

**FACTORS ASSOCIATED WITH THE NUTRITIONAL STATUS
OF CHILDREN AGED 3-5 YEARS IN KAMBI ODHA SUB-
LOCATION OF ISIOLO COUNTY, KENYA**

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**Factors Associated with the Nutritional Status of Children Aged 3-5
years in Kambi Odha Sub-location of Isiolo County, Kenya**

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Technology, Kenya**

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DECLARATION

This thesis is my original work and has not been presented for any degree in any other university.

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DEDICATION

This thesis is dedicated to my late parents, Karieny Wagura and Wangui Gitonga for implanting into me the virtue of fear of God and hard work. This has constantly inspired me to always trust in God and aim higher. To my late nephew, Karieny Taiti this is also for you.

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ABBRAVIATION AND ACRONMYS

| | |
|---------------|--|
| ACF | : Action Against Hunger (Action Contre la Farim) |
| AIDS | : Acquired Immuno-Deficiency Syndrome |
| ASAL | : Arid and Semi Arid Land |
| BMI | : Body Mass Index |
| CPR | : C-reactive Protein |
| DFID | : Department for International Development |
| EU | : European Union |
| FAO | : Food and Agriculture Organization |
| FGD | : Focus Group Discussion |
| GOK | : Government of Kenya |
| HIV | : Human Immunodeficiency Virus |
| JKUAT | : Jomo Kenyatta University of Agriculture and Technology |
| KEMRI | : Kenya Medical Research Institute |
| MUAC | : Mid-Upper Arm Circumference |
| NGO | : Non-governmental Organization |
| PEM | : Protein Energy Malnutrition |
| SMART | : Standardized Monitoring and Assessment of Relief and Transitions |
| SAS | : Statistical Analysis System |
| UNICEF | : United Nations Children’s Fund |
| UNAIDS | : United Nations Programme on HIV and AIDS |
| WB | : World Bank |
| WHO | : World Health Organization |

DEFINITION OF TERMS

Obesity: This is weight-for-height Z-score or Body Mass Index (BMI) -for-age Z-score greater than +3 (WHO, 2006).

Malnutrition: Malnutrition is the cellular imbalance between supply of nutrients and energy and the body's demand for them to ensure growth, maintenance and specific functions (WHO, 2006).

Under nutrition: Under nutrition is a consequence of consuming too few essential nutrients or using or excreting them more rapidly than they can be replaced (Golden, 1996).

Nutritional status: Refers to whether or not one is getting correct amounts and types of the required nutrients (WHO, 2006).

Severe Wasting: Severe wasting is weight-for-height Z-score of less than -3 or Mid-upper Arm circumference (MUAC) of less than 115mm and is associated with high mortality from infectious diseases (WHO, 2006).

ABSTRACT

Nutritional status of an individual depends on whether or not one is getting correct amounts and types of the required nutrients failure to which malnutrition develops. Malnutrition remains a public health concern as it affects a great number of children globally. Causes of malnutrition may be immediate like inadequate food intake and diseases, underlying causes such as inadequate care of women and children and poor health services or basic like socio-economic and political causes. The main objective of this study was to determine the factors associated with the nutritional status of children aged between three and five years in Kambi Odha Sub-location of Isiolo County, Kenya. This study was a community-based cross-sectional study which utilized both quantitative and qualitative techniques. Systematic random sampling was used in selecting the study participants. A sample size of 196 children was targeted. Questionnaires and focused group discussions were used to collect data from amongst mothers of children aged 3-5years. Nutritional status, socio-demographic and economic status, health related, food consumption, water consumption and sanitation status data were collected. Data from the questionnaire was analyzed using descriptive statistics and Chi-square test. Anthropometric data was analyzed using z-scores as standard reference as recommended by WHO Test (2006). Data has been presented using tables, measures of deviation, percentages, bar chart and pie chart. Data from the focus group discussions was analyzed manually using thematic analysis. The prevalence of stunting (height-for-age), underweight (weight-for-age) and wasting (weight-for height) was 17%, 9% and 2% respectively. Factors significantly associated with poor nutritional status were the child's mother being a housewife (OR 6.7; 95% CI 1.3-19.9, $p=0.0006$), child's mother having no formal education (OR 6.2;95% CI 1.8-21.4, $p=0.0040$), head of the household being employed (OR 3.3;95% CI 1.3-8.2, $p=0.0116$), mother's child having 7 or more children (OR 6.6; 95% CI 1.7-26.4, $p=0.0236$),child having poor appetite (OR 3.3; 95% CI 1-8, $p=0.0285$), husband determining the food to be bought or prepared in the household (OR7.1; 95% CI 2.7-18.7, $p< 0.0001$), money determining the food to be prepared or bought (OR8.7; 95% CI 3.4-22.1, $p<0.0001$), buying or borrowing water for household use (OR 4.8; 95% CI 1.7-13.9, $p=0.0039$) and absence of own pit latrine within the compound (OR 4.2; 95% CI 1.3-13.3, $p=0.0155$).Child malnutrition continue to be a public health concern as the study demonstrated manageable and largely preventable factors such as environmental and family

as having higher association with poor nutritional status of the children. Poor nutritional status of children mean continued and increased loss of productivity and lives given that malnutrition has severe and even irreversible consequences. To achieve optimal results, participation and involvement of mothers and other community stakeholders should be established or strengthened towards addressing child malnutrition.

CHAPTER ONE

INTRODUCTION

1.1 Background information

Nutritional status refers to whether or not one is eating correct amounts or types of the required nutrients whereby malnutrition develops incase wrong types and incorrect amounts are consumed. Malnutrition is the cellular imbalance between supply of nutrients and the body's demand for them to ensure growth, maintenance and specific functions (World Health Organization, 2006). Various types of malnutrition have different manifestations. For instance, stunting is a height-for-age Z-score of less than -2 and due to chronic under-nutrition. It is associated with impaired growth and intellectual development. Wasting is weight-for-height Z-score of less than -2 or Mid-upper Arm circumference (MUAC) of less than 125mm and it is due to acute under nutrition. Underweight is weight-for-age Z-score of less than -2 and is a result of stunting, wasting or both. Overweight is weight- for- height Z score or Body Mass Index (BMI) -for-Age Z-score of greater than +2 (United Nations Children's Fund, WHO & World Bank, 2014).

Causes of malnutrition include immediate, underlying and basic causes (UNICEF & WHO, 2013). Immediate causes are inadequate food intake and infections such as measles, respiratory infections and worm infestation. Insanitary environment, inadequate care of women and children, poor health service and household food insecurity are all underlying causes of malnutrition. Basic causes are such as socio-cultural, economic and political. Malnutrition therefore occurs when there is prolonged discrepancy between food consumption and nutritional needs. Malnutrition remains a public health concern as there are 42 million under five years old children who are overweight, 99 million underweight, 51 million wasted and one in four children stunted globally (UNICEF, et al, 2014). Malnutrition in children aged between three and five years affects both developed and developing countries. Numerous studies have reported alarming levels of malnutrition. A study in Netherlands on children aged 3-5 years observed that 74.3% of these children had risk factors for cardiovascular diseases due to malnutrition (Bocca *et al.*, 2013). Sixteen thousand, three hundred and thirty five children aged 1-17 years were grouped into four categories, healthy weight, overweight, obese and very obese and studied by University of North Carolina, America revealed that 42.5% of the very obese children were between 3-5 years and also had

elevated C-reactive Protein (Skinner *et al.*,2010). A study carried out from 2007-2010 on children aged 3-5 years in USA observed prevalence of obesity was highest among Hispanic 18.2% in boys, 15.2% in girls followed by Blacks 12.4% in boys and 12.7% in girls (Lo *et al.*,2013). In a study on preschool teachers to determine whether or not they find obesity to be a significant problem facing the 3-5 years old children in Philadelphia reported that they agreed obesity is a concern affecting academic, social and physical growth of the children (Mckinney, 2010). Prevalence of malnutrition was found to be 18.2% among children aged 3-5 years in Haor Basin of Bagladesh (Islam & Hasin, 2014). A study on children aged 3-5 years residing in the catchment area of Ram Nagar Health centre in India observed that 29.1% of the children were underweight, 28.4% wasted and 28% stunting (Das *et al.*, 2014). Ghazi *et al.*, (2013) in Baghdad City, Iraq also demonstrated an overall prevalence of malnutrition of 18.2% among children aged 3-5 years.

Prevalence of malnutrition was also observed by a study conducted in Hawassa, Southern Ethiopia on children aged 36-60 months whereby underweight was 43.6%, stunting 53.1%,wasted 28.2% and overweight and obesity 10.7% (Wolde *et al.*, 2012). A study in Kisumu, Kenya on children aged 3-5 years revealed 14.3% of the children were underweight, 3.6% wasted and 2.6% stunted (Wasunna, 2012). Another study on children aged 3-5 years in Nairobi, Kenya observed that underweight was at 16%, stunting 4.3% and 1% wasting (Ngatia *et al.*, 2005).

1.2 Problem Statement

The right to good nutrition for every individual is recognized under the international law (Ziegler, 2008). Despite this recognition many young children continue to suffer and die from malnutrition globally, including Kenya particularly in Arid and Semi Arid (ASAL) areas like Isiolo. Prevalence of chronic malnutrition in Isiolo county has stagnated at 20% which is very high compared to 6% the national malnutrition level (Government of Kenya/Food and Agriculture Organization, 2012). Poor growth, wasting and hair colour change are some of the characteristics of the malnourished children (UNICEF, 2013). Regular surveys and surveillance data in Isiolo county have concentrated on children aged five years and below in general and not specific age groups within this age bracket such as the preschool children who are aged 3-5 years (Action against Hunger & International Medical Corps, 2013; ACF, 2014). At 3 years the child has to learn the normal feeding methods as exclusive breast feeding and complementary feeding ends at 2 years and this subjects the child to consequences of malnutrition especially where the age appropriate food is not accessible. A

child between 3-5 years does not receive quality care from the mother because mostly they may have sibling followers meaning more work for the mother. Also the mother leaves the child under the care of other young children to engage in income generating activities therefore the child is exposed to eat anything at reach and this could lead to diarrheal diseases and later malnutrition. Children between 3-5 years mainly get their nutrients within the household hence their nutritional status reflects the status of the homestead. A child aged above 5years is likely to get nutrients outside his/her homestead and this may give a false reflection of the status of the household. The long standing prevalence of child malnutrition that leads to loss of lives and productivity may be combated by continued and regular studies to give the current nutritional status of children.

1.3 Justification of the study

Malnutrition among children aged five years and below is a public health problem globally. Worldwide, about 3 million children die annually of poor nutritional status and Global statistic for surviving undernourished children indicate that nearly 171 million children are chronically undernourished (stunted), 60 million acutely undernourished (wasted) and 100 million underweight. Malnourished children are highly susceptible to common childhood ailments such as respiratory infections and worm infestations. Recurrence of such ailments falters a child's physical, behavioral, motor and cognitive development as well as compromising his/her health and functioning in adulthood (Matanda *et al.*, 2014). As a country develops, the level of malnutrition is expected to decrease but in Kenya the level of stunting is at 35% which is an increase compared to 30% in 2003 (UNICEF, 2013).The prevalence of acute malnutrition now stands at 15% among the communities who live in ASAL region of Kenya such as Isiolo County despite of the presence of various feeding programs by government, charitable organizations and Non-governmental Organizations (GOK & FAO, 2012). Various studies confirm that the Isiolo County experiences plateau levels of acute and chronic malnutrition at 10% and 20% respectively (ACF, 2014).This signifies a worrying future to children, mothers, the ASAL region and Kenya as a whole. There is no documented evidence of any study of children aged 3-5 years in the study area. Since nutritional status of children aged 3-5 years has not been evaluated there exists a gap that needs to be addressed. The findings have given the current status which is a starting point for advocacy towards policy refinement and appropriate intervention focusing Isiolo County whose 70% and 71% of the population is pastoralist and live below poverty line respectively.

1.4 Research Questions

- 1) What is the nutritional status of children aged 3-5 years in Kambi Odha Sub-location, Isiolo County?
- 2) What are individual level factors associated with nutritional status of children aged 3-5 years in Kambi Odha Sub-location, Isiolo County?
- 3) What is the knowledge and attitude of mothers of children aged 3-5 years on nutritional needs of their children in Kambi Odha Sub-location, Isiolo County?

1.5 Objectives of the study

1.5.1 Broad objective

To determine the factors associated with the nutritional status of children aged 3-5 years in Kambi Odha Sub-location, Isiolo County.

1.5.2 Specific objectives

- 1) To determine the nutritional status of children aged 3-5 years of Kambi Odha Sub-location, Isiolo County.
- 2) To determine the individual level factors associated with nutritional status of children aged 3-5 years in Kambi Odha Sub-location, Isiolo County.
- 3) To determine knowledge, attitude and practices of mothers of children aged 3-5 years on nutritional needs of their children in Kambi Odha Sub-location, Isiolo County.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Malnutrition is the cellular imbalance between supply of nutrients and energy and the body's demand for them to ensure growth, maintenance and specific functions. Malnutrition results from either under-nutrition or over-nutrition and has for long time remained a public health problem both in developed and developing nations (UNICEF, 2013). Numerous studies on child malnutrition by several authors have evidenced this global problem (Mckinney, 2010; Bocca *et al.*, 2013; UNICEF *et al.*, 2014). The first five years of life are critical stages for a child's growth and development and all necessary measures should be taken to prevent nutritional deficiencies during this period. Nutritional deficiencies cause permanent mental and physical impairment and even death leading to huge loss to individual children and massive loss to nations' development. Giving enough attention to Nutrition as individuals, planners and leaders will result to effective nutrition care process provision (Rosenzweig & Binswanger, 1993; Dewey & Adu-Afarwuah, 2008; WHO, 2013). Lack of enough attention to nutrition as individuals, planners and leaders was acknowledged during a National Nutrition Symposium held in February, 2015 in Nairobi, Kenya. It was noted that 2.8 million of children aged less than five years were stunted and over 19,000 of these children die every year due to underweight in Kenya. As a significant contribution to efforts of scaling up nutrition a four year Nutrition Resilience programme was launched during the Symposium whose theme was step up commitments to Scale up Nutrition in Kenya (GOK & UNICEF, 2015).

Nutrition care process is the systematic approach to providing high quality nutrition care. The process includes various steps first, nutritional assessments which involve obtaining data about a client or population and then interpreting the data using evidence based standards. Secondly, nutrition classification or diagnosing which refers to identifying the problem and determining the causes or contributing risk factors. Thirdly, is nutrition intervention which involves selecting, planning and implementing appropriate action such as counseling, treating or referring the client for further management. Fourthly, nutrition monitoring and evaluation of the client is done. The results of the client's nutrition assessment and classification of nutritional status then determines all the other elements of nutrition care process which

include counseling, support treatment, or referral to food security and any other support (Rosenzweig & Binswanger, 1993; Ashworth *et al.*, 2008; WHO, 2013).

2.2 Nutrition assessment

Nutrition assessment is collecting information about a client's medical history, anthropometric measurements, clinical and biochemical characteristics, dietary practices, current treatment, and socioeconomic situation including food security. This information identifies medical complications that affect nutrition. It also tracks growth and weight, detects dietary habits that increase the risk of disease, informs nutrition education and counseling, and establishes a framework for an individual nutrition care plan. Nutrition assessment requires training and should be done by clinicians, dietitians, nutritionists and other appropriately trained health workers for it to result to a positive impact on child nutrition. For instance, a systematic review of interventions across 25 countries demonstrated a reduction in child malnutrition in areas where nutrition assessment was carried out and nutrition education interventions implemented (Dewey & Adu-Afarwuah, 2008).

2.2.1 Nutrition assessment methods

Types of nutrition assessment are varied such as Anthropometric assessment which involves for instance, weight and height taking and also measurement of Mid-Upper Arm Circumference (MUAC). Biochemical assessment is another type used and requires laboratory test that involve checking the levels of nutrients in a person's stool, urine and blood. Clinical assessment is another type of assessment that checks for any visible signs of nutritional deficiencies for instance emaciation, hair loss, bilateral pitting edema and hair colour change. It also include asking about symptoms of infections that can increase nutrients needs such as fever and nutrients loss such as diarrhea and vomiting as well as medical conditions that impair digestion and nutrients absorption and increase the risk of developing malnutrition. Dietary assessment is the method where food and fluid intake is assessed so as to get the dietary quantity and quality information. The results are then compared with the recommended intake such as recommended dietary allowance (Fishman *et al.*, 2004; WHO, 2013). However, due to finance and time constraints this study focused only on anthropometric method (weight-for-height, height-for-age and weight-for-age).

2.2.2 Importance and frequency of nutrition assessment

Nutrition assessment is very necessary for it helps to identify people at risk of malnutrition who require early interventions or referral before they become malnourished as well as those already malnourished clients who urgently need treatment. It helps detect practices that increase the risk of malnutrition and infection and establishment of appropriate nutrition care plans (WHO & UNICEF, 2013). A study by Cuizat and Mattinen, (2011) for instance, demonstrated that cultural values and beliefs especially those affect the children and mothers mediate the impact of risk factors of malnutrition on members of the household.

Bhutta *et al.*, (2008) described nutrition assessment of children under five years as an effective platform to deliver nutrition counseling and referrals for children identified as affected by malnutrition. A study in South Asia, Africa and Caribbean further demonstrated nutrition assessment importance after finding evidence that children who receive growth monitoring have better nutrition and survival outcomes than children who do not receive the growth monitoring interventions (Ashworth *et al.*, 2008).

The frequency of nutrition assessment depends on a client's age, pregnancy, disease status and also on national policies. The recommendations however should be adjusted based on national guidelines of each country. In Kenya the assessment is based to WHO guidelines whereby pregnant and postpartum women should be assessed on every antenatal/postnatal visit, infants aged less than 6 months of age is at birth and on every scheduled post-natal visit also termed as growth monitoring. Infants aged 6–59 months of age should be assessed during the monthly growth monitoring sessions recommended for children under 2 years and every 3 months for older children. Children over 5 years of age need to be assessed on every clinic visit whereas adolescents and adults should be assessed on every clinic visit. However people with HIV should be assessed on every clinic visit and when initiating or changing antiretroviral therapy (UNAIDS, 2008; WHO, 2012).

Malnutrition has remained a major Public Health problem globally posing grave health and economic consequences in population especially now the world is facing double burden of over-nutrition and under-nutrition.

2.3 Under- nutrition and classifications

Under-nutrition is a consequence of consuming too few essential nutrients or using or excreting them more rapidly than they can be replaced. In children, the outcome is growth

(weight or height) faltering and/ or specific symptoms and signs of micronutrients deficiency disorder (Golden, 1996; WHO, 2012). According to UNICEF framework developed in 1998 causes of malnutrition are number of direct determinants of nutrition termed as immediate causes, followed by a further group, the underlying causes and at the periphery, the basic causes. Basic causes include political, ideological, economic, environmental resource and technology factors (UNICEF, 2013). According to Golden, (1996) under-nutrition is classified into type I and type II nutrient deficiencies.

Type I nutrients includes iron, calcium, iodine, selenium and all the vitamins. These nutrients are stored in the body and mainly required for specific metabolic functions (biochemical, pathways) in the body, rather than for metabolism in general. When a person's diet is deficient in type I nutrients, the person initially continues to grow normally. The body store of the nutrient is consumed first. The concentration of the nutrients in the tissue then falls until the specific metabolic function that depends on the nutrient declines and the person becomes ill. The illness is recognized by characteristic sign and symptoms and after this stage is reached, growth may or may not be affected secondary to the overt illness.

Types II nutrients includes proteins, energy, zinc, magnesium, potassium and sodium. When there is deficiency in one of the type II or "growth" nutrients, the person stops growing. The body starts to conserve the nutrients; its excretion falls to very low levels so that there is no reduction in the tissue concentration. With continued or severe deficiency, the body starts to break its own tissues to release the nutrients for use by the rest of the body and this process is associated with reduced appetite. The nutrients have no body store that can be called on in an emergency and into which excess nutrients can be deposited. There are three kinds of type II under- nutrition in children; stunting, underweight and wasting (Golden, 1996).

UNICEF, (2013) revealed that stunting affects approximately 195 million children under 5 years old in the developing world, or about one in three children. That study revealed Africa and Asia were the continents with high stunting rates of 40% and 36%, respectively and had more than 90% of the world's stunted children. UNICEF estimates that 129 million children under 5 years old in the developing world are under-weight nearly one in four. 10% of children in the developing world are severely underweight. The prevalence of underweight is higher in Asia than in Africa, with rates of 27% and 21%, respectively. Children who suffer from wasting face a markedly increased risk of death. Also 13% of children who are under 5 years old in the developing world are wasted and 5% are extremely wasted according to the same report.

2.3.1 Risk factors for child under- nutrition

According to Hoddinatt *et al.*, (2012) there are proximal and distal risk factors:

2.3.1.1 Proximal Risk Factors

These are factors that act directly or almost directly to cause malnutrition. These risk factors are addressed by Nutrition-specific interventions or programs such as adequate food and nutrients intake, feeding, care-giving and parenting practices and low burden of infectious diseases (Lopez *et al.*, 2006; DFID, 2012).

2.3.1.1.1 Inadequate energy and nutrient intake

Inadequate energy and nutrient intake lead directly to child under-nutrition. Specifically, chronic energy and /or nutrients depletion in young children leads to slowed skeletal growth and a loss of or failure to accumulate muscle mass and fat. Deficiencies of specific nutrients including vitamin A, iron, iodine, zinc and thiamine are also directly associated with increased risk of morbidity and mortality in infants and young children as follows;

Vitamin A deficiency may lead to blindness and is also directly associated with increased risk of death before the age five years. Iron deficiency is associated with anemia and increased severity of infectious diseases like Malaria. Iodine deficiency is associated with goiter and cretinism, a condition of severely stunted physical and mental growth whereas Zinc deficiency is associated with impaired growth and increased mortality associated with diarrhea. Thiamine deficiency is associated with infantile beriberi, which may prove fatal by causing cardiac failure (Hoddinatt *et al.*, 2012; DFID, 2012).

2.3.1.1.2 Infectious Diseases

There is a strong correlation between infectious diseases such as acute respiratory infections, malaria and measles and under-nutrition in children. Infectious diseases negatively affect child nutrition status, with the impact proportional to the severity of infection (WB, 2008). Infectious diseases can lead directly to child under-nutrition in four ways;

Infections increase a child energy or nutrients requirement, making it difficult for them to consume sufficient food such as HIV positive children have 50-100% greater energy requirement than their HIV negative counterparts, because of the increased energy requirement to combat opportunistic infections (UNAIDS, 2008).

Infections common in low-income settings can also reduce the capacity of a child's body to absorb energy or nutrients from food. Intestinal helminthic infestations can lead to mal-absorption and helminthic infection in early childhood has been associated with a growth shortfall of 4.6 cm at 7 years of age (Moore, 2001). Infections including helminthes and HIV can directly reduce food consumption by reducing appetite. Symptoms like vomiting, abdominal pain and dry mouth can also decrease the capacity or desire of children to eat. Diseases can also lead to centrally controlled appetite suppression through the release of the cytokine interleukin-1 which is secreted by certain cells of the immune system in response to infection. Parents also withhold food and drinks from sick children in the belief that this will assist in their recovery from illness and this can lead to under-nutrition through restricted food intake (Stephenson *et al.*, 2008).

2.3.1.1.3 Inadequate care and feeding practices including health care seeking behaviors

The dependent status of infants and young children has made food intake and disease to be very strongly influenced by the feeding, care-giving and health care-seeking practices of the caregiver. It is not conceptually therefore meaningful to separate for example, food intake from feeding practices (DFID, 2012). Inappropriate infant and young child feeding practices have a negative impact on child nutrition status. WHO recommends breastfeeding initiation within 1 hour of birth, exclusive breastfeeding for the first 6 months and appropriate complementary feeding beginning at 6 months with breastfeeding continued for 2 years and beyond (WHO, 2013). Negative impact on child nutrition are seen where WHO's recommendations are not followed such as a study done in Ghana found that 22% of neonatal deaths could have been averted through early initiation of breastfeeding within the first hour of birth (DFID, 2012).

Health care-seeking practices of caregivers are key to whether or not infants and young children are protected from the harmful impact of infectious diseases on nutritional status (Bhutta *et al.*, 2008). In Sri Lanka, high rates of health care-seeking have been associated with low child mortality in a setting with a high prevalence of child under-nutrition and this suggests that appropriate health care seeking can reduce the risks of illness and death associated with under-nutrition (Amarasiri de Silva *et al.*, 2001). On the other hand, poor health care seeking has been implicated in 60-70 % of child deaths across diverse settings (Hill *et al.*, 2006; WHO, 2006). Findings by Reyes *et al.*, (1997) found that children whose caregivers seek health care in a timely way are 19.5 times less likely to die than children whose caregivers do not seek timely care.

2.3.1.1.4 Inequitable intra household food allocation

Inequitable food allocation between girls and boys children, women and men is a major contributing factor to child under-nutrition and can be considered a leading proximal cause of child under-nutrition at the global level. There is evidence in some rural areas of India that food intake of girl child is consistently of lower quality and/or quantity than that of male children in the same household (Dasgupta, 1987). This inequitable allocation of food between boy and girl child within household has also been recognized by the UNICEF regional office for South Asia (Dasgupta, 1987). Inequitable intra-household allocation of food also affects women and has been reported that food intake of women in South Asia is routinely of low quality and quantity than that of men and boy children within the same household (Ramalingaswami *et al.*, 1996; UNICEF, 2002).

2.3.1.1.5 Inadequate maternal, neonatal and child health service

There is an association between the quality and accessibility of maternal, neonatal and child health services and child nutritional status. This is because care seeking can have a protective effect on child health and survival outcomes associated with nutritional status (WB, 2008). Improvement in the quality and accessibility of health services lead to substantial improvements in child nutritional status and this was evident in Colombia and Ghana whereby a cross-country review of successful community based primary health care services found that there was an average fall in the prevalence of child underweight of 1-2% per year (Saaka & Galaa, 2011; Mosquera *et al.*, 2012). DFID, (2012) India found out that institutional discrimination in health services and among nutrition workers which excludes children from socially marginalized groups from accessing care contributed to a substantially higher prevalence of underweight in children within these groups.

2.3.1.2 Distal Risk Factors

These are factors that are further back in the causal chain and act via a number of intermediary causes. These factors at household level place children at risk of inadequate food intake, disease, inadequate care and feeding practices. These factors are addressed by Nutrition- sensitive interventions or programs such as food security, adequate care- giving resources at maternal level, household and community level, access to health services and safe and hygienic environment (Lopez *et al.*, 2006; DFID, 2012)

2.3.1.2.1 Unhealthy household environment, water, sanitation and hygiene

Insufficient access to safe water, adequate sanitation facilities and basic hygiene practices results in exposure to repeated water-related diseases, including enteric and helminthic infections (Stephenson *et al.*,2008). Exposure to these diseases in early childhood is associated with stunting. A substantial proportion of wasting in children is caused by acute and chronic diarrhea that is attributable to inadequate water, sanitation and hygiene practices. It is estimated that 50% of total disease burden of under- nutrition is attributable to environmental factors, including inadequate water, sanitation and hygiene practices (WHO, 2006); Ustun, Wolf & Corvalan, 2016).

2.3.1.2.2 Low agricultural productivity and inadequate access to food

There is a strong relationship between agricultural productivity, household food sufficiency and poverty such that a 1 % increase in agricultural yield reduces the percentage of a country's population living on less than \$1 per day by 0.64-0.91% (Thirtle *et al.*, 2002 ; DFID, 2009). Thus low agricultural productivity can be expected to restrict the financial capacity of households to access food. Also where agricultural yields are insufficient to provide adequate food throughout the year a hungry season occurs among food producers and groups within the rural economy who rely on producers for their livelihood and this season is associated with substantial acute under- nutrition in children (Devereux *et al.*,2008). A multi country study in Myanmar, Ethiopia, Bangladesh and Tanzania found that the minimum cost of healthy diet is beyond the means of most households indicating that the required quality or quantity of food is not being consumed in these households (Chastre *et al.*,2007). Most of the undernourishment globally is attributable to food insecurity since it results from the inability of households to access sufficient food during the annual 'hungry season' when food stock are at their lowest preceding the harvest season (Devereux *et al.*, 2008).

2.3.1.2.3 Low socio-economic status of women

There is a strong and well-established correlation between the status of women and child nutrition status in developing countries. Based on data from 36 developing countries, it is estimated that the regional prevalence in South Asia of underweight in children aged less than 3 years would drop by 13% if men and women had equal status. For Sub-Sahara African countries where existing gender disparities are generally less sharp, the estimated effect is nearly 3% (Smith *et al.*, 2003). One key explanation for the impact of women status on child nutrition is the role of women as caregivers. Women are almost always the primary caregivers of infants and young children in developing countries and are closely involved

with the quality of feeding, exposure to diseases and care of infants and young children. Consequently under-nutrition results where women lack the capacity to support child nutrition. Social stressors on mothers, such as poverty, violence and heavy workloads can increase under-nutrition in children (Walker *et al.*, 2007). Additionally, where women have little control over how resources are allocated within the household, resources are less likely to be allocated to children's nutrition and health. Also inability of women to access control of the use of resources for their own wellbeing has a significant negative impact on the nutrition and health of their children (UNICEF, 2013). A study in Uganda further demonstrated that mother's education is the best prediction of the child's health in a community and not the household assets, land ownership or father's education (Wamani *et al.*, 2004).

2.3.1.2.4 Poverty and household level factors

At national level in any country, poverty is strongly associated with child under-nutrition. Countries with high proportions of their populations living in poverty have substantially higher levels of child under-nutrition. Inequitable distribution of wealth also influences child under-nutrition within national populations. A review of 50 developing countries found that severe stunting in children is almost three times higher among the poor than among the rich (Gwatkin *et al.*, 2007).

Poverty places direct constraints on households' ability to access food and health services and provide care in the immediate term. A study in South India found that poor rural household typically select low-risk, low-return crops rather than investing in high-risk, high-return crops, because they do not have the financial reserves to manage the higher risk of high yield (Rosenwerg & Binswanger, 1993).

Value, beliefs, strategies and trade-offs within individual households can mediate the impact of risk factors on household members' nutrition. For example the impact of household food insufficiency on child nutrition is mediated by intra-household decisions about the allocation of food and feeding practices for young children hence resulting to negative or positive impact on child nutritional status. Cultural beliefs can play a significant role in determining the diet for pregnant and lactating women, infants and children. Traditional food taboos are common in some communities and are passed on from generation to the next. A study of eight minority ethnic groups in two remote Northern provinces of the Lao People's Democratic Republic found that certain nutrition behaviours such as food taboos may contribute to the high prevalence of child malnutrition and micronutrients deficiencies (Dasgupta, 1987; Holmes *et al.*, 2007).

2.3.1.2.5 Weak governance

Numerous studies have found a correlation between governance and child nutrition status. A robust multivariate analysis of 82 countries found a correlation between lower rates of child under-nutrition and higher levels of government effectiveness, political, stability and rule of law. An in-depth study of governance and child under- nutrition in Madagascar found that political commitments, accountability, demand for nutrition and nutrition governance and effective financing led to substantial reduction in child under- nutrition (Rokx, 2006). Reducing malnutrition in a country is not just a health priority but also a political choice that calls for a multi- sector focus driven by a political will that acknowledges and respects the integral role that nutrition plays in ensuring a productive workforce and healthy population. Communities should also be empowered to demand their right to good nutrition and be encouraged and guided to play their part towards realizing their rights (GOK, 2012).

2.3.2 Consequences of child under-nutrition

In general under nourished or hungry children cannot learn as much as fast or as well because chronic under-nutrition harms their cognitive development during this critical period of rapid brain growth. This changes the fundamental neurological architecture of the brain and central nervous system hence make them do more poorly in school and have lower academic achievement because they are not well prepared for school and cannot concentrate (*Cook et al.,2009*).

2.3.2.1 Under-nutrition and illness/cancer and mortality

Under-nutrition increases the risk of infection and infectious diseases for instance, is a major risk factor in the onset of active tuberculosis. In communities that lack access to safe drinking water, these additional health risks also present a critical problem (WB, 2008).Cancer is now common in developing countries. According to a study by the International Agency for Research on Cancer, in developing countries, cancers of the liver, stomach, and esophagus were common, often linked to consumption of carcinogenic preserved foods such as smoked or salted food and parasitic infections that attack organs (*Cook et al., 2009*).According to Jean Ziegler, (2008) mortality due to under-nutrition accounted for 58% of the total mortality in 2006.

2.3.2.2 Under-nutrition and future generation and nation progress

Hunger respects no age barrier. It is wreaking a disproportionate impact on children with dire consequences for current and future generations. In many communities chronic hunger is “inherited.” For instance, the impact of under-nutrition on pregnant and lactating women severely restricts their children’s lifelong capacity for physical growth, intellectual development and economic productivity, perpetuating a vicious cycle of inter-generational hunger and poverty. Under-nutrition has a negative impact on a country’s production capacity as a result of a higher prevalence of mortality and lower level of education attained by the population suffering from under-nutrition. It hampers the progress and process of economic development of any nation which are essential to economic growth. Economic growth is essential for increasing incomes, reducing under-nutrition, poverty and improving food security. The manner in which development strategies achieve growth, is to recognize that all the number of people who participate in and benefit from it are as important as the growth itself. A healthy labour force is therefore needed to boost the progress of the nation (Martinez & Gutierrez, 1997).

2.3.2.3 Under-nutrition and psychological disorders

Under-nutrition also creates psychological disorders. According to the Lancet, (2013) under-nutrition in the form of iodine deficiency is the most common preventable cause of mental impairment worldwide. Even moderate iodine deficiency, especially in pregnant women and infants, lowers intelligence by 10-15 IQ points, posing an incurable potential loss to a nation’s development. Research indicates that improving the awareness of nutritious meal choices and establishing long term habits of healthy eating have a positive effect on a cognitive and spatial memory capacity, potentially increasing a student’s potential to process and retain academic information (Walker *et al.*, 2007).

2.3.3 Diseases associated with under-nutrition

Kwashiorkor is one of the serious forms of protein energy malnutrition (PEM). It is most frequently seen in children aged one year to three years of age, but can occur in any age. It is found in children who have a diet that is usually insufficient in energy and protein. Often the food provided to the child is mainly carbohydrates. Kwashiorkor is often associated with or even precipitated by infectious diseases. Diarrhea, respiratory infections, measles, whooping cough, intestinal parasites and other infections are common underlying causes of PEM and may precipitate children into either kwashiorkor or marasmus. These infections result into loss of appetite which is important as a cause of serious PEM. Infections especially those

resulting in fever, lead to an increased loss of nitrogen from the body which can only be replaced by protein in the diet. Marasmus is the other severe form of PEM. In marasmus, the deficiency is food in general, energy inclusive. It may occur in any age, most common up to about three to three and half years, contrary to kwashiorkor which is more common during the first years of life. Marasmus is a form of starvation and the possible underlying causes are numerous. But whatever the cause the child does not get enough supplies of breast milk or of any alternative food. A very common cause is early cessation of breastfeeding. Children with features of both marasmus and kwashiorkor are diagnosed as having marasmic-kwashiorkor. These are children with severe malnutrition who are found to have both oedema and a weight- for- age below 60% of expected for his/ her age. Marasmic-kwashiorkor child has all features of marasmus including severe wasting, lack of subcutaneous fat, poor growth, oedema, as well as features of kwashiorkor like diarrhea (WHO, 2006; FAO, 2012).

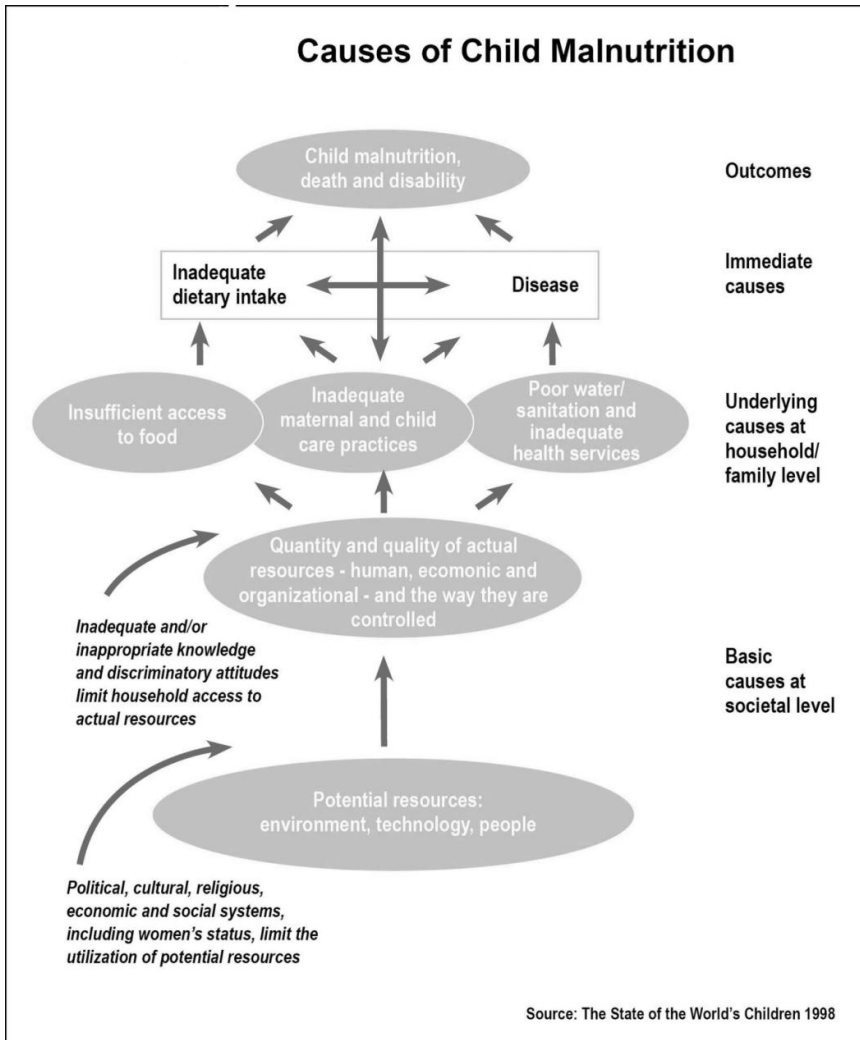
2.4 Over- nutrition

Overweight and obesity among the under five children are also on rise and have become a public health concern of the century low and middle income countries included. Globally, in 2013, 42 million under five children were overweight up from 32 million in the year 2000. In terms of regional breakdowns it was estimated that 18 million overweight children were in Asia, 11 million in Africa and 4 million in Latin America and the Caribbean. Countries with increased prevalence in overweight between the year 2000 and 2013 are such as South Eastern Asia which has an increase from 3% to 7% and South Africa from 1% to 19% (UNICEF et al, 2014). All these children are likely to develop non-communicable diseases like diabetes and cardiovascular diseases and even death all of which are largely preventable. For instance, during a Scaling up Nutrition national symposium in 2013, the Kenya government revealed that non-communicable diseases contribute to 33% of total mortality with prevalence of diabetes being reported at 4.2% and hypertension at 12.7% nationally. The government also revealed that 18% of the preschool children were overweight and 4 % of them were obese (GOK & UNICEF, 2013). The fundamental causes behind the rising levels of the childhood obesity and overweight are shift in diet towards increased intake of energy-dense foods that are high in fats and sugars but low in vitamins, minerals and other healthy micronutrients and a trend towards decreased levels of physical activity (UNICEF, et al, 2014). Parents focus on what their children love and not what is essentially vital as well as crucial to their children's nutrition and health in general for instance, consumption of greasy and fast foods.

As malnutrition remains a significant public health problem various studies focusing on the same have been carried out. In Anambra State, Nigeria, a study on children aged 3-5 years termed malnutrition as a major public health problem among preschool children after observing 4.8% of wasting, 6.8% underweight and 2.5% of severe stunting (Ilo *et al.*,2014). A study on prevalence of under-nutrition done in Malappuram, Kerala, on under five children observed that majority (87.9%) of undernourished children aged between 3-5 years whereby 24.1% of children were stunted 22.9% underweight and 15.1% wasted (Shibulal, 2013). Another study in Cameroon among Bangang community found out that the prevalence of stunting, underweight and wasting of preschool children was 41.26%, 10.52% and 3.58% respectively (Nolla *et al.*, 2014).A study in Dehradun, India found that 41.2% of preschool children suffered from some degree of malnutrition (Luthra & Parvani, 2010). Akorende and Abiola, (2011) in their study in Nigeria, Ondo State, found that the prevalence of stunted, wasted and underweight was 12.59%, 14.8% and 8.5% respectively. In Ludhiana, Punjab, a study on children aged 3-5 years revealed that 74% were stunted, 42% wasted, and 29.5% underweight (Sengupta *et al.*,2010).Ansuman and Sai, (2014), in their study involving children aged 3-5 years in Bhubaneswar, India found that 23.3%, 57.4%, and 45.4% were wasting, stunting, and underweight respectively. A study by ACF in Isiolo County, Kenya revealed that the major casual factors of acute child malnutrition is linked to inadequate access to safe water for household use, poor access to appropriate age- specific foods and impacts of recurrent drought (ACF, 2014).

2.5 Conceptual framework for malnutrition

Factors that contribute to malnutrition are many and varied. They range from immediate, underlying and basic causes. The immediate causes affect individuals, the underlying causes relate to families, and the basic causes are related to the community and the nation. These factors are analyzed within the framework adapted from UNICEF (1998) as shown in figure 2.1



Source: UNICEF, 1998.

Figure 2.1: Conceptual framework for malnutrition

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study area

The study was undertaken in Kambi Odha Sub-location within Isiolo County which is located 285 kilometers North of Nairobi. Kambi Odha Sub-location is one of three sub-locations in Odha location in Burrat ward. The main community living in the sub-location is Borana. Their main economic activities of the sub-location include livestock herding and small scale trade.

Isiolo County covers 25,336.1 square kilometers and it borders Samburu and Garissa to East, Tana River to South East, Laikipia to the West, Kitui, Meru and Tharaka Nithi to South West, Marsabit to North West and Wajir to North East. The county has a multi-ethnic composition and mostly Boran, Turkana, Somali and Meru. Temperature ranges from a minimum of between 12⁰c to a maximum of 28⁰c. Rainfall ranges from 150mm- 650mm per annum.

The population of the study area was 143, 294 people where 51% were males while females accounted for 49%. Nine hundred and fifty people of this population lived in the Kambi Odha Sub- location. Seventy one percent of the county population lived below the poverty line. Children aged five years and below accounted for 16.6% and those between three and five years were approximately 5.8% of the county population. Children aged between three and five years accounted for 41.9% of the Kambi Odha Sub-location population. The main economic activities of the Isiolo County include: pastoralism, subsistence agriculture, small scale trade and limited harvesting of gum Arabica resin. The agricultural products include: beef, milk and limited cultivation of crops. As far as health is concerned, Isiolo County has one district hospital, 1 health centre and 24 dispensaries (GOK & FAO, 2012; Kenya guide, 2015).

3.2 Study design

This was a community based cross-sectional study design. It also helped in assessing the health needs of the population through personal observations.

3.3 Study population

The study population were children aged 3-5 years and their mothers living in Odha 2 and Odha 3 villages of Kambi Odha Sub-location in Isiolo county.

3.4 Sample size calculation

Fisher's Formula (Fisher, 1968) was used to determine the sample size using a prevalence of malnutrition in Kenya ASAL region (Isiolo included) of 15% (GOK & FAO, 2012) as follows;

$$n = \frac{Z^2 P(1-P)}{d^2}$$
$$n = \frac{1.96^2 \times 0.15 \times 0.85}{0.05^2}$$
$$= \frac{3.8416 \times 0.85 \times 0.15}{0.0025}$$
$$= 195.9$$

n=Required sample size

Z=Confidence level at 95% (1.96)

P=Prevalence at 15% (0.15)

q (1-p)= 0.85

d=Margin of Error at 5% (0.05)

= 196 children. The difference in population size of Odha 2 and Odha 3 was minimal therefore proportion to size allocation was not possible.

3.5 Sampling frame

The sampling frame of this study consisted households within Kambi Odha Sub-location Isiolo County. According to the area chief's record the children and households were distributed as the following; Taqwa had 98 children and 121 households, Odha 1, 100 children and 204 households, Odha 2, 99 children and 209 households, Odha 3, 101 children and 213 households. The sampling unit of this current study is the household.

3.6 Sampling method

Kambi Odha Sub-location has four villages, Odha 1, Odha 2, Odha 3 and Taqwa and had a population of 398 children aged between 3-5 years with a total of 747 households. Two villages Odha 2 and Odha 3 out of the four were studied. The two villages were simple randomly selected by writing the names of the four villages on papers putting them in a bowl, mixed and randomly picked two of them. Systematic random sampling method was then used to select the households to be studied. The sampling interval was determined by the formula; $N/n=K$ where N = Number of households in Odha 2 and Odha 3 (422), n =Sample Size (196) and the sampling interval was between 1- K that is; $422/196=2.153$

K =2

The starting point was purposively chosen but the first household to be studied was simple randomly selected by writing numbers 1-2 on paper put them in a bowl, mixed and randomly picked one and this was the first household to be studied from where I was standing, then kept adding 2 to 1st, 2nd, 3rd household until the sample size was obtained. Thanking the mother/guardian for her time a polite exit was made from any chosen household with no eligible child or the mother/guardian declined to participate and proceeded to the next household according to the rule of sampling interval of this study.

3.7 Inclusion Criteria

- Mothers and their children aged 3-5years of Kambi Odha Sub-location, Isiolo county.
- Mothers and their children aged 3-5 years whose participation in the study was consented for.
- Residents of Kambi Odha Sub-location Isiolo county.

3.8 Exclusion criteria

- Mothers and their children who declined to consent for the study.
- Children with severe health issues.

3.9 Study variables

This study has two types of variables, dependent and independent variables. Dependent variable in this study is the nutritional status which is determined by weight-for-height, weight-for-age and height-for-Age. Independent variables are in three categories, environmental factors, family factors and child factors.

3.10 Data collection tools

The following tools and instruments were used to collect data; questionnaire (Appendix 4) was used to collect quantitative data from mothers/caretakers of the children. Focus group discussion guide (Appendix 9) which had pre-set questions provided a framework for the researcher to explore and probe during the focus group discussion sessions. Weighing scale and height board were used to take the weight and height of the index child respectively. Pencils, pen, and note book were used to fill in the questionnaire and for note taking during

discussions whereas the tape recorder was used as a back up during the focus group discussion sessions.

3.11 Data collection

A researcher administered Questionnaire (Appendix 4) was used to collect data from mothers of children aged 3-5 years with the assistance of two field researchers. For the validity of the data the questionnaire was in English (Appendix 4) and Borana (Appendix 5) language. The main issues which the questionnaire captured included information such as socio-demographic and economic, health, food and water practices and anthropometric measurements. Anthropometric measurements were weight-for height, height-for-age and weight-for-age of the index child. Weight was taken and recorded using a weighing scale (Seca gmbin model). Height was taken and recorded using a portable wooden and calibrated scale. The children were in light clothing during anthropometric measurements taking for accurate measurements so as to assess their nutritional status. Age of the index child was obtained from mother/caretaker and whenever possible verified by means of birth certificate or immunization booklet. Two focus groups discussion (FGD) among mothers of children aged 3-5 years were conducted, one group comprising 8 mothers who had 1 child and the other one comprising 7 mothers who had 2 or more children. A guide (Appendix 9) comprising open-ended questions was used in the discussions. The guide addressed issues such as, knowledge, attitude and practices on nutrition. The researcher moderated the discussion while the field assistant was taking notes and with permission from the participants tape recorded the sessions as a backup. The researcher with the assistance of field researchers made a summary sentence of each response from each participant and wrote down verbatim of any striking and important comments from the participants. Immediately after the session to avoid forgetting some of the information, the researcher and the field researchers made proper notes in order to give a full and clear account of the sessions. Personal observations were also useful to complement data obtained from FGDs.

3.12 Data management

All questionnaires were stored in a lockable cabinet throughout the study and accessed only by authorized persons so as to ensure confidentiality and to avoid data loss. Data was entered into a computer spreadsheet (Microsoft Excel). Coding and verification of the data was done for easy manipulation, analysis and presentation. Data verification and validation was performed by rechecking all data entries with the original questionnaires to achieve a clean dataset that was then exported to Statistical Analytical System (SAS) version 9.2.

The information from the FGDs were duplicated for back-up and stored in locked cabinets all throughout the study and accessed only by authorized persons so as to ensure confidentiality and to avoid data loss.

3.13 Data analysis

Descriptive statistics were used to explain descriptive aspects of the study. Anthropometric data was analyzed using z-score charts recommended by WHO Test (2006) (Appendix 10) Chi-Square test was used for the relationship between the independent and dependent variables at 0.05 significance level. Odds Ratio (OR) with their respective 95% confidence interval (CI) was used to estimate the strength of association between independent variables and dependent variables.

Analysis of the data was limited to those children where the mother was the primary respondent. Three children in this study were under the care of their aunts at the time of data collection and who were not full time guardians. To ensure that the responses given were relevant to the family of the index child these three children were excluded from the analysis. Only 193 children were therefore included in the analysis.

Nutritional status was defined by weight- for- age, height-for- age and weight- for -height. Normal nutritional status was defined as a weight-for- age, height-for -age or weight- for-height within $\pm 2SD$ of the reference population using WHO charts (Appendix 10). Poor nutritional status was defined as either weight- for- age or height- for -age or weight- for-height that were not $\pm 2SD$ of the reference population. Participants' characteristics were summarized using proportions. Chi square statistics were used to compare characteristics of children by nutritional status.

Logistic regression was used to determine factors associated with poor nutritional status. All variables at the 0.1 level of significance in the univariate analysis were included in the multivariate model. Using backward elimination criteria, variables that had a P value of <0.05 were retained. Variables that had zero cells in any cell in the nutritional comparison were excluded from the logistic regression. The variable significance was evaluated at $p < 0.05$ level. Data from FGDs was transcribed, translated, typed in Microsoft Word and analyzed manually based on main themes which were developed from the study objectives and results presented verbatim.

3.14 Ethical considerations

Data was collected after the study clearance was granted by Ethics Review and Research Committee at Kenyatta National Hospital/University of Nairobi (Appendix 11) and community entry permission from area administrators (Appendix 12). The movement was house to house with the approval of the area assistant chief and the guidance of the community based health workers to locate the households with all eligible children. Participants were taken through the consent form, addressed any study question from them and then requested to sign the informed consent form (Appendix 1) if they agreed to take part in the study. The informed consent form had been translated from English into Kiswahili (Appendix 2) and Borana (Appendix 3). Focus group discussion participants were required to sign individual guide consent (Appendix 6) before participating in the study. The guide consent had been translated to Kiswahili (Appendix 7) and Borana (Appendix 8). No name was indicated against any response from the participants instead numbers were used. Respondents were assured that no names were to be included in any report or write-up arising from the study. They were also assured that all their responses were to be kept strictly in confidence using computer passwords only accessible to the study team. All respondents were approached with due respect. Children with severe health issues were excluded from the study and referred to relevant health facility department for further management. Those with mild health issues were included in the study.

3.15 Study limitations

The current study was successful but not without some limitations. First, the cross-sectional nature of the study design measured exposure and outcome simultaneously. It was therefore difficult to derive the causal relationships in the current study. Secondly, the cross-sectional design measures prevalence rather than incidence.

CHAPTER FOUR

RESULTS

4.1 Characteristics of children aged 3-5 years

4.1.1 Socio-demographic and economic characteristics of study participants

Majority of children were aged below 4years (54%), females (53%), and 4th-10th (54%) in their family's birth order (Table 4.1)

Table 4.1: Socio demographic characteristics of the children aged 3-5 years

| Characteristics | n=193 | % |
|--|--------------|----------|
| <i>Socio –demographic</i> | | |
| Age group | | |
| 3yrs- 3yrs & 11 months | 105 | 54 |
| 4 yrs -5 yrs | 88 | 46 |
| Gender | | |
| Male | 91 | 47 |
| Female | 102 | 53 |
| Birth order | | |
| 1 st born | 15 | 8 |
| 2 nd & 3 rd born | 74 | 38 |
| 4 th -10 th | 104 | 54 |

Majority, (97%) of their mothers were of Muslim faith, 95% married, 54% housewives and 91% of them had some formal education. Majority (50%) of mothers had 3-4 children in the household and 61% of them had 5-7 people in the household (Table 4.2)

Table 4. 2: Characteristics of mothers of the children aged 3-5 years

| Characteristics | n =193 | % |
|--|---------------|----------|
| Mother's education | | |
| Non formal | 17 | 9 |
| Formal | 176 | 91 |
| Mother's occupation | | |
| Housewife | 104 | 54 |
| Self/formerly employed | 89 | 46 |
| Religion of the mother | | |
| Muslim | 188 | 97 |
| Christian | 5 | 3 |
| Marital status of the mother | | |
| Married | 183 | 95 |
| Divorced/Widowed | 10 | 5 |
| No. of children in household | | |
| 1-2 | 36 | 19 |
| 3-4 | 97 | 50 |
| 5-6 | 35 | 18 |
| 7 & Above | 25 | 13 |
| No. of people living in a household | | |
| 2-4 | 34 | 18 |
| 5-7 | 117 | 61 |
| 8-9 | 31 | 16 |
| 10 & Above | 11 | 5 |

4.1.2 Health related characteristics of study participants aged 3-5 years

All (100%) children were fully immunized and all (100%) accessed health services at public health facility. The public facility was located within 3-4 km of the homes of all (100%) participants. Most (72%) of the respondents accessed such facility on foot. Chi square statistics were used to compare health related characteristics of children who were well nourished to those who were malnourished. Malnutrition on children was significantly associated with accessibility to their nearest health facility (25%) ($p < 0.05$) (Table 4.3)

Table 4. 3: Health-related Characteristics of participants aged 3-5 years

| Characteristics | Total N=193 n(%) | Malnourished (n=37) n (%) | Well nourished (n=156) n (%) | Chi square statistic | P value* |
|---|---------------------------------|--|---|-------------------------------------|-----------------|
| <i>Health characteristics</i> | | | | | |
| Immunization status | | | | | |
| Fully immunized | 193 (100) | 37 (19) | 156 (81) | | - |
| Place of medical assistance | | | | | |
| Public health facility | 193 (100) | 37 (19) | 156 (81) | | - |
| Distance to nearest health facility | | | | | |
| 3-4 km | 193 (100) | 37 (19) | 156 (81) | | - |
| Mode of transport to nearest health facility | | | | | |
| On foot | 139 (72) | 35 (25) | 104 (75) | 11.5758 | 0.0007* |
| Car & motor bike | 54 (28) | 2 (4) | 52 (96) | | |

*Chi square statistics were used to compare health related characteristics of children who are well nourished to those who are malnourished.

4.1.3 Feeding practices among children aged 3-5 years

Majority (55%) of children received 3-4 meals a day. Ninety eight percent had no food problems (that is allergies or diabetes) and 81% had good appetite. All (100%) consumed food that was purchased. Eighty four percent of children were from households that food decisions were influenced by children's needs and 16% where husband made the food decisions. 38% of children were from households where money availability determined the food to be consumed and 62% were from households where food to be consumed depended on either distance to the market or availability of food in the market. Majority (97%) had traditional/religion practices that affected food consumption which included abstaining from pork (97%), abstaining from a combination of either pork and chicken (5%), pork and camel meat (3%) or pork and forelimbs meat of any animal (1%). Food was allocated equally across all (100%) children of either gender. Chi square statistics were used to compare feeding practices of children who were well nourished to those who were malnourished. Children

who were malnourished were significantly more likely to receive only 2 meals a day (55%) compared to children who were fed on demand (6%) or 3-4 times daily (12%). Their mothers were more likely to describe their appetite as 'not good' (32%) compared to those whose mothers described their appetite as 'good' (16%). They lived in homes where food decisions were determined by the husband (63%) as opposed to those where children's needs (11%) influenced the decision. Forty seven percent of children who had a communal mode of food serving were malnourished as opposed to 7% of children who had individual mode of serving in their homes ($p < 0.05$) (Table 4.4)

Table 4.4: Feeding practices of participants aged 3-5 years

| Characteristics | Total N=193 n(%) | Malnourished (n=37) n (%) | Well nourished (n=156) n (%) | Chi square statistic | P value* |
|--|---------------------------------|--|---|-------------------------------------|-----------------|
| <i>Feeding practices</i> | | | | | |
| No. of daily feeds given to child | | | | | |
| On demand | 48 (25) | 3 (6) | 45 (94) | 40.5205 | <0.0001* |
| 3-4 | 107 (55) | 13 (12) | 94 (88) | | |
| 2 | 38 (20) | 21 (55) | 17 (45) | | |
| Child has food problems | | | | | |
| Yes | 3 (2) | 0 (0) | 3 (100) | | |
| No | 190 (98) | 37 (19) | 153 (81) | 0.7228 | 0.3952 |
| Child's appetite | | | | | |
| Not good | 37 (19) | 12 (32) | 25 (68) | 5.1952 | 0.0226* |
| Good | 156 (81) | 25 (16) | 131 (84) | | |
| Food sources | | | | | |
| Purchased | 193 (100) | 37 (19) | 156 (81) | | - |
| Who determines food decisions | | | | | |
| Husband | 30 (16) | 19 (63) | 11 (37) | 44.7078 | <0.0001 |
| Children's needs | 163 (84) | 18 (11) | 145 (89) | | |
| What determines food decisions | | | | | |
| Money | 73 (38) | 28 (38) | 45 (62) | 32.5979 | <0.0001* |
| Distance to or availability in market | 120 (62) | 9 (11) | 111 (89) | | |
| Mode of serving | | | | | |
| Communal | 59 (31) | 28 (47) | 31 (53) | 43.8789 | <0.0001* |
| Individual | 134 (69) | 9 (7) | 125 (93) | | |
| Traditional/religion Practices that affect food consumption | | | | | |
| Present | 188 (97) | 36 (19) | 152 (81) | 27.8881 | 0.9619 |
| Absent | 5 (3) | 1 (20) | 4 (80) | | |
| Inequitable allocation of food to children of different genders | | | | | |
| No | 193 (100) | 37 (19) | 156 (81) | | - |

*Chi square statistics were used to compare feeding practices of children who are well nourished to those who are malnourished

4.1.4 Water consumption and sanitation among children aged 3-5 years

Majority (78%) of respondents drew their household water from a tapped source which was within their compounds. For majority (78%), the water supply was adequate. For those who it was not adequate (22%), they either borrowed (70%) from their neighbors, mosque or slaughterhouse, or bought (16%) water at Ksh. 2.00 for 20 litres, or prioritized (14%) their water needs (ensured that the available water at every single moment had served the most important purposes first such as cooking and did away with activities like bathing if the available water was not enough for such). Majority (98%) did not treat their water prior to consumption. They drank their water straight from the tap without either boiling it or taking any other measure to make it safe for drinking. The majority (84%) of the participants owned a pit latrine and washed their hands after visiting the toilet and before eating (89%). The data shown indicates that the rest (11%) of respondents washed their hands only when they were dirty. Chi square statistics were used to compare Water and sanitation practices of children who were well nourished to those who were malnourished. Children who were malnourished were significantly more likely to be from homes where, household water was either bought or borrowed and water was inadequate (56%) compared to children who came from homes where household water was drawn from a tap within their compounds and was adequate (9%). Children who were malnourished were significantly more likely to be from homes where they used the neighboring pit latrine (65%) compared to homes where they used their own pit latrine (11%). Children who were malnourished were significantly more likely to be from homes where the hands were only washed when they were dirty (59%) compared to homes where hands were washed both after visiting the latrine and before eating (14%) ($p < 0.05$) (Table 4.5)

Table 4.5: Water and sanitation practices of study participants aged 3-5 years

| Characteristics | Total N=193 n (%) | Malnourished (n=37) n (%) | Well nourished (n=156) n (%) | Chi square statistic | P value* |
|--|----------------------------------|--|---|-------------------------------------|-----------------|
| <i>Water consumption & sanitation</i> | | | | | |
| Source of household water | | | | | |
| Tap | 150 (78) | 13 (9) | 137 (91) | 47.9407 | <0.0001* |
| Borrow or buy | 43 (22) | 24 (56) | 19 (44) | | |
| Distance to water source | | | | | |
| Within the compound | 150 (78) | 13 (9) | 137 (91) | 47.9407 | <0.0001* |
| 1 km | 43 (22) | 24 (56) | 19 (44) | | |
| Water supply | | | | | |
| Adequate | 150 (78) | 13 (9) | 137 (91) | 47.9407 | <0.0001* |
| Inadequate | 43 (22) | 24 (56) | 19 (44) | | |
| Water treatment before consumption | | | | | |
| Chlorine treatment | 3 (2) | 0 (0) | 3 (100) | 0.7228 | 0.3952 |
| No treatment | 190 (98) | 37 (19) | 153 (81) | | |
| Toilet facilities | | | | | |
| Own pit latrine | 162 (84) | 17 (11) | 145 (89) | 49.0065 | <0.0001* |
| Neighboring pit latrine | 31 (16) | 20 (65) | 11 (35) | | |
| When hand- washing is done | | | | | |
| After visiting the toilet & before eating | 171 (89) | 24 (14) | 147 (86) | 25.5359 | <0.0001* |
| When dirty | 22 (11) | 13 (59) | 9 (41) | | |

*Chi square statistics were used to compare water and sanitation practices of children who are well nourished to those who are malnourished

4.2 Nutritional status of children aged 3-5 years

Nutritional status was defined by either weight- for- age, or height-for- age, or weight- for – height, and a combination of all the methods. Normal nutritional status was defined as a weight-for- age, height-for -age or weight- for- height within $\pm 2SD$ of the reference population using WHO charts (Appendix 10). Poor nutritional status was defined as either weight- for- age or height- for -age or weight- for- height that were not $\pm 2SD$ of the reference population.

4.2.1 Nutritional status of children as determined by height-for-age, weight-for-age and weight-for-height

Majority (82%) of children were within $\pm 2 SD$ of the recommended height- for- age while the others (17%) were below $-2 Z$ -scores or above $+2 Z$ -scores (1%) for recommended height- for –age (stunted) (Table 4. 6).

Majority (91%) of children were within $\pm 2 SD$ of the recommended weight- for- age while the others (9%) were below $-2 Z$ -scores for recommended weight-for- age (underweight) (Table 4.6).

Majority (98%) of children were within $\pm 2 SD$ of the recommended weight- for- height while the others (2%) were below $-2 Z$ -scores for recommended weight- for- height (wasted) (Table 4.6).

Table 4.6 Proportion of children with malnutrition as measured by 3 different anthropometric measurements

| <i>Nutritional status as determined by</i> | <i>No. of children measuring</i> | | | Total number of children N |
|--|-----------------------------------|---------------------------------------|----------------------------------|---|
| | < -2 SD n (%) | -2 SD to +2 SD n (%) | >+2 SD n (%) | |
| Height- for- age | 33 (17) | 158 (82) | 2 (1) | 193 |
| Weight- for- age | 17 (9) | 176 (91) | 0 (0) | 193 |
| Weight-for – height | 3 (2) | 190 (98) | 0 (0) | 193 |

4.2.2 Overall nutritional status of the children as determined by the three anthropometric measurements

In summary, a minority (19%) of children were malnourished as measured by either height-for-age, weight-for-age or weight-for-height (Figure 4.1).

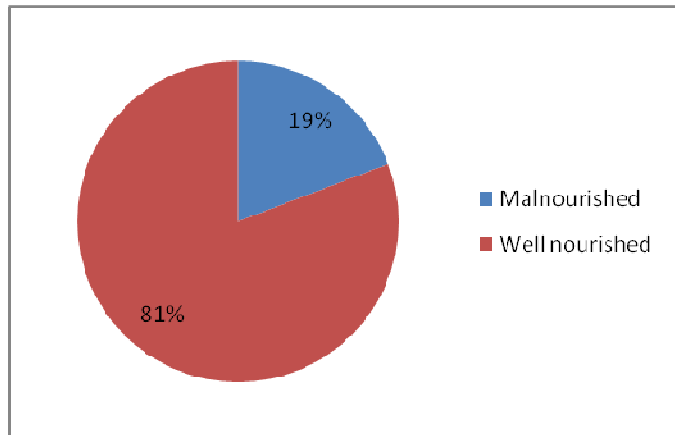


Figure 4.1: Proportion of malnourished children by either height- for- age or weight- for- age or weight- for- height

4.3 Factors associated with malnutrition of children aged 3-5 years of Kambi-Odha sub-location, Isiolo, county, Kenya

4.3.1 Socio-demographic and economic factors

The relationship between Socio-demographic and economic characteristics of the participants and their nutritional status was described using logistic regression. Participants whose mothers had no formal education were six times more likely to be malnourished compared with those whose mothers had formal education (OR 6.2, 95% CI 1.8-21.4; $p=0.0040$). Similarly, participants whose mothers were housewives were six times more likely to be malnourished compared to those whose mothers were self-employed or formally employed (OR 6.7, 95% CI 1.3-19.9; $p=0.0006$). Participants who lived in homes where the head of the household was employed were three times more likely to be malnourished compared to those who lived in homes where the head of the household was engaged in business (OR 3.3, 95% CI 1.3-8.2; $p=0.0116$). Similarly, participants from homes where there were seven or more children in a household were six times more likely to be malnourished compared to participants from homes where there were only one or two children (OR 6.6, 95% CI 1.7-26.4; $p=0.0236$) (Table 4.7)

Table 4.7: Socio-demographic factors associated with malnutrition among children

| Characteristics | Malnourished/ Total 37/193 (19%) n/N(%) | COR | P value | AOR | P value |
|--|--|-----------------|----------------|----------------|----------------|
| <i>Socio-demographic & Economic</i> | | | | | |
| Age group | | | | | |
| 3 yrs-3yrs & 11months | 20/105 (19) | 1.0 (0.5-2.1) | 0.9621 | | |
| 4 yrs- 5 yrs | 17/88 (19) | Ref | | Ref | |
| Gender | | | | | |
| Male | 18/91 (20) | Ref | | Ref | |
| Female | 19/102 (19) | 1.0 (0.5-2.0) | 0.8391 | | |
| Birth order | | | | | |
| 1 st born | 4/15 (27) | Ref | 0.4342 | Ref | |
| 2 nd & 3 rd born | 11/74 (15) | 0.5 (0.1-1.8) | | | |
| 4 th -10 th born | 22/104 (21) | 0.7 (0.2-2.5) | | | |
| Mother's Education | | | | | |
| Non formal | 11/17 (65) | 3.6 (10.6-31.1) | <0.0001* | 6.2 (1.8-21.4) | 0.0040 |
| Formal education | 26/176 (15) | Ref | | Ref | |
| Mother's Occupation | | | | | |
| Housewife | 32/104 (31) | 7.5 (2.8-20.2) | <0.0001* | 6.7 (1.3-19.9) | 0.0006 |
| Self/formally employed | 5/89 (6) | Ref | | Ref | |
| Religion of mother | | | | | |
| Muslim | 36/188 (19) | 1.1 (0.1-9.7) | 0.9691 | | |
| Christian | 1/5 (20) | Ref | | Ref | |
| Marital status of mother | | | | | |
| Married | 35/183 (19) | Ref | | Ref | |
| Widowed/ Divorced | 2/10 (20) | 1.1 (0.2-5.4) | 0.9455 | | |
| Occupation of the household head | | | | | |
| Business | 18/120 (15) | Ref | | Ref | |
| Formally employed | 19/73 (26) | 2.0 (1.0-4.1) | 0.0591* | 3.3 (1.3-8.2) | 0.0116 |
| No. of children in household | | | | | |
| 1-2 | 8/36 (22) | Ref | 0.0020* | Ref | 0.0236 |
| 3-4 | 12/97 (12) | 0.5 (0.2-1.3) | | 1.1 (0.3-3.5) | |
| 5-6 | 5/35 (14) | 0.6 (0.2-2.0) | | 1.8 (0.4-7.5) | |
| ≥7 | 12/25 (48) | 3.2 (1.1-9.8) | | 6.6 (1.7-26.4) | |
| No. of people living in household | | | | | |
| 2-4 people | 8/34 (24) | Ref | 0.0188* | Ref | |
| 5-7 people | 16/117 (14) | 0.5 (0.2-1.3) | | | |
| 8-9 people | 7/31 (23) | 0.9 (0.3-3.0) | | | |
| ≥10 people | 6/11 (55) | 3.9 (0.9-16.2) | | | |

*Variables that were significant at 0.1 level in the univariate analysis that were included in the multivariate model

4.3.2 Feeding practices of children aged 3-5 years

The relationship between Feeding practices of the participants and their nutritional status was described using logistic regression. Participants who had poor appetite were three times more likely to be malnourished compared to those who had good appetite (OR 3.3, 95% CI 1.1-8.1, $p=0.0285$). Where food decisions were determined by husband as opposed to where food decisions were influenced by children's needs, children were seven times more likely to be malnourished (OR 7.1, 95% CI 2.7-18.7, $p<0.0001$). Similarly, where food decisions were determined by money as opposed to where food decisions were determined by food availability or distance to the market children were eight times more likely to be malnourished (OR 8.7, 95% CI 3.4-22.1, $p<0.0001$) (Table 4. 8)

Table 4.8: Feeding practices associated with malnutrition of children aged 3-5 years

| Characteristics | Malnourished/ Total 37/193 (19%),n/N (%) | COR | P value | AOR | P value |
|---|--|-----------------|----------|----------------|---------|
| Feeding practices | | | | | |
| No. of daily feeds given to child | | | | | |
| On demand | 3/48 (6) | Ref | <0.0001* | Ref | |
| 3-4 | 13/107 (12) | 2.1 (0.6-7.7) | | | |
| 2 | 21/38 (55) | 18.5 (4.9-70.2) | | | |
| Child's appetite | | | | | |
| Not good | 12/37 (32) | 1.1 (2.5-5.6) | 0.0226* | 3.3 (1.1-8.1) | 0.0285 |
| Good | 25/156 (16) | Ref | | Ref | |
| Who determines food decisions | | | | | |
| Husband | 19/30 (63) | 13.9 (5.7-33.9) | <0.0001* | 7.1 (2.7-18.7) | <0.0001 |
| Children's needs | 18/163 (11) | Ref | | Ref | |
| What determines food decisions | | | | | |
| Money | 28/73 (38) | 4.7 (3.4-17.5) | <0.0001* | 8.7 (3.4-22.1) | <0.0001 |
| Distance to or availability in market | 9/120 (11) | Ref | | Ref | |
| Mode of serving | | | | | |
| Communal | 28/59 (47) | 12.5 (5.4-29.3) | <0.0001* | | |
| Individual | 9/134 (7) | Ref | | Ref | |
| Traditional/ religion practices that affect food consumption | | | | | |
| Present | 36/188 (19) | 0.0 (0.1-10.0) | 0.9619 | | |
| Absent | 1/5 (20) | Ref | | Ref | |

* Variables that were significant at 0.1 level in the univariate analysis that were included in the multivariate model

An inverse relationship was observed between the proportion of malnourished children and the number of daily meals as illustrated in figure 4. 2 below

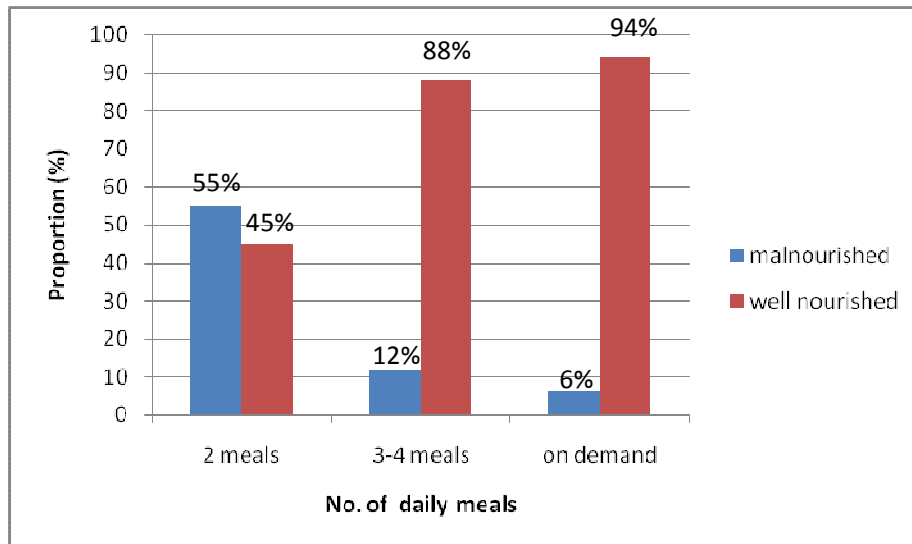


Figure 4. 2: Proportion of malnourished children by number of daily meals

4.3.3 Water and sanitation practices among children aged 3-5 years

The relationship between water and sanitation practices of the participants and their nutritional status was described using logistic regression. Participants whose mothers either borrowed or bought their household water were four times more likely to be malnourished compared to those that their mothers used tap water (OR 4.8, 95% CI 1.7-13.9, $p=0.0039$). Similarly, participants who did not have their own pit latrine were four times more likely to be malnourished compared to those who had their own pit latrine (OR 4.2, 95% CI 1.3-13.3, $p=0.0155$) (Table 4. 9)

Table 4.9: Water and sanitation practices associated with malnutrition

| Characteristics | Malnourished / Total 37/193 (19%) n/N (%) | COR | P value | AOR | P value |
|--|---|-----------------|----------|----------------|---------|
| Water consumption & sanitation | | | | | |
| Source of household water | | | | | |
| Tap | 13/150 (9) | Ref | <0.0001* | Ref | |
| Borrow or buy | 24/43 (56) | 13.3 (5.8-30.2) | | 4.8 (1.7-13.9) | 0.0039 |
| Distance to water source | | | | | |
| Within the compound | 13/150 (9) | Ref | <0.0001* | Ref | |
| 1 km | 24/43 (56) | 13.3 (5.8-30.2) | | | |
| Water supply | | | | | |
| Adequate | 13/150 (9) | Ref | <0.0001* | Ref | |
| Inadequate | 24/43 (56) | 13.3 (5.8-30.2) | | | |
| Toilet facilities | | | | | |
| Own pit latrine | 17/162 (11) | Ref | <0.0001* | Ref | 0.0155 |
| Neighboring pit latrine | 20/31 (65) | 15.5 (6.4-37.8) | | 4.2 (1.3-13.3) | |
| When hand-washing is done | | | | | |
| After visiting the toilet & before cooking | 24/171 (14) | Ref | <0.0001* | Ref | |
| When dirty | 13/22 (59) | 8.8 (3.4-22.9) | | | |

* Variables that were significant at 0.1 level in the univariate analysis that were included in the multivariate model

4.4 Summary of qualitative results on knowledge, attitude and practices on nutritional needs

A subset of participants that were involved in the questionnaire (n=15) also took part in FGDs to describe the knowledge and attitudes of mothers on nutritional needs. Majority of the participants captured issues on such as, knowledge about nutrition (“*Healthy food for our body*”), attitude towards nutrition (“*.. very important as it prevents children from falling sick on and off*”), nutrition information sources (“*MCH clinic*”) and challenges faced as they provided for their children (“*Money, Impassible roads*”). Age category of the mothers and the main themes that emerged from the discussions are presented in table 4.10 and table 4.11 respectively.

Table 4.10 Demographic characteristic of mothers who participated in FGDs

| Age category | No. | % |
|--------------|-----|-----|
| 18-26 years | 6 | 40 |
| 27-35 years | 4 | 27 |
| 36-43 years | 5 | 33 |
| Total | 15 | 100 |

Table 4.11: Knowledge, attitude and practices of mothers on nutritional needs

| THEMES | MAIN RESPONSES |
|---|--|
| Knowledge on nutrition | R1.5 “...eating healthy food for our body” R2.1 “...nutrition is basic to good healthy” |
| Attitude towards nutrition | R2.4 “Feel good nutrition is very important as it prevent children from falling sick on and off” R1.7 “Believe all women should work towards good nutrition” R2.7 “Jechin dansan finm” (“ more information is needed as it is always helpful”) |
| Source of nutrition information | R1.8 “Maternal and Child Health clinic in General Hospital” R2.1 “Mobile clinics” R2.4 “Community Based Healthy Workers” |
| Likes and dislikes on nutrition training sessions | R1.2 “Liked the knowledge I gained” R2.6 “Disliked the use of technical words” |
| Challenges faced when providing food | R1.1 “Insecurity” R2.3 “Impassable roads”, money” |
| Why food money did not last as expected | R1.6 “Unexpected relatives joining the family” R2.3 “Drought” |
| Actions taken to remedy food money shortage | R1.4 “Asked more money from my spouse” R2.4 “Asked help from my relatives” |
| Activities carried out to ensure good nutrition | R1.6 “Started a small business” R2.2 “Joined a Self Help Group” “Carried out casual jobs” |
| Practice to ensure better nutrition and health | R2.7 “Inclusion of fruits and vegetables in the family diet” R2.6 “Ensured no open defecation in the compound” R1.5 “Started washing vegetables before cooking” |
| Reasons for implementation | R1.6 “The information got from the health workers” R2.5 “The desire to better the health of my family” |
| Aspiration concerning food consumption | R1.3 “Wish I am able to provide better and right food for the family” R2.6 “Wish there are no food taboo for example, is a taboo for Dambitu clan to eat chicken or its product yet it is easy to keep chicken in one’s compound” R1.6 “Also my clan, Karayu Berre does not allow its members |

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Discussion

5.1.1 Nutritional status of the children

Nutritional status of children is very important as it determines their mental and physical health, growth and development, academic performance as well as progress in life (WHO, 2013). Nutritional status of the children in this study indicated that 17% were stunted, 9% were underweight and 2% were wasted with an overall malnutrition of 19%. Stunting however was not as high as that observed in 2013 and 2014 which was 20.8% and 23.2% respectively in the same county though not significantly different (ACF, 2014). According to WHO, (2013) stunting indicates chronic deprivation of required nutrients during the critical periods for growth and development in early life. Food shortage is very common in ASAL regions in Kenya, Isiolo included due to harsh conditions experienced in the region. Macharia *et al.*,(2006) demonstrated in their study that inadequate dietary intake which may be due to food scarcity was a cause of under-nutrition in ASAL area in Kenya. Children are the most affected in such unfavorable situations due to their vulnerability and this explains the poor nutritional status of the children in the present study.

Socio-economic factors influence nutritional status of the children either positively or negatively. Households with low socio-economic status especially of mothers have negative impact due to inability to afford most of the basic needs for their children. Various reasons such as finance constraints, values, beliefs as well as decision making capacity may lead to the negative impact. Lisa *et al.*, (2003) in their study revealed that high socio-economic woman status has a strong influence on both long- term and short-term nutritional status of children which result to reduction in both stunting and wasting. Low socio-economic status is a marker of poor health and this explains why the children in present study whose mothers had no formal education, were housewives and had large families were the most affected.

Feeding practices were also found to be associated with poor nutritional status. In this study children who had poor appetite were three times more likely to be malnourished compared to those who had good appetite. Children with poor appetite are also poor feeders and tend to be very selective on what to eat. Also the community has a poor socio-economic background

and what they consume is basically limited to their financial capability and would not afford variety and appetizing foods. Hence the likely explanation as to why children with poor appetite were more likely to be malnourished. Where food decisions were determined by husband as opposed to where food decisions were influenced by children's needs, the children were found to be seven times more likely to be malnourished. Similarly, where food decisions were determined by money as opposed to where food decisions were determined by food availability or distance to the market, children were eight times more likely to be malnourished. The primary care giver (woman) within the household should be allowed to make the decisions concerning the food consumption for any positive impact on nutrition. A negative impact on nutrition maybe experienced where the decision making is primarily in the hands of the husband. The community under study believes that a woman should not be allowed to make any decision even within the household. This explains why children from homes where decisions were made by the husband were the most affected. Evidence for the effects of feeding practices on child nutrition has also been demonstrated in numerous studies (Bouis & Hunt, 1999; Smith *et al.*, 2003; WHO, 2012).

Water and sanitation practices of the participants were significantly associated with poor nutritional status. Lack of access to safe and adequate water for household use can lead to poor nutritional status due to poor personal and food hygiene resulting to various infections and diseases. Absence of pit latrine will lead to open defecation which result to contamination of the environment including water sources (WHO, 2014). Many diseases such as diarrheal diseases are likely to occur due to the contamination and later lead to malnutrition. This explains as to why current study found out that children from households that either borrowed or bought water were more likely to be malnourished compared to those from households with adequate water. Similarly, children from households with no pit latrine were more likely to be malnourished compared to those with a pit latrine within their compound. Several studies have also demonstrated the relationship between water scarcity, poor sanitation and hygiene and child malnutrition (UNICEF & WHO, 2013; Ustun et al., 2016).

5.1.2 Relationship between nutritional status and study variables

5.1.2.1 Unhealthy household environment and nutritional status

Poverty and inequity is associated with inadequate food, water, poor sanitation and hygiene that lead to increased repeated infections and malnutrition in children. Poverty places direct constraints on households' ability to access food and other basic needs. Poverty also has long

term impacts on child nutrition by limiting households' capacity to make investments that would improve nutrition within the household. Poverty leads to high prevalence of malnutrition which constrains economic activity by individuals and economic growth at national level. Inequitable distribution of national resources has significant influence on child nutrition. Wealth settings experience positive nutrition impacts from the many natural and social services accessible to them whereas the poor regions have a negative nutrition impact subjecting the resources deprived communities to inaccessibility to even the basic needs. This relationship can be explained by the fact that rich people are in a position to afford good living conditions that improve child's healthy in general unlike the poor such as those from the community under study (WHO, 2006).

Unhealthy environmental factors such as water scarcity, absence of toilets lead to various infections and diseases due to poor food and personal hygiene as well as poor sanitation. Infections for instance lead to loss of appetite and also make one demand more energy so as to combat the infection. This later leads to malnutrition as the body's demand becomes more than the intake (Stephenson *et al.*,2008) . In current study there is a significant relationship between household level and environmental factors and malnutrition with children from households with unhealthy environmental factors being more likely to suffer from malnutrition. Fifty six percent of children who were from households that did not have adequate water for their household use were found to be malnourished. Similarly, 65% of children who were from households that did not have a pit latrine within their compounds were found to be malnourished. Ustun et al., (2016) supported the findings in current study by demonstrating in their study that 50% of the total disease burden of under-nutrition is attributed to environmental factors including inadequate water, sanitation and hygiene. The study findings also concur with previous studies regarding the relationship between unhealthy environment, household level factors and child malnutrition (Dasguta, 1987; Gwatikin, 2007); Chastre *et al.*,2007; (Stephenson *et al.*,2008). According to UNICEF, (2013) efforts to reduce malnutrition depend on reducing poverty and raising peoples' living standards by improving the quality of homes, hygiene and sanitation. This report from UNICEF, (2013) has prompted various countries and organizations to come up with social protection programs focused on the most disadvantaged communities. USAID, ACF, EU and Water Fund and Trust Services are such organizations that have helped in improving accessibility to safe water, health related services, pit latrines and primary school coverage in Kambi Odha Sub-location in Isiolo County, Kenya. For instance, Odha primary school and one borehole are within the Sub-location under study and are as a result of the said NGOs' sponsorship.

5.1.2.2 Socio-economic status of women and nutritional status

Women are almost always the primary caregivers of infants and young children in developing countries and are closely involved with the quality of feeding, exposure to diseases and care of young children. Child under-nutrition results where women lack the capacity to support child nutrition (Walker *et al.*, 2007). Additionally, where women have little control over how resources are allocated within the household, resources are less likely to be allocated to children's nutrition and health. Also inability of women to access or control the use of resources for their own wellbeing has a significant negative impact on the nutrition and health of their children (UNICEF, 2013). Low socio-economic status of women is also associated with poor maternal nutrition before and even during pregnancy and this has a negative impact on the unborn baby resulting to low birth weight babies who are highly likely to develop malnutrition (UNICEF, 2013). A study in Uganda demonstrated that mother's education is the best prediction of the child's health in a community and not the household assets, land ownership or father's education (Wamani *et al.*, 2004). There was a significant relationship in the current study between low socio-economic status of women and the child malnutrition with the children whose mothers had no employment, formal education and had their husbands made decisions on the food to be bought or cooked being the mostly affected. Sixty five percent of children whose mothers had no formal education were found to be malnourished compared to only 15% of the children whose mothers had formal education. Similarly, 63% of children from households where the food decisions were determined by the husband were discovered to be malnourished as compared to only 11% of children from households where the food decisions were influenced by children's needs. Thirty one percent of children whose mothers were housewives were found to be malnourished as opposed to only 6% of children whose mothers were self or formally employed. The community under study believes that women should not be allowed to make any decision even in the household. The women therefore become over dependent on their husbands for financial help as well as decision making. This explains the relationship between the malnourished children and socio-economic status of women in the study. Findings by ACF, (2014) revealed that low level of maternal education was an important risk factor for child malnutrition among the same community that also led to early pregnancies and inadequate birth spacing.

High socio-economic status of women on the other hand prevents early marriages, early childbearing and having large families. Findings by Lisa *et al.*, (2003) also supported this where high women status was found to have a positive influence on children nutrition status leading to a reduction in stunting and wasting. Frangilo *et al.*, (1997) also demonstrated that

high female literacy was one of the most important factors associated with lower prevalence of wasting in children. This explains why 65% of children in the present study whose mothers had no formal education were malnourished. Majority (54%) of women in the study area stayed at home and waited to be provided for by their husbands hence had no control over what or how much to be offered for household use. This can then explain as to why 31% of children whose mothers were housewives were malnourished compared to only 6% of children whose mothers were employed.

Education level of an individual dictates the socio-economic status within a community as education is key to many socio-economic services. The level of education among women in the study area was low and may be attributed as to why 65% of children whose mothers did not have any formal education were found to be malnourished. Among other things woman with no education will not be in a position to prioritize the household needs or make crucial decisions that affect the child nutrition and health in general. A woman of low socio-economic status has also low bargaining power within the household and this has a negative impact on nutrition and health of the children (Walker et al; 2007). This is demonstrated in this study whereby 63% of children from the household where the food decisions were made by the husband were found to be malnourished. Some communities have a negative attitude towards women and would not involve them in any decision making and this further explains as to why a higher (63%) percentage of malnourished children was found in households where the husband was the decision maker on food consumption. The lack of decision making power of a woman in household and in society at large among the community under study was also demonstrated in an earlier study (ACF, 2014).

5.1.2.3 Low Agricultural productivity and nutritional status

Low agricultural productivity can be expected to restrict the financial capacity of households to access food. Also where agricultural yields are insufficient to provide adequate food throughout the year a hungry season occurs among food producers and groups within the rural economy who rely on producers for their livelihood and this season is associated with substantial acute under- nutrition in children (Devereux *et al.*,2008).A strong relationship between agricultural productivity and poverty has been shown in a multi-country study where an increase in agricultural yields reduces the percentage of a country's population living below poverty line (Thirtle *et al.*, 2002; DFID, 2009). All (100%) of the respondents in this current study relied on purchased food for their household consumption. The area under study lies within the ASAL region, experiences drought spells and no water for irrigation is

available. This explains the overdependence on the market for food by the community. ACF, (2013) also confirmed the over dependence on purchased foods among the same community. Drought was also identified as a challenge that the community under study face when providing food for their families during the FGD sessions. Only 19% of children in the study were found to be malnourished contrary to the expected results from such community whose 100% of the study participants relied on purchased foods and also who reside in ASAL region. The likely explanation for the finding is that majority (62.2%) of the household heads were engaged in business while the rest (37.8%) were formally employed hence able to afford most of the basic needs for their household. However, the relationship between agricultural development and child nutrition should not be underestimated as low agricultural productivity restricts quantity and quality of food intake and generates household food insecurity subjecting community to risk of malnutrition. Also the over dependence on purchased food may contribute to food shortage in such times when the market get destabilized by for instance, tribal conflicts, unpredictable climate and inflation(International Medical Corps, 2013).

5.1.2.4 Feeding practices, food taboos and nutritional status

Feeding practices and food taboos may result to poor nutritional status of an individual and community as a whole. Past studies have recognized this which also include serving of different quantity and quality as per gender (DFID, 2012; WHO, 2013). Values and beliefs of a community are passed from one generation to another and can have either positive or negative impact on nutrition. Cultural beliefs may have significant role in determining the diet for young children, pregnant and lactating mothers as demonstrated in several studies (Smith *et al.*, 2003; Holmes *et al.*, 2007). The present study demonstrates a number of respondents who fed their children only two times daily, served the index child communally and others limited to what they served by the food taboos. According to the current study 20% of respondents could only afford two meals a day for their children whereby 55% of the children were found to be malnourished. Thirty one percent of the respondents served their children communally whereby 47% of these children were noted to be malnourished. Five percent, three percent and one percent of the respondents could not serve chicken and its products, camel and its products and meat from forelimbs from any animal respectively due to food taboos. Presence of food taboo was also confirmed from the FGD sessions as one mother stated;

“Sakuye Arsuwah clan members are not allowed to eat chicken meat or its products”(FGD, 33 years old female)

They believed one would have protruding eyes or mental retardation after the consumption of the said type of meat. This may significantly negatively affect nutritional status of the children as the restricted foods were easily available and accessible such as eggs and camel meat. Revelation of such traditional beliefs indicated that there could be more strong rooted beliefs in the community that affect nutrition and health in general that need to be addressed. WHO, (1986) recommended that to succeed in addressing such beliefs and practices the training and education should focus on community based strategies so that the particular community would appreciate and feel part of the program.

Grains, eggs, fruits and vegetables though available in the market were noted to be rarely consumed within the community. ACF, (2013; 2014) also reported the same findings amongst the community. The rare consumption of said foods though available and nutritious can only be explained as due to a tradition of feeding practices which has been passed on from generation to generation. Ignorance about the foods' value and their importance can also be attributed to the rare consumption of these foods. This has a negative impact on nutrition as the foods would otherwise constitute a balanced diet for the children.

5.1.2.5 Health seeking practices and nutritional status

Health care-seeking practices of mothers or guardians are a key to whether or not children are protected from the illnesses and diseases (Bhutta et. al, 2008). A study in Sri Lanka demonstrated low child mortality in settings with high rates of health care-seeking practices and 60-70% of child mortality across the settings with poor health care-seeking practices (Hill *et al.*,2004). Levels of immunization coverage are a good measure of health seeking practice of a community. Findings of the present study revealed a 100% of child immunization coverage. The findings contrast a previous study on prevalence of malnutrition among children aged 6-59 months whose immunization coverage was 76.1% which was below the WHO benchmark of 80% (ACF, 2013). The current positive response can be attributed to emphasis put on immunizations by various NGO present in the county of study in conjunction with Ministry of Health. Location of the study area which lies in ASAL region can better explain the presence of the various NGOs that offer humanitarian services to the underprivileged communities globally. All clinic defaulters were traced and followed strictly through social workers and the Community Based Health Workers (CBHW) in this Sub-location and this had a positive impact on health care seeking practice. The devotion of

CBHW to the community can be attributed to the motivation they got from the concerned stakeholders such as inviting them to seminars or workshops and awarding of certificate of participation, free treatment at public hospital and some allowance during public health campaigns.

5.1.2.6 Lack of commitment and accountability and nutritional status

Governance affects child nutrition status because it is central to several key areas that influence nutrition such as water, sanitation, health, education services and social protection. Weak or poor governance is associated with lack of political commitments, accountability, demands for nutrition and nutrition governance and effective financing. Good governance yields higher levels of government effectiveness, political stability and rule of law. The current study found that there was tremendous increment of toilet coverage (84%) and immunization coverage (100%) as well as water provision (78%) in the county compared to previous findings which were 60.8%, 76.1% and 40.7% respectively (ACF, 2013). For instance, building of pit latrines in various households by NGO was still ongoing during the data collection of the current study. Provision of tap water was also another project of recent past where the residents were required to pay only ksh.2000 and would have the water connected in their compounds. The finding concurs with an in-depth study done in Madagascar on governance and child under- nutrition which found that there was substantial reduction in child under- nutrition with good governance (Rokx, 2006; FAO, 2012). The improved situation can be attributed to a realization by the government of the day that reducing malnutrition in Kenya is not just a health priority but also a political choice that calls for a multi-sector focus driven by a political will that acknowledges the integral role that nutrition plays in ensuring a healthy population and productive workforce.

5.1.3 Knowledge, attitude and practice on nutritional needs and nutritional status

The participants of the current study were able to describe what nutrition is, what it entails as well as its importance. They also had a positive attitude towards it as some of the mothers from FGD expressed;

“...eating healthy food for our body”(FGD, 42 years old female)

“...good nutrition is basic to good healthy”(FGD, 35years old female)

“...feel is very important as good nutrition prevents children from falling sick on and off”(FGD, 26 years old female)

Mobile clinics, Maternal and Child Health (MCH) clinic and mothers were identified by the participants as their sources of information on nutrition. The perception that the information had helped their families change for the better made the participants express their desire to

continue seeking information on the same. The participants also expressed their dislike for the technical language used during training sessions by some facilitators as well as the negative attitude of some of them. Agreeing to seek information on nutrition from various sources demonstrates a positive attitude towards nutrition and health in general. Positive attitude promotes the adherence to the instructions and implementation of changes by participants hence better nutrition and health for the families. The use of technical language by the facilitators and their negative attitude has a negative impact on nutrition and health in general for the community would not honour information from someone they dislike. Such training would be of no use as the participants would not understand the technical language and would also discourage the community from attending such trainings. This indicates that some of the facilitators were not fully committed to their work and also that required qualities of a facilitator were not keenly considered while appointing some of them. Facilitator should for example be humble, sensitive to the surrounding, hold every individual as important and ready to learn from him/her and have good communication skills.

The participants of the FGD identified lack of money, unavailability of variety of food stuffs in the market, long distances, impassable roads and the prevailing insecurity in the region as challenges faced on food provision. Similar views were expressed in earlier studies (ACF, 2013; 2014). The location of the county explains why there is scarcity of food variety, money, good roads, security and other main amenities that nutrition of a community relies on. The county is located in ASAL area where rainfall is very low to support agriculture which would ensure food security in the community. The county also has very few natural and social services which would provide employment to the residents who would therefore be able to provide for their families unlike the current situation. Majority of the county's residents are pastoralists and usually engage in cattle rustling which is not only a threat to area security but also has a negative impact on nutrition. Cattle rustling destabilize the market and the community under study over depends on the market for the food purchase for their household use hence worsening the situation (ACF, 2013; 2014).

Participants also revealed that there were times when 'food money' did not last as long as needed and this was due to various reasons such as illness of a family member, drought, prices of commodities going up, poor budgeting and unexpected relatives joining the family. Majority of men from the community opted to have more wives which they consider as a symbol of status. This increases the chances of extended family members joining the nuclear family any time hence putting constrains on the available food in the household. Women in

this community also have low status and have no power to make any decision even in the household. This leaves women helpless, powerless and over dependent on their husbands even for crucial issues such as food consumption within the household. This affects nutrition and health of the family negatively. The same findings were noted during an earlier study in the county (ACF & International Medical Corps, 2013).

Obtaining loan from self-help groups, asking for additional money from their spouses, asking for help from relatives, getting food on credit from the shop and reducing the food ration in the house were some of the actions that the participants undertook to ensure continued food supply in the household. This proves that woman is and remains as the primary care giver for the children and therefore should be empowered and involved in decision making. Although all the participants were aware of emergency food programs in their county, none had ever used them. Slightly over half said they would use them in such situations as when food money ran out if they were available in their locality. The suggestion by the majority of the participants that they would use the emergency food programs if available in their locality may reflect the program under coverage within the county.

Majority of participants believed that women as primary caregivers of their children can engage in various activities to ensure that their children eat and live healthy. Such activities mentioned by the participants included joining a self-help group, starting a small business, doing casual jobs, practicing personal and food hygiene and buying and cooking the appropriate foods for their families. Half of the participants were members of self-help groups which included Liban women group, Gutole women group and Dagarah hokoh women group. Income generating activities that the participants were involved in included trading in miraa (Khat), selling tea to miraa consumers, charcoal, livestock and food stuffs, running a kiosk, and performing laundry and cleaning services. Carrying out of various income generating activities by the participants so as to top up food in the household can be attributed to their realization that good nutrition and health for their families is their responsibility and should work towards that goal. The activities such as selling of miraa, joining of self-help group, running a kiosk help them get extra money to buy more food for their children and this impact child nutrition positively.

None of the participants owned a vegetable kitchen garden despite that some respondents and other community members could be seen watering flowers within their compounds during quantitative data collection. The finding clearly indicates that the community lack awareness of the importance of a kitchen garden which would help in topping up food in the

household. It also indicates the need for Agricultural extension officers in the area to educate them on the same. The kitchen garden also does well with waste water from the kitchen and not only with clean tap water and Agricultural officers would demonstrate this.

For the betterment of their families' health, majority of the participants had attempted to adhere to instructions and information obtained from health workers. To this effect they had improved the health and nutrition of their families by ensuring, fruits and vegetables were washed before eating, hand-washing was performed before eating, proper disposal of human waste, daily baths for their family members, and by buying fruits and vegetables for their families. Health education to the community from the health workers explains that the government has acknowledged the integral role that nutrition play in ensuring a healthy population and productive workforce. Implementation of the changes and adherence to instructions indicates that the participants also have realized that good nutrition cannot be achieved without them playing their part.

The study findings also revealed some traditional beliefs that necessitated the participants to have some aspirations. All participants wished they were able to afford better and proper food for their families as well as allowed to make food decisions. Others especially those restricted by food taboo wished they were let free to consume such foods termed as taboo. All participants also expressed their desire to obtain more information on prevention and pre-hospital management of common illnesses especially of the children. They said more information would help them be in a position to make informed and better choices as one mother noted;

“ Jechin dansan finm” (more information is needed as it is always helpful) (FGD, 40 years old female)

The lamentation over traditional beliefs by the participants demonstrates that some community members have realized that some cultural beliefs such as restriction to eggs or any chicken product as well as negative attitude towards woman decision making work against good nutrition and are ready to give them up. Also the revelation of such food restrictions show that there could be more strong rooted beliefs in the community that affect nutrition and health in general that need to be addressed. There is also a need for community education on practices that have an impact on health. The participants' desire for more information demonstrates further the readiness of the community to work towards good health.

5.2 CONCLUSIONS

- The study revealed child malnutrition prevalence of 19% which is higher than the national (15%) ASAL malnutrition level here in Kenya. This calls for mitigating steps such as enforcement of systems that address child malnutrition.
- Factors that played a key role in child malnutrition occurrence in this study include: child's mother being a housewife, child's mother having no formal education, head of the household being employed, mother's child having 7 or more children, child having poor appetite, husband making food decision within the household, money determining the food to be prepared or bought, buying or borrowing water for household use and absence of own pit latrine within the compound.
- Nutritional status of children aged 3-5 years in Kambi Odha sub-location, Isiolo county is also influenced by cultural practices/beliefs such as food taboo and rare consumption of easily accessible nutritious foods.

5.3 RECOMMENDATIONS

The high level of child malnutrition observed in this study is unacceptable and all effort must be put in place to reduce the prevalence.

- Ministry of health and other stakeholders to ensure building of pit latrines in every household as 16 % of the respondents did not have access to own pit latrine and whose 65% of the children were malnourished. Promotion and continued health education on best hygienic practice among the community. Fifty nine percent of children from households where hands were washed only when dirty were noted to be malnourished.
- Ministry of water and all stakeholders to focus on improving safe water access for consumption as well as for irrigation. Twenty two percent of the respondents did not have adequate water for household use whose 56% of the children were malnourished. Lack of adequate water can lead to poor hygiene resulting to exposure to repeated water related diseases.
- It would be important to conduct larger studies utilizing other research designs in order to identify the actual magnitude of child malnutrition in a larger area in Isiolo county.

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APPENDICES

Appendix 1: Informed consent (English version)

Introduction

My name is Sophia N. Karienyeh, a Masters student at JKUAT, School of Public Health. I am inviting you to take part in a study about the factors associated with nutritional status of children aged 3-5 years of Kambi Odha Sub-location of Isiolo County.

Purpose

The purpose of this study is to determine the factors associated with child nutritional status.

Procedures

If you agree to be in this study, and sign this consent form, I will describe the questions you will be asked including their purpose. The questions will take about 35 minutes of your time. Also weight and height of the index child will be taken and recorded. The child will be in her/his light clothing for accurate measurements. A weighing scale and height board will be used. You are free not to answer any question you do not feel like answering. You are also free to decline, or withdraw from the study at anytime without any penalty.

Benefits and Risks

The benefit of this study is that you will be helping us understand the factors contributing to child nutritional status. The risks to you for taking part in the study are discomfort involved while assessing the child and the time used during interview.

Confidentiality and Compensation nature of the study

No name will be written on the questionnaire but will be assigned numbers instead. All information will be treated confidentially and be used only for this study. You will receive no money for participating in this exercise.

Contact

For anyone who would have any question regarding the study may contact the researcher through 0723742298, email: sophiakarienyeh@yahoo.com **OR**

The Chairperson, Kenyatta National Hospital/ University of Nairobi Ethical Review and Research Committee, Telephone: 254-20-2726300 Extension 43102.

Consent

I have read and understood the above information and have received answers to any question I asked. I voluntarily consent to take part in this study.

Signature/Thumb of participant

Date.....

Name of Researcher/Assistant

Date

Appendix 2: Ridhaa (Kiswahili version)

Utangulizi

Jina langu ni Sophia N. Karienyeh, mwanafunzi Uzamili katika JKUAT. Mimi nawakaribisha kushiriki katika utafiti. Utafiti wangu ni kuhusu mambo yanayohusiana na hali ya lishe ya watoto wenye umri wa miaka 3-5 ya Kambi Odha eneo kata la Isiolo.

Sababu

Utafiti huu ni kuhusu mambo yanayohusiana na hali ya marisho ya watoto.

Utaratibu

Ukikubali kuhusika ni takuelezea kuhusu utafiti huunitaenda kueleza kuhusu utafiti. Maswalihii itachukua muda wa dakika 25- 35 tu ya muda wako.Kupima usito na urefu ya mtoto wako pia ya husika na utafiti huu.Mtoto mwenyewe anabidi awe namafasi nyepesi ilikupata michamenti kamili. Kushiriki katika utafiti nihiari na tafadhali jisikie huru kuuliza mimi swali lolote unaweza kuwa kuhusu utafiti huo. Uko huru kushiriki aukutoshiriki kwautafiti huu mbira fainiyoyote.

Manufaa na hatari

Faida ya utafiti huu ni kwamba utakuwa kutusaidia kuelewa sababu za kuchangia mtoto lishe.Hatari kwa ajili ya kushiriki katika utafitini usumbufu kushiriki wakati kutathmini mtoto na wakati kutumika wakati wa mahojiano.

Siri na malipo

Hakuna jina itakuwa imeandikwa juu ya dodoso lakini utawekwa namba badala yake. Taarifa zote zitashughulikiwa kwa siri na kutumiwakuhusu utafiti huu.Hakuna malipo kutokana na kushiriki katika utafiti huu.

Masiliano

Kwa mtu yeyote ambaye angekuwa na swali lolote kuhusu utafiti huo,Wasiliana nami kwa 0723742298, email: sophiakarienyeh@yahoo.com au Kenyatta National Hospital/University of Nairobi Ethical Review and Research Committee, simu: 254-20-2726300, Extension 43102

Kibali

Nimesoma na kuelewa maelezo kuhusu utafiti huu. Mdadisi ameeleza vyema na kujibu maswali ninazo kwa sasa. Nakubali kushiriki kwa hiari yangu mwenyewe.

Sahihi/Kidole ya Mshiriki.....

Tarehe.....

Sahihi ya Mtafiti.....

Tarehe

Appendix 3: Barnanot gaffi (Borana version)

Jedepih uffi

Maqah Sophia N. Karienyeh, urah scular JKUAT. Yaathi soma tanah guthinih gargar batechin wan afya ilman kenah yakeh 3-5 gan agam es qubat Kambi Odha Sub-Location, Isiolo county. Galat qabthan ka somah tiyah tan kess Jiratan. Gamachu qabthan ka yaath kan daget, Gubah afya ilman kenah

Wan ojapah

Somipih wohi wan nanah deffeh nafah

Wan gunphemn

Galat qabthan ka somah tiyah tan kess Jiratan. Gamachu qabthan ka yaath kan daget, Gubah afya ilman kenah. Somipih kibimo deriin na bao bima. Daima kuna e kana den wayah sawahsawah. Balehum inojtean yoh kanini phuphu baghepin kayu inathban.

Faida wan depapan

Qarqarffa wohi wan nanah daima deffeh nafah

Po eoh hah anah imbeasanifi

Maqah tokolen kayu dahehn injiruh amaleh tepu kana ojumsu chapsan yoyuh iran thebian yofeteh odhu kenu inthitha.

Wan hi barbartha

Yo wanuh qafechu fete qabthe, egerileh fulan isan it na argachu thathetan 0723742298 email, sophiakarienyeh@yahoo.com yo kanin Kenyatta National Hospital/University of Nairobi, 254-20-2726300 extension 43102.

Gaffi

Wan arin isani gafede qubb quyu chuf yaken taariqi quay suni leeh.

Qub kena

Tariqi

Qub kuyah gudha

Tariqi

Makah nam taf korah

Tariqi

Appendix 4: Questionnaire (English version)

Factors associated with nutritional status of children aged 3-5 years of kambi odha sub-location of Isiolo county, Kenya

Date: (Day/Month/Year)-----/----- /-----

Number of Questionnaire

Socio-demographic and economic data

Code of the index child.....

1) How old are you.....?

2) What is your relationship with index child?

Mother 1 Aunt 2 Sister 3 Other Specify.....4

3) Sex of the index Child.....

4) Position of the index child.....

5) What type of education have you attained?

Formal 1 Non-formal 2 Others Specify.....3

6) What do you do for a living?

Housewife 1 Self-employed 2 Others Specify..... 3

7) Religion of the respondent?

Muslim 1 Christian 2 Hindu 3 Others Specify..... 4

8) How many children do you have?

Between 1-2 1 3-4 2 5-6 3 Above 7 4

9) What is your marital status?

Married 1 Divorced/widowed 2 Other Specify.....3

10) How many people live in this household?

2-4 1 5-7 2 8-9 3 Above10 4

11) What is the occupation of the head of the household?

Business 1 Formal employment 2 Others Specify.....3

Health related data

12) What is the immunization status of the child ?

Fully immunized 1 Incomplete 2 Others Specify..... 3 If incomplete why?

13) Where do you seek assistance when you or your family member is sick?

Public health facility 1 Traditional healer 2 Church 3
Use herb 4 Others Specify..... 5

14) What mode of transport do you use to get to the nearest health facility?

On foot 1 Car/motor bike 2 Others Specify..... 3

15) How far is your nearest health facility?

1km 1 2km 2 3- 4km 3 5-10km 4

Feeding practices data

16) How many times do you give food to this child?

On demand 1 2 times a day 2 3-4 times a day 3
Others Specify..... 4

17) Does your child have any problem related to food?

Allergy 1 Diabetic 2 Others Specify 3

18) How would you describe your child's appetite?

Not good 1 Good 2 Other Specify.....3

19) What is the main source of the dominant food item consumed in the household ?

Purchases 1 Own production 2 Emergency food program
Other Specify.....4

20) Who if anyone, affects your decisions on what foods to buy or meals to make?

Husband 1 Children 2 Others Specify.....3

21) What if anything, affects your decisions on what foods to buy or meals to make?

Money 1 Distance to market 2 Availability in the market 3

Others Specify..... 4

22) Do you serve the child in the same plate with other children?

Yes 1 No 2

23) Are there some practices within your community that prevent you from giving your child certain foods?

Yes 1 No 2

24) If Yes, which foods.....

25) Is there inequitable allocation of food between a boy child and a girl within the household (quality and quantity)

Yes 1 No 2 If yes, why.....

Water consumption & sanitation data

26) Where do you get water for your household?

Tap 1 River 2 Borehole 3 Other Specify4

27) How far is the water source?

Within my compound 1 1km 2 2-5km 3

More than 5km 4

28) Is the water enough for your household use? YES 1 NO 2

29) If No, what do you do?

30) What is done to water before household members drink the water?

Nothing 1 chlorine treatment 2 Other Specify.....3

31) Where do members of your household relieve themselves?

Own pit latrine 1 Neighbor's pit latrine 2 Other Specify3

32) On what occasion do you wash your hands?

After toilet 1 Before eating 2 Before cooking 3

When dirty 4 Others Specify..... 5

Anthropometric measurements for the index child

33) Weight of the index child..... (KG)

34) Height of the index child..... (CM)

35) Age of the index child..... (YRS)

Appendix 5: Gafih qorah afresitoh (Questionnaire in Borana)

Wohi wan nanah deffeh nafah daima 3-5 gan agam es qubat kambi odha sub-location, Isiolo county, Kenya

Tariqi

Gafih gaphatan –maro

Codhi daima.....

1) Gan agam.....?

(2) Ilm kanna mantat? Aad Arera Aad

Yowaandibiitatuf im

(3) Ilmikunnda loota namba agam.....?

(4) Yojirat sagale tam.....?

(5) Soma esgeet? Primary secondary college/university

Dibiinjiratim.....?

(6) Ujiwomatuqabtha? Ojatu manna ujibeshara nam
obru Dibii jed.....?

(7) Diniin te tam ? Muslim Christo Hindu

Dibii im.....?

(8) Ijole agamqabth.....? Jidhu gan 1-2 ka 3-4 ka
5-6 torbguba

(9) Takuma sifuudani? Yanafudan yagagarban
takuma nafuun narradhue

(10) Nam agammi mann keeti gal? 2-4 5-7 8-9
kudanguba

(11) Aban olla maan ojjat? Orri tis Obruabur besharaojjat
sirkalojjat Dibiin jirat im.....?

(12) Garami qarqars argatan, yo nammi ke sirafaya dab yokhan atinuu fayadabth? Sibital
chiness kanisa qors mukha Dibiiim.....?

(13) Kara kamin sibalta isani diat getaan? Babur bisqili
kareta Yokaradibiinjiraat im.....?

(14) Sibitali agam isan ira fago? km tokk km lamm km sadhi-
affur km shan-kudan kudani oll

(15) Sagale tesan ta issan gutho nyattan garami argatan? Qotiqotan
Imbittan wandibijjiran
sagalemusaadha Yogarum dibii argatan im.....?

(16) Enut waan isan bitatan yokhan daabatan isani yathat? Abboti warra
ijole biy dibi

(17) Maant yaadh kesan ka sagale daabatan yokhan bitatan fa bethel? Bese fageen
gabaya waan ethu gabaya gurguran Yodibi jirat im.....?

(18) Ilm kaan sahan takat ijolen waltgololchita?

eyyeh iyo

(19) War kesan keesa adhani ilm sagale garri dowart jirti ? Eyye iyo

(20) Wannu ilmi diratif kadubra golol waldabarsan fa jirti mann ke kes? Eyyeh
iyo Yojirat manif.....?

(21) Faydabi guthan ilmi keeti kam? Qando kah damoch
Yodibin jirat im.....?

(22) Ilm keh kaan nyatt isa kasagale ira maanjeet? Hama dansa
hammanin Yo akidibin jirat im.....?

(23) Ilmi keh dib sagale irradow fa qabba? Alaji sokari
Dibidibinjiratim.....?

(24) Ilmi keh talala obafate? Yaobafa t chuf in obafan

(25) Ilmi keh dirr mo dubr? Dirr dubr

Matumisibisanitifwaangarawarakeesa

(26) Bisan mann keeti esawarrabat? Mfereji lan eel madho
Yogaridibin jirat im.....?

(27) Fulan bisan warabatanif agam isanirra fago? Bolothumkes km tok
km lamm-shani km shanirr

(28) Bisan isan argatan matumisi gara wara isani gaani?

Eyyeh Iyo

(29) Yo bisan isani ingeen akam tatan.....?

(30) Bisan maan tochtan atho indune?Womu in owis
indimbiib qors it naq Yoakidibinjirim im
.....?

(31) Issan essa tharabfatan? Choo teen choo jirani rassa
Yo garidibi jirat im.....?

(32) Yo kam fa arkh diqatan? Yochoogathebie adho in gololfane
adhosagaleindamne Yo arkiturinaqab yo waktin dibin jirat
Im.....?

Bimiti daima

(33) Kilo daima.....(KG)

(34) Deriin daima..... (CM)

(35) Gan daima.....(YRS)

Appendix 6: Focus group discussion guide consent (English version)

Factors associated with nutritional status of children aged 3-5 years of kambi odha sub-location of Isiolo county, Kenya

Introduction

My name is Sophia Karienyeh. May I welcome you to this session and also thank you for participating where I seek to get your perception towards child nutritional needs. Please note that there is no right or wrong response to any of the issues I will raise. The purpose of this study is to determine the factors contributing to poor health of our children. The information you give is completely confidential and we do not associate your name with anything that you say in the group. With your permission we would like to tape group's information so that we make sure that we capture the right opinion, ideas and thoughts. No names will be attached to the responses and the tape will be destroyed as soon the information is transcribed. You may decline to answer any question. We understand the importance of privacy and confidentiality so we ask all the participants to respect each other confidentiality. Soft drink and a snack will be provided during the session. If you have any question now or after you can contact me through 0723742298 email:sophiakarienyeh@yahoo.com

Or Kenyatta National Hospital/ University of Nairobi Ethical Review and Research Committee; Telephone 254-20-2726300 Extension 43102

The purpose and procedures of this discussion are clear to me and I voluntarily consent to take part in this discussion.

Age of participant

Level of education of the participant

Signature of participant

Date

Thumb print

Date

Name of Researcher/Assistant

Date

Appendix 7: Mwongozo wa Kulenga Majadiliano Ya Kikundi (Kiswahili version)

Hali ya lishe ya watoto wenye umri wa miaka 3-5 ya kambi odhaeneo kata la Isiolo, Kenya.

Utangulizi

Asante kwa ajili ya kukubali kushiriki katika utafiti huu na sisi nia yetu ni kusikia maoni yako kuhusu afya ya watoto wetu. Madhumuni ya utafiti huu ili kujua sababu zinazochangia maskini afya ya watoto wetu. Kutoa habari ni siri kabisa na hatuna sababu kuliunga jina lako na kitu chochote kwamba unasema katika kundi. Kwa ruhusa yako tungependa habari mkanda wa kundi hilo ili tuweze kuhakikisha kwamba sisi tutakamata haki maoni na mawazo. Hakuna majina itawekwakwa majibu. Itakuwa masharti majibu na mkanda kuangamizwa kwa haraka baada ya kutumika. Unaweza kushuka kujibu swali lolote. Tunafahamu umuhimu wa faragha na uaminifu ili tunaomba washiriki wote kuheshimu kila usiri wa mwengine. Kinyuaji na snacki tutanghalamia wakati wa wamjadara. Kama una swali lolote sasa au baadaye, unaweza kuwasiliana na mimi kwa kupitia 0723742298 email: sophiakarienyeh@yahoo.com au Kenyatta National Hospital/ University of Nairobi ,simu: 254-20-2726300 Extension 43102.

Nimesoma na kuelewa maelezo kuhusu utafiti huu. Mtafiti ameeleza vyema na kujibu maswali ninazo kwa sasa. Nakubali kushiriki kwa hiari yangu mwenyewe.

Umuri wa mshiriki.....

Kiwango ya masomo ya mshirika

Sahihi ya mshiriki

Tarehe.....

Kidole.....

Tarehe.....

Sahihi ya Mtafiti.....

Tarehe.....

Appendix 8: Gubah namah tafih tan koree(Borana language version)

Wohi wan nanah deffeh nafah daima 3-5 gan agam es qubat kambu odha sub-location, Isiolo county, Kenya

Jedepih uffi

Galat qabthan ka somah tiyah tan kess Jiratan. Gamachu qabthan ka yaath kan daget, Gubah afya ilman kenah. Yaathi soma tanah guthinih gargar batechin wan afya ilman kenah yakeh. Odhaun atinih kentuh kabisumh dosah jirti amale makah kakeh indahani fulah tokoleti. Rusah atirin Odhu fanah tafili fena. Maqah tokolen kayu dahehn injiruh amaleh tepu kana ojumsu chapsan yoyuh iran thebian yofeteh odhu kenu inthitha. Yo wanuh qafechu fete qabthe, egerileh fulan isan it na argachu thathetan 0723742298 email, sphiakarienyeh@yahoo.com yo kanin Kenyatta National Hospital/ University of Nairobi, 254-20-2726300 ext.43102.

Wan arin isani gafede qubb quyu chuf yaken taariqi quay suni leeh.

Gan kena

Soma esgreet kena

.....

Qub kena

.....

Tariqi

.....

.....

Qub kuyah gudha

Tariqi

.....

.....

Makah nam taf korah

Tariqi

Appendix 9: Focus Group Discussion guide

Factors associated with nutritional status of children aged 3-5 years in kambi odha sub-location of Isiolo county, Kenya

Introduction

Thank you every one once again for coming. Having understood the purpose and procedures of our discussion let's now take 5 minutes and have our snacks and then proceed with the discussion.

Knowledge

Q1) What does the word nutrition mean to you and what do you know about nutrition?

Probe:

- Where did you get this information about nutrition from?
- Why should you care about your family's nutritional needs?

Attitude

Q2) Think about what you already know about food, cooking and healthy eating,

Probe:

- Thinking about any concerns you have for your family, how important do you feel nutrition is?
- What did you like or not like about the way you received this information?
- Do you think you need more information on the same?

Q3) Many people have had challenges when providing food, others had times when their food money has not lasted as long as needed. If this has ever happened to you, what challenges and can you describe the situation?

Probe:

- If so, what caused this to happen?
- What did you do when this happened?
- Are you aware of and have you ever used emergency food programs?

Practice

Q4) Women are almost always the primary caregivers of their young children and are closely involved with the quality of feeding, exposure to diseases and care in general. What as women can we do to ensure that our children eat and live healthy?

Probe:

-Are there self-help groups in the community? Are you a member?

-Any other income generating activity?

-Any activity to help you top up the food in household (growing of vegetables in bags/kitchen garden using water from the kitchen)?

Practice

Q5) Think about if you have ever tried to change the way you and your family live and eat/drink. If you have ever tried to do so, what did you change?

Probe:

-What made you want to change?

-How did you try to make this change?

-Is there anything about the food you buy/cook and life style you would like to change?

Attitude

Q6) Some people feel they need more information on better food choices/cooking, hygienic habits and the effect on health. What do you think on getting more information on this and why?

Probe:

-What other information do you think will be helpful to you and your family?

Closing remark

And on that note, we have come to the end of this discussion. Thank you very much for your time and contributions. Thank you.

Appendix 10: WHO Child Growth Standard
Charts

Height-for-age GIRLS
2 to 5 years (z-scores)



| Year | Month | Month | L | M | S | SD | -3 SD | -2 SD | -1 SD | Median | 1 SD | 2 SD | 3 SD |
|------|-------|-------|---|----------|---------|---------|-------|-------|-------|--------|-------|-------|-------|
| 2: | 0 | 24 | 1 | 85.7153 | 0.03764 | 3.2267 | 76.0 | 79.3 | 82.5 | 85.7 | 88.9 | 92.2 | 95.4 |
| 2: | 1 | 25 | 1 | 86.5904 | 0.03786 | 3.22783 | 76.8 | 80.0 | 83.3 | 86.6 | 89.9 | 93.1 | 96.4 |
| 2: | 2 | 26 | 1 | 87.4462 | 0.03808 | 3.3300 | 77.5 | 80.8 | 84.1 | 87.4 | 90.8 | 94.1 | 97.4 |
| 2: | 3 | 27 | 1 | 88.2830 | 0.03830 | 3.3812 | 78.1 | 81.5 | 84.9 | 88.3 | 91.7 | 95.0 | 98.4 |
| 2: | 4 | 28 | 1 | 89.1004 | 0.03851 | 3.4313 | 78.8 | 82.2 | 85.7 | 89.1 | 92.5 | 96.0 | 99.4 |
| 2: | 5 | 29 | 1 | 89.8991 | 0.03872 | 3.4809 | 79.5 | 82.9 | 86.4 | 89.9 | 93.4 | 96.9 | 100.3 |
| 2: | 6 | 30 | 1 | 90.6797 | 0.03893 | 3.5302 | 80.1 | 83.6 | 87.1 | 90.7 | 94.2 | 97.7 | 101.3 |
| 2: | 7 | 31 | 1 | 91.4430 | 0.03913 | 3.5782 | 80.7 | 84.3 | 87.9 | 91.4 | 95.0 | 98.6 | 102.2 |
| 2: | 8 | 32 | 1 | 92.1906 | 0.03933 | 3.6259 | 81.3 | 84.9 | 88.6 | 92.2 | 95.8 | 99.4 | 103.1 |
| 2: | 9 | 33 | 1 | 92.9239 | 0.03952 | 3.6724 | 81.9 | 85.6 | 89.3 | 92.9 | 96.6 | 100.3 | 103.9 |
| 2: | 10 | 34 | 1 | 93.6444 | 0.03971 | 3.7186 | 82.5 | 86.2 | 89.9 | 93.6 | 97.4 | 101.1 | 104.8 |
| 2: | 11 | 35 | 1 | 94.3533 | 0.03989 | 3.7638 | 83.1 | 86.8 | 90.6 | 94.4 | 98.1 | 101.9 | 105.6 |
| 3: | 0 | 36 | 1 | 95.0515 | 0.04006 | 3.8078 | 83.6 | 87.4 | 91.2 | 95.1 | 98.9 | 102.7 | 106.5 |
| 3: | 1 | 37 | 1 | 95.7399 | 0.04024 | 3.8526 | 84.2 | 88.0 | 91.9 | 95.7 | 99.6 | 103.4 | 107.3 |
| 3: | 2 | 38 | 1 | 96.4187 | 0.04041 | 3.8963 | 84.7 | 88.6 | 92.5 | 96.4 | 100.3 | 104.2 | 108.1 |
| 3: | 3 | 39 | 1 | 97.0885 | 0.04057 | 3.9389 | 85.3 | 89.2 | 93.1 | 97.1 | 101.0 | 105.0 | 108.9 |
| 3: | 4 | 40 | 1 | 97.7493 | 0.04073 | 3.9813 | 85.8 | 89.8 | 93.8 | 97.7 | 101.7 | 105.7 | 109.7 |
| 3: | 5 | 41 | 1 | 98.4015 | 0.04089 | 4.0236 | 86.3 | 90.4 | 94.4 | 98.4 | 102.4 | 106.4 | 110.5 |
| 3: | 6 | 42 | 1 | 99.0448 | 0.04105 | 4.0658 | 86.8 | 90.9 | 95.0 | 99.0 | 103.1 | 107.2 | 111.2 |
| 3: | 7 | 43 | 1 | 99.6795 | 0.04120 | 4.1068 | 87.4 | 91.5 | 95.6 | 99.7 | 103.8 | 107.9 | 112.0 |
| 3: | 8 | 44 | 1 | 100.3058 | 0.04135 | 4.1476 | 87.9 | 92.0 | 96.2 | 100.3 | 104.5 | 108.6 | 112.7 |
| 3: | 9 | 45 | 1 | 100.9238 | 0.04150 | 4.1883 | 88.4 | 92.5 | 96.7 | 100.9 | 105.1 | 109.3 | 113.5 |
| 3: | 10 | 46 | 1 | 101.5337 | 0.04164 | 4.2279 | 88.9 | 93.1 | 97.3 | 101.5 | 105.8 | 110.0 | 114.2 |
| 3: | 11 | 47 | 1 | 102.1360 | 0.04179 | 4.2683 | 89.3 | 93.6 | 97.9 | 102.1 | 106.4 | 110.7 | 114.9 |
| 4: | 0 | 48 | 1 | 102.7312 | 0.04193 | 4.3075 | 89.8 | 94.1 | 98.4 | 102.7 | 107.0 | 111.3 | 115.7 |

WHO Child Growth Standards

Height-for-age BOYS

2 to 5 years (z-scores)



| Year: Month | Month | L | M | S | SD | -3 SD | -2 SD | -1 SD | Z-scores (height in cm) | Median | 1 SD | 2 SD | 3 SD |
|-------------|-------|---|----------|---------|--------|-------|-------|-------|-------------------------|--------|-------|-------|-------|
| 2: 0 | 24 | 1 | 87.1161 | 0.03507 | 3.0551 | 78.0 | 81.0 | 84.1 | 87.1 | 90.2 | 93.2 | 96.3 | 97.3 |
| 2: 1 | 25 | 1 | 87.9720 | 0.03542 | 3.1160 | 78.6 | 81.7 | 84.9 | 88.0 | 91.1 | 94.2 | 97.3 | 98.3 |
| 2: 2 | 26 | 1 | 88.8065 | 0.03576 | 3.1757 | 79.3 | 82.5 | 85.6 | 88.8 | 92.0 | 95.2 | 98.3 | 99.3 |
| 2: 3 | 27 | 1 | 89.6197 | 0.03610 | 3.2353 | 79.9 | 83.1 | 86.4 | 89.6 | 92.9 | 96.1 | 99.3 | 100.3 |
| 2: 4 | 28 | 1 | 90.4120 | 0.03642 | 3.2928 | 80.5 | 83.8 | 87.1 | 90.4 | 93.7 | 97.0 | 100.3 | 101.3 |
| 2: 5 | 29 | 1 | 91.1828 | 0.03674 | 3.3501 | 81.1 | 84.5 | 87.8 | 91.2 | 94.5 | 97.9 | 101.2 | 102.1 |
| 2: 6 | 30 | 1 | 91.9327 | 0.03704 | 3.4052 | 81.7 | 85.1 | 88.5 | 91.9 | 95.3 | 98.7 | 102.1 | 103.0 |
| 2: 7 | 31 | 1 | 92.6631 | 0.03733 | 3.4591 | 82.3 | 85.7 | 89.2 | 92.7 | 96.1 | 99.6 | 103.0 | 103.9 |
| 2: 8 | 32 | 1 | 93.3753 | 0.03761 | 3.5118 | 82.8 | 86.4 | 89.9 | 93.4 | 96.9 | 100.4 | 103.9 | 104.8 |
| 2: 9 | 33 | 1 | 94.0711 | 0.03787 | 3.5625 | 83.4 | 86.9 | 90.5 | 94.1 | 97.6 | 101.2 | 104.8 | 105.6 |
| 2:10 | 34 | 1 | 94.7532 | 0.03812 | 3.6120 | 83.9 | 87.5 | 91.1 | 94.8 | 98.4 | 102.0 | 105.6 | 106.4 |
| 2:11 | 35 | 1 | 95.4236 | 0.03836 | 3.6604 | 84.4 | 88.1 | 91.8 | 95.4 | 99.1 | 102.7 | 106.4 | 107.2 |
| 3: 0 | 36 | 1 | 96.0835 | 0.03858 | 3.7069 | 85.0 | 88.7 | 92.4 | 96.1 | 99.8 | 103.5 | 107.2 | 108.0 |
| 3: 1 | 37 | 1 | 96.7337 | 0.03879 | 3.7523 | 85.5 | 89.2 | 93.0 | 96.7 | 100.5 | 104.2 | 108.0 | 108.8 |
| 3: 2 | 38 | 1 | 97.3749 | 0.03900 | 3.7976 | 86.0 | 89.8 | 93.6 | 97.4 | 101.2 | 105.0 | 108.8 | 109.5 |
| 3: 3 | 39 | 1 | 98.0073 | 0.03919 | 3.8409 | 86.5 | 90.3 | 94.2 | 98.0 | 101.8 | 105.7 | 109.5 | 110.3 |
| 3: 4 | 40 | 1 | 98.6310 | 0.03937 | 3.8831 | 87.0 | 90.9 | 94.7 | 98.6 | 102.5 | 106.4 | 110.3 | 111.0 |
| 3: 5 | 41 | 1 | 99.2459 | 0.03954 | 3.9242 | 87.5 | 91.4 | 95.3 | 99.2 | 103.2 | 107.1 | 111.0 | 111.7 |
| 3: 6 | 42 | 1 | 99.8515 | 0.03971 | 3.9651 | 88.0 | 91.9 | 95.9 | 99.9 | 103.8 | 107.8 | 111.7 | 112.5 |
| 3: 7 | 43 | 1 | 100.4485 | 0.03986 | 4.0039 | 88.4 | 92.4 | 96.4 | 100.4 | 104.5 | 108.5 | 112.5 | 113.2 |
| 3: 8 | 44 | 1 | 101.0374 | 0.04002 | 4.0435 | 88.9 | 93.0 | 97.0 | 101.0 | 105.1 | 109.1 | 113.2 | 113.9 |
| 3: 9 | 45 | 1 | 101.6186 | 0.04016 | 4.0810 | 89.4 | 93.5 | 97.5 | 101.6 | 105.7 | 109.8 | 113.9 | 114.6 |
| 3:10 | 46 | 1 | 102.1933 | 0.04031 | 4.1194 | 89.8 | 94.0 | 98.1 | 102.2 | 106.3 | 110.4 | 114.6 | 115.2 |
| 3:11 | 47 | 1 | 102.7625 | 0.04045 | 4.1567 | 90.3 | 94.4 | 98.6 | 102.8 | 106.9 | 111.1 | 115.2 | 115.9 |
| 4: 0 | 48 | 1 | 103.3273 | 0.04059 | 4.1941 | 90.7 | 94.9 | 99.1 | 103.3 | 107.5 | 111.7 | 115.9 | 116.6 |

WHO Child Growth Standards

Height-for-age BOYS 2 to 5 years (z-scores)



| Year: Month | Month | L | M | S | SD | -3 SD | -2 SD | -1 SD | Median | 1 SD | 2 SD | 3 SD |
|-------------|-------|---|----------|---------|--------|-------|-------|-------|--------|-------|-------|-------|
| 4: 1 | 49 | 1 | 103.8886 | 0.04073 | 4.2314 | 91.2 | 95.4 | 99.7 | 103.9 | 108.1 | 112.4 | 116.6 |
| 4: 2 | 50 | 1 | 104.4473 | 0.04086 | 4.2677 | 91.6 | 95.9 | 100.2 | 104.4 | 108.7 | 113.0 | 117.3 |
| 4: 3 | 51 | 1 | 105.0041 | 0.04100 | 4.3052 | 92.1 | 96.4 | 100.7 | 105.0 | 109.3 | 113.6 | 117.9 |
| 4: 4 | 52 | 1 | 105.5596 | 0.04113 | 4.3417 | 92.5 | 96.9 | 101.2 | 105.6 | 109.9 | 114.2 | 118.6 |
| 4: 5 | 53 | 1 | 106.1138 | 0.04126 | 4.3783 | 93.0 | 97.4 | 101.7 | 106.1 | 110.5 | 114.9 | 119.2 |
| 4: 6 | 54 | 1 | 106.6668 | 0.04139 | 4.4149 | 93.4 | 97.8 | 102.3 | 106.7 | 111.1 | 115.5 | 119.9 |
| 4: 7 | 55 | 1 | 107.2188 | 0.04152 | 4.4517 | 93.9 | 98.3 | 102.8 | 107.2 | 111.7 | 116.1 | 120.6 |
| 4: 8 | 56 | 1 | 107.7697 | 0.04165 | 4.4886 | 94.3 | 98.8 | 103.3 | 107.8 | 112.3 | 116.7 | 121.2 |
| 4: 9 | 57 | 1 | 108.3198 | 0.04177 | 4.5245 | 94.7 | 99.3 | 103.8 | 108.3 | 112.8 | 117.4 | 121.9 |
| 4:10 | 58 | 1 | 108.8689 | 0.04190 | 4.5616 | 95.2 | 99.7 | 104.3 | 108.9 | 113.4 | 118.0 | 122.6 |
| 4:11 | 59 | 1 | 109.4170 | 0.04202 | 4.5977 | 95.6 | 100.2 | 104.8 | 109.4 | 114.0 | 118.6 | 123.2 |
| 5: 0 | 60 | 1 | 109.9638 | 0.04214 | 4.6339 | 96.1 | 100.7 | 105.3 | 110.0 | 114.6 | 119.2 | 123.9 |

WHO Child Growth Standards

Weight-for-height BOYS

2 to 5 years (z-scores)



| Height (cm) | L | M | S | Z-scores (Weight in kg) | | | | | | |
|-------------|---------|---------|---------|-------------------------|-------|-------|--------|------|------|------|
| | | | | -3 SD | -2 SD | -1 SD | Median | 1 SD | 2 SD | 3 SD |
| 89.0 | -0.3521 | 12.6495 | 0.08045 | 10.0 | 10.8 | 11.7 | 12.6 | 13.7 | 14.9 | 16.3 |
| 89.5 | -0.3521 | 12.7683 | 0.08038 | 10.1 | 10.9 | 11.8 | 12.8 | 13.9 | 15.1 | 16.4 |
| 90.0 | -0.3521 | 12.8864 | 0.08032 | 10.2 | 11.0 | 11.9 | 12.9 | 14.0 | 15.2 | 16.6 |
| 90.5 | -0.3521 | 13.0038 | 0.08028 | 10.3 | 11.1 | 12.0 | 13.0 | 14.1 | 15.3 | 16.7 |
| 91.0 | -0.3521 | 13.1209 | 0.08025 | 10.4 | 11.2 | 12.1 | 13.1 | 14.2 | 15.5 | 16.9 |
| 91.5 | -0.3521 | 13.2376 | 0.08024 | 10.5 | 11.3 | 12.2 | 13.2 | 14.4 | 15.6 | 17.0 |
| 92.0 | -0.3521 | 13.3541 | 0.08025 | 10.6 | 11.4 | 12.3 | 13.4 | 14.5 | 15.8 | 17.2 |
| 92.5 | -0.3521 | 13.4705 | 0.08027 | 10.7 | 11.5 | 12.4 | 13.5 | 14.6 | 15.9 | 17.3 |
| 93.0 | -0.3521 | 13.5870 | 0.08031 | 10.8 | 11.6 | 12.6 | 13.6 | 14.7 | 16.0 | 17.5 |
| 93.5 | -0.3521 | 13.7041 | 0.08036 | 10.9 | 11.7 | 12.7 | 13.7 | 14.9 | 16.2 | 17.6 |
| 94.0 | -0.3521 | 13.8217 | 0.08043 | 11.0 | 11.8 | 12.8 | 13.8 | 15.0 | 16.3 | 17.8 |
| 94.5 | -0.3521 | 13.9403 | 0.08051 | 11.1 | 11.9 | 12.9 | 13.9 | 15.1 | 16.5 | 17.9 |
| 95.0 | -0.3521 | 14.0600 | 0.08060 | 11.1 | 12.0 | 13.0 | 14.1 | 15.3 | 16.6 | 18.1 |
| 95.5 | -0.3521 | 14.1811 | 0.08071 | 11.2 | 12.1 | 13.1 | 14.2 | 15.4 | 16.7 | 18.3 |
| 96.0 | -0.3521 | 14.3037 | 0.08083 | 11.3 | 12.2 | 13.2 | 14.3 | 15.5 | 16.9 | 18.4 |
| 96.5 | -0.3521 | 14.4282 | 0.08097 | 11.4 | 12.3 | 13.3 | 14.4 | 15.7 | 17.0 | 18.6 |
| 97.0 | -0.3521 | 14.5547 | 0.08112 | 11.5 | 12.4 | 13.4 | 14.6 | 15.8 | 17.2 | 18.8 |
| 97.5 | -0.3521 | 14.6832 | 0.08129 | 11.6 | 12.5 | 13.6 | 14.7 | 15.9 | 17.4 | 18.9 |
| 98.0 | -0.3521 | 14.8140 | 0.08146 | 11.7 | 12.6 | 13.7 | 14.8 | 16.1 | 17.5 | 19.1 |
| 98.5 | -0.3521 | 14.9468 | 0.08165 | 11.8 | 12.8 | 13.8 | 14.9 | 16.2 | 17.7 | 19.3 |
| 99.0 | -0.3521 | 15.0818 | 0.08185 | 11.9 | 12.9 | 13.9 | 15.1 | 16.4 | 17.9 | 19.5 |
| 99.5 | -0.3521 | 15.2187 | 0.08206 | 12.0 | 13.0 | 14.0 | 15.2 | 16.5 | 18.0 | 19.7 |
| 100.0 | -0.3521 | 15.3576 | 0.08229 | 12.1 | 13.1 | 14.2 | 15.4 | 16.7 | 18.2 | 19.9 |
| 100.5 | -0.3521 | 15.4985 | 0.08252 | 12.2 | 13.2 | 14.3 | 15.5 | 16.9 | 18.4 | 20.1 |

WHO Child Growth Standards

Weight-for-height BOYS 2 to 5 years (z-scores)



| Height (cm) | L | M | S | Z-scores (weight in kg) | | | | | | |
|-------------|---------|---------|---------|-------------------------|-------|-------|--------|------|------|------|
| | | | | -3 SD | -2 SD | -1 SD | Median | 1 SD | 2 SD | 3 SD |
| 113.0 | -0.3521 | 19.6185 | 0.08991 | 15.2 | 16.5 | 18.0 | 19.6 | 21.5 | 23.6 | 26.0 |
| 113.5 | -0.3521 | 19.8081 | 0.09022 | 15.3 | 16.6 | 18.1 | 19.8 | 21.7 | 23.9 | 26.3 |
| 114.0 | -0.3521 | 19.9990 | 0.09054 | 15.4 | 16.8 | 18.3 | 20.0 | 21.9 | 24.1 | 26.6 |
| 114.5 | -0.3521 | 20.1912 | 0.09085 | 15.6 | 16.9 | 18.5 | 20.2 | 22.1 | 24.4 | 26.9 |
| 115.0 | -0.3521 | 20.3846 | 0.09116 | 15.7 | 17.1 | 18.6 | 20.4 | 22.4 | 24.6 | 27.2 |
| 115.5 | -0.3521 | 20.5789 | 0.09147 | 15.8 | 17.2 | 18.8 | 20.6 | 22.6 | 24.9 | 27.5 |
| 116.0 | -0.3521 | 20.7741 | 0.09177 | 16.0 | 17.4 | 19.0 | 20.8 | 22.8 | 25.1 | 27.8 |
| 116.5 | -0.3521 | 20.9700 | 0.09208 | 16.1 | 17.5 | 19.2 | 21.0 | 23.0 | 25.4 | 28.0 |
| 117.0 | -0.3521 | 21.1666 | 0.09239 | 16.2 | 17.7 | 19.3 | 21.2 | 23.3 | 25.6 | 28.3 |
| 117.5 | -0.3521 | 21.3636 | 0.09270 | 16.4 | 17.9 | 19.5 | 21.4 | 23.5 | 25.9 | 28.6 |
| 118.0 | -0.3521 | 21.5611 | 0.09300 | 16.5 | 18.0 | 19.7 | 21.6 | 23.7 | 26.1 | 28.9 |
| 118.5 | -0.3521 | 21.7588 | 0.09331 | 16.7 | 18.2 | 19.9 | 21.8 | 23.9 | 26.4 | 29.2 |
| 119.0 | -0.3521 | 21.9568 | 0.09362 | 16.8 | 18.3 | 20.0 | 22.0 | 24.1 | 26.6 | 29.5 |
| 119.5 | -0.3521 | 22.1549 | 0.09393 | 16.9 | 18.5 | 20.2 | 22.2 | 24.4 | 26.9 | 29.8 |
| 120.0 | -0.3521 | 22.3530 | 0.09424 | 17.1 | 18.6 | 20.4 | 22.4 | 24.6 | 27.2 | 30.1 |

WHO Child Growth Standards

Weight-for-age GIRLS

Birth to 5 years (z-scores)



| Year: Month | Month | L | M | S | Z-scores (weight in kg) | | | | | | | | |
|-------------|-------|---------|---------|---------|-------------------------|-------|-------|--------|------|------|------|--|--|
| | | | | | -3 SD | -2 SD | -1 SD | Median | 1 SD | 2 SD | 3 SD | | |
| 2: 1 | 25 | -0.2975 | 11.6864 | 0.12414 | 8.2 | 9.2 | 10.3 | 11.7 | 13.3 | 15.1 | 17.3 | | |
| 2: 2 | 26 | -0.3005 | 11.8947 | 0.12441 | 8.4 | 9.4 | 10.5 | 11.9 | 13.5 | 15.4 | 17.7 | | |
| 2: 3 | 27 | -0.3032 | 12.1015 | 0.12472 | 8.5 | 9.5 | 10.7 | 12.1 | 13.7 | 15.7 | 18.0 | | |
| 2: 4 | 28 | -0.3057 | 12.3059 | 0.12506 | 8.6 | 9.7 | 10.9 | 12.3 | 14.0 | 16.0 | 18.3 | | |
| 2: 5 | 29 | -0.3080 | 12.5073 | 0.12545 | 8.8 | 9.8 | 11.1 | 12.5 | 14.2 | 16.2 | 18.7 | | |
| 2: 6 | 30 | -0.3101 | 12.7055 | 0.12587 | 8.9 | 10.0 | 11.2 | 12.7 | 14.4 | 16.5 | 19.0 | | |
| 2: 7 | 31 | -0.3120 | 12.9006 | 0.12633 | 9.0 | 10.1 | 11.4 | 12.9 | 14.7 | 16.8 | 19.3 | | |
| 2: 8 | 32 | -0.3138 | 13.0930 | 0.12683 | 9.1 | 10.3 | 11.6 | 13.1 | 14.9 | 17.1 | 19.6 | | |
| 2: 9 | 33 | -0.3155 | 13.2837 | 0.12737 | 9.3 | 10.4 | 11.7 | 13.3 | 15.1 | 17.3 | 20.0 | | |
| 2:10 | 34 | -0.3171 | 13.4731 | 0.12794 | 9.4 | 10.5 | 11.9 | 13.5 | 15.4 | 17.6 | 20.3 | | |
| 2:11 | 35 | -0.3186 | 13.6618 | 0.12855 | 9.5 | 10.7 | 12.0 | 13.7 | 15.6 | 17.9 | 20.6 | | |
| 3: 0 | 36 | -0.3201 | 13.8503 | 0.12919 | 9.6 | 10.8 | 12.2 | 13.9 | 15.8 | 18.1 | 20.9 | | |
| 3: 1 | 37 | -0.3216 | 14.0385 | 0.12988 | 9.7 | 10.9 | 12.4 | 14.0 | 16.0 | 18.4 | 21.3 | | |
| 3: 2 | 38 | -0.3230 | 14.2265 | 0.13059 | 9.8 | 11.1 | 12.5 | 14.2 | 16.3 | 18.7 | 21.6 | | |
| 3: 3 | 39 | -0.3243 | 14.4140 | 0.13135 | 9.9 | 11.2 | 12.7 | 14.4 | 16.5 | 19.0 | 22.0 | | |
| 3: 4 | 40 | -0.3257 | 14.6010 | 0.13213 | 10.1 | 11.3 | 12.8 | 14.6 | 16.7 | 19.2 | 22.3 | | |
| 3: 5 | 41 | -0.3270 | 14.7873 | 0.13293 | 10.2 | 11.5 | 13.0 | 14.8 | 16.9 | 19.5 | 22.7 | | |
| 3: 6 | 42 | -0.3283 | 14.9727 | 0.13376 | 10.3 | 11.6 | 13.1 | 15.0 | 17.2 | 19.8 | 23.0 | | |
| 3: 7 | 43 | -0.3296 | 15.1573 | 0.13460 | 10.4 | 11.7 | 13.3 | 15.2 | 17.4 | 20.1 | 23.4 | | |
| 3: 8 | 44 | -0.3309 | 15.3410 | 0.13545 | 10.5 | 11.8 | 13.4 | 15.3 | 17.6 | 20.4 | 23.7 | | |
| 3: 9 | 45 | -0.3322 | 15.5240 | 0.13630 | 10.6 | 12.0 | 13.6 | 15.5 | 17.8 | 20.7 | 24.1 | | |
| 3:10 | 46 | -0.3335 | 15.7064 | 0.13716 | 10.7 | 12.1 | 13.7 | 15.7 | 18.1 | 20.9 | 24.5 | | |
| 3:11 | 47 | -0.3348 | 15.8882 | 0.13800 | 10.8 | 12.2 | 13.9 | 15.9 | 18.3 | 21.2 | 24.8 | | |
| 4: 0 | 48 | -0.3361 | 16.0697 | 0.13884 | 10.9 | 12.3 | 14.0 | 16.1 | 18.5 | 21.5 | 25.2 | | |

WHO Child Growth Standards

Weight-for-age GIRLS

Birth to 5 years (z-scores)



| Year: Month | Month | L | M | S | Z-scores (weight in kg) | | | | | | | | |
|-------------|-------|---------|---------|---------|-------------------------|-------|-------|--------|------|------|------|--|--|
| | | | | | -3 SD | -2 SD | -1 SD | Median | 1 SD | 2 SD | 3 SD | | |
| 4: 1 | 49 | -0.3374 | 16.2511 | 0.13968 | 11.0 | 12.4 | 14.2 | 16.3 | 18.8 | 21.8 | 25.5 | | |
| 4: 2 | 50 | -0.3387 | 16.4322 | 0.14051 | 11.1 | 12.6 | 14.3 | 16.4 | 19.0 | 22.1 | 25.9 | | |
| 4: 3 | 51 | -0.3400 | 16.6133 | 0.14132 | 11.2 | 12.7 | 14.5 | 16.6 | 19.2 | 22.4 | 26.3 | | |
| 4: 4 | 52 | -0.3414 | 16.7942 | 0.14213 | 11.3 | 12.8 | 14.6 | 16.8 | 19.4 | 22.6 | 26.6 | | |
| 4: 5 | 53 | -0.3427 | 16.9748 | 0.14293 | 11.4 | 12.9 | 14.8 | 17.0 | 19.7 | 22.9 | 27.0 | | |
| 4: 6 | 54 | -0.3440 | 17.1551 | 0.14371 | 11.5 | 13.0 | 14.9 | 17.2 | 19.9 | 23.2 | 27.4 | | |
| 4: 7 | 55 | -0.3453 | 17.3347 | 0.14448 | 11.6 | 13.2 | 15.1 | 17.3 | 20.1 | 23.5 | 27.7 | | |
| 4: 8 | 56 | -0.3466 | 17.5136 | 0.14525 | 11.7 | 13.3 | 15.2 | 17.5 | 20.3 | 23.8 | 28.1 | | |
| 4: 9 | 57 | -0.3479 | 17.6916 | 0.14600 | 11.8 | 13.4 | 15.3 | 17.7 | 20.6 | 24.1 | 28.5 | | |
| 4: 10 | 58 | -0.3492 | 17.8686 | 0.14675 | 11.9 | 13.5 | 15.5 | 17.9 | 20.8 | 24.4 | 28.8 | | |
| 4: 11 | 59 | -0.3505 | 18.0445 | 0.14748 | 12.0 | 13.6 | 15.6 | 18.0 | 21.0 | 24.6 | 29.2 | | |
| 5: 0 | 60 | -0.3518 | 18.2193 | 0.14821 | 12.1 | 13.7 | 15.8 | 18.2 | 21.2 | 24.9 | 29.5 | | |

WHO Child Growth Standards

Appendix 11: Letter of Study Approval



UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
(254-020) 2726300 Ext 44355

09 SEP 2015

KNH/UON-ERC
Email: uonknh_erc@uonbi.ac.ke
Website: <http://www.erc.uonbi.ac.ke>
Facebook: <https://www.facebook.com/uonknh.erc>
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC



KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/381

9th September 2015

Sophia N. Karienyé
TM310-2077/20144
JKUAT

Dear Sophia

RESEARCH PROPOSAL –FACTORS ASSOCIATED WITH THE NUTRITIONAL STATUS OF CHILDREN AGED 3-5 YEARS IN KAMBI ODHA SUB-LOCATION OF ISIOLO COUNTY, KENYA (P471/07/2015)

This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and **approved** your above proposal. The approval periods are 9th September 2015 – 8th September 2016.

This approval is subject to compliance with the following requirements:

- a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
- b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation.
- c) Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH/UoN ERC within 72 hours of notification.
- d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH/UoN ERC within 72 hours.
- e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
- f) Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.
- g) Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.

For more details consult the KNH/UoN ERC website <http://www.erc.uonbi.ac.ke>

Protect to discover

Appendix12: Letter for community entry permission

REPUBLIC OF KENYA
THE PRESIDENCY
MINISTRY OF INTERIOR & CO-ORDINATION OF
NATIONAL GOVERNMENT

Telegrams 'DISTRICTER' Isiolo
Telephone: Isiolo 064 -52011
isiolocc@yahoo.com
Fax :064 - 52160
When replying please quote



OFFICE OF THE
COUNTY COMMISSIONER,
ISIOLO COUNTY,
P.O. BOX 3 - 60300,
ISIOLO.

Ref: No. ADM.15/19 VOL.III/73
and dates

DATE: 25th September, 2015

The Assistant Chief,
KAMBI ODHA SUB-LOCATION.

RE: RESEARCH AUTHORIZATION – SOPHIA N. KARIENYE
(TM310-2077/20144)

The above named person is a student from JKUAT.

This office has allowed her to carry out research on factors associated with nutritional status of children aged 3-5 years in your Sub-Location from 25th September, 2015 to 8th September, 2016.

Any assistance given to her will be highly appreciated.

A handwritten signature in black ink is written over a blue rectangular stamp. The stamp contains the text 'DEPUTY COUNTY COMMISSIONER' and 'ISIOLO SUB - COUNTY' in white capital letters.

Hassan Hokicha,
For: Deputy County Commissioner,
ISIOLO SUB-COUNTY.

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FACTORS ASSOCIATED WITH THE NUTRITIONAL STATUS OF CHILDREN AGED 3-5 YEARS IN KAMBI ODHA SUB-LOCATION OF ISIOLO COUNTY, KENYA

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S. KARIENYEE, D. MAKWORO and J. MUTAI

ABSTRACT

Background: Nutritional status of an individual depends on whether or not one is getting correct amounts and types of the required nutrients failure to which malnutrition develops. Malnutrition remains a public health concern as it affects a great number of children globally.

Objectives: To assess nutritional status, identify associated factors with nutritional status.

Design: A cross-sectional study.

Setting: Rural community living in Kambi Odha Sub-location of Isiolo County, Kenya.

Subjects: One hundred and ninety six children aged 3-5 years.

Results: Eighteen percent, nine percent and two percent were stunted, underweight, wasted respectively. Factors significantly associated with poor nutritional status were the child's mother being a housewife (OR 6.7; 95% CI 1.3-19.9, p=0.0006), child's mother having no education (OR 6.2; 95% CI 1.8-21.4, p=0.0040), head of the household being employed (OR 3.3; 95% CI 1.3-8.2, p=0.0116), mother's child having seven or more children (OR 6.6; 95% CI 1.7-26.4, p=0.0236), child having poor appetite (OR 3.3; 95% CI 1-8, p=0.0285), spouse determining the food to be bought or prepared in the household (OR 7.1; 95% CI 2.7-18.7, p< 0.0001), money determining the food to be prepared or bought (OR 8.7; 95% CI 3.4-22.1, p<0.0001), buying or borrowing water for household use (OR 4.8; 95% CI 1.7-13.9, p=0.0039) and absence of own pit latrine (OR 4.2; 95% CI 1.3-13.3, p=0.0155).

Conclusion: Child malnutrition continue to be a public health concern given that preventable factors such as environmental and family were demonstrated to have a higher association with nutritional status of the children.

INTRODUCTION

Malnutrition is the cellular imbalance between supply of nutrients and the body's demand for them to ensure growth, maintenance and specific functions (1). Causes of malnutrition include immediate and underlying causes. Immediate causes are inadequate food intake, improper feeding practices and infections such as diarrhoea, measles, respiratory infections and worm infestation. Insanitary environment, inadequate care of women and children, poor health service and cultural practices are all underlying causes of malnutrition. Malnutrition therefore occurs when there is prolonged discrepancy between food consumption and nutritional needs (1).

Malnutrition remains a public health concern globally as there are 42 million under five children

who are overweight, 99 million underweight, 51 million wasted and one in four children stunted globally (2). Malnutrition in children aged between three and five years affects both developed and developing countries. The first five years of life are critical stages for a child's growth and development and all necessary measures should be taken to prevent nutritional deficiencies during this period. Nutritional deficiencies cause permanent mental and physical impairment and even death leading to huge loss to individual children and massive loss to nations' development (2).

Numerous studies have reported alarming levels of malnutrition. A study in Netherlands on 75 children aged 3-5 years observed that 74.3% of these children had risk factors for cardio-vascular diseases due to malnutrition (3). A study carried out

from 2007-2010 on 42559 children aged 3-5 years in USA observed prevalence of obesity was highest among Hispanic (18.2% boys, 15.2% girls) followed by Blacks 12.4% boys, 12.7% girls (4). Prevalence of malnutrition was also observed by a study conducted in Hawassa, Southern Ethiopia on 358 children aged 36-60 months whereby underweight was 43.6%, stunting 53.1%, wasted 28.2% and overweight and obesity 10.7% (5). In Kenya, malnutrition is still a serious public health problem a study in Kisumu, on 196 children aged 3-5 years revealed 14.3% of the children were underweight, 3.6% wasting and 2.6% stunted (6). Another study on 304 children aged 3-5 years in Nairobi observed that underweight was at 16%, stunting 4.3% and 1% wasting (7). This current study was to identify the factors associated with the nutritional status of the children.

MATERIALS AND METHODS

This community based cross-sectional study was approved by Ethics Review and Research Committee at Kenyatta National Hospital / University of Nairobi on 9th September, 2015. Data collection was conducted after community entry permission was granted by the area administrators and having consent from mothers / guardians of the children aged 3-5 years who met the inclusion criteria.

A sample size of 196 was arrived at using Fisher's Formula, Confidence level at 95%, Error Margin at 5% and malnutrition Prevalence of 15%. The villages were simple randomly selected. Systematic random Sampling Method was then used to select the households. If a household was found to have more than one eligible child all the children were included in the study so as to give every child same chance of being selected. Also children living in the same household may have different or varying nutritional status depending on the contributing factors.

A Researcher administered Questionnaire was used to collect data. It captured socio-demographic, socio-cultural, socio-economic information and anthropometric measurements. Weight was taken and recorded using a weighing scale (Seca gmbin model). Height was taken and recorded using a portable wooden and calibrated scale. The children were in light clothing during anthropometric measurements taking. Age of the index child was asked from mother / guardian and whenever available verified by means of birth certificate or immunisation card.

Statistical analysis: The data collected were coded and entered into a computer database (MS-Excel). Data collected were then exported to Statistical Analysis System software (SAS, version 9.2). Descriptive statistics were used to explain descriptive aspects of the study. Anthropometric data was analyzed using z-score charts recommended by WHO Test (2006). Odds Ratio (OR) with their respective 95%

confidence interval (CI) was used to estimate the strength of association between independent variables and dependent variables. Chi-Square test was used for the relationship between the independent and dependent variables at 0.05 significance level.

Analysis of the data was limited to those children where the mother was the primary respondent to ensure that the responses given were relevant to the family of the index child. Nutritional status was defined by weight-for-age, height-for-age and weight-for-height. Normal nutritional status was defined as a weight-for-age, height-for-age or weight-for-height within 2 SD of the reference population using WHO charts. Poor nutritional status was defined as either weight-for-age or height-for-age or weight-for-height that were not $\pm 2SD$ of the reference population. Participants' characteristics were summarized using proportions. Chi square statistics were used to compare characteristics of children by nutritional status.

Logistic regression was used to determine factors associated with poor nutritional status. All variables at the 0.1 level of significance in the univariate analysis were included in the multivariate model. Using backward elimination criteria, variables that had a P value of <0.05 were retained. Variables that had zero cells in any cell in the nutritional comparison were excluded from the logistic regression. The variable significance was evaluated at $p < 0.05$ level.

RESULTS

Socio-demographic characteristics of children: Majority of children were, aged below 4 years (54%), female (53%), 4th-10th in their family's birth order (54%) (Table 1). *Characteristics of mothers of the children:* Majority of their mothers were of the Muslim faith (97%), married (95%), housewives (54%) and had some formal education (91%). Majority of respondents had 3-4 children in the household (50%) and 5-7 people in the household (61%) (Table 2).

Nutritional status of children as determined by Height-for-Age: Majority of children (158; 82%) were within 2 SD of the recommended Height-for-Age while the others were below 2Z scores (34; 18%) or above 2Z scores (1; 0%) for recommended Height-for-Age (Figure 1).

Nutritional status of the children as determined by Weight-for-Age: Majority of children were within 2 SD of the recommended weight-for-age (176; 91%) while the others were below 2Z scores (17; 9%) for recommended weight-for-age (Figure 2).

Nutritional status of children as determined by Weight-for-Height: Majority of children were within 2 SD of the recommended weight-for-height (190; 98%) while the others were below 2Z scores (3; 2%) for recommended weight-for-height (Figure 3).

Table 1
Socio demographic Characteristics of children

| Characteristic | n=193 | % |
|-------------------------------|-------|----|
| Socio –demographic & economic | | |
| Age group | | |
| 3yrs- 3yrs & 11 months | 105 | 54 |
| 4 yrs -5 yrs | 88 | 46 |
| Gender | | |
| Male | 91 | 47 |
| Female | 102 | 53 |
| Birth order | | |
| 1st born | 15 | 8 |
| 2nd & 3rd born | 74 | 38 |
| 4th -10th | 104 | 54 |

Table 2
Characteristics of mothers of children aged 3-5 years who participated in the study

| Characteristic | n=193 | % |
|-------------------------------------|-------|----|
| Mother's education | | |
| None | 17 | 9 |
| Some education | 176 | 91 |
| Mother's occupation | | |
| Housewife | 104 | 54 |
| Self/formerly employed | 89 | 46 |
| Religion of the mother | | |
| Muslim | 188 | 97 |
| Christian | 5 | 3 |
| Marital status of the mother | | |
| Married | 183 | 95 |
| Divorced/Widowed | 10 | 5 |
| Occupation of the house-hold | | |
| Business | 120 | 62 |
| Employed | 73 | 38 |
| No. Of children in household | | |
| 1-2 | 36 | 19 |
| 3-4 | 97 | 50 |
| 5-6 | 35 | 18 |
| 7 & Above | 25 | 13 |
| No. of people living in a household | | |
| -4 | 34 | 18 |
| 5-7 | 117 | 61 |
| 8-9 | 31 | 16 |
| 10 & Above | 11 | 6 |

Figure 1
Nutritional status of children as determined by Height-for-Age

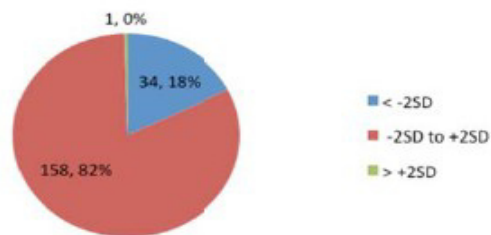


Figure 2
Nutritional Status as Determined by Weight-for-Age

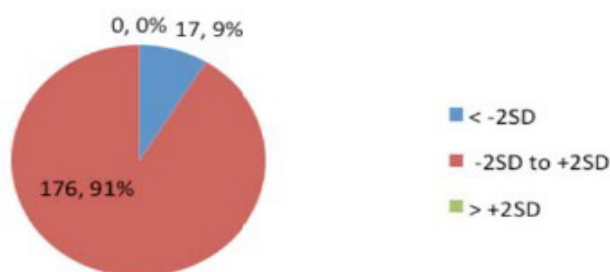
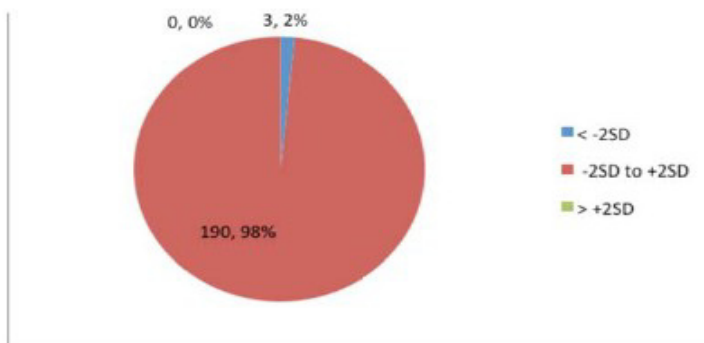


Figure 3
Nutritional Status as Determined by Weight-for-Height



Factors associated with poor nutritional status among children aged 3-5 years living in Kambi Odha Sub-location, Isiolo County, Kenya, 2015.

Socio-demographic factors: Participants whose mothers had no education were six times more likely to be malnourished compared to those whose mothers had some education (OR 6.2, 95% CI 1.8-21.4; p=0.0040). Similarly, participants whose mothers were housewives were six times more likely to be malnourished compared to those whose mothers were self-employed or formally employed

(OR 6.7, 95% CI 1.3-19.9; p=0.0006). Participants who lived in homes where the head of the household was employed were three times more likely to be malnourished compared to those who lived in homes where the head of the household was engaged in business (OR 3.3, 95% CI 1.3-8.2; p=0.0116). Similarly, participants from homes where there were seven or more children in a household were six times more likely to be malnourished compared to participants from a homes where there were only one or two children (OR 6.6, 95% CI 1.7-26.4; p=0.0236) (Table 3).

Table 3
Socio-demographic factors associated with poor nutritional status

| Characteristic | Malnourished/ Total 37/193 (19%) n/N (%) | COR | P value | AOR | P value |
|--|--|-----------------|----------|----------------|---------|
| Socio-demographic and Economic | | | | | |
| Age group | | | | | |
| 3 yrs-3yrs and 11 months | 20/105 (19) | 1.0 (0.5-2.1) | 0.9621 | | |
| 4 yrs- 5 yrs | 17/88 (19) | Ref | | | |
| Gender | | | | | |
| Male | 18/91 (20) | 1.0 (0.5-2.2) | 0.8391 | | |
| Female | 19/102 (19) | Ref | | | |
| Birth order | | | | | |
| 1st born | 4/15 (27) | Ref | 0.4342 | | |
| 2nd& 3rd born | 11/74 (15) | 0.5 (0.1-1.8) | | | |
| 4th -10th born | 22/104 (21) | 0.7 (0.2-2.5) | | | |
| Mother's Education | | | | | |
| None | 11/17 (65) | 3.6 (10.6-31.1) | <0.0001* | 6.2 (1.8-21.4) | 0.0040 |
| Some education | 26/176 (15) | Ref | | | |
| Mother's Occupation | | | | | |
| Housewife | 32/104 (31) | 7.5 (2.8-20.2) | <0.0001* | 6.7 (1.3-19.9) | 0.0006 |
| Self/formally Employed | 5/89 (6) | Ref | | | |
| Religion of mother | | | | | |
| Muslim | 36/188 (19) | 1.1 (0.1-9.7) | 0.9691 | | |
| Christian | 1/5 (20) | Ref | | | |
| Marital status of mother | | | | | |
| Married | 35/183 (19) | 1.1 (0.2-5.2) | 0.9455 | | |
| Widowed/ Divorced | 2/10 (20) | Ref | | | |
| Occupation of the household head | | | | | |
| Business | 18/120 (15) | Ref | | | |
| Employed | 19/73 (26) | 2.0 (1.0-4.1) | 0.0591* | 3.3 (1.3-8.2) | 0.0116 |
| No. of children in household | | | | | |
| 1-2 | 8/36 (22) | Ref | 0.0020* | Ref | 0.0236 |
| 3-4 | 12/97 (12) | 0.5 (0.2-1.3) | | 1.1 (0.3-3.5) | |
| 5-6 | 5/35 (14) | 0.6 (0.2-2.0) | | 1.8 (0.4-7.5) | |
| ≥7 | 12/25 (48) | 3.2 (1.1-9.8) | | 6.6 (1.7-26.4) | |
| No. of people living in household | | | | | |
| 2-4 people | 8/34 (24) | Ref | 0.0188* | | |
| 5-7 people | 16/117 (14) | 0.5 (0.2-1.3) | | | |
| 8-9 people | 7/31 (23) | 0.9 (0.3-3.0) | | | |
| ≥10 people | 6/11 (55) | 3.9 (0.9-16.2) | | | |

*Variables that were significant at 0.1 level in the univariate analysis that were included in the multivariate model

Feeding practices: Participants who had poor appetite were three times more likely to be malnourished compared to those who had good appetite (OR 3.3, 95% CI 1.1-8.1, p=0.0285). Where food decisions were determined by spouse (as opposed to

where food decisions were influenced by children's needs) children were seven times more likely to be malnourished (OR 7.1, 95% CI 2.7-18.7, p<0.0001). Similarly, where food decisions were determined by money (as opposed to where food decisions were determined by food availability or distance to the market) children were eight times more likely to be malnourished (OR 8.7, 95% CI 3.4-22.1, p<0.0001)

(Table 4).

Water and sanitation practices: Participants whose mothers borrowed or bought their household water were four times more likely to be malnourished compared to those that their mothers used tap

water (OR 4.8, 95% CI 1.7-13.9, $p=0.0039$). Similarly, participants who did not have their own pit latrine were four times more likely to be malnourished compared to those who had their own pit latrine (OR 4.2, 95% CI 1.3-13.3, $p=0.0155$) (Table 5).

Table 4
Feeding practices associated with poor nutritional status

| Characteristics | Malnourished/ Total 37/193 (19%) n/N (%) | COR | P value | AOR | P value |
|---|--|-----------------|----------|----------------|---------|
| Feeding practices | | | | | |
| No. of daily feeds given to child | | | | | |
| On demand | 3/48 (6) | Ref | <0.0001* | | |
| 3-4 | 13/107 (12) | 2.1 (0.6-7.7) | | | |
| 2 | 21/38 (55) | 18.5 (4.9-70.2) | | | |
| Child's appetite | | | | | |
| Not good | 12/37 (32) | 1.1 (2.5-5.6) | 0.0226* | 3.3 (1.1-8.1) | 0.0285 |
| Good | 25/156 (16) | Ref | | | |
| Who determines food decisions | | | | | |
| Spouse | 19/30 (63) | 13.9 (5.7-33.9) | <0.0001* | 7.1 (2.7-18.7) | <0.0001 |
| Children | 18/163 (11) | Ref | | | |
| What determines food decisions | | | | | |
| Money | 28/73 (63) | 4.7 (3.4-17.5) | <0.0001* | 8.7 (3.4-22.1) | <0.0001 |
| Distance to or availability in market | 9/120 (11) | Ref | | | |
| Mode of serving | | | | | |
| Communal | 28/59 (47) | 12.5 (5.4-29.3) | <0.0001* | | |
| Individual | 9/134 (7) | Ref | | | |
| Traditional/ religion | | | | | |
| Practices that affect food consumption# | | | | | |
| Present | 36/188 (19) | Ref | 0.9619 | | |
| Absent | 1/5 (20) | 1.1 (0.1-9.7) | | | |

* Variables that were significant at 0.1 level in the univariate analysis that were included in the multivariate model

Table 5
Water and sanitation practices associated with poor nutritional status

| Characteristics | Malnourished/ Total 37/193 (19%) n/N (%) | COR | P value | AOR | P value |
|---|--|-----------------|----------|----------------|---------|
| Water consumption and sanitation | | | | | |
| Source of household water | | | | | |
| Tap | 13/150 (9) | Ref | <0.0001* | Ref | |
| Borrow or buy | 24/43 (56) | 13.3 (5.8-30.2) | | 4.8 (1.7-13.9) | 0.0039 |
| Distance to water source | | | | | |
| Within the compound | 13/150 (9) | Ref | <0.0001* | | |
| 1 km | 24/43 (56) | 13.3 (5.8-30.2) | | | |
| Water supply | | | | | |
| Adequate | 13/150 (9) | Ref | <0.0001* | | |
| Inadequate | 24/43 (56) | 13.3 (5.8-30.2) | | | |
| Toilet facilities | | | | | |
| Own pit latrine | 17/162 (11) | Ref | <0.0001* | Ref | 0.0155 |
| Neighboring pit latrine | 20/31 (65) | 15.5 (6.4-37.8) | | 4.2 (1.3-13.3) | |
| When hand-washing is done | | | | | |
| After visiting the toilet | | | | | |
| and before cooking | 24/171 (14) | Ref | <0.0001* | | |
| When dirty | 13/22 (59) | 8.8 (3.4-22.9) | | | |

* Variables that were significant at 0.1 level in the univariate analysis that were included in the multivariate model

DISCUSSION

Child malnutrition is an indication of deprivation of nutrients in children and it remains a public health threat. The malnutrition prevalence of this study was 18% (stunted), 9% (underweight) and 2% (wasted). Various factors were found to be associated with poor nutritional status of these children.

Participants whose mothers had no education were six times more likely to be malnourished compared with those whose mothers had some education. Similarly, participants whose mothers were housewives were six times more likely to be malnourished compared to those whose mothers were self-employed or formally employed. Also participants from homes where there were seven or more children in a household were six times more likely to be malnourished compared to participants from homes where there were only one or two children.

Feeding practices were also found to be associated with poor nutritional status. Participants who had poor appetite were three times more likely to be malnourished compared to those who had good appetite. Where food decisions were determined by spouse as opposed to where food decisions were influenced by children's needs, the children were found to be seven times more likely to be malnourished. Similarly, where food decisions were determined by money as opposed to where food decisions were determined by food availability or distance to the market, children were eight times more likely to be malnourished.

Water and sanitation practices of the participants were found to be associated with poor nutritional status. Participants whose mothers borrowed or bought their household water were four times more likely to be malnourished compared to those that their mothers used tap water. Similarly, participants who did not have their own pit latrine were four times more likely to be malnourished compared to those who had their own pit latrine.

It is worth noting that the study area is in Arid and Semi-Arid Lands (ASAL) region and this maybe one of the reasons why the children had higher prevalence of stunting. The findings concur with the WHO report that revealed child malnutrition as a global public health concern whereby the contributing factors are many, varied and multifaceted (1).

Poverty and inequity is associated with inadequate food, water, poor sanitation and hygiene that lead to increased infections and malnutrition in children. In this current study there was a significant relationship between household level and environmental factors and malnutrition with children from poorer households being more likely to suffer from malnutrition. In the study, 24(56%)

children out of 43 who were from households that did not have adequate water for their household use were found to be malnourished. Similarly, 20(65%) children out of 31 children who came from households that did not have own pit latrines were found to be malnourished. This finding concurs with previous studies regarding unhealthy environment and household level factors and child malnutrition (8, 9, 10). This relationship can be explained by the fact that rich people are in a position to afford good living conditions that improve child's healthy in general. According to UNICEF, efforts to reduce malnutrition depend on reducing poverty and raising peoples' living standards by improving the quality of homes, hygiene and sanitation (8).

Women are almost always the primary caregivers of infants and young children in developing countries and are closely involved with the quality of feeding, exposure to diseases and care of these children. Consequently under-nutrition results where women lack the capacity to support child nutrition (11). Additionally, where women have little control over how resources are allocated within the household, resources are less likely to be allocated to children's nutrition and health hence a negative impact on the nutrition and health of their children (12). There was a significant relationship in the current study between low status of women and the child malnutrition with the children whose mothers had no employment, education and had their spouses made decisions on the food to be bought or cooked being the mostly affected. 65% of children whose mothers had no education were found to be malnourished compared to only 15% of the children whose mothers had some education. Similarly, 63% of children from households where the food decisions were determined by the spouse were discovered to be malnourished as compared to 11% of children from households where the food decisions were influenced by children's needs. 31% of children whose mothers were housewives were found to be malnourished as opposed to only 6% of children whose mothers were self or formally employed.

In conclusion the study demonstrates that child malnutrition continues to be a public health problem. Factors identified as having significant association with nutritional status in the study ranged from environmental, family and child factors. For instance, lack of own pit latrine, having 10 and above members sharing the same household and poor child appetite respectively. Malnutrition has severe and even irreversible consequences, therefore effective strategies and interventions aimed at preventing, early diagnosis and management of child malnutrition ought to be put in place.

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