reduced. Malnourished children

have impaired immune systems which increase their risk of sickness and death. Malnutrition certainly creates a huge human and economic waste (WHO, 2005; Nyaruhucha *et al.,* 2006). Malnutrition contributes to childhood illness and diet-related chronic diseases hence complicating their management and outcome (Sunguya, *et al.*, 2006). The occurrence of malnutrition increases complications of controlling human diseases and leads to high costs in treatment, high mortality, decreases labour availability and quality that ultimately lead to low productivity in economic activities.

It is estimated that about 50% of deaths in children below five years of age is attributed to mild-moderate malnutrition and 60% of all malaria deaths are also attributed to underlying malnutrition (WHO, 2005). Rapid growth of infants during the first year of life and specifically the rapid build-up of body muscles and other tissues is of prime importance and hence needs balanced nutrition. This critical transition period is associated with a dramatic increase in malnutrition among infants (Mamiro *et al*., 2005). Furthermore, those children who survive in the first two years of life cannot attain their full potential because of malnutrition. Early childhood malnutrition is irreversible and intergenerational, with consequences for adult health including increased chronic diseases. In addition, malnutrition erodes human capital.

Malnutrition in women in the reproductive age group is reflected in the high maternal mortality (WHO, 2005). The consequences of poor maternal nutritional status are reflected in low pregnancy weight gain and high infant maternal morbidity and mortality (Lartey, 2008). Malnutrition affects physical growth, cognitive development, reproduction, and physical work capacity, and it consequently impacts on human performance, health and

survival (Mahgoub *et al.,* 2006), socioeconomic inequality and poverty. (Van de Poel ***et al.,* 2007).**

2.3 Infant and Child Feeding Practices

Adequate nutrition is critical to child health and development. The period from birth to two years of age is particularly important because of the rapid growth and brain development that occurs during this time. The period is often marked by growth failure, micronutrient deficiencies, and common childhood illnesses such as diarrhoea, as children transit from exclusive breastfeeding to solid foods, in addition to breast milk (Mukuria *et al*., 2006).

2.3.1 Breastfeeding

Initiation of breastfeeding and pre-lacteal feeds

Early breastfeeding practices determine the successful establishment and duration of breastfeeding. It is recommended by WHO and UNICEF that children be put to the breast immediately or within one hour after birth. The first liquid to come from the breast, known as colostrum, is produced in the first few days after delivery. It is an important source of nutrition and provides natural immunity to the infant. When a mother initiates breastfeeding immediately after birth, breast milk production is stimulated. Pre-lacteal feeding refers to giving liquids or foods other than breast milk prior to the establishment of regular breastfeeding (Mukuria *et al.,* 2006). The practice of giving pre-lacteal feeds is discouraged because it limits the frequency of suckling by the infant, deprives the child of the valuable nutrients, protection and exposes the newborn to the risk of infection (NBS, 2005). However, many mothers are not aware of such information as a result they do not value the importance of giving colostrums to their new born babies.

Exclusive breastfeeding

UNICEF and WHO recommend that children be exclusively breastfed (i.e. feed only breast milk with no other liquids including water or food) on demand for the first 6 months of life. Exclusive breastfeeding is associated with a lower risk of HIV transmission (Lartey, 2008). Early introduction of foods and other liquids reduce breast milk intake, decreases the full absorption of nutrients from breast milk, and increases the risk of diarrhea and acute respiratory infections of infants (Mukuria *et al.*, 2006). An optimal breastfeeding practice, especially exclusive breastfeeding up to 6 months of age, has the single greatest potential impact on child survival. A cross-section comparative study by Maseta *et al. (*2008) carried out in Morogoro to compare nutritional status of children aged 6-36 months revealed that exclusive breastfeeding ranged from 32 to 50 days; and infants were breast-fed immediately (in less than one hour) after birth.

Optimal infant and young child feeding practices include continued on-demand, frequent breastfeeding for children aged between 6-23 months and beyond. After the initial period of exclusive breastfeeding during the first six months of life, breast milk continues to be an important source of energy, protein, and micronutrients for older infants and young children, in addition to the nutrients they get from complementary foods. Breast feeding provides half or more of the child's nutritional needs, and at least one-third of their nutritional needs of children aged between 12-24 months; provide protection to the child against many illnesses and provides closeness and contact that helps psychological development (UNICEF, 2008).

2.3.2 Complementary feeding

Appropriate complementary foods can be readily consumed and digested by the young child from six months onwards and provide nutrients (energy, protein, fat and vitamins and minerals) to help meet the growing child's needs in addition to breast milk (UNICEF, 2008). Breastfeeding alone is not adequate to meet a child's nutritional needs after the first six months of life. In the transition to eating the family diet, children from the age of about 6 months are fed small quantities of solid and semi-solid foods throughout the day. During this transition period (ages 6-23 months), the prevalence of malnutrition increases substantially in many countries because of increased infections and poor feeding practices (Mahgoub *et al.*, 2006). Sub-optimal infant feeding practices, poor quality of complementary foods, frequent infections and micronutrient deficiencies contribute to the high prevalence of malnutrition and mortality among infants and young children. However, feeding children whose mothers are infected with HIV continue to remain an issue requiring urgent attention (Lartey, 2008).

2.4 Food Security

Food security is achieved when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (Smith *et al.*, 2006). Household food security is the ability of the household to secure enough food to provide for all the nutrient requirements of all members of the household (Smith *et al.*, 2006).

The link between household food security and nutrition security is a complex one. Fig. 1 gives a conceptual framework for the analysis of food and nutrition insecurity. It shows how global and national food availability works through peoples' food security to ultimately influence their nutrition security. Food availability at global and national levels

is necessary for households to have access to food, but it is not a sufficient condition for nutrition security. People also need adequate care and a healthy living environment to be able to absorb the nutrients available in food and thus use it in their everyday lives (Smith *et al.,* 2006). Improving food and nutrition security for poor households and ensuring that households allocate food equitably are critical steps in improving maternal health (Braun *et al.,* 2004).

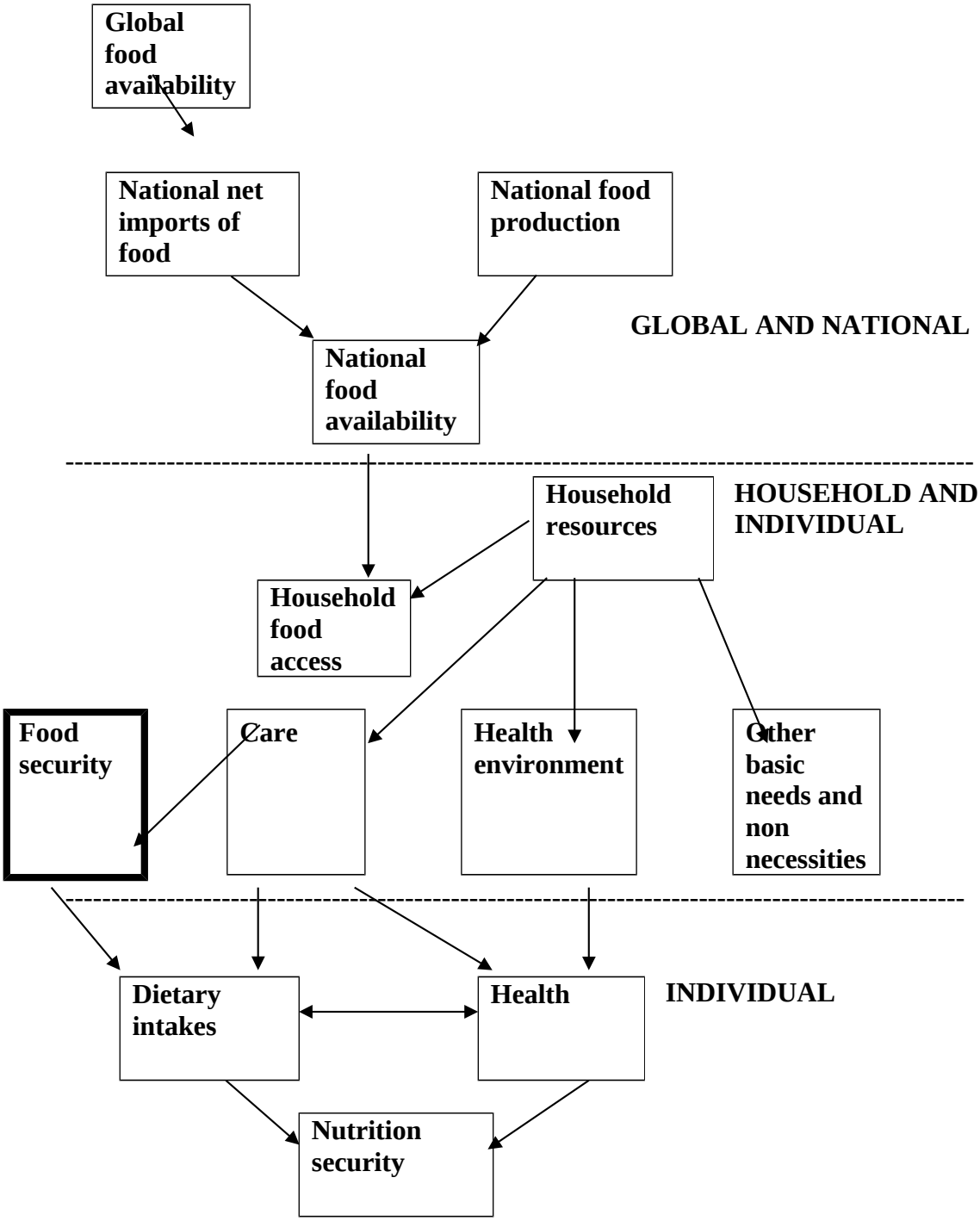

Figure 1: Conceptual framework for food and nutrition security

Source: Adapted from Frankenberger *et al.* (1997) and UNICEF (1998) cited in Smith *et al. (*2006).

2.4.1 Food security situation in Tanzania

Agricultural production is the primary source of livelihood for about 85% of the people in Tanzania to whom it ensures economic sustenance in terms of food security, income generation and employment (Ndiyo and Urassa, 2002). The overall food self-sufficiency ratio in Tanzania is satisfactory but the challenge has been on the distribution modalities of food stuff from surplus district/regions to those with food shortage (Mwinjaka *et al*., 2007). However, ensuring food security is at the heart of poverty reduction.

The rapid vulnerability assessment (RVA) conducted by Food Security Information Team(FSIT) during February/March 2009 in 38 districts in 11 regions revealed that 21 districts in 9 regions did not produce sufficient food crops to meet their needs. A total of 279,607 people (3%) in 20 districts of 9 regions were likely to be moderately/borderline food insecure between April and mid-May 2009 (FEWSNET, 2009).

During rapid vulnerability assessment (RVA) 2003, Morogoro region was found to be one of the food insecure regions (FEWSNET, 2003). In the region people spend about two thirds of their income on food (Paavola, 2004). Morogoro rural district during RVA in 2003 identified as food insecure district (FEWSNET, 2003). During RVA in 2006 Morogoro rural had high percentages of food insecure people (50%) (FSIT, 2006). Food security can influence nutrition security of an individual. From the above information it show that the district is facing food insecurity problem this can affect nutritional status of children in the area. Nutritional status of children below five years of age in Morogoro rural has been deteriorating since 2003 to 2007. For instance 2009 year prevalence of stunting is 43%, underweight is 13% and wasting is 3%.

2.5 Nutritional Programmes

Peoples' participation approach in reducing malnutrition in the community is of prime importance. The Child Survival, Protection and Development (CSPD) is a community-based programme whose main strategy is to empower communities to assess, analyse and take appropriate actions on development issues, especially those which are pertinent to health and nutrition situation of children and women (Nyaruhucha *et a.,* 2006). The CSPD programme started in Iringa region in 1983/84 and its aim is to improve the welfare of children and their mothers. It intends to combat malnutrition and provide nutrition education to children and women. The programme successfully expanded to Morogoro, Shinyanga, Kagera, Ruvuma and Kilimanjaro. In Morogoro, the CSPD programme started in 1986 (Nyaruhucha *et al*., 2006).

The programme has shown improvement in the nutritional status of infants and children and a decrease in child deaths. Not only that but it has also greatly empowered communities to handle food and nutrition health problems (Chorlton and Moneti, 1989; Nyaruhucha *et al.,* 2006). Other outcomes of CSPD in Morogoro region were improvements in exclusive breastfeeding rates and better attendance at growth monitoring clinics. Almost 100% of mothers attended antenatal clinics and over 93% of mothers had health professional present at the birth of their neonates. Furthermore, attendance at growth monitoring and child health clinics was very good, and piped water was available to a large majority of the households (Pettifor, 2008).

A study done by Nyaruhucha *et al*. (2006) in Morogoro Rural and Morogoro Urban found that the extent of community participation in the CSPD project is generally low. People were not aware of the programme and its activities making CSPD lose its effectiveness.

2.6 Socio-economic Changes that Affect Nutritional Status

Poor nutritional status reflects an imbalance in dietary intake and/or infectious diseases, and therefore is affected by multiple environmental and socioeconomic factors (Pongou *et al*., 2006). The most significant socio-economic factors directly related to nutrition are level of education, food production, household hygiene, access to case management in health services, family size, household economy, alcohol, smoking, drug abuse, urbanization, food security, reduced energy expenditure, adoption of the Free Trade Market Policy, psychological tension, nutritional and maternal education and HIV (Maletnlema, 2002; Pongou *et al*., 2006). These factors are likely to cause variations in health and nutrition status of children (Pongou *et al*., 2006).

CHAPTER THREE

METHODOLOGY

3.1 Description of the Study Area

Morogoro region has an estimated population of 1 759 809 with 351 961 children below five years of age (20%) (NBS, 2005). The region has six administrative districts namely Morogoro Urban, Morogoro Rural, Kilosa, Mvomero, Ulanga and Kilombero (Fig. 2). The study was conducted in Morogoro Rural District in Kiroka village. The district has a population of 263 920 and 39 297 children below five years of age (NBS, 2005). Morogoro rural is bordered to the East by the Pwani Region, Morogoro Urban District in the South and Mvomero District in the West. This district has ten divisions, 25 wards and 214 registered villages (NBS, 2005). Mkuyuni division comprises four wards namely, Kinole, Tegetelo, Kiroka and Mkuyuni. Kiroka is one of the five villages found in Kiroka ward. This village has a total population of 5 367 and 859 children below five years of age (Village Executive Office records, 2009).

3.2 Sample Size Determination

The study involved children below five years of age (0 - 59 months). The sample size was computed using the following formula (Fischer *et al*., 1991);

$n = (Z^2 \times p \times q) / d^2$

Where:

n = the sample size;
z = the risk of error (1.96);
p = the fraction of below-five children in the population;
q = 1- p and
d = the level of precision (5%),

Therefore, $n = 1.96^2 \times 0.2 \times 0.8/0.05^2 = 245$

Taking into account the attrition rate of 10%, the reasonable sample size for this study was 269 (i.e., 245 + 24). A total of 277 households were selected from the six hamlets of Kiroka village proportion to size of the hamlets. Then, the households of the selected children were visited to interview the heads of the households or mothers or caregivers (Table 1).

Table 1: Number of households surveyed by hamlet

Name of hamlet	Number of households	Percentage
Temekero	45	16.2
Kingongwe	107	38.6
Msamvu	35	12.6
Mwaya	17	6.1
Mahembe	64	23.1
Kimakenge	9	3.2
Total	**277**	**100.0**

3.3 Study Design and Sampling Procedure

A cross sectional study was conducted in the selected households in Kiroka village. A list of households with children below-five years of age was obtained from the Reproductive and Child Health Clinics (RCHC) (assumption was that all children below five years attend RCHC). Children included in the study were randomly selected from the list by using a table of random numbers. Inclusion criteria included children below five years of age and willingness of child's mother to be interviewed and the exclusion criteria included children reported with serious sickness like mental retardation, tuberculosis (TB), HIV and AIDS.

3.4 Methods and Materials for Data Collection

Methods used for data collection included direct observations, focused group discussions (FGDs) and face-to-face interview using a structured questionnaire for household survey. The household survey was conducted using seven enumerators who were trained on interviewing techniques and how to fill the questionnaire. Prior to actual data collection, training of enumerators was conducted for two days followed by pre-testing of the questionnaire at Morogoro RCHC. This was followed by questionnaire modification as per requirement. The methods used and types of data collected are explained in the following sections.

3.4.1 Direct observations

A visit to nine households (3% of the households sampled) was done to observe activities done at the household from 0700 h to 1900 h evening. The observation checklist included the general cleanliness of the mother/caregiver and the child, feeding habits, methods of food preparation and food distribution in the household. Others included frequency of child eating, water availability and sanitation facility, house quality/condition and types of food eaten in the households (Appendix 3).

3.4.2 Focus group discussions

Focused group discussion (FGDs) involved a group of women alone (mothers), men alone (fathers) and both (men and women) and were held in each hamlet or sub-village. The size of groups ranged from six to twelve people. All interviews and discussions were conducted in Kiswahili. Information collected included life style behaviour, food preparation, feeding practices, water and sanitation, presence of latrines, health services, endemic diseases, beliefs, food taboos, socio – economic changes and food beliefs. Male

and female focus group discussions were conducted separately, and then the two groups were brought together for plenary discussions (Appendix 2).

3.4.3 Structured questionnaires

Face-to-face interviews with the mothers or fathers /caregivers were administered to all selected households. The information collected using this survey instrument included socio-demographic factors, 24-hours dietary recall, food security information, utilization of health services, breast and complementary feeding practices, and diseases and infections (Appendix 1). Socio-demographic information collected was taken from heads of households and their spouses. This included information on gender, marital status, education level, occupation, reproductive history, housing and economic activities.

3.4.3.1 Dietary assessment

A home-visit was made to collect information on quantity and quality of food. Mothers were requested to show the types and amounts of foods, which the child had consumed within the last 24 hours, and cooking methods used. The amounts showed were estimated in term of bowel, cups and pieces and then converted into gram. Using the 24 hour-dietary recall, nutrient intake was measured by taking the average food intake for three days in a week; two week days and one weekend day. Weight of foods was measured by using TANITA digital cooking scale (Model No 1150, made in Japan). The cooking conversion factor was used to convert food into nutrient amount. The amount (gram) eaten by a child was converted to nutrient by using the food composition Table (Lukmanj *et al*., 2008). Mean intake of energy and protein was calculated for an individual child and for groups according to age and was then compared with Recommended Dietary Allowances (RDA)

(Lukmanj *et al*., 2008) and each child was classified as normal, below or above RDA following this procedure.

3.4.3.2 Anthropometric measurements and determination of nutrition status

Anthropometric variables such as weight, height/length, age and sex were collected. Height-for-age, weight-for height and height-for-age indices were employed to assess the nutritional status of children. Information on birth-weight of the children was obtained from their clinic cards. Anthropometric data were processed and analyzed using a computerized program ENA by SMART. Children were classified as having mild, moderate and severe malnutrition (Bruce, 2003).

Z-scores/percentiles were calculated from the measurements of height and weight. Z-score or standard deviation unit (SD) is defined as the difference between the value for an individual and the median value of the reference population for the same age or height, divided by the standard deviation of the reference population. Thus, Z-core was calculated using the following equation:

$$\text{Z-score} = \frac{\text{(observed value) - (median reference value)}}{\text{SD of reference population}}$$

Using the above formula, Z-scores were computed and Z-score of children were classified as follows: mild malnutrition -2 to <-1 Z-score; moderate malnutrition was ≤-2 to -3 Z-score and severe <-3 Z-score (Bruce, 2003).

a) Height/Length measurement for infants (0-23months)

The measuring board (Shorr production, 17802 Shotley, Bridge PL, Olney, Maryland 20832, USA) was used to measure length of infants (0-23months). The measuring board was placed on a hard flat surface. The child was placed face upward, with the head towards the fixed end and the body parallel to the long axis of the board (Fig. 2). The shoulder-blades rested against the surface of the board. The position of the child on the measuring board was; the child's feet, without shoes, toe pointing directly upward and the child's knees were kept straight. The movable footboard piece was placed firmly against the child's heels (Fig. 2). The measurements were taken to the nearest 0.1 cm (Gibson, 1990).

Figure 2: Measurement of length

b) Height for children 24 months and older

The measuring board was placed on a hard flat surface against a wall. The assistant placed the child's feet together in the centre of the flat surface of the board wall. The child's legs were placed straight and the heels and calves were pressed against the board/wall. The shoulders were level and relaxed, the hands were placed at the child's side, and the head, shoulder blades and buttocks against the board/wall. After the child's position was established, the measurement was recorded to the nearest 0.1 cm (Bruce, 2003).

c) Weight of infants/children

Weight was measured using an electronic SECA weighing scale (SECA Vogel and Halke, Hamburg, Germany) with a digital display. The scale was activated by turning it on displaying zeroes the panel. The mother/caregiver or father was asked to measure his/her weight, while still on the scale the solar panel covered, and then the zeroes appeared on the panel again. The picture of the mother caring child was displayed on the scale. Then the child was given to the mother and the baby's weight appeared on the display and was recorded on the data collection sheet.

d) Weight of children above 24 months

The scale was activated by turning it on and zeroes appeared on the display panel. The child's shoes were removed and any heavy clothing such as jackets. The child was asked to step onto the scale. A reading appeared on the display panel and was recorded to the nearest 0.1kg as the weight of the infant (Bruce, 2003).

e) Age

The exact age in months of children was obtained by asking the caregiver. This was later verified by checking the child's health cards and baptism cards.

3.4.4 Mid-upper arm circumference

Mid-upper arm circumference (MUAC) was measured with a Talc insertion tape (Talc Ltd, St. Albans, Hertz, UK). The Child's Midpoint of the left arm was located by measuring the length between the tip of elbow and tip of shoulder then the number was divided by two to estimate the midpoint. The MUAC tape was wrapped around the midpoint and the measurement was recorded to the nearest 0.1cm (Bruce, 2003).

3.4.5 Oedema

Oedema was diagnosed by exerting pressure using the medium thumb on the upper side of the foot for about three seconds. Oedema was present if a skin depression remained on both feet after the pressure was released (Bruce, 2003).

3.4.6 Food pattern consumption

A List of foods and frequency of use was prepared. This involved the food items consumed during a specified time period -daily and weekly. In addition, two indicators of food security (duration of food shortage and number of meals consumed per day in the household) were used to assess the food situation of the sampled households.

3.5 Data Processing and Analysis

Analysis was done by using the Statistical Package for Social Science (SPSS) for windows (Norusis and SPSS Inc, 2003) and ENA by SMART (Erhardt and Golden, 2007). Data from dietary assessment and household socio-demographic characteristics were analyzed using SPSS Version 16.0 for windows. Anthropometric data were analysed using ENA by SMART software program where Z-scores were generated and imported into SPSS for further analysis. Descriptive statistics was done to obtain means, frequencies, standard

deviation, and link between variables through Cross tabulation. T-test and ANOVA was used to test between means. Chi-square (χ^2) and t-test were used to test the significance of various independent variables. Pearson Correlation coefficient and simple regression analysis was used to determine the relationships that exist between variables and identify important factors affecting food security in the study area. Multiple regression analysis was needed to identify important factors and the interaction of factors. Therefore, probit regression analysis was performed to identify the determinants of nutrition insecurity as assessed by Z-scores. The dependent variables considered was binary variable (i.e., a child health was normal=1 and 0=malnutrition).

The important variables covered under this type of analysis included, sex of child (male=1), sex of household head (male=1), child age group (0 – 12 months=1 and otherwise=0), education level of mother (formal education=1 and no formal education=0), livestock keeping (kept = 1 and otherwise=0), crop production (maize harvest and rice harvest in kg), experienced food shortage (yes=1 and otherwise=0) and suffered from chronic diseases (yes=1 and otherwise=0).

CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter presents the statistical description of the important households' characteristics in relation to the health status of children below five years of age. The household characteristics included ethnic group, household size, marital status of household head, and number of children below five years of age, sex of household head, age and education level of parents. In addition, the status of household food security, types of crops cultivated and livestock keeping are described. It presents the important factors which affect health and nutritional status of the children below five years of age. Finally, it presents the findings of the nutritional assessment of children below five years of age. The nutritional status of children was assessed by using three nutritional indices; weight-for-age (W/A), height-for-age (H/A) and weight-for-height (W/H), and MUAC indicator for children above 12 months of age. The results are presented in Tables and Figures. Results are presented as mean and standard deviation (SD).

4.2 Demographic Information

Information on demographic factors which can influence the nutritional status of children below five years of age in the study community was collected. The important demographic factors covered in the study community were ethnic group, sex of household head, household size, marital status, level of education and age.

In terms of the ethnic aspects, Kiroka village is almost homogenously composed of the ethnic tribe of Waluguru/Luguru (94%). The other ethnic minority tribes include Kwere, Gogo, Ha, Hehe, Kaguru, Makonde, Ngoni, Nyamwezi, Gido, Fipa, Nyaturu, and Sukuma

(Table 2). The marital status of household heads was 86% married, 12% single and 2% divorced.

Table 2: Demographic characteristics of surveyed households in Kiroka village

Criteria	Sex of household head		All
	Female	Male	
Number of respondents	44	233	277
Ethnic groups (%):			
Luguru	90.90	93.99	93.50
Others	9.10	6.01	6.50
Average household size	5.11	4.97	5.00
Marital status			
Married	5.90	4.97	5.02
Single	4.90	4.75	4.87
Divorced	4.80	-	4.80
Number of children per household (%)			
One child	61.36	65.67	64.98
Two children	29.55	29.18	29.24
Three children	6.82	3.86	4.33
Four children	2.27	1.29	1.44
Average	1.50	1.41	1.42

The average household size was 5 people which ranged from 3 to 15 people. However, female headed households had relatively higher household size than male headed households but it was not significantly different (Table 2). Likewise, the number of children below 5 years of age per household was not significantly different between the

two types of households. About 51% of the women had no formal education and 47% had primary school education and 1% was having secondary school education. The mean age of mothers was 27.32 ± 6.56. Mothers with the age below 20 years were 13% (Fig. 3).

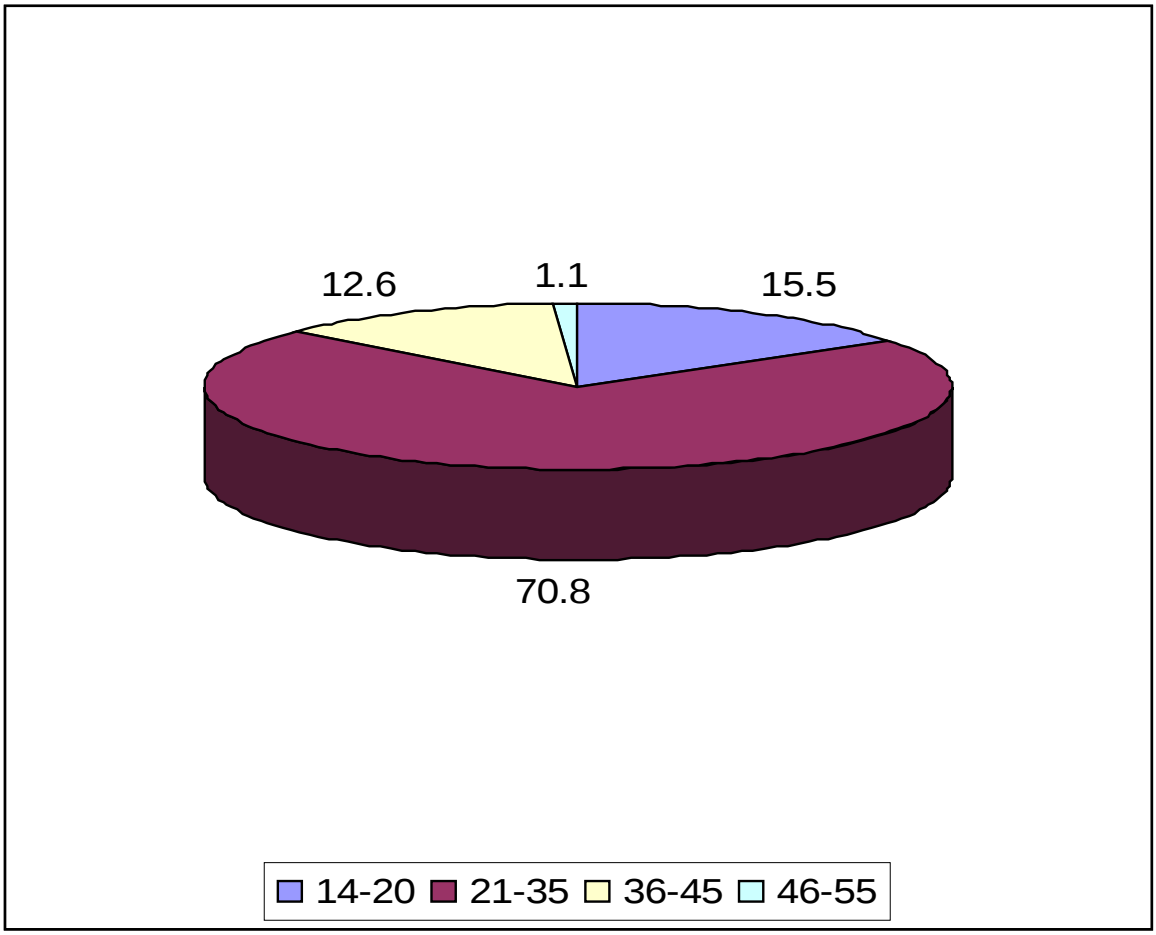

Figure 3: Age s of mothers

Farming was the most important livelihood activity of the respondents (91%). about 7% were involved in petty business, 2% civil servant and 0.4% were employed as causal labourers.

4.3 Physical Characteristics of the Children

4.3.1 Age and sex of the children

About 51% of the children sampled were males and 49% were females resulting into a ratio of 1:1.02. Children who were below 24 months of age accounted for 57% of the total sample size and those above 24 months of age were 43% (Fig. 4).

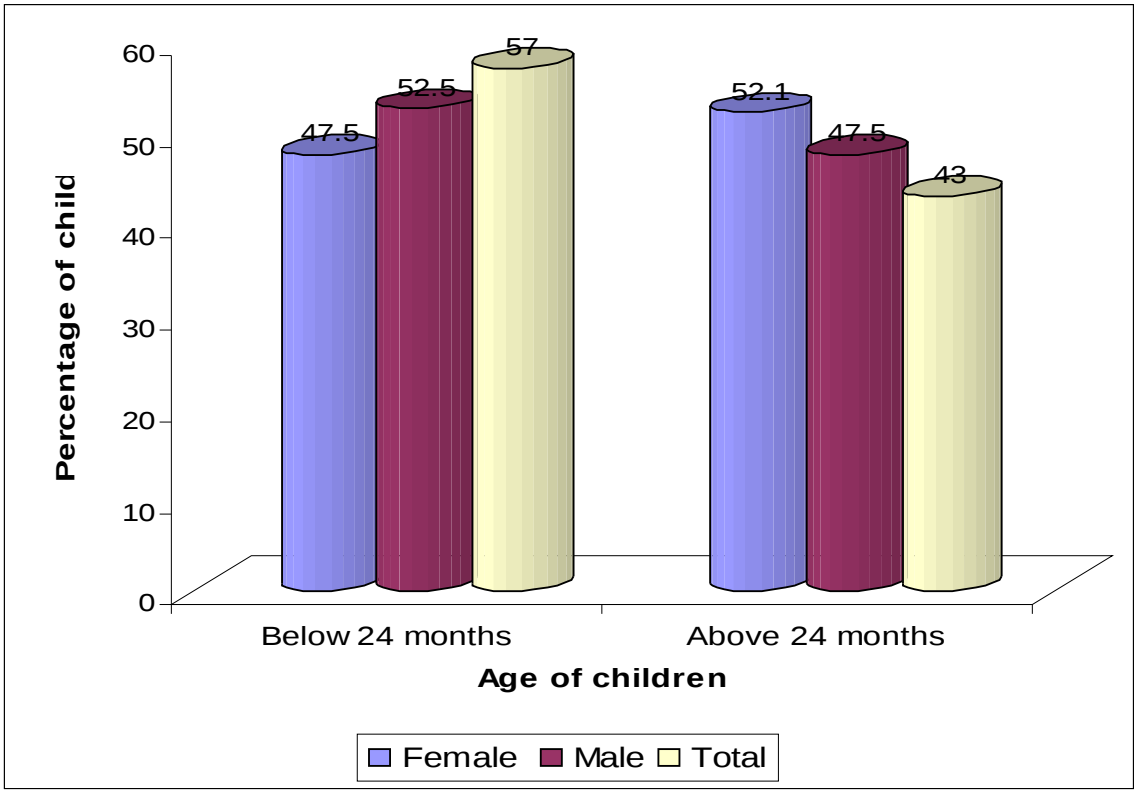

Figure 4: Distribution of children in various age groups below and above 24 months of age by sex

4.4 Nutritional Status of Children

Nutritional status of children aged between 0 and 59 months from Kiroka village was assessed by using the three nutritional indices; weight-for-age (W/A), height-for-age (H/A) and weight-for-height (W/H). For children above 12 months of age, the MUAC indicator was also used to assess their nutritional status. The prevalence of wasting,

underweight and stunting (chronic malnutrition) was 3%, 13%, and 43%, respectively (Table 3). There were no cases of oedema among the children.

Table 3: Nutritional status of children by sex in Kiroka village

Prevalence	Boys		Girls		Overall	
	n	%	n	%	n	%
Total	140	100.0	137	100.0	277	100.0
Weight-for-height:						
Wasting	4	2.9	4	2.9	8	2.9
Moderate wasting	3	2.1	4	2.9	7	2.5
Severe wasting	1	0.7	0	0.0	1	0.4
Weight-for-age:						
Underweight	22	15.7	15	10.9	37	13.4
Moderate underweight	15	10.7	12	8.8	27	9.7
Severe underweight	7	5.0	3	2.2	10	3.6
Height-for-age:						
Stunting	64	45.7	56	40.9	120	43.3
Moderate stunting	38	27.1	44	32.1	82	29.6
Severe stunting	26	18.6	12	8.8	38	13.7

4.4.1 Weight-for-age

The mean weight-for-age for children below five years of age was - 0.8 ± 1.2. Based on Z-score of weight-for-age, about 86% of the children surveyed had normal weight-for-age, 10% had moderate underweight and 4% were severely underweight (Table 3). About 16%

of the boys were underweight and 11% of the girls were underweight. Children between age group of 25-36 months are most affected by underweight (6%) (Table 4).

Table 4: Nutrition status of children by age

Age in months	Weight for age					
	2SD - +2 SD(normal)		<-2SD - -2.99SD (moderate underweight)		<-3SD(severely underweight	
	n	%	n	%	n	%
0-12	92	90.2	7	6.9	3	2.9
13-24	51	86.4	6	10.2	2	3.4
25-36	58	85.3	6	8.8	4	5.9
37-48	20	80.0	4	16	1	4.0
49-60	19	82.6	4	16	0	0.0

The prevalence of moderate underweight was higher among children of mothers who had not been through any formal education (Fig. 5), but there was no difference in the prevalence of severe underweight between the two groups. Underweight prevalence was higher in households with a large number of people (14%) compared to households with a small number of people (13%).

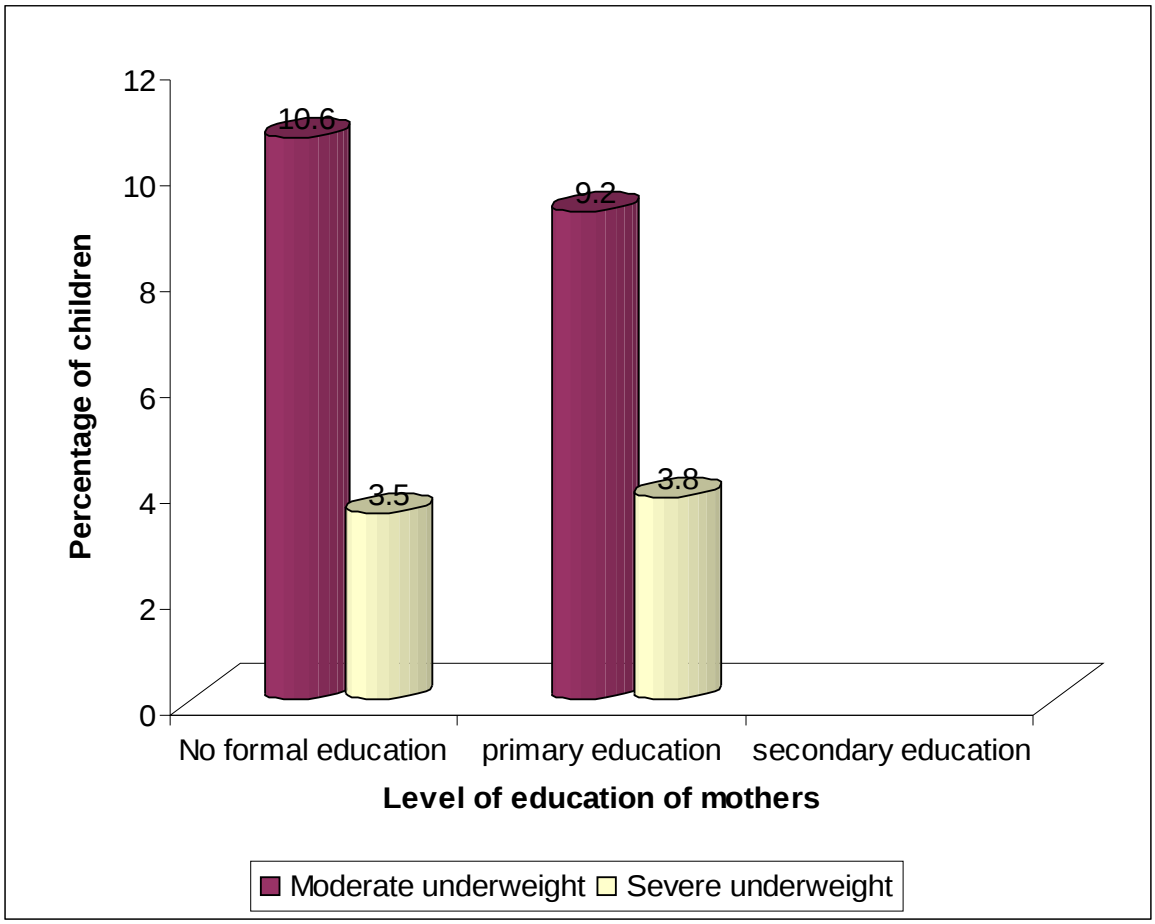

Figure 5: Level of education of mothers and weight-for-age Z-Score

The prevalence of severe underweight was only observed in male headed households (4.3%) and none in female headed households (Table 5).

Table 5: Prevalence of underweight for children below five years age as related to the general characteristics

Characteristics	Normal (>= -2 z score)		Moderate underweight (>= -3 and <-2 z-score)		Severe underweight (<-3 z-score)		Overall underweight	
	n	%	n	%	n	%	n	%
Sex of head of household:								
Female	39	88.6	5	11.4	0	0.0	5	11.4
Male	201	86.3	22	9.4	10	4.3	22	13.7
Marital status:								
Married	208	87.0	22	9.2	9	3.8	31	13.0
Single	29	87.9	3	9.1	1	3.0	4	12.1
Divorced	3	60.0	2	40.0	0.0	0.0	2	40.0
Livestock keeping (goats, pigs, chicken, ducks):								
With	160	87.4	19	10.4	4	2.2	23	12.6
Without	80	85.1	8	8.5	6	6.4	14	14.9
Household size								
3 – 6 persons	198	86.8	23	10.1	7	3.1	30	13.2
7 - 15 persons	240	85.7	4	8.2	3	6.1	7	14.3
All	**240**	**86.6**	**27**	**9.7**	**10**	**3.6**	**37**	**13.3**

Older children (two years and above) were found to be more prone to underweight than young children and infants (below two years) (Fig. 6).

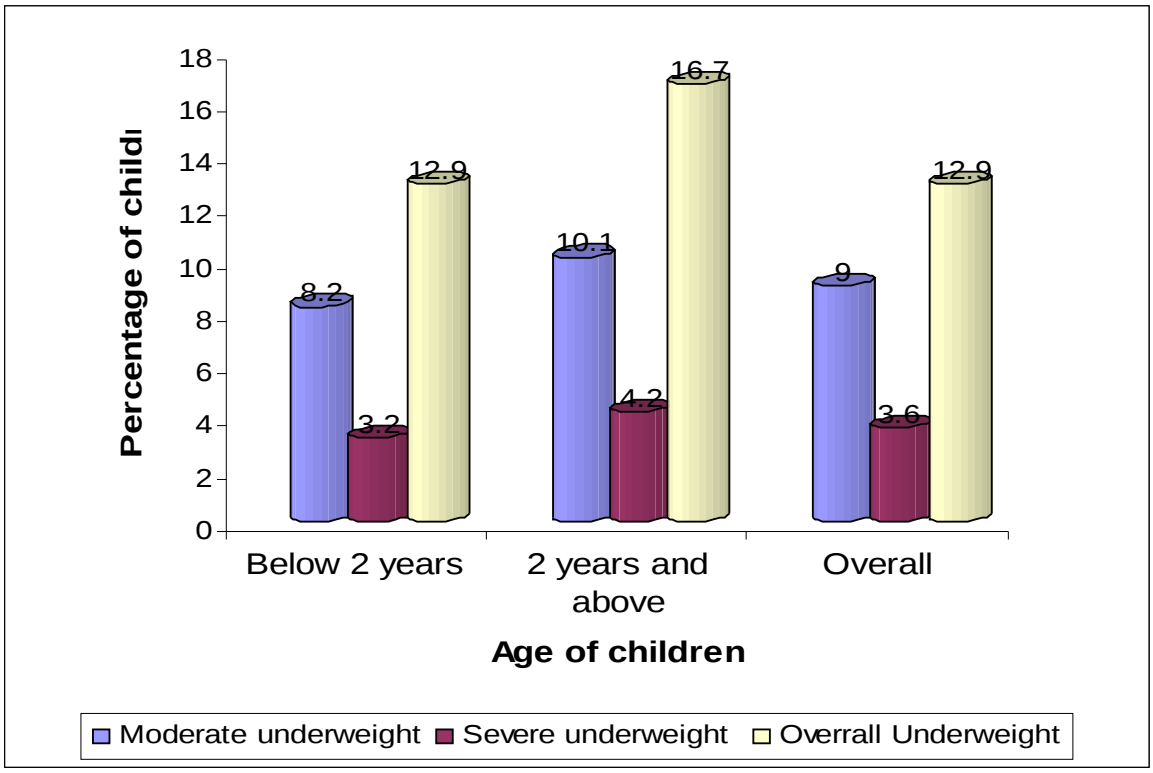

Figure 6: Prevalence of underweight among children of age below and above 2 of age

There was a higher proportion of boys having Z-scores of below -2 compared to girls (Fig. 7). The curve for boys was on the lower side compared to that of the girls from -2 Z-score and beyond (Fig. 7). Both curves show a shift to the left from the reference curve, this is an indication of low nutritional status as compared to the reference population.

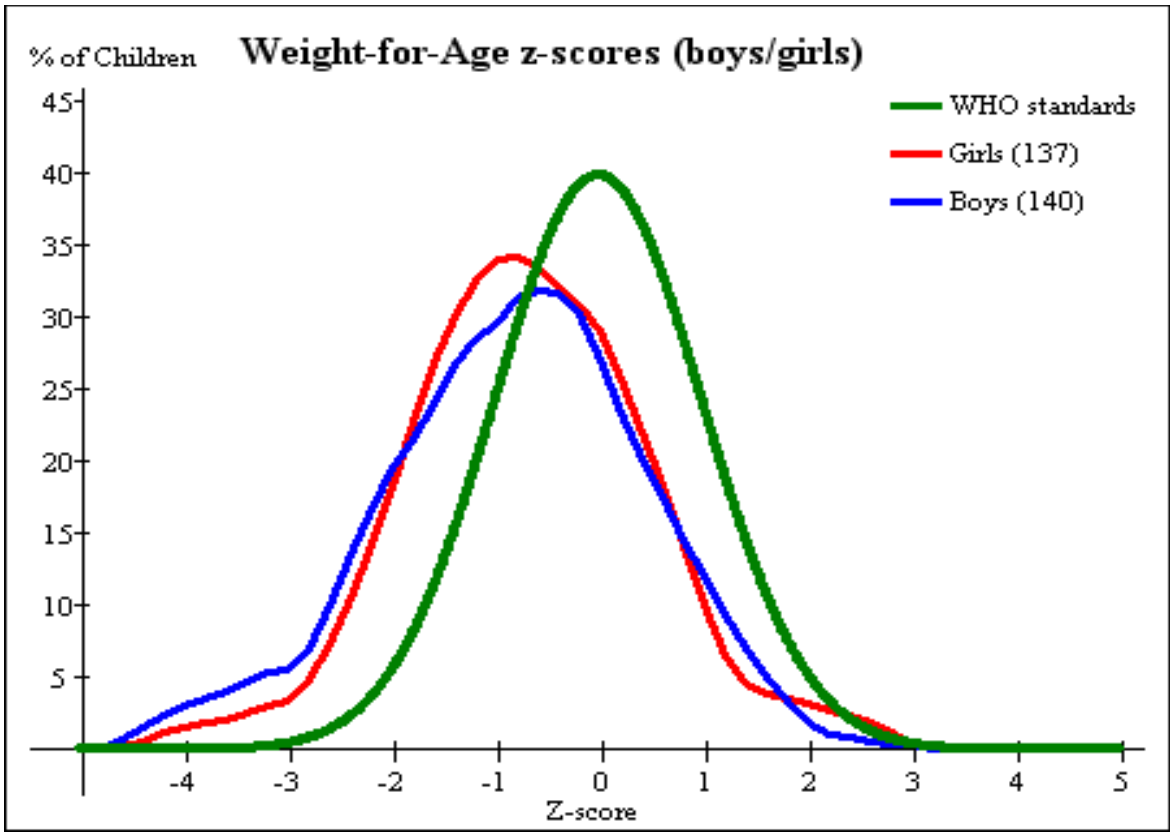

Figure 7: Prevalence of underweight among children below five years by sex

Trend of nutritional status

The prevalence of underweight in children showed increasing trend between 2005 and 2007 (Fig. 8). From January to March only 2008 the dispensary had already recorded 15% new cases of underweight children. During the period between 2003 and 2007, the prevalence of underweight in children in Kiroka village changed from 10% in 2005 which was significantly different from 19% in 2003 (χ^2 = 4.8, $p<0.05$). The prevalence of underweight in 2007 was significantly higher (χ^2= 9.34, $p<0.05$) than the prevalence values observed in other years.

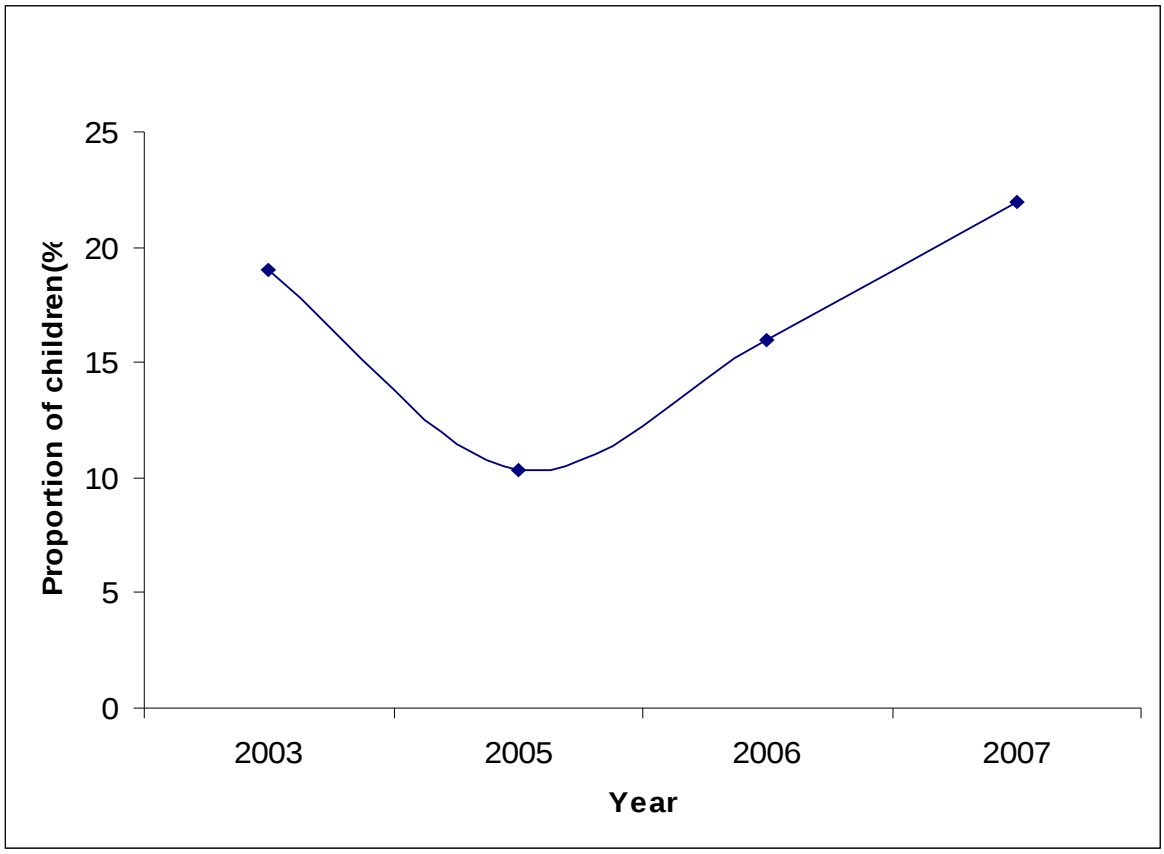

Figure 8: Prevalence of underweight of children in Kiroka village from 2003 to 2007.

4.4.2 Weight-for-height

The overall prevalence of wasting was 3%. Severe wasting (2%) was observed among children aged between 12 and 24 months of age. The children in the age group of 36-48 months were more wasted (8%) followed by the children in the age group of 24-36 months (4%).

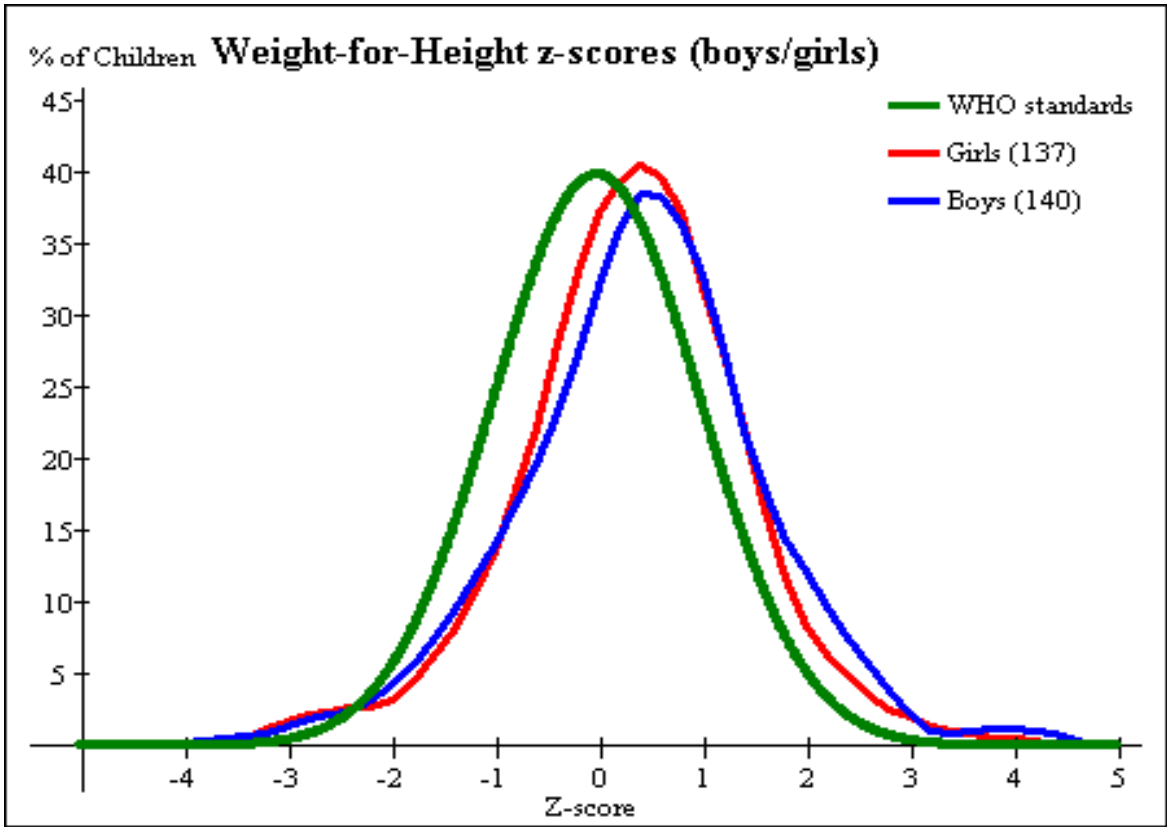

Figure 9: Prevalence of wasting among children below five years by sex

The curve for boys was on the lower side compared to that of the girls from -2 Z-score. Both curves are not much deviating from the reference curve (Fig. 9).

Table 6: Prevalence of wasting for children below five years age with general characteristics

Criteria	Normal – (2.00SD- +2.00 SD)		Moderate wasting – (2.01SD - -2.99SD)		Severe wasting (<3SD)		Overweight (>2SD)		Obese (>3SD)		Overall wasting	
	n	%	n	%	n	%	n	%	n	%	n	%
Sex of head of household:												
Female	43	97.7	0	0.0	0	0.0	1	2.3	0	0.0	0	0.0
Male	207	88.8	7	3.0	1	0.4	15	6.4	3	1.3	8	3.4
Marital status:												
Married	214	89.5	7	2.9	1	0.4	14	5.9	3	1.3	8	3.3
Single	32	97.0	0	0.0	0	0.0	1	3.0	0	0.0	0	0.0
Divorced	4	90.3	0	0.0	0	0.0	1	20.0	0	0.0	0	0.0
Livestock keeping (goats, pigs, chicken, ducks):												
With	164	89.6	5	2.7	0	0.0	11	6.0	3	1.6	5	2.7
Without	86	91.5	2	2.1	1	1.1	5	5.3	0	0.0	3	3.2
Household size												
3-6 persons	207	90.8	4	1.8	1	0.4	15	6.6	1	0.4	5	2.2
7-15 persons	43	87.8	3	6.1	0	0.0	1	2.0	2	4.1	3	6.1
All	**250**	**90.3**	**7**	**2.5**	**1**	**0.4**	**16**	**5.8**	**3**	**1.1**	**8**	**2.9**

Children from female headed households had no wasting cases. Higher prevalence of wasted children (6%) was observed in large sized households compared to (2%) of the children in small sized households (Table 6). Children from married mothers were more wasted than children from unmarried (single) mothers.

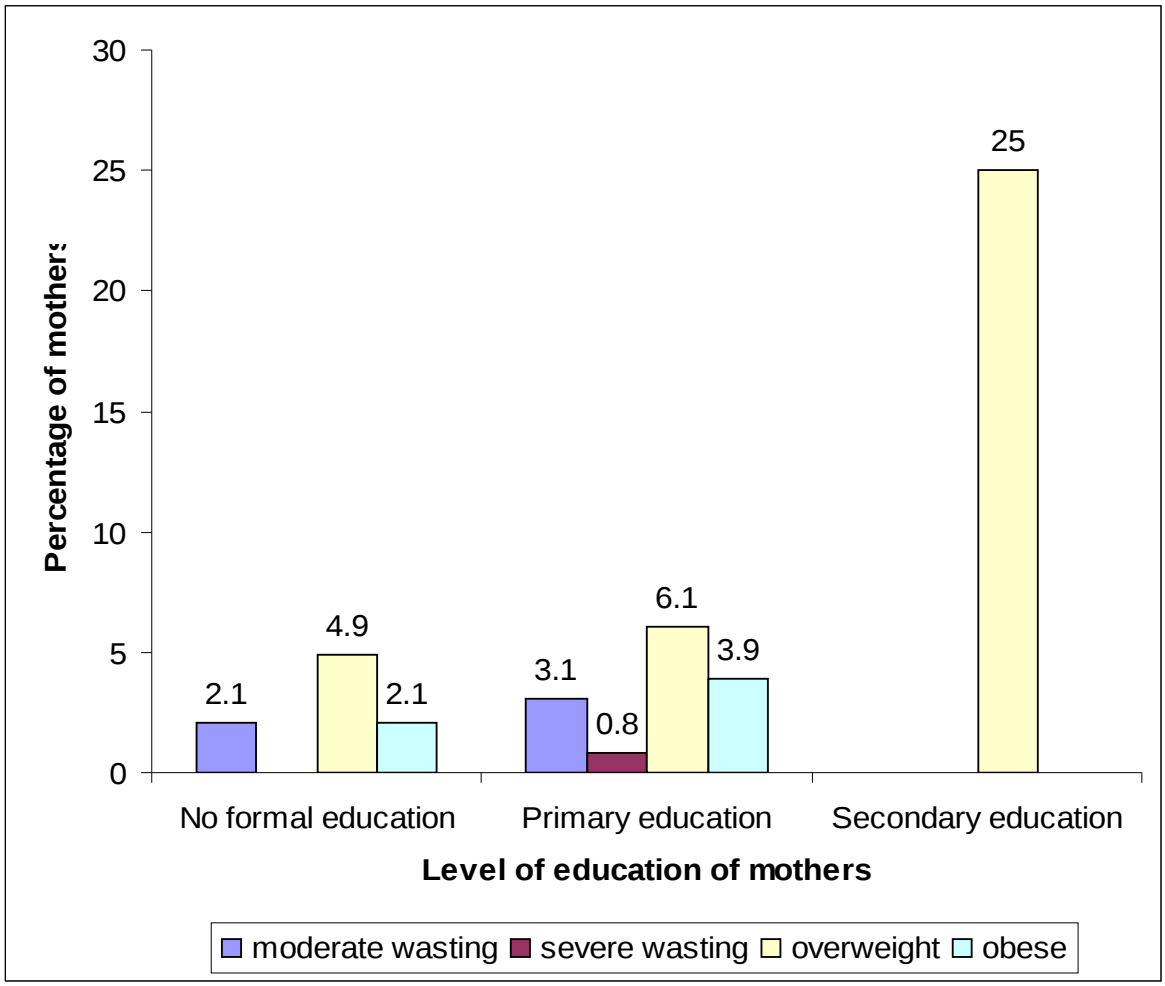

Figure 10: Level of education of mothers and prevalence of wasting

Mothers who had primary education had a high level (4%) of wasted children. Overweight (25%) children were found to mothers who had secondary education (Fig. 10).

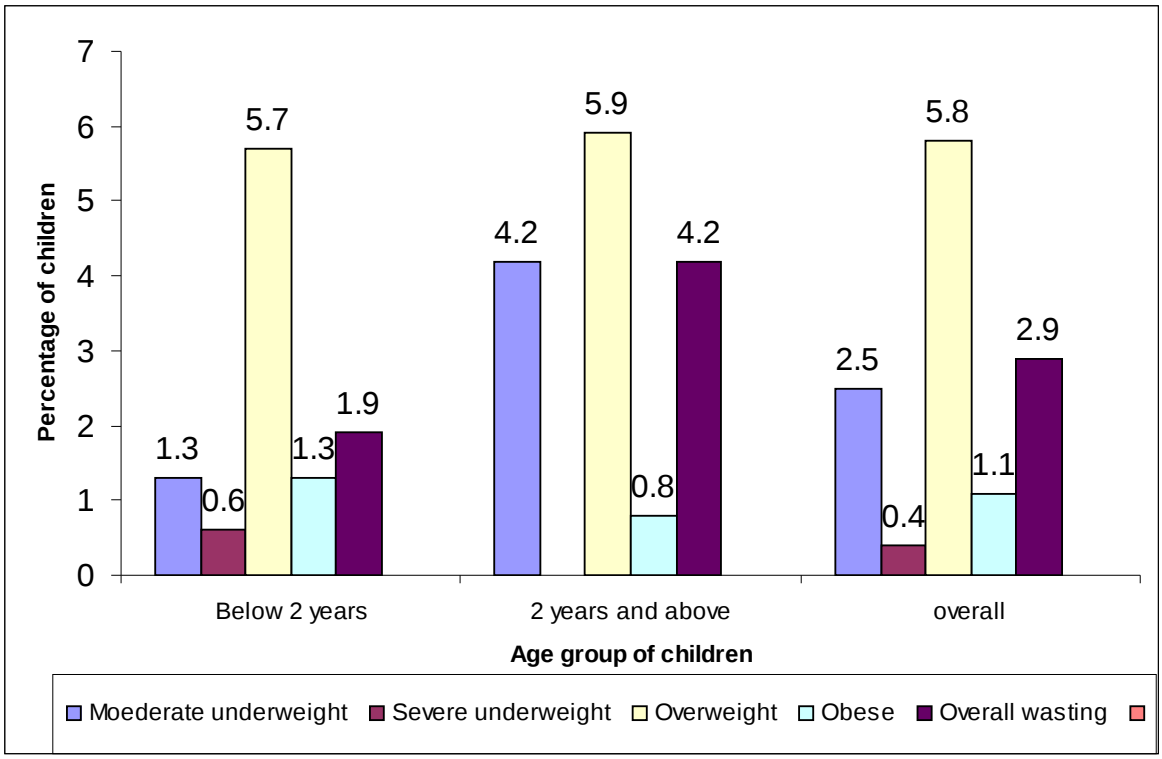

Figure 11: Prevalence of wasting among children below and above 2 years of age

Children who were two years old and above (4%) were more wasted than children who were below two years of age (2%). However, severe wasting was higher among children below two years of age (1%) and moderate wasting (4%) was high in children above two years (Fig.11). The mean weight-for-height Z-score among children of age below five years was 0.365 ± 1.116. Unlike underweight (χ^2 = 0.549) and stunting (χ^2 = 0.487), there was a significant association between household size and prevalence of wasting of children at 0.046 (χ^2). Likewise, there was an association between wasting and disease status (χ^2 = 0.008).

4.4.3 Height-for-age

The overall stunting rate of children below five years of age was 43% and that with severe and moderate stunting was 30% and 14%, respectively (Table 7). Boys (46%) were more stunted compared to girls (41%).

Table 7: Prevalence of stunting for children below five years age with general characteristics

Criteria	-2SD - +2SD (normal)		-2 SD- -2.99 SD (moderate stunted)		<-3SD (severely stunted)		Overall stunting	
	N	%	n	%	n	%	n	%
Age group of children (months):								
Sex of head of household:								
Female	24	54.5	13	29.5	7	15.9	20	45.4
Male	133	57.1	69	29.6	31	13.3	100	42.9
Marital status:								
Married	141	59.0	68	28.5	30	12.6	98	41.1
Single	14	42.4	12	36.4	7	21.2	19	57.6
Divorced	2	40.0	2	40.0	1	20.0	3	60.0
Livestock keeping (goats, pigs, chicken, ducks)								
With	102	55.7	57	31.1	24	13.1	81	44.2
Without	55	58.5	25	26.6	14	14.9	39	41.5
Household size								
3-6 persons	133	58.3	65	28.5	30	13.2	95	41.7
7-15 persons	24	49.0	17	34.7	8	16.3	25	51.0
All	**157**	**56.7**	**82**	**29.6**	**38**	**13.7**	**120**	**43.3**

Children from divorced mothers had high prevalence (60%) of stunting compared to childrenn single and married mothers (Table 7). Likewise, as with the case of weight-for-age Z-score, children in the large size households were more stunteed (51%) compared to children in small size households (42%) (Table 7).

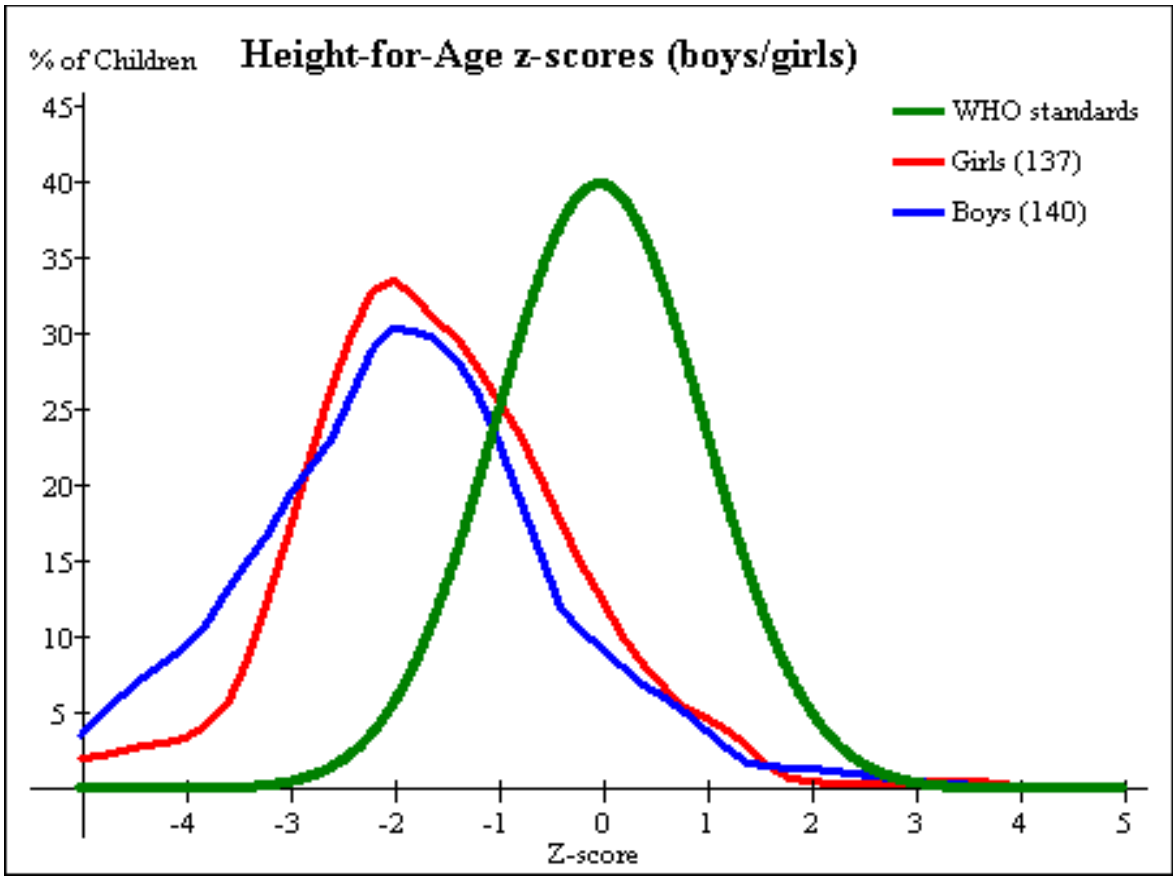

Figure 12: Prevalence of stunting among children below five years by sex

Similar to results of underweight, there was a higher proportion of stunted boys having Z-scores of below -2 compared to girls (Fig. 12). The curve for boys was on the lower side compared to that of the girls from -2 Z-score and beyond (Fig. 12). Both curves show a shift to the left from the reference curve, this is an indication of low height-for-age as compared to the reference population.

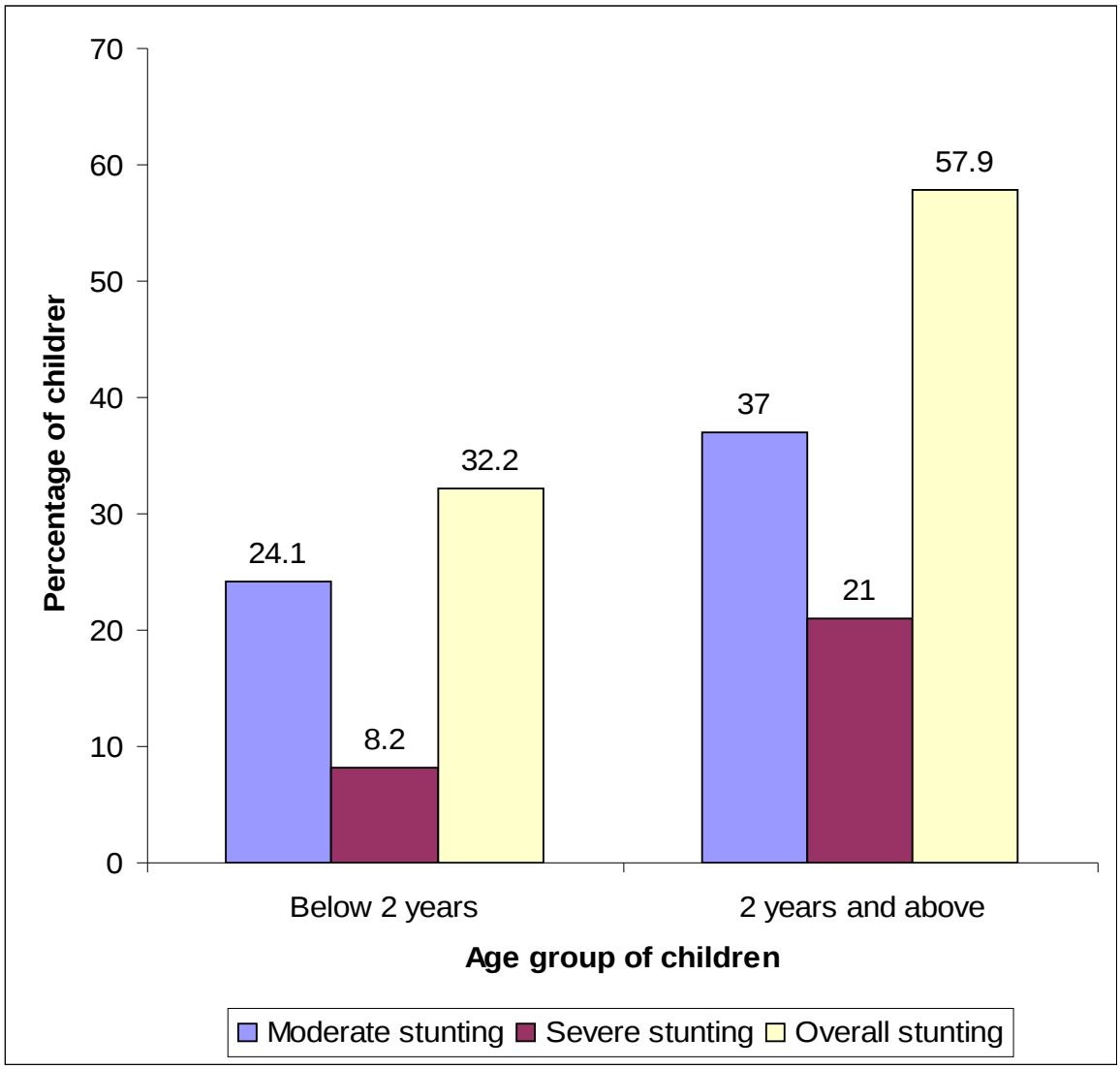

Figure 13: Prevalence of stunting among children below and above 2 years of age

Children of age two years and above had high prevalence of stunting compared to children of age below 2 years (Fig. 13). Severe and moderate stunting rate among children decreased with level of education (Fig. 14). Prevalence of stunting was associated ($r=0.13$, $p=0.037$) with increased cases of children with any illnesses.

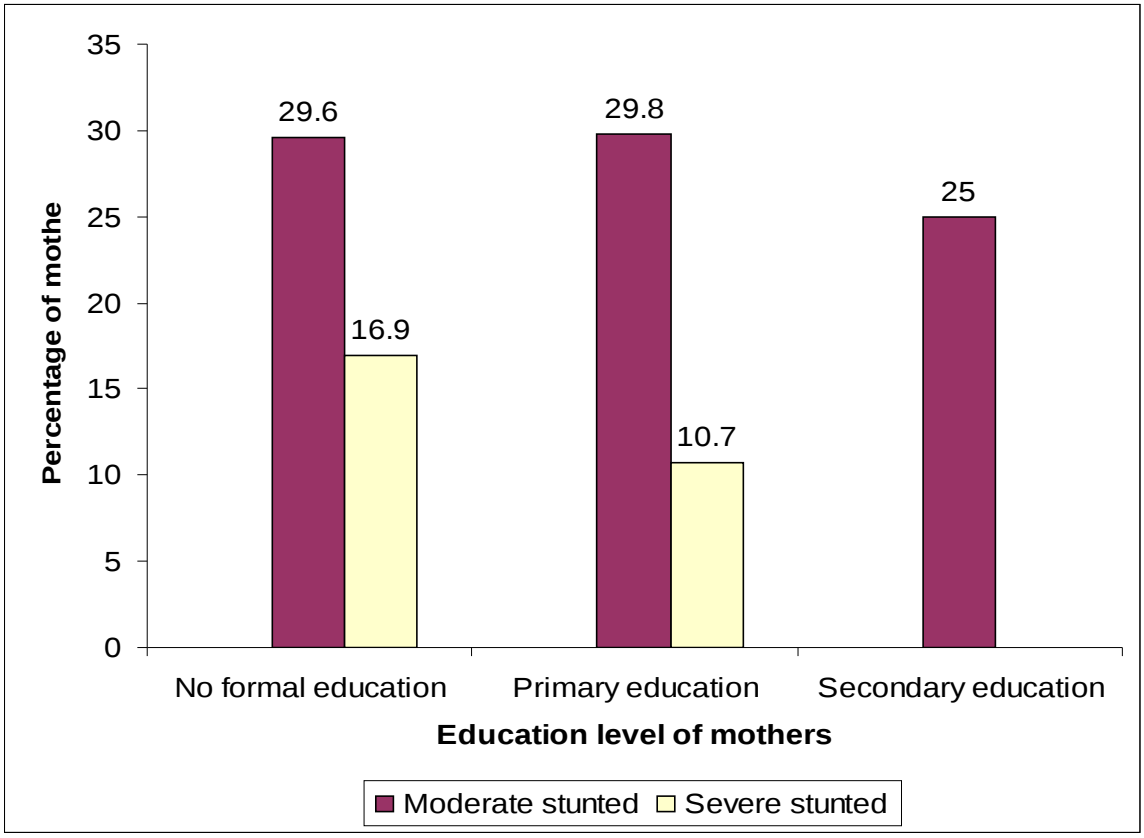

Figure 14: Level of education of the mother and prevalence of stunting

Children in the age group of 46 – 48 were more stunted compared to the other age groups (Table 8).

Table 8: Prevalence of stunting for various age categories

Age of children	Height-for- age					
	-2SD - +2SD (normal)		-2 SD- -2.99 SD(moderate stunted)		<-3SD (severely stunted)	
	n	%	n	%	n	%
0-12	78	76.5	21	20.6	3	2.9
13-24	31	52.5	18	30.5	10	16.9
25-36	29	42.6	25	36.8	14	20.6
37-48	11	44.0	8	32.0	6	24.0
49-60	8	34.8	10	43.5	5	21.7

4.4.4 Mid upper arm circumference

Results of MUAC for children aged between 12-59 months showed that there was no serious problem although the weight-for-height results revealed a serious problem. This is probably due to the fact that MUAC has less precision compared to weight-for-height indicator. MUAC is generally appropriate for quick assessment of nutrition status to identify children who are already at risk of being malnourished (Table 9).

Table 9: Mid upper arm circumference and percentage of children

Child age group (months)	N	Moderate malnourished		At risk of malnutrition		Normal	
		n	%	n	%	n	%
12.1 – 18.0	25	1	4.0	5	20.0	19	76.0
18.1 - 30.0	65	5	7.7	7	10.8	53	81.5
30.1 – 42.0	52	0	0.0	3	5.8	49	94.2
42.1- 54.0	23	0	0.0	1	4.3	22	95.7
54.1- 60.0	12	0	0.0	0	0.0	12	100.0
Overall	177	6	3.4	16	9.0	155	87.6

4.4.5 Health services

Most of the respondents took their children to Kiroka health centre when a child fell sick (Fig. 15).

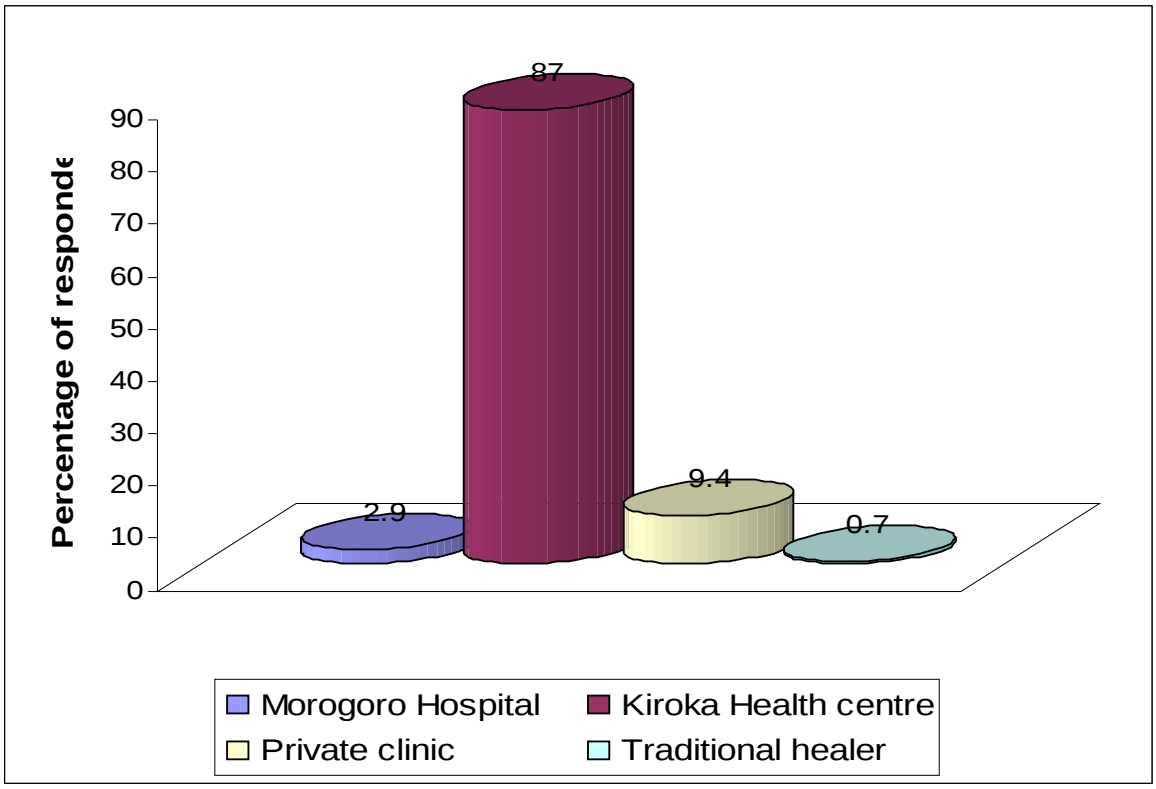

Figure 15: Health centres which are visited when child fell sick

Kiroka village has a health centre which is the major provider of the health services for the surrounding communities. The average distance to the health facility (Morogoro region hospital) is 57 Km. About 38% of the households walk half a kilometre to Kiroka health centre, 29% walk five kilometres, 16% cover a distance of one kilometre, 16% two kilometres, and 5% a distance of three kilometres.

Mothers are normally responsible for taking their children to the hospital or dispensary. Fathers rarely take their children to the clinic and do so only when the mother is sick or is involved in other important family responsibilities.

Figure 16: A father who has just brought his child back from clinic in Mahembe hamlet

Of the children surveyed, most were born at four places; at Kiroka Health Centre (48%), traditional nurses/ midwives (32%), Morogoro Hospital (18%) and at home (3%).

4.4.6 Morbidity

During the survey each mother was asked to list the type of disease(s) a child had suffered during a period of one month prior to the survey. The results to this question are summarised in Table 8. Mothers who had no formal education (51%) had a high number of children suffering from diseases (Table 10). The proportion of children who suffered from diseases in each age group increased with age (Table 10).

Table 10: Percentage of children suffered from chronic diseases by age group

Criteria	Suffered from chronic disease(s)				All	
	Yes		No			
	N	%	n	%	n	%
Child age group (in months):						
0.00 – 12.00	73	72.3	28	27.7	101	100.0
12.01 – 24.00	54	94.7	3	5.3	57	100.0
24.01 – 36.00	65	94.2	4	5.8	69	100.0
36.01 – 48.00	24	96.0	1	4.0	25	100.0
48.01 – 59.00	21	84.0	4	16.0	25	100.0
Level of education of mothers						
No formal education	119	50.2	23	57.5	142	51.3
Primary	116	48.9	15	37.5	131	47.3
Secondary	2	0.8	2	5.0	4	1.4
Overall	**237**	**85.6**	**40**	**14.4**	**277**	**100.0**

The morbidity rate of children was 87% mainly caused by four chronic diseases with Malaria being the most (75%) frequent disease that affected children in the Kiroka village during the stated period (Fig. 17).

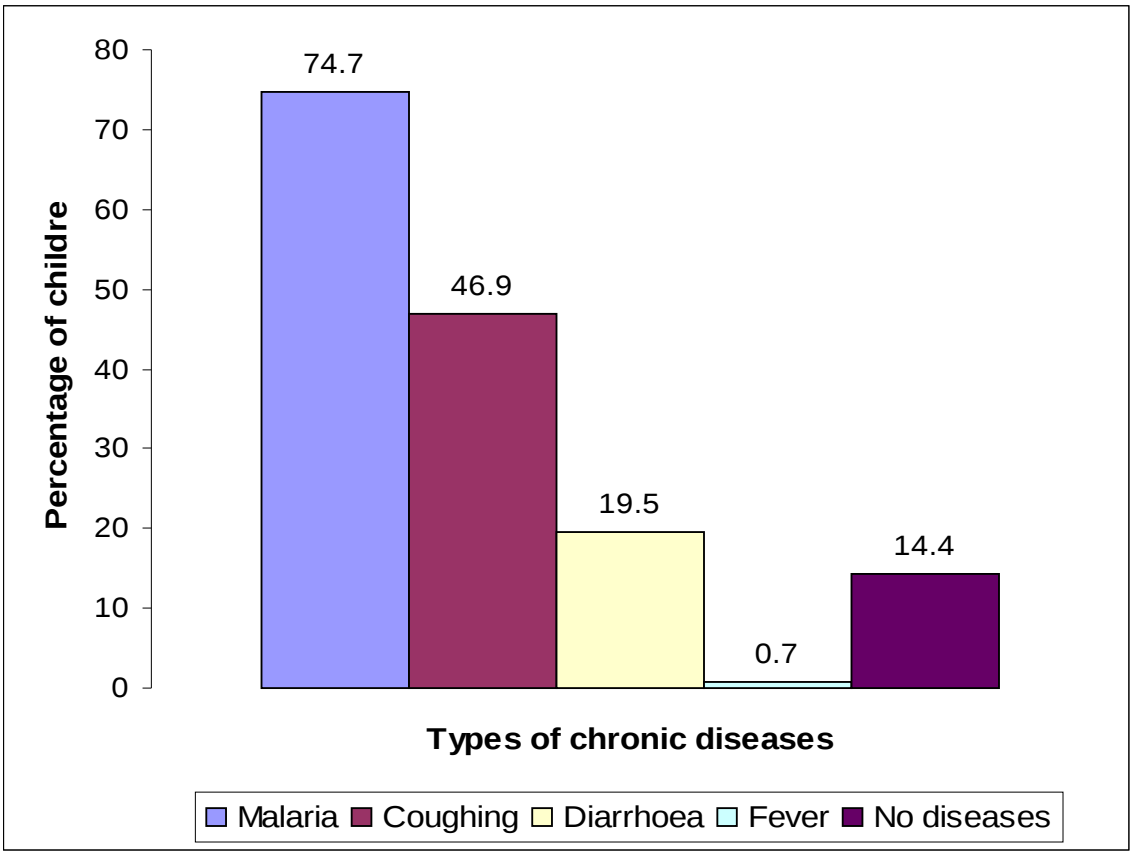

Figure 17: Type of diseases affecting children in Kiroka village

The prevalence of underweight, and stunting was higher for children who had suffered from diseases than for children who did not suffer from any diseases (Table 11).

Table 11: Z-values categories by health status of child

Criteria	Reported to have suffered from diseases		All
	Yes	No	
Weight for age:			
Normal	84.8	97.5	86.6
Moderate underweight	11.0	2.5	9.7
Severe underweight	4.2	0.0	3.6
Height for age:			
Normal	54.4	70.0	56.7
Moderate stunted	30.4	25.0	29.6
Severely stunted	15.2	5.0	13.7
Weight for height:			
Normal	92.0	80.0	90.3
Moderate wasted	3.0	0.0	2.5
Severely wasted	0.4	0.0	0.4
Overweight	3.8	17.5	5.8
Obese	0.8	2.5	1.1
Overall	**85.6**	**14.4**	**100**

4.4.7 Determinants of nutritional status of children

The descriptive statistics discussed in the previous sections of this chapter assist in understanding the factors important for children nutritional status in the study community. However, further multiple regression analysis was needed to identify important factors and the interaction of factors. Therefore, probit regression analysis was performed to identify the determinants of nutrition insecurity (or malnutrition status) as assessed by Z-scores.

The dependent variables considered was binary variable (i.e., a child health was normal=1 and 0=malnutrition).

Households that experienced food shortage and the child suffered from diseases (had significant high prevalence of children who were wasted at 0.05 and 0.1 significant levels respectively (Table 12). Children who suffered from chronic diseases have a greater chance by 0.7566 points higher of being wasted than children who did not suffer from chronic diseases. Other variables that were negatively correlated with nutritional status were household size and sex of a child (male=1). Similarly, it means that the larger the household size the higher the likelihood of children from that household to get wasting by 0.0242 points for each additional unit of household size but not significantly different (Table 12).

Table 12: Probit regression of determinants of child nutritional status

Determinants		Coefficient	Standard error	P>|Z|
W/H Log likelihood = - 44.1321 W/A Log likelihood = - 51.8777 H/A Log likelihood = - 113.3585				
W/H	Constant	-1.3720	0.7801	0.079
	Sex of child (1=male; and 0=female)	-0.2980	0.3217	0.354
	Age group (0 – 12 months =1)	0.3586	0.7738	0.643
	Age group (12 – 24 months=1)	0.9278	0.8803	0.292
	Age group (24 – 36 months=1)	0.1591	0.5699	0.780
	Age group (36 – 48 months=1)	- 0.0012	0.6602	0.999
	Sex of household head (male=1)	0.4773	0.5348	0.372
	Mother education level (formal education=1)	0.2786	0.3210	0.385
	Household size	- 0.0242	0.0823	0.769
	Livestock keeping (Yes=1)	0.0154	0.3612	0.966
	Experienced food shortage (Yes=1)	-1.0229*	0.3622	0.005
	Maize harvest	- 0.0005	0.0005	0.288
	Rice harvest	0.0001	0.0006	0.861
	Suffered from chronic diseases	0.7566^	0.4116	0.066
W/A	Constant	1.4999^	0.8517	0.078
	Sex of child (male=1)	-.0658*	0.3242	0.042
	Age group (0 – 12 months =1)	0.2486	0.7926	0.754
	Age group (12 – 24 months=1)	-0.3031	0.7909	0.701
	Age group (24 – 36 months=1)	-0.3999	0.6316	0.527
	Age group (36 – 48 months=1)	-0.9571	0.6959	0.169
	Sex of household head (male=1)	-0.4000	0.3490	0.252
	Mother education level (Formal education=1)	0.1083	0.2893	0.708
	Household size	0.0638	0.0947	0.500

	Keeping livestock (Yes=1)	0.0753	0.3074	0.806
	Experienced food shortage (Yes=1)	-0.5477	0.3752	0.144
	Maize harvest	-0.0003	0.0005	0.587
	Rice harvest	0.0009	0.0007	0.167
H/A	Constant	-0.2607	0.5752	0.650
	Sex of child (male=1)	-0.2658	0.2022	0.189
	Age group (0 – 12 months =1)	0.7396	0.4885	0.130
	Age group (12 – 24 months=1)	-0.1123	0.4960	0.821
	Age group (24 – 36 months=1)	-0.0062	0.3814	0.987
	Age group (36 – 48 months=1)	-0.1891	0.4764	0.691
	Sex of household head (male=1)	-0.0761	0.2700	0.778
	Mother education level (Formal education=1)	0.1586	0.2053	0.445
	Household size	0.0255	0.0565	0.652
	Keeping livestock (Yes=1)	0.0884	0.2213	0.690
	Experienced food shortage (Yes=1)	-0.4771^	0.2832	0.092
	Maize harvest	-0.0001	0.0003	0.708
	Rice harvest	0.0004	0.0004	0.312
	Suffered from chronic diseases	-0.0725	0.3299	0.826

Key:*, ^ - denotes statistical significance at the 5% & 10% level in the difference of means

Male children have a higher likelihood of being underweight by 0.0658 points higher than female children. Likewise, households that experienced food shortage had high prevalence of stunted children. Households which experienced food shortages had a higher likelihood of their children being stunted (0.4771) compared to the households that had sufficient food supply.

Table 13: Probit regression of determinants of food security at household

Determinant	Coefficient	Standard error	P>|Z|
Food security (Food secure=1)			
Constant	-5.2072	3.1523	0.099
Disease present (Yes=1)	-0.4594	0.3208	0.152
Education level of mothers (Formal education=1)	0.0143	0.2094	0.945
Marital status (Married=1)	-0.0965	0.2954	0.744
Distance from home to water source	-0.0786	0.1543	0.610
Distance from home to hospital	0.1079	0.0537	0.044*
Rice harvested	0.0000	0.0004	0.913
Maize harvested	0.0030	0.0006	0.000*
Age of mother	-0.0065	0.0152	0.666
Household kept animal (Yes=1)	0.0229	0.2242	0.919
Household size	-0.1832	0.0577	0.002*
W/A (Normal=1)	-0.1945	0.3187	0.542
H/A (Normal=1)	0.3768	0.2172	0.083^
W/H (Normal=1)	1.0316	0.3274	0.002*

Key:*, ^ - denotes statistical significance at the 5% & 10% level in the difference of means

Probit regression analysis was performed to identify the determinants of food insecurity. Distance from home to hospital, maize harvested and household size was factors that scored significant differences on food security at 0.05 (Table 13). Household size has negative association on food security by 0.1832 points for each additional unit of household. Households which had high quantity of maize were more food secure by 0.0030 points compared to households with low quantity of maize.

4.5 Delivery

Forty eight percent (48%) of the mothers give birth at Kiroka health centre, 34% at traditional nurses and 18% at Morogoro region hospital. About 66% of mothers got help from health professionals during delivery and 34% got help of traditional midwives. Most of the mothers who were assisted during delivery by health professionals (doctors, clinical

officers, nurses, midwives, and RCHC aides) were more able to initiate breastfeeding within one hour after delivery (Fig. 18).

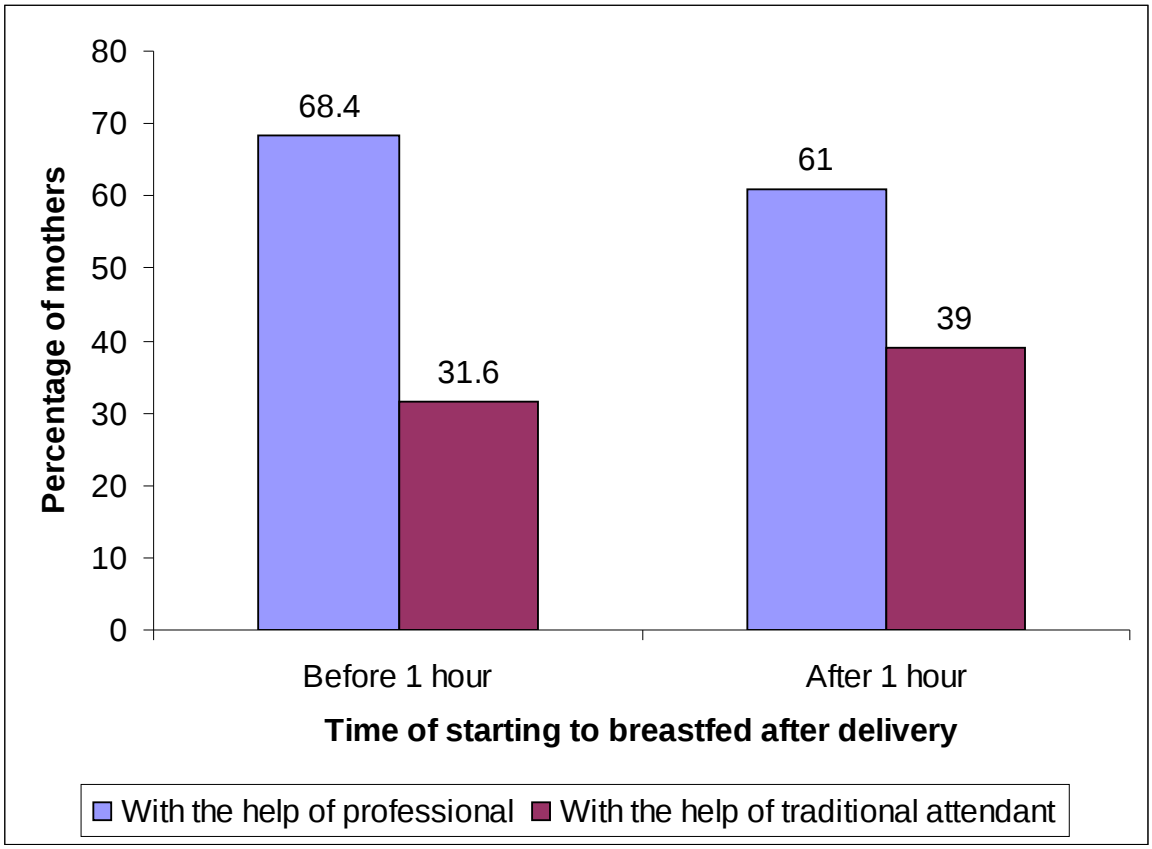

Figure 18: Breast feeding status Vs delivery assistance

The likelihood that a mother got help from health professional during delivery increases notably with the mother's educational status (Fig. 19).

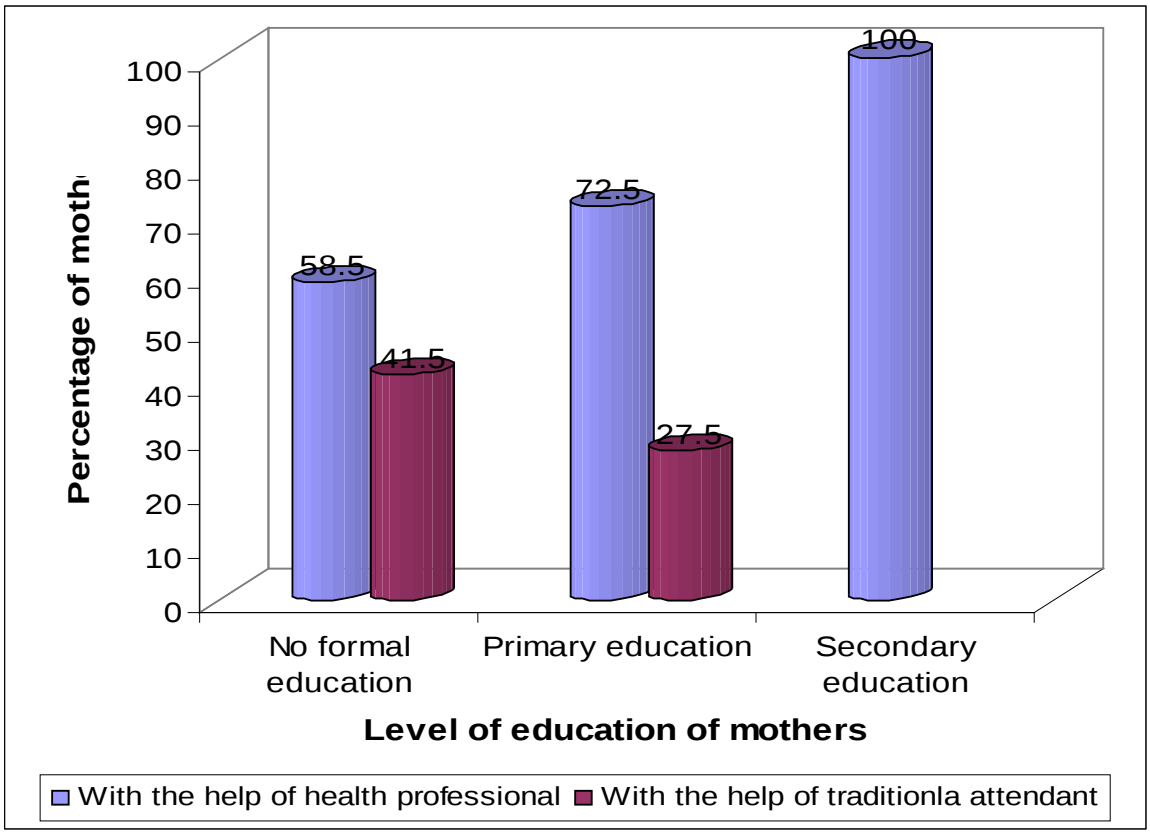

Figure 19: Assistance during delivery Vs level of education of mothers

4.6 Feeding Practices

4.6.1 Initiation of breast feeding

The time of starting breast feeding ranged from 5 minutes to 24 hours. Sixty four percent of the mothers began breastfeeding their new born baby within one hour after delivery and 36% started breastfeeding their new born baby after one hour of delivery. The duration of breastfeeding ranged from less than a year to two and a half years, with the majority of mothers stopping breastfeeding when the child is 2 years old (36%) (Fig. 20).

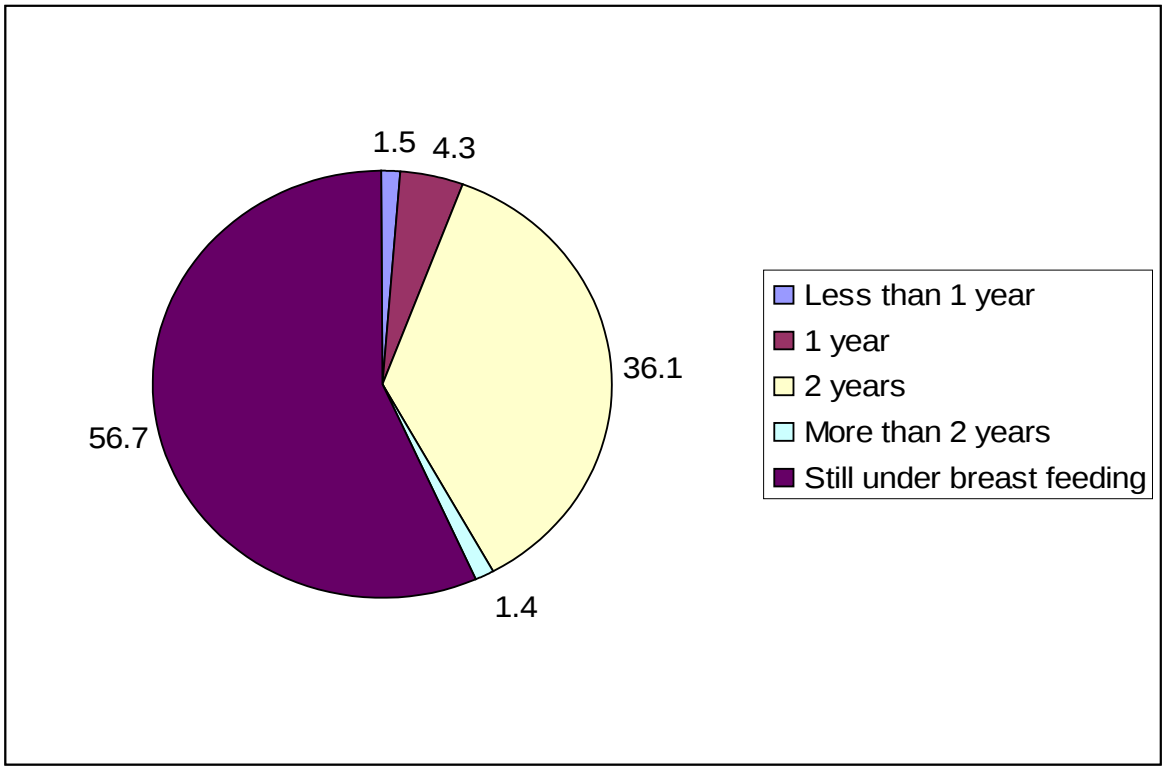

Figure 20: Duration of breast feeding (%)

4.6.2 Exclusive breast feeding

Exclusive breastfeeding for the first six months is not widely practiced in Kiroka village. Discussion with mothers revealed that it ranged from one week to six months of age. However, results show that only 3% of the infants were exclusively breastfed for six months and 61% exclusively breastfed for less than two months (Fig. 21).

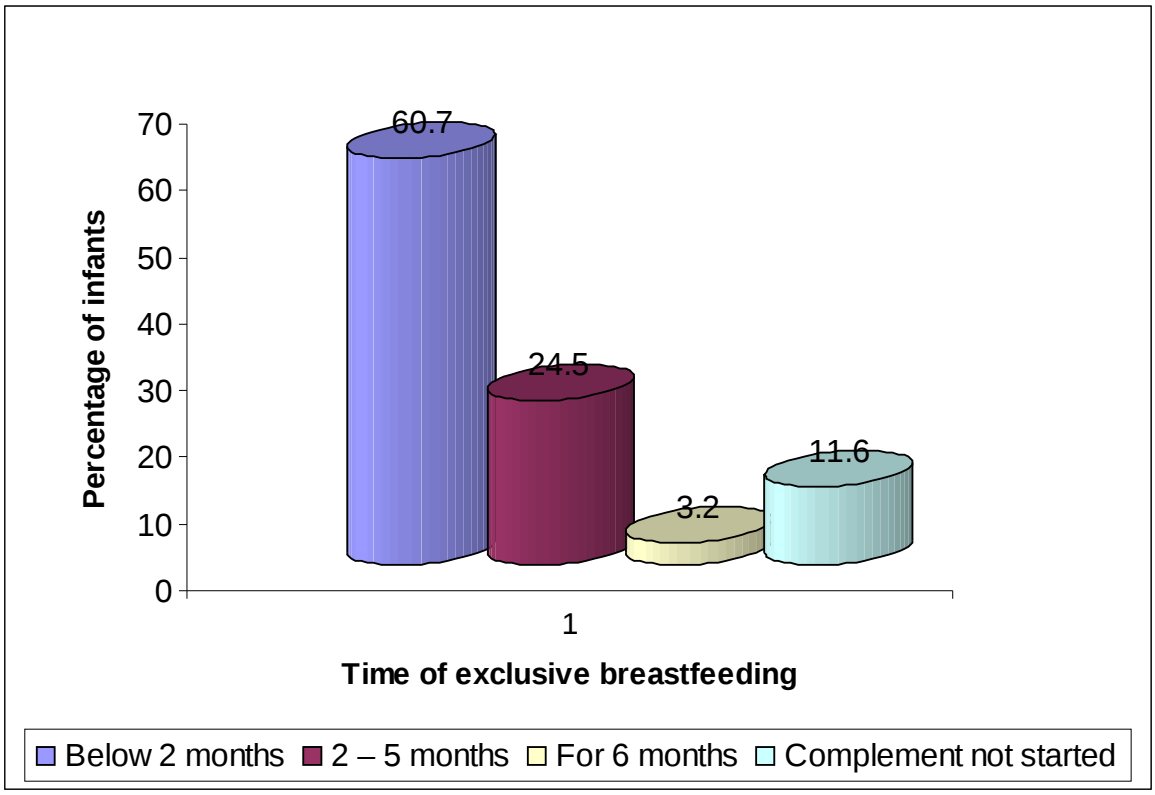

Figure 21: Duration of exclusive breast feeding of infants in Kiroka village

4.6.3 Introduction of liquids or semi-solid foods to infants /children

Close to 85% of the infants in Kiroka village was introduced to liquids or semi-solid foods after delivery before six months in which 61% of the children were given thin cereal-based gruels (Table 14).

Table 14: Types of pre-lacteal foods

Criteria	Sex of household head		Total
	Female	Male	
Number	44	233	277
Pre-lacteal foods given to children (%)			
Thin porridge (made from maize, rice, millet flour)	50.0	53.2	61.2
Water	20.4	14.6	23.3
Cow milk	6.8	9.9	9.3
Not given pre-lacteal	11.4	12.0	14.9

4.6.4 Complementary feeding

The main complementary food which was given to children by all the interviewees was maize or rice porridge which was introduced at the age of 2 weeks to 6 months. The porridge was mixed with either sugar, beans, groundnuts, sorghum, finger millet, vegetables and milk. The additional foods were mainly selected on the basis of availability and accessibility. About 39% of the mothers provided complementary foods to their children when they were less than one month old (Fig. 22).

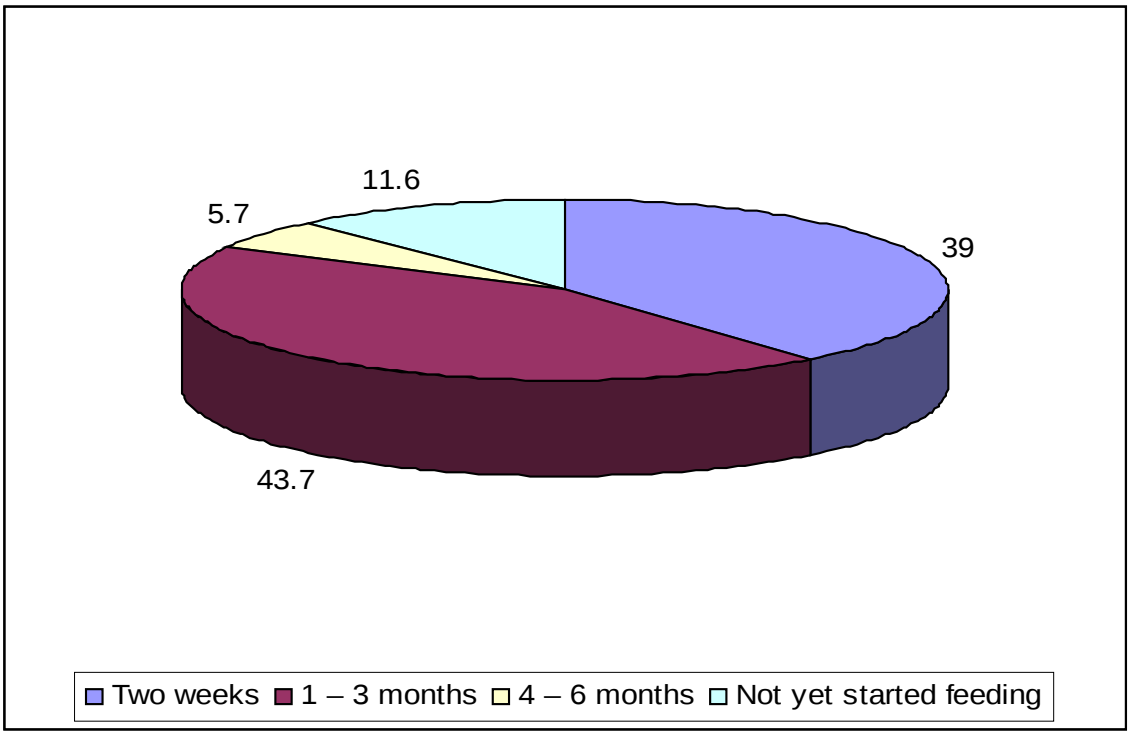

Figure 22: Age of child when started feeding complementary food (%)

Infant food complementation was done according to the parent's/caregiver's description. Infants of the age below 6 months were usually given thin porridge, but at 6 months of age they started eating the family food. Fathers or male parents contributed by buying food and help with infant feeding only if the mother was sick and not capable of breastfeeding her child. In general, people in the study area were not aware about balanced diet and health education.

4.6.5 Breast feeding status of children

At the time of the study, 57% (157 children) of the children surveyed were still breastfeeding, and 43% (120) had stopped breastfeeding. Higher prevalence of malnutrition was observed in children who were not breastfeeding compared to children who were still on breastfeeding (Fig. 23).

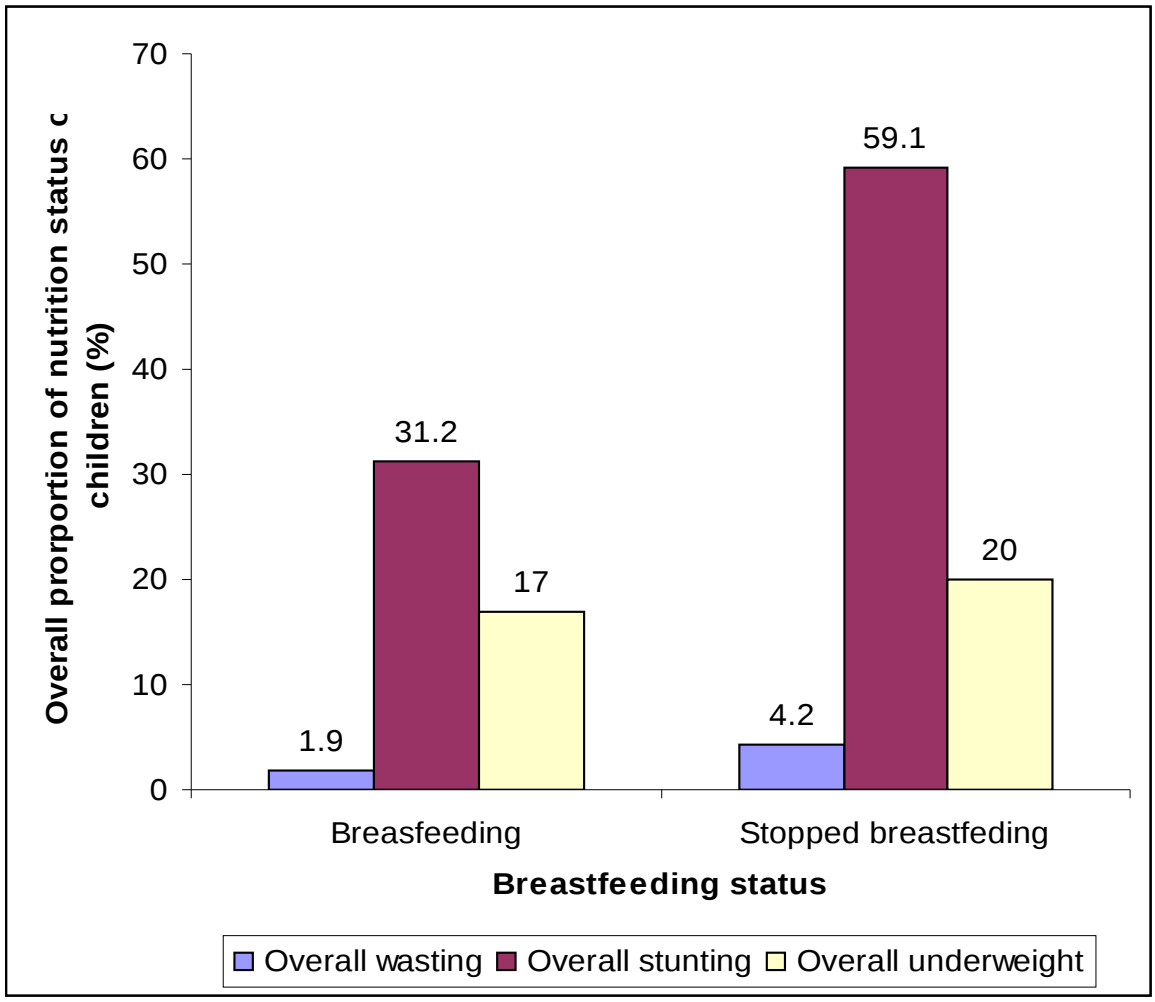

Figure 23: Breast feeding status and nutritional status among children below five years of age

For infants/children who were still breast-feeding, about 55% were being breastfed for more than 6 times per day (Fig. 24). The time of stopping breastfeeding started at the age of 12 to 24 months and above. A significant influence was observed between duration and frequency at what the baby was breastfed per day and underweight at $\chi 2=0.001$.

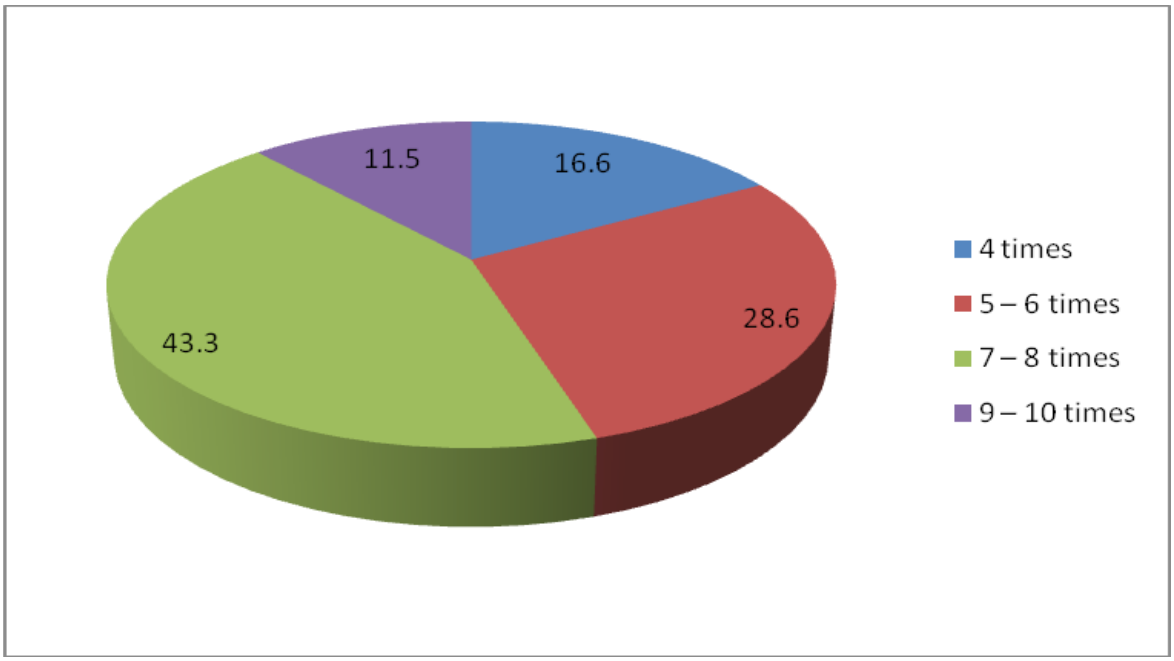

Figure 24: Number of breastfeeding per day (%)

4.6.6 Food preparation

Boiling was the common method used for preparing food in Kiroka village. The ingredients that are used for preparing porridge were maize flour, beans, groundnuts, sorghum flour, vegetables, millet, rice and milk. Groundnuts were the most common used ingredient. Vegetables are exposed under the sun to weather first before cooking. For example, it was observed that one household sweat potato leaves were exposed under the sun for 30 minutes and then washed and boiled.

4.6.7 Methods of serving food to children

About 25% of the children were served food on individual separate plates and were able to feed without assistance. Twenty two percent of the children were sharing plates with adults (Fig. 25). This had a significance influence on weight of children ($\chi 2 = 0.005$).

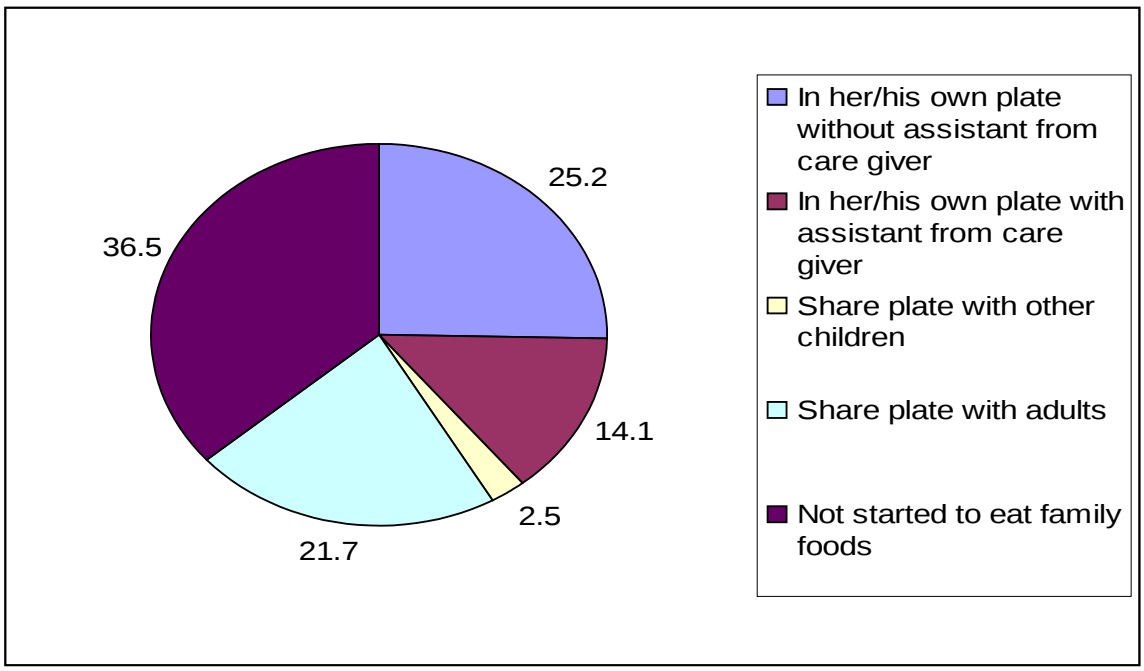

Figure 25: Ways of serving food to children of 12 months age and above (%)

The mother is the one who always prepares food for the family. Adults and children eat together and use one plate. During the survey, it was observed that in some families, children eat with their mother outside the house while the father eats alone inside the house (Fig. 26).

(a) Mother eating with her children outside the house

(b) Father eating alone inside the house

Figure 26: Ways of serving food to household members

4.6.8 Number of meals given to infants and children

The number of meals given to infants and children per day ranged between one to five meals with mode of three meals per day. Thus, about 74% of the children were taking three meals per day (Fig. 27).

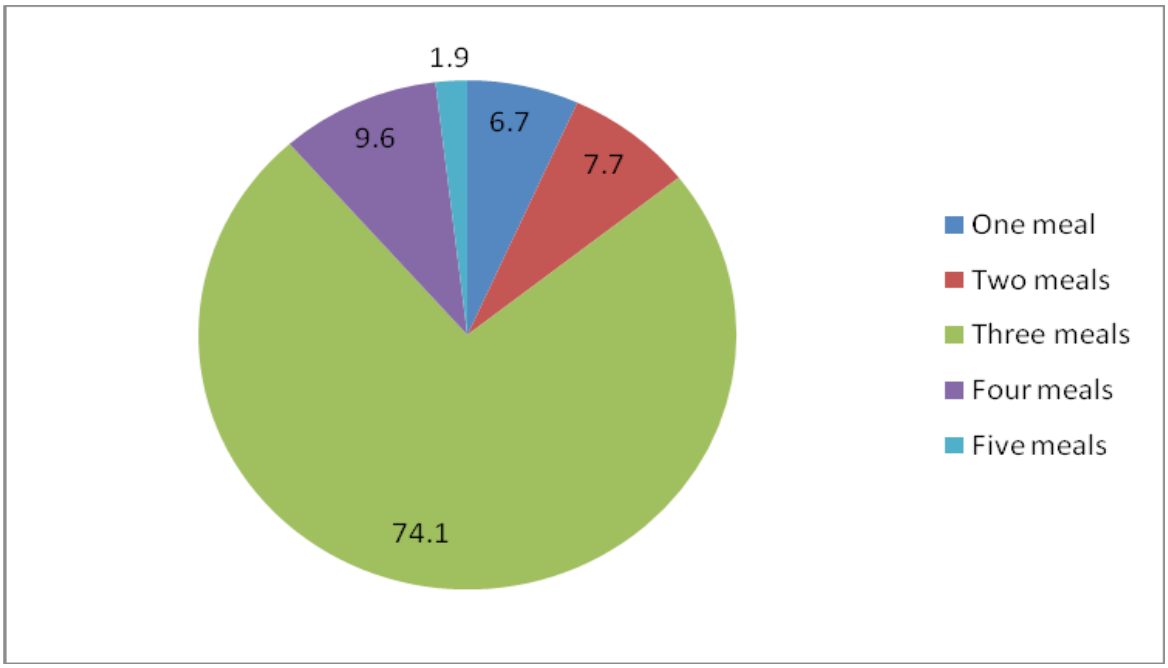

Figure 27: Number of meals of children per day for all children (%)

Ninety seven percent of the children who had stopped being breastfed were taking meals below the recommended rate of five meals per day. Eighty six percent of the children who were still being breastfed were given three to four meals per day (Fig. 28).

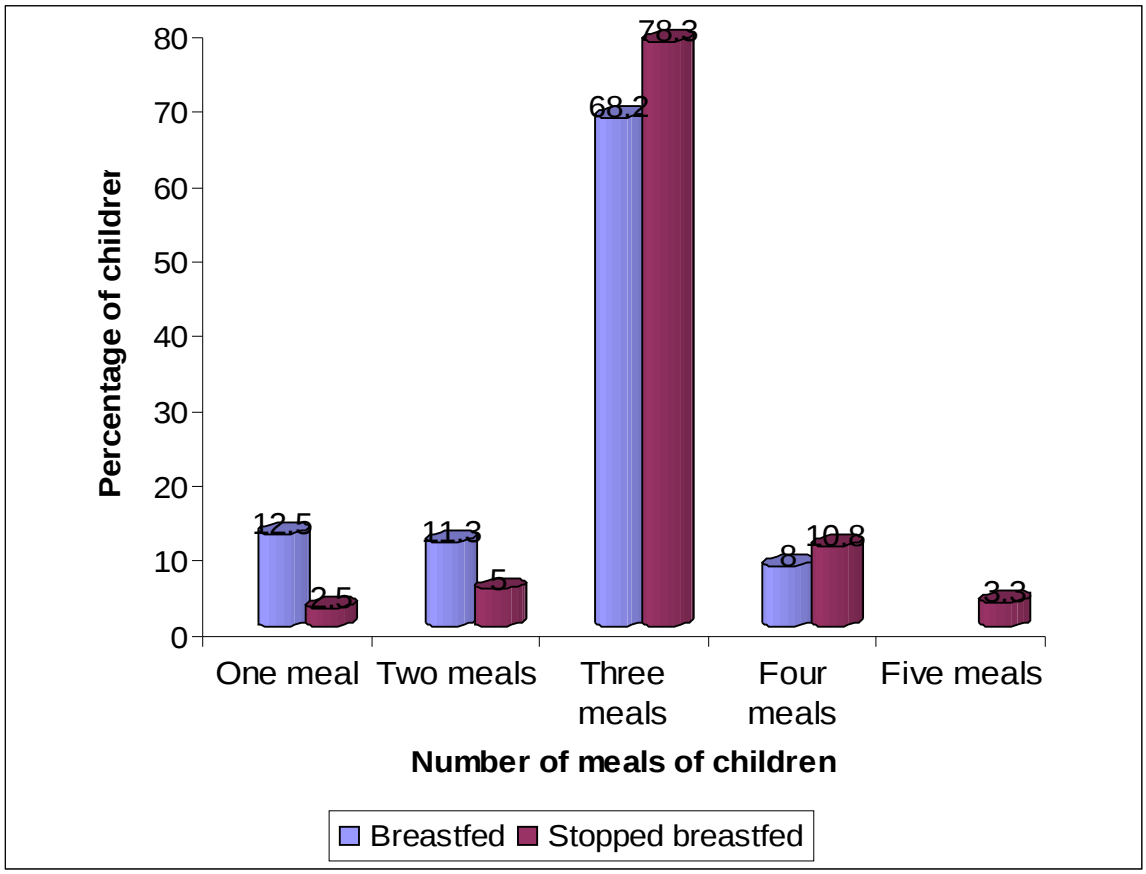

Figure 28: Number of meals of children per day and breastfeeding status (%)

4.6.9 Dietary recall

About 61% of the children had energy intake level below the RDA (Table 15). Only six percent (6%) of the infants and children had protein intake below the RDA (Table 15).

Table 15: Energy and protein consumed by children below five years of age

Energy from food consumed by children below 5 years of age		
	n	**%**
N/A	69	24.9
Normal RDA	40	14.4
Below RDA	168	60.6
Protein from food consumed by children below 5 years of age		
Normal RDA	191	68.9
Below RDA	17	6.1

NA: Not started to eat family food

4.7 Household Food Security in Kiroka Village

4.7.1 Food production

About 96% of the households surveyed cultivated at least one crop to during the 2007/08 cropping season and only 4% did not grow any crops. A total of 29 crops were cultivated by smallholder farmers in Kiroka (Table 16 and 17). Ninety one percent of households produced maize during the 2007/2008 crop season (Table 16). The most commonly produced crops included maize, rice, banana, cassava yams and sweet potatoes.

Table 16: Crops cultivated and percentage of growers in Kiroka village

Crop type	n	%
Carbohydrate crops		
Maize	251	90.6
Paddy	195	70.4
Bananas	163	58.8
Cassava	152	54.9
Yams	129	46.6
Sweet potatoes	90	32.5
Sorghum	18	6.5
Irish potatoes	8	2.9
Millet	5	1.8
Protein crops		
Pigeon peas	121	43.7
Beans	96	35.0
Cowpeas	41	14.8
Fat and oils		
Coconuts	76	27.4
Sesame	21	7.6
Groundnuts	12	4.3

Most of the people in Kiroka village do grow vegetables and fruits. Tomatoes, amaranths passion fruits and pumpkin leave are most produced in Kiroka village (Table 17).

Table 17: Vegetables/fruits and percentage of growers in Kiroka village

Fruits crop		
Crop type	**n**	**%**
Tomatoes	84	30.3
Passion fruits	65	23.5
Vegetables (leafy)		
Amaranths	87	32
Sweetpotato leaves	83	30
Pumpkin leaves	80	29
Cassava leaves	61	22
Spinach	41	15
Vegetables (non-leafy)		
Okra	53	19
Cabbage	19	6.9
Eggplant	15	5.4
Eggplants	15	5.4
Bitter tomatoes	12	4.3
Carrots	6	2.1
Onion	5	1.8

4.7.2 Household food shortage

About 5% of the surveyed households experienced food shortage for a period of one month to six months during the July 2007 - June 2008 period (Fig. 29).

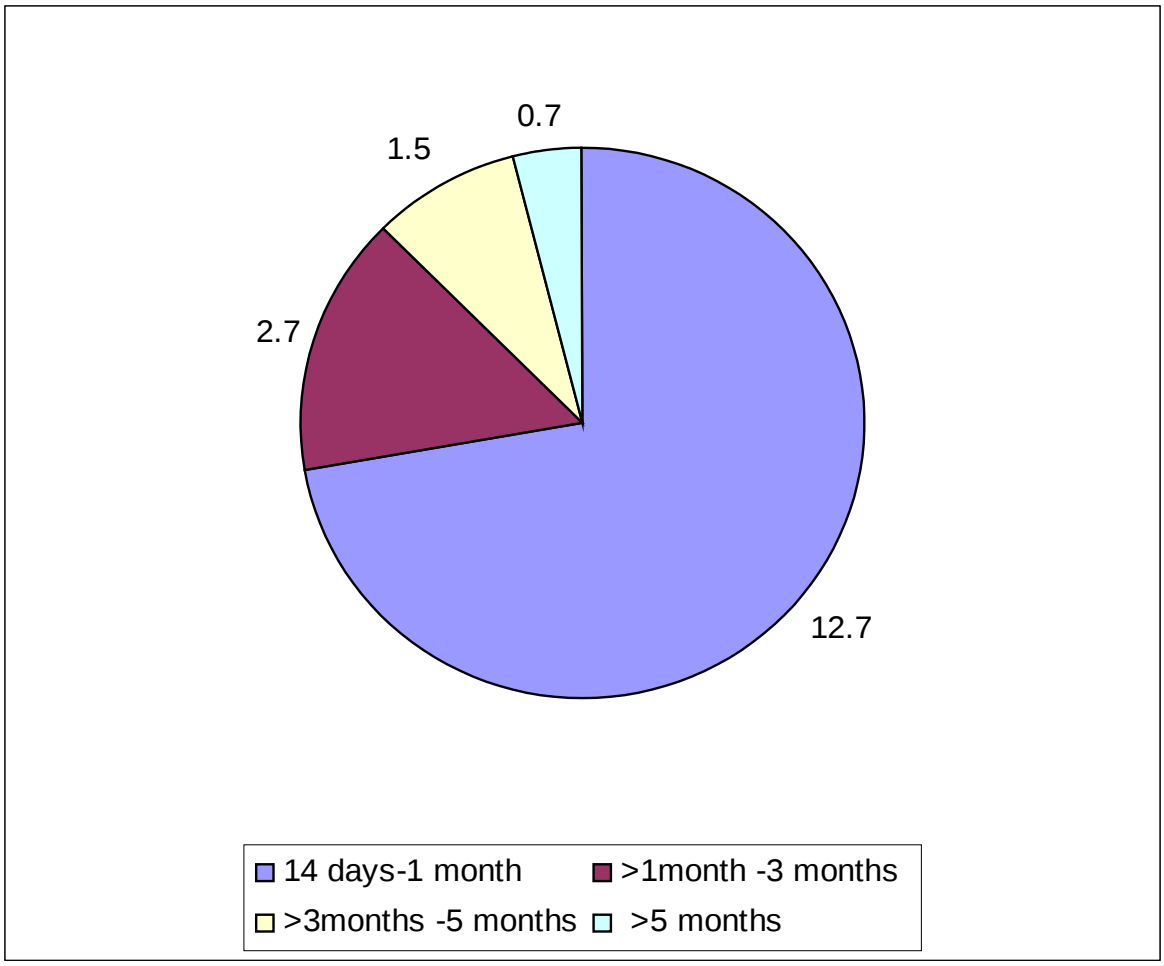

Figure 29: Period of food shortage in the last 12 months (%)

In the 2007/2008 crop season, average maize and rice harvest was 332.70 kg and 297.2 kg per household per year respectively (Table 18). Banana plots ranged from 0.25 to 5 acres, cassava acreage ranged from 0.25 to 1 acre and yam plots ranged from 0.5 to 1 acre. Participants of the FGDs revealed that food crops which were produced did not last until the next harvest season in some households, and hence households were forced to purchase food. The most common food that was purchased for home consumption was maize, whose amount ranged from 3 to 270 kg per year per household, rice 3 to 270 kg per year per household, beans 5 kg and bananas 1 bunch to 30 bunches per year per household. Thus, the pattern of crop harvest depicts the main food crops consumed by

households in Kiroka village these included in the order of importance maize, rice, plantains, cassava, yams, sorghum and millet.

Table 18: Crop harvested season 2007/2008 in Kiroka village

Crop type	Number of household cultivated	Minimum harvest (kg)	Maximum harvest (kg)	Mean harvest (kg)
Maize	246	20	3120	332.7
Rice	196	20	1920	297.2
Sorghum	9	20	360	177.8
Beans	17	2	600	114.4
Sesame	9	20	480	147.8

4.7.3 Food consumption

a) Carbohydrate consumption

The five important types of carbohydrate foods consumed by households were maize stiff porridge (*ugali*) (95%), rice (86%), bananas (79%), sweet potatoes (65%) and millet (10%). Most families consumed stiff porridge (*ugali)* as the main and the most important energy giving food in the surveyed households (Table 19). Although yams were cultivated by 47% of surveyed households, it was not recorded amongst the first five important carbohydrate crops.

Table 19: Frequency of consumption of carbohydrate rich foods

Type of food	Frequency of consumption per week (%)							
	Daily	**Once**	**Twice**	**Thrice**	**Four**	**Five**	**Six**	**Not consumed**
Stiff porridge	57.8	5.4	12.6	6.1	3.6	2.5	7.2	4.7
Rice	15.5	19.1	23.1	22.7	4.0	0	1.8	13.7
Bananas	16.6	24.2	26.4	9.7	0.7	0.4	1.4	20.6
Sweet Potatoes	10.1	19.5	23.5	9.7	1.4	0.0	0.4	35.4
Millet	0.4	4.3	2.9	1.1	0.0	0.7	0.4	90.3

More than 50% of the households surveyed, consume stiff porridge (*ugali)* on a daily basis. Banana was mainly consumed as a fruit. Most of the carbohydrate foods were consumed daily to three times per week.

b) Protein consumption

People in Kiroka village have a wide range of protein sources from both animal and crop foods. The important protein sources were beef, chicken, eggs, cow milk, pork, sardines, fish, yoghurt, beans, pigeon peas and cowpeas. Pigeon peas and beans were the main source of protein in 83% and 81% of the households surveyed, respectively (Table 20). Although none of the households surveyed kept cattle, about 60% of the respondents reported consuming beef at least once per week. The protein foods were obtained from household own farm, especially the legumes and some were bought from the market and shops (Table 20).

Table 20: Consumption of protein foods

Type of food	Frequency of consumption per week							
	Daily	**Once**	**Twice**	**Thrice**	**Four**	**Five**	**Six**	**Not consumed**
Pigeon peas	18.4	15.5	17.7	18.8	6.1	5.1	1.1	17.3
Beans	9.7	22.7	30.3	13.0	3.6	1.8	0.0	18.8
Fish	5.1	44.8	15.9	2.2	0.0	0.0	0.0	32.1
Sardines	6.1	19.5	22.7	8.3	4.3	0.0	0.0	39.0
Beef	0.7	42.6	15.5	1.4	0.0	0.0	0.0	39.7
Eggs	3.2	18.1	6.9	3.2	0.0	0.0	0.0	68.6
Chicken	0.0	20.9	5.8	0.4	0.0	0.0	0.0	72.9
Cowpeas	1.4	9.0	6.1	4.7	1.8	0.4	0.0	76.5
Milk	3.6	7.2	7.9	1.8	0.0	0.0	0.0	79.4
Pork	0.7	5.8	2.9	0.0	0.0	0.0	0.7	86.9
Yoghurt	0.4	2.2	0.7	0.0	0.4	0.0	0.0	96.4

c) Oil consumption

Important sources of oil foods recorded were coconut and processed oils found in shops. Coconut was the major source of oil (75%) followed by processed oils, such as vegetable oil (52%) (Table 21).

Table 21: Frequency of consumption of oil foods

Type of food	Frequency of consumption per week							
	Daily	Once	Twice	Thrice	Four	Five	Six	Not consumed
Coconut	36.1	13.4	7.9	5.8	5.1	4.3	2.5	24.9
processed oils	25.6	6.9	10.1	5.8	1.4	0.7	1.8	47.7
Ground nuts	6.1	12.3	7.6	4.7	1.8	1.8	0.0	65.7
Red palm oil	0.0	0.4	0.4	0.0	0.0	0.0	0.0	99.3

d) Vegetable consumption

The most frequently consumed vegetables were amaranths (64%), pumpkin leaves (54%), sweet potato leaves commonly known as *tembele* (54%) and cassava leaves (53%) (Table 22). Okra, spinach, eggplant and carrot were least consumed by households in Kiroka village.

Table 22: Consumption frequency of vegetable foods

Type of food	Frequency of consumption per week							
	Daily	Once	Twice	Thrice	Four	Five	Six	Not consumed
Leafy vegetables								
Amaranths	3.2	28.6	23.8	6.1	1.1	1.1	0.4	35.7
Pumpkin leaves	1.8	28.6	19.1	4.3	0.0	0.0	0.0	46.2
Sweet potato leaves	1.8	28.5	19.1	4.3	0.0	0.0	0.0	46.3
Non-leafy vegetables								
Cassava leaves	1.1	36.8	9.7	4.7	1.1	0.0	0.0	46.6
Okra	1.8	14.1	15.2	3.2	0.0	0.0	0.0	65.7
Spinach	0.0	15.5	6.9	0.7	0.4	0.0	0.0	76.5
Eggplant	0.0	10.5	5.1	0.7	0.0	0.0	0.0	83.7
Carrots	0.0	5.8	3.7	0.0	0.0	0.0	0.0	90.5

(e) Fruits consumption

The most common types of fruits consumed were ripe bananas (79%), tomatoes (78%) and pawpaw (61%) (Table 23). Other fruits recorded during the survey were pawpaw, passion fruits, pineapples, oranges, avocado, watermelon, mangoes and apple.

Table 23: Frequency of consumption of fruits

Type of food	Frequency of consumption per week							
	Daily	Once	Twice	Thrice	Four	Five	Six	Not consumed
Ripe banana	15.9	24.2	24.2	11.9	0.4	0.7	1.4	21.3
Tomato	39.1	9.4	9.4	8.7	4.3	1.1	6.5	21.7
Pawpaw	13.4	27.8	15.9	2.5	1.8	0.0	0.0	38.6
Passion fruit	5.8	16.2	7.9	2.9	0.0	0.0	0.4	66.8
Pineapple	0.0	12.6	5.8	1.1	0.0	0.0	0.4	80.1
Oranges	4.3	5.4	5.1	5.1	0.0	0.0	0.0	80.1
Avocado	3.2	4.3	5.1	0.7	0.4	0.0	0.0	86.3
Water melon	1.4	3.2	4.3	1.1	0.7	0.4	0.0	88.9
Mango	0.0	0.7	1.4	0.7	0.4	0.4	0.4	96.0

4.7.4 Food consumption and children nutritional status

About 89% of households reported that they usually take three meals per day, 10% take two meals per day and 1% takes four meals per day. Families which had four meals per day had no children who were malnourished. Children who did not get an adequate number of meals per day (14%) were more underweight compared to those who get an adequate number of meals per day (12%). Stunting was also more prevalent in 54% of children who did not take an inadequate number of meals per day compared to 35% of those who had an adequate number of meals per day (χ= 0.001).

4.8 Water and Sanitation

Distance from home to water sources ranged from a half to six kilometres. Ninety three percent of the households get their water within a distance of half a kilometre; residents in Kiroka village get their water from two main sources; water taps and wells. Water for home use is not treated and about 98% of the households surveyed were not boiling water for drinking. The reserve tank of the pipe water is located at Mahembe hamlet. It has no protection from human activities making it unsafe because people bath, wash utensils and clothes in the catchment's area of this water reserve. At the household level, the majority of the family members use the same cup/glass to take water from the bucket or a clay water pot, which could also lead to disease transmission from one person to another. About 10-20% of the households had no toilets in Kiroka village.

CHAPTER FIVE

DISCUSSION

5.1 Demographic Factors Related to Nutritional Status of Children

The important demographic characteristics of the household investigated included ethnic group, sex and marital status of household head, age and education level of spouses, and household size. Kiroka village is homogenous and is mainly occupied by the Luguru tribe (94%) having minimal interaction with other tribes. However other 12 tribes from all over Tanzania live in Kiroka due to economic activities such as mining activities in Matombo, employment opportunity in industries and farms. Some have migrated to Kiroka in search for new farm land. This implies that the nutritional status of children is mainly determined by customs and beliefs of these tribes, particularly at low literacy level of its people. For example, the Luguru tribe discourage children from eating green vegetables known as "*Mwidu*" because they believe that it causes convulsion in children. They also, believe that when an infant keeps crying it is a sign that she/he is hungry and needs to be given porridge to complement breastfeeding. Therefore, any intervention aiming at improving nutritional status of children in Kiroka should consider the customs and beliefs of Luguru tribe. There is a need of mobilising and creating awareness in communities on the importance of appropriate caring practices of children. Similarly, the homogeneity is expressed by the fact that other demographic factors investigated did not vary among the six hamlets implying that these factors have almost the same effect on the nutritional status of children found in different households in Kiroka village.

Farming is the most common livelihood activity in Kiroka village whereby about 91% of the respondents were farmers and the rest were involved in petty business, wage employment and casual labour. This depicts that the status of human nutrition is

determined much by farming activity, which is the major source of food in this community.

5.2 Nutritional Status of Children

A well-nourished child is one whose weight and height measurements compare very well with the standard normal distribution of heights and weights of healthy children of the same age and sex from a reference population. Measurements of height/length and weight are important indicators for health and nutritional well-being that indicate or show whether an individual's body measurements are appropriate for that individual's chronological age. The prevalence of stunting, wasting and underweight in Kiroka village was 43%, 3% and 13% respectively.

The height-for-age reflects achieved linear growth. This index is an indicator of past under nutrition or chronic malnutrition. A child who is below -2 SD from the median of the reference population in terms of height-for- age is considered stunted or short for his/her age. Stunting reflects failure to receive adequate nutrition over a number of years and is frequently associated with poor overall economic conditions, chronic or repeated infections, and consistently inadequate nutrient intake (NBS, 2005). This can lead to infants and children with low height for their age.

In Kiroka village, the prevalence of stunting was 43% which was higher when compared to that of the national average. These results indicate that the prevalence of stunting is higher in the study area compared to the prevalence for Morogoro region (36%), national level (38%) and that of Sub-Saharan African countries (41%) (NBS, 2005; Van de Poel ***et al.,*** **2007)**. Stunting has a lot of consequences in the child's life and economic

development of the country. Stunted children have reduced cognitive development, impaired immune function, poor school performance, and delayed attainment of walking, diminished work capacity, increased risk of diseases and metabolic disturbances leading to increased prospective risk of obesity and hypertension. Stunting is associated with a developmental delay, with retarded achievement of the main child development milestones, such as walking. Stunting is also associated with increased child mortality. A very low height-for-age is the single strongest predictor of childhood mortality in the first 5 years of life (Branca and Ferrari, 2002).

As previously stated, the stunted child is going to be an adult of small stature. A small adult has some functional limitations compared to a taller one, such as reduced working capacity. In societies where manpower is essential for subsistence as is the case in Kiroka village this may have further consequences on the health and well-being not only of the individual, but also of his/her dependants. Stunted individuals often remain in a state of poverty throughout their lives, as they are not able to produce the extra income that might allow them to escape the cycle of mere subsistence. Reproductive performance may also be affected by stature: a small woman will usually deliver a small child. The occurrence of intrauterine growth retardation (IUGR) is higher in stunted girls and this creates inter-generational cycle of stunting (Branca and Ferrari, 2002). This could lead to increased expenses on management and treatment of stunting not only that but also decreased economic productivity in the society and the whole country.

Male children were more stunted than female children, which might probably suggest that boys are more vulnerable to health inequalities than their female counterparts in the same age groups. This does not differ much from the results of a study conducted by Wamani *et*

al. (2007) in sub-Saharan Africa countries where it was found that male children under five years of age were more likely to become stunted than females. The stunting rate in Kiroka was observed to be very high, due to the long experienced food shortage and long term illness of some children. This is also probably due to low household income, which might reduce and limit the capability of families to afford and access food. This may in turn lead to low weight of mothers before conception with consequent low birth weight.

Similarly, the results of the index of the weight-for-height of older children in Kiroka village revealed that they were more severely stunted than the young ones. Deterioration of nutritional status after six months can be explained, in part, by the introduction of complementary foods to young children (NBS, 2005). Highest malnutrition rate coincides with the complementation period, which implies that there is inadequacy in quality or quantity of the complementary foods. The study findings also suggest that mother's education played a significant role in influencing prevalence of stunting. Chronic malnutrition was highest among children of illiterate mothers. The same trend reported in the NBS report (2005) and by Shah *et al*. (2003) in Tanzania and Pakistan, respectively. This can be explained by the fact that educational level of mothers facilitate and help mothers follow recommended children feeding regimes correctly.

Underweight reflects the effects of both acute (wasting) and chronic (stunting) under-nutrition. It is a useful tool in clinical settings for continuous assessment of nutritional progress and growth (NBS, 2005). Generally, underweight becomes more prevalent with increase in age, since from one year it increases steadily. This could be attributed to the fact that during infancy, it is known that breast milk has adequate and bio-available nutrients. As a result children below one year can grow well. Boys (16%) were more

underweight compared to girls (11%). The difference is attributed to physiological differences between males and females. The difference might be due to high metabolic rate in boys. Also boys were found to be more vulnerable to health problems than their female counterparts in the same age groups.

Children brought up by divorced parents (mothers) more suffered from underweight more than children living with both parents. This could be attributed to the fact that divorced parents (all were mothers) are one of the vulnerable groups in many communities since they have less access to resources. As a result they can't afford to provide for their basic children's needs such as food, and health services.

It was observed that in Kiroka village the rate of underweight tended to decrease with the mother's years of formal education. It appears that low level of education affects many aspects of human life, including demographic and health behaviour. This can be due to the fact that with low level of education one can base on customs and bad beliefs that affect nutrition status of an individual.

Wasting indicates current or acute malnutrition resulting from failure to gain weight or actual weight loss. Generally, the prevalence of wasting among children increased with an increase in age. Children of two years and above are in their active growth stage and therefore their diet should be adequate enough to meet their physiological needs. Wasting is caused by inadequate food intake, incorrect feeding practices, seasonal food insecurity, disease and infections such as malaria and diarrhoea or, more frequently, a combination of these factors (NBS, 2005). The most common complementary foods in this study area were maize porridge and rice porridge. This leads one to conclude that complimentary

foods given to the children were of low nutritional quality resulting into children loosing or not gaining weight. Wasting indicates deficit in tissue and fat mass resulted either from failure to gain weight or from actual weight loss. Failure to absorb nutrients and or recent episodes of illness may cause loss of weight. Children who have frequent illness may not have time to regain the weight they loose during one illness before the next illness reduces their appetite again.

Frequent illness such from malaria, lower respiratory infection, diarrhoea and fever are likely to increase the problem of wasting. Furthermore, this situation occurs when almost all children have stopped breastfeeding and therefore they depend on family meals for their nutrient intake. In Kiroka village most of the children eat from the family meals, which are prepared three times a day. Children have low gastric capacity and therefore they need to eat small amounts of foods but frequently to meet their nutritional requirements. The most used component of these meals includes cereals (maize, rice,) tubers (yams, cassava and sweet potatoes), banana and legumes (cow peas, beans). Animal protein food sources are less consumed, therefore this kind of meal can not meet nutrient requirement of the children especially protein.

Mothers who had secondary education had no children with wasting probably due to the fact that educated mothers are more conscious about their children’s health because they tend to look after their children in a better way (Rayhan and Khan, 2006). It might also be due to the fact that they tend to be employed and thus have a better economic status and access to more resources. This can lead to improvement of their child’s nutrition status.

Results of MUAC for children aged between 12 and 59 months showed that there was no serious problem, although the weight-for-height indicator revealed a serious problem. This situation is probably due to less sensitivity of the MUAC measurement to identifying malnourished children.

5.2.1 Morbidity

The morbidity rate was 87% and malaria was a major cause of morbidity (75%) in Kiroka village. This collaborates with the data from the Ministry of Health (2005) which showed that malaria is still a major public health concern in Tanzania, especially among pregnant women and children under five years of age (NBS, 2005). Infection and level of nutrition education of mothers has been associated with child's poor nutritional status. The percentage of children who suffered from diseases increased with the age of the infant/child. Older children tend to interact more with the environment and hence they can easily be contaminated or get bitten by mosquitoes. Malnourished children are weak to withstand infections and thus their antibodies are low compared to children who are well nourished. This indicates that human diseases greatly affect children nutritional status, and therefore children's should be protected from diseases in order to make them grow well and attain good health.

5.2.2 Factors influencing nutritional status of children

5.2.2.1 Household size

In Kiroka village, households with large numbers of people had more children who are wasted than small sized households. Household size has a negative association on food security; that the larger the household size the greater the livelihood of being food insecurity. It is likely that a larger family size experience food budget constraints

especially in households with low incomes; resulting in inadequate nutrient intake to meet daily nutrient requirements. In such a situation children are more likely to be at risk, especially in households which do not give priority to children during food distribution at the household level. The household size was a determinant of nutrition status of children, since the weight-for-age Z-score revealed that children in the households with large number of people were more stunted (51%) compared to children living in small sized households (42%).

5.3 Recurrence of Malnutrition in Kiroka

The prevalence of malnutrition trend in Kiroka village has been increasing since 2003. The Child Survival Protection and Development (CSPD) programme was established in the Kiroka village during 1980's. It was intended to show evidence to combat malnutrition and provide nutrition education to children and women. Nutrition education was provided to mothers of the reproductive age in 1980's and 1990's. However present women of the reproductive age have not been exposed to such intervention and the ones who were in the programme then are no longer in the reproductive age. Thus, there is a knowledge gap. This could contribute to recurrence of malnutrition in the area. A study conducted (Nyaruhucha *et al*., 2006) in Morogoro Rural and Morogoro Urban district established that the extent of community participation in the CSPD project was generally low. Communities were not aware of the programme and its activities indicating that CSPD was not effective. Therefore, there is a need to re-examine how the programme is currently being implemented and re-design it for it to be implemented in the community effectively and efficiently.

5.4 Maternal Services

The percentage of births assisted by health professionals increased with level of education of mothers indicating that educated mothers were more conscious about their health and that of their children. The type of assistance a woman receives during childbirth has important health consequences for both the mother and the child. Proper medical attention and hygienic conditions during delivery can reduce the risk of complications and infections that can cause the death or serious illness of the mother and/or the new born baby. Thus, another important component of efforts to reduce health risks to mothers and children is increasing the proportion of babies that are delivered in health facilities (NBS, 2005).

5.5 Feeding Practices in Kiroka Village

5.5.1 Initiation of breastfeeding

Initiation of breast feeding for new born babies was delayed due to several reasons including ignorance and cultural beliefs. The delay of initiation of breastfeeding in Kiroka village was partly due to low level of awareness because many women do not know the optimal time to start breastfeeding. The place of delivery was also a determinant factor for initiation of breastfeeding after delivery in which most (68%) of the mothers who were assisted by health professionals during delivery were able to breastfed their new born babies within one hour after birth. The likelihood that a child is breastfed in the first hour after birth increased notably with the mother's educational status. Mothers' education has the role in enhancing the quality of care and nutritional status of children (Smith *et al.*, 2004). Thus; an educated mother can have good child caring practices hence improving nutrition status of children.

5.5.2 Introduction of pre-lacteal Foods

In Kiroka village, mothers believe that when an infant keeps on crying it is assumed and concluded that the child is not satisfied with breast milk and therefore he or she needs to be given additional foods. About 85% of infants in Kiroka village were given pre-lacteal foods or drinks. The practice of giving pre-lacteal feeds is discouraged because it limits the frequency of suckling by the infant, deprives the child of the valuable nutrients and exposes the baby to the risk of infection (Mukuria *et al.*, 2006). Introducing breast milk substitutes to infants before the infants attain six months of age provides very few calories and can contribute to breastfeeding failure. Furthermore, possible contamination of these substitutes exposes the infant to the risk of illness and hence under-nutrition (NBS, 2005).

5.5.3 Exclusive breast feeding

UNICEF and WHO recommend that infants be breastfed exclusively (no other liquid, solid food, or plain water) during the first six months of life. In Kiroka village, duration of exclusive breastfeeding ranged between one week to six months of age and most of the infants (85%) were introduced to pre-lacteal foods or drinks before they were six months of age. This implies that mothers in Kiroka village do not practice exclusive breastfeeding for the first six months. This could be partly due to lack of awareness on proper child feeding practices and partly due to cultural beliefs. In Kiroka village, mothers in the present study participants were not aware that breast milk is enough for the baby up to six months; in addition mothers were unaware that giving children foods other than breast milk could be a source of infection through either feeding utensils or during preparation. Also they do believe that when a child keeps on crying breast milk is not enough for the baby.

The total duration of breastfeeding ranged from less than a year to two and half years, and for the majority of the mothers they stopped breastfeeding when the children were two years old. It is possible that due to the universal breastfeeding habit, children grow normally in the first months of life. But as children grow older, breast milk alone does not provide sufficient nutrient to meet nutritional requirements of growing children. This is related to, inadequate nutrient intake, improper complementary foods and high rates of infections. This calls for strategic programs to educate parents on the importance of breastfeeding. Children who had stopped breastfeeding before attaining two years of age are more likely to develop malnutrition. Sustained breastfeeding provides valuable nutritional and immunological benefits. Immunologic components of breast milk are maintained into the second year of lactation and are still providing protection to the infant. Production of antibodies operates throughout lactation (AAFP, 2008). Therefore Human milk continues to provide valuable nutrition and immuno-protection beyond the baby's first year.

5.5.4 Complementary feeding

Provision of complementary foods to children at an appropriate time helps them to acquire good nutritional status. However, the majority of mothers or parents in Kiroka village were not aware of the proper types of complementary foods to be given to infants and children. Also, they are not aware of the appropriate quantities to be given and at what time a child should be given complementary foods. Normally, after six months, a child requires adequate complementary foods for normal growth. The time of introduction of complementary food is a critical stage in the life of an infant especially in economically challenged communities. Lack of appropriate complementation may lead to malnutrition, frequent illnesses, which may lead to death. However, even with complementation, the

mother is advised to continue breastfeeding the child for two years and beyond (NBS, 2005). Parents believe that the appropriate time for complementing is when the infant is 3 months of age unless a child experiences health problems. Parents are not aware of the WHO recommendation of exclusive breastfeeding. However, mothers also believe that after the age of 3 months most infants require more than breast milk.

Complementary feeding has an impact on child's nutritional status. The higher the feeding frequency the more likely the chances that the infant/child will get adequate nutrient supply. Higher frequency of feeding leads to high food intake and therefore increases intake of nutrients. The feeding frequency for children in Kiroka village ranged from one to five meals; with 74% of children being given 3 meals per day. In this village most children eat from the family meals and use the same pots/plates. The number of meals for children which were not breastfeeding was less than the recommended four to five meals a day. This may result into inadequate nutrient intake to meet nutrient demands of growing children and hence lead to under-nutrition.

5.6 Household Food Security Status in Kiroka Village

Household food security is the ability of the household to secure enough food to provide for all the nutrient requirements of all members of the household (Smith *et al.*, 2006). Two indicators of food security were used to assess the situation of the sampled households. The indicators include; the reported duration in which a household experienced food shortage and number of meals consumed in the household per day.

5.6.1 Food availability and accessibility

In Kiroka village, farming is the major livelihood activity for the majority of the households. About 96% of the households surveyed cultivated at least one crop for their family needs during the 2007/08 cropping season and a total of 21 crops were cultivated in Kiroka by farmers. This indicates that the village has a diversity of crops for attaining food security.

Dietary intake of children below-five years of age was addressed by assessing the food consumption status at household level and 24-dietary recall. As mentioned earlier, Kiroka village has a good diversity of carbohydrate, protein, oil and vegetable foods and each household can produce enough crops for their own consumption. However most (81%) of the children's energy intake was below the RDA. Despite existence of a good range of a variety of foods, the consumption of protein among children was very low. This is attributed to lack of awareness of balanced food diet by parents at household level. It is obvious that under-nutrition status for children under five years of age is due to ignorance and lack of knowledge of human nutrition on the part of parents especially mothers.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The nutritional status of children below five years of age in Kiroka village was found to be affected by both adequacy and quality of food, improper feeding practices, level of education of mother, household size, marital status and disease. The findings showed that children in Kiroka village were most affected by stunting. Generally, children were more prone to malnutrition as the age increases. An educated mother was less likely to have stunted, wasted or underweight children. Highest malnutrition rate coincides with the complementary period, which implies that there is inadequate quality or quantity of the complementary foods. Child feeding practices are not well practised in the area because the majority of children (61%) had bellow RDA energy intake. Small sized households had children with better nutritional status. Recurrence of malnutrition in Kiroka village was found to be affected by lack of nutritional education. The prevalence of malnutrition in Kiroka village was very high; hence we reject the first null hypothesis. Some statistical differences were observed between feeding practices and nutrition status of children below five years of age at 0.05 level, hence we reject the second null hypothesis.

6.2 Recommendations

(i) Further research on child feeding practices is required in order to provide appropriate recommendations based on locally available foods. This should go hand in hand with strong promotion of the importance of optimal breastfeeding, complementary feeding practices, and raising awareness nutrition requirements among parents. Strategic campaign of educating the parents on the importance of breastfeeding their children exclusively for 0 – 6 months and complementary feeding for least two years and beyond should be done.

(ii) The study showed that the prevalence of malnutrition is high. Therefore, in order to meet MKUKUTA goal by 2010 (reduce stunting to 20%) and the MDGs by 2015 efforts to address malnutrition must be done. Therefore, optimal feeding practices for children above two years should be promoted, supported and widely disseminated with a focus on the target population groups; this would contribute to the realisation of the MDGs by 2015 and MKUKUTA by 2010.

(iii) Nutrition education has not been taken into account by district council therefore there is a need for the government to have programmes such as CSPD that promote nutrition education from household level to national level. Thus, CSPD programme has to be re-designed and implemented efficiently by the respective communities. Also there is a need learn from other region like Iringa which been successfully implemented the CSPD programme.

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APPENDIXES

Appendix 1: Questionnaire for mothers and children

SOKOINE UNIVERSITY OF AGRICULTURE

DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

SUA management is kindly requesting your assistance so as to assess Factors influencing nutrition and food insecurity in Kiroka village, Morogoro Tanzania. Please answer each question according to specific instruction given under each question.

a) Sex ☐ F……☐ M…… Date of birth ……

b) ANTHROPOMETRIC QUESTIONNAIRE:

Respondent No:	Household ID	Age in month	Weight (kg)	Height (cm)	MUAC (mm) >1 year	Edema
						☐Yes ☐No

Edema- check if depression or pit stays for at least 3 seconds on both feet

c) HOUSEHOLD QUESTIONNAIRE

SURVEY IDENTIFICATION		
1.1	Surname and initial of enumerator	……
1.2	Name of hamlet	……
1.3	Date of interview	
1.4	Starting time ……..	Ending time ……
1.5	Name of respondent	……
1.6	Sex of household head	☐ 1. Male ☐ 2. Female

DEMOGRAPHIC AND ECONOMIC STATUS			
1.7	Ethnicity	……	
1.8	What is the marital status of the household head?	☐ 1. Married ☐ 2. Single, not married before ☐ 3. Widow/widower ☐ 4. Divorced ☐	
1.9	How old is the household head? how old is the mother	------- years ------- years	
2.0	What is level of education of the household head? tick one only	☐ 1. none ☐ 2. primary ☐ 3. secondary ☐ 4. tertiary (college, university) ☐ 5. Others (specify).....	
2.1	What is your level of education? (respondent)	☐ 1. none ☐ 2. primary ☐ 3. secondary ☐ 4. tertiary (college, university) ☐ 5.Others (specify).....	
2.2	How many persons of 5 years (adults) and above live permanently in this household and share the same resources and expenses?	____ ≥**5** years	
2.3	How many children below 5 years old (orphans included) live in a household?	____ ≤ **5** years	
2.4	What is your main occupation? ***read options and tick one only***	☐ 1. farmer ☐ 2. civil servant ☐ 3. private sector employee 4. casual labourer	☐ 5. retiree ☐ 6. trader/business person 7. Others (specify) ……

<table>
<tr>
<td>2.
5</td>
<td>Does your household presently have any of the following animals, and if so, how many?

please read the options and tick all that is relevant and write the number owned</td>
<td>
<table>
<tr><th>ANIMAL TYPE</th><th>NUMBER</th></tr>
<tr><td>☐ 1. cattle</td><td></td></tr>
<tr><td>☐ 2. goats</td><td></td></tr>
<tr><td>☐ 3. sheep</td><td></td></tr>
<tr><td>☐ 4. pigs</td><td></td></tr>
<tr><td>☐ 5. chicken</td><td></td></tr>
<tr><td>☐ 6. ducks</td><td></td></tr>
<tr><td>☐ 7. other animals</td><td></td></tr>
<tr><td>☐ 8. none (no animals)</td><td></td></tr>
</table>
</td>
</tr>
</table>

2.6	On all the fields this household cultivated, which crops have you been growing during the last two seasons? Tick all options mentioned by the respondent	☐ 1. maize ☐ 2. beans ☐ 3. bananas ☐ 4.sweet potatoes ☐ 5. cassava ☐ 6. millet ☐ 7. sorghum ☐ 8. yams ☐ 9. groundnuts ☐ 10. coffee ☐ 11. tomatoes ☐ 12. Irish potatoes ☐ 13. rice ☐ 14. passion fruits	☐ 15. cabbage ☐ 16. green peas ☐ 17. onions ☐ 18. vegetables ☐ 19. eggplants ☐ 20. cocoa ☐ 21. cardamom ☐ 22. coconut ☐ 23. others ☐ 24..... ☐ 25..... ☐ 26.....
2.7	What are the major food crops consumed by your household?	☐ 1. maize ☐ 2. cassava ☐ 3. sorghum ☐ 4. sorghum ☐ 5. rice	☐ 6. finger millet ☐ 5. bananas ☐ 6. sweet potatoes ☐ 7. other s(specify) ----------

FOOD SECURITY IN THE HOUSEHOLD tick which is applicable		
2.8	How many meals per day does family have?	☐ 1. one meal ☐ 2. two meals ☐ 3. three meals ☐ 4. four meals ☐ 4. Others (specify) …….
2.9	How many meals per day does a child eat? (12-59 months)	☐ 1. one meals ☐ 2. two meals ☐ 3. three meals ☐ 4. four meals ☐ 5. five meals
3.0	Has the household consumed less preferred food in the last 1 month?	☐ 1. never ☐ 2. rarely (once) ☐ 3. from time to time (2 or 3 times) ☐ 4. often (5 or more)
3.1	Have you reduced quantity of food served to children in this household in the last seven days?	☐ 1. never ☐ 2. rarely (once) ☐ 3. from time to time (2 or 3 times) ☐ 4. often (5 or more)
3.2	A child skipped meals in the last seven days?	☐ 1. never ☐ 2. rarely (once) ☐ 3. from time to time (2 or 3 times) ☐ 4. often (5 or more) ☐ 5. not applicable
3.3	Have a child skipped meals for the whole days?	☐ 1. never ☐ 2. rarely (once) ☐ 3. from time to time (2 or 3 times) ☐ 4. often (5 or more) ☐ 5. not applicable
3.4	During the last 12 months, has there been a period when	☐ 1. yes ☐ 2. no

	your household didn't have enough food?		
3.5	If you experienced food shortage indicate the period last	☐ ……..days ☐ ……months	
3.6	The three most important food crops grown last cropping season and their quantities harvested	☐ **CROPS GROWN** ☐ ..... ☐ ..... ☐	☐ **QUANTITY HARVESTED** ☐ ..... ☐ ..... ☐ .....
3.7	Types and quantities of food bought for home consumption during the last three months	**TYPE OF FOOD** ☐ maize ☐ rice ☐ sweat potatoes ☐ banana ☐ …… ☐ ……	**QUANTITY** ☐ …….. ☐ …… ☐ …….. ☐ …….. ☐ …….. ☐ …….
3.8	In the last 12 months, did you ever cut the size of any of the children's meals because there wasn't enough food?	☐ 1. yes ☐ 2. no	
3.9	In the last 12 months, did any of the children ever skip meals	☐ 1. yes ☐ 2. no	

	because there wasn't enough food?	
4.0	If yes how often did this happen	☐ 1. almost every month, ☐ 2. some months but not every month ☐ 3. in only one or two months
4.1	In the last 12 months, were the children ever hungry but you just couldn't afford more food?	☐ 1. yes ☐ 2. no

UTILIZATION OF HEALTH SERVICES AND DISEASES AND INFECTION tick which is applicable		
4.2	If you or your child is sick where do you go for treatment first?	☐ 1.hospital ☐ 2. health center ☐ 3. private clinic ☐ 4. traditional healer ☐ 5. community health worker ☐ 6. drug distributor ☐ 7. Others (indicate)……
4.3	What is the distance from home to clinic, health centre and hospital?	clinic ……..km health centre ……..km hospital ……..km
4.5	How many times per month does your child visit health centre/clinic for treatment? (last month) How many times per month does your child visit clinic?	☐ 1. once ☐ 2. twice ☐ 3. Others (state)…… ☐ 1. once ☐ 2. twice ☐ 3. Others (state)……
4.6	Where did first child born	☐ 1. at RCH ☐ 2. at Morogoro regional hospital ☐ 3. traditional nurse ☐ 4. traditional healer ☐ 5. others (specify)
4.7	Other children	☐ 1. at RCH ☐ 2. at Morogoro regional hospital ☐ 3. traditional nurse ☐ 4. traditional healer ☐ 5. others (specify) ☐
4.8	What type of illnesses or diseases do	☐ 1. malaria ☐ 2. diarrhea ☐ 3. TB

	your child suffer from most	☐ 4. coughing ☐ 5. Other (specify)…….
WATER SANITATION Tick which is applicable		
4.9	What is the distance from home to water source?	……km
5.0	Is the water treated?	☐ 1.yes ☐ 2. no
5.1	Do you boil water for drinking?	☐ 1.yes ☐ 2. no
CHILD FEEDING PRACTICES (tick which is applicable)		
5.2	Time to start breastfed your baby after birth	☐ 1. after 5 minutes ☐ 2. one hour ☐ 3. two hours ☐ 4. after one day ☐ 5. after week ☐ 6. Others (specify) …….
5.3	After what time did you stop/exclude your child from breastfed	☐ 1. after 6 months ☐ 2. 1 year ☐ 3. 2 years ☐ 4. Others specify …….
5.4	When do you start weaning your child	☐ 1. after 1 months ☐ 2. after 2 months ☐ 3. after 3 months ☐ 4. after 4 month ☐ 5 after 5 month ☐ 6. after 6 month ☐ 7. after 9 month ☐ 8 after 2 years ☐ 9. Others (specify)……
5.6	What type of food do you give your child during complementation	☐ 1. rice porridge ☐ 2. maize porridge ☐ 3. millet porridge ☐ 4. all of the above ☐ 5. water ☐ 6. juice ☐ 7. black tea ☐ 8. cow's milk ☐ 9. Others specify ……..

5.7	How many times do you breastfeed your child per day?	☐ 1. 4 times ☐ 2. 6 times ☐ 3. 8 times ☐ 4. 10 times ☐ 5. Others specify……..
5.8	How many times do you feed your baby per day apart from breastfeeding ? (for breastfed child only)	☐ 1. 2 times ☐ 2. 3 times ☐ 3. 4 times ☐ 4. Others specify……..
5.9	What type of drinks does a baby drink?	☐ 1. juice ☐ 2. porridge ☐ 3. tea ☐ 4. local brewer ☐ 5. milk ☐ 6. Others (specify) ……..
6.0	What cooking method do you use to cook	☐ 1.frying ☐ 2. boiling ☐ 3. steaming ☐ 4. raw
6.1	What ingredients made porridge?	……
METHOD OF SERVING FOOD TO THE BREASTFEEDING CHILD Tick which is applicable		
6.2	How do you serve food to your child	☐ 1. eat in her/his own plate without assistant from care giver ☐ 2. eat in her/his own plate with assistant from care giver ☐ 3. share plate with other children ☐ 4. share plate with adults ☐ 5. Others (specify)……..

7.0 FOOD FREQUENCY QUESTIONNAIRE FOR THE HOUSEHOLDS [for the last week]

Please let me know the frequency to which your family and the study child consume the listed foods.

Tick the relevance

type of food	Daily	once per week	2 times /week	3 times per week	4 times per week	5times per week	6 times per week	Never
Millet								
Rice								
ugali/maize								
Plantain								
sweet potato								
Beans								
Peas								
cowpeas								
Tomato								
Mango								
Orange								
avocado								
ripe banana								
Pawpaw								
Carrot								
watermelon								
Passion								
apple								
pineapple								
other fruits (mention)								
amaranths								
dark green vegetables								
Okra								
pigeon peas leaves								
cassava leaves								
pumpkin leaves								
eggplant								
sweet potato leaves								
Spinach								
other vegetable (mention)								
Meat								
chicken								
Fish								
Egg								
Pork								
sardines								
Milk								
Yogurt								

groundnuts								
coconut								
red palm oil								
any types of oil								

8.0 FOOD 24-HRS FOOD RECALL QUESTIONNAIRE

	1st day		2nd day		WEEK END	
What type of food did your child ate in 24hrs and amount ***(mention and tell amount***)	Type	Amount	Type	Amount	Type	Amount

Appendix 2: Check list for focused group discussion

Life style behavior

Food preparation

Feeding practices

Environment

- Water sanitation
- Source of water protection
- Housing condition and quality
- Existence of latrines

Health education

- Family planning
- Sanitation and hygiene
- Feeding infants
- Prepare for the coming baby
- Use of mosquito net

Endemic diseases

- What type of endemic disease is of primary importance

Food beliefs

- In respect to health and nutrition issues.
- Religious belief about, food and utilization of health services

Services available

- School
- Dispensary

- Infrastructures

Appendix 3: Check list for direct observation

1. Sanitation of the environment
2. Methods of food preparation
3. General cleanliness of the house, mother/caregiver
4. General cleanliness of child
5. Eating habit
6. Food distribution in the household
7. Frequency of child eating
8. Water /sanitation
9. Types of food eaten in the household

THANK YOU, FOR YOUR COOPERATION