DIETARY DIVERSITY AND NUTRITIONAL STATUS OF CHILDREN 6-23 MONTHS IN MAKindu DIVISION, MAKUENI COUNTY, KENYA

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Dietary Diversity and nutritional status of

MAY, 2013
DECLARATION

This thesis is my original work and has not been presented for a Degree or any other academic award in any other University.

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DEDICATION

I dedicate this work to my husband Elijah, for his financial support and encouragement and all my friends for their support throughout my study period.
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<tbody>
<tr>
<td>AMREF :</td>
<td>African Medical and Research Foundation</td>
</tr>
<tr>
<td>ARI :</td>
<td>Acute Respiratory Infection</td>
</tr>
<tr>
<td>DD :</td>
<td>Dietary Diversity</td>
</tr>
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<td>DDS :</td>
<td>Dietary Diversity Score</td>
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<tr>
<td>ENA :</td>
<td>Emergency Nutrition Assessment</td>
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<tr>
<td>FAO :</td>
<td>Food and Agricultural Organization</td>
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<td>FANTA :</td>
<td>Food and Nutrition Technical Assistance</td>
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<td>FVS :</td>
<td>Food Variety Score</td>
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<td>GOK :</td>
<td>Government of Kenya</td>
</tr>
<tr>
<td>H/A :</td>
<td>Height for Age</td>
</tr>
<tr>
<td>HAZ :</td>
<td>Height for Age Z score</td>
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<tr>
<td>IGAs :</td>
<td>Income Generating Activities</td>
</tr>
<tr>
<td>IYCFP :</td>
<td>Infant and Young Child Feeding Practices</td>
</tr>
<tr>
<td>KDHS :</td>
<td>Kenya Demographic Health Survey</td>
</tr>
<tr>
<td>MoH :</td>
<td>Ministry of Health</td>
</tr>
<tr>
<td>MUAC :</td>
<td>Mid Upper Arm Circumference</td>
</tr>
<tr>
<td>NGOs :</td>
<td>Non Governmental Organizations</td>
</tr>
<tr>
<td>PAHO :</td>
<td>Pan American Health Organization</td>
</tr>
<tr>
<td>SES :</td>
<td>Socio Economic Status</td>
</tr>
<tr>
<td>SD :</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>SMART :</td>
<td>Standardized Monitoring and Assessment of Relief and Transitions</td>
</tr>
<tr>
<td>SSPHC :</td>
<td>Strengthening Systems in Support of Primary Health Care</td>
</tr>
<tr>
<td>SPSS :</td>
<td>Statistical Package for Social Sciences</td>
</tr>
<tr>
<td>SSA :</td>
<td>Sub-Saharan Africa</td>
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UNICEF: United Nations Children's Fund

W/A : Weight for Age

W/H : Weight for Height

WHO : World Health Organization

WHZ : Weight for Height Z score
ABSTRACT

Overpopulation, ecosystem destruction and loss of biodiversity, all associated with urbanization and changing lifestyles have led to dietary simplification. Childhood under nutrition remains a public health concern especially in the developing world. This could be partly because the diets offered to infants and young children are not diversified. The main objective of this study was to ascertain food consumption patterns, dietary diversity and nutritional status of children aged 6 to 23 months in Makindu division, Makueni County. Cross sectional analytical study design was used on a study sample of 263 child mother pair. A researcher administered questionnaire was used to collect demographic socioeconomic characteristics, food consumption patterns and dietary intake, anthropometric measurements and morbidity data and health seeking behaviour. Seven day food frequency questionnaire and a 24 hour recall were used to collect data on food consumption patterns and dietary intake. Observation check list and focus group discussion guide were also used to direct discussions to help ascertain food consumption patterns and dietary diversity. SPSS version 17 was used to analyze data in descriptive and inferential statistics. Data on anthropometry were analyzed using ENA for SMART, 2011. Dietary intake data were analyzed using Nutri-survey for windows, 2007. Chi-square test was used to establish associations between consumption of different food groups and demographic and socioeconomic status of the households, food consumption patterns and dietary intake of children and morbidity patterns and health seeking behaviour of mothers/caregivers’ among their children illnesses. Association between dietary diversity and nutritional status was analysed by regression analysis. Pearson product moment correlation was used to analyse continuous data. P Value of $< 0.05$ was considered significant. Results of 24 hr recall revealed inadequate dietary diversity score of 2 food groups as opposed to a minimum of 4 food groups according to WHO guidelines. Food consumption patterns were found to be poor. Majority of children 79.1% consumed foods made from maize on daily basis. Stunted children accounted for 21.6% lower than the national figure of 35%, underweight was 12.9% and wasting 7.6%. This poor nutritional status was attributed to inadequate dietary diversity. Main illnesses reported were cough 51%, fever 57%, diarrhoea 22%, vomiting 9%, common cold 27% and skin infection 7%. Socioeconomic statuses were found to influence health seeking behaviour. The study found a significant relationship between dietary diversity score, underweight and stunting $P = 0.001$, 0.024 respectively. This study recommends as a policy to the Ministry of Agriculture to promote production of diversified food crops which are drought resistant and also enlighten people on the importance of dietary diversity. The study suggests a similar study in the same location but during the harvest season to compare the dietary diversity score in relation to the nutritional status of the children.
CHAPTER ONE: INTRODUCTION

1.1 Background information

Lack of diversified diet is particularly a severe problem among poor populations in the developing world as most diets are based predominantly on starchy staples. The diets also often include few or no animal products as well as only seasonal fruits and vegetables (Arimond & Ruel, 2004). For infants and young children, the problem is critical because they need energy and nutrient dense foods to support their growth and develop physically, mentally and even to live a healthy live (Pan American Health Organization and World Health Organization, PAHO/WHO, 2003).

Diversified diets provide essential macro and micro nutrients without which malnutrition sets in. As diets become less diversified all forms of child malnutrition and poor health increases. Therefore, improving infant and young child feeding patterns specifically with reference to dietary diversification is critical towards achieving improved nutrition, health and development (WHO, 2007). It is for these reasons among others that dietary diversity has been included as a specific recommendation in the revised global set of indicators of Infant and Young Child Feeding (IYCF) of the children aged 6-23 months (WHO, 2007).

Though over the past few decades agricultural practices have been modernized and improved considerably globally, a significant percentage of diverse foods available in the environment have been progressively neglected. The erosion of agricultural biodiversity resulted in simplification and decrease in diversity of diets to large population particularly to those in the developing countries. This has led to
production of high energy foods such as cereals that are inadequate to meet nutrient requirements such as proteins and micronutrients. As part of addressing this challenge, global initiatives have been launched in order to promote the conservation and use of agro biodiversity as a means of ensuring nutritious and diversified dietary options for an increasingly unhealthy world population (Bioversity International, 2010). Bioversity International in 2006 reported a notable reduction of dietary diversity in Africa mainly attributed to the loss of traditional food systems particularly as a result of rapid urbanization estimated to reach over 50% of the total population by 2020. Kimiywe et al., (2007) further enumerated factors that exacerbated the consumption of undiversified diets such as time to look for and prepare diversified diets, high food costs among others.

In East Africa, a shift towards western type cereal based high energy diets that have lead to the breakdown of traditional food systems have caused a dramatic reduction in dietary diversity (Demment, Young & Sensenig, 2003). As a way of promoting the use of diversified diets in East Africa, Bioversity international (2006) investigated dietary diversity in particular through linking traditional foods and plant genetic resources to rural and urban health in Uganda, Kenya and Tanzania. The study aimed at advancing dietary diversification as a strategy in addressing nutritional deficiencies associated with emerging transition of energy rich foods. The desired outcome of the study envisaged significant improvements in the conservation and use by communities of agro-biodiversity as well as improved and nutritionally adequate diets. According to Onyango (2003), Kenya has experienced a decline in the consumption of diversified diets especially indigenous African foods due to lack of
nutrition knowledge, for example, in terms of making correct choices of foods and dietary diversity.

However, despite the recognized relationship between dietary diversity and improved nutritional status, up to now there is lack of scientific findings on the linkage between dietary diversity and nutritional status among children in Makindu Division, Kenya. To find out if the afore mentioned observations are valid, Makindu Division was selected as a region of focus. Makindu Division in Makindu District (Eastern Province) is mainly a semi arid region characterised by hot and dry climate at most times of the year. According to United Nations Children Fund (UNICEF, 2005) the degree of child malnutrition is worrying due to insufficient rains and food and the situation is worsened by lack of sufficient knowledge on nutrition. Therefore, the primary objective of this study was to investigate the food consumption patterns, dietary diversity and nutritional status among children aged 6-23 months in Makindu Division, Kenya.

1.2 Statement of the problem
Dietary Diversity (DD) is reflected in various dietary guidelines. The recommendation to eat diverse types of food is an internationally accepted recommendation of achieving a healthy diet (Food and Agricultural Organisation and Food and Nutrition Technical Assistance, FAO/FANTA, 2007). In Kenya dietary diversity is reflected among other references in the Kenya national dietary guidelines as a key element of high quality diets. Additionally, a number of studies linking dietary diversity to nutrient intake particularly among young children have observed that dietary diversity is associated with improved nutritional and health status (Hatloy et al., 2000; Ruel 2002; Arimond & Ruel, 2002).
Several studies suggest that dietary diversity may reflect higher dietary quality and greater likelihood of meeting daily energy and nutrient requirements. Nonetheless, if though there is link between dietary diversity, high quality diets and improved nutritional status in children, however, malnutrition has remained a public health concern in Kenya. For example, 35% of Kenyan children are stunted, and 14% are classified as severely stunted. In addition, 7% of Kenyan children are wasted while 16% are underweight (Kenya Demographic Health Survey (KDHS), 2008 - 2009).

Makindu Division experiences low bimodal rainfall, high temperatures, and the soils have low potential to support plant growth. Rainfall failure is common in the region, and this result to famine and widespread hunger (Kenya Agricultural Research Institute, (KARI), 2008). Bukusuba, Kikafunda and Whitehead (2009) highlighted that a low dietary diversity demonstrate poor food accessibility which increases children vulnerability to malnutrition and poor health. This study was therefore designed to establish the extent of the association of dietary diversity and nutritional status among children aged 6-23 months in Makindu division, Kenya.

1.3 Purpose of the study
The purpose of the study was to determine food consumption patterns, dietary diversity, and nutritional status among children aged 6 to 23 months in Makindu Division, Kenya.

1.4 Study objectives
To achieve the purpose of the study, the following specific objectives were pursued;
1) To establish the demographic and socioeconomic characteristics of households in Makindu division.

2) To determine food consumption patterns and dietary intake of children aged 6-23 months in Makindu division.

3) To assess the nutritional status of children aged 6-23 months in Makindu division.

4) To establish morbidity patterns among children and health seeking behaviour of mothers/caregivers for their children illnesses.

5) To establish the relationship between dietary diversity score and children’s nutritional status, ‘demographic socioeconomic’ characteristics of households.

6) To establish the relationship between dietary diversity score and morbidity pattern and health seeking behaviour of mothers/caregivers for their children illnesses.

1.5 Study hypotheses

As part of meeting the study objectives and core purpose of this research, the following hypotheses were formulated:-

Ho: There is no significant association between dietary diversity and nutritional status of children.

Ho: There is no significant association between morbidity patterns and nutritional status of children.

1.6 Study significance and anticipated output

The findings from this study will be useful to Government agencies, Non Governmental Organisations (NGOs), and other stakeholders interested in addressing
malnutrition to formulate strategies towards enhancing dietary diversity for improved diet quality particularly, within the context of regions with low rainfall. The findings are also beneficial to the mothers in creating awareness on the need for dietary diversity in attaining better nutritional status of their children.

1.7 The study assumptions

The study assumed the use of one day 24 hour recall to create the DD score was a good proxy for long term dietary diversity as recommended by FANTA (2006).

1.8 Study delimitation

This study did not focus on longitudinal determination of dietary patterns of children within the proposed age bracket.

1.9 Study limitation

The main use of dietary diversity score is to measure the quality of complementary diet. The calculation of minimum dietary diversity as recommended by WHO and as followed in this study considers a child’s age and breastfeeding status. Presented in this study are findings on dietary diversity and not on breastfeeding status.

1.10 The conceptual framework

This study was pursued based on the conceptual framework for causes of malnutrition proposed by (United Nations Children Fund, UNICEF, 1998) as shown in Figure 1.1. According to UNICEF (1998) several factors exhibit complex interaction to determine the nutritional status of children. The study focused on the immediate and underlying causes of malnutrition. Food consumption patterns and dietary diversity among children aged 6-23 months in Makindu Division were determined to ascertain whether the diversity of foods and dietary intake were
adequate since their inadequate intake would contribute to child’s poor nutritional status as shown in Figure 1.1.

Figure 1.1: Causes of Malnutrition Source: Adapted from UNICEF conceptual framework on causes of malnutrition, 1998.

'Demographic socioeconomic' characteristics of the households were also determined because inadequate access to food may contribute to inadequate dietary intake hence affecting DD, and therefore, placing children at a high risk of malnutrition and poor health (Bukusuba, Kikafunda & Whitehead, 2009). The morbidity patterns and health seeking behaviour among the children were established as poor health seeking behaviour can lead to insufficient health care. This may lead to diseases which in turn affect the dietary intake with unintentional consequence of affecting the child nutritional status.
1.11 Definition of terms

**Agro biodiversity** - The variety and variability of animals, plants and microorganisms that are used directly or indirectly for food and agriculture, including crops, livestock, forestry and fisheries.

**Dietary diversity** – (WHO, 2007; FANTA, 2007) defined dietary diversity in the context of children aged 6-23 months as the proportion of children aged 6-23 months who receive minimum dietary diversity of at least four (4) food groups from a standard list of seven food groups the previous day.

**Household** - was defined as a person or group of persons related or unrelated by blood, residing in the same compound, having one household head and eating from the same pot.

**Malnutrition** - Malnutrition is a general term that has been used to mean over nutrition, under nutrition, specific nutrient deficiencies, or imbalances (Chen *et al*, 2001). In this study, malnutrition referred to under nutrition.

**Nutrition status** - Nutrition status refers to the status of the body as expressed according to scientifically tested parameters such as weight, height, age or a combination of these (FAO, 1998). In this study nutritional status was measured using a combination of anthropometry and dietary methods.

**Underweight** - Means a low weight for age. This is a weight for age below-2 Standard Deviation (SD) of the reference population. It refers to acute and chronic malnutrition combined (WHO, 2006).

**Stunting** - Means a low length/height for age. This is a length/height for age below -2 SD of the reference population. It refers to chronic nutritional disorder (WHO, 2006).
**Wasting** - Means a low weight for length/height. Children are below -2 SD of the reference weight for length/height. It refers to acute nutritional disorder (WHO, 2006).

**Z scores** - A z-score is the number of Standard Deviations (SD) below or above the reference median value (WHO, 2006).
CHAPTER TWO: LITERATURE REVIEW

Literature was reviewed on child’s dietary diversity, demographic and socioeconomic status of the households. In addition were food consumption patterns and dietary intake among children aged 6-23 months and association between dietary diversity and nutritional status among children aged 6-23 months. Dietary diversity, information on morbidity patterns and health seeking behaviour of mothers/caregivers for their children illnesses were also reviewed.

2.1 Child’s dietary diversity, demographic and socio economic characteristics of households

Some studies have shown some associations between dietary diversity and household socioeconomic status (SES). A study done in Koutiala in Mali by Hatloy et al., (2000) that assessed urban and rural differences in food variety in relation to the nutritional status of children found that foods such as milk, meat, fruits, nuts and pulses were consumed more frequently among the higher SES groups.

Another study by Quattara et al., (2004) in rural Mali on nutrient adequacy and dietary diversity similarly found that dietary diversity was positively associated with high socioeconomic score for these particular foods: fruits, meat, milk and eggs. Kimiywe et al., (2007) also reported that among the factors that influenced the choice and consumption of varied vegetables in urban and peri-urban Nairobi was sex, occupation and income levels. Education levels, price and seasonality are also assumed to influence dietary diversity. Waudo et al., (2005) in a study on food consumption patterns and nutrient intakes by women and children under five in the wetlands of lake Victoria basin further reported that consumption and utilization of varied food crop, especially indigenous leafy vegetables was highest when the
vegetables prices were lower. From literature however, the association of dietary diversity and demographic characteristics is less documented. This study examined association between child’s dietary diversity and both household demographic and socioeconomic factors.

2.2 Food consumption patterns and dietary intake among children aged 6-23 months

According to Bordonada et al., (2003) children who do not comply with the dietary intake recommendations, register low values of energy and micronutrient intake. Hoddinott and Yahannes (2002) similarly reported that populations in developing countries that subsist on staple plant-based diets lacking dietary diversity suffer from micro-nutrients deficiencies. A study by Lin et al., (2007) on a prospective assessment of food and nutrient intake in a population of Malawian children at risk for kwashiorkor found that the habitual diet was monotonous and corn-based and were supplemented with small fish. The same study also found that approximately 50% of the dietary energy was derived from corn and that animal-derived foods constituted a small part of the diet.

In Kenya, another study by Onyango, Receveur and Esrey (2002) on the contribution of breast milk to toddler diets in western Kenya found that most infants begin to receive cereal and cassava based gruel before the age of three months and that gruel remain the most important food item in complementary diets. Mutie, Brouwer and Mwangi (2010) in a study on complementary feeding practices and dietary intake among children in Mwingi District Kenya similarly reported that unfortified maize porridge was the main complementary food among children in Mwingi district,
Kenya. Some studies suggest that dietary diversity may reflect higher dietary quality and greater likelihood of meeting daily energy and nutrient requirements. According to Action Against Hunger (2011) Majority of the households in Makindu division reported to be taking 1-2 meals which is inadequate. The recommendation was need for intensification of infant young child feeding practices in the division. This study was therefore designed to determine food consumption patterns and dietary intake among children aged 6-23 months in Makindu division, Kenya.

2.3 Association between dietary diversity and nutritional status among children aged 6-23 months

Several studies have shown an association between dietary diversity and nutritional status in children. A study by Hatloy et al., (2000) on food variety, socioeconomic and nutritional status in rural and urban areas in Mali found that children from households with the lowest food variety scores (fvs) and dietary diversity scores (dds) had a doubled risk of being malnourished (stunted or underweight). Another study by Bukusuba, Kikafunda and Whitehead (2009) in an urban setting of Uganda on nutritional status of children among Hiv-positive mothers found that children from households that reported consumption of a less diversified diet (low dietary diversity score) were more vulnerable to malnutrition. Moreover, according to FAO (2004) children from households consuming two or less food groups are more likely to be malnourished than those from households consuming four or more food groups.

However, this consistent positive association noted between dietary diversity and nutritional status in young children differs with a number of studies. According to a study done in Rural Burkina Faso on infant and child feeding index association with
the nutritional status of 6 to 23 month old children found that there was no particular food group associated with height for age Z score (HAZ), nor with weight for height Z score (WHZ) (Sawadogo et al., 2006). Another study carried by Honfo et al., (2010) on diversity and nutritional value of foods consumed by children in two agro-ecological zones of Benin found that although there was a large crop diversity and ingredient variability, a high prevalence of protein-energy malnutrition existed among children. The understanding of the relationship between dietary diversity and nutrient intake comes from studies applying several different methodologies to construct the dietary diversity scores. Some studies have used food variety while others have used food groups. This study constructed dietary diversity score based on food groups validated worldwide (WHO, 2007; FANTA, 2007).

2.4 Dietary diversity, morbidity patterns and health seeking behaviour of mothers/caregivers for their children illnesses

According to WHO (2002) undernutrition is the largest contributor to the global burden of disease in children. Pongou, Ezzati and Salomon (2006) similarly reported that under nutrition is a leading cause of child mortality in developing countries especially in Sub-Saharan Africa (SSA). In India up to half of deaths of children under the age of 5 years are associated with under nutrition (Deshmukh et al., 2009). In Kenya, the KDHS (2003) showed that higher prevalence of under nutrition is associated with higher morbidity rates. Literature also shows that undernourished children have lowered resistance to infection; they are more likely to die from common childhood ailments like diarrheal diseases and respiratory infections; and for those who survive, frequent illness saps their nutritional status, putting them into
a vicious cycle of recurring sickness, faltering growth and diminished learning ability (Caballero, 2002).

Studies show that health care seeking behaviour in child illnesses is determined by factors such as the household socio-economic status, parents' education, the household head's sex and age, the distance to the health facility and the quality of health care services among others (Hjortsberg, 2003; Hutton, 2004; Kemble et al., 2006). Poor health seeking behaviour can lead to insufficient health care resulting into diseases which in turn affect the dietary intake therefore affecting the child nutritional status. It is in this context the study established the child's dietary diversity, morbidity status and health seeking behaviour of mothers /caregivers among their children illnesses in Makindu division, Kenya.

2.5 Summary

This chapter has reviewed literature related to dietary diversity and nutritional status in infant and young children. Previous researches have shown that diets given to infants and young children are homogeneous and nutritionally inadequate to meet their nutritional needs. Some studies have reported dietary diversity to be associated with quality diets and improved nutritional status among children. However, childhood malnutrition has remained a public health concern in Kenya. This study determined food consumption patterns, dietary diversity and nutritional status among children aged 6 to 23 months in Makindu division, Kenya with the view of improving the nutritional status of the children.
CHAPTER THREE: METHODOLOGY

This chapter gives a description of the study design, the study area, target population, inclusion and exclusion criteria. Also described in this chapter are dependent and independent variables, sample size and sampling procedure, research instruments and data collection procedure. There is also description of pretesting, logistical and ethical considerations and method of data analysis.

3.1 Research design

The study used cross sectional analytical study design. It was employed because it is effective in collecting both qualitative and quantitative data (Mugenda & Mugenda, 2003). It is also useful in measuring the relationship between or among variables.

3.2 Study location

The study was carried out in Makindu division in Makindu District, Eastern province Kenya. Makindu division has a population of 50,512 people. Out of the total population given, the number of children under five years of age is 8082 (Kenya Population Census report, 2009). Makindu division lies in a marginal mixed farming zone. Climatic conditions like unreliable rainfall, poor soils and frequent droughts are nature’s negative dispositions for the area (KARI, 2008). AMREF (2007) reported that Makindu experiences the following challenges: a cycle of poverty occasioned by dependence on unreliable farm-based income, recurrent drought, high rates of illiteracy, especially among women; and major health problems.

Poverty in Makindu can be attributed to unreliable, inadequate and erratic rainfall; lack of clean drinking water leading to increased cases of water-borne diseases (typhoid and amoebic dysentery); reduced economic productivity and high rates of
unemployment; increased cost of medication; sparse location of health facilities and poor road network (GOK, 2002). The major food crop grown in Makindu is maize which is the staple food in the division. Other crops grown include cowpeas, pigeon peas, green grams and beans. Animal food sources in the region include goat’s milk, cow’s milk, beef and eggs. (Makueni District report, 2008).

3.3 Target population

The study target population were children aged 6 to 23 months and their mothers. Breastfeeding alone for children above 6 months is not adequate to meet the child’s nutritional needs after the first six months of life. This is a critical period when the prevalence of malnutrition increases substantially because of increased infections and poor feeding patterns, United States Agency for International Development (USAID, 2006). The sampling unit was the households.

3.4 Inclusion criteria and exclusion criteria

3.4.1 Inclusion criteria

The study included mother/caregiver child pair. Children aged 6 to 23 months and the ones their caregivers/mothers gave informed verbal consent were included. All mothers/caregivers gave the consent.

3.4.2 Exclusion criteria

The study excluded children with deformities that would affect anthropometric measurements since there are no nutritional standards for assessing nutritional status of such children.
3.5 Dependent and independent variables

Dependent variable for the study was nutritional status among children aged 6-23 months. Other independent variables were demographic and socioeconomic status of the households, food consumption patterns and dietary intake among children aged 6-23 months. Another independent variable was morbidity patterns and health seeking behaviour of mothers /caregivers' for their children illnesses.

3.6 Sample size and sampling procedure

3.6.1 Sample size determination

Sample size was determined using formula by Cochran (1963) as cited by Fisher et al., (1998). \( n = \frac{Z^2 pq}{d^2} \); where \( n \) = desired sample size; \( z \) = standard normal deviate which is 1.96; \( p \) = proportion of the target population estimated to have characteristics being measured (Kenyan population estimated to be receiving a minimum of four food groups which is 22% according to (Ohiokpehai et al., 2007). \( q \) = population without the characteristics being measured (who are not receiving a minimum of 4 food groups which is (1-p) therefore (1-0.22) \( d \) = degree required for this accuracy which is 0.05. \( 1.96 \times 1.96 \times 0.22 \times (1-0.22) \div 0.05 \times 0.05 = 263. 

3.6.2 Sampling procedure

Makindu division in Makueni County, Kenya was purposively sampled. This is because Makueni County is semi-arid to arid with low and erratic rainfall in terms of onset, distribution and intensity. Such climatic conditions make the area high prone to frequent drought, severe food shortages and scarcity of water characteristics that increase the likelihood of malnutrition (Leube & Abad, 2001). Ngumo location
among the three existing locations namely Ngumo, Kiu and Makindu lower and upper location was randomly selected.

All the households in the randomly selected location with children 6-23 months were established with the assistance of the chief of the location n = 283. From the total number of households with 6-23 months children obtained, a sampling interval was calculated which was one. The first household with 6-23 months old children to be sampled was randomly selected by use of random numbers, then there was subsequent selection of the other households after every one household (sampling interval) until the required sample size (263) was realised.

3.7 Research instruments

A researcher administered structured questionnaire was used to collect 'demographic socioeconomic characteristics', anthropometric measurements, morbidity patterns, food consumption patterns and dietary intake. A 24 hour recall and 7 day food frequency questionnaires were used to collect data on dietary intake.

An observation check list was used to observe variety of foods and their freshness in the households and nearby food markets, cleanliness in the house, refuse disposal and presence of latrines. A focus group discussion guide was conducted to direct a discussion with mothers/caregivers to help ascertain food consumption patterns and dietary diversity available for the children targeted. Three groups of mothers/caregivers each with 9 members were conducted for 25 minutes to discuss on food consumption patterns and any challenges in attaining diversity of foods. This ran simultaneously with a tape recorder recording all that transpired.
3.8 Data collection procedure

The District Commissioner in Makindu district Makueni County was briefed about the purpose of the study so as to give authority for the research to be done after which the chief was also informed. The researcher trained two research assistants with a minimum qualification of C mean grade in Kenya Certificate of Secondary Education (KCSE) for three days. The training covered the aim and objectives of the study. The researcher also trained them on anthropometric measurements and collection of anthropometric data through role plays. They were also trained on interviewing techniques.

3.8.1 Anthropometric data collection

In order to gather information for computing nutritional status of the children, the following parameters were used:

Anthropometric measurements included weight, length, Mid Upper Arm Circumference (MUAC) together with recording of age and sex. Weight- was taken with the subjects without shoes and only in minimal clothing to the nearest 0.1 kilogram. Calibrated hanging Salter scale was used. Length was taken with the child lying down straight on a length board to the nearest 0.1 cm. Height measurements were not taken since the study children were all below 2 years of age. MUAC measurements were taken on children who did not present with grade II or III oedema. It was measured by use of a paediatric MUAC tape to the nearest 0.1 cm on the left upper arm and the reading was done on arm straight. Age for the children was recorded as reported by the mother and verified with the maternal and child health cards. To ensure quality data all these measurements they were taken twice and an average calculated.
Dietary assessment- a) Seven day food frequency questionnaire was used to assess the food consumption pattern. b) 24 hr recall – participants were asked to mention foods consumed by their children in the previous 24 hours prior to the interview. Dietary diversity score was calculated based on the number of food groups consumed with each food group given a score of one as given in (WHO, 2010). Calculation of minimum dietary diversity indicator was done by the formula given by WHO (2010) that is (IYCF age in days ≥183) + (IYCF age in days <730) + (7 food group score ≥4)/ (IYCF age in days ≥183) + (IYCF age in days <730) × 100.

3.9 Pretesting
Pretesting was done to determine whether the data collection tools would collect the needed information with precision. Pretesting serves as a trial run that allows researcher to identify potential problems in administration of the proposed study (Varkevisserc, Pathmanathan & Brownlee, 2003).

According to Mugenda and Mugenda (2003) pretesting of sample size should be between one and ten percent. The questionnaire was pretested to ten parents/caregivers in Kiu location, Makindu division, Kenya. Ten parents/caregivers were four percent of the total sample size (263). This sample and location were excluded in the final study sample. After the pre-test, the tools were adjusted accordingly to ensure that all the data needed were collected.

3.9.1 Validity
The data collection instrument was validated by qualified nutritionists who included university supervisors and the respondents in the pretesting household’s. Corrections and amendments were made accordingly.
3.9.2 Reliability

Reliability refers to the degree of consistency within the measurements. Test re-test method was used to test the consistency of the questionnaire (Orodho, 2004). It was administered to five parents/caregivers who were randomly selected in Kiu location in Makindu division Kenya. Same questionnaire were administered again to the same study subjects after seven days then a comparison of the results was made.

3.10 Logistical and ethical considerations

Clearance to carry out research was sought from Kenyatta University Graduate School. Research permit was obtained from Kenya National Council of Research and Technology and the District Commissioner, Makueni County. The target respondents were given adequate explanations on the purpose of research and verbal consent was sought from them. Confidentiality was maintained at all levels of study.

3.11 Data analysis and presentation

Filled questionnaires were checked daily for completeness. Data were cleaned, coded and sorted using Statistical Package for Social Sciences (SPSS) version 17. The quantitative data were summarized using descriptive and inferential statistics namely mean, frequencies and percentages. Data on anthropometry were transformed to nutrition indices (Z score values) by use of ENA for SMART package, 2008. WHO (2006) cut offs on anthropometric measurements of infant and young children were used to interpret the nutritional status. Dietary data were entered and analyzed using Nutri-survey for windows, 2007. Dietary diversity cut-off point of at least four out of the possible seven food groups was considered adequate (WHO, 2007).
A Z score of more than -2 SD to 2 SD for stunting (H/A), underweight (W/A) and wasting (W/H) without bilateral pitting oedema reflected a well nourished child. A Z score of <-2 SD to -3 SD categorised the child as moderately malnourished while a Z score of <-3 SD reflected severely malnourished child. MUAC cut off ≥ 13.5 cm reflected a well nourished child; 12.5 cm to < 13.5 cm reflected mild malnutrition; < 12.5 cm to >11.5 cm reflected moderate malnutrition while a child with a MUAC of < 11.5 cm was considered as severely malnourished. The qualitative data were transcribed, coded and categorised to come up with themes.

A chi-square test was used to establish the associations between consumption of different food groups and demographic and socioeconomic status of the households. It was also used to establish the associations between food consumption patterns and dietary intake of the children and morbidity patterns and health seeking behaviour of mothers /caregivers’ among their children illnesses. Association between dietary diversity and nutritional status was analysed by regression analysis. Pearson product moment correlation was used to analyse continuous data. P- Value of < 0.05 was considered significant.
CHAPTER 4: RESULTS AND DISCUSSION

This chapter presents and discusses the study findings in order of the study objectives. Presented and discussed are results on demographic and socioeconomic characteristics of households, food consumption patterns and dietary intake of children and their nutritional status. Also presented is morbidity pattern and health seeking behaviour for children illnesses. The chapter has also presented findings on the relationship between dietary diversity score and children's nutritional status and the demographic socioeconomic characteristics of the households. Relationship between dietary diversity score and morbidity pattern and health seeking behaviour of mothers / caregivers for their children illnesses is also discussed.

4.1 Demographic and socioeconomic characteristics of the households

4.1.1 Demographic characteristics of the households

The household demographic variables considered in this study were; household composition of members by relationship to the household head, household composition members by sex, age, marital status and the household size.

4.1.1.1 Distribution of the household members by relationship to the household head, sex and mean age.

Household structure and the relationships between the members are intuitively important in decision making concerning the allocation of the available food to the members (Desai & Johnson, 2005). Table 4.1 presents distribution of household members by relationship to the household head, sex and mean age.
Table 4.1: Distribution of household members by relationship to the household head, sex and mean age

<table>
<thead>
<tr>
<th>Relationship type</th>
<th>% of the total N=1582</th>
<th>Mean age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>N %</td>
</tr>
<tr>
<td>Household head</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>263</td>
<td>249</td>
</tr>
<tr>
<td></td>
<td>26.36±8.0</td>
<td></td>
</tr>
<tr>
<td>Spouse</td>
<td>244</td>
<td>244</td>
</tr>
<tr>
<td>Parent of head</td>
<td>91</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single parent</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Child of head</td>
<td>855</td>
<td>420</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friend or not related to</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>head</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other relations to head</td>
<td>119</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1582</td>
<td>768</td>
</tr>
</tbody>
</table>

Table 4.1 shows the distribution of household members by relationship to the household head, sex and mean age. The results show that the total number of household members was 1582. Out of the total number of household members (1582) males were 768 (48.5%) and females 814 (51.5%). This study finding agrees with those reported in (KDHS 2008-2009; KNBS 2009) which showed that females were more represented by 51% and 50.3% compared to males 49% and 49.7% respectively. The study also established the nature of the household head as this influences decision making on food purchase and income use. The results revealed that of the total number of household heads 263, 94.7% (249) and 5.3 % (14) were headed by men and women respectively. These results compare favourably to those reported by Action Against Hunger (2011) which reported that of the 575 households assessed, 84.0% (483) and 16.0% (92) were headed by men and women accordingly.

According to KDHS (2008-2009) female headed households tend to be poorer than male headed households. This implies that female headed households tend to be economically disadvantaged compared to male headed households and this can contribute towards poor nutritional status of children. From focus group discussion it
was reported that although male headed house heads are likely to have more income than female headed households, female headed households make better decisions when it comes to purchasing of variety of foods. This observation is in line with literature. United Nations Population Fund, UNFPA, (2006) in Bangladesh noted that although female headed households seem to be more deprived than male headed households in terms of development, even with fewer available resources female headed households manages to achieve better child nutritional outcomes likely due to prioritizing expenditures toward improved health and nutrition.

Further, the results in Table 4.1 show that the mean age of household heads both male and female respondents fell within the reproductive age 35.97 and 26.36 respectively (KDHS, 2008-2009). This would probably explain why the number of children of the household heads 855 (54%) formed the biggest percentage in the household composition. On the other hand, according to Cancian and Danzige, (2009); Girma and Timotiows, (2002) women’s greater parenting responsibilities restrict their work hours in the paid labor market and women’s employment bolsters their preference to spend their earnings on health and nutrition thus based on the study results this would probably adversely affect the nutritional status of their children.

4.1.1.2 Distribution of household members by marital status

According to PAHO (2003) marital status influences the quality of care given to a child as both parents contribute greatly to the child by providing the basic needs and the general welfare of a child. Respondents were asked to state the marital status of the household members. The results are shown in Table 4.2.
Table 4.2: Distribution of household members by marital status

<table>
<thead>
<tr>
<th>Marital status</th>
<th>N</th>
<th>Male</th>
<th>N</th>
<th>Female</th>
<th>% of the total N = 687</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married</td>
<td>584</td>
<td>286</td>
<td>298</td>
<td></td>
<td>85%</td>
</tr>
<tr>
<td>Single adults</td>
<td>97</td>
<td>47</td>
<td>50</td>
<td></td>
<td>14.1%</td>
</tr>
<tr>
<td>Widowed</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
<td>0.6%</td>
</tr>
<tr>
<td>Divorced</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
<td>0.3%</td>
</tr>
<tr>
<td>Total</td>
<td>687</td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 4.2 shows that 85% of the household members were married. About 14.1% were single adults and 0.6% were widowers. Cases of divorce were very low with only 0.3% representing the divorced members. These findings compare closely with those by Mtimuni et al., (2010) in Malawi which found that in all the households assessed majority of respondents (73.2%) were married.

PAHO (2003) noted that both parents contribute to care of the child and absence of appropriate caregiver affects the feeding pattern of a child. Similarly, Cancian and Danzige (2009) noted that single mother families, generally relying on the earnings of only one adult, are more than five times as likely to be poor as married couple families and they may have the challenge in acquiring food. However, although some studies have observed the importance of both parents on the feeding pattern of a child, in this study this may not apply as the study findings revealed that most of the respondents 85% were married. Therefore, that would not have been attributed to the poor feeding patterns but would have been attributed to scarcity of resources or other factors. For instance, with more than half of the household composition members (54%) representing children of household heads with mean age of 11 years (Table 4.1) this implied that a big number of the population were dependants and if the parents/caregivers had limited access to resources this would negatively the children's nutritional status.
4.1.1.3 Household size with children aged 6-23 months

Household size was established. This was done by asking the respondents to state the number of people they were living with, in the same household and shared common source of food. The results are as presented in Figure 4.1.

![Figure 4.1: Household sizes with children aged 6 – 23 months.](image)

The findings of Figure 4.1 show that majority of the households 19.3% had six members while 17.5% of the households had four members. Similarly, equal number of households 17.5% had five members. About 15.2% and 9.9% of households had 7 and 8 members respectively. A small number of households 8.4% consisted of three members or less. Households with nine members and above were 12.2%. The smallest household had 3 members while the largest had 12 members and on average, each household had 6 members. These findings are in accordance with those reported by Action Against Hunger (2011) in Makueni County which established that
the average household size was 6.4. However, the average number of households established in this study was slightly higher compared to the national average level which is 4.02 persons according to (KDHS, 2008-2009) and also in Malawi which is 5.2 persons according to Mtimuni et al., (2010). This higher figure could be explained by the fact that the study was undertaken in a rural setting and rural households are higher on average compared to urban households.

Large sized households can have a negative implication on the dietary diversity as economic resources tend to be limited compared to small sized households. The bigger the household, the greater the quantity of food needed and thus the quality of food can be compromised. This affects the nutrient intake of the individual and may adversely affect the nutritional status of children as it is associated with limited availability of food which is shared among the many members. Studies have shown that large sized families are associated with poor food consumption patterns and inadequate intake of nutrients which may not meet the child’s nutritional needs (Wood et al., 2008). Further, it has been reported that where the size of the household is large, crowding can lead to health and nutritional problems (KDHS, 2008-2009).

4.1.2 Socioeconomic characteristics of households

There is no doubt that the nutritional status of children is closely related to the economic conditions of the family, which are a determining factor for both food consumption and health care (Desai & Johnson, 2005). The socioeconomic characteristics determine the accessibility of diversified foods which reflects quality diet associated with better nutritional status in young children. In this study the socioeconomic variables established were education level, income and occupation of
the households. Also established was the household ownership of consumer goods. Household possession of durable goods is a useful indicator of household socioeconomic status (Choi, Bishai & Hill, 2005; Cockburn & Dostie, 2007). Data on source of cooking fuel was also established as a determinant of socioeconomic characteristic and food consumption patterns. Some of this information was also confirmed by use of focus group discussions.

4.1.2.1 Education level of the household members

The respondents were asked to state the education level of each of the members of the household. Table 4.3 presents the results. The results in Table 4.3 reveal that the most educated people are those who had gone up to class 8. Focus group discussion confirmed that primary education was the highest education level members could attain due to lack of school fees.

Table 4.3: Distribution of household members by education levels

<table>
<thead>
<tr>
<th>Education level</th>
<th>Frequency</th>
<th>Male</th>
<th>% of total</th>
<th>Female</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>N</td>
<td>% of total</td>
<td>N</td>
<td>% of total</td>
</tr>
<tr>
<td>No formal education</td>
<td>101</td>
<td>34</td>
<td>4.9</td>
<td>67</td>
<td>9.6</td>
</tr>
<tr>
<td>Adult education</td>
<td>1</td>
<td>1</td>
<td>0.1</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Completed class 1-8</td>
<td>492</td>
<td>225</td>
<td>32.2</td>
<td>267</td>
<td>38.3</td>
</tr>
<tr>
<td>Form 4 only</td>
<td>83</td>
<td>50</td>
<td>7.3</td>
<td>33</td>
<td>4.8</td>
</tr>
<tr>
<td>Form 4 + training</td>
<td>16</td>
<td>8</td>
<td>1.1</td>
<td>8</td>
<td>1.2</td>
</tr>
<tr>
<td>Form 6</td>
<td>2</td>
<td>1</td>
<td>0.1</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Form 6 + training</td>
<td>2</td>
<td>1</td>
<td>0.1</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>University</td>
<td>1</td>
<td>1</td>
<td>0.1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>698</td>
<td>320</td>
<td>45.8</td>
<td>378</td>
<td>54.2</td>
</tr>
</tbody>
</table>

The findings in Table 4.3 provide an insight that the households may have had inadequate education which limited their knowledge in nutrition thus this would have been a challenge in terms of attaining better nutritional status of children. Kimiywe et al., (2007) and Waudo et al., (2005) noted that education level influences choice
and consumption of variety of foods. Inadequate education leads to poor nutrition knowledge on what constitutes dietary diversity and its recognized nutritional importance associated with high quality diets especially in infants and young children.

Some other studies have also shown the significance of education to the nutritional status of children. According to Bedi et al., (2004) educated parents have well nourished children, since they are more likely to be able to marshal information and other inputs that affect child health. Similarly, in India and Bangladesh Maffioli et al., (2007) reported that having a non-educated father/mother exacerbated the risk of a child being undernourished compared with having a father/mother with secondary/higher education. However, although the results revealed respondents had inadequate education, it is pleasing to note that more females (38.3%) had completed standard 8 compared to males (32.2%). Some studies suggest maternal education positively influences child nutrition (Emina et al., 2011; Mittal, Singh & AhluwaliaIndian, 2007) but others differ (Mahgoub et al., 2006; Frost, Forste & Haas, 2005; Mukuria, Cushing & Sangha, 2005).

4.1.2.2 Occupation of households

The study also sought to establish the variation in occupation of the household members. Respondents were asked to state the various occupations and the results were as indicated in Figure 4.2
Findings of Figure 4.2 show Casual waged labourers accounted for 25.6%. The results also reveal that about 24.4% household members worked at home as housewives while about 15.0 percent were not employed. The study results show that the main occupation in the study area was waged labour 25.6 percent. Focus group discussion confirmed this since almost all of the respondents reported irregular and unpredictable income which came from various waged labours ranging from cultivating gardens, fetching water, making ropes, making bricks and clearing garden fields among other casual jobs. These results have an indication that the population got income from unreliable sources and the income is inconsistent.

These findings indicated perennial dependence of the unemployed on the few who worked for such unreliable employers. With such poor economic implication this could affect the health and nutritional status of the children. Again mother’s participation in the workforce and her professional level has an advantage on
the nutritional status of a child. Participation in the labour force not only gives women the opportunity to earn income but also exercise more freedom of choice and decisional autonomy in the field of child nutrition (USAID, 2005). Therefore based on the present study findings this is another possible explanation as to why the nutritional status of the children would be negatively affected.

4.1.2.3 Income levels

Comparative distribution of households’ income levels of mothers and fathers was established as it influences the purchasing power of food. The respondents were asked to state and estimate the amount of money they earned on monthly basis. The same information was also confirmed by use of Focus group discussions. The results were as presented in Table 4.4.

Table 4.4: Income distribution of mothers and fathers

<table>
<thead>
<tr>
<th>Income per month</th>
<th>Income of the father</th>
<th>Income of the mother</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of households</td>
<td>% of the total</td>
</tr>
<tr>
<td>No monthly income</td>
<td>40</td>
<td>16.0</td>
</tr>
<tr>
<td>Less than Kshs1000</td>
<td>28</td>
<td>11.2</td>
</tr>
<tr>
<td>Kshs1000 - Kshs3000</td>
<td>101</td>
<td>40.4</td>
</tr>
<tr>
<td>Kshs3000 - Kshs5000</td>
<td>62</td>
<td>24.8</td>
</tr>
<tr>
<td>&gt;Kshs5000-Kshs10000</td>
<td>8</td>
<td>3.2</td>
</tr>
<tr>
<td>Above Kshs10,000</td>
<td>11</td>
<td>4.4</td>
</tr>
<tr>
<td>Total</td>
<td>250</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4.4 reveals that majority of fathers, 40.4% and mothers 23.3 % earned between Kshs 1000 - 3000. Focus group discussion confirmed that majority of the people worked as casual labourers who earned below Kshs 3000. The mean monthly income was Kshs 2486. This limited income may have translated into poor food consumption patterns and inadequate dietary intake as focus group discussion confirmed that most
of the foods were not affordable. Households in Makindu division were reported to rely on markets for purchase of food commodities whose prices have sky rocketed beyond the reach of many. This has been due to successive rain failures of both the long and short rains in 2010 resulting into insufficient, erratic, poorly distributed rain unable to sustain both crop and livestock parameters thus the division experienced near total crop failure (Makueni District long rains assessment report (2011)).

Poor households are known to spend a disproportionate portion of their income on staple foods, primarily maize meal, and vegetables which are generally considered less expensive (Arimond & Ruel, 2004). This may increase the risk of micronutrient deficiencies. Kimiywe et al., (2007) highlighted that factors that influence the choice of consumption of diversity of foods are income levels among others. The results of this study further reveal that more mothers, 36.6 % had no monthly income compared to fathers 16% and that many mothers, 17.1% earned less than Kshs 1000 compared to fathers, 11.2%. When women’s income is limited the nutritional status of the family is negatively affected. Studies have shown that women’s income is mostly used to purchase food and also care for the wellbeing of the family (Cancian & Danzige, 2009; Girma & Timotiows, 2002).

4.1.2.4 Household ownership of consumer goods

Ownership of household goods can be used as an indicator of the socioeconomic status of the household and as a source of nutrition knowledge and dietary diversity. The respondents were asked to state whether they owned any of the following items. Television (TV), Digital Versatile Disc (DVD) player, bicycle, land, plot, car and motorcycle. Multiple responses were allowed. The results were as indicated in Figure 4.3.
Figure 4.3: Household ownership of consumer goods

Results in Figure 4.3 shows the commonly owned items were radio, 66.2% and land, 71.1%. This was encouraging to note as radio is used as a means of communication and through it nutrition information can be conveyed. A good number of households 65.8% owned bicycles. These were used as means of transport and also to ferry water from the sources. The least owned item was car, 0% followed by motor cycle, 0.4%. Ownership of TV and DVD player were also as low as 3% and 3.4% respectively. Low rates of ownership of most of the items was attributed to lack of economic power to purchase as focus group discussion confirmed thus the finding indicating that the respondent’s socioeconomic statuses were low.

4.1.2.5 Source of cooking fuel

Some housing characteristics such as cooking fuel also reflect the household’s socioeconomic situation. The respondents were asked to state their source of cooking
fuel. The results obtained revealed that almost all households, 97% used firewood as a source of cooking fuel. About 1.9% used charcoal, 0.7% used kerosene and 0.4% used electricity. The high percentage of households using firewood as a source of cooking fuel could be explained by the reason that the study was undertaken in a rural setting where firewood could easily be obtained. This finding also confirms the high level of reliance of firewood as a source of fuel for cooking in Kenya.

For example, the Kenya Integrated Household Budget Survey (Basic Report) (2005-2006) indicates that 68.3% of all households in Kenya use firewood as the source of cooking fuel. Similar observation was reported in KDHS (2008 - 2009) which indicated that the most common cooking fuel in Kenya is wood, used by close to two-thirds (63%) of households. Policy Innovation Systems for Clean Energy Security (PISCES, 2010) noted that firewood is most commonly used for cooking in the rural regions because it is cheap compared to the other energy sources. These results indicate that the socioeconomic status of the households were low implying access to diversity of foods would have been difficult therefore this would have led to poor food consumption patterns.

4.2 Food consumption pattern and dietary intake

Adequate nutrition is critical to child development. The period from birth to 2 years is important for optimal growth, health and development. However, this period is often marked by growth faltering due to increased infections and poor feeding patterns. Under nutrition does not only kill, it also prevents children from growing up to live long and productive lives. Children who do not have access to an adequate diet between conception and age two suffer irreversible, long-term consequences such as impaired physical and cognitive development (WFP, 2011).
This study sought to establish the food consumption patterns and dietary intake among the children. Respondents were asked to state the frequency of consumption of the following selected food items given to their children in the last 7 days prior to the data collection. The listed food items were the ones locally available, familiar and commonly used by the community. The foods included; meats, grains, roots and tubers, legumes and nuts, dairy products, eggs, vitamin A rich fruits and vegetables and other fruits and vegetables.

4.2.1 Consumption pattern of meats

Animal source foods supply high quality and readily digested protein and energy in the child’s diet. They are also a compact and efficient source of readily available and absorbable micronutrients such as iron, zinc, and vitamin B₁₂. The effects of their inadequate intake are most pronounced during early childhood as they are useful in child growth, cognitive development and health. The meats considered in the study were beef, liver, poultry, fish and organ meats. Their consumption patterns in the last 7 days preceding the study were as shown in Table 4.5

<table>
<thead>
<tr>
<th>Frequency of consumption</th>
<th>Beef</th>
<th>Liver</th>
<th>Poultry</th>
<th>Fish</th>
<th>Organ meat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Once a week</td>
<td>11.4</td>
<td>3.0</td>
<td>5.3</td>
<td>4.6</td>
<td>2.3</td>
</tr>
<tr>
<td>Twice a week</td>
<td>1.5</td>
<td>0</td>
<td>0.8</td>
<td>0.4</td>
<td>0</td>
</tr>
<tr>
<td>Thrice a week</td>
<td>2.3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Not consumed</td>
<td>84.8</td>
<td>97</td>
<td>93.9</td>
<td>95</td>
<td>97.7</td>
</tr>
<tr>
<td>Daily</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Findings of Table 4.5 reveal that the consumption of meat was poor for the last 7 days preceding the study. About 84.8% of the study children did not consume beef even on a single day while only 2.3% consumed beef 3 days during that week. A
small number of children 1.5% consumed beef only twice a week whereas 11.4% consumed beef once in those last seven days.

The results further show that 97% of children did not consume liver at all for those last 7 days whereas about only 3% consumed liver once. Consumption of poultry was poor as well. Notably, a big number 93.9% of children did not consume poultry at all. For fish and organ meats, similar poor consumption patterns were observed with 95% of children and 97.7% of them having not consumed fish or organ meats respectively not even in a single day. Focus group discussion confirmed that adequate consumption of meat was usually constrained by high prices. One of the mothers said in the local native language, Kikamba “nyama nyie ona ndyisi ila niile uya itiuwika” (she doesn’t know the last time she took meat it is not affordable). Similar observation was reported in Uganda by Kajura, Mugisha and Okello (2008) meat especially beef, which was obtained from the market majority of the households indicated in the study was not readily available, accessible or affordable. Poor consumption pattern of meat has also been reported elsewhere. Nimrod and Neumann (2003) reported that although households may own cattle, goats and poultry, commonly these are not consumed. Similarly, in another study by Ekesa, Blomme and Garming (2011) in a study on dietary diversity and nutritional status of pre-school children from Gitega (Burundi) and Butembo (Democratic republic of Congo) found that less than 15% of the pre-school children consumed food from meat.

Foods of animal origin are of critical importance in young children’s diets because they provide essential micronutrients such as iron, zinc and vitamin A, which promote health, growth motor and cognitive development (Ruel & Garrett, 2003).
The nutrient density of the diet given to young children is often insufficient to meet their nutrient requirements, and increasing the diversity of foods provided to young children, particularly meat, poultry, fish, eggs, fruits and vegetables, is recommended to improve micronutrient intakes (PAHO/WHO, 2003).

4.2.2 Consumption pattern of grains, roots and tubers

This study established the consumption pattern of grains, roots and tubers. These were; maize, millet, chapatti, sweet potatoes, cassava, arrowroots, rice and sorghum. Respondents were asked to state how frequently these foods were taken by their children in the previous week prior to the data collection. Their consumption patterns as reported were as presented in Table 4.6. The results showed that foods made from maize were consumed by majority of the children daily, 79.1% while 7.6% of them consuming it in 3 days during that week preceding the study. The second most consumed grain was millet whereby 21.7% of children consumed millet based foods daily. Chapattis were not often consumed as 80.6% did not consume it at all. Sweet potatoes, cassava and arrowroots were hardly consumed. Notably, 95.4%, 97.7% and 97.3% respectively never consumed them even in a single day.

Table 4.6: Consumption patterns of grains roots and tubers

<table>
<thead>
<tr>
<th>Frequency of consumption</th>
<th>% of the total n = 263</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maize %</td>
</tr>
<tr>
<td>Once a week</td>
<td>1.5</td>
</tr>
<tr>
<td>Twice a week</td>
<td>5.7</td>
</tr>
<tr>
<td>Thrice a week</td>
<td>7.6</td>
</tr>
<tr>
<td>Not consumed</td>
<td>6.1</td>
</tr>
<tr>
<td>Daily</td>
<td>79.1</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>
Rice was fairly consumed with about 20.5% of the children having consumed it once in that week and 9.9% twice in the same week. Results from focus group discussion revealed that the daily consumption of foods made from maize was due to maize availability in the nearby markets and its price being relatively cheaper compared to the other foods. This study finding concurs with those reported in KDHS (2008-2009) which showed that the most commonly used foods given to children under age three include food made from grains (72%).

Other studies have also reported similar findings that cereal gruel remains the most common complementary food given to children (Onyango, Receveur & Esrey 2002; Mutie Brower & Mwangi, 2010). Ekesa, Blomme and Garming (2011) also reported that among the most popular food group among young children was cereals, in Burundi and Democratic Republic of Congo. A similar observation was made by Faber (2005) in a study on complementary foods consumed by 6 to 12 month old rural infants in South Africa which showed that cereals were consumed by 99% of all children. Monotonous diets based on starchy staples lack essential micronutrients and contribute to the burden of malnutrition and micronutrient deficiencies (Allen, 2008).

4.2.3 Consumption pattern of legumes

Respondents were asked to state the frequency of consumption of the following foods namely cowpeas, beans and green grams. Findings in Table 4.7 show that nearly a quarter of the children 24.4% consumed cowpeas daily whereas slightly more than half 53.2% did not consume it in those last seven days. Small percentages of the children 7.6% 3.8% and 11.0% consumed cowpeas for two days, three days and once in a week respectively. Beans consumption was fair compared to cowpeas as a smaller percentage of children, 37.9 % are the ones who did not consume them
at all for the last seven days prior to the data collection. Those who consumed beans
daily were about 15.6% while 8.4 % consumed for 3 days during that week. About
20.2% of the children consumed beans once while 17.9% consumed in two days
within those last 7 days.

Table 4.7: Consumption pattern of legumes

<table>
<thead>
<tr>
<th>Frequency of consumption</th>
<th>Cowpeas %</th>
<th>Beans %</th>
<th>Green grams %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Once a week</td>
<td>11.0</td>
<td>20.2</td>
<td>10.3</td>
</tr>
<tr>
<td>Twice a week</td>
<td>7.6</td>
<td>17.9</td>
<td>3.4</td>
</tr>
<tr>
<td>Thrice a week</td>
<td>3.8</td>
<td>8.4</td>
<td>0.8</td>
</tr>
<tr>
<td>Not consumed</td>
<td>53.2</td>
<td>37.9</td>
<td>83.6</td>
</tr>
<tr>
<td>Daily</td>
<td>24.4</td>
<td>15.6</td>
<td>1.9</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

The findings in Table 4.7 further show that green gram consumption was the poorest.
A big proportion of children 83.6% did not consume green grams even in a single
day. Only 1.9% managed to consume them daily. About 10.3% of the children, 3.4%
and 0.8% of them consumed the green grams once, twice and thrice in that order.
Legumes are good sources of plant proteins but the study results revealed that there
was poor consumption this could lead to inadequate intake of nutrients.

4.2.4 Consumption pattern of dairy products

Dairy products are good sources of calcium and they are required for formation of
strong bones and teeth in young children. The dairy products considered in this study
were; milk, yogurt and cheese. Respondents were asked to state how frequently their
children consumed them in the last seven days prior to the study. Their consumption
patterns were as depicted in Table 4.8.
Table 4.8: Consumption pattern of dairy products

<table>
<thead>
<tr>
<th>Frequency of consumption</th>
<th>% of the total n = 263</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Milk %</td>
</tr>
<tr>
<td>Once a week</td>
<td>4.9</td>
</tr>
<tr>
<td>Twice a week</td>
<td>5.7</td>
</tr>
<tr>
<td>Thrice a week</td>
<td>4.6</td>
</tr>
<tr>
<td>Not consumed</td>
<td>24.0</td>
</tr>
<tr>
<td>Daily</td>
<td>60.8</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

Results in Table 4.8 show that yoghurt and cheese were hardly consumed with 98.4% of the children and 99.2% having not consumed them in the previous 7 days preceding the study. The same findings in Table 4.8 reveal that milk was fairly consumed with more than half of the children, 60.8% having consumed it daily either in a sweetened tea or porridge. This result indicates poor consumption of dairy products which are good sources of calcium and this would probably lead to poor bone and teeth development. Nontobeko et al., (2008) in a study on decreased dietary diversity in association with HIV infection in South African children also reported a similar finding. At age 18 months, lack of milk contributed to low dietary diversity in South African children. Nimrod and Neumann (2003) noted that lack of calcium together with vitamin D deficiency is responsible for the resurgence of rickets.

4.2.5 Consumption pattern of eggs in any form

Eggs are good sources of essential nutrients such as iron, folic acid, zink, iodine and vitamin B₁₂ (Cherian et al., 2005). The consumption patterns of eggs were as indicated in Table 4.9.
Table 4.9: Consumption pattern of eggs

<table>
<thead>
<tr>
<th>Frequency of consumption</th>
<th>% of the total n =263</th>
</tr>
</thead>
<tbody>
<tr>
<td>Once a week</td>
<td>14.1</td>
</tr>
<tr>
<td>Twice</td>
<td>4.9</td>
</tr>
<tr>
<td>Thrice</td>
<td>1.1</td>
</tr>
<tr>
<td>Not consumed</td>
<td>79.5</td>
</tr>
<tr>
<td>Daily</td>
<td>0.4</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4.9 Indicates that a large percentage of children, 79.5% did not consume eggs for the last 7 days prior to the data collection. Daily consumption of eggs observed was very low 0.4%. Those who consumed once were 14.1% while 4.9% consumed twice. Findings from focus group discussion confirmed that the consumption of eggs was that poor because they were highly priced. From observation, eggs were available from the nearby markets however, as reported from the discussion they were not affordable. A study in Uganda reported similar findings that the economic status of the households tended to dictate the type and amount of eggs taken by their children. It was relatively difficult for poor category of households to avail eggs in the children diets (Kajura, Mugisha & Okello, 2008).

Eggs are good sources of iron, vitamins and other nutrients that strengthen the tissues and muscles however the consumption pattern was noted to be poor and this would probably contribute to iron deficiency. In Indonesia egg consumption remained low for children 6-24 months, especially for children from the poorest households and the consumption of eggs showed a significant protective effect on childhood anaemia, which was highly prevalent among young children (Shrimpton et al., 2004).
4.2.6 Consumption pattern of fruits and vegetables

According to Joshi (2003) fruits and vegetables provide micronutrients to the body. Respondents were asked to state the frequency of consumption of fruits and vegetables among their children for the last seven days prior to the study. The results were as indicated in Table 4.10.

Table 4.10: Consumption pattern of fruits and vegetables

<table>
<thead>
<tr>
<th>Frequency of consumption</th>
<th>Carrots%</th>
<th>Cowpeas leaves%</th>
<th>Avocado %</th>
<th>Spinach%</th>
<th>Mango%</th>
<th>Papaw%</th>
<th>Sukuma%</th>
<th>Tomatoes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>0.7</td>
<td>54.8</td>
<td>2.7</td>
<td>2.3</td>
<td>0.8</td>
<td>0.4</td>
<td>6.8</td>
<td>8.4</td>
</tr>
<tr>
<td>Once</td>
<td>3.8</td>
<td>5.3</td>
<td>22.4</td>
<td>4.9</td>
<td>4.6</td>
<td>5.7</td>
<td>11.4</td>
<td>11.4</td>
</tr>
<tr>
<td>Twice</td>
<td>0.8</td>
<td>9.5</td>
<td>3.5</td>
<td>1.5</td>
<td>0.4</td>
<td>1.1</td>
<td>5.4</td>
<td>6.8</td>
</tr>
<tr>
<td>Not consumed</td>
<td>94.7</td>
<td>22.8</td>
<td>68.4</td>
<td>90.9</td>
<td>94.2</td>
<td>92.4</td>
<td>72.2</td>
<td>49.4</td>
</tr>
</tbody>
</table>

Table 4.10 shows that the most consumed vegetable was cowpeas whereby 54.8% of the children consumed it daily. This was followed by tomatoes with 8.4% of the children having had consumed it daily in soup form while almost a quarter of the children, 24% had consumed it in 3 days during the week. The results reveal that the consumption patterns of majority of fruits and vegetables was poor with large percentages of children, 94.7%, 68.4%, 90.9%, 94.2%, 92.4% and 72.2% having not consumed carrots, avocado, spinach, mango, pawpaw, and sukuma respectively. There was no consumption of variety of other traditional vegetables other than cowpea leaves and/amaranth leaves. Some studies have given reasons for declining use of traditional vegetables such as loss of knowledge about which local plants are edible (Tabuti 2006; Rijal 2008). Therefore this would be a possible reason that led to consumption of a few of the traditional vegetables.
These findings show that there was inadequate consumption of fruits and vegetables and this would lead to micronutrient deficiencies. Nimrod and Neumann (2003) reported that Kenyan children have diets that are mainly cereal-based, with tubers and a few of vegetables and fruits when available. This leads to inadequate intakes of micronutrients such as zinc, iron, vitamins A and vitamin C. The Multiple micronutrient deficiencies contribute to early onset of stunting and poor child development. Another study in South Africa by Nontobeko et al., (2008) reported similar observation that in more than one half of the children observed for weeks, no fruit or vegetable was consumed due to poor access and availability.

Findings of food consumption patterns of various foods observed in the study showed lack of diversity of foods. Studies have shown that populations that subsist on diets lacking diversity are at a high risk of malnutrition and poor health. Similarly, it has been reported that malnutrition can result from poor quality complementary foods coupled with detrimental feeding patterns (Linkages, 2007). Dietary diversity reflects diet quality with greater likelihood of meeting daily energy and nutrient requirements.

4.2.7 Dietary intake

Undernutrition is related to an inadequate intake of nutrients which results in weight loss and growth faltering reflected as underweight, wasting and/or stunting (Theron et al., 2007). Table 4.11 presents the dietary intake of some selected food nutrients in the study.
Table 4.11 Dietary intake of some selected food nutrients

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Recom mended value</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-8 mo n = 39(29.1%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy (kcal/day)</td>
<td>769</td>
<td>433.56</td>
<td>3189.05</td>
<td>1527.7</td>
<td>688.81</td>
</tr>
<tr>
<td>Protein (g/day)</td>
<td>9.1</td>
<td>15.10</td>
<td>99.12</td>
<td>41.87</td>
<td>17.97</td>
</tr>
<tr>
<td>Vitamin A (ug/day)</td>
<td>400</td>
<td>.0</td>
<td>1665.0</td>
<td>717.30</td>
<td>450.24</td>
</tr>
<tr>
<td>Vitamin C (mg/day)</td>
<td>30</td>
<td>.00</td>
<td>64.3</td>
<td>12.24</td>
<td>16.33</td>
</tr>
<tr>
<td>Zinc (mg/day)</td>
<td>2.8</td>
<td>3.60</td>
<td>31.49</td>
<td>11.83</td>
<td>5.84</td>
</tr>
<tr>
<td>9-11 mo n= 17 (12.7%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy (kcal/day)</td>
<td>858</td>
<td>341.65</td>
<td>5040.66</td>
<td>1673.14</td>
<td>1047.77</td>
</tr>
<tr>
<td>Protein (g/day)</td>
<td>9.6</td>
<td>6.12</td>
<td>141.72</td>
<td>42.9</td>
<td>30.27</td>
</tr>
<tr>
<td>Vitamin A (ug/day)</td>
<td>400</td>
<td>46.4</td>
<td>2870.4</td>
<td>884.365</td>
<td>633.48</td>
</tr>
<tr>
<td>Vitamin C (mg/day)</td>
<td>30</td>
<td>0.07</td>
<td>109.50</td>
<td>22.80</td>
<td>26.84</td>
</tr>
<tr>
<td>Zinc (mg/day)</td>
<td>2.8</td>
<td>1.60</td>
<td>36.50</td>
<td>11.70</td>
<td>7.94</td>
</tr>
<tr>
<td>12-23 mo n= 78 (58.2%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy (kcal/day)</td>
<td>1118</td>
<td>226.37</td>
<td>5040.66</td>
<td>1907.61</td>
<td>936.95</td>
</tr>
<tr>
<td>Protein (g/day)</td>
<td>10.9</td>
<td>3.54</td>
<td>141.72</td>
<td>51.10</td>
<td>27.19</td>
</tr>
<tr>
<td>Vitamin A (ug/day)</td>
<td>400</td>
<td>4.0</td>
<td>10979.1</td>
<td>1196.12</td>
<td>1394.91</td>
</tr>
<tr>
<td>Vitamin C (mg/day)</td>
<td>30</td>
<td>.00</td>
<td>352.11</td>
<td>28.48</td>
<td>42.58</td>
</tr>
<tr>
<td>Zinc (mg/day)</td>
<td>2.8</td>
<td>1.04</td>
<td>36.50</td>
<td>14.03</td>
<td>7.72</td>
</tr>
</tbody>
</table>


Table 4.11 reveals that the energy intake was high as the mean analyzed values were high compared to the recommended values in all the age categories. A possible explanation for this would be due to the high daily intake of cereals specifically foods prepared from maize even observed in the food consumption patterns. This finding is in line with studies by Steyn et al., (2006); Theron et al., (2006) which indicated that nutrient intakes of children were high in energy intake due to frequent and high intake of maize meal porridge.

Further the results in Table 4.11 indicated there was excess intake of some micronutrients such as zinc and vitamin A but inadequate intake of vitamin C. This agrees with findings by (Bridge et al., 2006). Inadequate intake of vitamin C would have been due to poor intake of fruits observed in the study.
4.2.8 Dietary diversity score (DDS)

Dietary diversity, the consumption of an adequate variety of food groups, is an aspect of dietary quality and can be considered as an indicator of general nutritional adequacy in young children (Nontobeko et al., 2008). Dietary diversity score was established based on the different number of food groups the index child consumed in the previous 24 hours prior to the data collection. Seven food groups as recommended internationally by WHO (2007) were considered in the study. These were grains, roots and tubers, legumes and nuts, dairy products, meats, eggs, vitamin A rich fruits and vegetables, and other fruits and vegetables. The results were shown in Table 4.1

Table 4.12: Dietary diversity score

<table>
<thead>
<tr>
<th>Number of food groups</th>
<th>Number of children</th>
<th>% of the total n = 134</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>56</td>
<td>41.8</td>
</tr>
<tr>
<td>3</td>
<td>50</td>
<td>37.3</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>11.9</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>134</td>
</tr>
</tbody>
</table>

Data on 24 hour recall done on about half of the sample size (134) revealed that 41.8% of the children had consumed 2 food groups in the last 24 hours prior to the study. The next largest group 37.3% of the children had consumed 3 food groups while 11.9% had consumed 4 food groups. Notably, a small number 3% of the children had consumed 5 food groups. Lowest dietary diversity score was one food group; cereals (mostly thin porridge prepared from maize), followed by 2 food groups cereals and Vitamin A rich vegetables, then 3 food groups which were cereal, Vitamin A rich vegetables and legumes. Those who had consumed 4 food groups and above were a small number 14.9% and these were foods from cereals, Vitamin A
rich vegetables, legumes, dairy products (specifically diluted milk or in sweetened tea) and few sources of meat.

Eggs, fruits and other vegetables were not consumed, on average two food groups were consumed which were foods mainly from cereals and vitamin A rich vegetables (cowpeas leaves) and/or other traditional vegetables specifically (amaranth leaves). Although other factors would have contributed to consumption of few of these food groups, time of conducting the study would also have influenced in that the study was undertaken towards end of short rains when there are no plenty of harvests. However, these study findings are not different with those reported by Ministry of public Health and sanitation Makueni (2008) in Child Health and Nutrition Information System (CHANIS) data which reported that on average two to three food groups were consumed by children in Makueni region. Similarly, Ekesa, Walingo and Onyango (2008) in a study on role of agricultural biodiversity on dietary intake and nutrition status of pre-school children in Matungu division western Kenya reported that majority of children in the region were consuming inadequate and monotonous diets mainly from 2 food groups which were carbohydrates and few sources of proteins. Similar observation has also been reported in Malawi in a study that showed that 44.1% of children had low dietary diversity of ≤ 3 food groups which were cereals and vegetables. In the same study in Malawi it was reported that and high dietary diversity score consisted of foods from the following groups; cereals, vegetables, fruits and tubers (Mtimuni et al., 2010).

In another study on dietary diversity as a good predictor of the micronutrient density of the diet of 6 to 23 month old children in Madagascar showed that grains, roots, and tubers were the main food source at a dietary diversity score of one. Whereas
other fruits and vegetables were consumed by more than one-half of the children at a dietary diversity score of two and consumed by 90% at a dietary diversity score of 4. This study shows that foods like eggs, meat and other animal products and fruits were hardly consumed; their consumption was constrained by high prices and not being in season especially the fruits. Findings from focus group discussion confirmed that they were not affordable. A similar observation that animal products are hardly consumed by young children has been reported by Mourald et al., (2008) flesh foods and dairy products are rarely consumed by children and it occurs at a dietary diversity score of 4 and higher.

A minimum consumption of four food groups in the last 24 hours prior to the study is considered as the minimum DDS cut off according to (WHO, 2007). The cut of at least 4 food groups is associated with better quality diets and improved nutritional status of children. However, the results in Table 4.12 show that only a small number of children, 14.9% met the minimum standards with respect to food diversity (had managed to consume a minimum of 4 food groups) in the previous 24 hours preceding the study. This gave an indication that the children were not receiving adequate and essential nutrients hence placing them at the risk of poor nutritional status.

Studies have indicated that higher dietary diversity score is associated with increased nutrient intake and better child nutritional status (Arimond & Ruel 2004; Faber, 2005; Onyango 2003; Sawadogo et al., 2006; Steyn et al., 2006).KDHS (2008-2009) highlighted that providing variety of foods from different food groups seems to be more of a problem in young children. It further reported that increasing the diversity of foods given to children therefore would help meet the IYCF targets.
4.3 Nutritional status of children aged 6-23 months

The period 6 to 23 months in particular carries a great risk of growth faltering and malnutrition because of the inadequate nutritional quality of complementary foods and the increased risk of infections due to the decline in breastfeeding (Smuts et al., 2004). The variables used to examine the children’s nutritional status were; anthropometric indices - height for age, weight for height, weight for age and MUAC. Each of these indices provides different information about growth and body composition which is used to assess the nutritional status.

4.3.1 Malnutrition rate among children aged 6-23 months

The overall prevalence of malnutrition based on Height for Age (stunting) with $<-2$ Z scores of cut off point, weight for height (wasting) $<-2$ Z score cut off, weight for age (underweight) $<-2$ Z score cut off are as shown in Figure 4.4. It shows shows that prevalence of chronic malnutrition manifested as stunting was 21.6%, wasting was 7.6%, while underweight was 12.9%. In the present study stunting and underweight levels were lower than the national figure whereas wasting levels were almost the same.
4.3.2 Nutritional status of children 6 - 23 months old by sex

4.3.2.1 Wasting

Wasting, reflected by low weight-for-height, is a measure of acute malnutrition. The causes of wasting include inadequate food intake, poor feeding practices, disease and infection, or mostly, a combination of these factors (Cogill, 2003). The weight-for-height index measures body mass in relation to the body length. Wasting describes the current or short term nutritional status due to inadequate dietary intake or illness. Wasting is also referred to as acute malnutrition. Children whose weight-for-height was below minus three standard deviations (-3 SD) were considered severely wasted. In this study 7.6 % of the study children were wasted. Table 4.13: presents distribution of acute malnutrition of study children with Z scores, segregated by gender.
Table 4.13 shows that global acute malnutrition (GAM) was 7.6%. About 7.2% were moderately malnourished while 0.4% was severely malnourished. This results compare closely to what Action Against Hunger (2011) reported in Makueni District that GAM rate was 5.1% and SAM rate was 0.2%. More boys were moderately malnourished 7.8% than girls 6.7%. None of the boys was severely malnourished but about 0.7% of the girls were severely malnourished. However, the results showed no significance difference between boys and girls at all levels of acute malnutrition.

Table 4.13: Distribution of acute malnutrition of study children by weight for height Z scores, sex and presence or absence of oedema

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence of global malnutrition (GAM) (&lt;-2 z-score and/or oedema)</td>
<td>(20) 7.6%</td>
<td>(10) 7.8%</td>
<td>(10) 7.4%</td>
</tr>
<tr>
<td>Prevalence of moderate acute malnutrition (MAM) (&lt;-2 z-score and &gt;=-3 z-score, no oedema)</td>
<td>(19) 7.2%</td>
<td>(10) 7.8%</td>
<td>(9) 6.7%</td>
</tr>
<tr>
<td>Prevalence of severe acute malnutrition (SAM) (&lt;-3 z-score and/or oedema)</td>
<td>(1) 0.4%</td>
<td>(0) 0.0%</td>
<td>(1) 0.7%</td>
</tr>
</tbody>
</table>

The prevalence of oedema was 0.0%: indicating none of the children had oedema or kwashiorkor.

Table 4.13 shows that the prevalence of Global acute malnutrition (GAM) was 7.6% (95% C.I.). These were children with weight for height Z scores <-2. Prevalence of moderate acute malnutrition (MAM) (<-2 z-score and >=-3 z-score, no oedema) was 7.2% (95% C.I.). Prevalence of severe acute malnutrition (SAM) (<-3 z-score and/or oedema) was 0.4% (95% C.I.).
This study finding in Table 4.13 differs with that reported by Ndiku et al., (2011) in a study on gender inequality in food intake and nutritional status of children in rural Eastern Kenya which found that girls had higher prevalence rates for both moderate and severe acute malnutrition. This study finding is also contrary to finding by World Bank (2006) which reported that gender inequalities in quantity and quality of food intake may contribute to under-nutrition mainly in settings where the girl child is still considered less important than the boy child.

According to Ministry of Public Health and Sanitation Makueni (2008) CHANIS data report, global acute malnutrition stood at 3.7%. The findings in Table 4.13 shows slightly higher figure of 7.6% in all forms of acute malnutrition. This could be attributed to persistence drought due to successive poor rain distribution leading to crop failure. When the findings were compared to the WHO 2006 growth standards as represented in Figure 4.5 it revealed that there was slight displacement to the left of the reference curve. This indicates poor nutritional status.
4.3.2.2 Stunting

The length-for-age index is an indicator of linear growth retardation and cumulative growth deficits. Children whose length-for-age Z-score is below minus two standard deviations (-2 SD) of the reference population are considered short for their age (stunted) and are chronically malnourished. Stunting therefore is also referred to as chronic malnutrition. Children who are below minus three standard deviations (-3 SD) of the reference population are considered severely stunted. Length-for-age, therefore, represents the long-term effects of malnutrition in a population and is not sensitive to recent, short-term changes in dietary intake. Table 4.14 shows the prevalence of stunting among the study children.
Table 4.14: Prevalence of stunting based on length -for-age z-scores and by sex

<table>
<thead>
<tr>
<th></th>
<th>All N = 263</th>
<th>Boys n = 128</th>
<th>Girls n = 135</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prevalence of stunting (&lt;-2 z-score)</strong></td>
<td>(57) 21.6%</td>
<td>(35) 27.3%</td>
<td>(22) 16.3%</td>
</tr>
<tr>
<td><strong>Prevalence of moderate stunting (&lt;-2 z-score and &gt;=-3 z-score)</strong></td>
<td>(43) 16.3%</td>
<td>(28) 21.9%</td>
<td>(15) 11.1%</td>
</tr>
<tr>
<td><strong>Prevalence of severe stunting (&lt;-3 z-score)</strong></td>
<td>(14) 5.3 %</td>
<td>(7) 5.5 %</td>
<td>(7) 5.2 %</td>
</tr>
</tbody>
</table>

No significance difference between boys and girls and the level of stunting P value = 0.08

Results in Table 4.14 shows the prevalence of stunting was 21.6%). More boys were stunted than girls, 27.3% and 16.3% respectively. About 21.9% of boys were moderately stunted while 11.1% of girls were moderately stunted. Almost equal number of boys and girls were severely stunted 5.5% and 5.2 % in that order. The results indicated no significance difference between boys and girls and the level of stunting P = 0.08. These findings disagree with those reported by Ndiku et al., (2011) which showed that boys in overall had higher energy intakes than girls, and the prevalence of stunting was higher in the girls than the boys.

A similar observation was made by Rah et al., (2010) in a study in Bangladesh on association between dietary diversity and stunting in young children which showed that dietary diversity was a strong predictor of stunting in boys than girls. Because of increased nutritional needs and greater vulnerability, children are at greatest risk of stunting and mortality when they lack access to a diet that meets all their nutrient needs (WFP, 2011). Stunting is associated with a number of long term factors such
as chronic insufficient protein and energy intake, frequent infections, sustained poor feeding practices, and certain micronutrient deficiencies, particularly iron and zinc (Cogill, 2003).

4.3.2.3 Underweight

Weight-for-age (underweight) is a composite index of height-for-age and weight-for-height. It takes into account both acute and chronic malnutrition. Children whose weight-for-age is below minus two standard deviations are classified as underweight. Children whose weight-for-age is below minus three standard deviations (-3 SD) are considered severely underweight. Table 4.15 shows the prevalence of underweight based on weight for age - z scores by sex.

Table 4.15: Distribution of study children by underweight (Weight-for-Age) by Z scores and sex

<table>
<thead>
<tr>
<th></th>
<th>All N = 263</th>
<th>Boys n = 128</th>
<th>Girls n = 135</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence of underweight (&lt; -2 z-score)</td>
<td>(34) 12.9%</td>
<td>(22) 17.2%</td>
<td>(12) 8.9%</td>
</tr>
<tr>
<td>Prevalence of moderate underweight (&lt; -2 z-score and &gt;= -3 z-score)</td>
<td>(29) 11.0%</td>
<td>(20) 15.6%</td>
<td>(9) 6.7%</td>
</tr>
<tr>
<td>Prevalence of severe underweight (&lt; -3 z-score)</td>
<td>(5) 1.9%</td>
<td>(2) 1.6%</td>
<td>(3) 2.2%</td>
</tr>
</tbody>
</table>

Prevalence of underweight level is below national figure of 16% (KDHS, 2008-2009).

Findings in Table 4.15 show that the prevalence of underweight was 12.9% (95% C.I.). Underweight was more prevalent in boys than girls. About 17.2% of the boys were underweight compared to 8.9% of girls. Similarly, about 15.6% of boys were moderately underweight which is a higher percentage compared with that of girls 6.7
These findings compare favourably with those reported by Mahgoub, Nnyepi and Bandeke (2006) in a study on factors affecting prevalence of malnutrition among children under three years of age in Botswana that showed that underweight was more prevalent in boys than girls. Another study in Vietnam also reported higher prevalence of underweight in boys than girls (Nguyen et al., 2009).

However this finding differs in a study in India which reported 55.9% of the girls were underweight compared with 46.6% of the boys (Dey & Chaudhuri, 2008). The prevalence of stunting and underweight increases significantly from the first to second year of life, thereafter it remains fairly constant (Smuts et al., 2004). Armond and Ruel (2004) highlighted that lower dietary diversity scores are associated with twice the risk of being stunted or underweight.

4.3.2.4 Nutritional status based on Mid Upper Arm Circumference

MUAC is a rapid assessment tool for malnutrition. However, in this study MUAC measurements were taken for the purpose of comparing acute malnutrition and MUAC. Table 4.16 presents the MUAC results. Table 4.16 shows that majority of the children, 86.7% had adequate nutritional status. About 9.1% were at a risk of malnutrition, 3.8% had moderate acute malnutrition while 0.4% had severe acute malnutrition. According to Makueni District report (2011) the percentage of children at risk of malnutrition increased from 12.5% in July 2010 to 13.7% in the same month of 2011, it was noted that that was normal for that time of the year and within acceptable range for the county. The slight increase was attributed to variations in food access levels and escalated high food prices.
Table 4.16: Nutritional status of children aged 6-23 months based on MUAC measurements

<table>
<thead>
<tr>
<th>MUAC in cm</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 11.5 cm</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>&gt;= 11.5 to &lt; 12.5 cm</td>
<td>10</td>
<td>3.8</td>
</tr>
<tr>
<td>&gt;= 12.5 cm to &lt; 13.5</td>
<td>24</td>
<td>9.1</td>
</tr>
<tr>
<td>13.5 cm and above</td>
<td>228</td>
<td>86.7</td>
</tr>
<tr>
<td>Total</td>
<td>263</td>
<td>100</td>
</tr>
</tbody>
</table>

The results in Table 4.16 are in accordance with those by anthropometric index weight for height presented in this study. Both indicate severe acute malnutrition at the same level 0.4%; however moderate acute malnutrition was higher 7.2% by weight for height index whereas MUAC was 3.8%. In another study in Kenya that compared weight for height and MUAC in the assessment of severe malnutrition among hospitalized children noted that children with MUAC less than 11.5cm were more likely to be stunted and severely wasted (Berkley et al., 2005).

4.4 Distance, source and safety of water

Water access, availability and safety are key components and determinants of nutrition. Therefore the study established water consumption as it also influences food choice, preparation, sanitation and hygiene which in turn influence morbidity. Source of drinking water is an indicator of whether it is suitable for drinking. Sources that are likely to provide water suitable for drinking have been identified as improved sources (WHO & UNICEF, 2005). Improved water sources include a piped source within the dwelling or plot, public tap, tube well or borehole, protected well or spring, and rainwater (WHO & UNICEF, 2005).

The study results revealed that more than three quarters of the households 82% used water from protected wells where by hand water pumps were used to pump the water
into the surface. These findings are in line with those reported by KDHS (2008-2009) which reported that the most common improved water source category for rural households is a protected dug well (12 percent). According to Action Against Hunger (2011) in its report in Makueni county, it reported that majority (54.5%) of households consume unsafe water from shallow wells, traditional hand pumps, secondary water seller, water trucking or from earth pans with less than half (45.5%) using safe water.

Increasing access to improved drinking water is one of the Millennium Development Goals that Kenya along with other nations worldwide has adopted (United Nations General Assembly, 2001). The study findings also found that less than a quarter of the households 22% treated their drinking water, and the main method used was boiling, the rest of the respondents 78% reported they consume water as it is from the water source. This concurs with observation by Action Against Hunger (2011) that reported that 64.2% households did nothing to the water before consumption. Water sources were located far away from the homesteads on average 2 km. According to KDHS (2008-2009) lack of ready access to water source may limit the quantity of suitable drinking water that is available to a household. In the same report KDHS (2008-2009) it was further noted that even if water is obtained from an improved source which is not immediately accessible to the household it may be contaminated during transport or storage. This leads to poor hygienic conditions in the homesteads. Water contamination can result into diseases such as diarrhoea, upper respiratory infections that affects the children’s nutritional status.
4.5 Morbidity pattern of children and health seeking behaviour of mothers/caregivers for their children illnesses

Undernutrition characterized by lack of sufficient food and diversity of foods continues to be a major public health concern in most developing nations and it is exacerbated by diseases among other factors (Bridge et al., 2006).

4.5.1 Morbidity patterns among 6-23 months old children in the study

Respondents were asked to state whether the children suffered from any illness in the past 2 weeks prior to the study. The study results revealed that more than half of the children (52.5%) suffered from an illness in the past 2 weeks prior to the data collection. Less than half, (47.5%) did not suffer from any illness. The various illnesses or symptoms reported were cough, fever, diarrhoea, vomiting, common cold, skin infection and lack of appetite. These findings are supported by WFP (2011) which highlighted that under nutrition weakens the immune system and increases the risk and severity of infections. Literature has also shown that undernourished children have lowered resistance to infection and are more likely to die from common childhood ailments especially diarrheal diseases and respiratory infections (Caballero, 2002). These results therefore suggest majority of the children in the study were not receiving adequate nutrients acquired from various foods.

Ndugwa and Zulu (2008) on a study in Nairobi on child morbidity and care-seeking in Nairobi slum settlements reported that morbidity in young children is exacerbated by the child's age; children under 2 years of age have increased vulnerability to infections because this is the time when most children begin to walk and play around exposing them to contaminated environment. This observation is in line with another study by Ekesa, Blomme and Garming (2011) on dietary diversity and nutritional
status of pre-school children from Musa-dependent households in Burundi and Democratic republic of Congo which indicated that the prevalence of illnesses in children was higher among the younger group. Therefore in this study, age would have been another possible factor that influenced illnesses among the children as the target population was 6-23 months old.

4.5.2 Health care seeking behaviour of mothers/caregivers for their children illnesses

Poor health seeking behaviour leads to inadequate health care contributing to poor disease diagnosis and management that could worsen to affect the dietary intake hence affecting the child nutritional status. However, although health care seeking intervention has been known to have the potential to substantially reduce child mortality, in developing countries large number of children die without ever reaching a health facility and due to delays in seeking health care (Terra et al., 2000). Therefore this study sought to establish the health seeking behaviour of mothers/caregivers for their children illnesses.

4.5.2.1 Medical consultation

Respondents were asked to state whether they sought medical consultation for their children illnesses. The results indicated that out of 138 children who suffered an illness or symptoms two weeks prior to the study about three quarters of them (71.5%) their parents/caregivers sought some medical consultation. A small percentage (28.3%) did not seek any medical consultation. The medical consultation was sought from different sources which included health facility, traditional healer, Mobile clinics, pharmacy, ordinary shops and self medication. This results are in agreement with those reported in Nepal by Chandrashekhar et al., (2006)
showed that out of the 292 children who had one or more symptoms, a greater proportion 258 (88.4%) received some kind of medical care whereas no care was sought for 34 (11.6%) children.

4.5.2.2 Reasons stated for lack of medical consultation

The study went ahead to establish reasons for lack of medical consultation. Respondents were asked to state the reasons for not seeking medical consultation. The results were as depicted in Table 4.17.

Table 4.17: Reasons stated for lack of medical consultation

<table>
<thead>
<tr>
<th>Reason for not consulting</th>
<th>Frequency</th>
<th>% of the total n = 39</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of money to pay at the health facility</td>
<td>27</td>
<td>69.0</td>
</tr>
<tr>
<td>Health facility far</td>
<td>5</td>
<td>13.0</td>
</tr>
<tr>
<td>Illness not severe</td>
<td>7</td>
<td>18.0</td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
<td>100</td>
</tr>
</tbody>
</table>

The results showed that more than half of the respondents sixty nine percent gave the reason that they lacked money. About 13 percent said that the health facility was far; on average health facilities were located 10 km from the homesteads. KNBS (2005-2006); KIHBS (2005-2006) reported that more than a half of rural dwellers in Kenya travel 5 or more kilometres to reach a health facility. Other studies have also indicated that in most rural areas in Africa, majority of people live in more than five kilometres from the nearest health facility this negatively influences healthcare choices for young children (Mekonnen & Mekonnen, 2002; KIPPRA, 2005). Eighteen percent stated the reason that the illness was not severe.

Similar findings have been reported by Tsion et al., (2008) on a study on mothers’ health care seeking behaviour for childhood illnesses in Derra district, Ethiopia which reported that Mothers’ responses and actions to health care seeking were
influenced by Lack of money, far distances and perception of the illness not being serious. This study finding is also supported by other researches (Hjobortberg, 2003, Hutton, 2004; Kemble et al., 2006) that reported that some of the factors that determine health care seeking behaviour are household socioeconomic status and distance of health facility among others. When there are challenges in health care seeking diseases may worsen resulting in various complications which may then interfere with the food intake and eventually the child’s nutritional status gets affected.

4.5.2.3 Duration taken to seek medical consultation

According to KDHS 2008-2009 effective treatment should be sought promptly to prevent the disease from becoming severe and complicated as this contributes to high levels of under nutrition and mortality among young children. Table 4.18 shows the results.

Table 4.18: Duration taken to seek medical consultation

<table>
<thead>
<tr>
<th>Duration</th>
<th>No of respondents</th>
<th>% of the total n = 99</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within 24 hours</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>After 24 hours</td>
<td>80</td>
<td>81</td>
</tr>
<tr>
<td>Total</td>
<td>99</td>
<td>100</td>
</tr>
</tbody>
</table>

Results in Table 4.18 shows 81% of the respondents sought medical consultation after 24 hours. A small percentage 19 percent sought consultation within 24 hours. This finding therefore implies that health seeking behaviour was not prompt and appropriate and this makes diseases to worsen and may affect the intake of food thus affecting the child’s nutritional status. WHO, (2000) reported that seeking prompt and appropriate care could reduce child deaths due to acute respiratory infections by 20%. Other studies from developing countries have also reported that delay in
seeking appropriate care and not seeking any care contributes to the large number of child deaths (Mohan et al., 2004; Thind & Andersen, 2005).

4.6 Relationship between dietary diversity score and children’s nutritional status, demographic socioeconomic characteristics

Dietary diversity is important for health growth in children. Some studies have shown that undernutrition causes growth retardation, a physiologically and economically costly human condition (Leenstra et al., 2004). It also retards children’s physical and cognitive development and increases susceptibility to disease (World Bank, 2006). It is therefore important to enhance diversity in complementary foods, especially in young children who are dependent on these complementary foods for their nutrient intakes. Hoddinott and Yahannes (2002) highlighted that increase in dietary diversity is associated with socio-economic status and household food security).

4.6.1 Relationship between dietary diversity score and children’s nutritional status.

4.6.1.1 Relationship between dietary diversity score and underweight

Findings from the study show that there was a significant relationship between DDS and underweight $P = 0.001$. This implied that children with high dietary diversity score were less likely to be underweight.

4.6.1.2 Relationship between dietary diversity score and stunting

The study results showed that there was a significant relationship between DDS and stunting $P = 0.024$. This gave an indication those children with less dietary diversity score were more likely to be stunted than those with high dietary diversity score.
4.6.1.3 Relationship between dietary diversity score and wasting

Results relating DDS with wasting showed that although there was a relationship it was not significant with $P = 0.057$. These study findings establishing the relationship between DDS and the three types of malnutrition based on W/A, H/A, and W/H is not different from what other studies have reported in other regions.

A study by Hatloy et al., (2000) in a study on food variety socioeconomic status and nutritional status in urban and rural areas in Koutiala (Mali) reported that children with the lowest dietary diversity scores had a double risk of being malnourished (stunted and underweight). Similar results have been reported in a study by Bukusuba, Kikafunda and Whitehead (2009) in an urban setting in Uganda that found that children in households that reported consumption of less diversified diets were more vulnerable to being stunted and underweight.

In western Kenya, similar observation was reported. A study carried by Ekesa, Walingo and Onyango (2008) on role of agricultural biodiversity in dietary intake and nutritional status of pre-school children in Matungu division western Kenya reported that a positive relationship was observed between dietary diversity and underweight, stunting and wasting.

4.6.2 Relationship between dietary diversity score and demographic socioeconomic characteristics of households

The study established the relationship between education level, occupation and marital status and the dietary diversity score. The study results showed that there was no significant relationship between education level and the DDS score, $P = 0.062$. Although research has shown that education influence consumption of diversity of
diets as reported by (Kimiywe et al., 2007), this study finding differed on that. This could be explained by the reason that the highest education level majority of the respondents had attained was primary school level. This implied that there was no much nutrition knowledge attained at that level that would have contributed towards making choices on the purchase and consumption of variety of foods.

The results also revealed that there was no significant relationship between the kind of occupation and the DDS score $P = 0.076$. According to studies by Hatloy et al., (2000) and Quattara et al., (2004) foods such as milk, meat, fruits, nuts and pulses were consumed more frequently among the higher SES groups however these study findings are not in line with findings from that study. As noted earlier on these same study results, nearly all the respondents relied on casual labours with no irregular income and this would explain why the kind of occupation would not have made any significance difference on the dietary diversity.

Similar insignificance difference was noted between marital status and dietary diversity score with $P = 0.461$. This observation concurs with the findings and discussion of Table 4.2 in these same study results which showed that according to marital status, nearly both of all parents were there to contribute to care of the child therefore undiversified diets among the children would have been attributed to other factors.

4.7 Relationship between dietary diversity score and morbidity patterns and health seeking behaviour of mothers / caregivers for their children illnesses

The study established the relationship between dietary diversity and morbidity patterns of the children. Study results showed that there was no significant relationship between consuming high or low diversified diet and becoming sick in
the last two weeks, \( P = 542 \). Although some studies have shown that under nutrition is the largest contributor of the burden of disease in children the findings of this study did not affirm that fact. A possible explanation for the cause of morbidity in the children could be the children’s age. Previous researches by Ndugwa and Zulu (2008); Ekesa, Blomme and Garming (2011) highlighted that morbidity in young children is increased enhanced by the child’s age; children under 2 years of age have increased vulnerability to infections because this is the time when most children begin to walk and play around the contaminated environment.

The study also found that health seeking behaviour among the parents/caregivers among their children illness had no significance relationship with the number of food groups consumed by the children \( P = 0.869 \) however it was determined by factors such as lack of money, health facility being far and illness being not severe.
CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

5.1.1 Demographic and socioeconomic characteristics of households

Findings from the study showed that households comprised more females than males. Majority of the households were male headed. More than three quarters were married and on average household size composed of 6 members. Increased family size may negatively affect the nutritional status of the family because food is being shared among the many family members and especially in resource poor situations. Socioeconomic characteristics greatly determine availability of diversity of diets. Some of the socioeconomic characteristics considered were education, income, occupation and household ownership of household goods. The results revealed that the highest education level attained by majority was primary education level. Studies have shown that education level is important as it contributes to nutrition knowledge that influences choice and consumption of variety of foods. However, this work found no evidence that education influenced food consumption pattern.

Casual waged labour was the main occupation the households relied on so income flow was unpredictable. The findings also showed that majority earned between Kshs 1000-3000. When income flow is irregular and limited it interferes with the food purchasing power which eventually affects the nutritional status of the family. The study results also revealed that majority of the households owned goods of little value mainly radios, bicycles and cell phones. Firewood was the main source of cooking fuel. Other sources included charcoal, kerosene and electricity.
5.1.2 Food consumption patterns and dietary intake.

Results from this study revealed that food consumption patterns were poor with more than three quarters of the children, (79.1%) relying on foods made from maize on daily basis. Other foods such as meat, eggs, fruits and vegetables were hardly consumed and this was attributed to high costs. Dietary intake was inadequate for nutrients such as vitamin C but total energy intake was excess. Diversity of foods is needed to ensure nutrient requirements are met. Unfortified complementary foods that are predominantly plant based generally provide insufficient amount of nutrients which are recommended during the age of 6-23 months.

5.1.3 Dietary diversity score

A higher dietary diversity score reflects good nutritional status. The study revealed that the dietary diversity score was inadequate, on average children consumed 2 food groups as opposed to a minimum of four food groups recommended as the minimum dietary diversity score (WHO, 2007). These two food groups constituted of foods mainly from maize and vegetables (cowpeas leaves). Literature shows that undiversified diets with inadequate nutrients place children on the increased risk of malnutrition and poor health.

5.1.4 Nutritional status of children

Findings from the study showed prevalence of stunting was 21.6%, underweight 12.9% and wasting 7.6%. The study findings also revealed that malnutrition based on W/H, H/A and W/A was more pronounced in boys than girls. Results done on 24 hour recall showed undiversified diets which could be low in nutrient density as most respondents gave their children meals derived from cereals specifically maize porridge. This was a pattern that was affected by the fact that maize was the most
affordable food thus resulting in decreased nutritive value of diets leading to poor nutritional status of the children.

5.1.5 Morbidity pattern and health seeking behaviour
The study showed that more than half of the children suffered from an illness in the past 2 weeks prior to the data collection. The reported illnesses were cough, fever, diarrhoea, vomiting, cold, skin infection and lack of appetite. The study showed that nearly three quarters of those children who fell sick medical consultation was sought. This was done by majority of the caregivers after 24 hours. Reasons attributed to not seeking medical consultation were lack of money, illness not severe and health facility being far.

5.1.6 Relationship between dietary diversity score and children’s nutritional status
Findings from the study show that there was a significant relationship between dietary diversity score, underweight and stunting. The study findings also showed that although relationship existed between dietary diversity score and wasting, it was not statistically significant. These results implied that children who consumed high dietary diversity score diets were less likely to be underweight, stunted or wasted compared to those who consumed diets with low dietary diversity scores.

5.1.7 Relationship between dietary diversity and morbidity patterns among the children
The study findings revealed that there was no significant relationship between consuming high or low diversified diets and being sick in the last two weeks preceding the study.
5.2 Conclusion

5.2.1 Demographic and socioeconomic characteristics of households

The results showed that males were fewer in number compared to females in the household composition and most of the households were headed by men. The mean age of household heads fell within the reproductive age. This implied that women had greater parenting responsibilities that could restrict their work hours in the paid labor market and since women tend to spend their earnings on health and nutrition of their children this probably negatively affected the nutritional status of the children. Most of the respondents were married.

Average household size was (6.4) this figure is higher than the national figure. Studies have shown that large sized families are associated with poor food consumption patterns and inadequate intake of nutrients which may not meet the child’s nutritional needs. The highest education level was class 8, inadequate education leads to poor nutrition knowledge on dietary diversity. The main occupation in the study area was waged labour and therefore income was unpredictable. When occupation and income are unstable the purchasing power of variety of foods is affected and this can lead to poor child’s nutritional status. The results also confirmed the high level of reliance of firewood as a source of fuel for cooking in Kenya.

5.2.2 Food consumption pattern and dietary intake

Food consumption patterns together with dietary diversity score based on 24 hr recall were established to be poor. Children were consuming mostly cereals specifically foods made from maize on daily basis. This gave an indication that dietary diversity
was a challenge and this would have contributed to the poor nutritional status of the children. Mean energy intake was excess but vitamin C was inadequate.

5.2.3 Nutritional status of children

Findings from the study showed prevalence of stunting was 21.6%; underweight was 12.9% and wasting 7.6%. This poor nutritional status was attributed to poor complementary diets which lacked diversity and sufficient nutrients to meet the nutritional requirements.

5.2.4 Morbidity pattern of children and health seeking behaviour of mothers/caregivers for their children illnesses

The study revealed that more than half of the children suffered from an illness in the past 2 weeks prior to the data collection. A big number of the parents/caregivers sought some medical consultation from different sources which included health facility, traditional healer, mobile clinics, pharmacy, ordinary shops and self medication but this was after 24 hours so it was not prompt.

5.2.5 Relationship between dietary diversity score and children’s nutritional status, demographic, socioeconomic characteristics

Findings from the study showed that there was a significant relationship between dietary diversity score with underweight and stunting but for wasting it was not statistically significant. Thus the lower the dietary diversity scores the more likely of a child was underweight or stunted. Also the study findings revealed that there was no significant relationship between dietary diversity score and education, occupation and marital status.
5.2.6 Relationship between dietary diversity score and morbidity patterns and health seeking behaviour of mothers / caregivers for their children illnesses

Study results showed that there was no significant relationship between consuming high or low diversified diet and the morbidity patterns. However they would have been influenced by age of the children. The study also found that health seeking behaviour of the parents/caregivers for their children illness had no significant relationship with the number of food groups consumed by the children, but it was determined by factors such as lack of money, health facility being far and illness being not severe.

From this findings, it can be hypothesized that

There is a significant association between dietary diversity and nutritional status of children \( P = 0.024, 0.001 \) for stunting and underweight respectively.

There is a significant association between morbidity patterns and nutritional status of children \( P = 0.015, 0.009 \) for stunting and underweight respectively thus rejecting the null hypotheses.

5.3 Recommendations

5.3.1 Recommendations for policy

Ministry of Agriculture should promote production of diversified food crops which are drought resistant and also enlighten people on the importance of dietary diversity. For instance traditional leafy vegetables are good sources of various nutrients and tend to grow well in semi arid areas therefore the Ministry Agriculture should help strengthen dietary diversity awareness through organizing regular trainings, seminars
and having outreach programmes to have kitchen garden demonstrations in the homesteads.

The government should enforce policy on dietary diversity guidelines through provision of single user friendly dietary diversity guideline for 6 - 23 months old children. The guideline can be simplified according to the following age groups; 6 - 8 months, 9 - 11 months and 12-23 months and all the food groups in each age category listed alongside all the foods in that particular food group.

**5.3.2 Recommendations for practice**

The study recommends Ministry of Public health to promote dietary diversity awareness to parents/caregivers with emphasis on fruits, vegetables and meats. This can be done through organising regular health talks during the hospital visits and also in the health clinics basically on dietary diversity with clear demonstrations of the several food groups listed under dietary diversity. It should also encourage them to seek prompt treatments for their children illnesses.

**5.4 Suggestion for further research**

The study was done towards the end of the rain season and therefore it suggests a study on dietary diversity and the nutritional status of children 6 – 23 months old in Makindu division during the harvest season to compare the dietary diversity score in relation to the nutritional status of the children.
REFERENCES


Makueni District report (2011). *Long rains assessment report 1\textsuperscript{st} - 4\textsuperscript{th} August, 2011*.


USAID (2005). A focus on gender. Collected papers on gender using DHS data, ORC Macro, Calverton, Maryland, USA.


for-height and body mass index-for-age: Methods and development. Geneva: World Health Organization.


APPENDICES

APPENDIX 1: INFORMED CONSENT

My name is Salome Nduku Kasimba a Kenyatta University Postgraduate student pursuing a Master of Science degree in Foods Nutrition and Dietetics. I will be collecting data on Dietary Diversity and Nutritional status among children aged 6-23 months old in Makindu division. I would like to ask you questions about your family. Participation on this study is voluntary. Confidentiality of any information relating to your household is not subject to disclosure.

Do you agree to participate?
Yes [ ]
No [ ]
APPENDIX 2: RESEARCHER ADMINISTERED QUESTIONNAIRE

<table>
<thead>
<tr>
<th>Person ID</th>
<th>Person name</th>
<th>Age months for children &lt;5 and years for over 5's</th>
<th>Sex</th>
<th>Relationship type</th>
<th>Highest education attained</th>
<th>Main occupation</th>
<th>Marital status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1= HHH</td>
<td>1= no formal education</td>
<td>1= cattle keeping</td>
<td>1= polygamous married</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 = spouse</td>
<td>2 = subsistence farming</td>
<td>2= monogamous married</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>3 = parent of head</td>
<td>3 = adult education farming</td>
<td></td>
<td>2 = divorced</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>4 = child of head</td>
<td>4 = form 1-8</td>
<td></td>
<td>4 = widowed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5 = other relation to head</td>
<td>4 = form 4 only</td>
<td></td>
<td>5 = single adult</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6 = friend /not related to head</td>
<td>4 = form 4+training</td>
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<td></td>
<td></td>
<td></td>
<td>6 = Form 6</td>
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<td></td>
<td></td>
<td></td>
<td>7 = form 6+ training</td>
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<td></td>
<td></td>
<td></td>
<td>8 = University</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>9 = still in school</td>
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<td></td>
<td>10 = Other specify</td>
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<td></td>
<td></td>
<td></td>
<td>10 = domestic help</td>
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<td>11 = others specify</td>
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</tbody>
</table>

1. I would like to ask you questions on the composition on your household (HH), starting with the household head (HHH) please tell me the number of persons you are living with in the same household, including their age sex, marital status, relationship to HHH, education and occupation.
SECTION B: SOCIOECONOMIC STATUS

1. What are your sources of income?
   1. Salaried job [ ]
   2. Shop owner [ ]
   3. Help from children [ ]
   4. Casual waged labour [ ]
   5. Small own business [ ]
   6. Other specify

2. How much Kshs do you earn per month?
   1. Father ________________________
   2. Mother ________________________

3. Do you live in a
   1. Rented house [ ]
   2. Own house [ ]

4. What is the main source of cooking fuel?
   1. Kerosene [ ]
   2. Electricity [ ]
   3. Firewood [ ]
   4. Charcoal [ ]
   5. Gas [ ]
   6. other specify

5. Which of the following are owned by your family?
   1. Television [ ]
   2. Radio [ ]
   3. Telephone [ ]
4. DVD player [ ]
5. Bicycle [ ]
6. Land [ ]
7. Plot [ ]
8. Car [ ]
9. Motorcycle [ ]

SECTION C: MORBIDITY STATUS FOR CHILDREN AGED 6-23 MONTHS

<table>
<thead>
<tr>
<th>Child code</th>
<th>child name</th>
<th>During the past 2 weeks did (name) suffer from any illness/ injury? 1 = yes 2 = no</th>
<th>If yes for how many days did (name) suffer from any illness? 1 = &lt; 2 days 2 = 2-5 days 3 = other specify</th>
<th>Can you describe the symptoms 1 = Cough 2 = Fever 3 = Diarrhoea 4 = Vomiting 5 = Cold 6 = Skin infection 8 = No appetite 9 = Others specify</th>
<th>Was any one consulted for that illness? 1 = yes 2 = no</th>
<th>If no, reason 1 = lack of money 2 = health facility far 3 = illness not severe 4 = Other specify</th>
</tr>
</thead>
</table>

If yes where did you go for the consultation?
1 = Health facility
2 = traditional healer
3 = pharmacy
4 = ordinary shop
5 = other specify

How soon did you seek the consultation?
1 = within 24 hours
2 = after 24 hours

How far is the nearest health centre from your home?
1 = 1 kilometre
2 = 2 kilometres
3 = 3 kilometres
SOURCE OF WATER, SAFETY AND DISTANCE FROM WATER SOURCE

1. What is the source of your drinking water?
   1) Public tap [ ]
   2) Borehole [ ]
   3) Protected dug well [ ]
   4) Rainwater [ ]
   5) Unprotected dug well [ ]
   6) Surface water [ ]
   7) Other ____________________________

2. How long does it take to obtain the water (round trip)
   1) Less than 10 minutes
   2) More than 30 minutes
   3) Other ____________________________

3. Is the water treated before consumption?
   1) Yes [ ]
   2) No [ ]

4. If yes which method do you use? ____________________________

5. Distance of water source ____________________________
   1) < 2km [ ]
   2) 3km [ ]
   3) 4km [ ]
   4) 5km [ ]
   5) 7km [ ]
SECTION D: ASSESSMENT OF NUTRITIONAL STATUS OF CHILDREN

1. DIETARY ASSESSMENT

A) 7 DAY FOOD FREQUENCY QUESTIONNAIRE

1. Please tell me the frequency of consumption of the following foods you gave to your child in the last seven days.

<table>
<thead>
<tr>
<th>Child code</th>
<th>Child name</th>
<th>FOOD ITEM</th>
<th>1=daily</th>
<th>2=twice a week</th>
<th>3= thrice a week</th>
<th>4=Once a week</th>
<th>5=Not consumed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Meats</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Beef</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Liver</td>
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<tr>
<td></td>
<td></td>
<td>Poultry</td>
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<tr>
<td></td>
<td></td>
<td>Fish</td>
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<td></td>
<td></td>
<td>Organ meat</td>
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<tr>
<td></td>
<td></td>
<td>Grains, roots and tubers</td>
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<tr>
<td></td>
<td></td>
<td>Maize flour</td>
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<td>Millet</td>
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<td>Chapatti</td>
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<td></td>
<td></td>
<td>Sweet potatoes</td>
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<td></td>
<td></td>
<td>Cassava</td>
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<td></td>
<td></td>
<td>Arrow roots</td>
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<td></td>
<td></td>
<td>Rice</td>
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<td></td>
<td>Sorghum</td>
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<td></td>
<td></td>
<td>Others specify</td>
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<td>Legumes and nuts</td>
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<td></td>
<td></td>
<td>Cowpeas</td>
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<td>Beans</td>
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<td>Green gram</td>
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<td>Dairy products</td>
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<td>Milk</td>
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<td>Yogurt</td>
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<td>Cheese</td>
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<td>Eggs</td>
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<td>vitamin-A</td>
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<td>rich fruits and vegetables</td>
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<td>Carrots</td>
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<td>Avocado</td>
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<td>Spinach</td>
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<td>Mango</td>
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<tr>
<td>Pawpaw</td>
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<td>Sukuma wiki</td>
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<tr>
<td>Other fruits and vegetables</td>
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<td>Onion</td>
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<tr>
<td>Cabbage</td>
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<tr>
<td>Bananas</td>
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<tr>
<td>Tomatoes</td>
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<tr>
<td>Passion fruits</td>
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<tr>
<td>Others specify</td>
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</tbody>
</table>
**B) 24 HOUR RECALL**

1. Please mention all the foods given to the child yesterday during the day and the night.

<table>
<thead>
<tr>
<th>Child code</th>
<th>Child name</th>
<th>Child age in months</th>
<th>Time</th>
<th>Dish</th>
<th>Ingredient</th>
<th>Method of preparation</th>
<th>Amt in household measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 = 6-11</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2 = 12-17</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3 = 18-23</td>
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- Breakfast
- Snack
- Lunch
- Snack
- Supper
- Other
- specify
2. Is the child breastfed 1 = yes [ ] 2 = no [ ]

C. ANTROPOMETRIC ASSESSMENT

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APPENDIX 3: OBSERVATION CHECK LIST

1. Is there a latrine in the compound? 1 = yes [ ] 2 = no [ ]
2. Is there a garbage collection pit in the compound? 1 = yes [ ] 2 = no [ ]
3. Does the house look clean? 1 = yes [ ] 2 = no [ ]
4. Is there variety of foods groups in the households? 1 = yes [ ] 2 = no [ ]
5. Is there variety of food groups in the nearby markets? 1 = yes [ ] 2 = no [ ]
6. Is the variety of food groups' available fresh? 1 = yes [ ] 2 = no [ ]
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THIS IS TO CERTIFY THAT:

Prof./Dr./Mr./Mrs./Miss. Salome Nduku Kasimba

of (Address) ...Kenyatta University...
Box 43844 Nairobi

has been permitted to conduct research in ...

Location, Makindu
District, Eastern
Province,

on the topic:

"Dietary diversity and nutritional status among children aged 6-23 months in Makindu Division, Makueni County".

for a period ending, 31st July 2011...